

# ***Red Hat Linux 6.1***

**The Official Red Hat Linux Reference Guide**

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Red Hat, Inc.  
2600 Meridian Parkway Durham NC 27709 US 919-547-0012 1-888-733-4281 919-547-0024  
docs@redhat.com 13588 Research Triangle Park NC 27713

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# Introduction

## Welcome

Welcome to the *Official Red Hat Linux Reference Guide*.

One of the newest publications from Red Hat, the *Official Red Hat Linux Reference Guide* contains useful information about your Red Hat Linux system. In fact, much of the information you'll find within can be extended to just about any Linux distribution. From fundamental concepts such as using RPM and Gnome-RPM to the finer points of using disk partitioning, we hope you'll find this book to be a valuable resource.

This guide is for you if you want to learn a bit more about how your Red Hat Linux system works. Among the featured entries, you'll learn about:

- Partitioning concepts -- Both an introduction to disk partitions and the strategies behind "finding a home" for more than one operating system on hard drives.
- Text mode installation -- Despite Red Hat Linux's GUI installation, you may want the control of a text mode install. Here's what you'll find, and what to expect.
- RPM -- From both the Gnome-RPM front-end to using RPM at the console.
- RAID concepts -- Take one disk drive, add another, and another... Make them appear as a single logical unit, and you've got power and performance.
- Post-installation configuration -- Want to do a little tweaking after the installation? Here's where you can get a start.

## Getting the Documentation That's Right for You

While the *Official Red Hat Linux Reference Guide* digs into more of the nuts and bolts of your Red Hat Linux system, it is critical to make sure you have documentation that is appropriate to your level of Linux expertise. Regardless of your experience with Linux, it can be easy to feel overwhelmed without the right documentation.

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Let's take a look at three categories of people using Red Hat Linux, and try to be more explicit in terms of the documentation you'll need. Let's start by figuring out your experience level. Here are the three basic categories:

### ***New to Linux***

Has never used any Linux (or Linux-like) operating system before, or has had only limited exposure to Linux. May or may not have experience using other operating systems (such as Windows). Is this you? If so, please turn to *Documentation For First-Time Linux Users*.

### ***Some Linux Experience***

Has installed and successfully used Linux (but not Red Hat Linux) before. Or, may have equivalent experience with other Linux-like operating systems. Does this describe you? If so, please turn to *For the More Experienced*.

### ***Old-Timer***

Has installed and successfully used Red Hat Linux before. Are you an old-timer? If so, please turn to *Documentation for Linux Gurus*.

## **Documentation For First-Time Linux Users**

"A journey of a thousand miles begins with a single step." This old saying can be applied to learning about your Red Hat Linux system. Learning to use a Linux system effectively can be a long, rewarding journey, in which you find that you can easily do things about which people with other operating systems can only dream. But like all journeys, you've got to start somewhere, and take that first step.

First, get yourself some documentation! This cannot be stressed enough; without documentation you will only become frustrated at your inability to get your Red Hat Linux system working the way you want.

Here's the sort of Linux documentation you should get your hands on:

- A brief history of Linux -- Many aspects of Linux are the way they are because of historical precedent. There is also a Linux culture that, again, is based to a great deal on past history. A bit of knowledge about the history of Linux will serve
-



you well, particularly as you interact with more experienced Linux users on the Internet.

- An explanation of how Linux works -- While it's not necessary to delve into the most arcane aspects of the Linux kernel, it's a good idea to know something about how Linux is put together. This is particularly important if you've been working with other operating systems; some of the assumptions you hold about how computers work may not transfer from that operating system to Linux. A few paragraphs that discuss how Linux works (and particularly how it differs from the operating system you're used to) can be invaluable in getting off to a good start with your Red Hat Linux system.
- An introductory command overview (with examples) -- This is probably the most important thing to look for in Linux documentation. The design philosophy behind Linux is that it's better to use many small commands connected together in different ways than it is to have a few large (and complex) commands that do the whole job themselves. Without some examples that illustrate the Linux approach to doing things, you will find yourself intimidated by the sheer number of commands available on your Red Hat Linux system.

Here is some additional direction that may help to match all of your requirements:

- Books -- *Linux for Dummies*, by John "maddog" Hall, published by IDG; *Using Linux*, by William H. Ball, published by Que; *Running Linux*, by Matt Welsh and Lar Kaufman, published by O'Reilly & Associates; *Red Hat Linux Secrets*, by Naba Barkakati, published by IDG.
  - Red Hat's website -- At our very own website (<http://www.redhat.com>), you'll find links to the Linux Documentation Project (LDP), the *Official Red Hat Linux Installation Guide*, the *Official Red Hat Linux Getting Started Guide* FAQs (Frequently Asked Questions), a database which can help you search for a Linux Users Group near you, a knowledgebase of information and more. In short, you'll find a wealth of information to help you get started.
  - Newsgroups -- Linux users are second to none when it comes to helping new users understand Linux. You can find dozens of Linux-related newsgroups on the Usenet, but a quick search through Deja.com (<http://www.deja.com>) shows:
-

- `linux.help`
- `linux.redhat`
- `linux.redhat.digest`
- `linux.redhat.misc`
- `linux.redhat.rpm`

Also, from the Deja.com website, you can frequently search for specific information from Linux newsgroups.

Continue reading the next section to find out more about the kinds of documentation that will help you at that point.

## For the More Experienced

If you've used other Linux distributions, you probably already have a basic grasp of the most frequently used commands. You may have installed your own Linux system, and maybe you've even downloaded and built software you found on the Internet. What sorts of information will you need?

- Task-oriented items -- Many times, you will find that you would like to configure your Red Hat Linux system in a certain way, but you're not sure where to begin. In this case, it's often a big help to see what others in similar circumstances have done. This is where the Linux Documentation Project (also known as the LDP) can come in handy. Each of their HOWTOs document a particular aspect of Linux, from low-level kernel esoterica, to using Linux for amateur radio station work.

If you selected one of the various HOWTO packages when you installed Red Hat Linux, you'll find the HOWTOs on your system in `/usr/doc/HOWTO`.

## Documentation for Linux Gurus

If you're a long-time Red Hat Linux user, you probably already know that the following pretty much says it all when it comes to documentation:

*Use the Force -- Read the source!*

---

There are times when you'll just have to sit there and look at the sources to understand things. Fortunately, because of the freely available nature of Linux, it's easy to get the sources. Now if it were only that easy to understand them...

## **More to Come**

The *Official Red Hat Linux Reference Guide* is part of the Red Hat's growing commitment to provide useful and timely support to Red Hat Linux users. Future editions will feature expanded information on system administration, console tools and other resources to help you extend the power of your Red Hat Linux system -- and yourself.

That's also where you come in.

## **Send in Your Feedback**

If you'd like to make suggestions about the *Official Red Hat Linux Reference Guide*, please mention this guide's identifier:

RefGuide(EN)-6.1-Print-RHI (10/99)

You can send mail to:

`docs@redhat.com`

## **Sign Up for Support**

If you have an official edition of Red Hat Linux 6.1, please remember to sign up for the benefits you're entitled to as a Red Hat customer.

You'll be entitled to any or all of the following benefits, depending upon the Official Red Hat Linux product you purchased:

- Official Red Hat support -- Get help with your installation questions from Red Hat, Inc.'s support team.
- Priority FTP access -- No more late-night visits to congested mirror sites. Owners of Red Hat Linux 6.1 receive free access to `priority.redhat.com`, Red Hat's preferred customer FTP service, offering high bandwidth connections day and night.

- Red Hat Update Agent -- Receive e-mail directly from Red Hat as soon as updated RPMs are available. Use Update Agent filters to receive notification and quickly download updated packages about those subjects that interest you. Also receive -- automatically -- kernel updates, security updates and other packages.
- Under the Brim: The Official Red Hat E-Newsletter -- Every month, get the latest news and product information directly from Red Hat.

To sign up, go to <http://www.redhat.com/now>. You'll find your **Personal Product ID** on a red and white card in your Official Red Hat Linux box.

To sign up, go to [www.redhat.com/now](http://www.redhat.com/now). You'll find your **Personal Product ID** on the red and white card in your Official Red Hat Linux box. To read more about technical support for Official Red Hat Linux, refer to the Appendix in the Official Red Hat Linux Installation Guide.

Good luck, and thank you for choosing Red Hat Linux!!

*The Red Hat Documentation Team*

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## **Part I System-Related Reference**



# 1 Red Hat Linux 6.1 New Features

This chapter describes features that are new to Red Hat Linux 6.1.

## 1.1 Installation-related Enhancements

Red Hat Linux 6.1 includes a new graphical installation process in addition to the more traditional character-cell installation mode. Please read the *Official Red Hat Linux Installation Guide* for more information on our new installation technology.

## 1.2 System-Related New Features

There are many new features to Red Hat Linux 6.1 that are not just part of the installation process. Some new features are tools or applications that you can use, others are new versions of the kernel or desktop environments. This list is to provide a little more information about what to expect from Red Hat Linux 6.1 once you are actually using the OS itself.

- Automatic hardware detection on boot
- Linux 2.2.12 kernel
- Support for LDAP authentication
- Glibc 2.1.2
- XFree86 3.3.5
- Pentium and Pentium II optimized kernels
- Optional interactive boot sequence

Let's look at each feature in more detail.

### 1.2.1 Automatic hardware detection on boot

New to Red Hat Linux is Kudzu, a tool that automatically detects any new hardware on your system upon rebooting. A dialog box will appear identifying your new hardware and Kudzu will then ask if you would like to configure the hardware at that time. Kudzu

---

will make it both convenient and easy for you to install and configure new hardware components on your Red Hat Linux system.

### **1.2.2 Linux 2.2.12 kernel**

Red Hat Linux 6.1 includes the latest stable version of the 2.2.x Linux kernel.

### **1.2.3 Support for LDAP authentication**

LDAP (Lightweight Directory Access Protocol) is a directory service protocol designed to handle account information services. The protocol runs over Internet transport protocols, such as TCP, and can be used to access stand-alone directory servers or X.500 directories. The LDAP directory service is based on a client-server model.

### **1.2.4 Glibc 2.1.2**

The latest version of Glibc (version 2.1.2) is included in this Red Hat Linux release.

### **1.2.5 XFree86 3.3.5**

Red Hat Linux 6.1 contains the latest version of XFree86 (version 3.3.5 which supports many new drivers).

### **1.2.6 Pentium and Pentium II Optimized Kernels**

Pentium and Pentium II Optimized Kernels are now available in Red Hat Linux 6.1. These kernels have been recompiled for chip specific support.

### **1.2.7 Optional interactive boot sequence**

New to Red Hat Linux 6.1 is the ability to enter into an "interactive" mode upon booting and selecting which services are started individually. This is a helpful way of catching error messages or even changing the start-up services temporarily to test certain configurations you may have.

## **1.3 Miscellaneous New Features**

These new features defy categorization:

- Graphical PPP configuration tool
-



- KDE 1.1.1
- GNOME 1.0.15
- ISDN support

Let's look at each feature in more detail.

### **1.3.1 Graphical PPP configuration tool**

Configuring your PPP connection has never been easier with the introduction of RP3. Once running, RP3 can monitor connections to any network device that has been configured, as well as easily configure a new PPP connection.

### **1.3.2 KDE 1.1.1**

Also included in Red Hat Linux 6.1 is the most recent version of KDE. A very popular and powerful desktop environment, KDE offers a great graphical interface, window manager and more. New applets, tools and much more are included with this release of KDE.

### **1.3.3 GNOME 1.0.15**

The latest version of GNOME is included in this Red Hat Linux release. GNOME features a graphical interface which enables users to easily use and configure their systems. Enhancements to GNOME include many new applets, new control center tools, an improved file manager and login.

### **1.3.4 ISDN support**

ISDN connection support is now available in Red Hat Linux 6.1.

---



## 2 System Administration

This chapter is an overview of the Red Hat Linux system. It will illustrate aspects that you may not know about the system and things that are somewhat different from other UNIX systems.

### 2.1 Filesystem Structure

Red Hat is committed to the Linux File System Standard, a collaborative document that defines the names and locations of many files and directories. We will continue to track the standard to keep Red Hat Linux compliant.

While compliance with the standard means many things, the two most important are compatibility with other compliant systems, and the ability to mount the `/usr` partition read-only. The `/usr` partition contains common executables and is not meant to be changed by users. Because of this, the `/usr` partition can be mounted from the CD-ROM or from another machine via read-only NFS. The current Linux Filesystem Standard (FSSTND) document is the authoritative reference to any FSSTND compliant filesystem, but the standard leaves many areas undefined or extensible. In this section we provide an overview of the standard and a description of the parts of the filesystem not covered by the standard.

The complete standard can be viewed at:

<http://www.pathname.com/fhs/>

#### 2.1.1 Overview of the FSSTND

The directories and files noted here are a small subset of those specified by the FSSTND document. Check the latest FSSTND document for the most up-to-date and complete information.

##### The `/dev` Directory

The `/dev` directory contains file system entries which represent devices that are attached to the system. These files are essential for the system to function properly.

---

### The `/etc` Directory

The `/etc` directory is reserved for configuration files that are local to your machine. No binaries are to be put in `/etc`. Binaries that were in the past put in `/etc` should now go into `/sbin` or possibly `/bin`.

The `X11` and `skel` directories should be subdirectories of `/etc`:

```
/etc
|- X11
+- skel
```

The `X11` directory is for X11 configuration files such as `XF86Config`. The `skel` directory is for "skeleton" user files, which are files used to populate a home directory when a user is first created.

### The `/lib` Directory

The `/lib` directory should contain only those libraries that are needed to execute the binaries in `/bin` and `/sbin`.

### The `/proc` Directory

The `/proc` directory contains special files that either extract information or send information to the kernel. It is an easy method of accessing information about the operating system using the `cat` command.

### The `/sbin` Directory

The `/sbin` directory is for executables used only by the root user, and only those executables needed to boot and mount `/usr` and perform system recovery operations. The FSSTND says:

```
"/sbin typically contains files essential for booting the system in addition to the binaries in /bin. Anything executed after /usr is known to be mounted (when there are no problems) should be placed in /usr/sbin. Local-only system administration binaries should be placed into /usr/local/sbin."
```

At a minimum, the following programs should be in `/sbin`:

```
clock, getty, init, update, mkswap, swapon, swapoff, halt, reboot, shutdown, fdisk, fsck.*, mkfs.*, lilo, arp, ifconfig, route
```

---

## The /usr Directory

The /usr directory is for files that are shareable across a whole site. The /usr directory usually has its own partition, and it should be mountable read only. The following directories should be subdirectories of /usr:

```
/usr
|- X11R6
|- bin
|- dict
|- doc
|- etc
|- games
|- include
|- info
|- lib
|- local
|- man
|- sbin
|- share
+- src
```

The X11R6 directory is for the X Window System (XFree86 on Red Hat Linux), bin is for executables, doc is for random non-man-page documentation, etc is for site-wide configuration files, include is for C header files, info is for GNU info files, lib is for libraries, man is for man pages, sbin is for system administration binaries (those that do not belong in /sbin), and src is for source code.

## The /usr/local Directory

The FSSTND says:

"The /usr/local hierarchy is for use by the system administrator when installing software locally. It needs to be safe from being overwritten when the system software is updated. It may be used for programs and data that are shareable amongst a group of machines, but not found in /usr."

The /usr/local directory is similar in structure to the /usr directory. It has the following subdirectories, which are similar in purpose to those in the /usr directory:

---

```
/usr/local
| - bin
| - doc
| - etc
| - games
| - include
| - info
| - lib
| - man
| - sbin
+- src
```

### The /var Directory

Since the FSSTND requires that you be able to mount /usr read-only, any programs that write log files or need spool or lock directories probably should write them to the /var directory. The FSSTND states /var is for

"...variable data files. This includes spool directories and files, administrative and logging data, and transient and temporary files."

The following directories should be subdirectories of /var:

```
/var
| - log
| - catman
| - lib
| - local
| - named
| - nis
| - preserve
| - run
| - lock
| - tmp
+- spool
| - at
| - cron
| - lpd
| - mail
| - mqueue
| - rwho
| - smail
| - uucp
+- news
```

---

System log files such as `wtmp` and `lastlog` go in `/var/log`. The `/var/lib` directory also contains the RPM system databases. Formatted man pages go in `/var/catman`, and lock files go in `/var/lock`. The `/var/spool` directory has subdirectories for various systems that need to store data files.

### 2.1.2 `/usr/local` in Red Hat Linux

In Red Hat Linux, the intended use for `/usr/local` is slightly different from that specified by the FSSTND. The FSSTND says that `/usr/local` should be where you store software that is to remain safe from system software upgrades. Since system upgrades from Red Hat are done safely with the RPM system and Gnome-RPM, you don't need to protect files by putting them in `/usr/local`. Instead, we recommend you use `/usr/local` for software that is local to your machine.

For instance, let's say you have mounted `/usr` via read-only NFS from *beavis*. If there is a package or program you would like to install, but you are not allowed to write to *beavis*, you should install it under `/usr/local`. Later perhaps, if you've managed to convince the system administrator of *beavis* to install the program on `/usr`, you can uninstall it from `/usr/local`.

## 2.2 Special Red Hat File Locations

In addition to the files pertaining to the RPM system that reside in `/var/lib/rpm` (see Chapter 6, *Package Management with RPM*), there are two other special locations that are reserved for Red Hat Linux configuration and operation.

The control-panel and related tools put lots of stuff in `/usr/lib/rhs`. There is probably nothing here that you would want to edit. It is mostly small scripts, bitmaps and text files.

The other location, `/etc/sysconfig`, stores configuration information. The major users of the files in this directory are the scripts that run at boot time. It is possible to edit these by hand, but it would be better to use the proper control-panel tool.

## 2.3 Users, Groups and User-Private Groups

Managing users and groups has traditionally been tedious. Red Hat Linux has a few tools and conventions that make user and groups easier to manage, and more useful.

---

The easiest way to manage users and groups is through Linuxconf (see Chapter 3, *System Configuration*). However, you can also use `adduser` to create a new user from the command line.

### 2.3.1 Standard Users

In Table 2–1, *Standard Users*, you'll find the standard users set up by the installation process (this is essentially the `/etc/passwd` file). The group id (GID) in this table is the *primary group* for the user. See Section 2.3.3, *User Private Groups* for details on how groups are used.

**Table 2–1 Standard Users**

| User     | UID | GID | Home Directory       | Shell          |
|----------|-----|-----|----------------------|----------------|
| root     | 0   | 0   | /root                | /bin/bash      |
| bin      | 1   | 1   | /bin                 |                |
| daemon   | 2   | 2   | /sbin                |                |
| adm      | 3   | 4   | /var/adm             |                |
| lp       | 4   | 7   | /var/spool/lpd       |                |
| sync     | 5   | 0   | /sbin                | /bin/sync      |
| shutdown | 6   | 0   | /sbin                | /sbin/shutdown |
| halt     | 7   | 0   | /sbin                | /sbin/halt     |
| mail     | 8   | 12  | /var/spool/mail      |                |
| news     | 9   | 13  | /var/spool/news      |                |
| uucp     | 10  | 14  | /var/spool/uucp      |                |
| operator | 11  | 0   | /root                |                |
| games    | 12  | 100 | /usr/games           |                |
| gopher   | 13  | 30  | /usr/lib/gopher-data |                |



| User   | UID | GID | Home Directory | Shell |
|--------|-----|-----|----------------|-------|
| ftp    | 14  | 50  | /home/ftp      |       |
| nobody | 99  | 99  | /              |       |

### 2.3.2 Standard Groups

In Table 2–2, *Standard Groups*, you’ll find the standard groups as set up by the installation process (this is essentially the `/etc/group` file).

**Table 2–2 Standard Groups**

| Group  | GID | Members           |
|--------|-----|-------------------|
| root   | 0   | root              |
| bin    | 1   | root, bin, daemon |
| daemon | 2   | root, bin, daemon |
| sys    | 3   | root, bin, adm    |
| adm    | 4   | root, adm, daemon |
| tty    | 5   |                   |
| disk   | 6   | root              |
| lp     | 7   | daemon, lp        |
| mem    | 8   |                   |
| kmem   | 8   |                   |
| wheel  | 10  | root              |
| mail   | 12  | mail              |
| news   | 13  | news              |
| uucp   | 14  | uucp              |
| man    | 15  |                   |
| games  | 20  |                   |

| Group  | GID | Members |
|--------|-----|---------|
| gopher | 30  |         |
| dip    | 40  |         |
| ftp    | 50  |         |
| nobody | 99  |         |
| users  | 100 |         |
| floppy | 19  |         |

### 2.3.3 User Private Groups

Red Hat Linux uses a user private group (UPG) scheme, which makes UNIX groups much easier to use. The UPG scheme does not add or change anything in the standard UNIX way of handling groups. It simply offers a new convention for handling groups. Whenever you create a new user, by default, he or she has a unique group. The scheme works as follows:

#### *User Private Group*

Each user has its own primary group, of which only it is a member.

#### *umask = 002*

The traditional UNIX umask is 022, which prevents other users *and other members of a user's primary group* from modifying a user's files. Since every user has their own private group in the UPG scheme, this "group protection" is not needed. A umask of 002 will prevent users from modifying other users' private files. The umask is set in `/etc/profile`.

#### *setgid bit on Directories*

If you set the setgid bit on a directory (with `chmod g+s directory`), files created in that directory will have their group set to the directory's group.

Most computing sites like to create a group for each major project and assign people to the groups they need to be in. Managing files traditionally has been difficult, though, because when someone creates a file it is owned by the primary group he or she

---

belongs to. When a single person works on multiple projects, it becomes hard to make the files owned by the group that is associated with that project. In the UPG scheme, groups are automatically assigned to files on a project-by-project basis, which makes managing group projects very simple.

Let's say you have a big project called *devel*, with many people editing the *devel* files in a *devel* directory. Make a group called *devel*, `chgrp` the *devel* directory to *devel*, and add the all the *devel* users to the *devel* group. Now, all *devel* users will be able to edit the *devel* files and create new files in the *devel* directory, and these files will always retain their *devel* group. Thus, they will always be edit-able by other *devel* users.

If you have multiple projects like *devel*, and users who are working on multiple projects, these users will never have to change their `umask` or group when they move from project to project. The `setgid` bit on each project's main directory "selects" the proper group.

Since each user's `HOME` directory is owned by the user and their private group, it is safe to set the `setgid` bit on the `HOME` directory. However, by default, files are created with the primary group of the user, so the `setgid` bit would be redundant.

### User Private Group Rationale

Although UPG is not new to Red Hat Linux 6.1, many people still have questions about it, such as why UPG is necessary. The following is the rationale for the scheme.

- You'd like to have a group of people work on a set of files in say, the `/usr/lib/emacs/site-lisp` directory. You trust a few people to mess around in there, but certainly not everyone.
- So you enter:

```
chown -R root.emacs /usr/lib/emacs/site-lisp
```

and you add the proper users to the group.

- To allow the users to actually create files in the directory you enter:

```
chmod 775 /usr/lib/emacs/site-lisp
```

---

- But when a user creates a new file it is assigned the group of the user's default group (usually `users`). To prevent this you enter

```
chmod 2775 /usr/lib/emacs/site-lisp
```

which causes everything in the directory to be created with the "emacs" group.

- But the new file needs to be mode 664 for another user in the emacs group to be able to edit it. To do this you make the default umask 002.
- Well, this all works fine, except that if your default group is "users," every file you create in your home directory will be writable by everybody in "users" (usually everyone).
- To fix this, you make each user have a "private group" as their default group.

At this point, by making the default umask 002 and giving everyone a private default group, you can easily set up groups that users can take advantage of without doing any magic. Just create the group, add the users, and do the above `chown` and `chmod` on the group's directories.

## 2.4 Configuring Console Access

When normal (non-root) users log in to a computer locally, they are given two types of special permission; they can run certain programs that they would not otherwise be able to run, and they can access certain files (normally special device files used to access diskettes, CD-ROMS, etc.) that they would not otherwise be able to access.

Since there are multiple consoles on a single computer, and multiple users can be logged into the computer locally at the same time, one of the users has to "win" the fight to access the files. The first user to log in at the console owns those files. Once the first user logs out, the next user who logs in will own the files.

In contrast, *every* user who logs in on the console will be allowed to run programs normally restricted to the root user. By default, those programs will ask for the user's password. This will be done graphically if X is running which makes it possible to

---

make these actions menu items from within a graphical user interface. As shipped, the console-accessible programs are `shutdown`, `halt`, and `reboot`.

### 2.4.1 Disabling Console Program Access

In environments where the console is otherwise secured (BIOS and LILO passwords are set, [Ctrl]-[Alt]-[Delete] is disabled, the power and reset switches are disabled, etc.), it may not be desirable to allow arbitrary users at the console to run `shutdown`, `halt`, and `reboot`.

In order to disable all access by console users to console programs, you should run the command:

```
rm -f /etc/security/console.apps/*
```

### 2.4.2 Disabling All Console Access

In order to disable all console access, including program and file access, in the `/etc/pam.d/` directory, comment out all lines that refer to `pam_console.so`. The following script will do the trick:

```
cd /etc/pam.d
for i in * ; do
sed '/[^\#].*pam_console.so/s/^\#/' < $i > foo && mv foo $i
done
```

### 2.4.3 Defining the Console

The `/etc/security/console.perms` file defines the console group. The syntax of that file is very flexible, so it's possible to edit that file so that these instructions no longer apply. However, the default file has a line that looks like this:

```
<console>=tty[0-9][0-9]* :[0-9].[0-9] :[0-9]
```

When users log in, they are attached to some sort of named terminal, either an X server with a name like `:0` or `mymachine.example.com:1.0`; or a device like `/dev/tty0` or `/dev/pts/2`. The default is to define that local virtual consoles and local X servers are considered local, but if you want to consider the serial terminal next to you on port `/dev/ttyS1` to also be local, you can change that line to read:

---

```
<console>=tty[0-9][0-9]* :[0-9].[0-9] :[0-9] /dev/ttyS1
```

## 2.4.4 Making Files Console-Accessible

In `/etc/security/console.perms`, there is a section with lines like:

```
<cdrom>=/dev/cdrom
```

You can also add your own lines:

```
<scanner>=/dev/sga
```

(of course, make sure that `/dev/sga` is really your scanner and not, say, your hard drive).

That's the first part. The second part is to define what is done with those files. Look in the last section of `/etc/security/console.perms` for lines similar to:

```
<console> 0600 <cdrom> 0600 root
```

and add a line like:

```
<console> 0600 <scanner> 0600 root
```

Then when you log in at the console, you will be given ownership of the `/dev/sga` device and the permissions will be 0600 (readable and writable by you only). When you log out, the device will be owned by root and still have 0600 (now: readable and writable by root only) permissions.

## 2.4.5 Enabling Console Access for Other Applications

If you wish to make other applications besides `shutdown`, `reboot`, and `halt` accessible to console users, you will have to do just a little bit more work.

First of all, console access *only* works for applications which reside in `/sbin` or `/usr/sbin`, so the application that you wish to run must be there.

---

Create a link from the name of your application to the `/usr/bin/console-helper` application:

```
cd /usr/bin
ln -s consolehelper foo
```

Create the file `/etc/security/console.apps/foo`

```
touch /etc/security/console.apps/foo
```

Create a PAM configuration file for the `foo` service in `/etc/pam.d/`. We suggest that you start with a copy of the `shutdown` service, then change it if you want to change the behavior:

```
cp /etc/pam.d/shutdown /etc/pam.d/foo
```

Now, when you run `/usr/bin/foo`, it will call `consolehelper`, which with the help of `/usr/sbin/userhelper` will authenticate the user (asking for the user's password if `/etc/pam.d/foo` is a copy of `/etc/pam.d/shutdown`; otherwise, it will do precisely what is specified in `/etc/pam.d/foo`) and then run `/usr/sbin/foo` with root permissions.

## 2.5 The floppy Group

If, for whatever reason, console access is not appropriate for you, and you need to give non-root users access to your system's diskette drive, this can be done using the floppy group. Simply add the user(s) to the floppy group using the tool of your choice. Here's an example showing how `gpasswd` can be used to add user `fred` to the floppy group:

```
[root@bigdog root]# gpasswd -a fred floppy
Adding user fred to group floppy
[root@bigdog root]#
```

User fred will now be able to access the system's diskette drive (using the `mtools` utility programs, for instance).

## 2.6 User Authentication with PAM

Programs which give users access to privileges of any sort need to be able to authenticate the users. When you log into a system, you provide your name and password, and the login process uses those to authenticate the login -- to verify that you are who you say you are. Other forms of authentication than passwords are possible, and it is possible for the passwords to be stored in different ways.

PAM, which stands for "Pluggable Authentication Modules," is a way of allowing the system administrator to set authentication policy without having to recompile programs which do authentication. With PAM, you control how the modules are plugged into the programs by editing a configuration file.

Most Red Hat Linux users will never need to touch this configuration file. When you use RPM to install programs that need to do authentication, they automatically make the changes that are needed to do normal password authentication. However, you may want to customize your configuration, in which case you need to understand the configuration file.

### 2.6.1 PAM Modules

There are four types of modules defined by the PAM standard. `auth` modules provide the actual authentication, perhaps asking for and checking a password, and set "credentials" such as group membership or kerberos "tickets." `account` modules check to make sure that the authentication is allowed (the account has not expired, the user is allowed to log in at this time of day, etc.). `password` modules are used to set passwords. `session` modules are used once a user has been authenticated to make it possible for them to use their account, perhaps mounting the user's home directory or making their mailbox available.

These modules may be *stacked*, so that multiple modules are used. For instance, `rlogin` normally makes use of at least two authentication methods: if "rhosts" authentication succeeds, it is sufficient to allow the connection; if it fails, then standard password authentication is done.

---



New modules can be added at any time, and PAM-aware applications can then be made to use them. For instance, if you have a one-time-password calculator system, and you can write a module to support it (documentation on writing modules is included with the system), PAM-aware programs can use the new module and work with the new one-time-password calculators without being recompiled or otherwise modified in any way.

## 2.6.2 Services

Each program using PAM defines its own "service" name. The login program defines the service type `login`, `ftpd` defines the service type `ftpd`, etc. In general, the service type is the name of the program used to *access* the service, not (if there is a difference) the program used to *provide* the service.

## 2.6.3 The Configuration Files

The directory `/etc/pam.d` is used to configure all PAM applications. (This used to be `/etc/pam.conf` in earlier PAM versions; while the `pam.conf` file is still read if no `/etc/pam.d/` entry is found, its use is deprecated.) Each application (really, each *service*) has its own file. A file looks like this:

```
##PAM-1.0
auth      required /lib/security/pam_securetty.so
auth      required /lib/security/pam_pwdb.so shadow nullok
auth      required /lib/security/pam_nologin.so
account   required /lib/security/pam_pwdb.so
password  required /lib/security/pam_cracklib.so
password  required /lib/security/pam_pwdb.so shadow nullok use_authok
session   required /lib/security/pam_pwdb.so
```

The first line is a comment. (Any line that starts with a `#` character is a comment.) Lines two through four stack up three modules to use for login authorization. Line two makes sure that *if* the user is trying to log in as root, the tty on which they are logging in is listed in the `/etc/securetty` file *if* that file exists. Line three causes the user to be asked for a password and the password checked. Line four checks to see if the file `/etc/nologin` exists, and if it does, displays the contents of the file, and if the user is not root, does not let him or her log in.

---

Note that all three modules are checked, *even if the first module fails*. This is a security decision -- it is designed to not let the user know why their authentication was disallowed, because knowing why it was disallowed might allow them to break the authentication more easily. You can change this behavior by changing `required` to `requisite`; if any `requisite` module returns failure, PAM fails immediately without calling any other modules.

The fifth line causes any necessary accounting to be done. For example, if shadow passwords have been enabled, the `pam_pwdb.so` module will check to see if the account has expired, or if the user has not changed his or her password and the grace period for changing the password has expired.

The sixth line subjects a newly changed password to a series of tests to ensure that it cannot, for example, be easily determined by a dictionary-based password cracking program.

The seventh line (which may be wrapped) specifies that if the login program changes the user's password, it should use the `pam_pwdb.so` module to do so. (It will do so only if an `auth` module has determined that the password needs to be changed --- ie, if a shadow password has expired.)

The eighth and final line specifies that the `pam_pwdb.so` module should be used to manage the session. Currently, that module doesn't do anything; it could be replaced (or supplemented by stacking) by any necessary module.

Note that the order of the lines within each file matters. While it doesn't really matter much in which order `required` modules are called, there are other *control flags* available. While `optional` is rarely used, and never used by default on a Red Hat Linux system, `sufficient` and `requisite` cause order to become important.

Let's look at the `auth` configuration for `rlogin`:

```
auth required /lib/security/pam_securetty.so
auth sufficient /lib/security/pam_rhosts_auth.so
auth required /lib/security/pam_pwdb.so shadow nullok
auth required /lib/security/pam_nologin.so
```

That looks *almost* like the `login` entry, but there's an extra line specifying an extra module, and the modules are specified in a different order.

---

First, `pam_securetty.so` keeps root logins from happening on insecure terminals. This effectively disallows all root rlogin attempts. If you wish to allow them (in which case we recommend that you either not be Internet-connected or be behind a good firewall), you can simply remove that line.

Second, `pam_nologin.so` checks `/etc/nologin`, as specified above.

Third, if `pam_rhosts_auth.so` authenticates the user, PAM immediately returns success to rlogin without any password checking being done. If `pam_rhosts_auth.so` fails to authenticate the user, that failed authentication is ignored.

Finally (if `pam_rhosts_auth.so` has failed to authenticate the user), the `pam_pwdb.so` module performs normal password authentication.

Note that if you do not want to prompt for a password if the `securetty` check fails, you can change the `pam_securetty.so` module from `required` to `requisite`

## 2.6.4 Shadow Passwords

The `pam_pwdb.so` module will automatically detect that you are using shadow passwords and make all necessary adjustments. Please refer to Section 2.7, *Shadow Utilities* for more information.

## 2.6.5 Rexec and PAM

For security reasons, `rexec` is not enabled in Red Hat Linux 6.1. Should you wish to enable it, you will need to comment out one line in the file `/etc/pam.d/rexec`. Here is a sample of the file (note that your file may differ slightly):

```
##PAM-1.0
auth      required      /lib/security/pam_pwdb.so shadow nullok
auth      required      /lib/security/pam_nologin.so
account   required      /lib/security/pam_pwdb.so
```

To enable `rexec`, the line referring to the `pam_nologin.so` module must be commented out:

```
##PAM-1.0
auth      required      /lib/security/pam_pwdb.so shadow nullok
#auth     required      /lib/security/pam_nologin.so
```

---

```
account    required    /lib/security/pam_pwdb.so
```

After this file is modified, `rexec` will be enabled.

---

### Please Note

If your `/etc/pam.d/rexec` file contains a line referring to the `pam_securetty.so` module, you will not be able to `rexec` as root. To do so, you must also comment out the line referring to the `pam_securetty.so` module.

---

### More Information

This is just an introduction to PAM. More information is included in the `/usr/doc/pam*` directory, including a *System Administrators' Guide*, a *Module Writers' Manual*, an *Application Developers' Manual*, and the PAM standard, DCE-RFC 86.0. In addition, documentation is available from the Red Hat website, at <http://www.redhat.com/linux-info/pam/>.

## 2.7 Shadow Utilities

Support for shadow passwords has been enhanced significantly for Red Hat Linux 6.1. Shadow passwords are a method of improving system security by moving the encrypted passwords (normally found in `/etc/passwd`) to another file with more restrictive file access permissions. During the installation, you were given the option of setting up shadow password protection on your system.

The `shadow-utils` package contains a number of utilities that support:

- Conversion from normal to shadowed passwords and back (`pwconv`, `pwunconv`).
  - Verification of the password, group, and associated shadow files (`pwck`, `grpck`).
  - Industry-standard methods of adding, deleting and modifying user accounts (`useradd`, `usermod`, and `userdel`).
-

- Industry-standard methods of adding, deleting, and modifying user groups (`groupadd`, `groupmod`, and `groupdel`).
- Industry-standard method of administering the `/etc/group` file (`gpasswd`).

---

#### Please Note

There are a few additional points of interest concerning these utilities:

- The utilities will work properly whether shadowing is enabled or not.
- The utilities have been slightly modified to support Red Hat's user private group scheme. For a description of the modifications, please see the `useradd` man page. For more information on user private groups, please turn to Section 2.3.3, *User Private Groups*.
- The `adduser` script has been replaced with a symlink to `/usr/sbin/useradd`.

---

## 2.8 Building a Custom Kernel

With the introduction of modularization in the Linux 2.2.x kernel there have been some significant changes in building customized kernels. In the past you were required to compile support into your kernel if you wanted to access a particular hardware or filesystem component. For some hardware configurations the size of the kernel could quickly reach a critical level. To require ready support for items that were only occasionally used was an inefficient use of system resources. With the capabilities of the 2.2.x kernel, if there are certain hardware components or filesystems that are used infrequently, driver modules for them can be loaded on demand. For information on handling kernel modules see Section 3.2.2, *Kernel Daemon Configuration*.

---

Many people new to Linux often ask, "why should I build my own kernel?" Given the advances that have been made in the use of kernel modules, the most accurate response to that question is, "unless you know why you need to build your own kernel, you probably don't." So unless you have a specific reason to build a customized kernel (or you're just the curious sort), you may skip ahead to Section 2.9, *Sendmail*.

### 2.8.1 Building a modularized kernel

These instructions provide you with the knowledge needed to take advantage of the power and flexibility available through kernel modularization. If you do not wish to take advantage of modularization, please see Section 2.8.3, *Building a monolithic kernel* for an explanation of the different aspects of building and installing a monolithic kernel. It's assumed that you've already installed the `kernel-headers` and `kernel-source` packages and that you issue all commands from the `/usr/src/linux` directory.

It is important to begin a kernel build with the source tree in a known condition. Therefore, it is recommended that you begin with the command `make mrproper`. This will remove any configuration files along with the remains of any previous builds that may be scattered around the source tree. Now you must create a configuration file that will determine which components to include in your new kernel. Depending upon your hardware and personal preferences there are three methods available to configure the kernel.

- `make config` -- An interactive text program. Components are presented and you answer with **Y** (yes), **N** (no), or **M** (module).
  - `make menuconfig` -- A graphical, menu driven program. Components are presented in a menu of categories, you select the desired components in the same manner used in the Red Hat Linux installation program. Toggle the tag corresponding to the item you want included; **Y** (yes), **N** (no), or **M** (module).
  - `make xconfig` -- An X Window System program. Components are listed in different levels of menus, components are selected using a mouse. Again, select **Y** (yes), **N** (no), or **M** (module).
-

---

**Please Note**

In order to use `kernel` (see Section 3.2.2, *Kernel Daemon Configuration* for details) and kernel modules you must answer **Yes** to `kernel` support and module version (`CONFIG_MODVERSIONS`) support in the configuration.

---

---

**Please Note**

If you are building a Linux/Intel kernel on (or for) a machine that uses a "clone" processor (for example, one made by Cyrix or AMD), it is recommended to choose a Processor type of 386.

---

If you wish to build a kernel with a configuration file (`/usr/src/linux/.config`) that you have already created with one of the above methods, you can omit the `make mrproper` and `make config` commands and use the command `make dep` followed by `make clean` to prepare the source tree for the build.

The next step consists of the actual compilation of the source code components into a working program that your machine can use to boot. The method described here is the easiest to recover from in the event of a mishap. If you are interested in other possibilities, details can be found in the Kernel-HOWTO or in the `Makefile` in `/usr/src/linux` on your Linux system.

- Build the kernel with `make boot`.
- Build any modules you configured with `make modules`.
- Move the old set of modules out of the way with:

```
rm -rf /lib/modules/2.0.36-old
mv /lib/modules/2.0.36 /lib/modules/2.0.36-old
```

---

Of course, if you have upgraded your kernel, replace 2.0.36 with the version you are using.

- Install the new modules (even if you didn't build any) with `make modules_install`.

If you have a SCSI adapter and made your SCSI driver modular, build a new `initrd` image (see Section 2.8.2, *Making an initrd image*; note that there are few practical reasons to make the SCSI driver modular in a custom kernel).

In order to provide a redundant boot source to protect from a possible error in a new kernel you should keep the original kernel available. Adding a kernel to the LILO menu is as simple as renaming the original kernel in `/boot`, copying the new kernel to `/boot`, adding a few lines in `/etc/lilo.conf` and running `/sbin/lilo`. Here is an example of the default `/etc/lilo.conf` file shipped with Red Hat Linux:

```
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
prompt
timeout=100
image=/boot/vmlinuz
label=linux
root=/dev/hda1
read-only
```

Now you must update `/etc/lilo.conf`. If you built a new `initrd` image you must tell LILO to use it. In this example of `/etc/lilo.conf` we have added four lines in the middle of the file to indicate another kernel to boot from. We have renamed `/boot/vmlinuz` to `/boot/vmlinuz.old` and changed its label to `old`. We have also added an `initrd` line for the new kernel:

```
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
prompt
timeout=100
image=/boot/vmlinuz
```

---



```
label=linux
initrd=/boot/initrd
root=/dev/hda1
read-only
image=/boot/vmlinuz.old
label=old
root=/dev/hda1
read-only
```

Now when the system boots and you press [Tab] at the LILO boot: prompt, two choices will be shown;

```
LILO boot:
linux    old
```

To boot the new kernel (**linux**) simply press [Enter], or wait for LILO to time out. If you want to boot the old kernel (**old**), type **old** and press [Enter].

Here is a summary of the steps:

- `mv /boot/vmlinuz /boot/vmlinuz.old`
- `cp /usr/src/linux/arch/i386/boot/zImage /boot/vmlinuz`
- `edit /etc/lilo.conf`
- `run /sbin/lilo`

You can begin testing your new kernel by rebooting your computer and watching the messages to ensure your hardware is detected properly.

### 2.8.2 Making an initrd image

An `initrd` image is needed for loading your SCSI module at boot time. The shell script `/sbin/mkinitrd` can build a proper `initrd` image for your machine if the following conditions are met:

- The loopback block device is available.
- The `/etc/conf.modules` file has a line for your SCSI adapter; for example:

```
alias scsi_hostadapter BusLogic
```

---

To build the new `initrd` image, run `/sbin/mkinitrd` with parameters such as this:

```
/sbin/mkinitrd /boot/newinitrd-image 2.0.36
```

where `/boot/newinitrd-image` is the file to use for your new image, and `2.0.36` is the kernel whose modules (from `/lib/modules`) should be used in the `initrd` image (not necessarily the same as the version number of the currently running kernel).

### 2.8.3 Building a monolithic kernel

To build a monolithic kernel you follow the same steps as building a modularized kernel with a few exceptions.

- When configuring the kernel only answer **Yes** and **No** to the questions (don't make anything modular).
- Omit the steps:

```
make modules
make modules_install
```

- Edit the file `/etc/rc.d/rc.sysinit` and comment out the line `depmod -a` by inserting a `"#"` at the beginning of the line.

## 2.9 Sendmail

A default `sendmail.cf` file will be installed in `/etc`. The default configuration should work for most SMTP-only sites. It will *not* work for UUCP sites; you will need to generate a new `sendmail.cf` if you must use UUCP mail transfers.

To generate a new `sendmail.cf`, you will need to install `m4` and the `sendmail` source package. Read the `README` file in the `sendmail` sources for more details on

---

creating sendmail configuration files. Also, O'Reilly & Associates publishes a good sendmail reference entitled *sendmail*, by Bryan Costales.

One common sendmail configuration is to have a single machine act as a mail gateway for all the machines on your network. For instance, at Red Hat we have a machine `mail.redhat.com` that does all our mail. On that machine we simply need to add the names of machines for which `mail.redhat.com` will handle mail to `/etc/sendmail.cf`. Here is an example:

```
# sendmail.cf - include all aliases for your machine
# here.
torgo.redhat.com
poodle.redhat.com
devel.redhat.com
```

Then on the other machines, `torgo`, `poodle`, and `devel`, we need to edit `/etc/sendmail.cf` to "masquerade" as `mail.redhat.com` when sending mail, and to forward any local mail processing to `redhat.com`. Find the DH and DM lines in `/etc/sendmail.cf` and edit them thusly:

```
# who I send unqualified names to
# (null means deliver locally)
DRmail.redhat.com

# who gets all local email traffic
DHmail.redhat.com

# who I masquerade as (null for no masquerading)
DMredhat.com
```

With this type of configuration, all mail sent will appear as if it were sent from `redhat.com`, and any mail sent to `torgo.redhat.com` or the other hosts will be delivered to `mail.redhat.com`.

Please be aware that if you configure your system to masquerade as another any e-mail sent from your system to your system will be sent to the machine you are masquerading as. For example, in the above illustration, log files that are periodically sent to `root@poodle.redhat.com` by the cron daemon would be sent to `root@mail.redhat.com`.

## 2.10 Controlling Access to Services

As a security measure, most network services are managed by a protective program called a **TCP wrapper**. The protected services are those listed in `/etc/inetd.conf` that specify `/usr/sbin/tcpd`. `tcpd` can allow or deny access to a service based on the origin of the request, and the configuration in `/etc/hosts.allow` and `/etc/hosts.deny`.

By default Red Hat Linux allows all service requests. To disable or limit services you can edit `/etc/hosts.allow`. Here is an example `/etc/hosts.allow` file:

```
ALL: redhat.com .redhat.com
in.talkd: ALL
in.ntalkd: ALL
in.fingerd: ALL
in.ftpd: ALL
```

This configuration allows all connections from `redhat.com` and `*.redhat.com` machines. It also allows talk, finger, and FTP requests from all machines.

`tcpd` allows much more sophisticated access control, using a combination of `/etc/hosts.allow` and `/etc/hosts.deny`. Read the `tcpd(8)` and `hosts_access(5)` man pages for complete details.

## 2.11 Anonymous FTP

Setting up anonymous FTP is simple. All you need to do is install the `anon-ftp` RPM package (which you may have already done at install time). Once it is installed, anonymous FTP will be up and running.

There are a few files you might wish to edit to configure your FTP server.

### **`/etc/ftppaccess`**

This file defines most of the access control for your FTP server. Some of the things that you can do are: set up logical "groups" to control access from different sites, limit the number of simultaneous FTP connections, configure transfer logging, and much more. Read the `ftppaccess` man page for complete details.

---

### `/etc/ftphosts`

The `ftphosts` file is used to allow or deny access to certain accounts from various hosts. Read the `ftphosts` man page for details.

### `/etc/ftpusers`

This file lists all the users that are *not* allowed to ftp into your machine. For example, `root` is listed in `/etc/ftpusers` by default. That means that you can not ftp to your machine and log in as `root`. This is a good security measure, but some administrators prefer to remove `root` from this file.

## 2.12 NFS Configuration

NFS stands for *Network File System*, and is a way to share files between machines as if they were on your local hard drive. Linux can be both an NFS server and an NFS client, which means that it can **export** filesystems to other systems, and **mount** filesystems exported from other machines.

### 2.12.1 Mounting NFS Filesystems

Use the `mount` command to mount an NFS filesystem from another machine:

```
mkdir /mnt/local # Only required if /mnt/local doesn't exist
mount bigdog:/mnt/export /mnt/local
```

In this command, `bigdog` is the hostname of the NFS fileserver, `/mnt/export` is the filesystem that `bigdog` is exporting, and `/mnt/local` is a directory on my local machine where we want to mount the filesystem. After the `mount` command runs (and if we have the proper permissions from `bigdog`) we can enter `ls /mnt/local` and get a listing of the files in `/mnt/export` on `bigdog`.

### 2.12.2 Exporting NFS Filesystems

The file that controls what filesystems you wish to export is `/etc/exports`. Its format is:

```
directory      hostname(options)
```

the (*options*) are optional. For example:

---

```
/mnt/export    speedy.redhat.com
```

would allow `speedy.redhat.com` to mount `/mnt/export`, but:

```
/mnt/export    speedy.redhat.com(ro)
```

would just allow `speedy` to mount `/mnt/export` read-only.

Each time you change `/etc/exports`, you must tell the NFS daemons to examine it for new information. One simple way to accomplish this is to just stop and start the daemons:

```
/etc/rc.d/init.d/nfs stop
/etc/rc.d/init.d/nfs start
```

The following will also work:

```
killall -HUP rpc.nfsd rpc.mountd
```

See the following man pages for more details: `nfsd(8)`, `mountd(8)`, and `exports(5)`. Another good reference is *Managing NFS and NIS Services*, by Hal Stern, published by O'Reilly & Associates.

## 2.13 The Boot Process, Init, and Shutdown

This section contains information on what happens when a Red Hat Linux system is booted and shut down. Let's start with information on the files in `/etc/sysconfig`.

### 2.13.1 Sysconfig Information

The following information outlines the various files in `/etc/sysconfig`, their function, and their contents.

#### Files in `/etc/sysconfig`

The following files are normally found in `/etc/sysconfig`:

---

- `/etc/sysconfig/clock`
- `/etc/sysconfig/keyboard`
- `/etc/sysconfig/mouse`
- `/etc/sysconfig/network`
- `/etc/sysconfig/pcmcia`
- `/etc/sysconfig/amd`
- `/etc/sysconfig/tape`

Let's take a look at each one.

#### **`/etc/sysconfig/clock`**

The `/etc/sysconfig/clock` file controls the interpretation of values read from the system clock. Earlier releases of Red Hat Linux used the following values (which is deprecated):

- `CLOCKMODE=mode`, where *mode* is one of the following:
  - `GMT` -- indicates that the clock is set to UTC.
  - `ARC` -- on Alpha only indicates the ARC console's 42-year time offset is in effect.

Currently, the correct values are:

- `UTC=boolean`, where *boolean* is one of the following:
  - `true` -- indicates that the clock is set to UTC. Any other value indicates that it is set to local time.
- `ARC=boolean`, where *boolean* is one of the following:
  - `true` -- (for Alpha-based systems only) Indicates the ARC console's 42-year time offset is in effect. Any other value indicates that the normal UNIX epoch is assumed.

**/etc/sysconfig/keyboard**

The `/etc/sysconfig/keyboard` file controls the behavior of the keyboard. The following values may be used:

- `KEYTABLE=`*file*, where *file* is the name of a keytable file. For example:  
`KEYTABLE="/usr/lib/kbd/keytables/us.map"`

**/etc/sysconfig/mouse**

The `/etc/sysconfig/mouse` file is used to specify information about the available mouse. The following values may be used:

- `MOUSETYPE=`*type*, where *type* is one of the following:
    - `microsoft` -- A Microsoft mouse.
    - `mouseman` -- A MouseMan mouse.
    - `mousesystems` -- A Mouse Systems mouse.
    - `ps/2` -- A PS/2 mouse.
    - `msbm` -- A Microsoft bus mouse.
    - `logibm` -- A Logitech bus mouse.
    - `atibm` -- An ATI bus mouse.
    - `logitech` -- A Logitech mouse.
    - `mmseries` -- An older MouseMan mouse.
    - `mmhittab` -- An mmhittab mouse.
  - `XEMU3=`*emulation*, where *emulation* is one of the following:
    - `yes` -- Three mouse buttons should be emulated.
    - `no` -- The mouse already has three buttons.
-



In addition, `/dev/mouse` is a symlink that points to the actual mouse device.

### `/etc/sysconfig/network`

The `/etc/sysconfig/network` file is used to specify information about the desired network configuration. The following values may be used:

- `NETWORKING=answer`, where *answer* is one of the following:
  - `yes` -- Networking should be configured.
  - `no` -- Networking should not be configured.
- `HOSTNAME=hostname`, where *hostname* should be the FQDN (Fully Qualified Domain Name), but can be whatever hostname you want.

---

#### **Please Note**

For compatibility with older software that people might install (such as `trn`), the `/etc/HOSTNAME` file should contain the same value as here.

---

- `FORWARD_IPV4=answer`, where *answer* is one of the following:
  - `yes` -- Perform IP forwarding.
  - `no` -- Do not perform IP forwarding.

(The current Red Hat Linux installation sets this to "no" by default [for RFC compliance], but if `FORWARD_IPV4` is not set at all, forwarding is *enabled* for compatibility with the configuration files used on Red Hat Linux versions 4.2 and earlier.)

- `GATEWAY=gw-ip`, where *gw-ip* is the IP address of the network's gateway.
-

- GATEWAYDEV=*gw-dev*, where *gw-dev* is the gateway device (e.g. eth0).
- NISDOMAIN=*dom-name*, where *dom-name* is the NIS domain name.

#### **/etc/sysconfig/pcmcia**

The `/etc/sysconfig/pcmcia` file is used to specify PCMCIA configuration information. The following values may be used:

- PCMCIA=*answer*, where *answer* is one of the following:
  - yes -- PCMCIA support should be enabled.
  - no -- PCMCIA support should not be enabled.
- PCIC=*pcic-type*, where *pcic-type* is one of the following:
  - i82365 -- The computer has an i82365-style PCMCIA socket chipset.
  - tcic -- The computer has a tcic-style PCMCIA socket chipset.
- PCIC\_OPTS=*option*, where *option* is the socket driver (i82365 or tcic) timing parameters.
- CORE\_OPTS=*option*, where *option* is the list of `pcmcia_core` options.
- CARDMGR\_OPTS=*option*, where *option* is the list of options for the PCMCIA `cardmgr`.

#### **/etc/sysconfig/amd**

The `/etc/sysconfig/amd` file is used to specify operational parameters for `amd`. The following values may be used:

- ADIR=*path*, where *path* is the `amd` directory. It should be `"/.automount"` and is normally never changed.
  - MOUNTPTS=*mountpts*, where *mountpts* is, for example, `"/net/etc/amd.conf"`
-

- `AMDOPTS=options`, where *options* are any extra options for AMD.

### `/etc/sysconfig/tape`

The `/etc/sysconfig/tape` file is used to specify tape-related configuration information. The following values may be used:

- `DEV=devnam`, where *devnam* is the tape device (for example, `/dev/nst0`). Use the non-rewinding device for these scripts.

For SCSI tapes this is `/dev/nst#`, where `#` is the number of the tape drive you want to use. If you only have one, then use `/dev/nst0`.

For IDE tapes you use `/dev/ht#`, where `#` is the number of the tape drive you want to use. If you only have one, then use `/dev/ht0`.

For floppy tape drives use `/dev/ftape`.

- `ADMIN=account`, where *account* is the user account to send mail to if the backup fails for any reason. Normally set to `root`.
- `SLEEP=time`, where *time* is the time to sleep between tape operations. Some drives need a bit more than others, but `5` seems to work for 8mm, 4mm, and DLT.
- `BLOCKSIZE=size`, where *size* is the tape drive's optimal block size. A value of `32768` worked fine for 8mm, then 4mm, and now DLT. An optimal setting is probably however much data your drive writes at one time.
- `SHORTDATE=date`, where *date* is a string that evaluates to a short date string, to be used in backup log filenames. The default setting is: `\$(date +%y:%m:%d:%H:%M)`.
- `DAY=date`, where *date* is a string that evaluates to a date string, to be used for the log file directory. The default setting is: `$(date +log-%y:%m:%d)`.
- `DATE=date`, where *date* is a string that evaluates to a regular date string, to be used in log files. The default setting is: `$(date)`.
- `LOGROOT=path`, where *path* is the root of the logging directory.

- `LIST=`*file*, where *file* is the file name the incremental backup will use to store the incremental list. It will be followed by a sequence number.
- `DOTCOUNT=`*count*, where *count* is the name of a file used for counting as you go, to know which incremental list to use.
- `COUNTER=`*count-file*, where *count-file* is used for rewinding when done.
- `BACKUPTAB=`*file*, where *file* is the name of the file in which we keep our list of backup(s) we want to make.

### **Files in `/etc/sysconfig/network-scripts/`**

The following files are normally found in `/etc/sysconfig/network-scripts/`:

- `/etc/sysconfig/network-scripts/ifup`
- `/etc/sysconfig/network-scripts/ifdown`
- `/etc/sysconfig/network-scripts/network-functions`
- `/etc/sysconfig/network-scripts/ifcfg-interface-name`
- `/etc/sysconfig/network-scripts/ifcfg-interface-name--clone-name`
- `/etc/sysconfig/network-scripts/chat-interface-name`
- `/etc/sysconfig/network-scripts/dip-interface-name`
- `/etc/sysconfig/network-scripts/ifup-post`
- `/etc/sysconfig/network-scripts/ifdhcpc-done`

Let's take a look at each one.

**`/etc/sysconfig/network-scripts/ifup,`  
**`/etc/sysconfig/network-scripts/ifdown`****

Symlinks to `/sbin/ifup` and `/sbin/ifdown`, respectively. These are the only two scripts in this directory that should be called directly; these two scripts call all the other scripts as needed. These symlinks are here for legacy purposes only -- they will

---

probably be removed in future versions, so only `/sbin/ifup` and `/sbin/if-down` should currently be used.

These scripts take one argument normally: the name of the device (e.g. "eth0"). They are called with a second argument of "boot" during the boot sequence so that devices that are not meant to be brought up on boot (ONBOOT=no, [see below]) can be ignored at that time.

**`/etc/sysconfig/network-scripts/network-functions`**

Not really a public file. Contains functions which the scripts use for bringing interfaces up and down. In particular, it contains most of the code for handling alternative interface configurations and interface change notification through netreport.

**`/etc/sysconfig/network-scripts/ifcfg-<interface-name>,`**  
**`/etc/sysconfig/network-scripts/ifcfg-<interface-name>--<clone-name>`**

The first file defines an interface, while the second file contains only the parts of the definition that are different in a "clone" (or alternative) interface. For example, the network numbers might be different, but everything else might be the same, so only the network numbers would be in the clone file, while all the device information would be in the base `ifcfg` file.

The items that can be defined in an `ifcfg` file depend on the interface type.

The following values are common to all base files:

- `DEVICE=name`, where *name* is the name of the physical device (except dynamically-allocated PPP devices where it is the "logical name").
- `IPADDR=addr`, where *addr* is the IP address.
- `NETMASK=mask`, where *mask* is the netmask value.
- `NETWORK=addr`, where *addr* is the network address.
- `BROADCAST=addr`, where *addr* is the broadcast address.
- `GATEWAY=addr`, where *addr* is the gateway address.
- `ONBOOT=answer`, where *answer* is one of the following:
  - `yes` -- This device should be activated at boot-time.

- `no` -- This device should not be activated at boot-time.
- `USERCTL=answer`, where *answer* is one of the following:
  - `yes` -- Non-root users are allowed to control this device.
  - `no` -- Non-root users are not allowed to control this device.
- `BOOTPROTO=proto`, where *proto* is one of the following:
  - `none` -- No boot-time protocol should be used.
  - `bootp` -- The bootp protocol should be used.
  - `dhcp` -- The dhcp protocol should be used.

The following values are common to all PPP and SLIP files:

- `PERSIST=answer`, where *answer* is one of the following:
    - `yes` -- This device should be kept active at all times, even if deactivated after a modem hangup.
    - `no` -- This device should not be kept active at all times.
  - `MODEMPORT=port`, where *port* is the modem port's device name (for example, `/dev/modem`).
  - `LINESPEED=baud`, where *baud* is the modem's linespeed (for example, `"115200"`).
  - `DEFABORT=answer`, where *answer* is one of the following:
    - `yes` -- Insert default abort strings when creating/editing the script for this interface.
    - `no` -- Do not insert default abort strings when creating/editing the script for this interface.
-

The following values are common to all PPP files:

- DEFROUTE=*answer*, where *answer* is one of the following:
  - yes -- Set this interface as the default route.
  - no -- Do not set this interface as the default route.
  
- ESCAPECHARS=*answer*, where *answer* is one of the following:
  - yes -- Use the pre-defined asyncmap.
  - no -- Do not use the pre-defined asyncmap.

(This represents a simplified interface; it doesn't let people specify which characters to escape. However, almost everyone can use an asyncmap of 00000000 anyway, and it's possible to set PPPOPTIONS to use an arbitrary asyncmap if so desired.)

- HARDFLOWCTL=*answer*, where *answer* is one of the following:
  - yes -- Use hardware flow control.
  - no -- Do not use hardware flow control.
  
- PPPOPTIONS=*options*, where *options* is an arbitrary option string. It is placed last on the command line so it can override other options (such as asyncmap) that were specified previously.
  
- PAPNAME=*name*, where *name* is used as part of "name **\$PAPNAME**" on the pppd command line.

Note that the "remotename" option is always specified as the logical PPP device name, like "ppp0" (which might perhaps be the physical device ppp1 if some other PPP device was brought up earlier...), which makes it easy to manage

---

pap/chap files -- name/password pairs are associated with the logical PPP device name so that they can be managed together.

In principle, there shouldn't anything that would keep the logical PPP device names from being "worldnet" or "myISP" instead of "ppp0" -- "pppN."

- `REMIP=addr`, where *addr* is the remote IP address (which is normally unspecified).
- `MTU=value`, where *value* is the value to be used as MTU.
- `MRU=value`, where *value* is the value to be used as MRU.
- `DISCONNECTTIMEOUT=value`, where *value* represents the number of seconds to wait before re-establishing the connection after a successfully-connected session terminated.
- `RETRYTIMEOUT=value`, where *value* represents the number of seconds to wait before re-attempting to establish a connection after a previous attempt has failed.

**`/etc/sysconfig/network-scripts/chat-<interface-name>`**

This file is a chat script for PPP or SLIP connections, and is intended to establish the connection. For SLIP devices, a DIP script is written from the chat script; for PPP devices, the chat script is used directly.

**`/etc/sysconfig/network-scripts/dip-<interface-name>`**

This write-only script is created from the chat script by `netcfg`. Do not modify this file. In the future, this file may disappear and instead will be created on-the-fly from the chat script.

**`/etc/sysconfig/network-scripts/ifup-post`**

This file is called when any network device (except a SLIP device) comes up. Calls `/etc/sysconfig/network-scripts/ifup-routes` to bring up static routes that depend on that device. Brings up aliases for that device. Sets the hostname if it is not already set and a hostname can be found for the IP for that

---



device. Sends SIGIO to any programs that have requested notification of network events.

Could be extended to fix up nameservice configuration, call arbitrary scripts, and more, as needed.

**/etc/sysconfig/network-scripts/ifdhcpc-done**

This file is called by dhcpcd once dhcp configuration is complete; sets up `/etc/resolv.conf` from the version dhcpcd dropped in `/etc/dhcpcd/resolv.conf`.

## 2.13.2 System V Init

This section is a brief description of the internals of the boot process. It basically covers in detail how the machine boots using SysV init, as well as the differences between the init used in older Linux releases, and SysV init.

init is the program that gets run by the kernel at boot time. It is in charge of starting all the normal processes that need to run at boot time. These include the getty processes that allow you to log in, NFS daemons, FTP daemons, and anything else you want to run when your machine boots.

SysV init is quickly becoming the standard in the Linux world to control the startup of software at boot time. This is because it is easier to use and more powerful and flexible than the traditional BSD init.

SysV init also differs from BSD init in that the config files are in a subdirectory of `/etc` instead of residing directly in `/etc`. This directory is called `rc.d`. In there you will find `rc.sysinit` and the following directories:

```
init.d
rc0.d
rc1.d
rc2.d
rc3.d
rc4.d
rc5.d
rc6.d
```

`init.d` contains a variety of scripts. Basically, you require one script for each service you may need to start at boot time or when entering another runlevel. Services

---

include things like networking, `nfs`, `sendmail`, `httpd`, etc. Services do not include things like `setserial` that must only be run once and then exited. Things like that should go in `rc.local` or `rc.serial`.

If you want `rc.local`, it should be in `/etc/rc.d`. Most systems include one even though it doesn't do much. You can also include an `rc.serial` file in `/etc/rc.d` if you need to do serial port specific things at boot time.

The chain of events is as follows:

- The kernel looks in several places for `init` and runs the first one it finds
- `init` runs `/etc/rc.d/rc.sysinit`
- `rc.sysinit` does a bunch of necessary things and then runs `rc.serial` (if it exists)
- `init` runs all the scripts for the default runlevel.
- `init` runs `rc.local`

The default runlevel is decided in `/etc/inittab`. You should have a line close to the top like:

```
id:3:initdefault:
```

From this, you'd look in the second column and see that the default runlevel is 3. If you want to change it, you can edit `/etc/inittab` by hand and change the 3. Be very careful when you are messing with the `inittab` file. If you do mess up, you can fix it by rebooting and doing:

```
LILO boot: linux single
```

This *should* allow you to boot into single user mode so you can fix `inittab`.

Now, how does it run all the right scripts? If you enter `ls -l` on `rc3.d`, you might see something like:

```
lrwxrwxrwx 1 root root 17 3:11 S10network -> ../init.d/network
lrwxrwxrwx 1 root root 16 3:11 S30syslog -> ../init.d/syslog
lrwxrwxrwx 1 root root 14 3:32 S40cron -> ../init.d/cron
lrwxrwxrwx 1 root root 14 3:11 S50inet -> ../init.d/inet
```

```
lrwxrwxrwx 1 root root 13 3:11 S60nfs -> ../init.d/nfs
lrwxrwxrwx 1 root root 15 3:11 S70nfsfs -> ../init.d/nfsfs
lrwxrwxrwx 1 root root 18 3:11 S90lpd -> ../init.d/lpd.init
lrwxrwxrwx 1 root root 11 3:11 S99local -> ../rc.local
```

What you'll notice is that there are no "real" files in the directory. Everything there is a link to one of the scripts in the `init.d` directory. The links also have an "S" and a number at the beginning. The "S" means to start this particular script and a "K" would mean to stop it. The number is there just for ordering purposes. Init will start all the services based on the order in which they appear. You can duplicate numbers, but it will only confuse you somewhat. You only need to use a two digit number, along with an upper case "S" or "K" to start or stop the services you require to.

How does `init` start and stop services? Simple. Each of the scripts is written to accept an argument which can be "start" and "stop". You can execute those scripts by hand, in fact, with a command like:

```
/etc/rc.d/init.d/httpd.init stop
```

to stop the `httpd` server. `init` just reads the name and if it has a "K," it calls the script with the "stop" argument. If it has an "S" it calls the script with a "start" argument.

Why all these runlevels? Some people want an easy way to set up machines to be multi-purpose. You could have a "server" runlevel that just runs `httpd`, `sendmail`, networking, etc. Then you could have a "user" runlevel that runs `xdm`, networking, etc.

### 2.13.3 Init Runlevels

Generally, Red Hat Linux operates in run level 3 -- full multiuser mode. The following runlevels are defined in Red Hat Linux:

- 0 -- Halt
  - 1 -- Single user mode
  - 2 -- Multiuser mode, without NFS
  - 3 -- Full multiuser mode
-

- 4 -- Not used
- 5 -- Full multiuser mode (with an X-based login screen)
- 6 -- Reboot

If your machine gets into a state where it will not boot due to a bad `/etc/inittab`, or will not let you log in because you have a corrupted `/etc/passwd` or have simply forgotten your password, boot into single user mode by typing `linux 1` at the LILO boot prompt. A very bare system will come up and you will be given a shell from which you can fix things.

### 2.13.4 Initscript Utilities

The `chkconfig` utility provides a simple command-line tool for maintaining the `/etc/rc.d` directory hierarchy. It relieves system administrators from having to directly manipulate the numerous symlinks in `/etc/rc.d`.

In addition, there is the `ntsysv` utility, that provides a screen-oriented interface, versus `chkconfig`'s command-line interface.

Please see the `chkconfig` and `ntsysv` man pages for more information.

### 2.13.5 Running Programs at Boot Time

The file `/etc/rc.d/rc.local` is executed at boot time, after all other initialization is complete, and whenever you change runlevels. You can add additional initialization commands here. For instance, you may want to start up additional daemons, or initialize a printer. In addition, if you require serial port setup, you can edit `/etc/rc.d/rc.serial`, and it will be executed automatically at boot time.

The default `/etc/rc.d/rc.local` simply creates a nice login banner with your kernel version and machine type.

### 2.13.6 Shutting Down

To shut down Red Hat Linux, issue the `shutdown` command. You can read the `shutdown` man page for complete details, but the two most common usages are:

```
shutdown -h now
shutdown -r now
```

---

Each will cleanly shutdown the system. After shutting everything down, the first will halt the machine, and the second will reboot.

Although the `reboot` and `halt` commands are now "smart" enough to invoke `shutdown` if run while the system is in runlevels 1-5, it is a bad habit to get into, as not all Linux-like operating systems have this feature.

## 2.14 Rescue Modes

When things go wrong, there are several ways to work on fixing them. However, they require that you understand the system well. This manual can't teach you what to do, but we will present the ways that you can use our products to get into rescue modes where you can use your own knowledge to rescue the system.

## 2.15 What is Rescue Mode?

Rescue mode is a term used to describe a method of booting a small Linux environment completely from diskettes.

What follows in this section may help you recover from a problem at some point. A copy of these instructions is also available as `rescue.txt` on your Red Hat Linux 6.1 CD-ROM.

As the name implies, rescue mode is there to rescue you from something. In normal operation, your Red Hat Linux system uses files located on your system's hard drive to do everything -- run programs, store your files, and more.

However, there may be times when you are unable to get Linux running completely enough to access its files on your system's hard drive. By using rescue mode, it's possible to access the files stored on your system's hard drive, even if you can't actually run Linux from that hard drive.

Normally, you'll need to get into rescue mode for one of two reasons:

- You are unable to boot Linux, and you'd like to fix it.
- You are having hardware or software problems, and you want to get a few important files off your system's hard drive.

Let's take a closer look at each these scenarios.

---

## 2.15.1 Unable to boot Linux

Many times this is caused by the installation of another operating system after you've installed Red Hat Linux. Some other operating systems assume that you have no other operating systems on your computer, and overwrite the Master Boot Record (or MBR) that originally contained the LILO bootloader. If LILO is overwritten in this manner, you're out of luck -- unless you can get into rescue mode.

## 2.15.2 Hardware/software problems

There can be as many different situations under this category as there are systems running Linux. Things like failing hard drives and forgetting to run LILO after building a new kernel are just two instances that can keep you from booting Red Hat Linux. If you can get into rescue mode, you might be able to resolve the problem -- or at least get copies of your most important files.

What do you need to get into rescue mode?

To get into rescue mode, you'll need a rescue disk set. These are two diskettes that contain the files necessary to boot into rescue mode.

If you elected to make a boot disk while you were installing Red Hat Linux, you're halfway there! The first diskette in a rescue disk set is this boot disk.

Now on to the second diskette...

The second diskette is called the rescue disk. It is produced by writing an **image file** onto a diskette. The image file is called `rescue.img`, and is located in the `images` directory on the first Red Hat Linux CD-ROM.

To gain access to this file, you'll first need to mount your Red Hat Linux CD-ROM.

Start by inserting the CD-ROM in your system's CD-ROM drive. You'll need to do this while logged in as root.

Type the following command:

```
mkdir /mnt/cdrom
```

Now, type:

---

```
mount /dev/cdrom /mnt/cdrom
```

You may get an error message from the first command saying that the file exists. That's fine; we just want to make sure that there is a `/mnt/cdrom` directory on your system. The second command should issue an informational message that `/dev/cdrom` is being mounted read-only.

---

### Please Note

Some systems may not recognize `/dev/cdrom`. If this is your case, you'll have to replace `/dev/cdrom` in the command with the appropriate device name for your CD-ROM.

---

Next, issue the following command (again, while logged in as root):

```
cd /mnt/cdrom/images
```

then type:

```
ls
```

to list the contents of the `images` directory.

You should see a file named `rescue.img`. This is the rescue disk image file. Next, put a diskette in your first diskette drive, and enter the following command:

```
dd if=rescue.img of=/dev/fd0 bs=1440k
```

Your system's diskette drive should start writing to the diskette. After a minute or so, the `dd` command will complete, and you'll get your shell prompt back.

Wait for your diskette drive's access light to go out, and that's it!

You now have a rescue disk set. Label this diskette something like "Red Hat Linux 6.1 rescue disk" and store it someplace safe.

Let's hope you never have to use it.

---

If you should ever need to use rescue mode, here's how.

Boot your system with the boot disk in the first diskette drive. At the `LILLO Boot :` prompt, enter the word `rescue`. You will see the usual kernel messages as the Linux kernel starts up.

Eventually, it will ask you to insert the next diskette, and press `[Enter]`. Remove the boot disk, insert the rescue disk, and press `[Enter]`.

The rescue disk will be read into memory. After a minute or so, you should see the shell prompt. That's it -- you're in rescue mode!

Now what?

When it comes to rescue mode, that's a bit like asking, "how long is a piece of string?" What you require depends a great deal on what your system's problem is, your level of Linux expertise, and several variables we haven't even thought of yet. So we can't give you explicit instructions.

But we can tell you what programs you have access to while in rescue mode.

Here's the list:

|                         |                     |                     |
|-------------------------|---------------------|---------------------|
| <code>badblocks</code>  | <code>bash</code>   | <code>bzip2</code>  |
| <code>cat</code>        | <code>chmod</code>  | <code>chroot</code> |
| <code>cp</code>         | <code>cpio</code>   | <code>dd</code>     |
| <code>e2fsck</code>     | <code>fdisk</code>  | <code>grep</code>   |
| <code>gunzip</code>     | <code>gzip</code>   | <code>head</code>   |
| <code>ifconfig</code>   | <code>init</code>   | <code>ln</code>     |
| <code>ls</code>         | <code>lsmod</code>  | <code>mkdir</code>  |
| <code>mke2fs</code>     | <code>mknod</code>  | <code>mount</code>  |
| <code>mt</code>         | <code>mv</code>     | <code>open</code>   |
| <code>pico</code>       | <code>ping</code>   | <code>ps</code>     |
| <code>restore</code>    | <code>rm</code>     | <code>route</code>  |
| <code>rpm</code>        | <code>sed</code>    | <code>sh</code>     |
| <code>swapoff</code>    | <code>swapon</code> | <code>sync</code>   |
| <code>tac</code>        | <code>tail</code>   | <code>tar</code>    |
| <code>traceroute</code> | <code>umount</code> | <code>vi</code>     |
| <code>vim</code>        |                     |                     |

You're likely to be unfamiliar with most, if not all of these commands. However, the commands do have *man pages*. Once you begin to feel more comfortable with

---



commands, you should consider familiarizing yourself them through the man pages. (You may not have that luxury if you have to use these commands ...)

### 2.15.3 Through LILO

If your system boots, but does not allow you to log in when it has completed booting, you can use the `single` or `emergency` boot option. At the `LILO boot :` prompt, type `linux single` in order to boot in single-user mode. In single-user mode, your local filesystems will be mounted, but your network will not be activated. In emergency mode, almost nothing will be set up. Only the root filesystem will be mounted, and it will be mounted read-only.

### 2.15.4 Emergency Boot Disks

The boot disk created during installation of Red Hat Linux 6.1 may be used as part of a rescue disk set. For more information, please read the file `rescue.txt` in the `/doc` directory on your Red Hat Linux 6.1 CD-ROM or refer to the *Official Red Hat Linux Getting Started Guide*.

### 2.15.5 A Handy Trick

Have you ever rebuilt a kernel and, eager to try out your new handiwork, rebooted before running LILO? And you didn't have an entry for an older kernel in `lilo.conf`? Read on...

Here's a handy trick. In many cases, it's possible to boot your Red Hat Linux/Intel system from the Red Hat Linux boot disk with your root filesystem mounted and ready to go. Here's how:

Enter the following command at the boot disk's `boot :` prompt:

```
linux single root=/dev/hdXX initrd=
```

(Replace the `XX` in `/dev/hdXX` with the appropriate letter and number for your root partition.)

---

What does this do? First, it starts the boot in single-user mode, with the root partition set to your root partition. The empty `initrd` specification bypasses the installation-related image on the boot disk, which will cause you to enter single-user mode immediately.

Is there a downside to this trick? Unfortunately, yes. Because the kernel on the Red Hat Linux boot disk only has support for IDE built-in, those of you with SCSI-based systems won't be able to use this trick. In that case, you'll have to use the boot/rescue disk combination mentioned above.

---

## 3 System Configuration

After installing your Red Hat Linux system, it's easy to think that the decisions you made during the installation are engraved in granite, never to be changed again. Nothing could be further from the truth!

One of the main strengths of Linux is that the operating system can be configured to do just about anything. Here at Red Hat, we try to make system configuration as easy and accessible as possible. To that end, we've worked hard on two fronts:

- By developing system configuration tools in-house;
- By working with outside developers of world-class system configuration tools.

Anyone familiar with Red Hat Linux over the years has probably seen what we call our "control panel" system configuration tools. These tools have been developed by Red Hat to make system configuration easier. And while these tools *do* make life easier for the Red Hat Linux user, we began a search for a system configuration tool with even more flexibility and power.

Our search ended with the inclusion of `Linuxconf` into Red Hat Linux 5.1 in June 1998.

One of `Linuxconf`'s greatest strengths is the incredible range of configuration options under its control.

But what about the control panel tools? They're still there. While `Linuxconf` at present can do nearly everything the control panel tools can, there are two areas in which the control panel still holds the upper hand:

- Printer configuration
- Kernel daemon control

But now, let's take a look at `Linuxconf`...

### 3.1 System Configuration With `Linuxconf`

`Linuxconf` is a utility that allows you to configure and control various aspects of your system, and is capable of handling a wide range of programs and tasks. Fully documenting `Linuxconf` could be a separate book in its own right and certainly more than we

---

can cover in this chapter. So we'll focus on those areas that address common tasks such as adding new users and getting connected to a network.

More information on Linuxconf, including its status, most recent release, and more can be found at the Linuxconf Project homepage:

<http://www.solucorp.qc.ca/linuxconf/>

This website includes fairly extensive information on Linuxconf including description, rationale, history, list of contacts and a lot of other information in addition to the software itself. It is maintained by Linuxconf's creator, Jacques Gelinas, so it's the best source of Linuxconf information on the Internet.

### 3.1.1 Notation

Accurately describing the location of specific screens within Linuxconf is easy, but lengthy given Linuxconf's hierarchical nature. If the structure was a family tree, most of the data entry screens are in the fourth generation. To describe the path to the screen where you would add new users to your system, we could write this out as:

"Select the **Config** option from the main screen, then the users accounts option off of that; on the users accounts screen that appears, select the normal option and then select the user accounts option."

Rather lengthy and not immediately accessible. Given the structural similarity to a family tree, we could write it as:

"main window beget **Users accounts** tab, beget Normal tab..."

But that's an awful lot of begets. Instead, we'll use the following format:

**Config => Users accounts => Normal => User accounts**

It's more concise and clear. It assumes as its base the Linuxconf entry screen. The other advantage to this approach is that it's not interface specific, so regardless of which interface you're using, you know exactly where the information is.

### 3.1.2 Running Linuxconf

To run Linuxconf you must have root access. If you are logged in as something other than root, there is an easy way to handle this situation. Use the `su` command to become root.

---

In case you aren't familiar with it yet, type `su` at the shell prompt and press [Enter]. The password you're asked to provide is the root account's.

Now, type `linuxconf` at the shell prompt to begin the program. `Linuxconf` has the following user interfaces:

- **Command line** -- `Linuxconf`'s command-line mode is handy for manipulating your system's configuration in scripts.
- **Character-Cell** -- Using the same user interface style as the Red Hat Linux installation program, the character-cell interface makes it easy to navigate your way through `Linuxconf`, even if you aren't running X.
- **X Window-Based** -- `Linuxconf` can take advantage of X, and give you an easy-to-use "point and click" tree menu interface (see *Tree Menu Interface* in Section 3.1.2 for more information).
- **Web-Based** -- A Web-based interface makes remote system administration a breeze; it can also be displayed with the character cell browser called `Lynx`.

`Linuxconf` will normally start in either character-cell or X mode, depending on the **DISPLAY** environment variable. The first time you run `Linuxconf`, an introductory message will be shown; although it is only displayed once, accessing help from the main screen will give you the same basic information.

`Linuxconf` has context-specific help available. For information on any specific aspect of `Linuxconf`, please select **Help** from the screen you'd like help with. Note that not all help screens are complete at this time; as help screens are updated, they will be included in subsequent versions of `Linuxconf`.

### **Tree Menu Interface**

`Linuxconf` comes complete with a tree menu interface.

---

**Figure 3–1 Linuxconf Entry Screen**

Finding the appropriate panel should be simple and fast. You can collapse and expand sections by clicking on the menu item icons. Click the icon once to activate it for that particular sub-menu. A single click will then collapse it; another single click will expand it again.

Selected entries will appear as tabs in the right-hand panel and will remain there until closed. This will greatly reduce the clutter of windows on your desktop that Linuxconf has typically caused. If you end up with more tabs open than you like, just select **Cancel** on the bottom of each tab to close it without making any changes, or **Accept** to implement them.

---

#### **Please Note**

If you've grown fond of your previous X Window System interface, it's still available. To return to it:

---

1. Start `Linuxconf` by typing `linuxconf` at the shell prompt
2. Open **Control => Control files and systems => Linuxconf modules**
3. De-select the **This module is active** check box for the `treemenu` module.
4. Click **Accept**
5. Click **Quit**
6. Restart `Linuxconf`

### Enabling Web-Based `Linuxconf` Access

For security reasons, Web-based access to `Linuxconf` is disabled by default. Before attempting to access `Linuxconf` with a Web browser, you'll need to enable access. Here's how to do it from the text-mode interface:

1. Start `Linuxconf` by typing `linuxconf` at the shell prompt
2. Open **Config => Networking => Misc => Linuxconf network access**
3. In the **Linuxconf html access control** dialog box, enter the hostname of any computers that should be allowed access to `Linuxconf`. This would also include your own system, if you wish to use the Web-based interface locally. Web accesses related to `Linuxconf` may be logged to your system's `htmlaccess.log` file by selecting the check box shown.
4. Select the **Accept** button and press [Space]. Then select the **Quit** buttons on each dialog box to back out of the menu hierarchy. When you come to a dialog box labeled **>Status of the system**, press [Enter] to take the default action, which is to apply the changes you've made.

At this point, Web-based access has been enabled. To test it out, go to one of the systems that you added to the access control list. Then, launch your Web browser, and enter the following URL:

```
http://<host>:98/
```

(Replacing `<host>` with your system's hostname, of course.) You should see the main `Linuxconf` page. Note that you will need to enter your system's root password to gain access beyond the first page.

---

### Adding a User Account – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt
2. Open **Config** => **Users accounts** => **Normal** => **User accounts**
3. Select **Add**
4. Enter the account's login and full names
5. Enter information in other fields only as necessary
6. Select **Accept**
7. Enter the initial password for the account
8. Reenter the initial password for the account in the **Confirmation** field
9. Select **Accept**

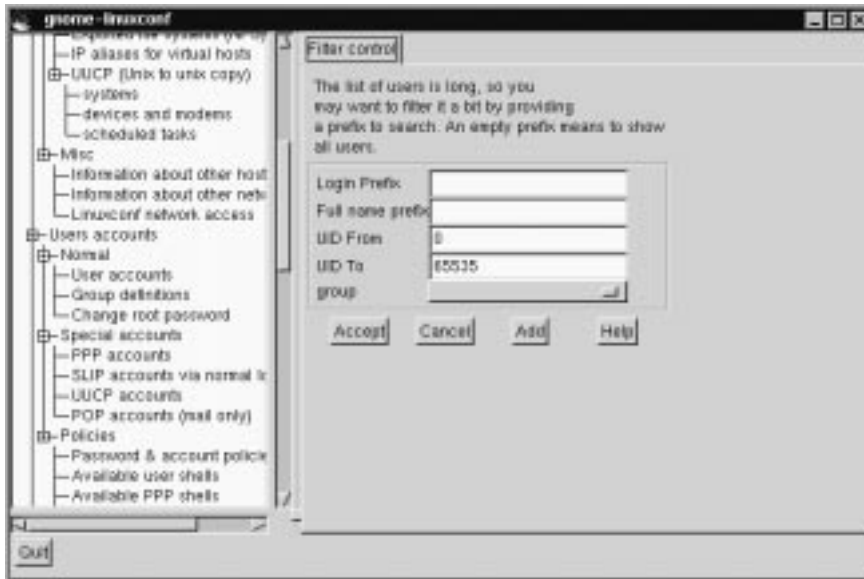
### Adding a User Account – General Overview

Adding a user is one of the most basic tasks you will encounter in administering your system. To add a user:

- Start Linuxconf by typing `linuxconf` at the shell prompt.
  - Open **Config** => **Users accounts** => **Normal** => **User accounts** This will open the **Users accounts** tab (see Figure 3–3, *Users Accounts Screen*).
  - If you have more than 15 accounts on the system, Linuxconf will provide you with a filter screen (see Figure 3–2, *Filter Control Screen*). You can use this to select a smaller range of accounts than the full list. To get the full list, select **Accept** without changing any of the parameters. For detailed information on the various filters, select the **Help** button on the **Filter control** screen.
  - Select **Add**. This will open the **User account creation** tab (see Figure 3–4, *User Account Creation*).
-



Figure 3-2 Filter Control Screen

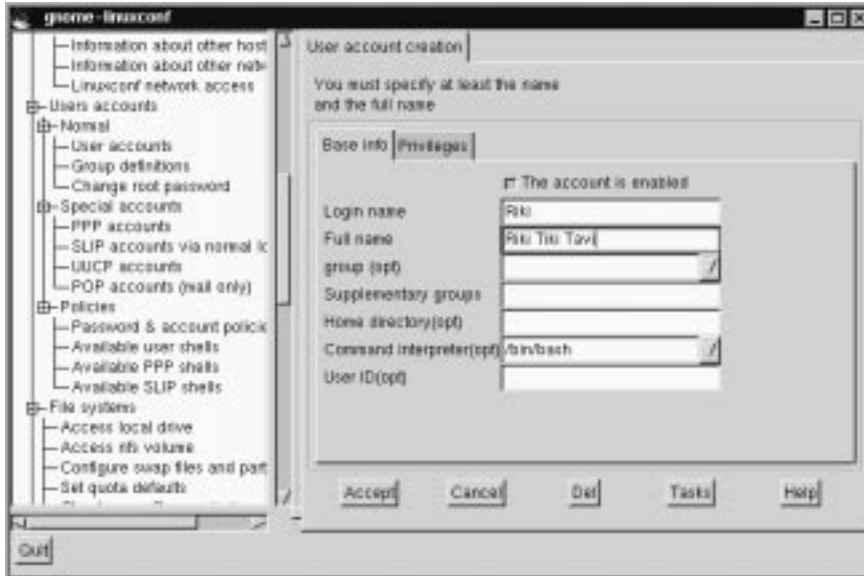


The **User account creation** tab is where you enter all the information on the new account. There are a number of fields you should be aware of, some required, some optional.

Figure 3-3 Users Accounts Screen



Figure 3-4 User Account Creation



#### Required Fields:

- Login name -- the name of the account. Usually all lowercase letters. First or last names, initials or some combination thereof are fairly common login names. For a user named John T. Smith, "smith," "john," "jts," or "jsmith" would be common user names. Of course "spike" or something else works just fine, too. You can also use numbers, so "jts2" would be fine if you had a second person with the same initials. There is no default for this field.

#### Optional Fields:

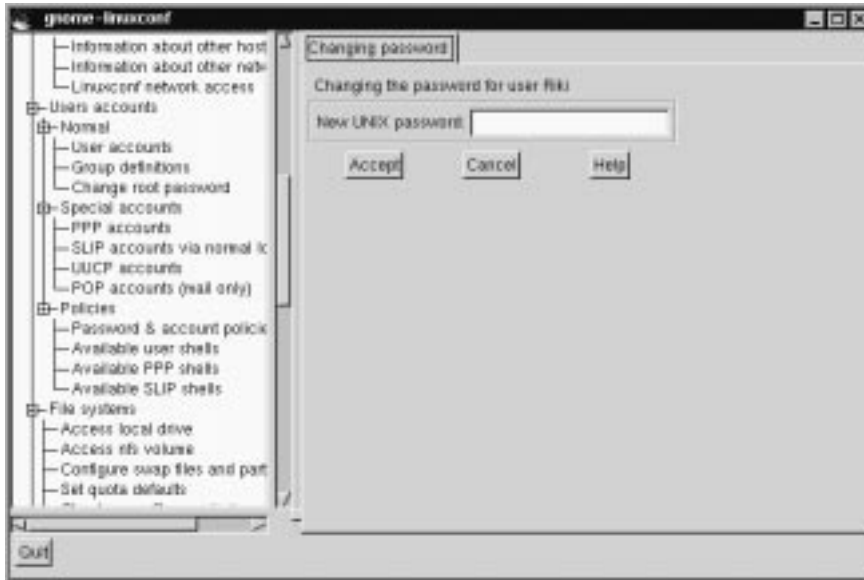
- Full name -- this is the name of the user or the account. For an individual, it would be their name, "John T. Smith" for example. If the account represents a position rather than a person, the full name might be the title. So an account called "webmaster" might have a full name of "Red Hat Webmaster" or just "Webmaster." There is no default for this field.

- `group` -- here you can specify the group associated with the account. The default is a group that's the same as the login name. So "jsmith" would have the group "jsmith."
- `Supplementary groups` -- here is where you can specify any additional groups. We suggest that if you want to add a user to a group or groups, you do so here, rather than changing the `group` field. Group names should be separated by spaces. The default for this field is blank, meaning no supplementary groups.
- `Home directory` -- specifies the home or login directory for the account. The default is `/home/login`, where `login` is replaced by the login name. A home directory is your starting point in the directory structure when you log in, or if in X, for each xterm window opened. This is also where account specific preference files are stored.
- `Command interpreter` -- specifies the location of the command interpreter. Command interpreters are usually referred to as shells. The default is displayed in the drop down box.
- `User ID` -- the number associated with each user account. This is automatically generated by the system when the account is created.

The **User account creation** screen has a number of fields; only the login name is required, though filling in the **Full name** field is strongly recommended. Once you have entered the login name and any other desired information select the **Accept** button at the bottom of the screen. If you decide against creating a new user, select **Cancel** instead.

---

Figure 3-5 Change Password Screen



When you click on **Accept** Linuxconf will prompt you to enter the password. There is also a field called **Confirmation** where you will need to type the password again. This is to prevent you from mistyping the password. Passwords must be at least 6 characters in length. They may contain numbers as well as a mix of lowercase and uppercase letters. Press the **Accept** button again when finished.

### Modifying a User Account – Quick Reference

---

#### Please Note

Although you can change the settings in any user account, it is usually a bad idea to change the settings in a pre-created account. It is best to change settings and explore options in an account that you have created yourself.

---

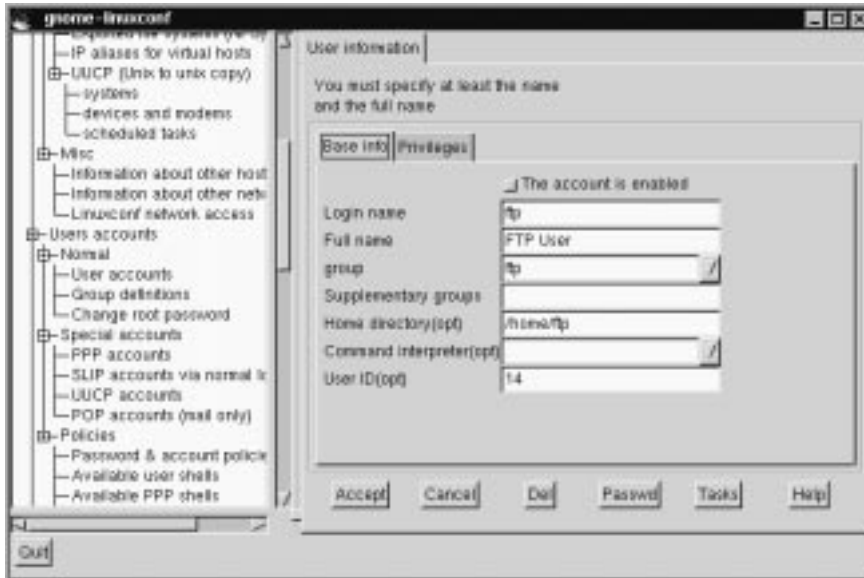
1. Start Linuxconf by typing `linuxconf` at the shell prompt.
-

2. Open **Config => Users accounts => Normal => User accounts**.
3. Select the user account.
4. Modify entries as desired.
5. Select **Accept**.

### **Modifying a User Account – General Overview**

- Start Linuxconf by typing `linuxconf` at the shell prompt.
  - Open **Config => Users accounts => Normal => User accounts**. This will open the **Users accounts** tab (see Figure 3–3, *Users Accounts Screen*).
  - If you have more than 15 accounts on the system, Linuxconf will provide you with a filter screen (see Figure 3–2, *Filter Control Screen*). You can use this to select a smaller range of accounts than the full list. To get the full list, select **Accept** without changing any of the parameters. For detailed information on the various filters, select the **Help** button on the **Filter control** screen.
  - Select the account you wish to modify. This will open the **User information** tab.
-

Figure 3-6 User Information Screen



On the **User information** screen, the information can be changed as desired. To implement the changes select **Accept**. If you decide against making any changes select **Cancel**. This guarantees that no changes are made.

### Changing a User's Password – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt.
2. Open **Config** => **Users accounts** => **Normal** => **User accounts**.
3. Select the user account.
4. Select **Passwd**.
5. Enter the user's new password.
6. Reenter the user's new password in the **Confirmation** field.
7. Select **Accept**.

## Changing a User's Password – General Overview

- Start Linuxconf by typing `linuxconf` at the shell prompt.
- Open **Config => Users accounts => Normal => User accounts**. This will open the *Users accounts* tab (see Figure 3–3, *Users Accounts Screen*).
- If you have more than 15 accounts on the system, Linuxconf will provide you with a filter screen (see Figure 3–2, *Filter Control Screen*). You can use this to select a smaller range of accounts than the full list. To get the full list, select **Accept** without changing any of the parameters. For detailed information on the various filters, select the **Help** button on the *Filter control* screen.
- Select the account whose password you wish to change. This will open the *User information* tab (see Figure 3–6, *User Information Screen*).
- Select **Passwd** from the options at the bottom of the screen.

Linuxconf will then prompt you to enter the new password. There is also a field called **Confirmation** where you will need to type the password again. This is to prevent you from mistyping the password. Passwords must be at least 6 characters in length. They may contain numbers as well as a mix of lowercase and uppercase letters. If you decide against changing the password, just hit **Cancel**. Once you have entered the new password select **Accept**.

## Changing the root Password – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt.
  2. Open **Config => Users accounts => Normal => Change root password**.
  3. Enter the current root password.
  4. Select **Accept**.
  5. Enter the new root password.
  6. Reenter the new root password in the *Confirmation* field.
  7. Select **Accept**.
-

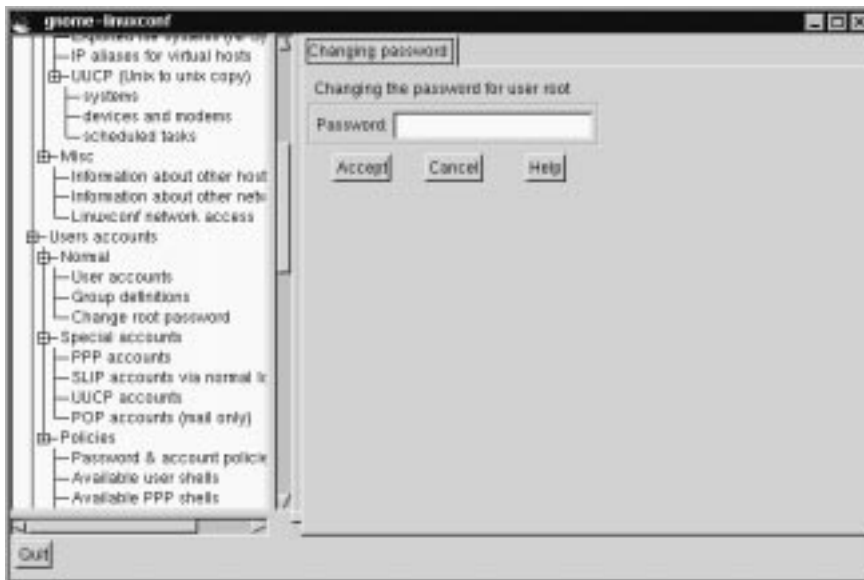


## Changing the root Password – General Overview

Changing the root's password isn't handled in the same manner as changing a user's password. Because of both the importance and security considerations surrounding root access, Linuxconf requires you to verify that you currently have access to the root account.

- Start Linuxconf by typing `linuxconf` at the shell prompt.
- Open **Config => Users accounts => Normal => Change root password**.

Figure 3–7 Root Password Verification Screen



Here, Linuxconf wants the current root password to verify access to the root account. Linuxconf does require root access to run, but once running there's nothing to keep anyone from sitting down at the computer if the person using Linuxconf steps out for a minute. The potential pitfalls are extensive! If the person who was originally using Linuxconf logs out of root, they won't be able to get back into it. A lack of validation would also give free reign over the computer to whoever had changed root's password.

Once you have entered root's current password, it will prompt you for a new password. There is also a field called *Confirmation* where you will need to type the password again (see Figure 3–5, *Change Password Screen*). This is to prevent you from mistyping the password. Passwords must be at least 6 characters in length. They may contain numbers as well as a mix of lowercase and uppercase letters. If you decide against changing the root password, just hit `Cancel`. Once you have entered the new password select `Accept`. The change takes place immediately and is effective not only for logging in as root, but also for becoming root using the `su` command.

### Disabling a User Account – Quick Reference

1. Start `Linuxconf` by typing `linuxconf` at the shell prompt.
2. Open `Config => Users accounts => Normal => User accounts`.
3. Select the account.
4. Deselect the `account is enabled` check box.
5. Select `Accept`.

### Disabling a User Account – General Overview

Why disable an account? Good question! There's no single answer, but we can provide some reasons why this option is available. The biggest reason is security. For example, you may have created a special account to be used by clients, co-workers, or friends to access specific files on your system. This account gets used from time to time, but should only be used when you know there's a need. Leaving an unused account around is a target for people who'd want to break into your system. Deleting it requires you to recreate it every time you want to use it. Disabling an account solves both problems by allowing you to simply select or de-select a check-box.

To disable an account:

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
- Open `Config => Users accounts => Normal => User accounts`.
- De-select the check-box that states that `The account is enabled`. Select the `Accept` button at the bottom of the window and you're all set.

The account is disabled and can be enabled later using a similar method.

---

## Enabling a User Account

By default, all newly created user accounts are enabled. If you need to enable an account, you can use `Linuxconf` to do it.

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
- Open **Config => Users accounts => Normal => User accounts**.
- Select the account you want to enable.
- Select the `The account is enabled` check-box and then select `Accept` at the bottom of the screen.

## Deleting a User Account – Quick Reference

1. Start `Linuxconf` by typing `linuxconf` at the shell prompt.
2. Open **Config => Users accounts => User accounts**.
3. Select the account you wish to delete.
4. On the *User information* screen select `Del`.
5. On the *Deleting account...* screen, choose the appropriate option for the account's data.
6. Select `Accept`.

## Deleting a User Account – General Overview

---

### Please Note

While there are a couple options that let you retain files associated with an account, any information or files deleted are gone and effectively unrecoverable. Take care when using this option!

---

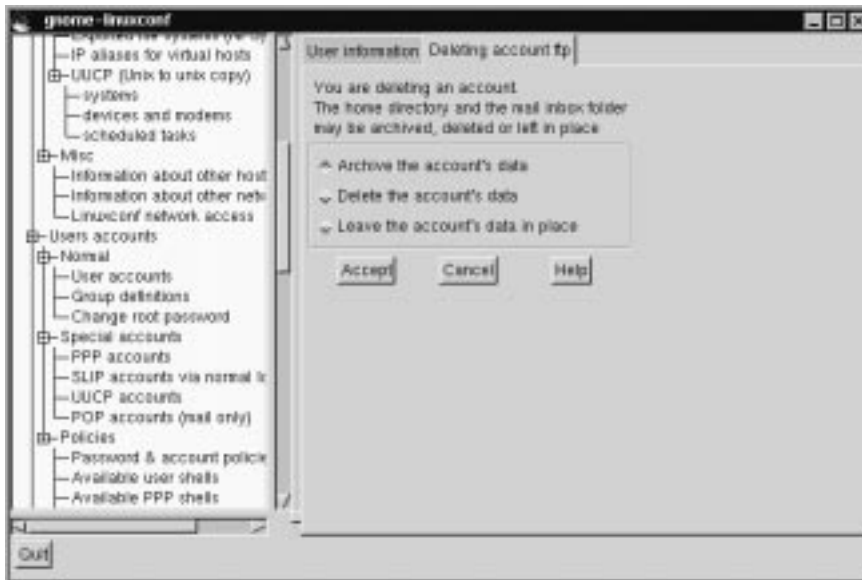
To delete an account:

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
  - Open **Config => Users accounts => User accounts**.
-

- On the *User accounts* screen (see Figure 3–3, *Users Accounts Screen*) select the account you wish to delete.
- At the bottom of the *User information* screen (see Figure 3–6, *User Information Screen*) select `Del` to delete the account.

Linuxconf will then prompt you with a list of options.

**Figure 3–8 Deleting Account Screen**



The default option is to archive the account's data. The archive option has the following effects:

1. Removes the user from the user accounts list;
2. Takes everything contained in the user's home directory and archives it (using tar and gzip compression), storing the resulting file in a directory called `oldaccounts`. For an account named `useraccount` the file name would be similar to:

```
useraccount-1999-10-10-497.tar.gz
```

The date indicates when the account was deleted, and the number following it is the ID of the process that actually performed the deletion. The `oldaccounts` directory is created in the same place as all of your user directories, and is created automatically the first time you remove a user account using this option.

3. Files not contained in the user's home directory, but owned by that user remain. The file is owned by the deleted account's user ID (UID). If you create a new account and specifically assign it the UID of a deleted account, it will then become the owner of any remaining files.

Selecting **Delete** the account's data on the *Deleting account* `<accountname>` screen (see Figure 3–8, *Deleting Account Screen*) will:

1. Remove the user from the user accounts list;
2. Remove the user's home directory and all its contents.

---

#### **Please Note**

Files not contained in the user's home directory, but owned by that user will remain on the system. The file will still be owned by the deleted account's user ID (UID). If you create a new account and specifically assign it the UID of a deleted account, it will then become the owner of any such "orphaned" files.

---

Selecting **Leave** the account's data in place on the *Deleting account* `<accountname>` screen (see Figure 3–8, *Deleting Account Screen*) will:

1. Remove the user from the user accounts list;
  2. Leave the user's home directory (with all its files) in place.
-

---

**Please Note**

Files and directories owned by the deleted account's user ID (UID) will remain on the system. If you create a new account and specifically assign it the UID of a deleted account, it will then become the owner of these "orphaned" files.

---

### 3.1.3 Groups

All users belong to one or more groups. Just as each file has a specific owner, each file belongs to a particular group as well. The group might be specific to the owner of the file, or may be a group shared by all users. The ability to read, write or execute a file can be assigned to a group; this is separate from the owner's rights. For example, the owner of a file will be able to write to a document, while other group members may only be able to read it.

#### Creating a Group – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt.
2. Open **Config => Users accounts => Normal => Group definition**.
3. Select **Add**.
4. Enter the Group name, and optionally alternate members.
5. Select **Accept**.

#### Creating a Group – General Overview

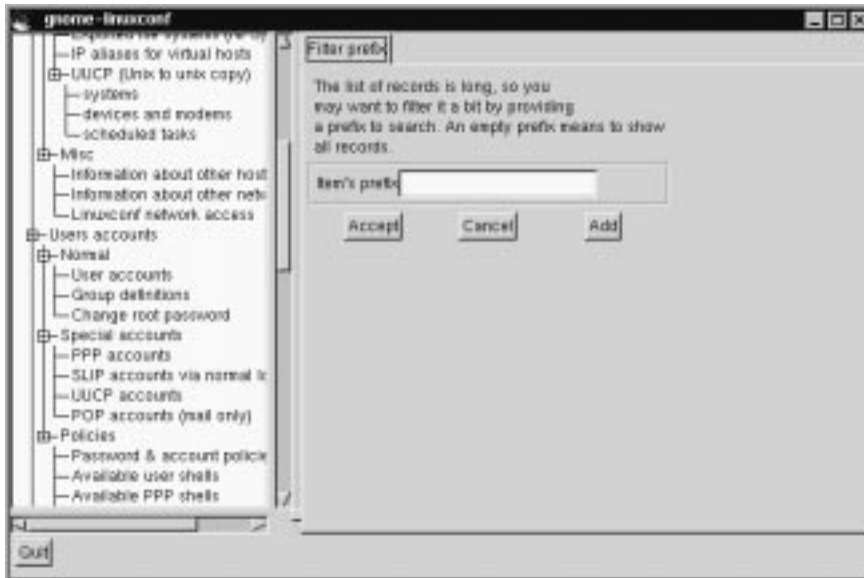
To create a new group:

- Start Linuxconf by typing `linuxconf` at the shell prompt.
- Open **Config => Users accounts => Normal => Group definition**.

If you have more than 15 groups, you will be given the option to select the groups by providing a prefix.

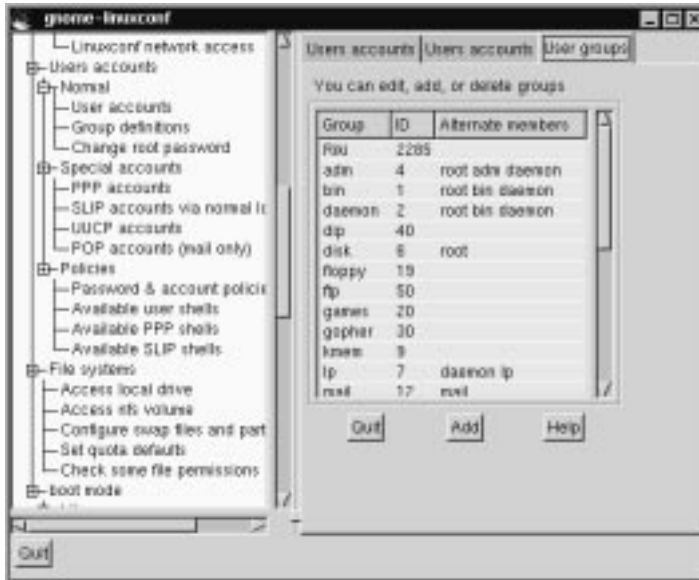
---

Figure 3-9 Group Filter Screen



You may add a group directly from this screen, or move on to the **User groups** screen. To move on select **Accept** with or without a prefix, to add a new group, hit **Add**.

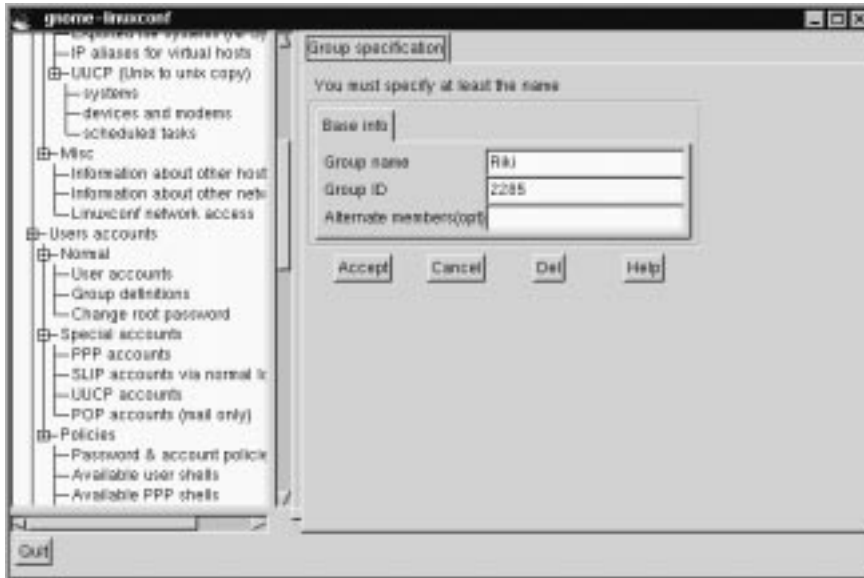
Figure 3–10 User Groups Screen



Select Add at the bottom of the *User groups* screen.



Figure 3–11 Group Specification Screen



Enter a group name. You may also wish to specify members of the group and can do so in the *Alternate members* field. The list of users should be space delimited, meaning that each username must have a space between it and the next one. When you're finished, select **Accept** and the group will be created.

### Deleting a Group – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt.
2. Open **Config => Users accounts => Normal => Group definitions**.
3. Select the group you wish to delete.
4. Select **Del**.
5. Confirm deletion.

### Deleting a Group – General Overview

To delete a group:

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
- Open **Config => Users accounts => Normal => Group definitions**.

If you have more than 15 groups, you will be given a filter screen (see Figure 3–9, *Group Filter Screen*) to narrow your choice of groups by specifying a prefix.

- With or without a prefix select **Accept** at the bottom of the screen.
- On the *User groups* screen (see Figure 3–10, *User Groups Screen*) select the group you wish to delete.
- You'll be presented with the *Group specification* screen (see Figure 3–11, *Group Specification Screen*).
- Select **Del** to delete the group. `Linuxconf` will then prompt you to confirm the deletion. Choose **yes** to delete the group.

The group's files will still remain and their respective owners will still have sole control over them. The group name will be replaced with the deleted group's ID. The files may be assigned to a new group by using the `chgrp` command. More information on `chgrp` can be found by typing the command `info chgrp` or `man chgrp` at the shell prompt. If a new group is created and the deleted group's ID is specified then the new group will have access to the deleted group's files. Don't worry, `Linuxconf` doesn't recycle old group numbers any more than it does old user IDs, so it won't happen by accident.

## Modifying Group Membership

There are two ways to modify the list of users that belong to a group. You can either update each user account itself, or you can update the group definitions. In general, the fastest way is to update each of the group definitions. If you're planning on changing more information for each user than just the group information, then updating each user account may prove easier.

## Modifying Group Membership – Quick Reference

Under **Groups**:

1. Start `Linuxconf` by typing `linuxconf` at the shell prompt.
  2. Open **Config => Users accounts => Normal => Group definitions**.
-

3. Select the group to which you wish to add or remove users.
4. Add or remove new users to the *Alternate members(opt)* field; make sure all user names are separated with a space " " character.
5. Select `Accept`.

### Modifying Group Membership – Quick Reference

Under Users:

1. Start `Linuxconf` by typing `linuxconf` at the shell prompt.
2. Open **Config => Users accounts => Normal => User accounts**.
3. Select a user to which you wish to add or remove groups.  
Adjust the *Supplementary groups* field accordingly; make sure all the group names are separated with a space " " character.
4. Select `Accept`.
5. Repeat steps 3 through 5 for each additional user to be added.

### Modifying Group Membership – General Overview

We'll start by detailing the group definitions method.

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
- Open **Config => Users accounts => Normal => Group definitions**.

If you have more than 15 groups, you will be given a filter screen (see Figure 3–9, *Group Filter Screen*) to narrow your choice of groups by specifying a prefix.

- With or without a prefix, select `Accept` at the bottom of the screen.
  - Select the group you wish to modify. This will open the `Group specification` screen (see Figure 3–11, *Group Specification Screen*).
  - Add or remove each user from the *Alternate members* field. Make sure that all of the user names are separated by a space " " character.
  - Once you've done this select `Accept` which can be found at the bottom of the screen.
-

This will automatically update each user account with the group showing up in the *Supplementary groups* field if added or absent if removed.

Adding and removing groups can also be done by modifying each individual user account.

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
- Open **Config => Users accounts => Normal => User accounts**.

If you have more than 15 accounts on the system, `Linuxconf` will provide you with a filter screen (see Figure 3–2, *Filter Control Screen*).

- On the *User accounts* screen (see Figure 3–3, *Users Accounts Screen*), select a user that you wish to update. You will be presented with the *User information* screen (see Figure 3–6, *User Information Screen*).
- Add or remove the desired groups from the *Supplementary groups* field. Each group should be separated by a space " " character.
- Once you've made all the changes you'd like, select `Accept` at the bottom of the screen.

This will automatically update the group definitions. Repeat the process for each user.

### 3.1.4 CD-ROMs, Diskettes, Hard Drives and Filesystems – the Inside Track

A filesystem is composed of files and directories, all starting from a single root directory. The root directory may contain any number of files and other directories, with each directory in turn following suit. The average filesystem often looks like an inverted tree with the directories as branches and the files as leaves. Filesystems reside on mass storage devices such as diskette drives, hard drives, and CD-ROMs.

For example, a diskette drive on DOS and Windows machines is typically referenced by `A:\`. This describes both the device (`A:`), and the root directory on that device (`\`). The primary hard drive on the same systems is typically referred to as the "C" drive because the device specification for the first hard drive is `C:`. To specify the root directory on the C drive, you would use `C:\`.

---

Under this arrangement, there are two filesystems -- the one on A:, and the one on C:. In order to specify *any* file on a DOS/Windows filesystem, you must either explicitly specify the device on which the file resides, or it must be on the system's default drive (which is where DOS' infamous C prompt comes from -- that's the default drive in a system with a single hard drive).

Under Linux, it is possible to link the filesystems on several mass storage devices together into a single, larger, filesystem. This is done by placing one device's filesystem "under" a directory on another device's filesystem. So while the root directory of a diskette drive on a DOS machine may be referred to as A:\, the same drive on a Linux system may be accessible as `/mnt/floppy`.

The process of merging filesystems in this way is known as **mounting**. When a device is mounted, it is then accessible to the system's users. The directory "under" which a mounted device's filesystem becomes accessible is known as the **mount point**. In the previous paragraph's example, `/mnt/floppy` was the diskette drive's mount point. Note that there are no restrictions (other than common conventions) as to the naming of mount points. We could have just as easily mounted the floppy to `/long/path/to/the/floppy/drive`.

One thing to keep in mind is that all of a device's files and directories are relative to its mount point. Consider the following example:

- A Linux System:
    - / --- system root directory
    - /foo --- mount point for the CD-ROM
  
  - A CD-ROM:
    - / --- CD-ROM's root directory
    - /images --- a directory of images on the CD-ROM
    - /images/old --- a directory of old images
-

So, if the above describes the individual filesystems, and you mount the CD-ROM at `/foo`, the new operating system directory structure would be:

- A Linux System (with the CD-ROM mounted):
  - `/` --- system root directory
  - `/foo` --- CD-ROM root directory
  - `/foo/images` --- a directory of images on the CD-ROM
  - `/foo/images/old` --- a directory of old images

To mount a filesystem make sure to be logged in as root, or become root using the `su` command. For the latter, type `su` at the shell prompt and then enter the root password. Once you are root, type `mount` followed by the device and then the mount point. For example, to mount the first diskette drive on `/mnt/floppy`, you would type the command `mount /dev/fd0 /mnt/floppy`.

At installation, Red Hat Linux will create `/etc/fstab`. This file contains information on devices and associated mount points. The advantage to this file is that it allows you to shorten your mount commands <sup>1</sup>. Using the information in `/etc/fstab`, you can type `mount` and then either the mount point or the device. The mount command will look for the rest of the information in `/etc/fstab`. It's possible to modify this file by hand, or by using `Linuxconf`. To use `Linuxconf`, please see *Reviewing Your Current Filesystem -- Quick Reference* in Section 3.1.4 immediately following.

### Reviewing Your Current Filesystem – Quick Reference

1. Start `Linuxconf` by typing `linuxconf` at the shell prompt.
2. Open **Config => File systems => Access local drive** or to look at your network environment: **Open Config => File systems => Access nfs volume**.

### Reviewing Your Current Filesystem – General Overview

We'll start by looking at your current directory structure.

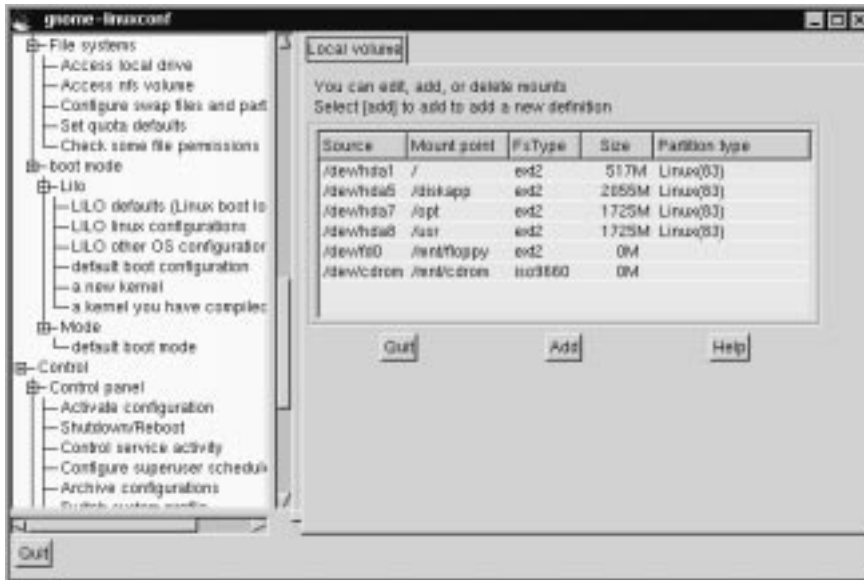
- Start `Linuxconf` by typing `linuxconf` at the shell prompt.

<sup>1</sup> It also controls which filesystems are automatically mounted when the system is booted.

---

- Open Config => File systems => Access local drive.

Figure 3–12 Local Volume Screen



The fields are:

- Source -- The physical hardware; `hd` indicates an IDE hard drive, `fd` indicates a diskette drive, and `cdrom` typically indicates a CD-ROM drive. If your system has a SCSI drive, you will see an `sd` instead. More than one drive of a type are listed by letters, so `hda` represents the first IDE drive, while `hdb` would be the second. In some cases, you'll see numbers following these letters; on hard drives, the numbers represent the partitions on that drive, while for diskette drives, this number refers to the actual unit.
- Mount point -- This is where in the system the drive is to be mapped when mounted.
- FsType -- This is where the type of filesystem is indicated. A standard Linux partition uses the `ext2` filesystem type. A filesystem type of `vfat` indicates a DOS filesystem with long filename support, while a `fat` filesystem type is for DOS

filesystems supporting traditional 8.3 filenames. The `iso9660` filesystem type indicates a CD-ROM drive, as seen in Figure 3–12, *Local Volume Screen*.

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**Please Note**

Red Hat Linux 6.1 can access FAT32 filesystems using the `vfat` filesystem type.

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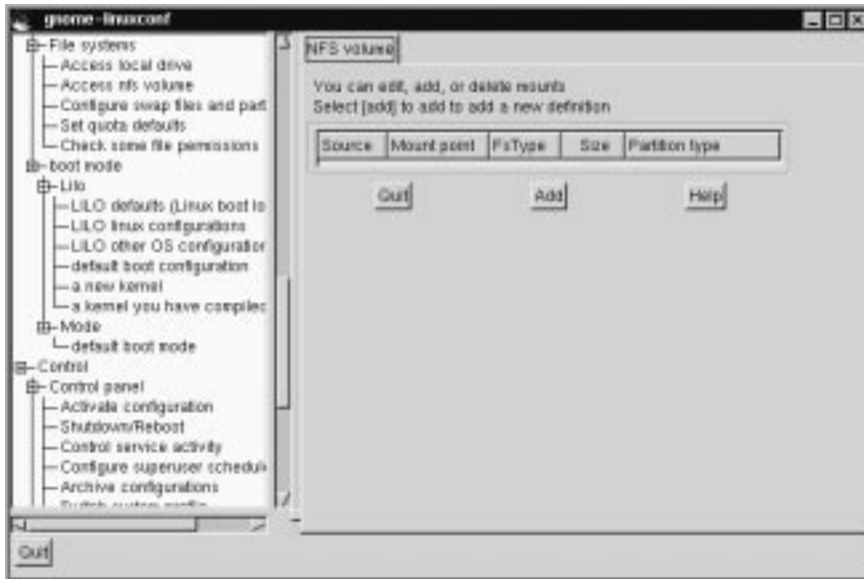
- **Size** -- Size indicates the size of the filesystem in megabytes (M). For removable media devices such as diskette and CD-ROM drives the stated size is listed as zero.
- **Partition type** -- A description of the filesystem used on that partition.

Filesystems from other machines on a network may also be available. These can range from single small directories to entire volumes. No information on **Size** or **Partition type** is available for these partitions, either. Additional information on these filesystems (should you have any available) will be contained under:

**Config => File systems => Access nfs volume**



Figure 3–13 NFS Volume Screen



The screen is similar to the *Local volume screen* (see Figure 3–12, *Local Volume Screen*), with some notable differences in the information provided for each entry:

- Source -- This will be the name of the machine serving the filesystem, followed by the remote directory. For example: `foo:/var/spool/mail` where `foo` is the machine serving the directory, and `/var/spool/mail` is the directory being served.
- FsType -- This will always be "nfs."

### Adding NFS Mounts – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt.
2. Open **Config** => **File systems** => **Access nfs volume**.
3. Select **Add**.
4. Enter the host name where the filesystem resides.

5. Enter the path to the remote filesystem in the *Volume* field. For example, `/var/spool/mail`.
6. Specify the mount point on your system. For example, `/mnt/foo`.
7. Select `Accept`.

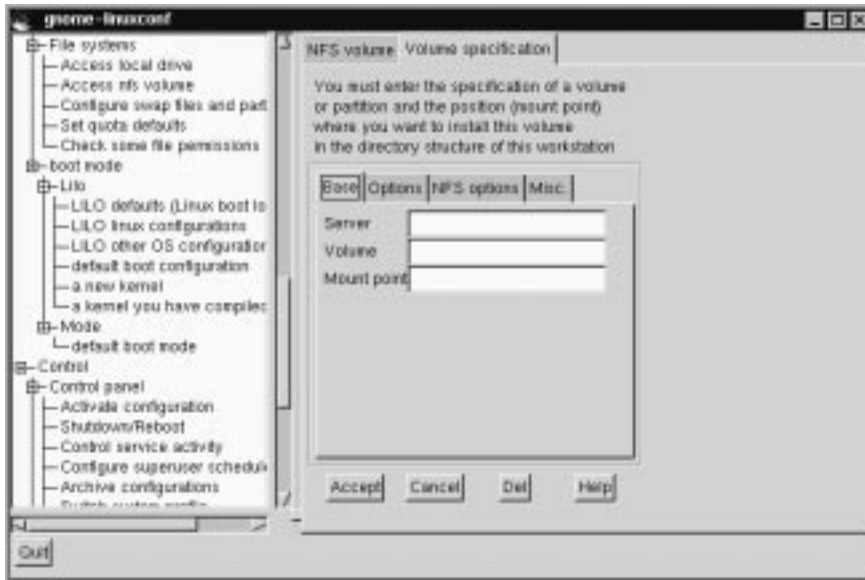
### **Adding NFS Mounts – General Overview**

NFS stands for Network File System. It is a way for computers to share sections of their local filesystem across a network. These sections may be as small as a single directory, or include thousands of files in a vast hierarchy of directories. For example, many companies will have a single mail server with individuals' mail files served as an NFS mount to each users' local systems.

To add an NFS mount:

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
  - Open **Config** => **File systems** => **Access nfs volume**.
  - On the *NFS volume* screen (see Figure 3–13, *NFS Volume Screen*), select `Add`.
-

Figure 3–14 Volume Specification Screen



The three fields on the *Base* tab are what you'll need to concern yourself with.

- **Server** -- The host name of the machine the desired filesystem resides on. For example, `foo.bar.com`.
- **Volume** -- The filesystem you wish to add. For example, `/var/spool/mail`.
- **Mount point** -- Where in your system you want the remote file system accessible from. For example, `/mnt/mail`.

This is all you need to get the mount created. Linuxconf will update your `/etc/fstab` file accordingly. If you are aware of additional requirements, please read the help file on the *Volume specification* screen and see the `mount` man page for more information.

Once you have entered the information, select **Accept**.

### 3.1.5 Getting Connected with Linuxconf (Network Configuration)

The first thing to determine when getting hooked up is whether you're connecting to a local area network, such as a group of computers in an office, or a wide area network, such as the Internet. Before continuing, it's important to know what hardware you have and how you intend to connect. If you're going to dial into another computer, then make sure your modem is installed and that the cables are arranged properly. If you're using a network card, make sure it is installed properly and that the cables are correctly connected. Regardless of what network configuration you specify, if every phone line or cable is not in place, you'll never get connected. We'll start with modem connections and then move on to using network cards.

#### Adding Modem/PPP/SLIP connections – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt.
2. Open **Config => Networking => PPP/SLIP/PLIP**.
3. Select **Add**.
4. Select the type of connection.
5. Enter the phone number, login name and password.
6. Select **Use PAP authentication only if necessary** (only available for PPP accounts).
7. Select **Accept**.

#### Adding Modem/PPP/SLIP connections – General Overview

Red Hat Linux 6.1 uses the utility called RP3, or the RH PPP Dialer, a graphical tool which helps users configure and monitor network accounts -- particularly PPP accounts. (To read more about RP3, see the related chapter in the *Official Red Hat Linux Getting Started Guide*.) However, you can still depend on Linuxconf to set up network configuration.

There are several pieces of information you will need to get from your ISP (Internet Service Provider) or systems administrator before getting your PPP or SLIP account working. In the case of some providers, you may have to sort through directions on

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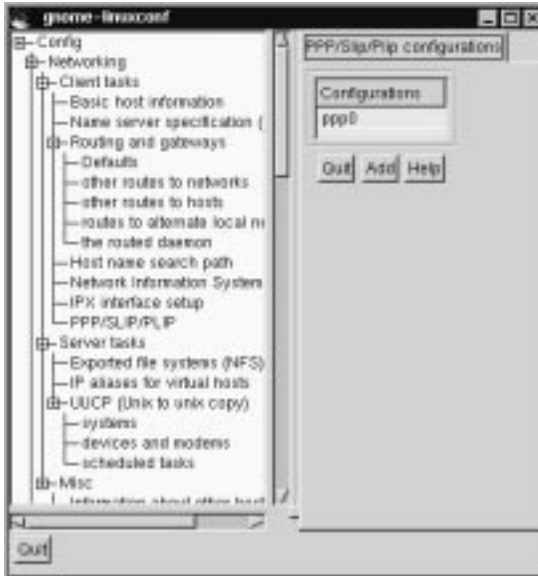
how to set up a PPP connection on a Linux system. Some ISPs are ill-equipped to handle individuals using Linux. Don't worry, you can still get connected; you just need some additional information from your ISP.

The following is what you need for a connection with Red Hat Linux. The ISP representatives may respond that you don't need this information, or may suggest that you need more than this. Red Hat has streamlined the information needed using intelligent defaults and tools such as `Linuxconf` to simplify this process for you. Unless they have a document specifically for Red Hat Linux, just request the information below and go from there. Specifically, you'll need:

- the IP address for a domain nameserver (DNS);
- the telephone number to dial;
- your login and password;
- an IP address for your machine if the network you are connecting to isn't going to provide you with a dynamic one;
- whether or not your ISP uses an authentication method such as PAP, CHAP or MS-CHAP. If so, you will need a "secret" to enable authentication. The secret will be a word or sequence of characters. CHAP and MS-CHAP are not currently supported using `Linuxconf`, and are rarely used.

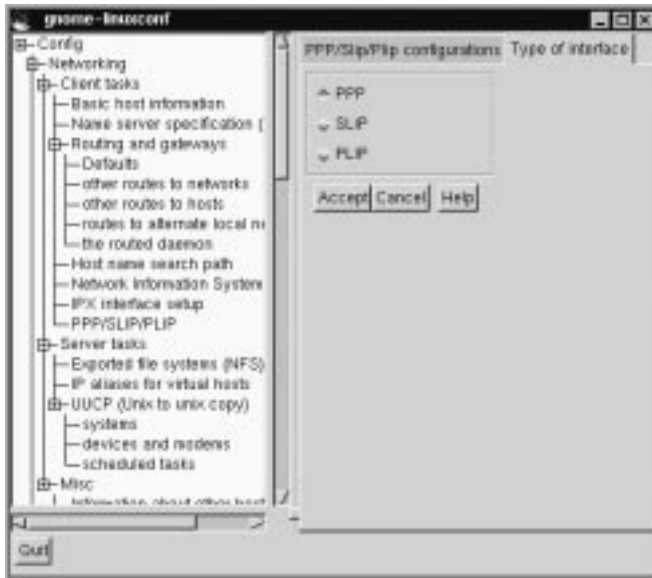
Additional information which may be helpful, but isn't necessary includes a secondary nameserver address, and a search domain. Once you have all this information, you're ready to get connected.

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
  - Open **Config => Networking => PPP/SLIP/PLIP**.
  - Select **Add**.
-

**Figure 3–15 PPP/SLIP/PLIP Configurations Screen**

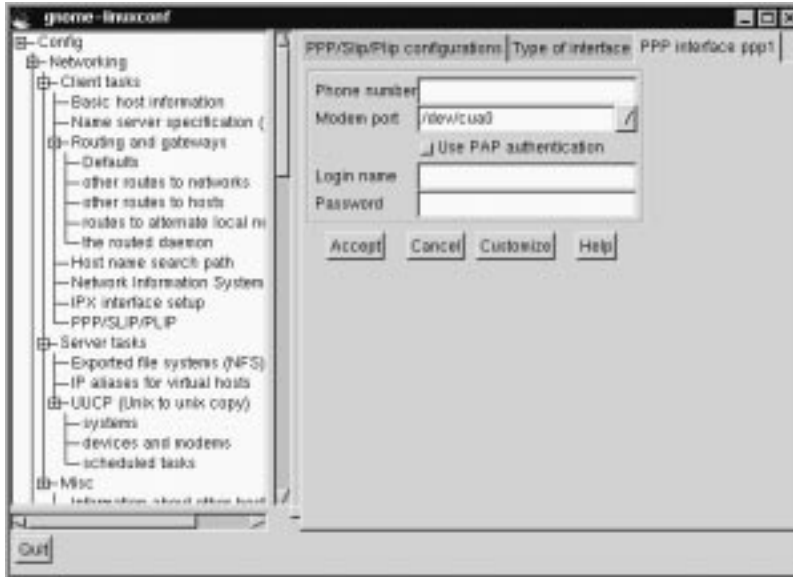
Initially there won't be any configurations specified. When you select Add you will be given a choice between PPP, SLIP and PLIP.

Figure 3–16 Type of Interface Screen



PPP is the most commonly used interface and is the default. To set up a PPP connection select PPP and hit Accept.

Figure 3–17 PPP Interface Screen



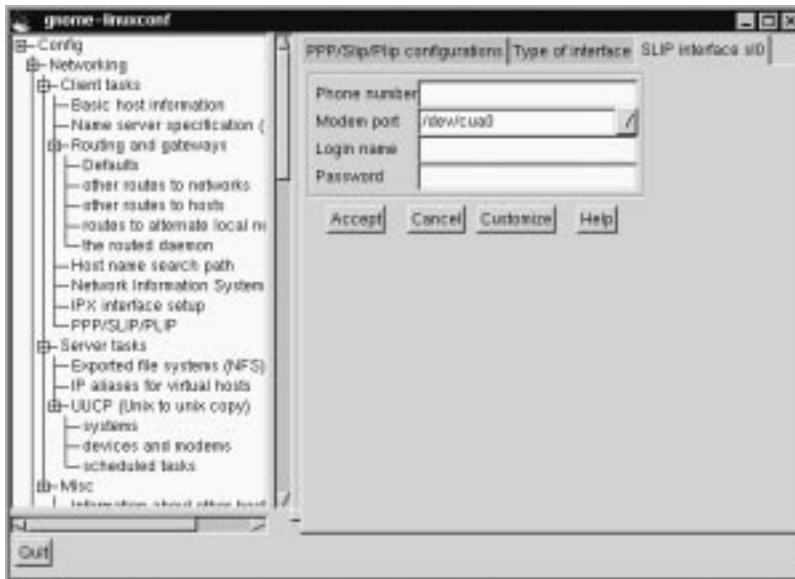
You'll see the following fields:

- Phone number - number used to access to remote system;
- Modem port - indicates where your modem is. Should already be set.
- Use PAP authentication (checkbox) - check if you know that the system you are dialing into requires this;
- Login name - your login name for the PPP account;
- Password - your password for the PPP account.

Notice that the title bar is *PPP interface ppp0*. *ppp0* is the first PPP interface, *ppp1* would be the second and so on. It's important to keep track of which interface you're using if you have more than one. SLIP connections use *sl* instead of *ppp* for their interface prefix. With the exception of a PAP authentication option, the entry screens for adding a PPP or a SLIP account are identical.



Figure 3–18 SLIP Interface Screen



Enter the complete phone number for the remote machine, and make sure to include any numbers required to access outside lines.

For example, if you need to dial "9" and then the number, and the computer you're connecting to has a telephone number of "555-0111," then you'd enter "95550111."

The next information you're asked for is the modem port. This is a drop down box of available ports. If you're using a dual-boot Linux/Windows system and you know the COM port your modem is on, the following map may be of use:

Map to Windows COM ports are as follows:

- `ttys0` -- COM1: under MS-DOS;
- `ttys1` -- COM2: under MS-DOS;
- `ttys2` -- COM3: under MS-DOS;
- `ttys3` -- COM4: under MS-DOS.

The login name is the one for the PPP account. The password you enter will be shown in plain text, so be careful who you have around when you enter it! If you will be using PAP authentication, check the box; when you've entered the other required information, select the **Customize** button at the bottom of the screen. All the other information is provided on the various tabs and can be set within the **Customize** screen, but it's easier to find the information all in one place on the primary screen.

**Figure 3–19 PPP Interface Customization Screen**



Select the *PAP* tab and enter your username and then the secret the ISP has provided you in the *Secret field*. The other defaults should be sufficient, but if you need to, you can edit the initial settings using the *Customize* option.

### Modifying a PPP or SLIP Configuration – Quick Reference

1. Start Linuxconf by typing `linuxconf` at the shell prompt.
2. Open **Config => Networking => PPP/SLIP/PLIP**.
3. Select the configuration to modify.
4. Change the desired settings; most are on the *Communications* tab.

5. Select `Accept`.

### Modifying a PPP or SLIP Configuration – General Overview

You can edit an existing configuration as well as delete it by selecting it from the list on the *PPP/SLIP/PLIP configurations* screen.

- Start `Linuxconf` by typing `linuxconf` at the shell prompt.
- Open `Config => Networking => PPP/SLIP/PLIP`.
- You will then be presented with the `PPP/SLIP/PLIP configurations` screen (see Figure 3–15, *PPP/SLIP/PLIP Configurations Screen*). Select the configuration you would like to modify or delete.

This will open the appropriate interface screen for your configuration. If you wish to delete the configuration, the handy `Del` button is there at the bottom of the screen. The Modem port is on the *Hardware* tab and is a drop down menu. If you want to change the other settings you entered when you originally created the configuration, select the *Communication* tab. The first *Send* field contains your login, and the next *Send* field contains your password. The *Expect* fields correspond to the `login:` and `password:` prompts, which explains the `ogin:` and `ord:` entries.

---

#### Please Note

The `ogin:` and `ord:` entries may not be the same for your system. Different ISP/PPP servers may use different text and should be changed to fit the needs of whatever server type you are logging in to. Instead, you may see such prompts as `User ID` and `authentication`.

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Figure 3–20 SLIP Interface Customization Screen



Once you have made your changes, you can test to see if your configuration is working. Select **Connect** from the bottom of the screen. This will attempt to connect you to the remote system using the information you've entered. Once you've finished configuring and testing your setup, we recommend using the `usernet` utility to control your dial-up networking connection on a daily basis. See the `usernet` man page for more information.

### Other Network Connections – Quick Reference

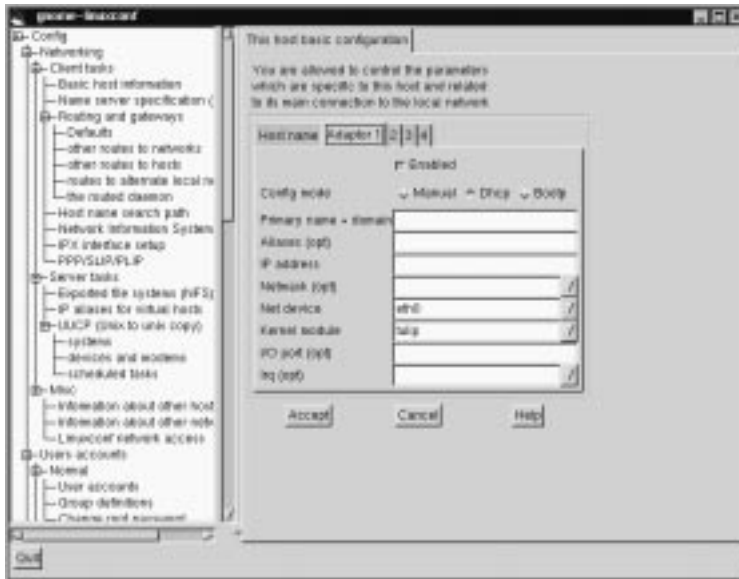
Due to the number of possible choices and sub-choices, no quick reference is available for this section.

### Other Network Connections – General Overview

Setting up a network connection over ethernet requires an entirely different type of setup. Network connections to token ring or arcnet networks follow a similar procedure, but will not be discussed here.

- First you will need to have an Ethernet card installed.
- Start Linuxconf by typing `linuxconf` at the shell prompt.
- Open **Config** => **Networking** => **Client tasks** => **Basic host information**. The `Host` name tab will request a host name, which should be specified by default unless you did not setup your networking during the installation process. If it is not already specified, please take the time now to configure it. It should be specified at `localhost.localdomain`. Skip this tab. Select the tab for `Adaptor 1`.

Figure 3–21 Adaptor 1



The first item on this screen is a check box to indicate whether this adaptor is enabled or not. It should be checked if this is the one you intend to use. Below that is a choice of Config modes. `Manual` means that you will be providing all the information and entering it yourself. `DHCP` and `bootp` retrieve their information from a remote server of the corresponding kind. If you're not sure what option to choose, talk to your network administrator.

DHCP and bootp Required fields:

- Net device - The type of network card you are using; for example, `eth0` would be the appropriate entry to use the first Ethernet card.
- Kernel module - The correct module based on your network card; for further information see the list below.

For DHCP and bootp configurations you only need to specify the `Net device` and the `Kernel module`. For the `Net device`, you will choose from a list where the `eth` prefix represents ethernet cards, the `arc` specifies an arcnet card and the `tr` specifies token ring cards. A complete list of network cards and their respective modules can be found in Appendix B, *General Parameters and Modules*. For the most up-to-date list, please see our website at:

<http://www.redhat.com>

The netmask information will be set by default, although depending on what kind of network you are setting up, or becoming a part of, you may need to specify this. If you are connecting to an ISP, ask them for the information. Most likely it will be `255.255.255.0` (the default).

Required fields for Manual Configuration:

- Primary name + domain -- the primary name is the name of your computer, while the domain is how your network is specified. For example, `foo.bar.com`; `foo` is the primary name and `bar.com` is the domain.
- IP address -- this is the address of the machine and will follow the pattern of `x.x.x.x`. For example, `192.168.0.13`.
- Net device -- type of network card you are using; `eth0` would be the appropriate entry to use the first ethernet card.
- Kernel module -- the correct module based on your network card.

Information on net devices and kernel modules is described above. The appropriate primary name + domain and IP address will depend on whether you are adding the computer to an existing network or creating a new network. For connecting to an existing network, contact your network administrator for the information. Getting a

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network connected to the Internet is beyond the scope of this book, and we recommend the following starting point:

*TCP/IP Network Administration, 2nd Edition*, by Craig Hunt (O'Reilly and Associates).

If you're setting up a private network that won't *ever* be connected to the Internet, then you can choose any primary name + domain name you would like and have several choices for IP addresses (See Table 3-1, *Addresses available and Examples*).

**Table 3-1 Addresses available and Examples**

| Addresses available          | Examples               |
|------------------------------|------------------------|
| 10.0.0.0 - 10.255.255.255    | 10.5.12.14             |
| 172.16.0.0 - 172.31.255.255  | 172.16.9.1, 172.28.2.5 |
| 192.168.0.0 - 192.168.255.25 | 192.168.0.13           |

The three sets of numbers above correspond to class a, b, and c networks respectively. The classes are used to describe the number of IP addresses available as well as the range of numbers used to describe each. The numbers above have been set aside for private networks.

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#### Please Note

You should not use these IP addresses if you connect to the Internet since 192.168.0.\* and 192.168.255.\* are not reliably considered private. If you want your network to be connected to the Internet, or think you might want to at some point in the future, do yourself a favor and get yourself non-private addresses now.

---

### Nameserver Specification

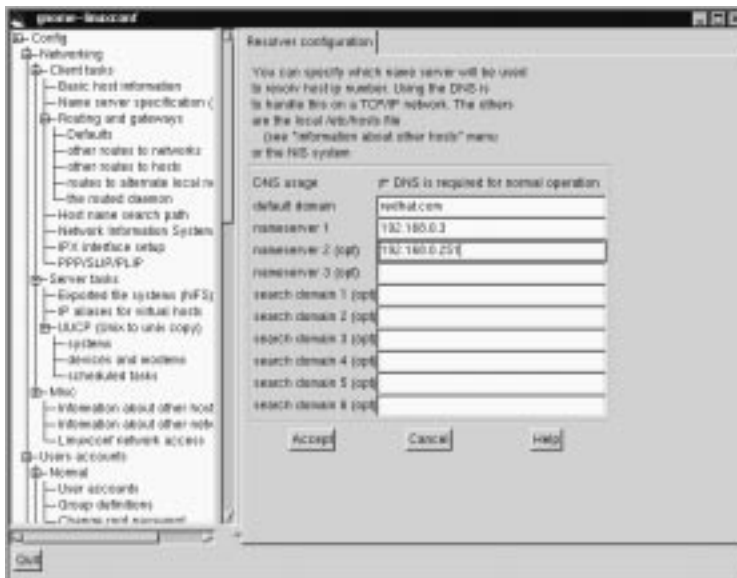
A nameserver and default domain are also needed to establish a network connection. The nameserver is used to translate host names such as `private.network.com` to their corresponding IP address such as `192.168.7.3`.

---

The default domain tells the computer where to look if a fully qualified hostname isn't specified. Fully qualified means that the full address is given, so `foo.redhat.com` is the fully qualified hostname, while the hostname is simply `foo`. If you specified your default domain as `redhat.com`, then you could use just the hostname to connect successfully. For example `ftp foo` would be sufficient if your search domain is `redhat.com`, while `ftp foo.redhat.com` would be required if it wasn't.

To specify the nameserver, open **Config => Networking => Name server specification (DNS)**.

**Figure 3–22 Resolver Configuration Screen**



Nameservers are ranked according to the order in which they are accessed, so it's not unusual to see nameservers referred to as primary, secondary, tertiary and so on down the list if more than one is specified. Each of these must be an IP address and not a name. The computer has no way to resolve the name until it connects to a nameserver. Screamingly obvious when stated, but occasionally overlooked when people are simply asked to supply an address for a computer.



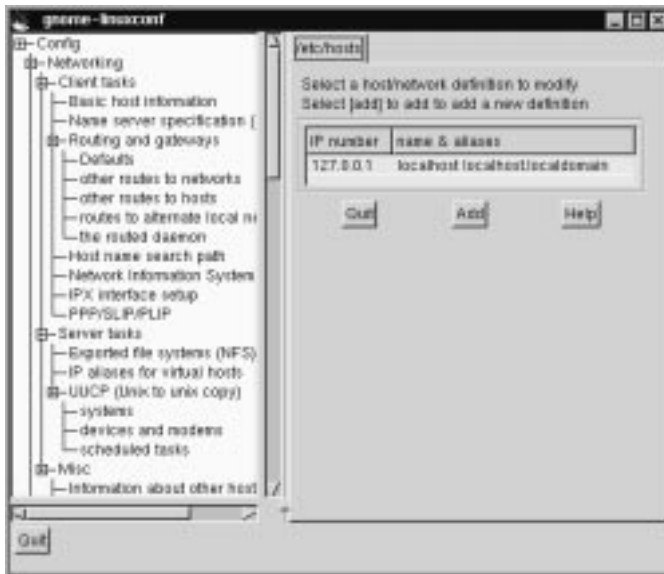
In addition to a default domain, you can also specify search domains. Search domains work differently; they progress from one to six in a similar manner to the nameserver. However, they all take precedence over the default domain! Keep this in mind when specifying search domains. Search domains are not commonly used.

The one item not yet covered is the check box for DNS usage. If you are running a small private network with no Internet connection, then using `/etc/hosts` files and keeping them all synchronized will work. As you add more and more machines, the complexity increases until it is easier to have a single machine run a DNS than to continue to sync `/etc/hosts` files.

There is another reason for not using DNS, and that is if your network is going to use NIS instead. Note that NIS can be used in conjunction with DNS. So to sum it all up, unless you know why using `/etc/hosts` or NIS would be best for your situation, DNS is probably going to be your best choice.

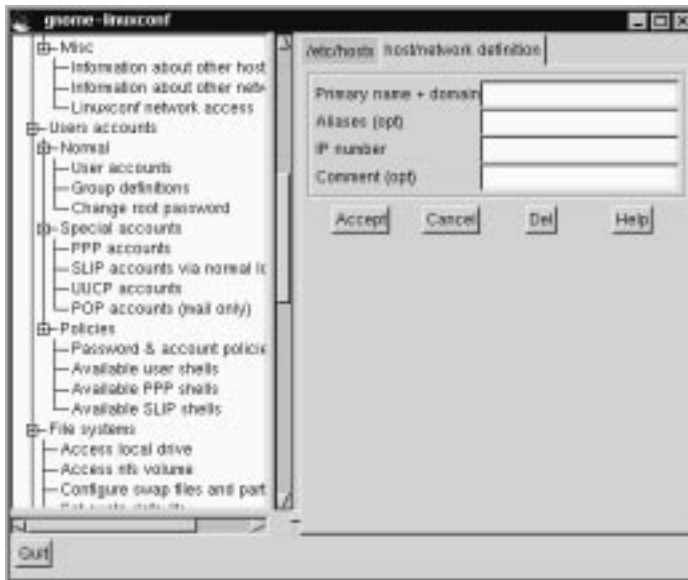
You can add, modify, or delete entries from the `/etc/hosts` file using Linuxconf. Open **Config => Networking => Misc => Information about other hosts**.

**Figure 3–23** `/etc/hosts` Screen



To modify or delete an entry select it. To delete the entry, select Del at the bottom of the host/network definition screen.

**Figure 3–24 Host/Network Definition Screen**



To modify it, change the information as necessary. To add a new entry, select Add at the bottom of the /etc/hosts screen. This will also open the host/network definition screen.

#### Required Fields:

- Primary name + domain -- the primary name is the name of the computer, while the domain is how the network it is attached to is specified. For example, given `foo.bar.com`, `foo` is the primary name and `bar.com` is the domain.
- IP number -- also referred to as IP address; this is the address of the machine and will follow the pattern of `x.x. x.x. x.x`. For example, `192.168.0.13`

#### Optional Fields:

- **Alias** -- A shorthand for the fully qualified domain name. This is often the same as the primary name. So, for example, if the fully qualified domain name is `foo.bar.com`, you could select `foo` as the alias.
- **Comment** -- a comment on the machine. For example, "The remote nameserver."

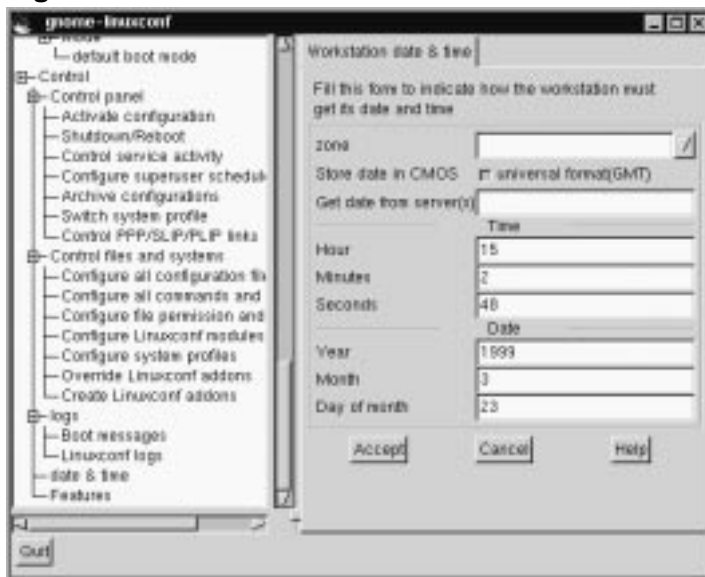
You will need to specify both the primary name + domain and the IP number. The other fields are optional. Once finished, select **Accept**.

### Date and Time

To get to the `date` & `time` control panel:

- Start Linuxconf by typing `linuxconf` at the shell prompt.
- Enter root's password when prompted (if you're not already root).
- Open **Control** => **Date & Time**.

**Figure 3–25 Workstation Date & Time**



The zone field is a pull-down list that is long and extensive. It is often designated by a large region and then a city or zone within it. Examples include `Europe/Vienna`

and US/Eastern. There is a check box to Store date in CMOS in GMT format. Hours are specified from 0 (midnight) to 23 (11 PM). Months are specified by number as well. For the year, please specify all four digits. All other fields should be self-explanatory.

## 3.2 System Configuration with the Control Panel

---

### Please Note

Most of what can be done with the control panel applications can also be done using Linuxconf. In addition, Linuxconf supports both character-cell *and* graphical user interfaces. Please refer to Section 3.1, *System Configuration With Linuxconf* for an introduction to Linuxconf.

---

The control panel is a launching pad for a number of different system administration tools (see Figure 3–26, *The Control Panel*). These tools make your life easier by letting you configure things without remembering configuration file formats and awkward command line options.

**Figure 3–26** The Control Panel



To start the control-panel, start the X Window System as root with `startx` and type `control-panel` in an xterm. You will need to be root to run the control-panel tools successfully. You can do this as well if you already have X running as a normal user. Just type `su -c control-panel` and then type the root password when prompted. If you plan to do other tasks as root, you could type `su` followed by the root password when prompted.

---

---

**Please Note**

If you are not running X as root, you may need to give root access to your system's X server. To do this, enter the following command on a *non-root* terminal window:

```
xhost +localhost
```

After starting the control panel, simply clicking on an icon starts up a tool. Please note that you are not prevented from starting two instances of any tool, but doing so is a very bad idea because you may try to edit the same files in two places and end up overwriting your own changes.

---

**Please Note**

If you do accidentally start a second copy of a tool, you should quit it immediately. Also, do not manually edit any files managed by the control-panel tools while the tools are running. Similarly, do not run any other programs (such as Linuxconf) that may change those files while the tools are running.

---

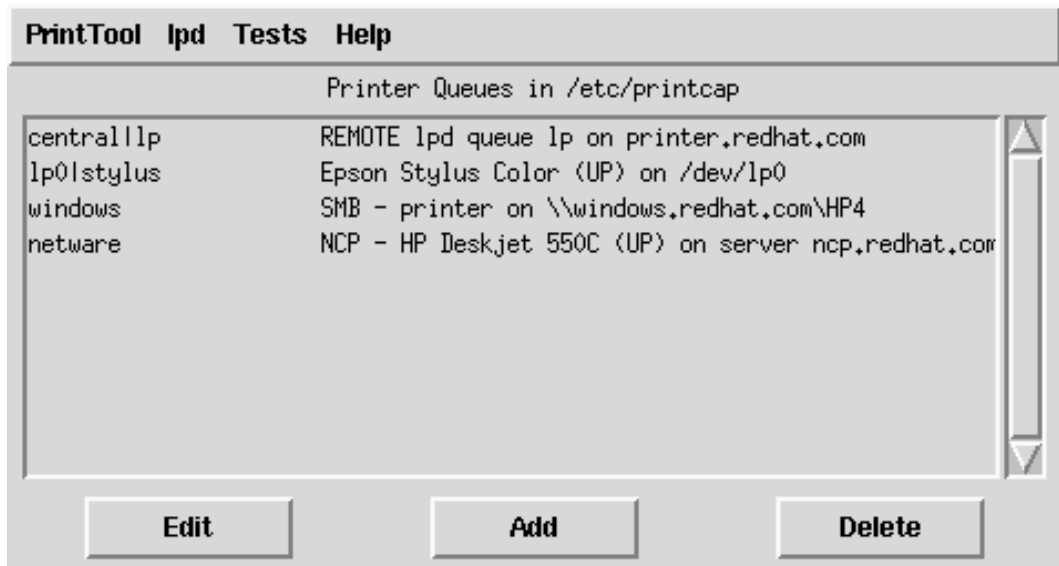
### 3.2.1 Printer Configuration

The printer configuration tool (`printtool`) maintains the `/etc/printcap` file, print spool directories, and print filters. The filters allow you to print many different types of files, including:

- plain text (ASCII) files
  - PostScript files
  - TeX `.dvi` files
  - GIF, JPEG, TIFF, and other graphics formats
  - RPMs
-

In other words, simply printing a GIF or RPM file using the `lpr` command will result in the printer doing "the right thing."

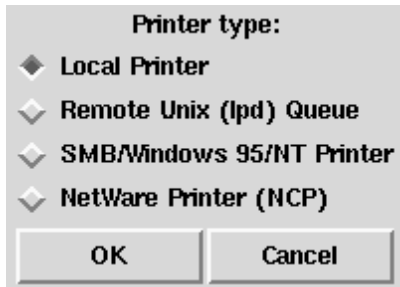
**Figure 3–27 Print Tool**



In order to create a new **print queue**, choose **Add**. Then, select what type of printer is being added. There are four types of print queues which can be configured with `printtool`:

- Local print queues are for printers attached to a printer or serial port on your Red Hat Linux system.
- Remote print queues are attached to a different system which you can access over a TCP/IP network.
- SMB print queues are attached to a different system which uses LAN-Manager-type (SMB) networking.
- NCP print queues are attached to a different system which uses Novell's NetWare network technology.

Figure 3–28 Selecting a Printer Type



After choosing the printer type, a dialog box requests further information about the print queue (see Figure 3–29, *Adding a Local Printer*). All types of print queues require the following information:

- **Queue Name:** What the queue will be called. Multiple names can be specified with the | (pipe) character separating entries.
- **Spool Directory:** This is the directory on the local machine where files are stored before printing occurs. Be careful to not have more than one printer queue use a given spool directory.
- **File Limit:** Maximum size print job accepted, in kilobytes (1 kb = 1024 bytes). A size of 0 indicates no limit should be imposed.
- **Input Filter:** Filters convert printed files into a format the printer can handle. Press **Select** to choose the filter which best matches your printer (see Figure 3–30, *Configuring a Print Filter*).

In addition to configuring print queues able to print graphical and PostScript output, you can configure a **text-only** printer, which will only print plain ASCII text. Most printer drivers are also able to print ASCII text without converting it to PostScript first; simply choose **Fast text printing** when you configure the filter.

---

**Please Note**

This only works for non-PostScript printers.

---

- **Suppress Headers:** Check this if you don't want a header page printed at the beginning of each print job.

For **local** printers, the following information is also required:

- **Printer Device:** Usually `/dev/lp1`; the name of the port which the printer is attached to. Serial printers are usually on `/dev/ttyS?` ports. Note that you will need to manually configure serial parameters.

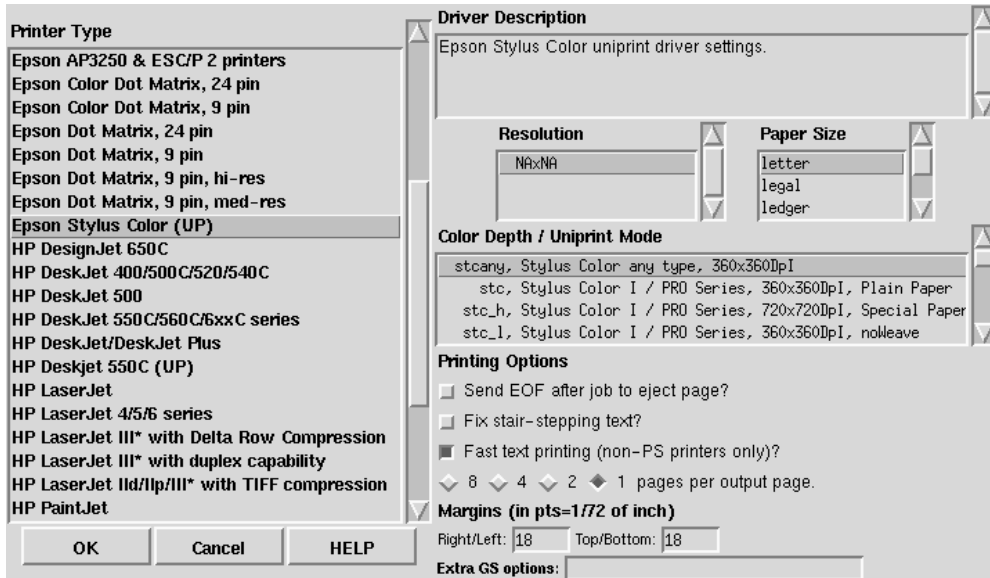
**Figure 3–29 Adding a Local Printer**

The screenshot shows a dialog box with the following fields and controls:

|  |                    |
|--|--------------------|
| Names (name1 name2 ...)                              | lp0 stylus         |
| Spool Directory                                      | /var/spool/lpd/lp0 |
| File Limit in Kb (0 = no limit)                      | 0                  |
| Printer Device                                       | /dev/lp0           |
| Input Filter   | Select             |
| <input checked="" type="checkbox"/> Suppress Headers |                    |
| OK Cancel  |                    |



Figure 3–30 Configuring a Print Filter



For **remote** printers, the dialog box contains additional fields; fill in the following information:

- Remote Host: Hostname of the remote machine hosting the printer.
- Remote Queue: Name of the queue to print to on the remote machine.

The remote machine must be configured to allow the local machine to print on the desired queue. Typically `/etc/hosts.lpd` controls this.

**Figure 3–31 Adding a Remote Printer**

|   |                            |
|---|----------------------------|
| Names (name1 name2 ...)                   | central1lp                 |
| Spool Directory                           | /var/spool/lpd/centr.      |
| File Limit in Kb (0 = no limit)           | 0                          |
| Remote Host                               | printer.redhat.com         |
| Remote Queue                              | lp                         |
| Input Filter                              | Select *auto* - PostScript |
| <input type="checkbox"/> Suppress Headers |                            |
| OK  | Cancel                     |

**Figure 3–32 Adding an NCP Printer**

|   |                            |
|---|----------------------------|
| Names (name1 name2 ...)                   | netware                    |
| Spool Directory                           | /var/spool/lpd/netware     |
| File Limit in Kb (0 = no limit)           | 0                          |
| Printer Server Name                       | nps.redhat.com             |
| Print Queue Name                          | deskjet                    |
| User                                      | npsuser                    |
| Password                                  | *****                      |
| Input Filter                              | Select *auto* - PostScript |
| <input type="checkbox"/> Suppress Headers |                            |
| OK  | Cancel                     |

Figure 3–33 Adding an SMB Printer

|                                 |                        |
|---------------------------------|------------------------|
| Names (name1 name2 ...)         | windows                |
| Spool Directory                 | /var/spool/lpd/windows |
| File Limit in Kb (0 = no limit) | 0                      |
| Hostname of Printer Server      | windows.redhat.com     |
| IP number of Server (optional)  |                        |
| Printer Name                    | HP4                    |
| User                            | guest                  |
| Password                        | *****                  |
| Workgroup                       | USERS                  |
| Input Filter                    | Select                 |

Suppress Headers

OK Cancel

For SMB and NCP printers, fill in the following information:

- **Hostname of Printer Server:** Name of the machine to which the printer you want to use is attached.
- **IP number of Server:** The IP address of the machine to which the printer you want to use is attached; this is optional and only relevant for SMB printers.
- **Printer Name:** Name of the printer on which you want to print.
- **User:** Name of user you must login as to access the printer (typically `guest` for Windows servers, or `nobody` for samba servers).
- **Password:** Password (if required) to use the printer (typically blank). Someone should be able to tell you this if you do not already know it.

---

**Please Note**

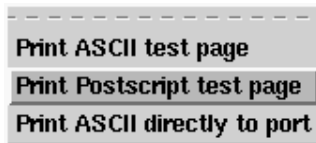
If you require a username and password for an SMB (LAN Manager) or NCP (NetWare) print queue, they are stored unencrypted in a local script. Thus, it is possible for another person to learn the username and password. It is therefore recommended that the username and password for use of the printer to be different than that for a user account on the local Red Hat Linux system, so that the only possible security compromise would be unauthorized use of the printer. If there are file shares from the SMB server, it is recommended that they also use a different password than the one for the print queue.

---

After you have added your print queue, you may need to restart the printer daemon (`lpd`). To do so, choose `Restart lpd` from the `lpd` menu.

You may print a **test page** for any print queue you have configured. Select the type of test page you would like to print from the `Tests` menu.

**Figure 3–34 Printing a Test Page**



### 3.2.2 Kernel Daemon Configuration

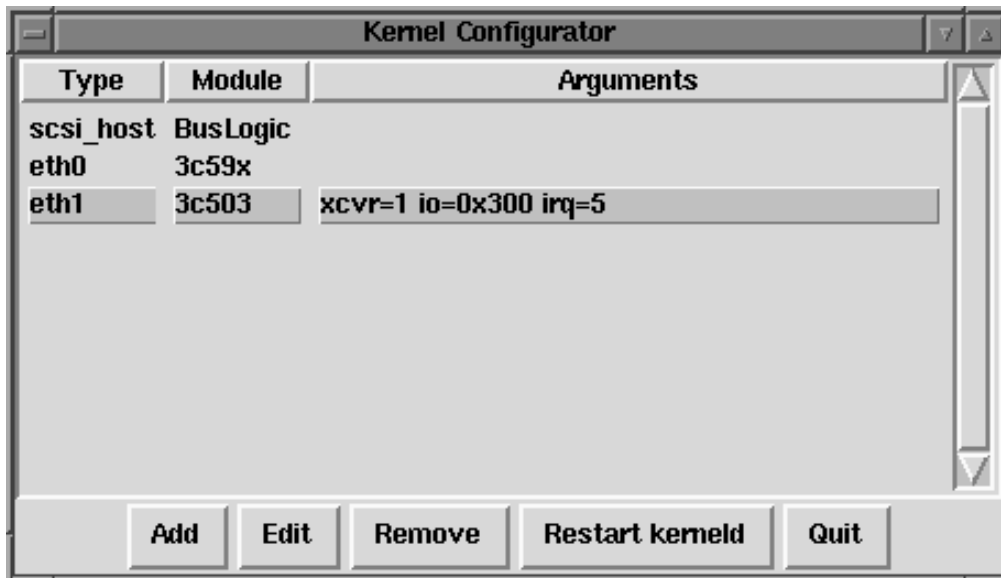
Red Hat Linux includes `kerneld`, the Kernel Daemon, which automatically loads some software and hardware support into memory as it is needed, and unloads it when it is no longer being used.

The tool shown in Figure 3–35, *Kernel Module Management* manages the configuration file for `kerneld`. While `kerneld` can load some things, such as filesystems, without

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explicit configuration, it needs to be told what hardware support to load when it is presented with a generic hardware request.

**Figure 3–35 Kernel Module Management**

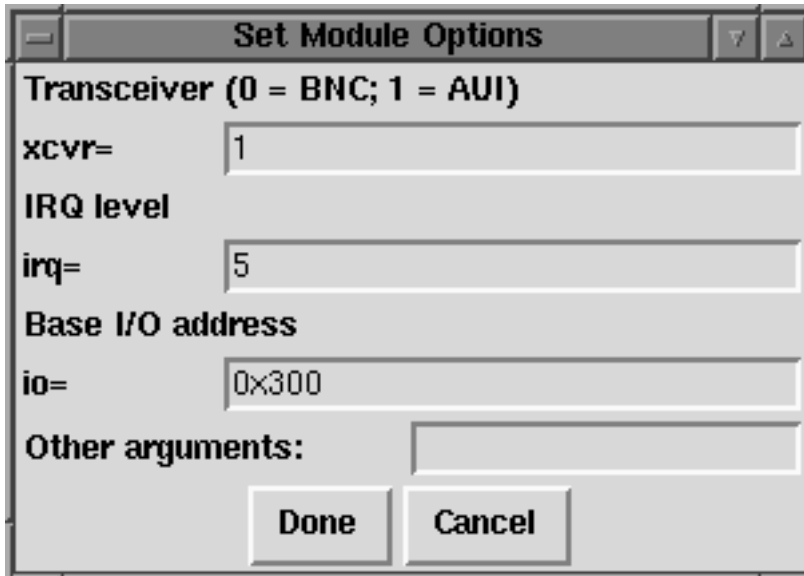


For instance, when the kernel wants to load support for ethernet, kernel needs to know which ethernet card you have, and if your ethernet card requires special configuration, it needs to know about that, too.

### Changing Module Options

To change the options being given to a module when it is loaded, click on the line to select it, then click the **Edit** button. `kernelcfg` will bring up a window which looks like Figure 3–36, *Editing Module Options*. The options `kernelcfg` knows about (normally all available options) will each have their own field. Normally, you will want to ignore the `Other arguments` field. Some modules normally take no arguments; just in case, they have an `Arguments` field which allows you to enter configuration information.

Figure 3–36 Editing Module Options



### Changing Modules

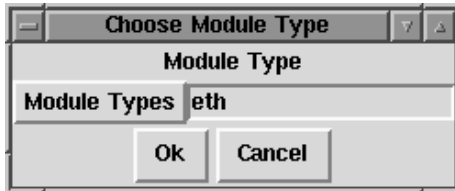
To change which module gets invoked to provide a generic service, such as an ethernet card or SCSI host adapter module, you must delete the old one and add a new one. To delete a module, select it by clicking on it, then click on Remove. Then click on Add to add the new module, as explained in the following section.

If you have changed your SCSI controller (`scsi_hostadapter`), remember to make a new initial ramdisk with the `/sbin/mkinitrd` command as documented in Section 2.8.2, *Making an initrd image*.

### Adding Modules

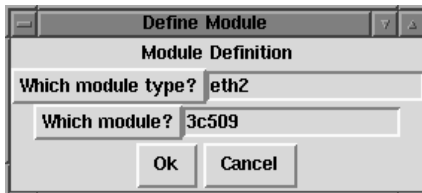
To add a module of any type, click on the Add button. You will be presented with a dialog box (Figure 3–37, *Adding a module*) asking you to choose a module type. Ethernet is `eth`, Token Ring is `tr`, SCSI controllers are `scsi_hostadapter`, and so on. Click Ok to continue to the next dialog box.

Figure 3–37 Adding a module



If there is more than one module which can be used for the module type you have chosen, you will be presented with a dialog box (Figure 3–38, *Selecting From Available Modules*) which asks which module you want to use, and may also ask for specifics about the type of module; for ethernet, for example, you need to choose from `eth0`, `eth1`, etc. When you are done, click `Ok` again to continue to specify any module options in the next dialog box (Figure 3–38, *Selecting From Available Modules*), which is the same as the dialog for editing a module.

Figure 3–38 Selecting From Available Modules



## Restarting Kerneld

The changes that you make with the Kernel Daemon Configuration tool will be made in the `/etc/conf.modules` file, which `kerneld` reads whenever it is started. Once you have made changes, you can restart `kerneld` by clicking on the `Restart kerneld` button. This will *not* cause any modules which are currently in use to be reloaded, it will only notify `kerneld` to use the configuration when it loads more modules in the future.

### 3.2.3 Network Configuration

---

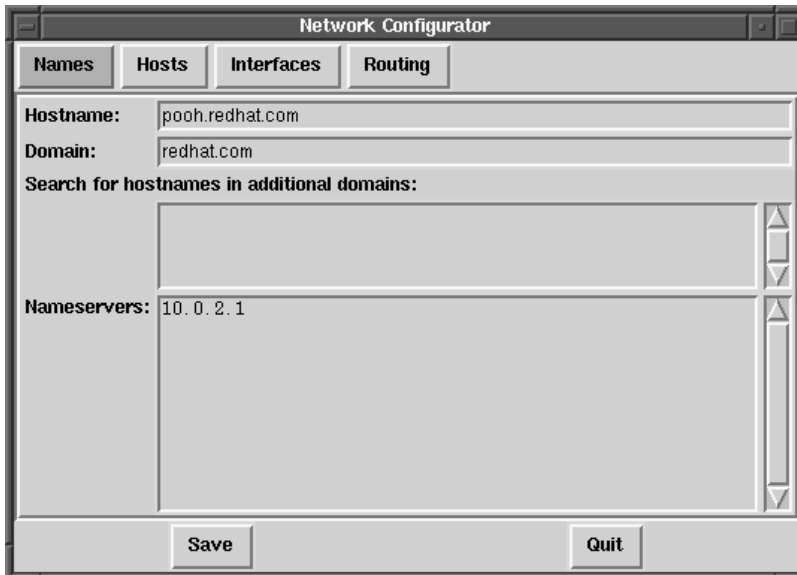
#### Please Note

Documentation on network configuration using Linuxconf can be found in Section 3.1.5, *Getting Connected with Linuxconf (Network Configuration)*.

---

The network configuration tool (`netcfg`) shown in Figure 3–39, *Network Configuration Panel* is designed to allow easy manipulation of parameters such as IP address, gateway address, and network address, as well as name servers and `/etc/hosts`.

**Figure 3–39 Network Configuration Panel**



Network devices can be added, removed, configured, activated, deactivated and aliased. Ethernet, arcnet, token ring, pocket (ATP), PPP, SLIP, PLIP and loopback devices are supported. PPP/SLIP/PLIP support works well on most hardware, but some hardware setups may exhibit unpredictable behavior. When using the Network

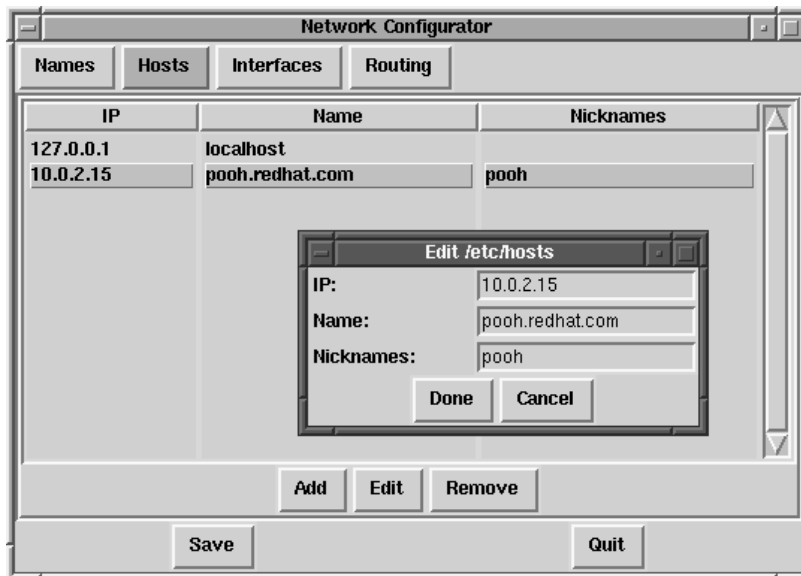


Configuration Tool click **Save** to write your changes to disk, to quit without making any changes select **Quit**.

## Managing Names

The Names panel of the Network Configuration tool serves two primary purposes: setting the hostname and domain of the computer, and determining which name server will be used to look up other hosts on the network. The Network tool is not capable of configuring a machine as a nameserver. To edit a field or add information to a field, simply click on the field with the left mouse button and type the new information.

**Figure 3–40 Adding/Editing Hosts**



## Managing Hosts

In the Hosts management panel you have the ability to add, edit, or remove hosts from the `/etc/hosts` file. Adding or editing an entry involves identical actions. An edit dialog box will appear, simply type the new information and click **Done** when you are finished. See Figure 3–40, *Adding/Editing Hosts* for an example.

## Adding a Networking Interface

If you have added a networking interface to your machine since installing Red Hat Linux, or you didn't configure your ethernet card at install time, you can configure it with a few clicks of a mouse.

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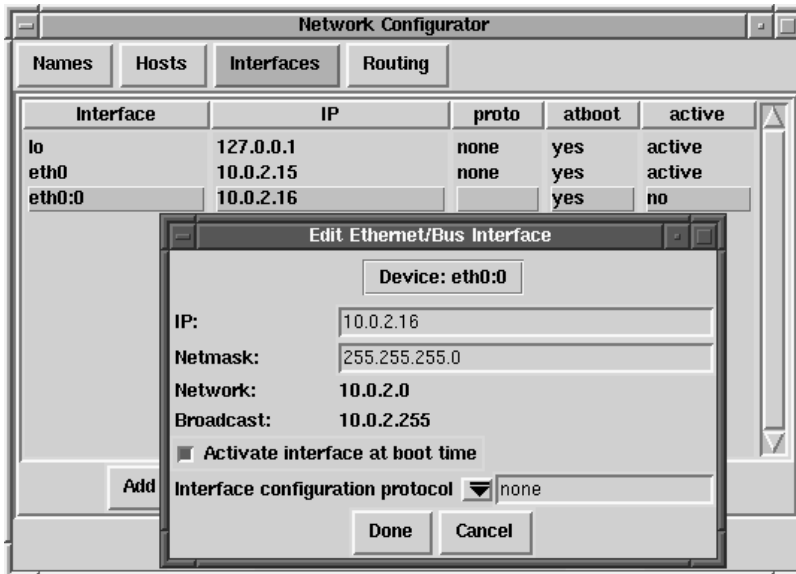
### Please Note

You may need to configure `kernel.d` to load a driver for the network interface you are adding (e.g., `eth0`); see Section 3.2.2, *Kernel Daemon Configuration* for more information.

---

Begin adding an interface by clicking on `Interfaces` in the main panel. This will bring up a window of configured devices with a row of available options, see Figure 3-41, *Configured Interfaces*.

**Figure 3-41 Configured Interfaces**



To add a device, first click the Add button then select the type of interface you want to configure from the box that appears (See Figure 3–42, *Choose Interface Type*).

**Figure 3–42 Choose Interface Type**



---

#### Please Note

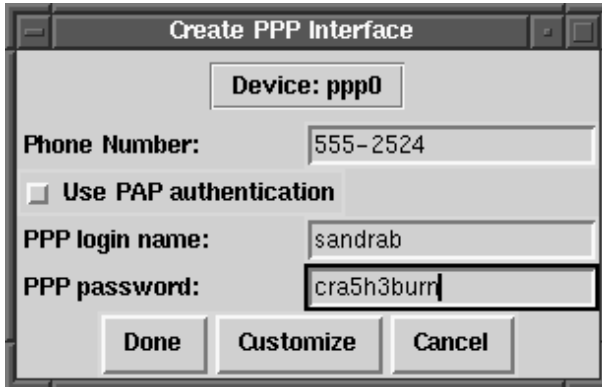
There is now a clone button available in `netcfg`. This button can be used to create a "clone" of an already-existing interface. By using clone interfaces, it is possible for a laptop to have one Ethernet interface defined for a work LAN, and a clone Ethernet device defined for a home LAN.

---

#### PPP Interface

Adding a PPP interface can be as simple as supplying the phone number, login name and password in the Create PPP Interface dialog shown in Figure 3–43, *Create PPP Interface*. If you must use PAP authentication for your PPP connection, choose Use PAP authentication. In many cases some degree of customization will be needed to establish a PPP connection. Choosing the Customize button will allow you to make changes to the hardware, communication, and networking settings for the PPP interface.

---

**Figure 3–43 Create PPP Interface**

The screenshot shows a window titled "Create PPP Interface". At the top, there is a label "Device:" followed by a text box containing "ppp0". Below this is a "Phone Number:" label with a text box containing "555-2524". A checkbox labeled "Use PAP authentication" is present and is not checked. Underneath is a "PPP login name:" label with a text box containing "sandrab". The "PPP password:" label is followed by a text box containing "cra5h3burr". At the bottom of the window are three buttons: "Done", "Customize", and "Cancel".

### SLIP Interface

In order to configure a SLIP interface you must first supply a phone number, login name, and password. This will supply the initial parameters for the chat script needed to establish a SLIP connection. When you choose **Done**, a dialog titled **Edit SLIP Interface** appears that enables you to further customize the hardware, communication and networking parameters for your SLIP interface.

### PLIP Interface

To add a PLIP interface to your system you only have to supply the IP address, the remote IP address, and the Netmask. You can also select if you want to activate the interface at boot time.

### Ethernet, Arcnet, Token Ring and Pocket Adaptor Interfaces

If you are adding an ethernet, arcnet, token ring or pocket adaptor to your computer you will need to supply the following information:

- **Device:** This is determined by netconfig based on the devices already configured.
- **IP Address:** Enter an IP address for your network device.
- **Netmask:** Enter the network mask for your network device.

The network and broadcast addresses are calculated automatically based on the IP address and netmask you enter.

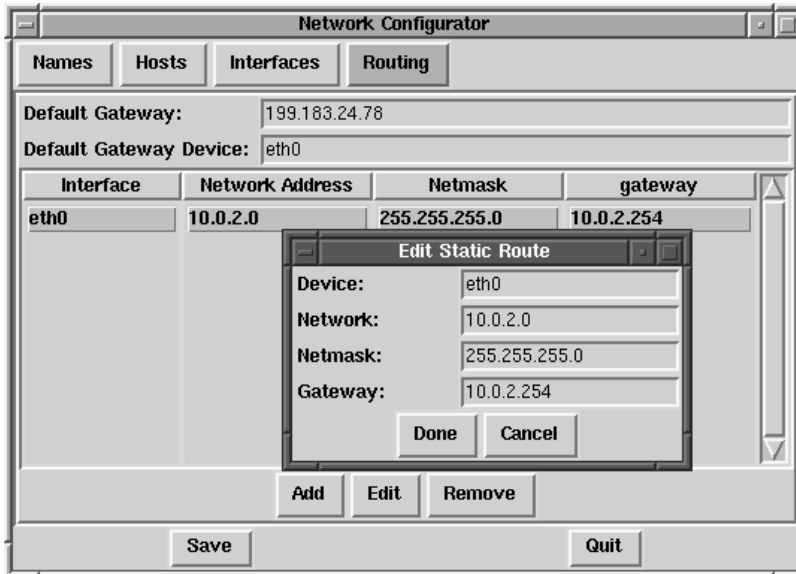
- **Activate interface at boot time:**  
If you want the device to be configured automatically when your machine boots select this by clicking on the box.
- **Allow any user to (de)activate interface:**  
Check this if you want any user to be able to activate or deactivate the interface.
- **Interface configuration protocol:**  
If you have a BOOTP or DHCP server on your network and would like to use it to configure the interface, choose the appropriate option; otherwise, choose none.

After providing the configuration information for your new device, click `Done`. The device should appear in your `Interfaces` list as an inactive device. (The active column should have a label of `no`.) To activate the new device, first select it with a mouse click and then choose on the `Activate` button. If it does not come up properly, you may need to reconfigure it by choosing `Edit`.

## **Managing Routes**

In the Routes management screen you have the ability to add, edit, or remove static networking routes. Adding or editing an entry involves identical actions, just like the Hosts panel. An edit dialog box will appear; simply type the new information and click `Done` when you are finished. See Figure 3–44, *Adding/Editing Routes* for an example.

Figure 3–44 Adding/Editing Routes



### 3.2.4 Time and Date

---

#### Please Note

Documentation on setting your system's time and date using Linuxconf can be found in *Date and Time* in Section 3.1.5.

---

The time machine allows you to change the time and date by clicking on the appropriate part of the time and date display and clicking on the arrows to change the value.

The system clock is not changed until you click on the **Set System Clock** button.

Click on **Reset Time** to set the time machine time back to that of the system.

---

---

### **Please Note**

Changing the time can seriously confuse programs that depend on the normal progression of time, and could possibly cause problems. Try to quit as many applications and processes as possible before changing the time or date.

---





## 4 PowerTools

### 4.1 PowerTools Packages

Red Hat PowerTools is a collection of software packages built for the Red Hat Linux 6.1 operating system. PowerTools includes the latest versions (as of this product's release date) of hundreds of programs -- so finding an interesting app should be easy.

Among the many applications are audio programs, chat clients, development tools, editors, file managers, emulators, games, graphics programs, productivity applications, math/statistics packages, systems administration and network management tools, and window managers.

Additionally, for PalmPilot personal assistant users, the `pilot` directory on the CD-ROM contains applications for use with PalmPilots.

Now that you know what you can find on PowerTools, you may want to know how to install them. See Section 4.2, *Installing PowerTools Packages* for installation information.

### 4.2 Installing PowerTools Packages

If you're running the GNOME or KDE GUI desktop environments, just place the CD in your CD-ROM drive. You'll be prompted for the root password (you need to be root in order to install packages). After you type in the root password, either the Gnome-RPM or the Kpackage package management program will start automatically and can be used to install PowerTools.

See Chapter 7, *Gnome-RPM* for specific instructions on how to use Gnome-RPM. See <http://www.general.uwa.edu.au/u/toivo/kpackage/> for more information on how to use Kpackage.

If you're not running GNOME or KDE, you'll need to use RPM to install PowerTools. See Section 4.3, *If You're Not Running GNOME or KDE* for more information on how to install PowerTools if you're not running GNOME or KDE.

---

### 4.3 If You're Not Running GNOME or KDE

First, you'll need to mount the PowerTools CD-ROM on your CD-ROM drive.

Place the PowerTools CD in your CD-ROM drive. As root, type the following:

```
# mount -t iso9660 /dev/cdrom /mnt/cdrom
#
```

---

#### Please note

On your system, you or the system administrator may already allow users (instead of only root) to mount the CD-ROM drive. Users have this privilege if the `user` option is included in the `/dev/cdrom` line in the `/etc/fstab` file. However, keep in mind that you must be logged in as root to install any PowerTools RPMs.

---

After you've mounted the drive, `cd` to the mounted CD-ROM directory with the following command:

```
# cd /mnt/cdrom
#
```

When you list the contents of the CD with an `ls` command, you'll see the following directories: `SRPMS`, `alpha`, `i386`, `i586`, `i686`, `noarch`, `nosrc`, `sparc`, and `sparc64`. The `SRPMS` directory contains the PowerTools source RPMs. The `alpha`, `i386` and `sparc` directories contain the RPMs for the three specified operating system architectures. The `noarch` directory contains RPMs which are not architecture-specific and should install on any of the three architectures.

In the examples in this chapter, the `/mnt/cdrom/i386` path will be used as a general example. You should substitute the correct directory for `i386`, depending upon your architecture and which package you're installing.

`cd` to the `i386` directory, like this:

```
# cd i386
```

---

---

#

List the RPM files in the directory with an `ls` command to see the complete list of RPM packages included for Intel-compatible systems.

You will probably want more information about a specific package before you can decide whether you want to install it. You can use RPM's querying capability to find out more information about the packages, like whether the package has a Web page associated with it. See Section 6.3, *Impressing Your Friends with RPM* for instructions on how to find out information about packages using RPM.

After you've decided what you'd like to install, you can install it with RPM. RPM is a powerful command line driven package management system with many capabilities. See Chapter 6, *Package Management with RPM* for more information on how to use RPM to install and manage PowerTools packages.

---



## 5 Working with Update Agent

New to Red Hat Linux 6.1, Update Agent allows you to automatically locate, download and install the latest packages from Red Hat.

Through a secure connection to `priority.redhat.com`, Red Hat's own fast access FTP server, you're assured that new packages are specific to your Red Hat Linux system, rather than untested upgrades you might find through another source. Upgrades and bugfixes are presented to you on a single "page" in your Web browser. You can select individual packages or all of the packages for download and installation. By using `priority.redhat.com`, you can save yourself the time and trouble of searching for and downloading individual packages from numerous FTP servers.

---

### Please note

To use Update Agent, you must first register your copy of Red Hat Linux 6.1. To register, go to <http://www.redhat.com/now>. Once you register, you can select a **key** which you should use to configure Update Agent.

---

Update Agent can also automatically download specific packages, based on your preferences.

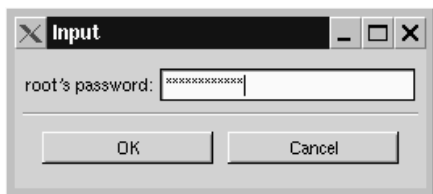
It isn't necessary to have a dedicated line in order to work with Update Agent; if you have dialup access to an ISP you can also benefit from the application's features.

### 5.1 Starting Update Agent

In most cases, Update Agent will be installed as a matter of course during a new installation or an upgrade.

To start the application in GNOME, select the **Main Menu Button** on the **Panel**, then go to **System => Update Agent**. If you're using KDE as your graphical environment, you can start Update Agent by going to the **Panel => Red Hat => System => Update Agent**.

---

**Figure 5–1** Box Requesting Root Passowrd

---

**Please Note**

Only root can use Update Agent, since root is the system administrator and is the only user who can install and modify software on the system. Each time you start the application, you will be asked to supply your root password, as Figure 5–1, *Box Requesting Root Passowrd* shows.

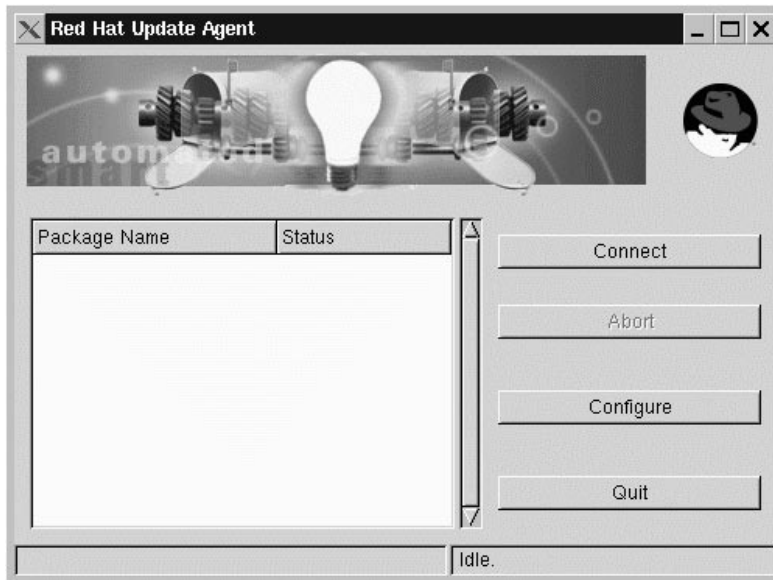
---

You'll be required to supply your root password each time you wish to use Update Agent. Before continuing, however, you'll also have to configure the application with information that's specific to your machine and software.

## 5.2 Configuring Update Agent

As shipped, Update Agent will not automatically connect, download and install updated packages. Before proceeding, you'll have to supply information about yourself, such as your user name and the **login ID** which you selected when you registered Red Hat Linux 6.1. (To learn more about registration benefits, go to <http://www.redhat.com/now>.)

Figure 5–2 Main Update Agent Window



Once the application starts, you'll see a screen like Figure 5–2, *Main Update Agent Window*. From within this window, you have the option of connecting to the priority update server, configuring or quitting the application. To configure, select **Configure**. (The button labeled **Abort** is only active during a download or installation process; selecting this button causes Update Agent to cease any work.)

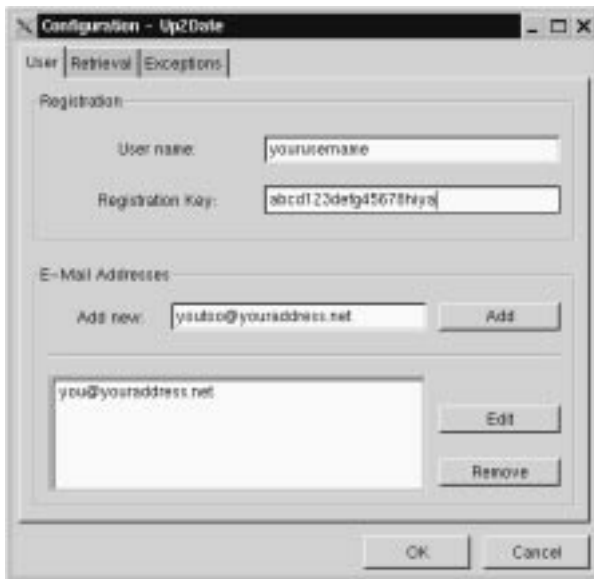
The **Configuration** dialog presents you with three tabbed windows in which you must enter information:

- **User** -- Here, you'll enter your user name, e-mail address where feedback and summaries of packages from the application will be sent, and the login ID (called **Registration Key** here) which you had selected when you registered Red Hat Linux 6.1 at <http://www.redhat.com/now>.
- **Retrieval** -- Specify the name of the server and certain installation instructions, which will be `priority.redhat.com`.

- **Exceptions** -- Specify files and/or packages which you want to exclude from your update search, such as kernel files.

Let's begin with the **User** tab. When you're finished, your information should appear somewhat like Figure 5-3, *User Configuration Tab*.

**Figure 5-3 User Configuration Tab**



The **User** dialog is separated into two sections: **Registration** and **E-Mail Addresses**. In the **Registration** section, enter your user name and the login ID (called **Registration Key**) you selected when you registered.

In the **E-Mail Addresses** section, you should specify the e-mail address to which feedback and summaries from Update Agent should be sent for review. You can have the feedback and summaries sent to numerous accounts, such as your user account. Just enter the addresses in the **Add new** box, then click on the **Add** button. The entry will appear in the address window.

Now it's time to specify your options in the **Retrieval** tab.



The **Retrieval** tab is divided into three sections, which detail the location of the priority updates server, specific download and installation instructions, and the location of the directory where updates are stored on your system. (See Figure 5–4, *Retrieval Configuration Tab* for an example.)

**Figure 5–4 Retrieval Configuration Tab**



In the **Server** entry, you should enter `priority.redhat.com` as the priority updates server, if it isn't already present. The entry for **Program** is unavailable for you to specify; it simply indicates the location of the CGI script which executes Update Agent.

Similar to options you might find in Gnome-RPM, the four selections which follow the server information allow you to customize how you want to retrieve and install updates. Selecting a button chooses that option. Your options are:

- **Do not replace config files** -- Packages which contain configuration files that are modified on your system will not be selected for updating. Let's say, for example, that you've modified the `/etc/syslog.conf` configuration file. If there is an update available for `syslogd`, which would create a new `/etc/syslog.conf` file, this package will not be downloaded and installed. If you haven't

modified the configuration file on your system, it will be available for downloading and installation -- and the previous file will be backed up (in this case, as `/etc/syslog.conf.rpmsave`).

- **Display all available packages** -- Select this box if you want Update Agent to show you *all* the available packages, not just the packages specific to your installed system.
- **Retrieve packages, but do not install** -- Selecting this will allow Update Agent to download the packages into a temporary directory. Once downloaded, you will be able to install the packages yourself. If this option is unchecked, Update Agent will download and automatically install your selections.
- **Keep packages after installation** -- Retains the package files after they've been installed. This could be useful if you want to keep copies of packages, however selecting this could potentially eat up quite a bit of disk space.

Beneath the package options, two additional boxes allow you to specify the version of Red Hat Linux files you want to update, and the location where those upgrade files will be kept.

The drop-down menu for **Override version** will show you either Red Hat Linux 6.0 or Red Hat Linux 6.1. Most users will probably retain the default entry, which is Red Hat Linux 6.1. If no value is specified here, the proper value will automatically be determined.

The default entry **Package storage directory** is set to `/var/spool/up2date` as the default, although you can specify a more preferable location. For example, if you've chosen to download packages without automatically installing them, you may find that these downloads can eat up quite a bit of space over time. Specifying a directory on your filesystem allows you to send these packages to a directory on a filesystem which you know can accommodate their size.

The **Exceptions** tab allows you to specify packages or individual files which you don't want to be retrieved from `priority.redhat.com` and offered as an update. (See Figure 5-5, *Update Exceptions Tab* for an example of this tab.)

Figure 5-5 Update Exceptions Tab



You may be a firm believer in the "if it ain't broke, don't fix it" axiom. In this tab, you have the opportunity to specify which files and packages you would prefer not to be updated or modified. Both entries -- **Skip Packages** and **Skip Files** -- allow you to use **wildcards**, such as an asterisk (\*) and a question mark (?).

The default entry in the **Skip Packages** section lists **kernel\***, meaning that any packages which begin with **kernel** are excluded from download and installation. Most users will likely want to keep this exclusion.

To add new entries, type the name of the package you do not want selected (for example **exmh\*** for the e-mail application **exmh**), then click on the **Add** button. Your entry will be added to the list.

Like the **Skip Packages** option, the **Skip Files** section allows you to specify individual files you do not want selected. For example, if you want to exclude all the files in **/home**, you would enter **/home/\*** and the accounts in **/home** would be excluded from updates.

## 5.3 Using Update Agent

When you sign up for services at <http://www.redhat.com/now>, you can select an option to receive update notifications by e-mail. If you choose, you'll be told when updates are available, based on your preferences.

Once you receive an update notification and have correctly configured Update Agent, you can begin to use it to search `priority.redhat.com` for updates to download and install.

---

### Please note

You must have either a dedicated connection, or be connected to your ISP through a dialup connection to use Update Agent.

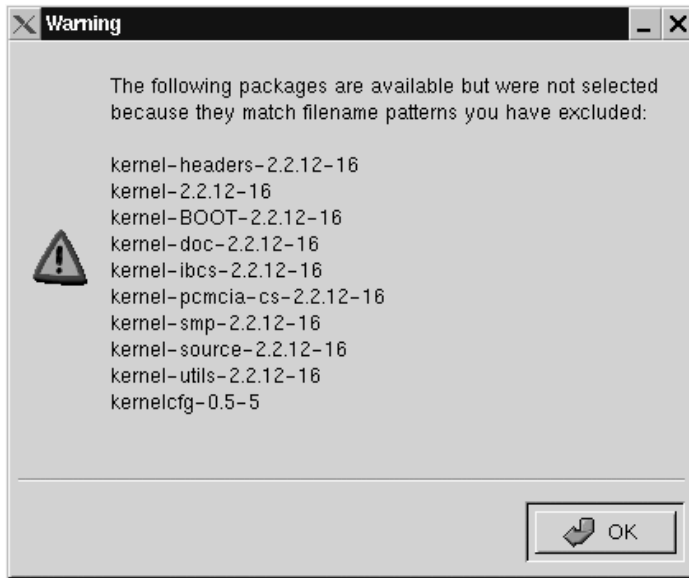
---

To begin a session, start Update Agent (in **System => Update Agent**), and provide the root password.

From the main screen of the application, click on **Connect**. The status bar at the bottom of the window will indicate that the application is connecting and retrieving information from the updates FTP site.

If you have chosen to exclude packages or files (such as kernel updates), you may see a response similar to Figure 5–6, *Excluded Files*. Click on the **OK** button to continue.

---

**Figure 5–6 Excluded Files**

The status bar on the main Update Agent window will indicate the the application is creating a page which will be displayed in your Web browser. Once it's finished sorting the packages and building the page, your browser will open and you'll see results similar to Figure 5–7, *Available Updates*.

For those packages available to be updated, you'll see the name of the package, a summary of its function, the date the package was built and the size of file.

Figure 5-7 Available Updates



You can select individual packages by scrolling down the page and checking the box next to the package. When you're finished, click on the **Request selected packages** button at the bottom of the page.

If you'd prefer to update your system with all the available packages, click on the **Request ALL packages** button; you won't be required to make individual selections beside each package.

After you've made your selections and clicked on the **Request packages** button, the browser window will close. (You may receive a message in a window, asking you whether you want to close the window; confirm this decision by clicking on **OK**.)

Next, you'll see that the packages which are being downloaded will be shown in the main Update Agent screen, under **Package Name** and a small button will appear next to each package in the **Status** column.

When packages have completed downloading, the button in the **Status** column will reflect this change by becoming a red arrow. The arrow will become a checkmark

when each package has been successfully installed. The progress bar on the lower right of the window will reflect the work which remains before all the updates have been downloaded and installed.

To quit Update Agent once all the packages have been retrieved and installed, click on the **Quit** button.





## 6 Package Management with RPM

The *Red Hat Package Manager* (RPM), is an open packaging system available for anyone to use, and works on Red Hat Linux as well as other Linux and UNIX systems. Red Hat, Inc. encourages other vendors to take the time to look at RPM and use it for their own products. RPM is distributable under the terms of the GPL.

For the end user, RPM provides many features that make maintaining a system far easier than it has ever been. Installing, uninstalling, and upgrading RPM packages are all one line commands, and all the messy details have been taken care of for you. RPM maintains a database of installed packages and their files, which allows you to perform powerful queries and verification of your system.

During upgrades, RPM handles configuration files specially, so that you never lose your customizations -- a feature that is impossible with straight `.tar.gz` files.

For the developer, RPM allows you to take source code for software and package it into source and binary packages for end users. This process is quite simple and is driven from a single file and optional patches that you create. This clear delineation of "pristine" sources and your patches and build instructions eases the maintenance of the package as new versions of the software are released.

---

### Please Note

Although it can be important to understand the concepts behind RPM, for those who prefer a graphical interface to the command line, we suggest you use *Gnome-RPM*. Please see Chapter 7, *Gnome-RPM* for more information.

---

## 6.1 RPM Design Goals

Before trying to understand how to use RPM, it helps to have an idea of what the design goals are.

### Upgradability

---

With RPM you can upgrade individual components of your system without completely reinstalling. When you get a new release of an operating system based on RPM (such as Red Hat Linux), you don't need to reinstall on your machine (as you do with operating systems based on other packaging systems). RPM allows intelligent, fully-automated, in-place upgrades of your system. Configuration files in packages are preserved across upgrades, so you won't lose your customizations.

### **Powerful Querying**

RPM is also designed to have powerful querying options. You can do searches through your entire database for packages or just certain files. You can also easily find out what package a file belongs to and where it came from. The files an RPM package contains are in a compressed archive, with a custom binary header containing useful information about the package and its contents, allowing you to query individual packages quickly and easily.

### **System Verification**

Another powerful feature is the ability to verify packages. If you are worried that you deleted an important file for some package, simply verify the package. You will be notified of any anomalies. At that point, you can reinstall the package if necessary. Any configuration files that you modified are preserved during reinstallation.

### **Pristine Sources**

A crucial design goal was to allow the use of "pristine" software sources, as distributed by the original authors of the software. With RPM, you have the pristine sources along with any patches that were used, plus complete build instructions. This is a big advantage for several reasons. For instance, if a new version of a program comes out, you don't necessarily have to start from scratch to get it to compile. You can look at the patch to see what you *might* need to do. All the compiled-in defaults, and all of the changes that were made to get the software to build properly are easily visible this way.

---

This goal may only seem important for developers, but it results in higher quality software for end users too. We would like to thank the folks from the BOGUS distribution for originating the pristine source concept.

## 6.2 Using RPM

RPM has five basic modes of operation (not counting package building): installing, uninstalling, upgrading, querying, and verifying. This section contains an overview of each mode. For complete details and options try `rpm --help`, or turn to Section 6.4, *Other RPM Resources* for more information on RPM.

### 6.2.1 Installing

RPM packages typically have file names like `foo-1.0-1.i386.rpm`, which includes the package name (`foo`), version (`1.0`), release (`1`), and architecture (`i386`). Installing a package is as simple as:

```
# rpm -ivh foo-1.0-1.i386.rpm
foo #####
#
```

As you can see, RPM prints out the name of the package (which is not necessarily the same as the file name, which could have been `1.rpm`), and then prints a succession of hash marks as the package is installed, as a progress meter.

Installing packages is designed to be simple, but you can get a few errors:

#### Package Already Installed

If the package is already installed, you will see:

```
# rpm -ivh foo-1.0-1.i386.rpm
foo          package foo-1.0-1 is already installed
error: foo-1.0-1.i386.rpm cannot be installed
#
```

If you really want to install the package anyway, you can use `--replacepkgs` on the command line, which tells RPM to ignore the error:

```
# rpm -ivh --replacepkgs foo-1.0-1.i386.rpm
foo #####
```

```
#
```

## Conflicting Files

If you attempt to install a package that contains a file which has already been installed by another package, you'll see:

```
# rpm -ivh foo-1.0-1.i386.rpm
foo          /usr/bin/foo conflicts with file from bar-1.0-1
error: foo-1.0-1.i386.rpm cannot be installed
#
```

To cause RPM to ignore that error, use `--replacefiles` on the command line:

```
# rpm -ivh --replacefiles foo-1.0-1.i386.rpm
foo          #####
#
```

## Unresolved Dependency

RPM packages can "depend" on other packages, which means that they require other packages to be installed in order to run properly. If you try to install a package for which there is such an unresolved dependency, you'll see:

```
# rpm -ivh bar-1.0-1.i386.rpm
failed dependencies:
    foo is needed by bar-1.0-1
#
```

To handle this error you should install the requested packages. If you want to force the installation anyway (a bad idea since the package probably will not run correctly), use `--nodeps` on the command line.

## 6.2.2 Uninstalling

Uninstalling a package is just as simple as installing:

```
# rpm -e foo
#
```

---

Notice that we used the package *name* "foo," not the name of the original package *file* "foo-1.0-1.i386.rpm".

You can encounter a dependency error when uninstalling a package if some other installed package depends on the one you are trying to remove. For example:

```
# rpm -e foo
removing these packages would break dependencies:
    foo is needed by bar-1.0-1
#
```

To cause RPM to ignore that error and uninstall the package anyway (which is also a bad idea since the package that depends on it will probably fail to work properly), use `--nodeps` on the command line.

### 6.2.3 Upgrading

Upgrading a package is similar to installing.

```
# rpm -Uvh foo-2.0-1.i386.rpm
foo #####
#
```

What you don't see above is that RPM automatically uninstalled any old versions of the `foo` package. In fact you may want to always use `-U` to install packages, since it works fine even when there are no previous versions of the package installed.

Since RPM performs intelligent upgrading of packages with configuration files, you may see a message like:

```
saving /etc/foo.conf as /etc/foo.conf.rpmsave
```

This means that your changes to the configuration file may not be "forward compatible" with the new configuration file in the package, so RPM saved your original file, and installed a new one. You should investigate and resolve the differences between the two files as soon as possible to ensure that your system continues to function properly.

---

Since upgrading is really a combination of uninstalling and installing, you can encounter any errors from those modes, plus one more: If RPM thinks you are trying to upgrade to a package with an *older* version number, you will see:

```
# rpm -Uvh foo-1.0-1.i386.rpm
foo package foo-2.0-1 (which is newer) is already installed
error: foo-1.0-1.i386.rpm cannot be installed
#
```

To cause RPM to "upgrade" anyway, use `--oldpackage` on the command line:

```
# rpm -Uvh --oldpackage foo-1.0-1.i386.rpm
foo #####
#
```

## 6.2.4 Freshening

Freshening a package is similar to upgrading:

```
# rpm -Fvh foo-1.2-1.i386.rpm
foo #####
#
```

RPM's `freshen` option checks the versions of the packages specified on the command line against the versions of packages that have already been installed on your system. When a newer version of an already-installed package is processed by RPM's `freshen` option, it will be upgraded to the newer version. However, RPM's `freshen` option will not install a package if no previously-installed package of the same name exists. This differs from RPM's `upgrade` option, as an upgrade *will* install packages, whether or not an older version of the package was already installed.

RPM's `freshen` option works well with single packages or with a group of packages. It's especially handy if you've just downloaded a large number of different packages, and you only want to upgrade those packages that are already installed on your system. Using the `freshen` option means that you won't have to pick through the downloaded packages, deleting any unwanted ones before using RPM.

In this case, you can simply issue the following command:

```
# rpm -Fvh *.rpm
```

---

RPM will automatically upgrade only those packages that have already been installed.

## 6.2.5 Querying

Querying the database of installed packages is accomplished with `rpm -q`. A simple use is `rpm -q foo` which will print the package name, version, and release number of the installed package `foo`:

```
# rpm -q foo
foo-2.0-1
#
```

Instead of specifying the package name, you can use the following options with `-q` to specify what package(s) you want to query. These are called *Package Specification Options*.

- `-a` queries all currently installed packages.
- `-f <file>` will query the package owning `<file>`.
- `-p <packagefile>` queries the package `<packagefile>`.

There are a number of ways to specify what information to display about queried packages. The following options are used to select the type of information for which you are searching. These are called *Information Selection Options*.

- `-i` displays package information such as name, description, release, size, build date, install date, vendor, and other miscellaneous information.
  - `-l` displays the list of files that the package "owns".
  - `-s` displays the state of all the files in the package.
  - `-d` displays a list of files marked as documentation (man pages, info pages, README's, etc).
  - `-c` displays a list of files marked as configuration files. These are the files you change after installation to adapt the package to your system (sendmail.cf, passwd, inittab, etc).
-

For those options that display file lists, you can add `-v` to your command line to get the lists in a familiar `ls -l` format.

### 6.2.6 Verifying

Verifying a package compares information about files installed from a package with the same information from the original package. Among other things, verifying compares the size, MD5 sum, permissions, type, owner and group of each file.

The command `rpm -V` verifies a package. You can use any of the *Package Selection Options* listed for querying to specify the packages you wish to verify. A simple use is `rpm -V foo` which verifies that all the files in the `foo` package are as they were when they were originally installed. For example:

- To verify a package containing particular file:

```
rpm -Vf /bin/vi
```

- To verify ALL installed packages:

```
rpm -Va
```

- To verify an installed package against an RPM package file:

```
rpm -Vp foo-1.0-1.i386.rpm
```

This can be useful if you suspect that your RPM databases are corrupt.

If everything verified properly there will be no output. If there are any discrepancies they will be displayed. The format of the output is a string of 8 characters, a possible "c" denoting a configuration file, and then the file name. Each of the 8 characters denotes the result of a comparison of one attribute of the file to the value of that attribute recorded in the RPM database. A single "." (period) means the test passed. The following characters denote failure of certain tests:

- 5 -- MD5 checksum
-



- S -- File size
- L -- Symbolic link
- T -- File modification time
- D -- Device
- U -- User
- G -- Group
- M -- Mode (includes permissions and file type)

If you see any output, use your best judgment to determine if you should remove or reinstall the package, or otherwise fix the problem.

## 6.3 Impressing Your Friends with RPM

RPM is a very useful tool for both managing your system and diagnosing and fixing problems. The best way to make sense of all the options is to look at some examples.

- Let's say you delete some files by accident, but you aren't sure what you deleted. If you want to verify your entire system and see what might be missing, you would enter:

```
rpm -Va
```

If some files are missing, or appear to have been corrupted, you should probably either re-install the package or uninstall, then re-install the package.

- Let's say you run across a file that you don't recognize. To find out which package owns it, you would enter:

```
rpm -qf /usr/X11R6/bin/xjewel
```

The output would look like:

```
xjewel-1.6-1
```

---

- We can combine the above two examples in the following scenario. Say you are having problems with `/usr/bin/paste`. You would like to verify the package that owns that program but you don't know which package that is. Simply enter:

```
rpm -Vf /usr/bin/paste
```

and the appropriate package will be verified.

- Want to find more about a particular program? You can find out by entering the following to locate the documentation which came with the package that "owns" that program (in this case `ispell`):

```
rpm -qdf /usr/bin/ispell
```

The output would be:

```
/usr/man/man4/ispell.4
/usr/man/man4/english.4
/usr/man/man1/unsq.1
/usr/man/man1/tryaffix.1
/usr/man/man1/sq.1
/usr/man/man1/munchlist.1
/usr/man/man1/ispell.1
/usr/man/man1/findaffix.1
/usr/man/man1/buildhash.1
/usr/info/ispell.info.gz
/usr/doc/ispell-3.1.18-1/README
```

- Let's say you find a new koules RPM, but you don't know what it is. To find out some information on it, enter:

```
rpm -qip koules-1.2-2.i386.rpm
```

The output would be:

```
Name           : koules Distribution: Red Hat Linux Colgate
Version        : 1.2           Vendor: Red Hat Software
Release       : 2             Build Date: Mon Sep 02 11:59:12 1996
Install date  : (none)       Build Host: porky.redhat.com
Group         : Games        Source RPM: koules-1.2-2.src.rpm
Size          : 614939
Summary       : SVGalib action game; multiplayer, network
```

Description :

This arcade-style game is novel in conception and excellent in execution. No shooting, no blood, no guts, no gore. The play is simple, but you still must develop skill to play. This version uses SVGAlib to run on a graphics console.

- Now you want to see what files the koules RPM installs. You would enter:

```
rpm -qlp koules-1.2-2.i386.rpm
```

The output is:

```
/usr/man/man6/koules.6
/usr/lib/games/kouleslib/start.raw
/usr/lib/games/kouleslib/end.raw
/usr/lib/games/kouleslib/destroy2.raw
/usr/lib/games/kouleslib/destroy1.raw
/usr/lib/games/kouleslib/creator2.raw
/usr/lib/games/kouleslib/creator1.raw
/usr/lib/games/kouleslib/colize.raw
/usr/lib/games/kouleslib
/usr/games/koules
```

These are just several examples. As you use the system you will find many more uses for RPM.

## 6.4 Other RPM Resources

For more information on RPM, check out the man page, the help screen (`rpm --help`), and the RPM documents available at

<http://www.rpm.org/>

There is also an RPM book available. It's called *Maximum RPM*, and it is available from Red Hat, at your local bookstore and through online booksellers. It contains a wealth of information about RPM for both the end-user and the package builder.

---

An on-line version of the book is available at <http://www.rpm.org/>.

There is also a mailing list for discussion of RPM-related issues, called [rpm-list@redhat.com](mailto:rpm-list@redhat.com).

The list is archived on <http://www.redhat.com/support/mailling-lists/>. To subscribe, send mail to [rpm-list-request@redhat.com](mailto:rpm-list-request@redhat.com) with the word `subscribe` in the subject line.

## 7 Gnome-RPM

One of the most convenient package manipulation tools available is Gnome-RPM, a graphical tool which runs under the X Window System. Gnome-RPM was written by James Henstridge (james@daa.com.au); RPM 3.0 support was written by Red Hat and additional rpmfind code was written by Daniel Veillard.

Gnome-RPM (which is also referred to as gnorpm) allows the end-user to easily work with RPM technology; it is fast, powerful and features a friendly interface.

To learn more about RPM technology, turn to Chapter 6, *Package Management with RPM*.

Gnome-RPM is "GNOME-compliant," meaning that it seamlessly integrates into GNOME, the X Window System desktop environment.

With Gnome-RPM, you can easily

- install RPM packages
- uninstall RPM packages
- upgrade RPM packages
- find new RPM packages
- query RPM packages
- verify RPM packages

The interface features a menu, a toolbar, a tree and a display window of currently installed packages.

Operations are often performed in Gnome-RPM by finding and selecting packages, then choosing the type of operation to perform via push-button on the toolbar, through the menu or by right-clicking with the mouse.

- Installing a package places all of the components of that package on your system in the correct locations.
  - Uninstalling a package removes all traces of the package except for configuration files you have modified.
-

- Upgrading a package installs the newly available version and uninstalls all other versions that were previously installed. This allows quick upgrading to the latest releases of packages. Refer to Section 7.4, *Configuration* for information about how to alter the default settings for installing and uninstalling packages.

You can also use the **Web find** option to search the Internet for newly released packages. You can direct Gnome-RPM to search for particular distributions when you want to look for new packages. (If you have a slow connection, this option can take some time to fully execute.) See Section 7.4, *Configuration* for more information about this feature.

---

#### Please Note

Exercise caution if you choose to use the **Web find** option, since there is no way to verify the integrity of the many packages which are available at numerous repositories. Before installing packages, you should perform a query on that package to help you determine whether it can be trusted. Packages not produced by Red Hat are not supported in any way by Red Hat.

---

Using Gnome-RPM to perform all of these and many other operations is the same as using `rpm` from the shell prompt. However, the graphical nature of Gnome-RPM often makes these operations easier to perform.

The usual way to work with Gnome-RPM is to display the available packages, select the package(s) you want to operate on, and then select an option from the toolbar or menu which performs the operation. However, Gnome-RPM is flexible enough to display packages in a variety of views, thanks to the use of **filters**. Refer to Section 7.3, *Installing New Packages* for more information on using filters to identify packages.

You can install, upgrade or uninstall several packages with a few button clicks. Similarly, you can query and verify more than one package at a time. Because of Gnome-RPM's integration with GNOME, you can also perform installation, query and verification on packages from within the GNOME File Manager.

---

## 7.1 Starting Gnome-RPM

You can start Gnome-RPM from either an Xterm window or from the GNOME desktop Panel (**Main Menu Button => System => GnoRPM**).

To start Gnome-RPM from an Xterm window, at the shell prompt, simply type

```
gnorpm &
```

That will bring up the main Gnome-RPM window (as shown in Figure 7–1, *Main Gnome-RPM Window*).

---

### Please Note

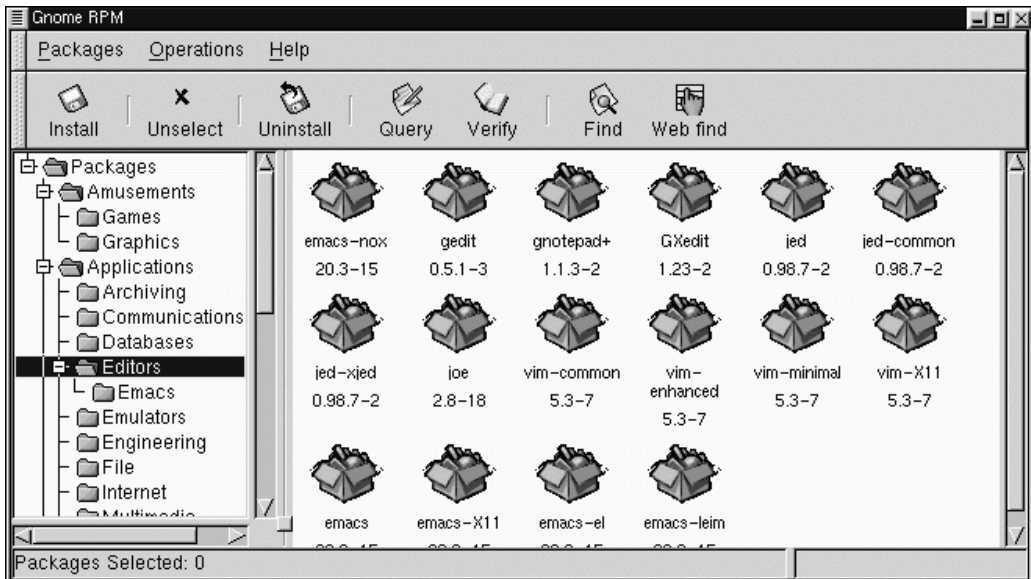
If you would like to install, upgrade or uninstall packages, you must be in root. The easiest way to do this is to type `su` to become root, and then type the root password at a shell prompt. However, it isn't necessary to be root in order to query and verify packages.

---

There are several parts to the Gnome-RPM interface.

- Package Panel - On the left; allows you to browse and select packages on your system.
  - Display window - To the right of the package panel; shows you contents from folders in the panel.
  - Toolbar - Above the display and panel; a graphical display of package tools.
  - Menu - Above the toolbar; contains text-based commands, as well as help info, preferences and other settings.
  - Status bar - Beneath the panel and display windows; shows the total number of selected packages.
-

Figure 7-1 Main Gnome-RPM Window



## 7.2 The Package Display

Each folder icon in the tree view at left represents a group of packages. Each group can contain subgroups. Groups are used to place packages that perform similar functions in similar locations. For example, the folder **Editors** contains text editors such as `ed`, `vim` and `GXedit`. From the tree view on the left, you might find another folder beneath **Editors** called **Emacs**, which would contain both `emacs` and `emacs-X11`.

The tree view is also arranged in an expandable and collapsible manner, which helps you to easily navigate through the packages. A folder which appears with a **+** next to it indicates that there are subfolders within that category.

To view the packages and subgroups within a group, click once on a folder or a **+** with your left mouse button. The display window will then show you the contents of that folder. By default, you will be presented with icons to represent the packages. You can change that view to a list view by selecting **View as list** from the **Interface** tab



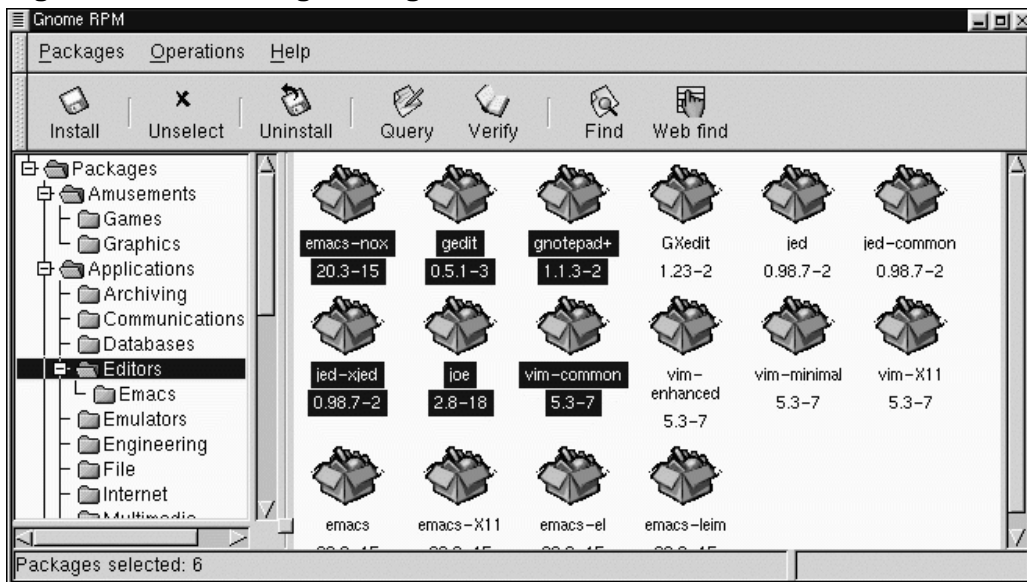
you'll find under **Operations** => **Preferences**. Refer to Section 7.4, *Configuration* for more information about customizing the settings.

In this manner, you can move about the tree view, opening and expanding folders containing applications, games, tools and more. The contents of each folder will be displayed at the right.

## 7.2.1 Selecting Packages

To select a single package, click on it with the left mouse button. You'll notice that highlighting will appear around the package title (as shown in Figure 7–2, *Selecting Packages in Gnome-RPM*) which reflects the selection. To unselect it, either click on an empty space in the display panel with the left mouse button, or click on the **Unselect** button on the toolbar. When you unselect a package, the highlighting will disappear.

**Figure 7–2 Selecting Packages in Gnome-RPM**



You can select and unselect multiple packages, in more than one folder in the tree panel. To select more than one package incrementally, left-click with your mouse

button, while holding down the [Ctrl] key; you'll see highlighting around each additional selection.

To select more than one package **globally**, that is, make larger selections within a folder, left-click one package, then, while holding down the [Shift] key, left-click on the final package you wish to select. By doing so, you'll notice that individual packages between your starting and ending selections will also be highlighted for selection. Using this option makes selecting groups of packages quicker than selecting each package individually.

The status bar at the bottom of Gnome-RPM will display the total number of packages you have selected.

## 7.3 Installing New Packages

To install new packages, choose **Install** from the toolbar. The **Install** window will open, revealing packages which are either already installed, newer packages or other options, which can be selected from the **Filter** drop-down bar at the top of the window. See Figure 7-4, *The Add Packages Window* for an example of the **Install** window, using the filter for "**All but installed packages.**"

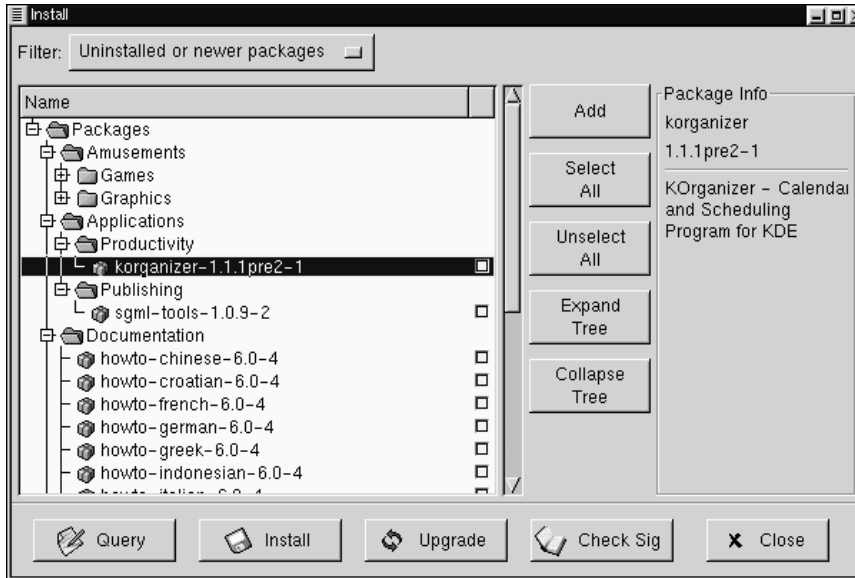
Using the **Filter** feature allows you to winnow your choices for viewing packages. Available filters for viewing include:

- All packages
- All but installed packages
- Only uninstalled packages
- Only newer packages
- Uninstalled or newer packages

You can switch the display of packages by using the drop-down bar at the top of the window.

---

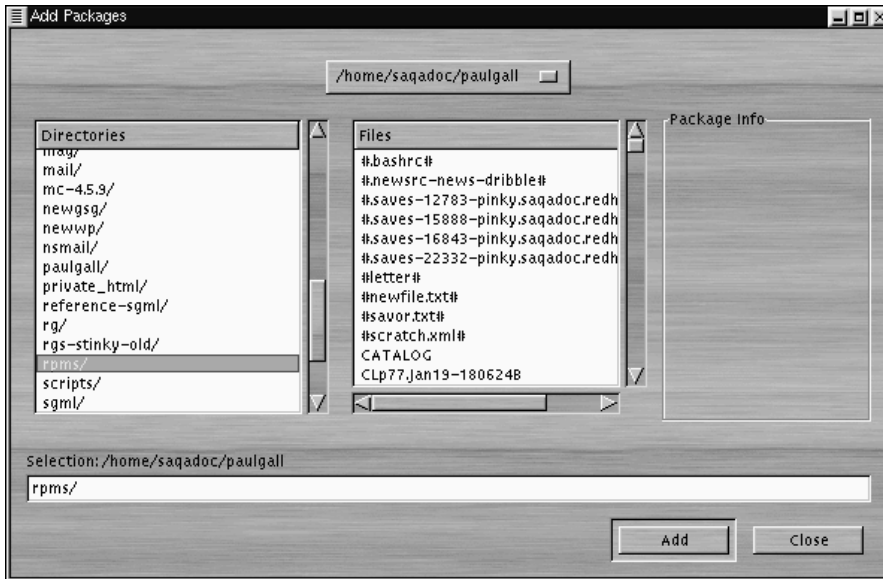
Figure 7-3 The Install Window



Choose the **Add** button. By default, if your CD-ROM is mounted with a Red Hat Linux CD-ROM, Gnome-RPM will search in `/mnt/cdrom/RedHat/RPMS` for new packages. (You can find this default option in the **Install Window** tab of the **Preferences** dialog. See Section 7.4, *Configuration* for more information on this feature.)

If no packages are available in the default path, you'll be presented with an **Add Packages** window from which you can select the appropriate location of your new package. In this view, you can select the correct path by using the drop-down bar at the top of the window to quickly navigate to pre-set locations; or you can double-click in the left panel of the **Add Packages** window to navigate to the correct path (as in Figure 7-4, *The Add Packages Window*). You can also type the path in the text window at the bottom of the **Add Packages** window.

Figure 7–4 The Add Packages Window




---

### Please Note

If you download RPMs, you'll likely find those downloaded packages in a directory called `rpms` within your home directory. For example, if your home directory is `/home/bill`, your downloaded RPMs will be in `/home/bill/rpms`.

---

By clicking on the item, you'll find a brief description of the package in the **Package Info** panel of the **Install** window. To perform an installation or a query on the package, click inside the **checkbox** next to the package, then select the **Install** button. You can also query the item once it's checked; from within the **Package Info** window, you can also perform the installation (see Figure 7–10, *Query Window* in Section 7.5.1, *Querying Packages* for an example).

---

To choose an item, double-click on it with your left mouse button, or click on the **Add** button. The selected package(s) will be added to the **Install** window. You can also install more than one package in the same manner; each selection will be added to the **Install** window.

In addition to choosing to install the packages from within the **Install** window, you can install after performing a query on the selected package. Click on **Query**, which will open the **Package Info** window. Here, you can find a variety of details about the file(s) you've selected to install. Information will include the origination of the package, the date it was built, its size and more.

Within this **Package Info** window, you have the option of installing or upgrading packages.

If the package already exists on your system and you're querying a newer release, the **Package Info** window provides an **Upgrade** button, which will perform an upgrade to newer releases.

You can also "drag and drop" packages from GNOME File Manager. Within the File Manager, left-click on your selected RPM file then, while still holding down the mouse button, "drag" the file to the **Install** window and place it within the **Name** panel.

When dragging files to the **Install** window from the File Manager, you'll notice that the file appears as an icon while it's being dragged toward Gnome-RPM. Once inside the **Name** panel, you'll see that the package is checked for installation by default, and its information appears in the **Package Info** panel to the right.

To install the package now, just select the **Install** button.

You'll see a progress indicator when your package is being installed.

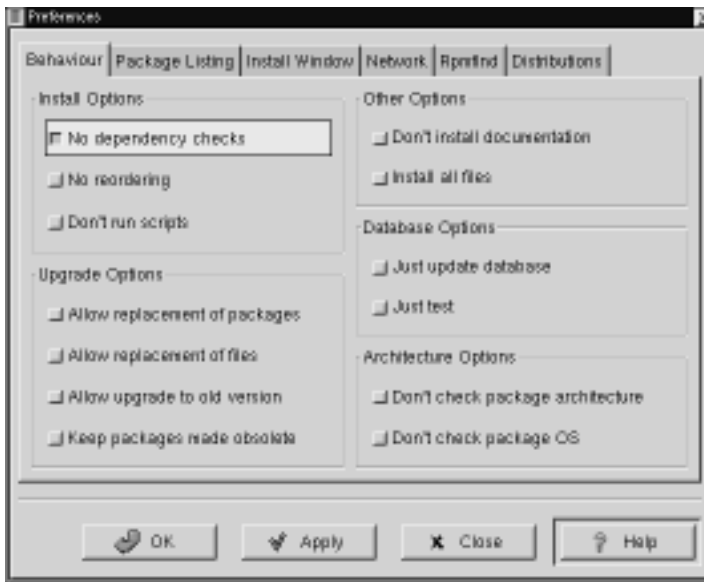
## 7.4 Configuration

Gnome-RPM offers a wide selection of choices for installing and uninstalling packages, documentation and other features. You can customize Gnome-RPM through the **Preferences** dialog, which you can access from **Operations** => **Preferences** on the menu. To make selections in the many of the **Preferences** dialogs, select the check boxes next to the options.

---

Under the **Behavior** tab, you'll find a number of options for configuring the way Gnome-RPM installs, uninstalls and upgrades packages. The Behavior tab is split into five sections: Install, Upgrade, Other, Database and Architecture. Note that by default these boxes not checked (see Figure 7–5, *Behavior Tab in Preferences*).

**Figure 7–5 Behavior Tab in Preferences**



Under **Install Options**, you have the following choices:

- **No dependency checks** - When selected, this will install or upgrade a package without checking for other types of files on which the program may be dependent in order to work. However, unless you know what you're doing we strongly suggest you not use this option as some packages may depend on other packages for files, libraries or programs to function correctly.
- **No reordering** - This option is useful if RPM is unable to change the installation order of some packages to satisfy dependencies.

- **Don't run scripts** - Pre- and post-install scripts are sequences of commands that are sometimes included in packages to assist with installation. This check box is similar to the `--noscripts` option when installing from the shell prompt.

Under **Upgrade Options**, you can select the following:

- **Allow replacement of packages** - Replaces a package with a new copy of itself. Similar to the `--replacepkgs` option from the shell prompt. This option can be useful if an already-installed package has become damaged or may require other repair to function correctly.
- **Allow replacement of files** - Allows the replacement of files which are owned by another package. The shell prompt equivalent for this RPM option is `--replace-files`. This option can sometimes be useful when there are two packages with the same file name but different contents.
- **Allow upgrade to old version** - Like the shell prompt RPM option equivalent `--oldpackage`, this option allows you to "upgrade" to an earlier package. It can sometimes be useful if the latest version of a package doesn't function correctly for your system.
- **Keep packages made obsolete** - Prevents packages listed in an Obsoletes header from being removed.

In **Other Options**, you can select:

- **Don't install documentation** - Like `--excludedocs`, this option can save on disk space by excluding documentation such as man pages or other information related to the package.
- **Install all files** - Installs all files in the package.

The choices available in **Database Options** and **Architecture Options** allow you to decide, among other things, whether you want to perform a "test" installation (which will check for file conflicts without actually performing an install), or whether you want to exclude packages for other operating systems or system architectures.

In the **Package Listing** tab, you'll find a choice of displays for your packages: either **View as icons**, which will be graphically-based, or **View as list**, which is not graphical but can provide more information about the packages.

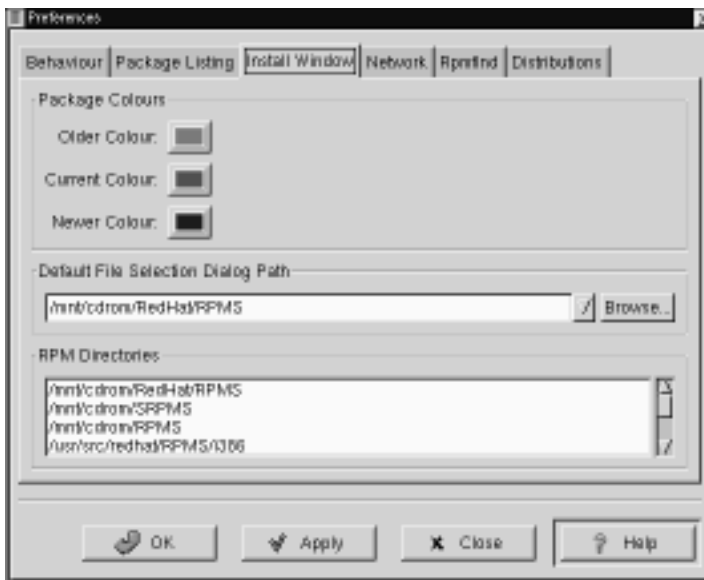
---

In **Install Window**, you can specify the path through which Gnome-RPM can find new RPMs on your system. Refer to Figure 7–6, *Install Window* for an example of this dialog. If you're using your Red Hat Linux CD-ROM, this path will probably be

```
/mnt/cdrom/RedHat/RPMS
```

or a similar path which had been set as the default path for Gnome-RPM. If you download new RPMs from the Internet or want to install RPMs via a NFS-mounted CD-ROM this path will be different for you.

**Figure 7–6 Install Window**



To change this path, type the full path to the RPMs you'd like to work with. Choosing the **Apply** or **OK** buttons will save this path, making it the default path for future sessions. You can also determine the default path by selecting the **Browse...** button, and visually navigating through the **RPMPATH** window.

After changing install path and closing the dialog box, you can use the **Install** button to view the packages available in your new location.



(If the path for your RPMs doesn't match the default path in your preferences, you'll be presented with a browser window, which will allow you to select the correct path for your new RPMs.)

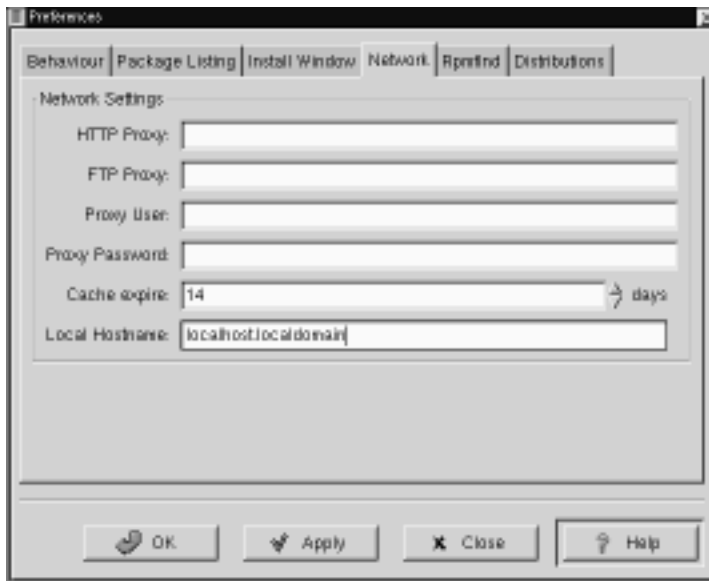
Under **Package Colors**, you'll find color coding for packages. The default setting for older packages is gray; for current packages, the color is green; for newer packages than those installed, the color is blue. These color values can be customized to suit your needs.

The **RPM Directories**, contains a listing of default locations where Gnome-RPM will search for packages.

In **Network**, you have the ability to specify proxies for use with HTTP and FTP transfers, as well as user and password names (see Figure 7-7, *Network Settings*). Note, however, that the password will not be stored securely.

In the **Cache expire** window, you can set the length of time before data from the rpmfind database is considered out of date.

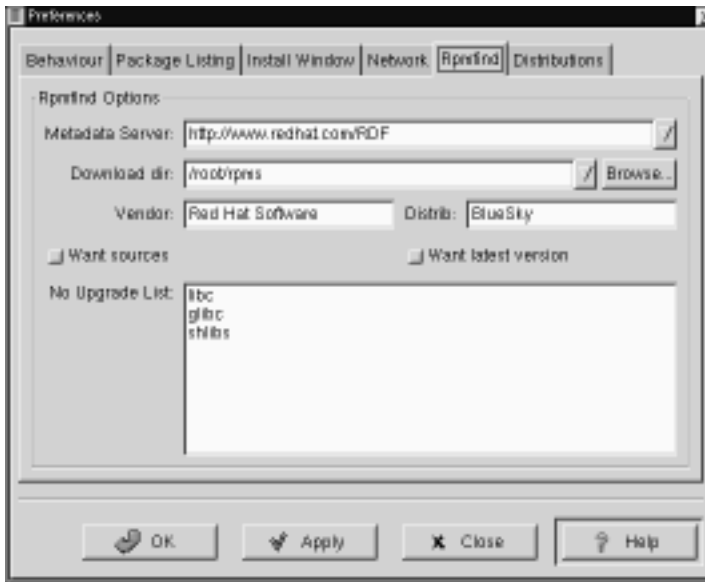
**Figure 7-7 Network Settings**



In **Rpmfind** and **Distributions**, you'll find settings and options which correspond to the **Web find** feature.

The Rpmfind system was devised by Daniel Veillard, and allows the user to search the Internet for packages by name, summary, architecture and more (see Figure 7–8, *The Rpmfind Window*). The user is then given the option of downloading and installing the most appropriate packages for their system. To learn more about Rpmfind, go to <http://rpmfind.net/>.

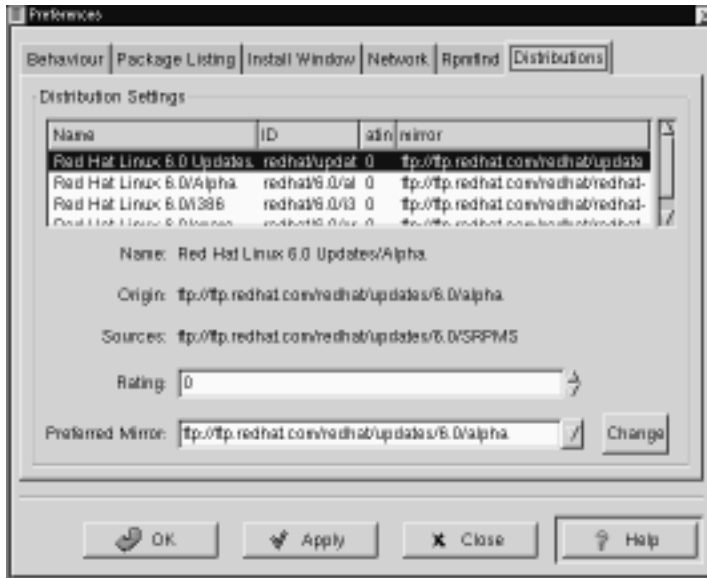
**Figure 7–8** The Rpmfind Window



The **Metadata server** sets the server to be used for searches. The **Download dir:** entry allows you to specify where you want the files to be placed.

You can also specify the vendor, distribution name and whether to find sources and/or the latest files.

Figure 7–9 Distribution Settings in Preferences



In **Distribution Settings**, you can set the options for choosing the most appropriate package out of the selections Rpmfind returns, as well as which mirror you would like to use. The higher the rating you indicate for your selection (as shown in Figure 7–9, *Distribution Settings in Preferences*) the higher the priority it will receive; the lower rating, such as "-1," will specify that packages not be recommended.

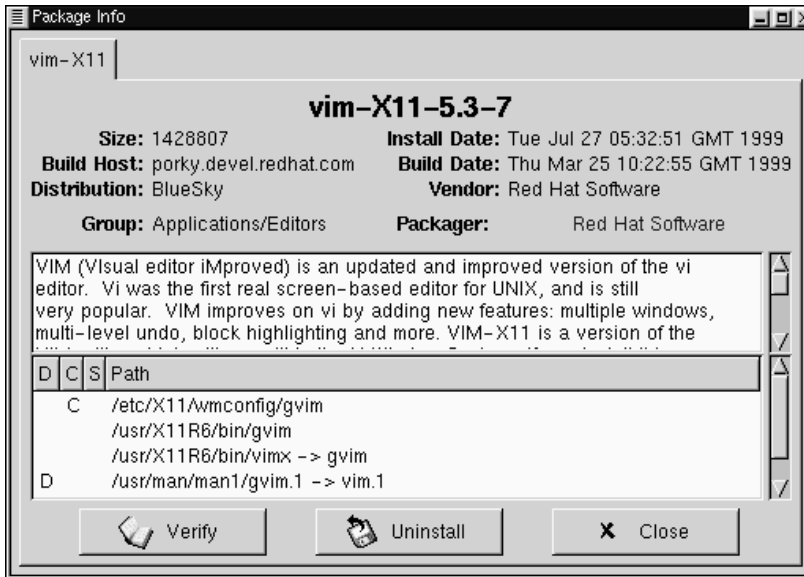
## 7.5 Package Manipulation

### 7.5.1 Querying Packages

The easiest way to query packages is to use the **Query** option from the menu at the top. If you want to query more than one package, make all your selections then press the **Query** button on the menu.

You'll be presented with a window like the one shown in Figure 7–10, *Query Window*. The more packages you've queried, the more "tabs" you'll find within the **Query** box, each tab representing a **Query** window for a package.

Figure 7–10 Query Window



The name of the package is centered at the top of the box. Below, the box is divided into two columns of listed information; below this information, you'll see a display area showing package files.

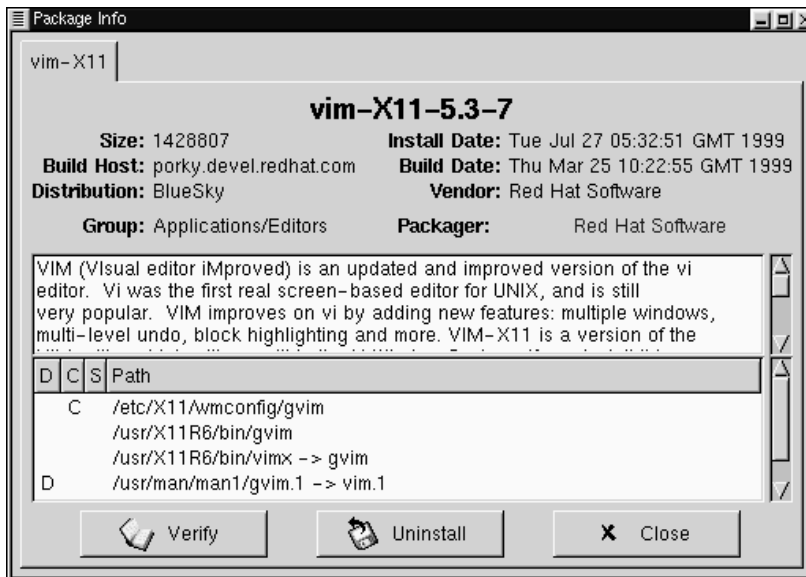
In the left column in the information list, you'll find the size of the file, the machine on which the file is found, the name of the package distribution and the group to which its function belongs.

In the right column, you'll find the date of the package's installation on your machine, the date the package was built, the name of the vendor and the name of the group who packaged the software. If the package has not been installed on your machine, that space will simply read, "not installed." Clicking on the name following **Packager** will cause your browser's e-mail application to open in compse, so that you can write to the packager.

Centered at the bottom of the information list is the URL of the application's developer (see Figure 7–11, *URL in the Query Window*). Similar to the e-mail function of

the **Packager** entry, clicking on the URL will cause your browser to open to the corresponding website.

**Figure 7–11 URL in the Query Window**



Below the description is a list of the files contained in the package. If a D appears in its related column to the left of the path, that file is a documentation file and would be a good thing to read for help on using the application. If a C appears in its respective column, the file is a configuration file. Under the S column, you can view the "state" of the package; here, you'll receive information if any files are reported as "missing" from the package (and therefore probably mean there's a problem with the package).

If you're querying a package that's already installed, you'll also find two additional buttons beneath at the bottom of this window: **Verify** and **Uninstall**. If you're performing a query on a package that hasn't been installed yet, the buttons on the bottom will be labeled **Install**, **Upgrade** and **Check Sig**.

To close the query window without performing any action, left-click on the **X** at the top right of the window bar.

## 7.5.2 Verifying Packages

Verifying a package checks all of the files in the package to ensure they match the ones present on your system. The checksum, file size, permissions, and owner attributes are all checked against the database. This check can be used when you suspect that one of the program's files has become corrupted for some reason.

Choosing the packages to verify is like choosing the packages to query. Select the packages in the display window and use the **Verify** button on the toolbar or from **Packages => Verify** on the menu. A window opens like the one in Figure 7-12, *Verify Window*.

**Figure 7-12** Verify Window



As the package is being checked, you'll see the progress in the **Verify** window. If there are any problems discovered during the verify process, they'll be described in the main display area.

### 7.5.3 Uninstalling Packages

Uninstalling a package removes the application and associated files from your machine. When a package is uninstalled, any files it uses that are not needed by other packages on your system are also removed. Changed configuration files are copied to `<filename>.rpm_save` so you can reuse them later.

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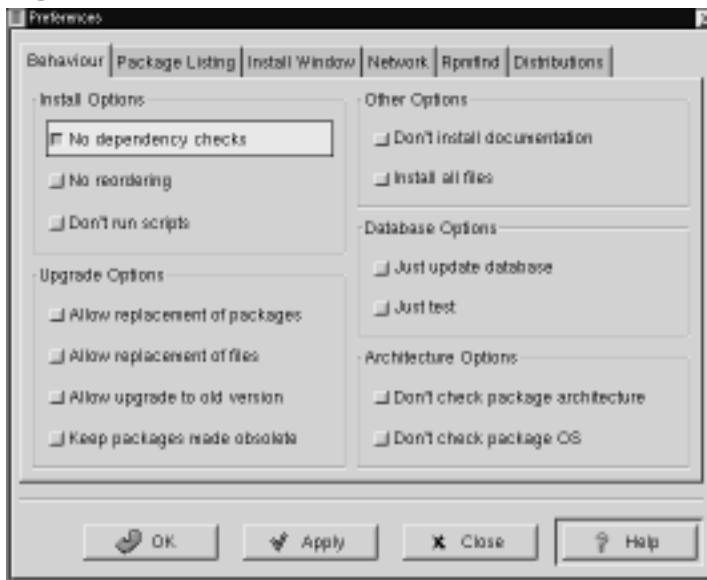
#### Please Note

Remember that you must be root to uninstall packages.

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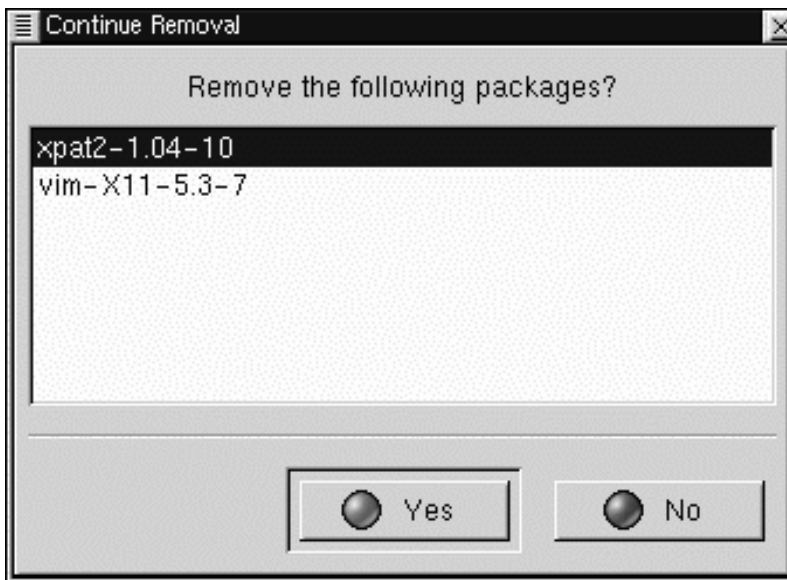
If uninstalling a package would break "dependencies" (which could hobble other applications that require one or more of the removed files in the package), a dialog will pop up, asking you to confirm the deletion. This will occur if you haven't selected the "No dependency checks" box from the **Preferences** menu (as shown in Figure 7-13, *The Behavior Tab in Preferences*).

**Figure 7-13** The Behavior Tab in Preferences



There are a variety of methods through which you can remove a selected package: from the menu, under **Packages**; from the toolbar and from the **Query** function. If you decide to remove more than one package at a time, you can choose either an incremental or global selection in the same way as you would when installing, querying or verifying. The total of your selections will be reflected in the status bar on the bottom of the main window. Because you can remove more than one package at a time, use caution to select only those which you wish to remove.

**Figure 7–14 Uninstall Window**



Once you've begun the uninstall, Gnome-RPM asks for confirmation, showing a window like the one in Figure 7–14, *Uninstall Window*. All of the packages that are about to be uninstalled are listed. You should look at them all to ensure you're not about to remove something you want to keep. Clicking the **Yes** button will start the uninstallation process. After it completes, the packages and groups that have been removed will disappear from any windows they were in.



## Upgrading Packages

When a new version of a package has been released, it is easy to install it on your system. Select the packages from the window of available packages in the same way you select packages for installation. Both the **Upgrade** button on the toolbar and, from the menu, under **Operations => Upgrade** will begin the process. You simply **Add** packages in the same manner as you would a new package installation.

During the upgrade, you'll see a progress indicator like the one for installing packages. When it's finished, any old versions of the packages will be removed, unless you specify otherwise (refer to Section 7.4, *Configuration* for more information).

It is much better to use the upgrade option than to uninstall the old versions of a package and then install the new one. Using upgrade ensures that any changes you made to package configuration files are preserved properly, while uninstalling and then reinstalling a new package could cause those changes to be lost.

If you run out of disk space during an installation, the install will fail. However, the package which was being installed when the error occurred may leave some files around. To clean up after this error, reinstall the package after you've made more disk space available.

---



## **Part II    Installation-Related Reference**



## 8 Before You Begin

### 8.1 Things You Should Know

In order to prevent any surprises during the installation, you should collect some information before attempting to install Red Hat Linux. You can find most of this information in the documentation that came with your system, or from the system's vendor or manufacturer.

The most recent list of hardware supported by Red Hat Linux can be found at Red Hat's World Wide Web site at <http://www.redhat.com/hardware>. It's a good idea to check your hardware against this list before proceeding.

---

#### Please Note

You can perform a text mode installation of Red Hat Linux by following instructions in this chapter and in Chapter 9, *Installing Red Hat Linux with the Text Mode Installer*, which follows. However, if you're installing from a CD-ROM, you might prefer to use the graphical installation mode, which offers both ease of use and a flexible, custom installation. For more information on this option, turn to the Inst.

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#### Please Note

At the end of the *Before You Begin* chapter in the *Official Red Hat Linux Installation Guide* is a table for you to fill out with your specific system requirements. This should help you keep up with any information about your system in general as well as to the information you will need during your installation.

---

### 8.1.1 Basic Hardware Configuration

You should have a basic understanding of the hardware installed in your computer, including:

- hard drive(s) -- Specifically, the number, size, and type. If you have more than one, it's helpful to know which one is first, second, and so on. It is also good to know if your drives are IDE or SCSI. If you have IDE drives, you should check your computer's BIOS to see if you are accessing them in **LBA** mode. Please refer to your computer's documentation for the proper key sequence to access the BIOS. Note that your computer's BIOS may refer to LBA mode by other names, such as "large disk mode". Again, your computer's documentation should be consulted for clarification.
- memory -- The amount of RAM installed in your computer.
- CD-ROM -- Most importantly, the unit's interface type (IDE, SCSI, or other interface) and, for non-IDE, non-SCSI CD-ROMs, the make and model number. IDE CD-ROMs (also known as ATAPI) are the most common type in recently manufactured, PC-compatible computers.
- SCSI adapter (if one is present) -- The adapter's make and model number.
- network card (if one is present) -- The card's make and model number.
- mouse -- The mouse's type (serial, PS/2, or bus mouse), protocol (Microsoft, Logitech, MouseMan, etc.), and number of buttons; also, for serial mice, the serial port it is connected to.

On many newer systems, the installation program is able to automatically identify most hardware. However, it's a good idea to collect this information anyway, just to be sure.

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### Alpha

In addition to the latest hardware compatibility list on Red Hat's website, owners of Alpha-based systems should refer to the Red Hat Linux/Alpha Alpha Installation Addendum for more information on supported hardware configurations.

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### SPARC

In addition to the latest hardware compatibility list on Red Hat's website, SPARC owners should refer to the Red Hat Linux/SPARC for a list of supported hardware.

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### Learning About Your Hardware With Windows®

If your computer is already running Windows 9x, you can use the following procedure to get additional configuration information:

- With Windows running, click on the "My Computer" icon using the secondary (normally the right) mouse button. A pop-up menu should appear.
  - Select "Properties." The "System Properties" window should appear (see Figure 8-1, *Windows System Properties Window*). Note the information listed under "Computer:" -- in particular the amount of RAM listed.
-

**Figure 8–1 Windows System Properties Window**

- Click on the "Device Manager" tab. You will then see a graphical representation of your computer's hardware configuration. Make sure the "View devices by type" button is selected.

At this point, you can either double-click on the icons (or single-click on the plus sign [+]) to look at each entry in more detail (see Figure 8–2, *Device Manager Under Windows 95*). Look under the following icons for more information:



Figure 8–2 Device Manager Under Windows 95



- Disk drives -- You will find the type (IDE or SCSI) of hard drive here. (IDE drives will normally include the word "IDE," while SCSI drives won't.)
- Hard disk controllers -- You can get more information about your hard drive controller here.
- CDROM -- Here is where you'll find out about any CD-ROM drives connected to your computer.

---

**Please Note**

In some cases, there may be no CD-ROM icon, yet your computer has a functioning CD-ROM drive. This is normal, depending on how Windows was originally installed. In this case, you may be able to learn additional information by looking at the CD-ROM driver loaded in your computer's `config.sys` file.

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- Mouse -- The type of mouse present on your computer can be found here.
- Display adapters -- If you're interested in running the X Window System, you should write down the information you find here.
- Sound, video and game controllers -- If your computer has sound capabilities, you'll find more information about that here.
- Network adapters -- Here you'll find additional info on your computer's network card (if you have one).
- SCSI controllers -- If your computer uses SCSI peripherals, you'll find additional info on the SCSI controller here.

While this method is not a complete substitute for opening your computer's case and physically examining each component, in many cases it can provide sufficient information to continue with the installation.

---

**Please Note**

This information can also be printed by clicking on the "Print..." button. A second window will appear, allowing you to choose the printer, as well as the type of report (the "All Devices and System Summary" report type is the most complete).

---

## 8.1.2 Video Configuration

If you will be installing the X Window System, you should also be familiar with the following:

- your video card -- The card's make and model number (or the video chipset it uses), and the amount of video RAM it has. (Most PCI-based cards are auto-detected by the installation program.)
- your monitor -- The unit's make and model number, along with allowable ranges for horizontal and vertical refresh rates.

## 8.1.3 Network-related Information

If you will be connected to a network, be sure you know your:

- IP address -- Usually represented as a set of four numbers separated by dots, such as 10.0.2.15.
  - netmask -- Another set of four numbers separated by dots. An example netmask would be 255.255.248.0.
  - gateway IP address -- Yet another set of four dot-separated numbers. For instance, 10.0.2.254.
  - one or more name server IP addresses -- One or more sets of dot-separated numbers. 10.0.2.1 might be the address of a name server.
  - domain name -- The name given to your organization. For instance, Red Hat has a domain name of redhat.com.
  - hostname -- The name of your computer. A computer might be named pooh, for instance.
-

---

**Please Note**

The information given above is an example only! Do *not* use it when you install Red Hat Linux! If you don't know the proper values for your network, ask your network administrator.

---

## 9 Installing Red Hat Linux with the Text Mode Installer

This release of Red Hat Linux features a new graphical, mouse-based installation program, documented in the *Official Red Hat Linux Installation Guide*. But you can also install Red Hat Linux with a text mode, keyboard-based installation program. This chapter explains how to use it. Here are some recommendations:

- If you've never installed Linux before, you should read the *Official Red Hat Linux Installation Guide* first. Even though it covers the graphical installation process, most of the concepts do apply to the text-mode installation as well. After that, you'll find that Chapter 8, *Before You Begin* will give you more in-depth information regarding those aspects of installing Red Hat Linux that do not apply to the graphical installation process.

In addition, you might find Appendix C, *An Introduction to Disk Partitions* interesting, as it discusses disk partition resizing (crucial if you plan to install Linux on a disk where Windows or another operating system is currently installed).

- If you'll need PCMCIA to perform the install (for example, you're installing on a laptop equipped with a PCMCIA card), you must make a PCMCIA boot disk. The *Official Red Hat Linux Installation Guide* explains how to do this.
  - If you plan to install over a network (via NFS, FTP, or HTTP), you must make a network boot diskette. The *Official Red Hat Linux Installation Guide* explains how to do this.
  - If you've never used the text mode installation program, or need a refresher on its user interface, read the next section.
  - If you want to use the `fdisk` partitioning program during installation, start the install program in expert mode. (Section 9.2.2, *Boot Options* explains how to do this.) If you're installing on an Alpha or SPARC station, read the *Official Red Hat Linux Alpha/SPARC Installation Addendum* to determine whether you must start the install program in expert mode.
-

- To begin installation without further delay, turn to Section 9.2, *Starting the Installation Program*.

## 9.1 The Installation Program User Interface

The Red Hat Linux text mode installation program uses a screen-based interface that includes most of the on-screen "widgets" commonly found on graphical user interfaces. Figure 9–1, *Installation Program Widgets* and Figure 9–2, *More Installation Program Widgets* illustrate the screens you'll see.

Figure 9–1 Installation Program Widgets

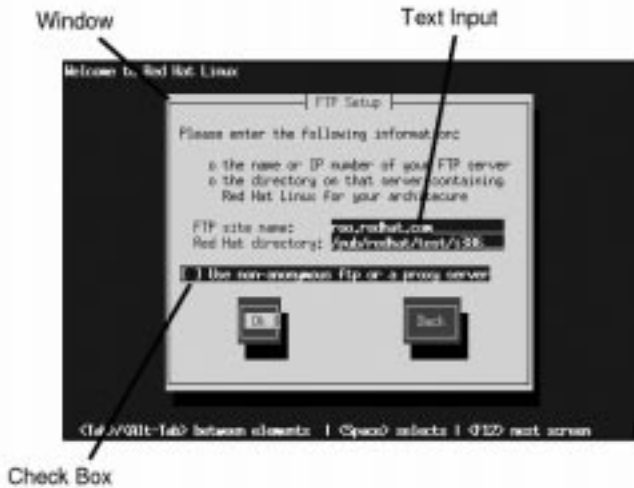
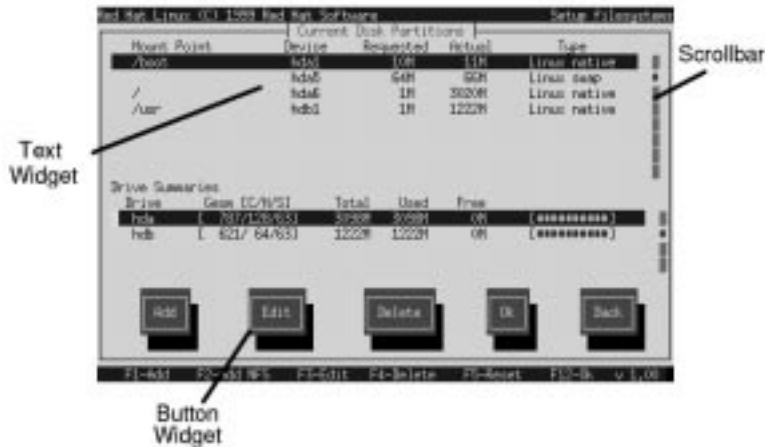


Figure 9–2 More Installation Program Widgets



Here's a list of the most important widgets shown in the figures:

- Window -- Windows (usually referred to as **dialog boxes** in this manual) will appear on your screen throughout the installation process. At times, one window may overlay another; in these cases, you may only interact with the window on top. When finished with that window, it will disappear, allowing you to continue with the window that was 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.
- Check Box -- Check boxes allow you to select or deselect a feature. The box displays either an asterisk (selected) or a space (unselected). With the cursor resting within a check box, press [Space] to select an unselected feature or to deselect a selected feature.

- **Text Widget** -- Text widgets are regions of the screen that are devoted to the display of text. At times, text widgets may also contain other widgets, such as check boxes. 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 [uparrow] and [downarrow] 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 "pressing" these buttons. Buttons may be pressed 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 9–1, *Installation Program Widgets*, the cursor is positioned on the **Ok** button. Figure 9–2, *More Installation Program Widgets* shows the cursor on the first line of the text widget at the top of the window.

### 9.1.1 Using the Keyboard to Navigate

You navigate through the installation dialogs using a simple set of keystrokes. To move the cursor, use [leftarrow], [rightarrow], [uparrow], and [downarrow]. Use [Tab], and [Alt]-[Tab] to cycle forward or backward through each widget on the screen. Most screens display along the bottom a summary of available cursor positioning keys.

To "press" a button, position the cursor over the button (using [Tab], for instance) 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 **check box**, move the cursor to the check box 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.

---



---

**Please Note**

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.

---

## 9.2 Starting the Installation Program

While the installation program loads, messages scroll on your screen. When loading is complete, this prompt appears:

```
boot :
```

There are several ways to reach this point. You can:

- Insert the diskette included in your boxed set (or a PCMCIA support or network boot diskette that you've created) into the primary diskette drive and reboot your computer.
- If your computer can boot from the CD-ROM drive, insert the Red Hat Linux CD into the drive and reboot.
- Boot MS-DOS, and start a program in the `dosutils` directory of the Red Hat Linux CD-ROM named `autoboot.bat`. (This will work from DOS only; it will not work from a DOS window started from Windows.)

---

**Alpha and SPARC**

If you haven't created your diskettes yet, please refer to the *Official Red Hat Linux Alpha/SPARC Installation Addendum* for more information on the diskettes required to install Red Hat Linux on your system. After you've created the necessary diskettes, please finish reading the appropriate chapter of the *Official Red Hat Linux Alpha/SPARC Installation Addendum* for information on starting the installation.

---

## 9.2.1 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.

## 9.2.2 Boot Options

If you press [Enter] at the `boot` prompt, or if you take no action within the first minute after the `boot` prompt appears, the graphical installation program explained in the *Official Red Hat Linux Installation Guide* starts. Pressing one of the help screen function keys as described above disables this autostart feature. To start the text mode installation program explained here, before pressing [Enter], type:

```
boot: text
```

If the install program does not properly detect your hardware, you may need to restart the installation in "expert" mode. To start an expert mode installation, type:

```
boot: text expert
```

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

---

### Please 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.

---

Other options that may be entered with the boot command include the following.

For example, to instruct the kernel to use all the RAM in a 128 MB system, enter:

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

---

## 9.3 Choosing a Language

The Choose Language dialog (Figure 9–3, *Selecting a Language*) lists the languages into which Red Hat Linux has been translated. Using the [uparrow] and [downarrow] keys, select the appropriate language and press [Enter]. Subsequent dialogs and instructions of the installation program will appear in the language you choose.

**Figure 9–3** Selecting a Language

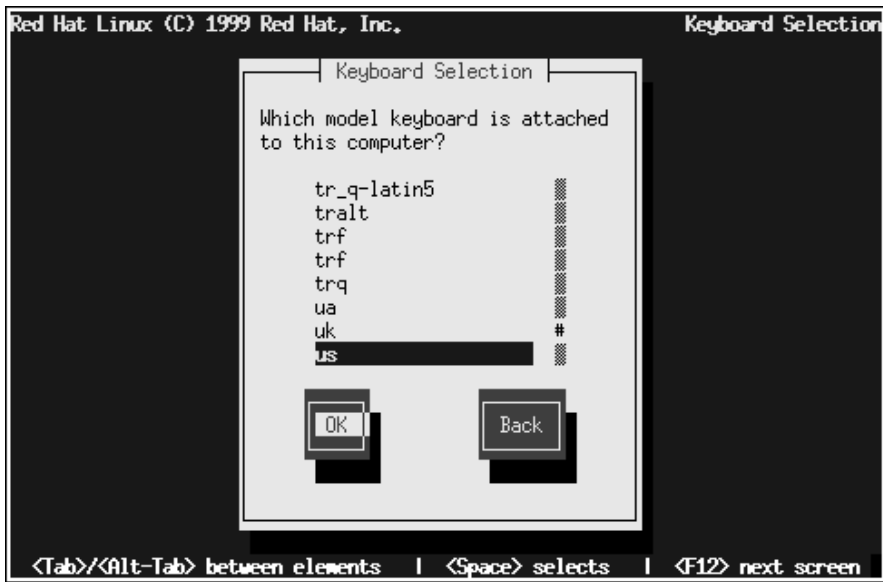


A scroll bar appears to the right of the list. Where present, a scroll bar indicates that there are more entries than can be displayed in the available space at once. You'll be seeing scroll bars like this throughout the installation program.

## 9.4 Selecting a Keyboard Type

Next, the installation program gives you an opportunity to select a keyboard type (Figure 9–4, *Selecting a Keyboard Type*). Select your keyboard in the same way you selected your language preference.

Figure 9-4 Selecting a Keyboard Type



After selecting the appropriate keyboard type, press [Enter]; the keyboard type you select will be loaded automatically both for the remainder of the installation process and each time you boot your Red Hat Linux system.

If you wish to change your keyboard type after you have installed your Red Hat Linux system, become root and type either `/usr/sbin/kbdconfig` or `setup`.

## 9.5 Selecting an Installation Method

If you booted the installation program directly from the Red Hat Linux CD-ROM, you'll next see the Welcome dialog: go to Section 9.8, *Welcome*. Otherwise, an Installation Method dialog appears. The choices presented in the dialog vary depending on the type of diskette you booted from (the one in your boxed set, or a network or PCMCIA diskette that you've created). Figure 9-5, *Select Installation Method* shows all available choices.

Figure 9–5 Select Installation Method



Red Hat Linux can be installed via any of five methods described below:

### CD-ROM

You booted from the diskette in your boxed set and are installing with the Red Hat Linux CD-ROM in a local drive. If you chose this method, you'll next see the Language Selection dialog: go to Section 9.8, *Welcome*.

### Hard Drive

You booted from the diskette in your boxed set and are installing from the Red Hat Linux files that you have previously copied to a local hard drive. If you select this method, you'll next see the Select Partition dialog: go to Section 9.6, *Identify Disk Partition to Install From*.

### NFS Image

You booted from a network or PCMCIA diskette and are installing from an NFS Image server which is exporting the Red Hat Linux CD-ROM (or a mirror

image of one.) If you chose this method, you'll next see the NFS Setup dialogs: go to Section 9.7, *Installing over a Network*

### **FTP**

You booted from a network or PCMCIA diskette and are installing directly from an FTP server. If you select this method, you'll next see the FTP Setup dialogs: go to Section 9.7, *Installing over a Network*.

### **HTTP**

You booted from a network or PCMCIA diskette and are installing directly from an HTTP Web server. If you select this method, you'll next see the HTTP Setup dialogs: go to Section 9.7, *Installing over a Network*.

## **9.6 Identify Disk Partition to Install From**

You'll see the Select Partition screen (Figure 9–6, *Selecting Partition for Hard Drive Install*) only if you are installing from a disk partition (that is, only if you selected Hard Disk in the Installation Method dialog). This dialog allows you to name the disk partition you are installing from.

Figure 9-6 Selecting Partition for Hard Drive Install



Enter the device name of the partition containing the RedHat directory tree. There is also a field labelled "Directory holding Red Hat:." If the RedHat directory is not in the root directory of that partition, enter the path to the RedHat directory (for example, /test/new/RedHat).

After you've identified the disk partition, you'll next see the Welcome dialog: go to Section 9.8, *Welcome*.

## 9.7 Installing over a Network

If you're doing a network installation, the Configure TCP/IP dialog appears; for an explanation of this dialog, go to Section 9.13, *Configuring a Network Connection* and then return here.

### 9.7.1 NFS Setup

You'll see the NFS setup dialog (Figure 9-7, *Installing via NFS*) only if you are installing from an NFS server (that is, only if you booted from a network or PCMCIA diskette and selected NFS Image in the Installation Method dialog).

**Figure 9-7** Installing via NFS



Enter the name (which must be a fully-qualified domain name) or IP address of your NFS server, and the name of the exported directory that contains the Red Hat Linux installation files or CD. For example, if you're installing from a host named east-coast in the domain redhat.com, enter eastcoast.redhat.com in the **NFS Server** field.

If the NFS server has the Red Hat Linux CD mounted on /mnt/cdrom, enter /mnt/cdrom in the **Red Hat directory** field. If the NFS server is exporting a mirror of the Red Hat Linux installation tree instead of a CD, enter the directory which contains the RedHat directory. For example, if your NFS server contains the directory /mirrors/redhat/i386/RedHat, enter /mirrors/redhat/i386.



After you've supplied information about your NFS boot server, you'll next see the Welcome dialog: go to Section 9.8, *Welcome*.

## 9.7.2 FTP Setup

You'll see the FTP Setup screen (Figure 9–8, *Installing via FTP*) only if you are installing from an FTP server (that is, only if you selected FTP in the Installation Method dialog). This dialog allows you to identify the FTP server you are installing from.

**Figure 9–8** Installing via FTP



Enter the fully-qualified domain name or IP address of the FTP site you are installing from, and the name of the directory there which contains the RedHat installation files for your architecture. For example, if the FTP site contains the directory `/pub/mirrors/redhat/i386/RedHat`, enter `/pub/mirrors/redhat/i386`.

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

After you've supplied information about your FTP boot server, you'll next see the Welcome dialog: go to Section 9.8, *Welcome*.

### 9.7.3 HTTP Setup

You'll see the HTTP Setup screen (Figure 9–9, *Installing via HTTP*) only if you are installing from an HTTP server (that is, only if you selected HTTP in the Installation Method dialog). This dialog prompts you for information about the HTTP server you are installing from.

**Figure 9–9** Installing via HTTP



Enter the name or IP address of the HTTP site you are installing from, and the name of the directory there which contains the RedHat directory for your architecture. For example, if the HTTP site contains the directory `/pub/mirrors/redhat/i386/RedHat`, enter `/pub/mirrors/redhat/i386`.

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

After you've supplied information about your HTTP boot server, you'll next see the Welcome dialog described in the next section.

## 9.8 Welcome

Once you've selected your language and keyboard and indicated the installation method, Figure 9–10, *Welcome dialog* appears. Press [Enter] to continue.

**Figure 9–10** Welcome dialog



## 9.9 Upgrading or Installing

The Installation Type dialog (Figure 9–11, *Installation Type Dialog*) presents you with five choices, described below.

Figure 9–11 Installation Type Dialog



- **Install GNOME Workstation** -- Install on a system that will be used primarily as a workstation. Load the Gnome GUI and configure the system to start Gnome when the system boots. The installation program deletes all data in any existing Linux partitions, decides how to partition the disk for the new version, and chooses which software packages to load. (Do not choose this method if you're sharing a disk with Windows NT; if you do, you will be unable to boot Windows NT.)
- **Install KDE Workstation** -- Install on a system that will be used primarily as a workstation. Load the KDE GUI and configure the system to start KDE when the system boots. The installation program deletes all data in any existing Linux partitions, decides how to partition the disk for the new version, and chooses which software packages to load. (Do not choose this method if you're sharing a disk with Windows NT; if you do, you will be unable to boot Windows NT.)
- **Install Server System** -- Install on a system that will be used primarily as a server. The X Window system is not configured and no GUI starts when the system boots. The Installation program deletes all data in any existing partitions of any kind,

decides how to partition the disk for the new version, and chooses which software packages to load.

- **Install Custom System** -- Perform a custom installation. You make all decisions regarding disk partitioning and initialization, which software packages to install, and how to configure the X Window System and the user interface.
- **Upgrade Existing System** -- Upgrade an earlier version (2.0 or later) of Red Hat Linux without deleting any existing data. The installation program updates the modular 2.2.x kernel and all currently installed software packages.

### 9.9.1 Upgrading

If you choose to upgrade and the install program detects more than one installed Linux version on the system, you'll be asked which version to upgrade. After you indicate this, or if there's only one installed Linux version on the system, the install program probes your existing system to determine which software packages require updating and presents the Customize Packages to Upgrade dialog (Figure 9–12, *Customize Packages to Upgrade Dialog*).

---

Figure 9–12 Customize Packages to Upgrade Dialog



If you answer **No**, the install program starts upgrading existing packages. The next dialog you'll see is Figure 9–41, *Installation Status Display*. This dialog remains on the screen until the upgrade is complete.

Answer **Yes** if you want to add to or remove from the list of individual packages to be upgraded. Section 9.19.1, *Selecting Individual Packages* shows the dialogs and explains how to use them. The upgrade starts when you finish making your changes.

The upgrade process preserves existing configuration files by renaming them using a `.rpmsave` extension (e.g., `sendmail.cf.rpmsave`) and leaves a log telling what actions it took in `/tmp/upgrade.log`. As software evolves, configuration file formats can change, so you should carefully compare your original configuration files to the new files before integrating your changes.

---

**Please Note**

Some upgraded packages may require that other packages are also installed for proper operation. The upgrade procedure takes care of these **dependencies**, but it may need to install additional packages which are not on your existing system.

---

## 9.9.2 Installing

If you choose a workstation or server install (one of the first three choices), Figure 9–13, *Automatic Partitioning Dialog* appears.

**Figure 9–13 Automatic Partitioning Dialog**



If you select **Continue**, the install program partitions your disk and decides which software packages to install. You'll next see the Hostname dialog explained in Section 9.12, *Naming Your Computer*.

If you select **Manually partition**, the disk partitioning dialogs described in the next section will appear showing you how the install program has partitioned your disk. You can inspect the partitions and mount points and make any changes you wish.

If you choose a custom install, the disk partitioning dialogs will appear showing any existing disk partitions. It is up to you to indicate the partitions and mount points to be used for installation of this version of Red Hat Linux.



Installing Red Hat Linux over another installation of Linux (including Red Hat Linux) does *not* preserve any information (files or data) from the prior installation. Make sure you save any important files! If you are worried about saving the current data on your existing system (without making a backup on your own), you should consider performing an upgrade instead.

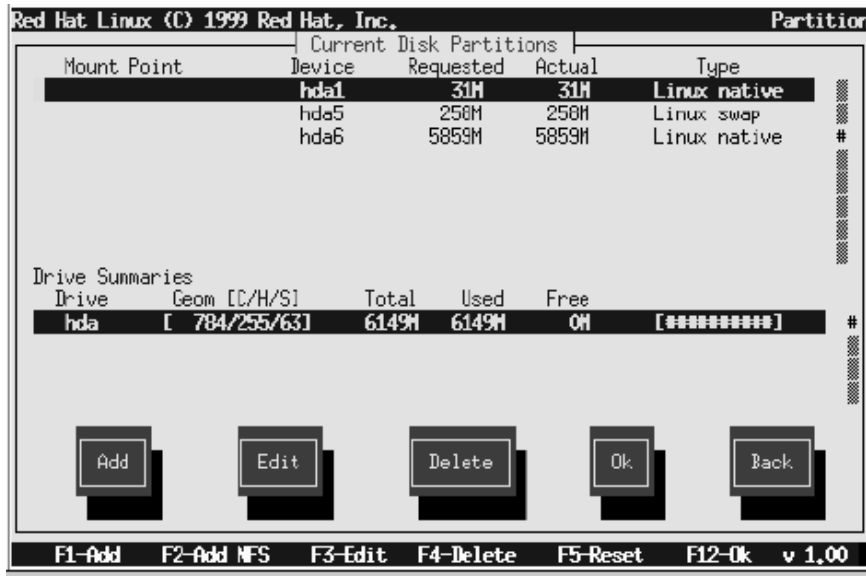
---

## 9.10 Partitioning Your Disk for Red Hat Linux

You use the disk partitioning dialogs to tell the installation program where to install Red Hat Linux. If you're doing an expert installation, you will be given the choice of using `fdisk` instead of Disk Druid to partition your disk. (For a quick refresher on how to use `fdisk`, see Section 9.10.11, *Using fdisk*.) Otherwise, the install program displays the main Disk Druid dialog (Figure 9–14, *Disk Druid Main Screen*).



Figure 9–14 Disk Druid Main Screen



If you have not yet planned how you will set up your partitions, turn to Appendix C, *An Introduction to Disk Partitions*. Here you'll find an introduction to basic disk partitioning concepts. If you're familiar with disk partitions, you can skip ahead to Section C.1.4, *Making Room For Red Hat Linux* for more information on the process of freeing up disk space to prepare for a Red Hat Linux installation. This section also discusses the partition naming scheme used by Linux systems, sharing disk space with other operating systems, and related topics. As a bare minimum, you'll need an appropriately-sized root partition, and a swap partition of at least 16 MB.

The following sections describe the layout of Figure 9–14, *Disk Druid Main Screen* and how to use its buttons to set up partitions. If you're already familiar with Disk Druid, you can partition your disk and skip to Section 9.10.10, *Formatting Partitions*.

### 9.10.1 The Current Disk Partitions Section

Each line in the Current Disk Partitions section represents a disk partition. In Figure 9–14, *Disk Druid Main Screen*, there are existing partitions in the section, indicating that Linux has been installed on this disk in the past.

You'll note that this section has a scroll bar to the right, which means that there might be more partitions than can be displayed at one time. If you use the [uparrow] and [downarrow] keys, you can see if there are any additional partitions. Each line in this section has five different fields:

#### **Mount Point**

Indicates where the partition will be mounted when Red Hat Linux is installed and running.

#### **Device**

Displays the partition's device name.

#### **Requested**

Shows the partition's initial size.

#### **Actual**

Shows the partition's current size.

#### **Type**

Shows the partition's type.

As you scroll through the Current Disk Partitions section, you might see an Unallocated Requested Partitions title bar, followed by one or more partitions. As the title implies, these are partitions that have been requested but, for one reason or another, have not been allocated. A common reason for having an unallocated partition is a lack of sufficient free space for the partition. In any case, the reason the partition remains unallocated will be displayed after the partition's mount point.

---

## 9.10.2 The Drive Summaries Section

Each line in the Drive Summaries section represents a hard disk on your system. Each line has the following fields:

### Drive

Shows the hard disk's device name.

### Geom [C/H/S]

Shows the hard disk's **geometry**. The geometry consists of three numbers representing the number of cylinders, heads and sectors as reported by the hard disk.

### Total

Shows the total available space on the hard disk.

### Used

Shows how much of the hard disk's space is currently allocated to partitions.

### Free

Shows how much of the hard disk's space is still unallocated.

### Bar Graph

Presents a visual representation of the space currently used on the hard disk. The more pound signs there are between the square braces, the less free space there is. In Figure 9–14, *Disk Druid Main Screen*, the bar graph shows no free space.

---

#### Please Note

The Drive Summaries section is displayed only to indicate your computer's disk configuration. It is not meant to be used as a means of specifying the target hard drive for a given partition. This is described more completely in Section 9.10.5, *Adding a Partition*.

---

### 9.10.3 Disk Druid's Buttons

These buttons control Disk Druid's actions. They are used to add and delete partitions, and to change partition attributes. In addition, there are buttons that are used to accept the changes you've made, or to exit Disk Druid entirely. Let's take a look at each button in order.

**Add**

Request a new partition. Selecting this button causes a dialog box to appear containing fields that must be filled in.

**Edit**

Modify the mount point of the partition currently highlighted in the Current Disk Partitions section. Selecting this button will cause a dialog box to appear allowing you to change the name of the mount point.

**Delete**

Delete the partition currently highlighted in the Current Disk Partitions section. Selecting this button will cause a dialog box to appear asking you to confirm the deletion.

**Ok**

Confirm that changes made to your system's partitions to be written to disk. You will be asked to confirm the changes before Disk Druid rewrites your hard disk partition table(s). In addition, any mount points you've defined are passed to the installation program, and will eventually be used by your Red Hat Linux system to define the filesystem layout.

**Back**

Abort without saving any changes you've made. When this button is selected, the installation program will take you back to the previous screen, so you can start over.

---

### 9.10.4 Handy Function Keys

Use the [F5] (Reset) function key to discard all changes you may have made while in Disk Druid, and return the list of partitions to those read from the partition table(s) on your hard disk(s). When selected, you'll be asked to confirm whether you want to discard the changes. Note that any mount points you've specified will be lost, and will need to be reentered.

---

#### Please Note

You will need to dedicate at least one partition to Red Hat Linux, and optionally more. This is discussed more completely in Section C.1.8, *How Many Partitions?*.

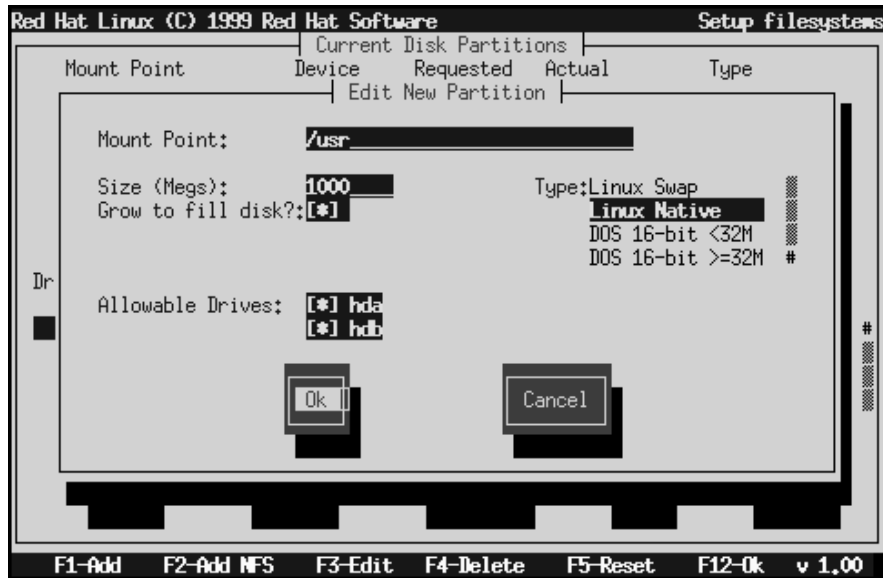
---

### 9.10.5 Adding a Partition

To add a new partition, select the **Add** button and press [Space] or [Enter]. The Edit New Partition dialog (Figure 9–15, *Creating a New Partition*) appears.

---

Figure 9–15 Creating a New Partition



The screen contains the following fields:

- **Mount Point** -- Highlight this field and enter the partition's mount point. For example, if this partition should be the root partition, enter /; enter /usr for the /usr partition, and so on.
- **Size (Megs)** -- In this field, enter the size (in megabytes) of the partition. Note that this field starts with a "1" in it, meaning that unless you change it, you'll end up with a 1 MB partition. Delete it using the [Backspace] key, and enter the desired partition size.
- **Grow to fill disk?** -- This check box indicates whether the size you entered in the previous field is to be considered the partition's exact size, or its minimum size. Press [Space] to check and uncheck the box. When checked, the partition will grow to fill all available space on the hard disk. In this case, the partition's size will expand and contract as other partitions are modified. If you make more than

one partition growable, the partitions will compete for the available free space on the disk.

- **Type** -- This field contains a list of different partition types. Select the appropriate partition type by using the [uparrow] and [downarrow] keys.
- **Allowable Drives** -- This field contains a list of the hard disks installed on your system, with a check box for each. If a hard disk's box is checked, then this partition may 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 check box settings, you can direct Disk Druid to place partitions as you see fit, or let Disk Druid decide where partitions should go.
- **Ok** -- Select this button and press [Space] when you are satisfied with the partition's settings, and wish to create it.
- **Cancel** -- Select this button and press [Space] when you don't want to create the partition.

### 9.10.6 Problems When Adding a Partition

---

#### Please Note

If you are having problems adding a partition, you may want to reference Appendix C, *An Introduction to Disk Partitions* to get more information.

---

If you attempt to add a partition and Disk Druid can't carry out your request, you'll see a dialog box like Figure 9-16, *Unallocated Partition Warning*. In the box are listed any partitions that are currently unallocated, along with the reason they could not be allocated. Select the **Ok** button, and press [Space] to continue. Note that the unallocated partition(s) are also displayed on Disk Druid's main screen (though you may have to scroll the "Current Disk Partitions" section to see them).

**Figure 9–16 Unallocated Partition Warning**

### 9.10.7 Deleting a Partition

To delete a partition, highlight the partition in the "Current Disk Partitions" section, select the **Delete** button, and press [Space]. You will be asked to confirm the deletion.

### 9.10.8 Editing a Partition

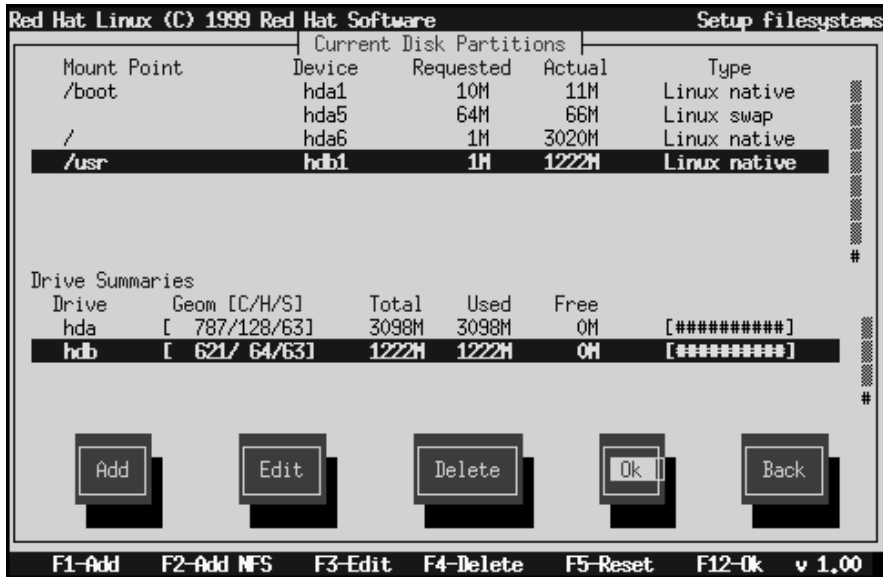
To change a partition's mount point, highlight the partition in the "Current Disk Partitions" section, select the **Edit** button, and press [Space]. The Edit Partition dialog is similar to the one shown in Figure 9–15, *Creating a New Partition*. The difference here is that all fields except the mount point are read-only. To modify any other value, delete the partition and add it again with the new values.

### 9.10.9 When You're Finished...

Once you've finished configuring partitions and entering mount points, your screen should look something like Figure 9–17, *Partitions and Mount Points Defined*. Select **Ok**, and press [Space].



Figure 9–17 Partitions and Mount Points Defined



### 9.10.10 Formatting Partitions

Use Figure 9–18, *Formatting Partitions* to select for formatting all newly-created partitions and other partitions that contain old data (assuming they don't contain data you wish to keep.)



Do not select partitions such as `/home` or `/usr/local` if they contain data you wish to keep.

Select each partition to format and press [Space]. If you wish to check for bad blocks while formatting each filesystem (recommended), select **Check for bad blocks during format**. Select **Ok**, and press [Space].

Figure 9–18 Formatting Partitions



### 9.10.11 Using `fdisk`

This section applies only if you're doing an expert install. It explains how to partition your disk with `fdisk`. Once you've selected `fdisk`, you'll be presented with the Partition Disks dialog box (Figure 9–19, *Selecting a Disk for Partitioning*). In this box is a list of every disk on your computer. Move the highlight to the disk you'd like to partition, select **Edit**, and press [Space]. You will then enter `fdisk` and can partition the disk you selected. Repeat this process for each disk you want to partition. When you're done, select "Done."

Figure 9–19 Selecting a Disk for Partitioning



## An Overview of `fdisk`

`fdisk` includes online help which is terse but useful. Here are a few tips:

- The command for help is `m`.
- To list the current partition table, use the `p` command (see Figure 9–20, *Sample Output From `fdisk`*).
- To add a new partition, use `n`.
- Linux `fdisk` creates partitions of type **Linux native** by default. When you create a swap partition, don't forget to change it to type **Linux swap** using the `t` command. The value for the **Linux swap** type is 82. For other partition types, use the `l` command to see a list of partition types and values.
- Linux allows up to four (4) partitions on one disk. If you wish to create more than that, one (and only one) of the four may be an **extended** partition, which acts as a container for one or more **logical** partitions. Since it acts as a container,

the extended partition must be at least as large as the total size of all the logical partitions it is to contain.

- It's a good idea to write down which partitions (e.g., `/dev/hda2`) are meant for which filesystems (e.g., `/usr`) as you create each one.

---

### Please Note

None of the changes you make take effect until you save them and exit `fdisk` using the `w` command. You may quit `fdisk` at any time without saving changes by using the `q` command.

---

**Figure 9–20** Sample Output From `fdisk`

```

This is the fdisk program for partitioning your drive. It is running
on /dev/hda.

Command (m for help): p

Disk /tmp/hda: 128 heads, 63 sectors, 620 cylinders
Units = cylinders of 8064 * 512 bytes

   Device Boot   Begin    Start    End  Blocks  Id System
/tmp/hda1        1         1      21   84640+  83 Linux native
/tmp/hda2        22        22     148  512064  83 Linux native
/tmp/hda3        149       149     620 1903104   5 Extended
/tmp/hda5        149       149     275  512032+  83 Linux native
/tmp/hda6        276       276     402  512032+  83 Linux native
/tmp/hda7        403       403     419   68512+  82 Linux swap
/tmp/hda8        420       420     620  810400+  83 Linux native

Command (m for help): █

```

## Changing the Partition Table

When you are finished partitioning your disks, press **Done**; you may see a message indicating that the installation program needs to reboot. This is a normal occurrence

---

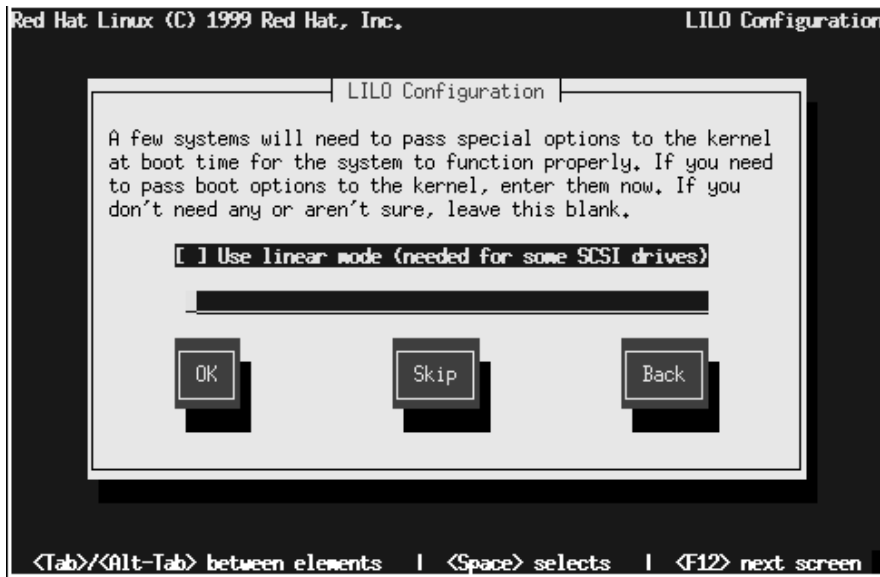
after changing a disk's partition data; it usually happens if you created, changed or deleted any extended partitions. After you press **Ok**, your machine will reboot. Follow the same installation steps you did up until the "Partition Disks" dialog; then simply choose **Done**.

## 9.11 Installing LILO

The *Linux LO*ader (LILO) lets you specify at boot time whether to start Linux or another operating system. (If you are performing a Workstation or Server installation, LILO is configured automatically in the Master Boot Record.) If you're doing a Custom installation, at this point the LILO Installation dialogs let you indicate how or whether to install LILO.

The first LILO dialog (Figure 9–21, *LILO options*) lets you add default options to the LILO boot command. Any options you enter will be passed to the Linux kernel at boot time.

**Figure 9–21** LILO options



In Section 8.1.1, *Basic Hardware Configuration*, you were asked to review your computer's BIOS settings. If you determined that your computer accesses a hard drive in LBA mode, check **Use linear mode**. Select **Ok** and press [Space] to continue.

The next LILO dialog (Figure 9–22, *Installing LILO*) lets you indicate how or whether to install LILO.

**Figure 9–22** Installing LILO



You may install LILO in one of two places:

### The Master Boot Record (MBR)

This is the recommended place to install LILO, unless the MBR already starts another operating system loader, such as System Commander or OS/2's Boot Manager. The master boot record is a special area on your hard drive that is automatically loaded by your computer's BIOS, and is the earliest point at which LILO can take control of the boot process. If you install LILO in the MBR, when your machine boots, LILO will present a `boot :` prompt; you can then boot Red Hat Linux or any other operating system you configure LILO to

boot (see below). Do not choose MBR if Linux is sharing a disk with Windows NT: if you do, you will be unable to boot NT.

### The first sector of your root partition

This is recommended if you are already using another boot loader on your system (such as OS/2's Boot Manager). In this case, your other boot loader will take control first. You can then configure that boot loader to start LILO (which will then boot Red Hat Linux).

Select the location where you wish to install LILO and press **Ok**. If you do not wish to install LILO, press **Skip**.

---

**WARNING**

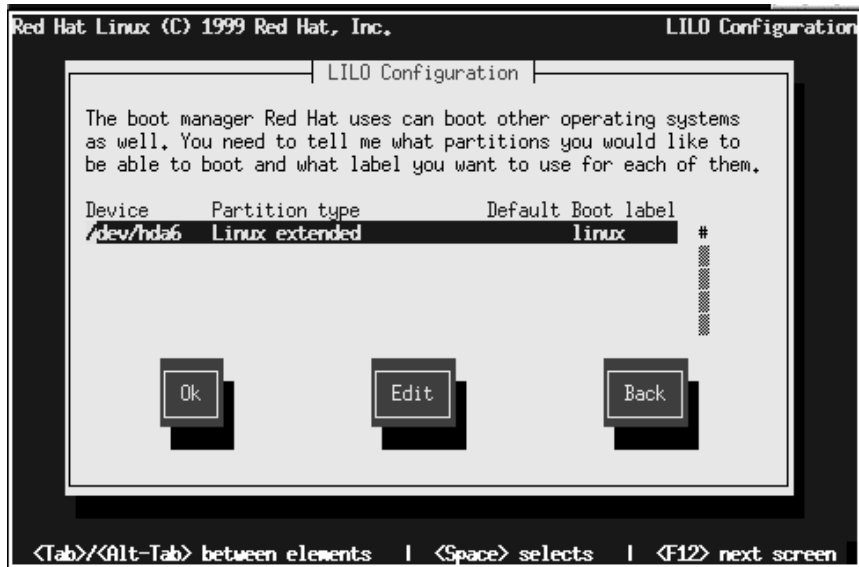
**If you choose Skip, you will not be able to boot your Red Hat Linux system directly, and will need to use another boot method (such as a boot diskette). Use this option only if you are sure you have another way of booting your Red Hat Linux system!**

---

Finally (Figure 9–23, *Selecting Bootable Partitions*), the install program lets you set the default operating system and specify boot labels.

---

Figure 9–23 Selecting Bootable Partitions



Every partition that may be bootable is listed, including partitions used by other operating systems. The "Boot label" column will be filled in with the word `linux` on the partition holding your Red Hat Linux system's root filesystem. Other partitions may also have boot labels.

To add a boot label for a partition (or change an existing boot label), use the arrow keys to highlight the desired partition. Then use the [Tab] key to select the **Edit** button, and press [Space]. You'll then see a small dialog box permitting you to enter/modify the partition's boot label. Press **Ok** when done.



---

**Please Note**

The contents of the "Boot label" column will be what you will need to enter at LILO's `boot :` prompt in order to boot the desired operating system. Should you forget the boot labels defined on your system, press `[tab]` at LILO's `boot :` prompt to display a list of defined boot labels.

---

There is also a column labeled "Default." Only one partition will contain an asterisk under that column. The partition marked as the default will be the partition LILO will boot if there is no user input during the boot process. Initially the root partition for your Red Hat Linux installation will be selected as the default. If you'd like to change this, use the arrow keys to highlight the partition you'd like to make the default, and press `[F2]`. The asterisk should move to the selected partition. When you've finished, select **OK**, and press `[Space]`.

### 9.11.1 SMP Motherboards and LILO

If the installer detects a symmetric multi-processor motherboard on your system, it will automatically create two `lilo.conf` entries: `linux`, the default, boots the system in SMP mode and `linux-up` boots the system in uni-processor mode.

### 9.11.2 Alternatives to LILO

If you do not wish to use LILO to boot your Red Hat Linux system, there are a few alternatives:

#### Boot Diskette

You can use the boot diskette created by the installation program (if you elected to create one).

#### LOADLIN

LOADLIN can load Linux from MS-DOS; unfortunately, it requires a copy of the Linux kernel (and an initial RAM disk, if you have a SCSI adapter) to be available on an MS-DOS partition. The only way to accomplish this is to

---

boot your Red Hat Linux system using some other method (e.g., from LILO on a diskette) and then copy the kernel to an MS-DOS partition. LOADLIN is available from <ftp://metalab.unc.edu/pub/Linux/system/boot/dualboot/> and associated mirror sites.

## **SYSLINUX**

SYSLINUX is an MS-DOS program very similar to LOADLIN; it is also available from <ftp://metalab.unc.edu/pub/Linux/system/boot/loaders/> and associated mirror sites.

## **Commercial Bootloaders**

Some commercial bootloaders (such as System Commander) are able to boot Linux. However, these products still require LILO to be installed in your Linux root partition).

## **9.12 Naming Your Computer**

Figure 9–24, *Hostname Configuration Dialog* prompts you to enter a name for your computer (called a **hostname** in TCP/IP parlance).

Figure 9–24 Hostname Configuration Dialog



If you have a network card in your computer, enter a **fully-qualified domain name** of this format:

*hostname.domain.name*

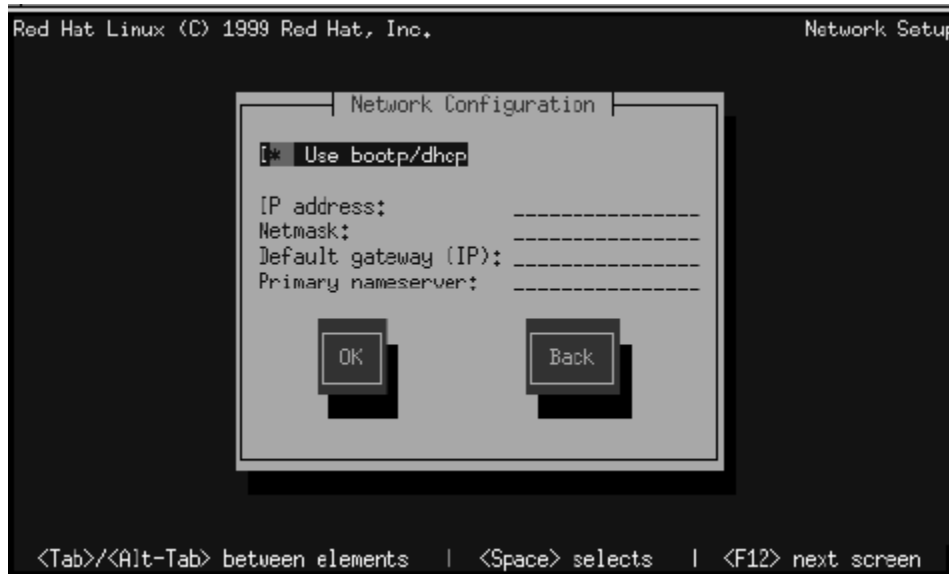
where *hostname* is the name you've chosen for your computer and *domain.name* is the TCP/IP domain. (A domain name may contain more nodes: for example, *eastcoast.redhat.com* and *westcoast.redhat.com*).

## 9.13 Configuring a Network Connection

If you are installing over the network, configure your network connection as explained in this section and then return to Section 9.7, *Installing over a Network*.

Figure 9–25, *Configure TCP/IP Dialog* appears only if your computer has a network card. (If there is more than one network card, this dialog configures the primary card.)

Figure 9–25 Configure TCP/IP Dialog



You have two choices:

- Select **Use bootp/dhcp**. In this case, an existing server on your LAN dynamically supplies network-related information needed to add this system to the network at connect-time. (Note that if you do this, the remaining fields in this dialog will be disabled, as DHCP and BOOTP in essence "fill in the blanks" for you.)
- Enter static network information in the fields provided. In this case, the network information you supply is assigned permanently to this computer.

Table 9–1, *Sample Static Network Information* shows *sample* information. Obtain the actual information from your network administrator.

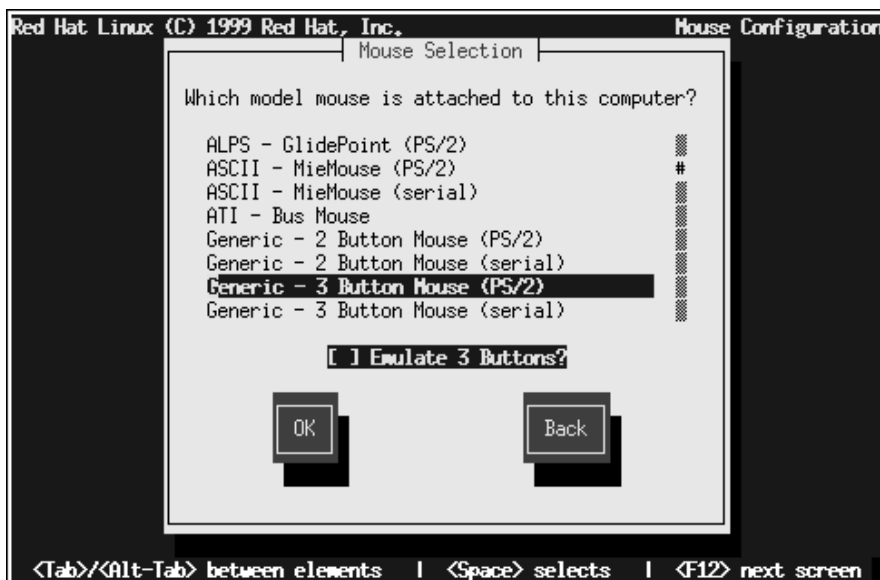
Table 9–1 Sample Static Network Information

| Field                | Example Value |
|----------------------|---------------|
| IP Address           | 192.168.0.40  |
| Netmask              | 255.255.255.0 |
| Default gateway (IP) | 192.168.0.254 |
| Primary nameserver   | 192.168.0.1   |

## 9.14 Configuring Your Mouse

The install program then probes your system for a mouse and Figure 9–26, *Mouse Configuration* appears with the mouse it thinks you have highlighted. Use the [uparrow] and [downarrow] keys to confirm or change the selection as required.

Figure 9–26 Mouse Configuration



If no mouse is detected, you'll have to indicate the type of mouse on your system. Follow these guidelines:

- If you find an *exact* match for your mouse in the list, highlight that entry.
- If you find a mouse that you are *certain*<sup>1</sup> is compatible with your mouse, highlight that entry.
- Otherwise, select one of the **Generic** entries, based on your mouse's number of buttons, and its interface. To determine your mouse's interface, follow the mouse cable back to where it plugs into your system. If the connector at the end of the mouse cable plugs into a rectangular connector, you have a serial mouse. On the other hand, if the connector is round, you have a PS/2 mouse. If you are installing Red Hat Linux on a laptop computer, in most cases the pointing device will be PS/2 compatible.

The **Emulate 3 Buttons** check box allows you to emulate a three-button mouse with one that has only two buttons. If you select this check box, you can simulate the third, "middle" button by pressing both mouse buttons simultaneously. If you have a two-button mouse, checking this box is almost always a good idea, as the graphical user interface makes heavy use of all three mouse buttons.

If you've selected a mouse with a serial interface, Figure 9–27, *Serial Mouse Port Selection*) appears. Highlight the appropriate serial port, select **Ok**, and press [Space].

<sup>1</sup> No guessing allowed!

---

Figure 9–27 Serial Mouse Port Selection



To change your mouse configuration after you have booted your Red Hat Linux system, use the `/usr/sbin/mouseconfig` command.

---

To configure your mouse as a left-handed mouse after you have booted your Red Hat Linux system, open a terminal and type `gpm -B 321`.

---

## 9.15 Configuring the Time Zone

Figure 9–28, *Configuring Time Zones* allows you to enter your system's time zone.

Figure 9–28 Configuring Time Zones



If you wish to set the hardware (CMOS) clock to GMT (Greenwich Mean Time, also known as UTC, or Universal Coordinated Time), select **Hardware clock set to GMT**. Setting it to GMT means your system will properly handle daylight-saving time, if your time zone uses it.

---

**WARNING**

**If your computer runs another operating system from time to time, setting the clock to GMT may cause the other operating system to display the incorrect time. Also keep in mind that if more than one operating system is allowed to automatically change the time to compensate for daylight-saving time, it is likely that the time will be improperly set.**

---



Select the time zone your system will be operating in from the list, and press [Enter].

To change your time zone configuration after you have booted your Red Hat Linux system, use the `/usr/sbin/timeconfig` command.

## 9.16 Setting a Root Password

Figure 9–29, *Root Password* prompts you to set a **root password** for your system. You'll use the root password to log into your Red Hat Linux system to perform system administration functions.

**Figure 9–29** 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 poor 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. Write down this password and keep it in a secure place.

## 9.17 Creating a Login Account

Figure 9–30, *Creating a Login Account* gives you the opportunity to create a login account for yourself. If you do not do this, after installation you'll have to log in as the **root** user (also known as the **superuser**). Because this special account has complete access to the entire system, logging in as the root user is best done *only* to perform system maintenance or administration. For instruction on how to create or modify user accounts after installation, either see Chapter 3, *System Configuration* or the *Welcome to Linux* chapter in the *Official Red Hat Linux Getting Started Guide*.

**Figure 9–30** Creating a Login Account



If you choose to create a user account, the account directory will be created under the path /home (for example, /home/p.smith). Passwords are case-sensitive and must contain at least six characters.

After you add a user account for yourself, the "User Account Setup" dialog (Figure 9–31, *Creating Additional Login Accounts*) appears, giving you the opportunity to create additional accounts. Select **Add** to do so or **Ok** to continue.

**Figure 9–31 Creating Additional Login Accounts**



If you're doing a Workstation or Server installation, you'll next confirm or select your video card: go to Section 9.20, *Configuring your Video Adapter*.

## 9.18 Authentication Configuration

If you're doing a custom install and your system has a network card, Figure 9–32, *Authentication Configuration* lets you configure the type of password authentication your Red Hat Linux system will use. You will also have the opportunity to configure NIS support; If you are unsure as to whether or not you should do this, ask your network administrator.

Figure 9–32 Authentication Configuration



Here's a brief explanation of the authentication password prompts:

- **Use Shadow Passwords** -- provides a very secure method of retaining passwords for you. The `/etc/passwd` file is replaced by `/etc/shadow` which is only readable by root.
- **Enable MD5 Passwords** -- allows a long password to be used (up to 256 characters) instead of the standard eight letters or less.
- **Enable NIS** -- allows you to run a group of computers in the same Network Information Service domain with a common password and group file. There are two options here to choose from:
  - **NIS Domain** -- this option allows you to specify which domain or group of computers your system will belong to.

- **NIS Server** -- this option causes your computer to use a specific NIS server, rather than "broadcasting" a message to the local area network asking for any available server to host your system.

---

**Please Note**

To configure the NIS option, you must be connected to an NIS network. If you are unsure whether or not you are connected to an NIS network, please ask your network administrator.

---

Unless you are setting up NIS, you will notice that both shadow passwords and MD5 passwords are selected. We recommend you use both to make your machine as secure as possible.

## 9.19 Select Packages to Install

Figure 9–33, *Selecting System Components* appears only if you're doing a Custom install. Use this dialog to select the types of software packages you wish to install.

Figure 9–33 Selecting System Components



In other words, you use this dialog to select **components**. For example, if you use the arrow keys to move to **Dialup Workstation** and press [Space], software components needed to support dialup networking are selected for installation. Selecting **Everything** (which can be found at the end of the component list) installs all packages included with Red Hat Linux. Selecting every package will require close to 1.5GB of free disk space.

### 9.19.1 Selecting Individual Packages

You can also select or deselect individual packages in an application category. To do this, check the **Select individual packages** check box. When you select **Ok**, a screen like Figure 9–34, *Selecting Individual Packages* appears.

Figure 9–34 Selecting Individual Packages



For example, to see the list of packages in the **Applications/Editors** category, use the arrow keys to select this group and press [Enter] or [Space]. When you do, the "+" sign (closed) changes to a "-" sign (open) and a list of packages in this category appears (Figure 9–35, *Selecting Packages -- Expanded View*). An "\*" appears beside currently selected packages and a " " beside unselected packages. Press the [Enter] or [Space] keys to select or deselect packages.

Figure 9–35 Selecting Packages – Expanded View



Note that some packages that are required for every Red Hat Linux system (such as the kernel and certain libraries) do not appear in the package selection dialogs.

For descriptive information about software packages, turn to Appendix A, *Red Hat Linux 6.1 Package List*.

### 9.19.2 Unresolved Package Dependencies

Many software packages, in order to work correctly, require that other software packages are also installed on your system. For example, many of the graphical 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 checks these package **dependencies** each time you install or remove software packages.



Figure 9–36 Unresolved Dependencies



After you have finished selecting packages to install, the installation program checks the list of selected packages for dependencies. 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 9–36, *Unresolved Dependencies*). If you simply press **ok**, the program will resolve them automatically by adding all required packages to the list of selected packages.

## 9.20 Configuring your Video Adapter

The install program then probes for your video card. If your card is detected, a dialog like Figure 9–37, *Video Card Confirmation Dialog* displays its name: click **OK** to continue.

**Figure 9–37 Video Card Confirmation Dialog**

If the install program cannot detect your video adapter, you'll see Figure 9–38, *Video Card Selection Dialog*. In this case, select your video card from the list using the arrow keys and [Space] bar.

Figure 9–38 Video Card Selection Dialog



If you're doing a Workstation or Server installation, the installation program is ready to begin loading software; go to Section 9.22, *Package Installation*.

## 9.21 Creating a Boot Diskette

If you're doing a Custom installation, the Bootdisk dialog (Figure 9–39, *Creating a Boot Diskette*) gives you the opportunity to create a customized boot diskette for your Red Hat Linux system.



Select **Yes** and press [Space] to create a boot diskette. If you do this, you'll be prompted to insert a diskette in the last step of the installation procedure (Section 9.24, *Finishing Up*).

For instructions on how to create a boot diskette after the installation, read the `mk-bootdisk` man page. Be sure you create a new boot diskette if you make any changes to your kernel.

## 9.22 Package Installation

Figure 9–40, *Begin Installation Dialog* appears when the install program is ready to format partitions and load software packages. The dialog names the log file (`/tmp/install.log`) for this Red Hat Linux installation. Select **Ok** and press [Space] to continue.

**Figure 9–40** Begin Installation Dialog



While software packages are loading, a screen like Figure 9–41, *Installation Status Display* appears.

Figure 9-41 Installation Status Display



As each software package starts to load, the top part of the Package Installation screen displays its name, size, and a summary description of its function.

In the bottom part of the Package installation screen, the Total row shows the total number of packages to be loaded, the total size of all packages, and the amount of time required to load all packages. As each package begins and completes loading, the Completed and Remaining rows are updated.

If you're doing a Server installation, this is the last step; go to Section 9.24, *Finishing Up*.

## 9.23 Configuring the X Window System

If you're doing a Workstation installation, or if you're doing a Custom installation and you have chosen to install the X Window System, the Xconfigurator utility starts and gives you the opportunity to configure the X server for your system. If

you're doing a Server installation or you did not choose to install the X Window System, skip ahead to Section 9.24, *Finishing Up*.

First, `Xconfigurator` presents a list of monitors (Figure 9–42, *Select Monitor Dialog*). If your monitor is listed, select it and press [Enter]. Otherwise, select **Custom**.

**Figure 9–42 Select Monitor Dialog**



If you select **Custom**, `Xconfigurator` prompts you to select the horizontal sync range and vertical sync range of your monitor (these values are generally available in the documentation which accompanies your monitor, or from your monitor's vendor or manufacturer).



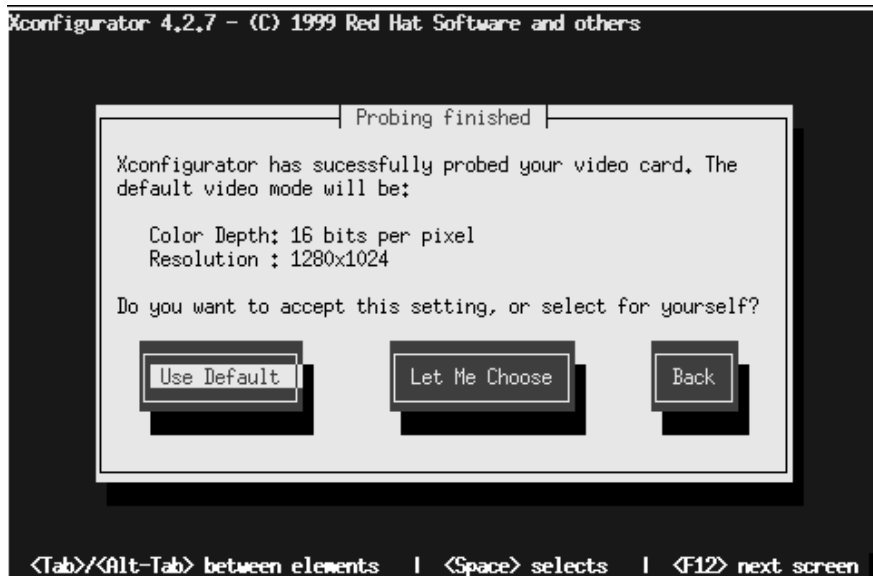
Do not select any range that exceeds the capacity of your monitor. If you do this, it is possible you may overclock your monitor and damage or destroy it.

---

After you've selected your monitor, the program starts to probe your video card. To bypass the probe and enter scan ranges and display modes manually, select **Do Not Probe**. This option is provided because an unsuccessful probe of your video card could cause your system not to boot properly or a program hang. If you select **Probe** ranges and display modes manually. While the probe is in progress, it is normal for your display to blink.

When the probe is finished, Figure 9–43, *Probe Dialog* appears, displaying the results of the probe.

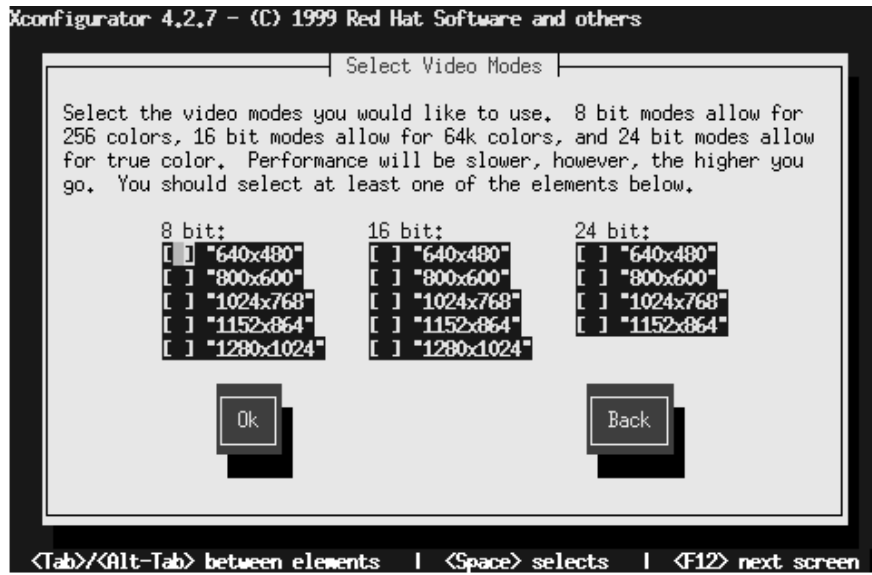
**Figure 9–43 Probe Dialog**



Select **Use Default** to accept the displayed color depth and resolution. If you select **Let Me Choose**, the Select Video Modes dialog (Figure 9–44, *Select Video Mode Dialog*) displays the video modes supported by your monitor.



Figure 9–44 Select Video Mode Dialog



Do not select a mode that exceeds the capacity of your monitor. Once you've either selected the default video mode or specified a different mode, the Starting X dialog (Figure 9–45, *Test Your X Configuration*) lets you test your X configuration.

**Figure 9–45 Test Your X Configuration**

If you select **Ok**, you'll have the opportunity to go back enter different configuration values should there be an error. If no error is detected, X will start, and a small display window will ask you if you can read it clearly: using the mouse, click **Yes** within ten seconds. Then you are asked whether you wish for X to be started when the system boots.

In most cases, X configuration is complete at this point, and you'll see the completion screen.

To modify your X configuration after installation, issue the `Xconfigurator` command.

### 9.23.1 If Your Video Card Was Not Detected...

Earlier, in Section 9.20, *Configuring your Video Adapter*, your system was probed for a video card. If none was detected, you were asked to select your card. If your card was not listed and you selected **Custom**, you are now asked for additional information about your video card:

- The amount of video memory installed on your video card. If you are not sure, consult the documentation accompanying your video card. Choosing more memory than is present in your card will not damage it, but may cause the XFree86 server to start incorrectly.
- If your video card supports a video clockchip, whether or not it has one. The recommended choice is **No Clockchip Setting**, since XFree86 can automatically detect the proper clockchip in most cases.
- The preferred display mode (see Figure 9–44, *Select Video Mode Dialog*. Select one or more modes by pressing [Space].

Xconfigurator then saves all of your choices to the configuration file `/etc/X11/XF86Config`. To modify your X configuration after installation, issue the `Xconfigurator` command.

## 9.24 Finishing Up

If you are doing a Custom installation, in Section 9.21, *Creating a Boot Diskette*, you may have chosen to make a boot diskette. If you did, you'll now be prompted to insert a blank, suitably labeled diskette.

When the installation is finished, the install program displays the completion dialog (Figure 9–46, *Ready for Reboot*) telling you to reboot your computer. Don't forget to remove any diskette from the diskette drive (unless you decided to skip the standard LILO installation, in which case you'll need to use the boot diskette created during the installation), or the Red Hat Linux CD if your system is able to boot from the CD-ROM.

Figure 9-46 Ready for Reboot



Select **Ok** to start your newly installed system. After your computer's normal power-up sequence has completed, you should see LILO's standard prompt, which is `boot :`. At the `boot :` prompt, you can do any of the following things:

- Press [Enter] -- Causes LILO's default boot entry (as defined by the dialog box shown in Figure 9-23, *Selecting Bootable Partitions*) to be booted.
- Enter a Boot Label, followed by [Enter] -- Causes LILO to boot the operating system corresponding to the entered boot label.
- Wait -- After LILO's timeout period, (which, by default, is five seconds) LILO will automatically boot the default boot entry.

Do whatever is appropriate to boot Red Hat Linux. You should see one or more screens of messages scroll by. Eventually, you should see either a graphical login box, or a `login :` prompt.

Congratulations! Your Red Hat Linux installation is complete!

## 10 Kickstart Installations

Due to the need for automated installation, Red Hat has created the kickstart installation method. With this method, a system administrator can create a single file containing the answers to all the questions that would normally be asked during a typical Red Hat Linux installation. The kickstart installation method is powerful enough that often a single kickstart file can be used to install Red Hat Linux on multiple machines.

---

### Please Note

Kickstart installations can only be performed using the CD-ROM and NFS installation methods. FTP, HTTP, SMB, or local hard disk installations cannot be automated using kickstart mode.

---

### 10.1 Where to Put A Kickstart File

To use kickstart mode, you must first create a kickstart file, and make it available to the Red Hat Linux installation program. Normally this is done by copying the kickstart file to the boot disk, or making it available on the network. The network-based approach is most commonly used, as most kickstart installations tend to be performed on networked computers. This also makes it easier to install Red Hat Linux on many computers, as the kickstart files can be kept on single server system, and read by the individual computers during the installation.

Let's take a more in-depth look at the locations where the kickstart file may be placed.

#### 10.1.1 On Diskette

To perform a diskette-based kickstart installation, the kickstart file must be named `ks.cfg`, and reside in the boot disk's top-level directory. Note that the Red Hat Linux boot disks are in MS-DOS format, making it easy to copy the kickstart file under Linux using the `mcopy` command (or, if you insist, you can also use Windows). Although there's no technological requirement for it, most diskette-based kickstart installations install Red Hat Linux from CD-ROM.

---

## 10.1.2 On the Network

Network installations using kickstart are quite common, because system administrators can easily automate the installation of many networked computers quickly and painlessly. In general, the approach most commonly used is for the administrator to have both a BOOTP/DHCP server and an NFS server on the local network. The BOOTP/DHCP server is used to give the client system its networking information, while the NFS server serves the actual files used during the installation. Often these two servers run on the same physical machine, but there is no requirement for this.

To do a network-based kickstart installation, you must have a BOOTP/DHCP server on your network, and it must include configuration information for the machine you are attempting to install. The BOOTP/DHCP server will be used to give the client its networking information as well as the location of the kickstart file.

If a kickstart file is specified by the BOOTP/DHCP server, the client system will attempt an NFS mount of the file's path, and will copy the specified file to the client, using it as the kickstart file. The exact settings required vary depending on the BOOTP/DHCP server you use.

Here's an example for the DHCP server shipped with Red Hat Linux:

```
filename "/usr/new-machine/kickstart/";  
next-server blarg.redhat.com;
```

Note that you should use `filename` for the kickstart file's name (or the directory in which the kickstart file resides) and `next-server` to set the NFS server name.

If the filename returned by the BOOTP/DHCP server ends with a slash ("/"), then it is interpreted as a path only. In this case, the client system mounts that path using NFS, and searches for a specially-named file. The filename the client searches for is:

```
<ip-addr>-kickstart
```

The `<ip-addr>` section of the filename should be replaced with the client's IP address in dotted decimal notation. For example, the filename for a computer with an IP address of 10.10.0.1 would be `10.10.0.1-kickstart`.

---

Note that if you don't specify a server name, then the client system will attempt to use the server that answered the BOOTP/DHCP request as its NFS server. If you don't specify a path or filename, the client system will try to mount `/kickstart` from the BOOTP/DHCP server, and will try to find the kickstart file using the same `<ip-addr>-kickstart` filename as described above.

## 10.2 Starting a Kickstart Installation

To begin a kickstart installation, you must boot the system from a Red Hat Linux boot disk, and enter a special boot command at the boot prompt. If the kickstart file resides on the boot disk, the proper boot command would be:

```
boot: linux ks=floppy
```

If, on the other hand, the kickstart file resides on a server, the appropriate boot command would be:

```
boot: linux ks
```

## 10.3 The Kickstart File

Now that you have some background information on kickstart installations, let's take a look at the kickstart file itself. The kickstart file is a simple text file, containing a list of items, each identified by a keyword. You can create it by editing a copy of the `README.ks` file found in the `docs/` directory of a Red Hat Linux CD-ROM, or you can create it from scratch. You should be able to edit it with any text editor or word processor that can save files as ASCII text.

First, some ground rules to keep in mind while creating your kickstart file:

- Items must be specified *in order*. It is not a good idea to try to change the order of the required items.
- Items that aren't required can be omitted.
- For kickstart *upgrades*, the following items are required:
  - language

- installation method
- device specification
- keyboard setup
- the `upgrade` keyword
- LILO configuration

If any other items are specified for an upgrade, those items will be ignored (note that this includes package selection).

- Omitting any required item will result in the installation process prompting the user for an answer to that question, just as during a normal installation. If this happens, once the answer is given the installation will continue unattended (unless it comes across another missing item).
- Lines starting with a pound sign ("`#`") are treated as comments, and are ignored.

Let's take a look at each item in order.

### 10.3.1 `lang` – Language Setting

The first item that must appear is the language setting. The language you specify will be used during the installation as well as to configure any language-specific aspect of the installed system. The language specification must be a two letter ISO language code, such as `en` for English, `de` for German, `fr` for French, and so on. For example, to set the language to English, the kickstart file should contain the following line:

```
lang en
```

### 10.3.2 `network` – Networking Configuration

The next item is the network configuration information. This line is used to tell the system how it should configure networking for itself. It is optional, and if omitted, the system will be configured for stand-alone operation.

There are three different methods of network configuration:

- DHCP
-



- BOOTP
- static

The DHCP method uses a DHCP server system to obtain its networking configuration. As you might guess, the BOOTP method is similar, requiring a BOOTP server to supply the networking configuration.

The static method requires that you enter all the required networking information in the kickstart file. As the name implies, this information is static, and will be used during the installation, and after the installation as well.

To direct a system to use DHCP to obtain its networking configuration, use the following line:

```
network --bootproto dhcp
```

To direct a machine to use BOOTP to obtain its networking configuration, use the following line in the kickstart file:

```
network --bootproto bootp
```

The line for static networking is more complex, as you must include all network configuration information on one line. You'll need to specify:

- IP address
- netmask
- gateway IP address
- nameserver IP address

Here's an example static line:

```
network --bootproto static  
--ip 10.0.2.15  
--netmask 255.255.255.0  
--gateway 10.0.2.254  
--nameserver 10.0.2.1
```

---

---

**Please Note**

The entire network configuration *must* appear on one line! We've wrapped it here to make it easier to read.

---

There are two restrictions you must keep in mind should you use the static method:

- All static networking configuration information must be specified on *one* line; you cannot wrap lines using a backslash, for example.
- You can only specify one nameserver here. However, you can use the kickstart file's `%post` section (described in Section 10.3.22, *%post -- Post-Installation Configuration Section*) to add more nameservers, if needed.

### 10.3.3 Installation Methods

The next required item is the installation method. This item directs the installation program for the rest of the files required to install Red Hat Linux. There are two choices: NFS or CD-ROM. Let's look at both, starting with NFS.

#### 10.3.4 `nfs` – The NFS Installation Method

For the NFS installation method, you must include the NFS server's name and the directory to be mounted. Here's an example:

```
nfs --server hostname.of.server --dir /path/to/RH/CD/image
```

#### 10.3.5 `cdrom` – The CD-ROM Installation Method

For a CD-ROM-based kickstart installation, simply use the following line:

```
cdrom
```

#### 10.3.6 `device` – Optional Hardware Information

The next set of items in the kickstart file is used to specify optional hardware information. For most PCI-based hardware you can omit this step, as this information can

---

be obtained directly from the hardware. Note that IDE hard disks and common PCI cards fall into this category. Any other hardware may need to be specified here.

To specify a device, start with the `device` keyword, followed by the type of device:

- `ethernet` (for Ethernet cards)
- `scsi` (for SCSI cards)
- `cdrom` (for non-SCSI, non-IDE CD-ROM drives; usually sound cards with proprietary CD-ROM interfaces)

If a kernel module is required to support the device, the module name follows the device type.

Finally, if there are any parameters that are required by a device, they can be specified using the `--opts` option. Enclose the parameters in quotes after `--opts`. We'll show you some examples below.

Note that you can specify more than one type of device in a given kickstart file. For example, if you know the machines you'll be kickstart-installing have either an Adaptec 1542 or a Buslogic SCSI card, you can enter both in the kickstart file. But be aware that the installation program uses only the first card found, so order the device entries appropriately.

An example for an ISA 3Com Ethernet card would be:

```
device ethernet 3c509 --opts "io=0x330, irq=7"
```

Here's an example line for an Adaptec 1542 SCSI card:

```
device scsi aha154x
```

An example of a SoundBlaster CD-ROM might look like this:

```
device cdrom --opts "io=0x240"
```

### 10.3.7 keyboard – Keyboard Type

The next item you'll need to specify is the correct code for your keyboard type. For US keyboards, the type is `us`. For the others, please run the `/usr/sbin/kbdconfig` program on an already-installed Red Hat Linux system. (An alternative approach would be to set the keyboard type to `us` and run `kbdconfig` on the installed system to set it properly after the installation completes.)

An example of this would be:

```
keyboard us
```

### 10.3.8 noprobe

If you do not want your system device controllers to be automatically probed then you can issue the command:

```
noprobe
```

If you configure this command, your system will not probe for any device controllers, SCSI or otherwise. Use this command only if you want to manually specify the devices that are on your system.

---

#### Please Note

You will not be prompted to enter devices at any point. You will have to manually enter them into the kickstart configuration file or else you will not be able to continue with the installation.

---

### 10.3.9 device --continue

Your system is normally set up to take or find one device of a type. Without changes, the kickstart configuration will load the modules for one type of device, such as loading the module for one SCSI adapter type. Beyond that, the program will not load further modules for that type of device.

---

In order to load modules for more than one adapter type, (for example, two different SCSI adapters) you will need to add the following command:

```
device --continue
```

So, if you need to have modules for a Adaptec and a BusLogic adapter, then you will need to have both of these specified in the configuration file and you will need to have `--continue` after the first one in the configuration file:

```
device scsi aic7xxx --continue
device scsi BusLogic
```

However, if you have multiple adapters of the same type, then you don't need to use this line, since the single module insertion is enough to control all adapters of that type. For example, if you have three Adaptec adapters, then the following single line:

```
device scsi aic7xxx
```

will load and allow all three adapters to function.

### 10.3.10 Partitioning

The hard drive in the machine must be partitioned before Red Hat Linux can be installed. In this section, we will describe how to specify disk partitioning in the kickstart file.

#### 10.3.11 `zerombr` – Partition table initialization

First, if you are installing Red Hat Linux on a new machine, you should use the `zerombr` keyword to clear the current partition information. This is a good idea, because the partition table on new hard drives is usually bogus. Here's an example of `zerombr` on a new system:

```
zerombr yes
```

On the other hand, if you are installing machines that have a valid partition table, even if you want to change part (or all) of it, you should use `zerombr` this way:

```
zerombr no
```

---

### 10.3.12 `clearpart` – Removing partitions based on partition type

The next command is optional, but can come in handy. If you'd like to remove all partitions, or just any Linux-related partitions, you can use `clearpart`. For example, to clear all partitions of type "Linux native" and "Linux swap," you could add this line:

```
clearpart --linux
```

To clear *all* partitions from a disk, this line would do the trick:

```
clearpart --all
```

The only options `clearpart` supports are `--linux` and `--all`.

### 10.3.13 `part` – Partition definition

The next step is to specify the partitions you want to create. These will only be created using the system's unpartitioned free space. (In other words, if the machine had Windows-related partitions, and you invoked `clearpart --linux`, those Windows partitions would remain untouched.) You must enter one partition per line using the following format:

```
part <mntpt> --size <size in megs> [--grow] [--maxsize  
<size in megs>]
```

(This `part` line may be wrapped to make it more readable; your `part` line must be on one line.)

<mntpt> is the location where you are going to mount that partition in your installed system (for example, the root partition would have a mount point of `/`, while you may decide that another partition should have a mount point of `/home`).

<size in megs> is the size of the partition in megabytes. You can optionally specify that the partition is **growable** by adding the `--grow` option. Note that making a partition growable does *not* mean that you can later increase its size. Instead,

---

a growable partition will be automatically resized to use all available unpartitioned free space (after all fixed-size partitions have been created).

Since the amount of unpartitioned free space can vary, and you probably want to use it all, by tagging partitions as growable you can easily make sure no space is wasted. If you have multiple partitions tagged as growable, the free space is split evenly among them.

Note that you can also limit the size of growable partitions with the optional `--max-size` argument.

Here's an example of kickstart partitioning in action. Let's say you know the smallest disk out of a set of machines you plan to kickstart-install is 1GB. You'd like to use the same kickstart file. You could use the following partitioning scheme:

```
zerombr no
clearpart --all
part / --size 250
part swap --size 50
part /usr --size 500 --grow --maxsize 800
part /tmp --size 100 --grow
```

When defined this way, the installation program will first clear all partitions. It will then set up a 250MB root filesystem, followed by a 50MB swap partition. Next the installation program will create a `/usr` partition of at least 500MB (remember, it's growable), but it cannot grow beyond 800MB. Finally, the last line will create a `/tmp` partition of at least 100MB (again, it's growable).

So for that 1GB system, you would end up with a 250MB root, a 50MB swap, a 550MB `/usr`, and a 150MB `/tmp` partition. If another system has a 2GB drive, you would get a 250MB root, a 50MB swap, a 800MB `/usr`, and a 900MB `/tmp`.

### 10.3.14 `install` and `upgrade` – Install/Upgrade Selection

The next item to specify is whether you are doing a fresh install, or an upgrade of an already-installed system. For a fresh install, use:

```
install
```

For an upgrade of an existing system, use:

---

```
upgrade
```

Keep in mind that for upgrades, the only items that matter are:

- installation media (CD-ROM or NFS)
- device specification (if necessary)
- keyboard setup
- install/upgrade specification (which should be `upgrade`, of course!)
- LILO configuration

### 10.3.15 `mouse` – Mouse Configuration

To define the type of mouse your system has, you must use the `mouse` keyword. Run `mouseconfig --help` on an already-installed Red Hat Linux for a list of mouse types.

Depending on the type of mouse, you may also need to specify the device to which the mouse is attached. The default device is correctly set for bus mice. For serial mice, the default device is `/dev/cua0`, but can be overridden with the `--device` option followed by the device name, such as `cua1`.

### 10.3.16 `timezone` – Timezone Definition

Red Hat Linux is timezone-aware, so you'll need to specify the timezone in which the machine will operate. This is done using the `timezone` keyword. There are *many* different timezones; the best way to find yours is to run `/usr/sbin/timeconfig` on an already-installed Red Hat Linux system.

If you would like to have your system's hardware clock set to use GMT/UTC, add the `--utc` option to your `timezone` line. Here's an example that defines the timezone as US Eastern with the system clock set to GMT:

```
timezone --utc US/Eastern
```

---



### 10.3.17 `xconfig` – X Window Setup

The next item is the X Window setup line. The installation program will normally find common PCI video hardware and will know which X server to install. The keyword for X configuration is `xconfig`.

If your video card isn't autoprobed properly, you can use the `--card` option to explicitly specify the card. You can use `Xconfigurator --help` on a running Red Hat Linux system to get a list of supported cards to choose from.

If your card isn't in the list but *is* supported by one of the existing servers, you can simply install the proper server by using the `--server` option. Again, use `Xconfigurator --help` to get the list of server names.

You also need to specify a monitor type. If you don't, the installation will assume a generic monitor capable of 640x480@60hz. Use the `--monitor` option to specify something other than the default. Again, `Xconfigurator --help` will list all valid monitor types.

If your monitor isn't listed, you can enter the actual monitor specifications by using the `--hsync` and `--vsync` options for horizontal and vertical sync rates, respectively. The rates may be single numbers (representing kilohertz and megahertz, as appropriate), groups of numbers separated by commas, or two numbers separated by a dash (signifying a range). For example:

```
xconfig --hsync "31.5,35.5,50-65" --vsync "50-70"
```

An example for a machine where the video card can be autoprobed properly would be:

```
xconfig --monitor "tattung cm14uhe"
```

An example for a machine where nothing is probed and the monitor isn't in the list might be:

```
xconfig --server "Mach64" --hsync "31.5,35.5,50-65"  
--vsync "50-70"
```

---

### 10.3.18 `rootpw` – Setting the Root Password

You can put the root passwd in a kickstart file in the clear (in which case it would go over the network in the clear on an NFS install) or you can specify that an encrypted password is to be used. To specify an unencrypted password in the kickstart file, use the `rootpw` keyword, followed by the cleartext password:

```
rootpw mypasswd
```

If you would rather use an encrypted password, grab it out of `/etc/passwd` (or wherever you have the encrypted version stored), and add the `--iscrypted` option:

```
rootpw --iscrypted encryptedpasswdstring
```

### 10.3.19 `authconfig` – Setting up Authentication Configuration

After you have set the root password, you have the ability to set up different network password authentications:

- Enable NIS -- allows you to run a group of computers in the same Network Information Service domain with a common password and group file. There are two options here to choose from:
  - NIS Domain -- this option allows you to specify which domain or group of computers your system will belong to.
  - NIS Server -- this option causes your computer to use a specific NIS server, rather than "broadcasting" a message to the local area network asking for any available server to host your system.
- Enable Shadow Passwords -- provides a very secure method of retaining passwords for you.
- MD5 Password allows a long password to be used up to 256 characters, instead of the standard eight letters or less.

The `authconfig` format for kickstart looks similar to:

```
auth --enablenis --nisdomain foo.redhat.com --nissserver
```

---

```
server.foo.redhat.com [--useshadow] [--enablemd5]
```

---

### Please Note

The commands in the square brackets are optional. If you choose to set them up, you do not need to use the brackets.

---

You are able to change `authconfig` using these commands to set up the different password options:

```
--enablenis           enable nis by default
--nisdomain <domain> default NIS domain
--nisserver <server> default NIS server
--useshadow           use shadow passwords
--enablemd5           enable MD5 passwords
```

### 10.3.20 `lilo` – LILO Configuration

For machines that use LILO (Intel-based systems), you can specify the LILO configuration using the `lilo` keyword. The default line can be as simple as this:

```
lilo
```

This will install LILO in the hard drive's master boot record (MBR), and automatically configure boot entries for your Linux installation as well as a DOS or Windows installation (if one is present).

If you don't want LILO installed in the MBR, you can do so with by using the `--location` option. There are three possible places where LILO can be installed:

- `mbr` - put LILO on the master boot record (default)
- `partition` - put LILO on the beginning of the root partition
- `none` - don't install LILO at all (in which case you'll need your own method of booting the installed system)

You can also use the `--append` option to add an `append=` line to the Linux boot entry. This is handy if you need to do things like set memory sizes, etc. For example,

---

to install LILO on the MBR on a machine with 128MB of RAM, add the following `lilo` line:

```
lilo --append "mem=128M" --location mbr
```

(Due to the new kernel in Red Hat Linux 6.1, the `mem` boot-time option shouldn't be necessary, but we needed an example.)

### 10.3.21 `%packages` – Package Selection

You can use the `%packages` keyword to start the beginning of a kickstart file section that lists the packages you'd like to install (note that this is for installs only, as package selection during upgrades is not supported).

Packages can be specified by component or by individual package name. The installation program defines several components that group together related packages. See the `RedHat/base/comps` file on any Red Hat Linux CD-ROM for a list of components. The components are defined by the lines that begin with a number followed by a space, and then the component name. Each of the packages in that component are then listed, line-by-line, until the `end` keyword. Individual packages lack the leading number found in front of component lines.

In most cases, it's only necessary to list the desired components and not individual packages. Note that the `Base` component is always selected by default, so it's not necessary to specify it in the `%packages` section.

Here's an example `%packages` section:

```
%packages
@ Networked Workstation
@ C Development
@ Web Server
@ X Window System
bsd-games
```

As you can see, components are specified, one to a line, starting with an "@" symbol, a space, and then the full component name as given in the `comps` file. Specify individual packages with no additional characters (the `bsd-games` line in the example above is an individual package).

---

---

### Please Note

You can also direct the kickstart install to use the workstation- and server-class installations. To do this, simply add *one* of the following lines to the `%packages` section:

---

```
@ Workstation
@ Server
```

## 10.3.22 `%post` – Post-Installation Configuration Section

You have the option of adding commands to be run on the installed system after the installation is complete. This section must be at the end of the kickstart file and must start with the `%post` keyword. Note that you can access the network in the `%post` section; however, `nameservice` has not yet been configured at this point, so only IP addresses will work. Here's an example `%post` section:

```
%post

# add comment to /etc/motd
echo "Kickstart-installed Red Hat Linux `bin/date`" > /etc/motd

# add another nameserver
echo "nameserver 10.10.0.2" >> /etc/resolv.conf
```

This section creates a message-of-the-day file containing the date the kickstart installation took place, and gets around the `network` keyword's one-nameserver-only limitation by adding another nameserver to `/etc/resolv.conf`.

---



## **Part III    Appendixes**





## A Red Hat Linux 6.1 Package List

This appendix lists the packages that make up Red Hat Linux 6.1. In each entry, you'll find the following information:

- The name of the package
- The packaged software's version number
- The size of the packaged software, in kilobytes
- A short description of the software

In addition, some packages will have one or more of the following letters alongside the package name:

- *B* -- This package is part of the Red Hat Linux **base**, meaning that it is always installed.
- *K* -- KDE Workstation-class installations include this package.
- *G* -- GNOME Workstation-class installations include this package.
- *S* -- Server-class installations include this package.

---

### Please Note

This package list was automatically generated right before Red Hat Linux 6.1 went into production. Because of the short timeframes involved, you might find minor typesetting problems in the package lists. However, we felt that an up-to-date package list was more important than a picture-perfect package list. We hope you'll agree...

---

You may also notice that some packages have different versions, and that packages listed here are not mentioned in the installation program (and vice versa). Any differences in package versions are normally due to the normal bug fixing process. It's possible that "missing" or "extra" packages are the result of last-minute changes prior

---

to pressing CDROMs. Also note that all the packages in the "Base" group (and sub-groups) are always installed, therefore you will not see them mentioned explicitly during the installation process.

## A.1 Using the Package List After Installation

This list can come in handy even after you've installed Red Hat Linux. You can use it search for documentation. Here's how:

1. Find the package in this list.
2. Note the package name (The very first thing listed in bold at the start of each package description).
3. Enter the following command, taking care to enter the package name *exactly* as it is shown in the list (the package name is case-sensitive):

```
rpm -qd package-name
```

(Replacing *package-name* with the actual name of the package, of course.)

If you installed the package, you should get a list of filenames. Each file contains documentation relating to the package you specified. Here are some of the types of filenames you'll see:

- `/usr/man...something.n` -- This is a man page. You can view it by using the `man` command (for example, `man something`. You might also need to include the file's ending number in the `man` command (as in `man n something`).
  - `/usr/X11R6/man...something.nx` -- This is a man page for part of the X Window System. View these files the same way as a regular man page.
  - `/usr/doc/something...` -- Files under `\fil{/usr/doc}` can be in any number of different formats. Sometimes the end of the filename can provide a clue as to how it should be viewed:
    - `.html` -- An HTML file. View with the web browser of your choice.
    - `.txt` -- A text file. View with `cat` or `less`.
-

- `.ps` -- A Postscript file. You can print it to a Postscript printer, or you can view it with `gv`.
- `.gz` -- A file compressed with `gzip`. If you make a copy of the original file, you can use `gunzip` to decompress it (you'll probably want to keep the original file compressed to save space). You can then view the file as you would normally. The `zless` command combines `gunzip` and `less`, and makes it possible to read compressed text files without making interim copies. There are other, more elegant ways to work with compressed files, but this approach will work for those just starting to use Linux.

In general, most of the documentation files you'll find will be one of those listed above. If in doubt, it's a good bet that the file is text. You can always try the `file` command to see if the file's contents can be identified.

- `/usr/info...` -- Files in `/usr/info` are meant to be viewed using the `info` (or Emacs' Info mode). If you use Emacs, press `[Ctrl]-[H]`, followed by `[I]` to view the main Info screen.

## A.2 Amusements

This section lists the packages that provide fun and entertainment to Red Hat Linux system owners the world over.

### A.2.1 Games

This section lists packages that contain games of different kinds.

#### **cxhextris (Version 1.0, 39K)**

CXHextris is a color version of the popular `xhextris` game, which is a Tetris-like game that uses hexagon shapes instead of square shapes. CXHextris runs within the X Window System.

Install `cxhextris` if you enjoy playing Tetris or Tetris-like games and you'd like to play one on your system. You'll need to have X installed in order to play CXHextris.

**fortune-mod (Version 1.0, 2,342K)**

Fortune-mod contains the ever-popular fortune program. Want a little bit of random wisdom revealed to you when you log in? Fortune's your program. Fun-loving system administrators can add fortune to users' .login files, so that the users get their dose of wisdom each time they log in.

Install fortune if you want a program which will bestow these random bits o' wit.

**gnome-games (Version 1.0.2, 3,354K) (G)**

GNOME is the GNU Network Object Model Environment. That's a fancy name, but really GNOME is a nice GUI desktop environment. Its powerful, friendly and easy-to-configure interface makes using your computer easy.

This package installs some GNOME games on your system, such as gnothello, solitaire, tetris and others.

**gnuchess (Version 4.0.pl80, 1,428K)**

The gnuchess package contains the GNU chess program. By default, GNUchess uses a curses text-based interface. Alternatively, GNUchess can be used in conjunction with the xboard user interface and the X Window System for a graphical chessboard.

You should install the gnuchess package if you would like to play chess on your computer. You'll also need to install the curses package. If you'd like to use a graphical interface with GNUchess, you'll also need to install the xboard package and the X Window System.

**kdegames (Version 1.1.2, 5,205K) (K)**

Games for the K Desktop Environment. Included with this package are: kabalone, kasteroids, kblackbox, kmahjongg, kmines, konquest, kpat, kpoker, kreversi, ksame, kshisen, ksokoban, ksmiletris, ksnake, ksirtet.

**trojka (Version 1.1, 16K)**

The game of Trojka involves a set of falling blocks. The point is to move the blocks around as they fall, so that three of the same blocks end up next to each other, either horizontally or diagonally. Once the blocks fill up the entire game area, the game is over.

---

Install the trojka package if you want to play a non-X game of falling blocks.

**xbill (Version 2.0, 183K)**

The xbill game tests your reflexes as you seek out and destroy all forms of Bill, establish new operating systems and boldly go where no geek has gone before. Xbill has become an increasingly attractive option as the Linux Age progresses, and it is very popular at Red Hat.

**xboard (Version 4.0.3, 675K)**

Xboard is an X Window System based graphical chessboard which can be used with the GNUchess and Crafty chess programs, with Internet Chess Servers (ICSs), with chess via email, or with your own saved games.

Install the xboard package if you need a graphical chessboard.

**xboing (Version 2.4, 1,045K)**

Xboing is an X Window System based game like the Breakout arcade game. The object of the game is to keep a ball bouncing on the bricks until you've broken through all of them.

**xgammon (Version 0.98, 3,282K)**

Xgammon is an X Window System based backgammon game. Xgammon allows you to play against the computer, or you can play against another person. Xgammon also supports playing a game against another person on a remote X terminal, and will display a second board there for their use.

**xjewel (Version 1.6, 52K)**

Xjewel is an X Window System game much like Domain/Jewelbox, Sega's Columns and/or Tetris. The point of the game is to move or rotate the blocks as they fall, to get jewels in patterns of three when they come to rest.

**xpat2 (Version 1.04, 456K)**

Xpat2 is a generic patience or Solitaire game for the X Window System. Xpat2 can be used with different rules sets, so it can be used to play Spider, Klondike, and other card games.

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**xpilot (Version 4.1.0, 2,131K)**

Xpilot is an X Window System based multiplayer game of aerial combat. The object of the game is to shoot each other down, or you can use the race mode to just fly around. Xpilot resembles the Commodore 64 Thrust game, which is similar to Atari's Gravitar and Asteriods (note: this is not misspelled). Unless you already have an xpilot server on your network, you'll need to set up the server on one machine, and then set up xpilot clients on all of the players' machines.

**xpuzzles (Version 5.4.1, 469K)**

A set of geometric puzzles and toys for the X Window System. Xpuzzles includes a version of Rubik's cube and various other geometric Rubik's cube style puzzles.

**xtrojka (Version 1.2.3, 216K)**

The xtrojka game is an X Window System game of falling blocks, like Xjewel or Tetris.

## A.2.2 Graphics

This section lists packages that are related to the production or viewing of graphics.

**kdetoys (Version 1.1.1, 319K) (K)**

Toys for the K Desktop Environment.

Includes: kmoon (displays various phases of the moon); kworldwatch (displays where in the world it is light and dark depending on time), and kodo (a mouse odometer which shows how far your mouse has traveled).

**mxx (Version 1.0, 55K)**

The mxx (Mandelbrot explorer) program is an X Window System application for computing and exploring Mandelbrot sets. Mxx supports zoom/un-zoom, dynamic resizing of drawing windows, setup save/load, asynchronous image generation, GIF outputs, animation, nine color schemes, color rotation, color change options, and detailed statistics.

Install the mxx package if you need a Mandelbrot set generator for the X Window System.

---

**xdaliclock (Version 2.14, 80K)**

The xdaliclock program displays a digital clock, with digits that merge into the new digits as the time changes. Xdaliclock can display the time in 12 or 24 hour modes and can will display the date if you hold your mouse button down over it. Xdaliclock has two large fonts built in, but is capable of animating other fonts.

Install the xdaliclock package if you want a fairly large clock, with a melting special effect, for your system.

**xearth (Version 1.0, 192K)**

Xearth is an X Window System based graphic that shows a globe of the Earth, including markers for major cities and Red Hat Software. The Earth is correctly shaded for the current position of the sun, and the displayed image is updated every five minutes.

**xfishtank (Version 2.0, 388K)**

The xfishtank program displays an animated aquarium background on your screen. Xfishtank works with the X Window System.

**xloadimage (Version 4.1, 255K) (G K S)**

The xloadimage utility displays images in an X Window System window, loads images into the root window, or writes images into a file. Xloadimage supports many images types (GIF, TIFF, JPEG, XPM, XBM, etc.).

Install the xloadimage package if you need a utility for displaying images or loading images into the root window.

**xlockmore (Version 4.14, 792K)**

The xlockmore utility is an enhanced version of the standard xlock program, which allows you to lock an X session so that other users can't access it. Xlockmore runs a provided screensaver until you type in your password.

Install the xlockmore package if you need a locking program to secure X sessions.

**xmorph (Version 1996.07.12, 127K) (G K)**

Xmorph is a digital image warping (aka morphing) program. Xmorph provides the tools needed and comprehensible instructions for you to create morphs: changing one image into another. Xmorph runs under the X Window System.

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Install the `xmorph` package if you need a program that will create morphed images.

### **xscreensaver (Version 3.17, 3,716K) (G)**

The `xscreensaver` package contains a variety of screensavers for your mind-numbing, ambition-eroding, time-wasting, hypnotized viewing pleasure.

Install the `xscreensaver` package if you need screensavers for use with the X Window System.

### **xsri (Version 1.0, 18K) (G K S)**

The `xsri` program allows the display of text, patterns and images in the root window, so users can customize the XDM style login screen and/or the normal X background.

Install `xsri` if you'd like to change the look of your X login screen and/or X background. It is also used to display the default background (Red Hat logo).

### **xwpick (Version 2.20, 50K)**

The `xwpick` program allows you to choose an image or a rectangular piece of an image from an X Window System window and then write the image to a file in a variety of formats, including PostScript(TM), GIF, and PICT.

Install the `xwpick` program if you need to take screenshots from X Window System screens and write them to files.

## **A.3 Applications**

As this section's name implies, this is where you can find most of the applications available with Red Hat Linux. We've split the applications into several different categories to make finding things a bit easier.

(If you noticed that we said "*most* of the applications" above, you can find more apps by looking at X11's application section towards the end of the appendix.)

### **A.3.1 Archiving**

This section lists packages that provide utilities for data archiving.

---



**cdrecord (Version 1.8a25, 620K)**

Cdrecord allows you to create CDs on a CD-Recorder (SCSI/ATAPI). Supports data, audio, mixed, multi-session and CD+ discs etc.

**cpio (Version 2.4.2, 70K) (B)**

GNU cpio copies files into or out of a cpio or tar archive. Archives are files which contain a collection of other files plus information about them, such as their file name, owner, timestamps, and access permissions. The archive can be another file on the disk, a magnetic tape, or a pipe. GNU cpio supports the following archive formats: binary, old ASCII, new ASCII, crc, HPUX binary, HPUX old ASCII, old tar and POSIX.1 tar. By default, cpio creates binary format archives, so that they are compatible with older cpio programs. When it is extracting files from archives, cpio automatically recognizes which kind of archive it is reading and can read archives created on machines with a different byte-order.

Install cpio if you need a program to manage file archives.

**dump (Version 0.4b4, 144K)**

The dump package contains both dump and restore. Dump examines files in a filesystem, determines which ones need to be backed up, and copies those files to a specified disk, tape or other storage medium. The restore command performs the inverse function of dump; it can restore a full backup of a filesystem. Subsequent incremental backups can then be layered on top of the full backup. Single files and directory subtrees may also be restored from full or partial backups.

Install dump if you need a system for both backing up filesystems and restoring filesystems after backups.

**lha (Version 1.00, 56K) (G K)**

LHA is an archiving and compression utility for LHarc format archives. LHA is mostly used in the DOS world, but can be used under Linux to extract DOS files from LHA archives.

Install the lha package if you need to extract DOS files from LHA archives.

---

**ncompress (Version 4.2.4, 31K) (B)**

The ncompress package contains the compress and uncompress file compression and decompression utilities, which are compatible with the original UNIX compress utility (.Z file extensions). These utilities can't handle gzipped (.gz file extensions) files, but gzip can handle compressed files.

**rmt (Version 0.4b4, 11K) (B)**

The rmt utility provides remote access to tape devices for programs like dump (a filesystem backup program), restore (a program for restoring files from a backup) and tar (an archiving program).

**sharutils (Version 4.2, 221K) (G K S)**

The sharutils package contains the GNU shar utilities, a set of tools for encoding and decoding packages of files (in binary or text format) in a special plain text format called shell archives (shar). This format can be sent through e-mail (which can be problematic for regular binary files). The shar utility supports a wide range of capabilities (compressing, uuencoding, splitting long files for multi-part mailings, providing checksums), which make it very flexible at creating shar files. After the files have been sent, the unshar tool scans mail messages looking for shar files. Unshar automatically strips off mail headers and introductory text and then unpacks the shar files.

Install sharutils if you send binary files through e-mail.

**taper (Version 6.9a, 853K)**

Taper is a backup and restoration program with a friendly user interface. Files may be backed up to a tape drive or to a hard disk. The interface for selecting files to be backed up/restored is very similar to the Midnight Commander interface, and allows easy traversal of directories. Taper supports recursive selection of directories. Taper also supports backing up SCSI, ftape, zftape and removable drives. By default, taper is set for incremental backups and automatic most recent restore.

Install the taper package if you need a user friendly file backup and restoration program.

---

**tar (Version 1.13.11, 630K) (B)**

The GNU tar program saves many files together into one archive and can restore individual files (or all of the files) from the archive. Tar can also be used to add supplemental files to an archive and to update or list files in the archive. Tar includes multivolume support, automatic archive compression/ decompression, the ability to perform remote archives and the ability to perform incremental and full backups.

If you want to use Tar for remote backups, you'll also need to install the rmt package. You should install the tar package, because you'll find its compression and decompression utilities essential for working with files.

**unarj (Version 2.43, 24K)**

The UNARJ program is used to uncompress .arj format archives. The .arj format archive was mostly used on DOS machines.

Install the unarj package if you need to uncompress .arj format archives.

**unzip (Version 5.40, 386K) (G K)**

The unzip utility is used to list, test, or extract files from a zip archive. Zip archives are commonly found on MS-DOS systems. The zip utility, included in the zip package, creates zip archives. Zip and unzip are both compatible with archives created by PKWARE(R)'s PKZIP for MS-DOS, but the programs' options and default behaviors do differ in some respects.

Install the unzip package if you need to list, test or extract files from a zip archive.

**zip (Version 2.2, 226K) (G K)**

The zip program is a compression and file packaging utility. Zip is analogous to a combination of the UNIX tar and compress commands and is compatible with PKZIP (a compression and file packaging utility for MS-DOS systems).

Install the zip package if you need to compress files using the zip program.

**A.3.2 Communications**

This section contains packages that help you communicate -- either via fax, on-line chat, or simple terminal emulation.

---

**dip (Version 3.3.7o, 88K) (G K S)**

Dip is a modem dialer. Dip handles the connections needed for dialup IP links like SLIP or PPP. Dip can handle both incoming and outgoing connections, using password security for incoming connections. Dip is useful for setting up PPP and SLIP connections, but isn't required for either. Netcfg uses dip for setting up SLIP connections.

Install dip if you need a utility which will handle dialup IP connections.

**efax (Version 0.9, 205K)**

Efax is a small ANSI C/POSIX program that sends and receives faxes using any Class 1, 2 or 2.0 fax modem.

You need to install efax if you want to send faxes and you have a Class 1, 2 or 2.0 fax modem.

**getty\_ps (Version 2.0.7j, 127K) (B)**

The getty\_ps package contains the getty and uugetty programs, basic programs for accomplishing the login process on a Red Hat Linux system. Getty and uugetty are used to accept logins on the console or a terminal. Getty is invoked by the init process to open tty lines and set their modes, to print the login prompt and get the user's name, and to initiate a login process for the user. Uugetty works just like getty, except that uugetty creates and uses lock files to prevent two or more processes from conflicting in their use of a tty line. Getty and uugetty can also handle answer a modem for dialup connections, but mgetty is recommended for that purpose.

**kpilot (Version 3.1b9, 901K) (K)**

KPilot allows you to synchronize your PalmPilot with your desktop. It allows you to backup and restore the various databases (Addressbook, ToDo List, Memos, etc.) as well as install applications to the pilot. Two "conduits" for the third party application KOrganizer are included which will let you sync your ToDo list and Calendar with that program.

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**lrzsz (Version 0.12.20, 391K) (G K S)**

Lrzs (consisting of lrz and lsz) is a cosmetically modified zmodem/ymodem/xmodem package built from the public-domain version of the rzs package. Lrzs was created to provide a working GNU copylefted Zmodem solution for Linux systems.

You should install lrzsz if you're also installing a Zmodem communications program that uses lrzsz. If you're installing minicom, you need to install lrzsz.

**mgetty (Version 1.1.21, 956K)**

The mgetty package contains a "smart" getty which allows logins over a serial line (i.e., through a modem). If you're using a Class 2 or 2.0 modem, mgetty can receive faxes. If you also need to send faxes, you'll need to install the sendfax program.

If you'll be dialing in to your system using a modem, you should install the mgetty package. If you'd like to send faxes using mgetty and your modem, you'll need to install the mgetty-sendfax program. If you need a viewer for faxes, you'll also need to install the mgetty-viewfax package.

**mgetty-sendfax (Version 1.1.21, 255K)**

Sendfax is a standalone backend program for sending fax files. The mgetty program (a getty replacement for handling logins over a serial line) plus sendfax will allow you to send faxes through a Class 2 modem.

If you'd like to send faxes over a Class 2 modem, you'll need to install the mgetty-sendfax and the mgetty packages.

**mgetty-viewfax (Version 1.1.21, 94K)**

Viewfax displays the fax files received using mgetty in an X11 window. Viewfax is capable of zooming in and out on the displayed fax.

If you're installing the mgetty-viewfax package, you'll also need to install mgetty.

**mgetty-voice (Version 1.1.21, 720K)**

The mgetty-voice package contains the vgetty system, which enables mgetty and your modem to support voice capabilities. In simple terms, vgetty lets your modem act as an answering machine. How well the system will work depends upon your modem, which may or may not be able to handle this kind of implementation.

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Install `mgetty-voice` along with `mgetty` if you'd like to try having your modem act as an answering machine.

**minicom (Version 1.82.1, 306K) (G K S)**

Minicom is a simple text-based modem control and terminal emulation program somewhat similar to MSDOS Telix. Minicom includes a dialing directory, full ANSI and VT100 emulation, an (external) scripting language, and other features.

Minicom should be installed if you need a simple modem control program or terminal emulator.

**pilot-link (Version 0.9.0, 770K) (K)**

This suite of tools allows you to upload and download programs and data files between a \*nix machine and the USR Pilot. It has a few extra utils that will allow for things like syncing the Pilot's calendar app with Ical. Note that you might still need to consult the sources for pilot-link if you would like the Python, Tcl, or Perl bindings.

**sliplogin (Version 2.1.1, 54K)**

The sliplogin utility turns the terminal line on standard input into a SLIP (Serial Line Internet Protocol) link to a remote host. Sliplogin is usually used to allow dial-in SLIP connections.

Install the sliplogin package if you need to support dial-in SLIP connections.

**uucp (Version 1.06.1, 2,079K) (G K S)**

The uucp command copies files between systems. Uucp is primarily used by remote machines downloading and uploading email and news files to local machines.

Install the uucp package if you need to use uucp to transfer files between machines.

### A.3.3 Databases

This section contains packages that provide basic database support for Red Hat Linux.

**postgresql (Version 6.5.1, 7,086K) (S)**

Postgresql includes the programs needed to create and run a PostgreSQL server, which will in turn allow you to create and maintain PostgreSQL databases. PostgreSQL is an advanced Object-Relational database management system (DBMS) that

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supports almost all SQL constructs (including transactions, subselects and user-defined types and functions).

You should install postgresql if you want to create and maintain your own PostgreSQL databases and/or your own PostgreSQL server. If you are installing postgresql, you should also install postgresql-data, which will help you get started with PostgreSQL.

#### **postgresql-jdbc (Version 6.5.1, 140K)**

postgresql-jdbc includes the jar file that you'll need to access a PostgreSQL database management system server.

#### **postgresql-odbc (Version 6.5.1, 148K)**

Postgresql-odbc includes the odbc driver and sample configuration files that you'll need to access a PostgreSQL database management system server.

#### **postgresql-perl (Version 6.5.1, 143K)**

postgresql-perl includes the perl-based client programs and client libraries that you'll need to access a PostgreSQL database management system server.

#### **postgresql-python (Version 6.5.1, 121K)**

postgresql-python includes the python-based client programs and client libraries that you'll need to access a PostgreSQL database management system server.

#### **postgresql-server (Version 6.5.1, 1,433K) (S)**

postgresql-server includes the programs needed to create and run a PostgreSQL server, which will in turn allow you to create and maintain PostgreSQL databases. PostgreSQL is an advanced Object-Relational database management system (DBMS) that supports almost all SQL constructs (including transactions, subselects and user-defined types and functions).

You should install postgresql if you want to create and maintain your own PostgreSQL databases and/or your own PostgreSQL server.

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**postgresql-tcl (Version 6.5.1, 922K)**

postgresql-tcl includes the tcl-based client programs and client libraries that you'll need to access a PostgreSQL database management system server. This package contains the tcl client libraries, as well as pgsaccess, a wish-based utility for manipulating PostgreSQL databases.

**postgresql-test (Version 6.5.1, 4,493K)**

postgresql-test includes the source and pre-built binaries of the various tests included with PostgreSQL, such as the regression tests and benchmarks.

### A.3.4 Editors

In this section, we have an assortment of packages that provide basic (and in some cases not so basic) file editing capabilities.

**GXedit (Version 1.23, 570K)**

GXedit is a fast, easy-to-use editor which is both network-oriented and very secure. GXedit is a graphical text editor which features a toolbar, network bar and tooltips, spell checking, inline help, the ability to send text as e-mail, macros and more. GXedit was designed to balance these and many other features without becoming too bloated.

You'll need GTK+ to use GXedit.

**emacs (Version 20.4, 18,691K) (G K S)**

Emacs is a powerful, customizable, self-documenting, modeless text editor. Emacs contains special code editing features, a scripting language (elisp), and the capability to read mail, news and more without leaving the editor.

This package includes the libraries you need to run the Emacs editor, so you need to install this package if you intend to use Emacs. You also need to install the actual Emacs program package (emacs-nox or emacs-X11). Install emacs-nox if you are not going to use the X Window System; install emacs-X11 if you will be using X.

**emacs-X11 (Version 20.4, 5,670K) (G K)**

Emacs-X11 includes the Emacs text editor program for use with the X Window System (it provides support for the mouse and other GUI elements). Emacs-X11 will

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also run Emacs outside of X, but it has a larger memory footprint than the 'non-X' Emacs package (emacs-nox).

Install emacs-X11 if you're going to use Emacs with the X Window System. You should also install emacs-X11 if you're going to run Emacs both with and without X (it will work fine both ways). You'll also need to install the emacs package in order to run Emacs.

### **emacs-el (Version 20.4, 21,601K)**

Emacs-el contains the emacs-elisp sources for many of the elisp programs included with the main Emacs text editor package.

You need to install emacs-el only if you intend to modify any of the Emacs packages or see some elisp examples.

### **emacs-leim (Version 20.4, 4,273K)**

The Emacs Lisp code for input methods for various international character scripts.

### **emacs-nox (Version 20.4, 2,498K) (G K S)**

Emacs-nox is the Emacs text editor program without support for the X Window System.

You need to install this package only if you plan on exclusively using Emacs without the X Window System (emacs-X11 will work both in X and out of X, but emacs-nox will only work outside of X). You'll also need to install the emacs package in order to run Emacs.

### **gedit (Version 0.5.4, 456K) (G)**

gEdit is a small but powerful text editor designed specifically for the GNOME GUI desktop. gEdit includes a plug-in API (which supports extensibility while keeping the core binary small), support for editing multiple documents using notebook tabs, and standard text editor functions.

You'll need to have GNOME and GTK+ installed to use gEdit.

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**gnotepad+ (Version 1.1.4, 192K) (G)**

gnotepad+ is an easy-to-use, yet fairly feature-rich, simple text editor for systems running X11 and using GTK+. It is designed for as little bloat as possible, while still providing many of the common features found in a modern GUI-based text editor.

**jed (Version 0.98.7, 140K)**

Jed is a fast, compact editor based on the slang screen library. Jed features include emulation of the Emacs, EDT, WordStar and Brief editors; support for extensive customization with slang macros, colors, keybindings, etc.; and a variety of programming modes with syntax highlighting.

You should install jed if you've used it before and you like it, or if you haven't used any text editors before and you're still deciding what you'd like to use. You'll also need to have slang installed.

**jed-common (Version 0.98.7, 1,502K)**

The jed-common package contains files (such as .sl files) that are needed by any jed binary in order to run.

**jed-xjed (Version 0.98.7, 166K)**

Xjed is a version of the Jed text editor that will work with the X Window System.

You should install xjed if you like Jed and you'd like to use it with X. You'll also need to have the X Window System installed.

**joe (Version 2.8, 282K)**

Joe is an easy to use, modeless text editor which is very easy to use. Joe uses the same WordStar keybindings used in Borland's development environment.

You should install joe if you've used it before and you liked it, or if you're still deciding what text editor you'd like to use, or if you have a fondness for WordStar. If you're just starting out, you should probably install joe because it is very easy to use.

**vim-X11 (Version 5.4, 1,571K)**

VIM (VISual editor iMproved) is an updated and improved version of the vi editor. Vi was the first real screen-based editor for UNIX, and is still very popular. VIM improves on vi by adding new features: multiple windows, multi-level undo, block

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highlighting and more. VIM-X11 is a version of the VIM editor which will run within the X Window System. If you install this package, you can run VIM as an X application with a full GUI interface and mouse support.

Install the vim-X11 package if you'd like to try out a version of vi with graphics and mouse capabilities. You'll also need to install the vim-common package.

#### **vim-common (Version 5.4, 5,728K) (B)**

VIM (VISual editor iMproved) is an updated and improved version of the vi editor. Vi was the first real screen-based editor for UNIX, and is still very popular. VIM improves on vi by adding new features: multiple windows, multi-level undo, block highlighting and more. The vim-common package contains files which every VIM binary will need in order to run.

If you are installing any version of the VIM editor, you'll also need to the vim-common package installed.

#### **vim-enhanced (Version 5.4, 1,464K)**

VIM (VISual editor iMproved) is an updated and improved version of the vi editor. Vi was the first real screen-based editor for UNIX, and is still very popular. VIM improves on vi by adding new features: multiple windows, multi-level undo, block highlighting and more. The vim-enhanced package contains a version of VIM with extra, recently introduced features like Python and Perl interpreters.

Install the vim-enhanced package if you'd like to use a version of the VIM editor which includes recently added enhancements like interpreters for the Python and Perl scripting languages. You'll also need to install the vim-common package.

#### **vim-minimal (Version 5.4, 339K) (B)**

VIM (VISual editor iMproved) is an updated and improved version of the vi editor. Vi was the first real screen-based editor for UNIX, and is still very popular. VIM improves on vi by adding new features: multiple windows, multi-level undo, block highlighting and more. The vim-minimal package includes a minimal version of VIM, which is installed into /bin/vi for use when only the root partition is present.

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### A.3.5 Emulators

In this section are packages that let your Red Hat Linux system run programs meant for other operating systems.

#### **dosemu (Version 0.99.10, 1,756K) (G K)**

Dosemu is a DOS emulator. Once you've installed dosemu, start the DOS emulator by typing in the dos command.

You need to install dosemu if you use DOS programs and you want to be able to run them on your Red Hat Linux system. You may also need to install the dosemu-freedos package.

#### **dosemu-freedos (Version 0.99.10, 16,218K)**

Generally, the dosemu DOS emulator requires either that your system have some version of DOS available or that your system's partitions were formatted and installed with DOS. If your system does not meet either of the previous requirements, you can instead use the dosemu-freedos package, which contains an hdimage file which will be installed in the /var/lib/dosemu directory. The hdimage file is already bootable with FreeDOS.

You will need to edit your /etc/dosemu.conf file to add the image to the list of disk 'drives' used by dosemu.

Install dosemu-freedos if you are installing the dosemu package and you don't have a version of DOS available on your system, and your system's partitions were not formatted and installed with DOS.

#### **xdosemu (Version 0.99.10, 26K) (G K)**

Xdosemu is a version of the dosemu DOS emulator that runs with the X Window System. Xdosemu provides VGA graphics and mouse support.

Install xdosemu if you need to run DOS programs on your system, and you'd like to do so with the convenience of graphics support and mouse capabilities.

### A.3.6 Engineering

This section contains packages for those of you that are into engineering.

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**bc (Version 1.05a, 128K) (B)**

The bc package includes bc and dc. Bc is an arbitrary precision numeric processing arithmetic language. Dc is an interactive arbitrary precision stack based calculator, which can be used as a text mode calculator.

Install the bc package if you need its number handling capabilities or if you would like to use its text mode calculator.

**gnuplot (Version 3.7.0.1, 917K)**

Gnuplot is a command-line driven, interactive function plotting program especially suited for scientific data representation. Gnuplot can be used to plot functions and data points in both two and three dimensions and in many different formats.

Install gnuplot if you need a graphics package for scientific data representation.

**units (Version 1.55, 216K)**

Units converts an amount from one unit to another, or tells you what mathematical operation you need to perform to convert from one unit to another. Units can only handle multiplicative scale changes (i.e., it can't tell you how to convert from Celsius to Fahrenheit, which requires an additive step in addition to the multiplicative conversion).

Units is a handy little program which contains a large number of conversions, from au's to parsecs and tablespoons to cups. You probably don't need to install it, but it comes in handy sometimes.

**xlispstat (Version 3.52.12, 2,874K)**

The xlispstat package contains XLISP-PLUS, an implementation of the Lisp programming language for the X Window System. XLISP-PLUS also includes extensions for performing advanced statistical computations.

Install the xlispstat package if you need a version of the Lisp programming language for X with statistics extensions.

**A.3.7 File**

This section lists packages containing file-related utility programs.

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**bzip2 (Version 0.9.5c, 258K) (B)**

Bzip2 is a freely available, patent-free, high quality data compressor. Bzip2 compresses files to within 10 to 15 percent of the capabilities of the best techniques available. However, bzip2 has the added benefit of being approximately two times faster at compression and six times faster at decompression than those techniques. Bzip2 is not the fastest compression utility, but it does strike a balance between speed and compression capability.

Install bzip2 if you need a compression utility.

**file (Version 3.27, 214K) (B)**

The file command is used to identify a particular file according to the type of data contained by the file. File can identify many different file types, including ELF binaries, system libraries, RPM packages, and different graphics formats.

You should install the file package, since the file command is such a useful utility.

**fileutils (Version 4.0, 1,283K) (B)**

The fileutils package includes a number of GNU versions of common and popular file management utilities. Fileutils includes the following tools: chgrp (changes a file's group ownership), chown (changes a file's ownership), chmod (changes a file's permissions), cp (copies files), dd (copies and converts files), df (shows a filesystem's disk usage), dir (gives a brief directory listing), dircolors (the setup program for the color version of the ls command), du (shows disk usage), install (copies files and sets permissions), ln (creates file links), ls (lists directory contents), mkdir (creates directories), mkfifo (creates FIFOs or named pipes), mknod (creates special files), mv (renames files), rm (removes/deletes files), rmdir (removes empty directories), sync (synchronizes memory and disk), touch (changes file timestamps), and vdir (provides long directory listings).

You should install the fileutils package, because it includes many file management utilities that you'll use frequently.

**findutils (Version 4.1, 118K) (B)**

The findutils package contains programs which will help you locate files on your system. The find utility searches through a hierarchy of directories looking for files

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which match a certain set of criteria (such as a filename pattern). The locate utility searches a database (create by updatedb) to quickly find a file matching a given pattern. The xargs utility builds and executes command lines from standard input arguments (usually lists of file names generated by the find command).

You should install findutils because it includes tools that are very useful for finding things on your system.

### **git (Version 4.3.17, 715K) (G K)**

GIT (GNU Interactive Tools) provides an extensible file system browser, an ASCII/hexadecimal file viewer, a process viewer/killer and other related utilities and shell scripts. GIT can be used to increase the speed and efficiency of copying and moving files and directories, invoking editors, compressing and uncompressing files, creating and expanding archives, compiling programs, sending mail and more. GIT uses standard ANSI color sequences, if they are available.

You should install the git package if you are interested in using its file management capabilities.

### **gzip (Version 1.2.4, 242K) (B)**

The gzip package contains the popular GNU gzip data compression program. Gzipped files have a .gz extension.

Gzip should be installed on your Red Hat Linux system, because it is a very commonly used data compression program.

### **slocate (Version 2.0, 48K) (B)**

Slocate is a security-enhanced version of locate. Just like locate, slocate searches through a central database (which is updated nightly) for files which match a given pattern. Slocate allows you to quickly find files anywhere on your system.

### **stat (Version 1.5, 6K) (B)**

The stat utility prints out filesystem level information about a specified file, including size, permissions, link count, inode, etc.

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**tree (Version 1.2, 19K)**

The tree utility recursively displays the contents of directories in a tree-like format. Tree is basically a UNIX port of the tree DOS utility.

Install tree if you think it would be useful to view the contents of specified directories in a tree-like format.

**A.3.8 Internet**

This section lists packages that contain Internet-related applications.

**elm (Version 2.5.1, 620K) (G K S)**

Elm is a popular terminal mode email user agent. Elm includes all standard mailhandling features, including MIME support via metamail.

Elm is still used by some people, but is no longer in development. If you've used Elm before and you're devoted to it, you should install the elm package. If you would like to use metamail's MIME support, you'll also need to install the metamail package.

**exmh (Version 2.0.2, 1,814K) (G K S)**

Exmh provides an X interface for MH/nmh mail, a feature-rich email handling system. Exmh supports almost all (but not all) of MH's features: viewing the messages in a folder, reading/deleting/refiling messages, and sorting arriving mail into different folders before the messages are read. Exmh highlights which folders have new mail, and indicates which messages have not been read (so you don't lose the sorted, unread mail).

If you like MH/nmh mail, you should install exmh, because it makes the MH/nmh mail system much more user friendly. You may also want to use exmh if you prefer a graphical user interface for your mail client. Note that you will also have to install the nmh package.

**faces (Version 1.6.1, 144K)**

Faces is a program for visually monitoring a list (typically a list of incoming mail messages, a list of jobs in a print queue or a list of system users). Faces operates in five different modes: monitoring for new mail, monitoring an entire mail file, monitoring a specified print queue, monitoring users on a machine and custom monitoring. Faces

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also includes a utility for including a face image (a compressed, scanned image) with mail messages. The image has to be compressed in a certain way, which can then be uncompressed and displayed on-the-fly in the mail program. This feature of faces is typically used with the exmh mail handling system.

Install faces if you'd like to use its list monitoring capability or its face image inclusion capability. If you would like to include face images in email, you'll also need to install the faces-xface package. If you would like to develop xface applications, you'll need to also install faces-devel.

#### **faces-xface (Version 1.6.1, 21K)**

The Faces program includes the ability to send a compressed image along with an email message. Faces-xface includes the utilities that mail user agent programs need to handle X-Face mail header. When an email program reads the X-face header line in an email message, it calls these utilities to display the face image included in the message.

You'll need to install faces-xface if you want your mail program to display Faces' X-face images.

#### **fetchmail (Version 5.0.4, 572K) (G K S)**

Fetchmail is a remote mail retrieval and forwarding utility intended for use over on-demand TCP/IP links, like SLIP or PPP connections. Fetchmail supports every remote-mail protocol currently in use on the Internet (POP2, POP3, RPOP, APOP, KPOP, all IMAPs, ESMTP ETRN) for retrieval. Then Fetchmail forwards the mail through SMTP, so you can read it through your normal mail client.

Install fetchmail if you need to retrieve mail over SLIP or PPP connections.

#### **fetchmailconf (Version 5.0.4, 62K)**

Fetchmailconf is a tcl/tk application for graphically configuring your .fetchmailrc preferences file. Fetchmail has many options which can be daunting to the new user. This utility takes some of the guesswork and hassle out of setting up fetchmail.

#### **finger (Version 0.10, 33K) (G K S)**

Finger is a utility which allows users to see information about system users (login name, home directory, name, how long they've been logged in to the system, etc.).

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The `finger` package includes a standard finger client and server. The server daemon (`fingerd`) runs from `/etc/inetd.conf`, which must be modified to disable finger requests.

You should install `finger` if your system is used by multiple users and you'd like finger information to be available.

**`ftp` (Version 0.15, 89K) (G K S)**

The `ftp` package provides the standard UNIX command-line FTP (File Transfer Protocol) client. FTP is a widely used protocol for transferring files over the Internet and for archiving files.

If your system is on a network, you should install `ftp` in order to do file transfers.

**`fwhois` (Version 1.00, 8K) (G K S)**

The `fwhois` program is a different style of the `whois` program. Both `fwhois` and `whois` query Internet `whois` databases to find information about system users. `Fwhois` is smaller and more compact than `whois`, and runs in a different manner.

Install `fwhois` if you or your system's users need a program for querying `whois` databases. You may also want to install `whois`, and then decide for yourself which program you prefer.

**`gftp` (Version 2.0.4, 593K) (G)**

`gFTP` is a multi-threaded FTP client for the X Window System. `gFTP` supports simultaneous downloads, resumption of interrupted file transfers, file transfer queues to allow downloading of multiple files, support for downloading entire directories/sub-directories, a bookmarks menu to allow quick connection to FTP sites, caching of remote directory listings, local and remote `chmod`, drag and drop, a connection manager and much more.

Install `gftp` if you need an FTP client. You'll also need to install `GTK+ 1.2.3` or higher and `X11R6`.

**`ircii` (Version 4.4, 997K)**

`IrcII` is a popular Internet Relay Chat (IRC) client. IRC clients communicate with IRC servers, enabling users to "chat" via the Internet.

Install `ircii` if you want to participate in chat rooms.

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**kdenetwork (Version 1.1.2, 8,010K) (K)**

Network applications for the K Desktop Environment.

Includes: karchie (ftp archive searcher); kbiff (mail delivery notification) kfinger ("finger" utility); kmail (mail client); knu (network utilities); korn (mailbox monitor tool); kppp (easy PPP connection configuration); krn (news reader); ktalkd (talk daemon); ksirc (irc client).

**kpppload (Version 1.04, 88K) (K)**

Monitors the load on your PPP connection. Looks a lot like xload.

**lynx (Version 2.8.2, 2,089K) (G K S)**

Lynx is a text-based Web browser. Lynx does not display any images, but it does support frames, tables and most other HTML tags. Lynx's advantage over graphical browsers is its speed--Lynx starts and exits quickly and swiftly displays Web pages.

Install lynx if you would like to try this fast, non-graphical browser (you may learn to appreciate its strengths).

**mailx (Version 8.1.1, 89K) (B)**

The mailx package installs the /bin/mail program, which is used to send quick email messages (i.e., without opening up a full-featured mail user agent). Mail is often used in shell scripts.

You should install mailx because of its quick email sending ability, which is especially useful if you're planning on writing any shell scripts.

**metamail (Version 2.7, 341K) (G K S)**

Metamail is a system for handling multimedia mail, using the mailcap file. Metamail reads the mailcap file, which tells Metamail what helper program to call in order to handle a particular type of non-text mail. Note that metamail can also add multimedia support to certain non-mail programs.

Metamail should be installed if you need to add multimedia support to mail programs and some other programs, using the mailcap file.

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**mutt (Version 1.0pre2us, 1,656K) (G K S)**

Mutt is a text mode mail user agent. Mutt supports color, threading, arbitrary key remapping, and a lot of customization.

You should install mutt if you've used mutt in the past and you prefer it, or if you're new to mail programs and you haven't decided which one you're going to use.

**nc (Version 1.10, 105K)**

The nc package contains Netcat (the program is actually nc), a simple utility for reading and writing data across network connections, using the TCP or UDP protocols. Netcat is intended to be a reliable back-end tool which can be used directly or easily driven by other programs and scripts. Netcat is also a feature-rich network debugging and exploration tool, since it can create many different connections and has many built-in capabilities.

You may want to install the netcat package if you are administering a network and you'd like to use its debugging and network exploration capabilities.

**ncftp (Version 3.0beta19, 755K) (G K S)**

Ncftp is an improved FTP client. Ncftp's improvements include support for command line editing, command histories, recursive gets, automatic anonymous logins and more.

Install ncftp if you use FTP to transfer files and you'd like to try some of ncftp's additional features.

**netscape-common (Version 4.61, 6,887K) (G K S)**

This package contains the files that are shared between the Netscape Navigator Web browser and the Netscape Communicator suite of tools (the Navigator Web browser, an e-mail client, a news reader and Web page editor).

Install the netscape-common package if you're installing the netscape-navigator and/or the netscape-communicator program.

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**netscape-communicator (Version 4.61, 13,533K) (G K S)**

Netscape Communicator is the industry-leading Web browser. It supports the latest HTML standards, Java, JavaScript and some style sheets. It also includes a full-featured Usenet news reader as well as a complete e-mail client.

Information on the Netscape Communicator license may be found in the file `/usr/doc/netscape-common-4.51/LICENSE`.

**netscape-navigator (Version 4.61, 7,251K)**

Netscape Navigator is the industry-leading Web browser. It supports the latest HTML standards, Java, JavaScript and some style sheets.

Information on the Netscape Navigator license may be found in the file `/usr/doc/netscape-common-4.51/LICENSE`.

This will install the basic Netscape Navigator Web browser. If you want additional features, such as the Usenet news reader and HTML editor, you should install the `netscape-communicator` package.

**nmh (Version 1.0, 5,156K) (G K S)**

Nmh is an email system based on the MH email system and is intended to be a (mostly) compatible drop-in replacement for MH. Nmh isn't a single comprehensive program. Instead, it consists of a number of fairly simple single-purpose programs for sending, receiving, saving, retrieving and otherwise manipulating email messages. You can freely intersperse nmh commands with other shell commands or write custom scripts which utilize nmh commands. If you want to use nmh as a true email user agent, you'll want to also install `exmh` to provide a user interface for it--nmh only has a command line interface.

If you'd like to use nmh commands in shell scripts, or if you'd like to use nmh and `exmh` together as your email user agent, you should install nmh.

**pine (Version 4.10, 3,438K) (G K S)**

Pine is a very popular, easy to use, full-featured email user agent which includes a simple text editor called `pico`. Pine supports MIME extensions and can also be used to read news. Pine also supports IMAP, mail and MH style folders.

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Pine should be installed because Pine is a very commonly used email user agent and it is currently in development.

**rsh (Version 0.10, 117K) (G K S)**

The rsh package contains a set of programs which allow users to run commands on remote machines, login to other machines and copy files between machines (rsh, rlogin and rcp). All three of these commands use rhosts style authentication. This package contains the clients and servers needed for all of these services. It also contains a server for rexec, an alternate method of executing remote commands. All of these servers are run by inetd and configured using /etc/inetd.conf and PAM. The rexecd server is disabled by default, but the other servers are enabled.

The rsh package should be installed to enable remote access to other machines.

**rsync (Version 2.3.1, 224K)**

Rsync uses a quick and reliable algorithm to very quickly bring remote and host files into sync. Rsync is fast because it just sends the differences in the files over the network (instead of sending the complete files). Rsync is often used as a very powerful mirroring process or just as a more capable replacement for the rcp command. A technical report which describes the rsync algorithm is included in this package.

Install rsync if you need a powerful mirroring program.

**slrn (Version 0.9.5.7, 424K) (G K S)**

SLRN is a powerful, easy to use, threaded Internet news reader. SLRN is highly customizable and allows you to design complex filters to sort or kill news articles. SLRN works well over slow network connections, and includes a utility for reading news off-line.

Install slrn if you need a full-featured news reader, if you have a slow network connection, or if you'd like to save on-line time by reading your news off-line.

**slrn-pull (Version 0.9.5.7, 71K)**

This package provides slrnpull, which allows set up of a small news spool for offline news reading.

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**talk (Version 0.11, 38K) (G K S)**

The `ntalk` package provides client and daemon programs for the Internet talk protocol, which allows you to chat with other users on different systems. Talk is a communication program which copies lines from one terminal to the terminal of another user.

Install `ntalk` if you'd like to use talk for chatting with users on different systems.

**tcpdump (Version 3.4, 260K) (G K S)**

Tcpdump is a command-line tool for monitoring network traffic. Tcpdump can capture and display the packet headers on a particular network interface or on all interfaces. Tcpdump can display all of the packet headers, or just the ones that match particular criteria.

Install `tcpdump` if you need a program to monitor network traffic.

**telnet (Version 0.10, 142K) (G K S)**

Telnet is a popular protocol for logging into remote systems over the Internet. The `telnet` package provides a command line telnet client as well as a telnet daemon, which will support remote logins into the host machine. The telnet daemon is enabled by default. You may disable the telnet daemon by editing `/etc/inetd.conf`.

Install the `telnet` package if you want to telnet to remote machines and/or support remote logins to your own machine.

**tin (Version 1.4\_990517, 1,368K) (G K S)**

Tin is a basic, easy to use Internet news reader. Tin can read news locally or remotely via an NNTP (Network News Transport Protocol) server.

Install `tin` if you need a basic news reader.

**traceroute (Version 1.4a5, 27K) (G K S)**

The `traceroute` utility displays the route used by IP packets on their way to a specified network (or Internet) host. Traceroute displays the IP number and host name (if possible) of the machines along the route taken by the packets. Traceroute is used as a network debugging tool. If you're having network connectivity problems, `traceroute` will show you where the trouble is coming from along the route.

Install `traceroute` if you need a tool for diagnosing network connectivity problems.

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**trn (Version 3.6, 446K) (G K S)**

Trn is a basic news reader that supports threading. This version is configured to read news from an NNTP news server.

Install trn if you need a basic news reader that shows you newsgroup postings in threaded format.

**urlview (Version 0.7, 38K) (G K S)**

urlview extracts URLs from a given text file, and presents a menu of URLs to view using a user specified command.

**w3c-libwww-apps (Version 5.2.8, 50K)**

Web applications built using Libwww: Robot, Command line tool, line mode browser. The Robot can crawl web sites faster, and with lower load, than any other web walker that we know of, due to its extensive pipelining and use of HTTP/1.1.

The command line tool (w3c) is very useful for manipulation of Web sites that implement more than just HTTP GET (e.g. PUT, POST, etc.).

The line mode browser is a minimal line mode web browser; often useful to convert to ascii text. Currently unavailable until someone updates it to some new interfaces. (hint, hint...)

**wget (Version 1.5.3, 343K)**

GNU Wget is a file retrieval utility which can use either the HTTP or FTP protocols. Wget features include the ability to work in the background while you're logged out, recursive retrieval of directories, file name wildcard matching, remote file timestamp storage and comparison, use of Rest with FTP servers and Range with HTTP servers to retrieve files over slow or unstable connections, support for Proxy servers, and configurability.

Install wget if you need to retrieve large numbers of files with HTTP or FTP, or if you need a utility for mirroring web sites or FTP directories.

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**xchat (Version 1.2.0, 1,013K) (G)**

X-Chat is yet another IRC client for the X Window System, using the Gtk+ toolkit. It is pretty easy to use compared to the other Gtk+ IRC clients and the interface is quite nicely designed.

**xmailbox (Version 2.5, 33K) (G K S)**

The xmailbox program is an X Window System program which notifies you when mail arrives. Xmailbox is similar to the xbiff program, but it offers more features and notification options.

Install the xmailbox package if you'd like a graphical program for X which will notify you when new mail arrives.

**xrn (Version 9.01, 253K) (G K S)**

A simple Usenet News reader for the X Window System. Xrn allows you to point and click your way through reading, replying and posting news messages.

Install the xrn package if you need a simple news reader for X.

**ytalk (Version 3.1, 68K)**

The YTalk program is essentially a chat program for multiple users. YTalk works just like the UNIX talk program and even communicates with the same talk daemon(s), but YTalk allows for multiple connections (unlike UNIX talk). YTalk also supports redirection of program output to other users as well as an easy-to-use menu of commands.

Install the ytalk package if you need a chat program for multiple users.

### A.3.9 Multimedia

This section contains packages that help you work with graphics-related material. This section contains packages that let you use your Red Hat Linux system's sound capabilities.

**ImageMagick (Version 4.2.9, 2,928K) (G K S)**

ImageMagick(TM) is an image display and manipulation tool for the X Window System. ImageMagick can read and write JPEG, TIFF, PNM, GIF and Photo CD image

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formats. It can resize, rotate, sharpen, color reduce or add special effects to an image, and when finished you can either save the completed work in the original format or a different one. ImageMagick also includes command line programs for creating animated or transparent .gifs, creating composite images, creating thumbnail images, and more.

ImageMagick is one of your choices if you need a program to manipulate and display images. If you'd also like to develop your own applications which use ImageMagick code or APIs, you'll need to install ImageMagick-devel as well.

**aktion (Version 0.3.6, 354K) (K)**

aKtion! is a video player based on xanim. It supports many different file formats:

FLI animations. FLC animations. IFF animations. GIF87a and GIF89a files. GIF89a animation extension support. DL animations. Formats 1, 2 and most of 3. Amiga MovieSetter animations(For those Eric Schwartz fans). Utah Raster Toolkit RLE images and anims. AVI animations. Quicktime Animations. SGI Movie Format Files.

**aumix (Version 1.22.1, 72K) (G K)**

Aumix is a tty-based, interactive method of controlling a sound card mixer. It lets you adjust the input levels from the CD, microphone, and board synthesizers, as well as the output volume. Aumix can adjust audio mixers from the command line, from a script, or interactively at the console or terminal with an ncurses-based interface.

Install aumix if you need to control an audio mixer. If you want to use Aumix's GUI, you'll need to install ncurses and gpm for mouse support.

**awesfx (Version 0.4.3a, 299K) (G K)**

The awesfx package contains necessary utilities for the AWE32 sound driver.

If you must use an AWE32 sound driver, you should install this package.

**cdp (Version 0.33, 39K) (G K)**

The cdp program plays audio CDs in your computer's CD-ROM drive. Cdp includes a full-screen interface version and a command line version.

Install cdp to play audio CDs on your system.

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**cdparanoia (Version alpha9.6, 152K)**

Cdparanoia (Paranoia III) reads digital audio directly from a CD, then writes the data to a file or pipe in WAV, AIFC or raw 16 bit linear PCM format. Cdparanoia's strength lies in its ability to handle a variety of hardware, including inexpensive drives prone to misalignment, frame jitter and loss of streaming during atomic reads. Cdparanoia is also good at reading and repairing data from damaged CDs.

**desktop-backgrounds (Version 1.0.0, 10,198K) (G)**

If you use a desktop environment like GNOME you can use these images to spruce up your background.

**ee (Version 0.3.10, 498K) (G)**

The ee package contains the Electric Eyes image viewer for the GNOME desktop environment. Electric Eyes is primary an image viewer, but it also allows many types of image manipulations. Electric Eyes can handle almost any type of image.

Install the ee package if you need an image viewer.

**extace (Version 1.1.16, 262K) (G)**

eXtace is a audio visualization plugin for the GNOME GUI desktop environment. It connects to Esound (the Enlightened Sound Daemon) and displays the audio data as either a 3D textured landscape, a 3D pointed landscape, a 16-128 channel graphic EQ, or a colored Oscilloscope.

**giftrans (Version 1.12.2, 22K)**

Giftrans will convert an existing GIF87 file to GIF89 format. In other words, Giftrans can make one color in a .gif image (normally the background) transparent.

Install the giftrans package if you need a quick, small, one-purpose graphics program to make transparent .gifs out of existing .gifs.

**gimp (Version 1.0.4, 6,508K) (G K)**

The GIMP is an image manipulation program suitable for photo retouching, image composition and image authoring. Many people find it extremely useful in creating logos and other graphics for web pages. The GIMP has many of the tools and filters

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you would expect to find in similar commercial offerings, and some interesting extras as well.

The GIMP provides a large image manipulation toolbox, including channel operations and layers, effects, sub-pixel imaging and anti-aliasing, and conversions, all with multi-level undo.

This version of The GIMP includes a scripting facility, but many of the included scripts rely on fonts that we cannot distribute. The GIMP ftp site has a package of fonts that you can install by yourself, which includes all the fonts needed to run the included scripts. Some of the fonts have unusual licensing requirements; all the licenses are documented in the package. Get <ftp://ftp.gimp.org/pub/gimp/fonts/free-fonts-0.10.tar.gz> and <ftp://ftp.gimp.org/pub/gimp/fonts/sharefonts-0.10.tar.gz> if you are so inclined. Alternatively, choose fonts which exist on your system before running the scripts.

**gimp-data-extras (Version 1.0.0, 7,825K)**

Patterns, gradients etc. for gimp. This package isn't required, but contains lots of goodies for gimp.

**gnome-audio (Version 1.0.0, 828K) (G K S)**

If you use the GNOME desktop environment, you may want to install this package of complementary sounds.

**gnome-media (Version 1.0.9.1, 276K) (G)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of GUI applications and desktop tools to be used in conjunction with a window manager for the X Window System. The gnome-media package will install media features like the GNOME CD player.

Install gnome-media if you want to use GNOME's multimedia capabilities.

**kdegraphics (Version 1.1.2, 3,105K) (K)**

Graphics applications for the K Desktop Environment.

Includes: kdvi (displays TeX .dvi files); kfax (displays fax files); kfract (a fractal generator); kghostview (displays postscript files); kiconedit (icon editor); kpaint (a

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simple drawing program); ksnapshot (screen capture utility); kview (image viewer for GIF, JPEG, TIFF, etc.).

### **kdemultimedia (Version 1.1.2, 2,548K) (K)**

Multimedia applications for the K Desktop Environment. Included: kmedia (media player); kmid (midi/karaoke player); kmidi (midi-to-wav player/converter); kmix (mixer); kscd (CD audio player)

### **libgr-progs (Version 2.0.13, 1,580K) (G K S)**

The libgr-progs package contains a group of scripts for manipulating the graphics files in formats which are supported by the libgr library. For example, libgr-progs includes the rastopnm script, which will convert a Sun rasterfile into a portable anymap. Libgr-progs contains many other scripts for converting from one graphics file format to another.

If you need to use these conversion scripts, you should install libgr-progs. You'll also need to install the libgr package.

### **libungif-progs (Version 4.1.0, 336K)**

The libungif-progs package contains various programs for manipulating GIF format image files.

Install this package if you need to manipulate GIF format image files. You'll also need to install the libungif package.

### **mikmod (Version 3.1.6, 837K) (G K)**

MikMod is one of the best and most well known MOD music file players for UNIX-like systems. This particular distribution is intended to compile fairly painlessly in a Linux environment. MikMod uses the OSS /dev/dsp driver including all recent kernels for output, and will also write .wav files. Supported file formats include MOD, STM, S3M, MTM, XM, ULT, and IT. The player uses ncurses for console output and supports transparent loading from gzip/pkzip/zoo archives and the loading/saving of playlists.

Install the mikmod package if you need a MOD music file player.

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**mpg123 (Version 0.59r, 224K) (G K)**

Mpg123 is a fast, free and portable MPEG audio player for Unix. It supports MPEG 1.0/2.0 layers 1, 2 and 3 ("mp3" files). For full CD quality playback (44 kHz, 16 bit, stereo) a Pentium CPU is required. Mono and/or reduced quality playback (22 kHz or 11 kHz) is possible on 486 CPUs.

For information on the MP3 License, please visit: <http://www.mpeg.org/>

**multimedia (Version 2.1, 344K) (G K)**

The multimedia package contains several X Window System utilities for handling multimedia files: xplaycd, xmixer and xgetfile. Xplaycd is a CD player for playing audio CDs on your machine's CD-ROM drive. Xmixer controls the volume settings on your machine's sound card. Xgetfile is a versatile file browser, intended for use in shell scripts.

Install the multimedia package if you need an audio CD player, a sound card volume controller, or a file browser for use in shell scripts.

**playmidi (Version 2.4, 98K) (G K)**

Playmidi plays MIDI (Musical Instrument Digital Interface) sound files through a sound card synthesizer. This package includes basic drum samples for use with simple FM synthesizers.

Install playmidi if you want to play MIDI files using your computer's sound card.

**playmidi-X11 (Version 2.4, 39K) (G K)**

Playmidi-X11 provides an X Window System interface for playing MIDI (Musical Instrument Digital Interface) sound files through a sound card synthesizer. This package includes basic drum samples for use with simple FM synthesizers.

Install playmidi-X11 if you want to use an X interface to play MIDI sound files using your computer's sound card.

**sndconfig (Version 0.37, 347K) (G K)**

Sndconfig is a text based tool which sets up the configuration files you'll need to use a sound card with a Red Hat Linux system. Sndconfig can be used to set the proper

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sound type for programs which use the /dev/dsp, /dev/audio and /dev/mixer devices. The sound settings are saved by the aumix and sysV runlevel scripts.

Install sndconfig if you need to configure your sound card.

### **sox (Version 12.16, 189K) (G K)**

SoX (Sound eXchange) is a sound file format converter for Linux, UNIX and DOS PCs. The self-described 'Swiss Army knife of sound tools,' SoX can convert between many different digitized sound formats and perform simple sound manipulation functions, including sound effects.

Install the sox package if you'd like to convert sound file formats or manipulate some sounds.

### **transfig (Version 3.2.1, 292K)**

The transfig utility creates a makefile which translates FIG (created by xfig) or PIC figures into a specified LaTeX graphics language (for example, PostScript(TM)). Transfig is used to create TeX documents which are portable (i.e., they can be printed in a wide variety of environments).

### **xanim (Version 2.80.1, 789K) (G K)**

The XAnim program is an animation/video/audio viewer for the X Window System. XAnim can display a large variety of animation, audio and video formats.

Install the xanim package if you need a viewer for an animation, video or audio file.

### **xfig (Version 3.2.2, 2,543K)**

Xfig is an X Window System tool for creating basic vector graphics, including bezier curves, lines, rulers and more. The resulting graphics can be saved, printed on PostScript printers or converted to a variety of other formats (e.g., X11 bitmaps, Encapsulated PostScript, LaTeX).

You should install xfig if you need a simple program to create vector graphics.

### **xmms (Version 0.9.1, 1,311K) (G K)**

Xmms is an MP3 player for the X Window System with an interface similar to WinAMP's. Xmms supports playlists, streaming content and other sound sources (like CDs), and has a configurable interface.

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For information on the MP3 License, please visit: <http://www.mpeg.org/>.

**xmms-gnome (Version 0.9.1, 47K)**

The xmms-gnome package contains a GNOME panel applet that allows you to control the Xmms MP3 player.

**xpaint (Version 2.4.9, 448K) (G K)**

XPaint is an X Window System color image editing program which supports most standard paint program options. XPaint also supports advanced features like image processing algorithms. XPaint allows you to edit multiple images simultaneously and supports a variety of image formats, including PPM, XBM, TIFF, JPEG, etc.

Install the xpaint package if you need a paint program for X.

### **A.3.10 Productivity**

This section lists packages that will enhance your productivity.

**gnome-pim (Version 1.0.9, 810K) (G)**

The GNOME Personal Information Manager consists of applications to make keeping up with your busy life easier.

Currently these apps are present:

- gnomecal : personal calendar and todo list - gnomecard: contact list of friends and business associates

**gnumeric (Version 0.35, 5,468K) (G)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of GUI applications and desktop tools to be used in conjunction with a window manager for the X Window System. Gnumeric is a spreadsheet program for GNOME. This program is intended to be a replacement for a commercial spreadsheet, so quite a bit of work has gone into the program.

Install gnumeric if you want to use a spreadsheet program with GNOME.

**ical (Version 2.2, 790K) (G K S)**

Ical is an X Window System based calendar program. Ical will easily create/edit/delete entries, create repeating entries, remind you about upcoming

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appointments, print and list item occurrences, and allow shared calendars between different users.

Install ical if you need a calendar program to track your schedule. You'll need to have the X Window System installed in order to use ical.

### **korganizer (Version 1.1.1, 1,495K) (K)**

KOrganizer is a complete calendar and scheduling program for KDE. It allows interchange with other calendar applications through the industry standard vCalendar file format.

## **A.3.11 Publishing**

This section lists packages that can aid in the production of high-quality electronic and paper-based publications.

### **enscript (Version 1.6.1, 1,515K)**

Enscript is a print filter. It can take ASCII input and format it into PostScript output. At the same time, it can also do nice transformations like putting two ASCII pages on one physical page (side by side) or changing fonts.

### **freetype-utils (Version 1.2, 107K)**

This package contains several utilities which allow you to view and manipulate true type fonts. They are mainly useful for debugging and testing purposes, and are not required for using the FreeType library.

### **ghostscript (Version 5.10, 3,443K) (G K S)**

Ghostscript is a set of software that provides a PostScript(TM) interpreter, a set of C procedures (the Ghostscript library, which implements the graphics capabilities in the PostScript language) and an interpreter for Portable Document Format (PDF) files. Ghostscript translates PostScript code into many common, bitmapped formats, like those understood by your printer or screen. Ghostscript is normally used to display PostScript files and to print PostScript files to non-PostScript printers.

If you need to display PostScript files or print them to non-PostScript printers, you should install ghostscript. If you install ghostscript, you also need to install the ghostscript-fonts package.

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**ghostscript-fonts (Version 5.10, 1,490K) (G K S)**

These fonts can be used by the GhostScript interpreter during text rendering. They are in addition to the shared fonts between GhostScript and X11.

**groff (Version 1.11a, 2,842K) (B)**

Groff is a document formatting system. Groff takes standard text and formatting commands as input and produces formatted output. The created documents can be shown on a display or printed on a printer. Groff's formatting commands allow you to specify font type and size, bold type, italic type, the number and size of columns on a page, and more.

You should install groff if you want to use it as a document formatting system. Groff can also be used to format man pages. If you are going to use groff with the X Window System, you'll also need to install the groff-gxditview package.

**groff-gxditview (Version 1.11a, 73K)**

Gxditview displays the groff text processor's output on an X Window System display.

If you are going to use groff as a text processor, you should install gxditview so that you preview your processed text files in X. You'll also need to install the groff package and the X Window System.

**gv (Version 3.5.8, 424K) (G K S)**

Gv provides a user interface for the ghostscript PostScript(TM) interpreter. Derived from the ghostview program, gv can display PostScript and PDF documents using the X Window System.

Install the gv package if you'd like to view PostScript and PDF documents on your system. You'll also need to have the ghostscript package installed, as well as the X Window System.

**lout (Version 3.08, 3,452K)**

Lout is a high-level language for document formatting. Lout reads a high-level description of a document (similar in style to LaTeX) and can produce a PostScript(TM) file for printing or produce plain text. Lout supports the typesetting of documents which contain floating figures, table, diagrams, rotated and scaled text or graphics, footnotes, running headers, footers, an index, a table of contents and bibliography,

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cross-references, mathematical equations and statistical graphs. Lout can be extended with definitions that should be easier to write than other languages, since Lout is a high-level language. Lout supports (with hyphenation) a variety of languages: Czech, Danish, Dutch, English, Finnish, French, German, Norwegian, Russian, Slovenian, Spanish and Swedish.

Install the lout package if you'd like to try the Lout document formatting system. Unless you're already a Lout expert, you'll probably want to also install the lout-doc package, which contains the documentation for Lout.

#### **lout-doc (Version 3.08, 2,069K)**

The lout-doc package includes all of the documentation for the Lout document formatting language. The documentation includes manuals for regular users and for experts, written in Lout and available as PostScript(TM) files. The documentation provides good examples for how to write large documents with Lout.

If you're installing the lout package, you should install the lout-doc package.

#### **mpage (Version 2.4, 90K) (G K S)**

The mpage utility takes plain text files or PostScript(TM) documents as input, reduces the size of the text, and prints the files on a PostScript printer with several pages on each sheet of paper. Mpage is very useful for viewing large printouts without using up tons of paper. Mpage supports many different layout options for the printed pages.

Mpage should be installed if you need a useful utility for viewing long text documents without wasting paper.

#### **printtool (Version 3.41, 114K) (G K S)**

The printtool is a printer configuration tool with a graphical user interface. Printtool can manage both local and remote printers, including Windows (SMB) and NetWare (NCP) printers.

Printtool should be installed so that you can manage local and remote printers.

#### **rhs-printfilters (Version 1.57, 94K) (G K S)**

The rhs-printfilters package contains a set of print filters which are primarily meant to be used with the Red Hat printtool. These print filters provide an easy way for users to handle printing numerous file formats.

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**sgml-tools (Version 1.0.9, 1,877K)**

SGMLtools is a text formatting package based on SGML (Standard Generalized Markup Language). SGMLtools allows you to produce LaTeX, HTML, GNU info, LyX, RTF, plain text (via groff), and other format outputs from a single source. SGMLtools is intended for writing technical software documentation.

Install SGMLTools if you need a text formatting program that can produce a variety of different formats from a single source file. You should probably also install and try SGMLTtools if you're going to write technical software documentation.

**tetex (Version 1.0.6, 28,767K) (G K)**

TeX is an implementation of TeX for Linux or UNIX systems. TeX takes a text file and a set of formatting commands as input and creates a typesetter independent .dvi (DeVice Independent) file as output. Usually, TeX is used in conjunction with a higher level formatting package like LaTeX or PlainTeX, since TeX by itself is not very user-friendly.

Install tetex if you want to use the TeX text formatting system. If you are installing tetex, you will also need to install tetex-afm (a PostScript(TM) font converter for TeX), tetex-dvilj (for converting .dvi files to HP PCL format for printing on HP and HP compatible printers), tetex-dvips (for converting .dvi files to PostScript format for printing on PostScript printers), tetex-latex (a higher level formatting package which provides an easier-to-use interface for TeX) and tetex-xdvi (for previewing .dvi files in X). Unless you're an expert at using TeX, you'll also want to install the tetex-doc package, which includes the documentation for TeX.

**tetex-afm (Version 1.0.6, 2,879K) (G K)**

Tetex-afm provides afm2tfm, a converter for PostScript font metric files. PostScript fonts are accompanied by .afm font metric files which describe the characteristics of each font. To use PostScript fonts with TeX, TeX needs .tfm files that contain similar information. Afm2tfm will convert .afm files to .tfm files.

If you are installing tetex in order to use the TeX text formatting system, you will need to install tetex-afm. You will also need to install tetex-dvilj (for converting .dvi files to HP PCL format for printing on HP and HP compatible printers), tetex-dvips (for converting .dvi files to PostScript format for printing on PostScript printers), tetex-

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latex (a higher level formatting package which provides an easier-to-use interface for TeX) and tetex-xdvi (for previewing .dvi files in X). Unless you're an expert at using TeX, you'll probably also want to install the tetex-doc package, which includes documentation for TeX.

### **tetex-doc (Version 1.0.6, 39,256K)**

The tetex-doc package contains documentation for the TeX text formatting system.

If you want to use TeX and you're not an expert at it, you should install the tetex-doc package. You'll also need to install the tetex package, tetex-afm (a PostScript font converter for TeX), tetex-dvilj (for converting .dvi files to HP PCL format for printing on HP and HP compatible printers), tetex-dvips (for converting .dvi files to PostScript format for printing on PostScript printers), tetex-latex (a higher level formatting package which provides an easier-to-use interface for TeX) and tetex-xdvi (for previewing .dvi files).

### **tetex-dvilj (Version 1.0.6, 345K) (G K)**

Dvilj and dvilj's siblings (included in this package) will convert TeX text formatting system output .dvi files to HP PCL (HP Printer Control Language) commands. Using dvilj, you can print TeX files to HP LaserJet+ and fully compatible printers. With dvilj2p, you can print to HP LaserJet IIP and fully compatible printers. And with dvilj4, you can print to HP LaserJet4 and fully compatible printers.

If you are installing tetex, so that you can use the TeX text formatting system, you will also need to install tetex-dvilj. In addition, you will need to install tetex-afm (for converting PostScript font description files), tetex-dvips (for converting .dvi files to PostScript format for printing on PostScript printers), tetex-latex (a higher level formatting package which provides an easier-to-use interface for TeX) and tetex-xdvi (for previewing .dvi files in X). If you're installing TeX and you're not a TeX expert, you'll also want to install the tetex-doc package, which contains documentation for TeX.

### **tetex-dvips (Version 1.0.6, 734K) (G K)**

Dvips converts .dvi files produced by the TeX text formatting system (or by another processor like GFToDVI) to PostScript(TM) format. Normally the PostScript file is sent directly to your printer.

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If you are installing `tetex`, so that you can use the TeX text formatting system, you will also need to install `tetex-dvips`. In addition, you will need to install `tetex-afm` (for converting PostScript font description files), `tetex-dvilj` (for converting `.dvi` files to HP PCL format for printing on HP and HP compatible printers), `tetex-latex` (a higher level formatting package which provides an easier-to-use interface for TeX) and `tetex-xdvi` (for previewing `.dvi` files in X). If you're installing TeX and you're not an expert at it, you'll also want to install the `tetex-doc` package, which contains documentation for the TeX system.

**`tetex-fonts` (Version 1.0.6, 17,876K) (G K S)**

The `tetex-fonts` package contains fonts used by both the Xdvi previewer and the TeX text formatting system.

You will need to install `tetex-fonts` if you wish to use either `tetex-xdvi` (for previewing `.dvi` files in X) or the `tetex` package (the core of the TeX text formatting system).

**`tetex-latex` (Version 1.0.6, 8,564K) (G K)**

LaTeX is a front end for the TeX text formatting system. Easier to use than TeX, LaTeX is essentially a set of TeX macros which provide convenient, predefined document formats for users.

If you are installing `tetex`, so that you can use the TeX text formatting system, you will also need to install `tetex-latex`. In addition, you will need to install `tetex-afm` (for converting PostScript font description files), `tetex-dvilj` (for converting `.dvi` files to HP PCL format for printing on HP and HP compatible printers), `tetex-dvips` (for converting `.dvi` files to PostScript format for printing on PostScript printers) and `tetex-xdvi` (for previewing `.dvi` files in X). If you're not an expert at TeX, you'll probably also want to install the `tetex-doc` package, which contains documentation for TeX.

**`tetex-xdvi` (Version 1.0.6, 1,246K) (G K S)**

Xdvi allows you to preview the TeX text formatting system's output `.dvi` files on an X Window System.

If you are installing `tetex`, so that you can use the TeX text formatting system, you will also need to install `tetex-xdvi`. In addition, you will need to install `tetex-afm` (a PostScript font converter for TeX), `tetex-dvilj` (for converting `.dvi` files to HP PCL format for printing on HP and HP compatible printers), `tetex-dvips` (for converting

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.dvi files to PostScript format for printing on PostScript printers), and tetex-latex (a higher level formatting package which provides an easier-to-use interface for TeX). If you're not a TeX expert, you'll probably also want to install the tetex-doc package, which contains documentation for the TeX text formatting system.

### **texinfo (Version 3.12h, 814K) (G K S)**

Texinfo is a documentation system that can produce both online information and printed output from a single source file. Normally, you'd have to write two separate documents: one for online help or other online information and the other for a typeset manual or other printed work. Using Texinfo, you only need to write one source document. Then when the work needs revision, you only have to revise one source document. The GNU Project uses the Texinfo file format for most of its documentation.

Install texinfo if you want a documentation system for producing both online and print documentation from the same source file and/or if you are going to write documentation for the GNU Project.

### **xpdf (Version 0.90, 1,943K)**

Xpdf is an X Window System based viewer for Portable Document Format (PDF) files. PDF files are sometimes called Acrobat files, after Adobe Acrobat (Adobe's PDF viewer). Xpdf is a small and efficient program which uses standard X fonts.

Install the xpdf package if you need a viewer for PDF files.

## **A.3.12 System**

This section lists packages that provide utilities that perform various system-related functions.

### **SVGATextMode (Version 1.8, 852K)**

SVGATextMode is a utility for reprogramming (S)VGA hardware, which can improve the appearance of text consoles. You should install SVGATextMode if you want to alter the appearance of your text consoles. The utility uses a configuration file (Xconfig or XF86Config) to set up textmodes with higher resolution, larger fonts, higher display refresh rates, etc.

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Although `SVGATextMode` can be used to program any text mode size, your results will depend on your VGA card.

**arpwatch (Version 2.1a4, 127K)**

The `arpwatch` package contains `arpwatch` and `arpsnmp`. `Arpwatch` and `arpsnmp` are both network monitoring tools. Both utilities monitor Ethernet or FDDI network traffic and build databases of Ethernet/IP address pairs, and can report certain changes via email.

Install the `arpwatch` package if you need networking monitoring devices which will automatically keep traffic of the IP addresses on your network.

**auth\_ldap (Version 1.4.0, 76K)**

This is an authentication module for Apache that allows you to authenticate HTTP clients using user entries in an LDAP directory.

**autorun (Version 2.3, 359K) (G K)**

`autorun` automatically recognizes all available CDRoms in your system and mounts them upon insertion and executes a possible `autorun` executable on the CD. To allow an ordinary user to do this you have to add the options `user,exec` in `/etc/fstab` to the `cdroms` you want to use.

**bind-utils (Version 8.2.1, 1,277K) (G K S)**

`Bind-utils` contains a collection of utilities for querying DNS (Domain Name Service) name servers to find out information about Internet hosts. These tools will provide you with the IP addresses for given host names, as well as other information about registered domains and network addresses.

You should install `bind-utils` if you need to get information from DNS name servers.

**comanche (Version 990405, 375K)**

`Comanche` (CONfiguration MANager for apaCHE) is a front-end for the Apache Web server, the most popular Web server used on the Internet. `Comanche` aims to make it easier to manage and configure Apache.

Install the `comanche` package if you need a configuration manager for the Apache Web server. You'll also need to install the `apache` package.

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**console-tools (Version 19990302, 1,467K) (B)**

The console-tools package contains tools for managing a Linux system's console's behavior, including the keyboard, the screen fonts, the virtual terminals and font files.

**dialog (Version 0.6, 88K) (G K)**

Dialog is a utility that allows you to show dialog boxes (containing questions or messages) in TTY (text mode) interfaces. Dialog is called from within a shell script. The following dialog boxes are implemented: yes/no, menu, input, message, text, info, checklist, radiolist, and gauge.

Install dialog if you would like to create TTY dialog boxes.

**dosfstools (Version 2.2, 113K) (G K)**

The mkdosfs program is used to create an MS-DOS FAT file system on a Linux system device, usually a disk partition.

The mkdosfs package should be installed if your machine needs to support MS-DOS style file systems.

**ext2ed (Version 0.1, 288K)**

Ext2ed is a program which provides a text and window interface for examining and editing an ext2 filesystem. Ext2ed is supposed to be easier to use than debugfs, but debugfs is more powerful. Note that this program should only be used by someone who is very experienced at hacking filesystems.

Install ext2ed if you want to examine and/or edit your ext2 filesystem, and you know what you're doing.

**fbset (Version 2.0.19990118, 34K)**

fbset is a utility for querying and changing video modes of fbcon consoles.

**gnome-linuxconf (Version 0.22, 320K) (G K S)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of applications and desktop tools to be used in conjunction with a window manager for the X Window System. The gnome-linuxconf package includes GNOME's front end for the linuxconf system configuration utility.

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**gnome-utils (Version 1.0.13, 1,000K) (G)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of GUI applications and desktop tools to be used in conjunction with a window manager for the X Window System. The `gnome-utils` package includes a set of utilities for GNOME, including `Gcalc`, `Gdialog`, `Gdiskfree`, and many others.

**gnorpm (Version 0.9, 424K) (G K S)**

GnoRPM is a graphical front-end to the Red Hat Package Manager (RPM). GnoRPM is similar to Glint, but is written using the GTK+ widget set and the GNOME libraries. GnoRPM is currently in development, so some features are missing, but you can currently query, install, upgrade, uninstall and verify packages using a GUI interface.

**gtop (Version 1.0.1, 267K) (G)**

GNOME is the GNU Network Object Model Environment. This powerful environment is both easy to use and easy to configure.

This package will install the GNOME system monitor `gtop`, which shows memory graphs and processes.

**hdparm (Version 3.5, 38K) (B)**

Hdparm is a useful system utility for setting (E)IDE hard drive parameters. For example, `hdparm` can be used to tweak hard drive performance and to spin down hard drives for power conservation.

**iproute (Version 2.2.4, 1,344K)**

Linux 2.2 maintains compatibility with the basic configuration utilities of the network (`ifconfig`, `route`) but a new utility is required to exploit the new characteristics and features of the kernel. This package includes the new utilities (`/sbin/ip`, `/sbin/rtnetlink`).

**ipxutils (Version 2.2.0.16.a, 70K) (S)**

The `ipxutils` package includes utilities (`ipx_configure`, `ipx_internal_net`, `ipx_interface`, `ipx_route`) necessary for configuring and debugging IPX interfaces and networks under Linux. IPX is the low-level protocol used by Novell's NetWare file server system to transfer data.

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Install ipxutils if you need to configure IPX networking on your network.

**isdn4k-utils (Version 3.0, 3,883K)**

This package contains a collection of utilities. It is required for configuration of isdn-subsystem.

**isicom (Version 1.0, 38K)**

Binary images and loader for Multitech IntelligentSerialInternal (ISI) data files.

**kdeadmin (Version 1.1.2, 1,614K) (K)**

System Administration tools for the K Desktop Environment.

Included with this package are: kdat (tape backup); ksysv (sysV init editor); kuser (user administration tool)

**kdeutils (Version 1.1.2, 3,723K) (K)**

Utilities for the K Desktop Environment. Includes: ark (tar/gzip archive manager); kab (address book); karm (personal time tracker); kcalc (scientific calculator); kedit (simple text editor); kfloppy (floppy formatting tool); khxedit (hex editor); kjots (note taker); klipper (clipboard tool); kljettool(HP printer configuration tool); klpq (print queue manager) knotes (post-it notes for the desktop); kpm (process manager similar to 'top', but more advanced);kwrite (improved text editor).

**kernelcfg (Version 0.5, 58K) (G K S)**

The kernelcfg package contains an X Window System based graphical user interface tool for configuring the kernel daemon (kerneld). Kerneld automatically loads some hardware and software support into memory as needed and unloads the support when it is no longer being used. The kernel configurator tool can be used to tell kerneld what hardware support to load when it is presented with a generic hardware request.

Kernelcfg should be installed because it is a useful utility for managing the kernel daemon.

**nfdsd-clients (Version 1.4.7, 39K) (G K S)**

The nfs-server-clients package contains the showmount program. Showmount queries the mount daemon on a remote host for information about the NFS (Network File System) server on the remote host. For example, showmount can display the

clients which are mounted on that host. This package is not needed to mount NFS volumes.

Install `nfs-server-clients` if you'd like to use the `showmount` tool for querying NFS servers.

### **kpackage (Version 1.3.8, 628K) (K)**

Kpackage is a GUI interface to the RPM, Debian, Slackware and BSD package managers, it is similar in some ways to GLINT. Kpackage is part of the K Desktop Environment and, as a result, it was designed from the outset to integrate with the KDE file manager.

### **kudzu (Version 0.15, 257K) (B)**

Kudzu is a hardware probing tool run at system boot time to determine what hardware has been added or removed from the system.

### **linuxconf (Version 1.16r1.3, 9,377K) (B)**

Linuxconf is an extremely capable system configuration tool. Linuxconf provides four different interfaces for you to choose from: command line, character-cell (like the installation program), an X Window System based GUI and a web-based interface. Linuxconf can manage a large proportion of your system's operations, including networking, user accounts, file systems, boot parameters, and more.

Linuxconf will simplify the process of configuring your system. Unless you are completely happy with configuring your system manually, you should install the `linuxconf` package and use `linuxconf` instead.

### **macutils (Version 2.0b3, 218K)**

The `macutils` package includes a set of utilities for manipulating files that are commonly used by Macintosh machines. `Macutils` includes utilities like `binhex`, `hexbin`, `macunpack`, etc.

Install `macutils` if you need to manipulate files that are commonly used by Macintosh machines.

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**mkxauth (Version 1.7, 15K) (G K S)**

The mkxauth utility helps create and maintain X authentication databases (.Xauthority files). Mxauth is used to create an .Xauthority file or to merge keys from another local or remote .Xauthority file. .Xauthority files are used by the xauth user-oriented access control program, which grants or denies access to X servers based on the contents of the .Xauthority file.

The mkxauth package should be installed if you're going to use user-oriented access control to provide security for your X Window System (a good idea).

**modemtool (Version 1.21, 15K) (G K S)**

The modemtool is a simple graphical configuration tool for selecting the serial port to which your modem is connected.

Install modemtool if you use a modem.

**mt-st (Version 0.5b, 69K) (B)**

The mt-st package contains the mt and st tape drive management programs. Mt (for magnetic tape drives) and st (for SCSI tape devices) can control rewinding, ejecting, skipping files and blocks and more.

Install mt-st if you need a tool to manage tape drives.

**mtools (Version 3.9.1, 486K) (G K)**

Mtools is a collection of utilities for accessing MS-DOS files. Mtools allow you to read, write and move around MS-DOS filesystem files (normally on MS-DOS floppy disks). Mtools supports Windows95 style long file names, OS/2 Xdf disks, and 2m disks.

Mtools should be installed if you need to use MS-DOS disks.

**ncpfs (Version 2.2.0.16.a, 980K) (S)**

Ncpfs is a filesystem which understands the Novell NetWare(TM) NCP protocol. Functionally, NCP is used for NetWare the way NFS is used in the TCP/IP world. For a Linux system to mount a NetWare filesystem, it needs a special mount program. The ncpfs package contains such a mount program plus other tools for configuring and using the ncpfs filesystem.

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Install the `ncpfs` package if you need to use the `ncpfs` filesystem to use Novell NetWare files or services.

**netcfg (Version 2.21, 166K) (G K S)**

A Red Hat Linux tool which provides a graphical user interface for setting up and configuring networking for your machine.

**open (Version 1.4, 13K)**

The `open` command starts a specified command with the first available virtual console, or on a virtual console that you specify.

Install the `open` package if you regularly use virtual consoles to run programs.

**pciutils (Version 2.0, 124K) (B)**

This package contains various utilities for inspecting and setting devices connected to the PCI bus.

It requires kernel version 2.1.82 or newer (supporting the `/proc/bus/pci` interface).

**psmisc (Version 18, 46K) (B)**

The `psmisc` package contains utilities for managing processes on your system: `pstree`, `killall` and `fuser`. The `pstree` command displays a tree structure of all of the running processes on your system. The `killall` command sends a specified signal (SIGTERM if nothing is specified) to processes identified by name. The `fuser` command identifies the PIDs of processes that are using specified files or filesystems.

**procinfo (Version 17, 57K)**

The `procinfo` command gets system data from the `/proc` directory (the kernel filesystem), formats it and displays it on standard output. You can use `procinfo` to acquire information about your system from the kernel as it is running.

Install `procinfo` if you'd like to use it to gather and display system data.

**procps (Version 2.0.3, 312K) (B)**

The `procps` package contains a set of system utilities which provide system information. `Procps` includes `ps`, `free`, `sessreg`, `skill`, `snice`, `tload`, `top`, `uptime`, `vmstat`, `w`, and `watch`. The `ps` command displays a snapshot of running processes. The `top` command provides a repetitive update of the statuses of running processes. The `free`

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command displays the amounts of free and used memory on your system. Sessreg is a simple program for managing utmp/wtmp entries for xdm sessions. The skill command sends a terminate command (or another specified signal) to a specified set of processes. The snice command is used to change the scheduling priority of specified processes. The tload command prints a graph of the current system load average to a specified tty. The uptime command displays the current time, how long the system has been running, how many users are logged on and system load averages for the past one, five and fifteen minutes. The w command displays a list of the users who are currently logged on and what they're running. The watch program watches a running program. The vmstat command displays virtual memory statistics about processes, memory, paging, block I/O, traps and CPU activity.

### **procps-X11 (Version 2.0.3, 0K)**

The procps-X11 package contains the XConsole shell script, a backwards-compatibility wrapper for the xconsole program. The xconsole program displays system messages which are usually sent to /dev/console.

### **psacct (Version 6.3, 87K)**

The psacct package contains several utilities for monitoring process activities, including ac, lastcomm, accton and sa. The ac command displays statistics about how long users have been logged on. The lastcomm command displays information about previous executed commands. The accton command turns process accounting on or off. The sa command summarizes information about previously executed commands.

Install the psacct package if you'd like to use its utilities for monitoring process activities on your system.

### **rdate (Version 0.960923, 5K) (G K S)**

The rdate utility retrieves the date and time from another machine on your network, using the protocol described in RFC 868. If you run rdate as root, it will set your machine's local time to the time of the machine that you queried. Note that rdate isn't scrupulously accurate. If you are worried about milliseconds, get the xntpd program instead.

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**rdist (Version 6.1.5, 141K) (G K S)**

The rdist program maintains identical copies of files on multiple hosts. If possible, rdist will preserve the owner, group, mode and mtime of files and it can update programs that are executing.

**rp3 (Version 0.12, 2,016K) (G)**

The rp3 program provides an easy-to-use interface for configuring PPP connections, and for activating and monitoring any type of network configuration. rp3 includes a GNOME panel applet, a more highly functional replacement for usernet, and a graphical configuration tool that takes you through the process of setting up a PPP connection from start to finish, one step at a time.

**rhmask (Version 1.0, 8K)**

The rhmask utility creates mask files from original and updated files. The mask files, which may be the latest new versions of software, can then be freely distributed on public Internet servers. The mask files are only useful for people who already have a copy of the original package. The rhmask utility uses a simple XOR scheme for creating the file mask and uses file size and md5 sums to ensure the integrity of the result.

Install the rhmask package if you need a utility for creating file masks.

**rpm2html (Version 1.2, 296K)**

The rpm2html utility automatically generates web pages that describe a set of RPM packages. The goals of rpm2html are to identify the dependencies between various packages, and to find the package(s) that will provide the resources needed to install a given package. Rpm2html analyzes the provides and requires of the given set of RPMs, and then shows the dependency cross-references using hypertext links. Rpm2html can now dump the metadata associated with RPM files into standard RDF files.

**rpmfind (Version 1.2, 424K)**

Rpmfind will query the local RPM database, or will request the associated RDF file for a program on a remote database, for information on a specified program. Specifically, rpmfind will tell you what packages are needed to install the program to satisfy

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all dependencies and the size of the packages (so you can estimate download time). Rpmfind can then download the packages for you.

**samba-client (Version 2.0.5a, 1,018K) (G K S)**

Samba-client provides some SMB clients, which complement the built-in SMB filesystem in Linux. These allow the accessing of SMB shares, and printing to SMB printers.

**samba-common (Version 2.0.5a, 900K) (G K S)**

Samba-common provides files necessary for both the server and client packages of Samba.

**screen (Version 3.9.4, 453K)**

The screen utility allows you to have multiple logins on just one terminal. Screen is useful for users who telnet into a machine or are connected via a dumb terminal, but want to use more than just one login.

Install the screen package if you need a screen manager that can support multiple logins on one terminal.

**setconsole (Version 1.0, 3K) (B)**

Setconsole is a basic system utility for setting up the `/etc/inittab`, `/dev/systty` and `/dev/console` files to handle a new console. The console can be either the local terminal (i.e., directly attached to the system via a video card) or a serial console.

**setserial (Version 2.15, 37K) (B)**

Setserial is a basic system utility for displaying or setting serial port information. Setserial can reveal and allow you to alter the I/O port and IRQ that a particular serial device is using, and more.

You should install setserial because you may find it useful for detecting and/or altering device information.

**setuptools (Version 1.2, 7K) (B)**

Setuptools is a user-friendly text mode menu utility which allows you to access all of the text mode configuration programs included in the Red Hat Linx operating system.

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You should install the `setuptools` package because you will find yourself using its features for essential system administration.

**statserial (Version 1.1, 289K) (G K S)**

The `statserial` utility displays a table of the signals on a standard 9-pin or 25-pin serial port and indicates the status of the handshaking lines. `Statserial` is useful for debugging serial port and/or modem problems.

Install the `statserial` package if you need a tool to help debug serial port or modem problems.

**swatch (Version 2.2, 129K)**

The `Swatch` utility monitors system log files, filters out unwanted data and takes specified actions (i.e., sending email, executing a script, etc.) based upon what it finds in the log files.

Install the `swatch` package if you need a program that will monitor log files and alert you in certain situations.

**symlinks (Version 1.2, 212K)**

The `symlinks` utility performs maintenance on symbolic links. `Symlinks` checks for symlink problems, including dangling symlinks which point to nonexistent files. `Symlinks` can also automatically convert absolute symlinks to relative symlinks.

Install the `symlinks` package if you need a program for maintaining symlinks on your system.

**time (Version 1.7, 18K) (B)**

The GNU `time` utility runs another program, collects information about the resources used by that program while it is running and displays the results.

`Time` can help developers optimize their programs.

**timeconfig (Version 3.0, 416K) (B)**

The `timeconfig` package contains two utilities: `timeconfig` and `setclock`. `Timeconfig` provides a simple text mode tool for configuring the time parameters in `/etc/sysconfig/clock` and `/etc/localtime`. The `setclock` tool sets the hardware clock on the system to the current time stored in the system clock.

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**timetool (Version 2.7, 22K) (G K S)**

The timetool utility provides a graphical user interface for setting the current date and time on your system.

**tksysv (Version 1.0, 35K) (G K S)**

Tksysv is an X Window System based graphical interface for editing the services provided by different runlevels. Tksysv is used to set which services are stopped and which services are started in the different runlevels on your system.

Install the tksysv package if you'd like to use a graphical tool for editing runlevel services.

**tunelp (Version 1.3, 9K)**

The tunelp utility sets various parameters for lp devices (/dev/lp0, /dev/lp1, /dev/lp2). Tunelp can set parameters like the lp device's interrupt usage, polling rate, etc.

Install the tunelp package if you need a utility for setting lp device parameters.

**ucd-snmp-utils (Version 4.0.1, 322K) (G K S)**

The ucd-snmp package contains various utilities for use with the UCD-SNMP network management project.

Install this package if you need utilities for managing your network using the SNMP protocol. You'll also need to install the ucd-snmp package.

**usermode (Version 1.10, 106K) (G K S)**

The usermode package contains several graphical tools for users: userinfo, usermount and userpasswd. Userinfo allows users to change their finger information. Usermount lets users mount, unmount, and format filesystems. Userpasswd allows users to change their passwords.

Install the usermode package if you would like to provide users with graphical tools for certain account management tasks.

**vlock (Version 1.3, 9K)**

The vlock program locks one or more sessions on the console. Vlock can lock the current terminal (local or remote) or the entire virtual console system, which completely

disables all console access. The vlock program unlocks when either the password of the user who started vlock or the root password is typed.

Install vlock if you need to disable access to one console or to all virtual consoles.

**which (Version 2.8, 26K) (B)**

The which command shows the full pathname of a specified program, if the specified program is in your PATH.

**xcpustate (Version 2.5, 33K)**

The xcpustate utility is an X Window System based monitor which shows the amount of time that the CPU is spending in different states. On a Linux system, xcpustate displays a bar that indicates the amounts of idle, user, nice and system time (from left to right) used by the CPU.

Install the xcpustate package if you'd like to use a horizontal bar style CPU state monitor.

**xisdnload (Version 1.37, 54K)**

xisdnload displays a periodically updating histogram of the ISDN load average.

**xosview (Version 1.7.1, 109K)**

The xosview utility displays a set of bar graphs which show the current system state, including memory usage, CPU usage, system load, etc. Xosview runs under the X Window System.

Install the xosview package if you need a graphical tool for monitoring your system's performance.

**xsysinfo (Version 1.6, 22K)**

Xsysinfo is a graphic kernel monitoring tool for the X Window System. Xsysinfo displays vertical bars for certain kernel parameters: CPU load average, CPU load, memory and swap sizes.

Install the xsysinfo package if you'd like to use a graphical kernel monitoring tool.

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**xtoolwait (Version 1.2, 10K)**

Xtoolwait is a utility which starts an X client in the background, waits for a window to be mapped on the root window, and then exits. Xtoolwait can improve performance for users who start a bunch of X clients automatically (for example, xterm, xlock, xconsole, whatever) when the X session starts.

Install xtoolwait if you'd like to try to speed up the startup time for X sessions.

**A.3.13 Text**

This section lists packages that provide utilities related to the handling and manipulation of text.

**diffutils (Version 2.7, 161K) (B)**

Diffutils includes four utilities: diff, cmp, diff3 and sdiff. Diff compares two files and shows the differences, line by line. The cmp command shows the offset and line numbers where two files differ, or cmp can show the characters that differ between the two files. The diff3 command shows the differences between three files. Diff3 can be used when two people have made independent changes to a common original; diff3 can produce a merged file that contains both persons' changes and warnings about conflicts. The sdiff command can be used to merge two files interactively.

Install diffutils if you need to compare text files.

**ed (Version 0.2, 102K) (B)**

Ed is a line-oriented text editor, used to create, display, and modify text files (both interactively and via shell scripts). For most purposes, ed has been replaced in normal usage by full-screen editors (emacs and vi, for example).

Ed was the original UNIX editor, and may be used by some programs. In general, however, you probably don't need to install it and you probably won't use it much.

**gawk (Version 3.0.4, 2,344K) (B)**

The gawk packages contains the GNU version of awk, a text processing utility. Awk interprets a special-purpose programming language to do quick and easy text pattern matching and reformatting jobs. Gawk should be upwardly compatible with the

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Bell Labs research version of `awk` and is almost completely compliant with the 1993 POSIX 1003.2 standard for `awk`.

Install the `gawk` package if you need a text processing utility. `Gawk` is considered to be a standard Linux tool for processing text.

### **grep (Version 2.3, 287K) (B)**

The GNU versions of commonly used `grep` utilities. `Grep` searches one or more input files for lines which contain a match to a specified pattern and then prints the matching lines. GNU's `grep` utilities include `grep`, `egrep` and `fgrep`.

You should install `grep` on your system, because it is a very useful utility for searching through text files, for system administration tasks, etc.

### **indent (Version 2.2.0, 104K)**

`Indent` is a GNU program for beautifying C code, so that it is easier to read. `Indent` can also convert from one C writing style to a different one. `Indent` understands correct C syntax and tries to handle incorrect C syntax.

Install the `indent` package if you are developing applications in C and you'd like to format your code automatically.

### **ispell (Version 3.1.20, 6,202K) (G K S)**

`Ispell` is the GNU interactive spelling checker. `Ispell` will check a text file for spelling and typographical errors. When it finds a word that is not in the dictionary, it will suggest correctly spelled words for the misspelled word.

You should install `ispell` if you need a program for spell checking (and who doesn't...).

### **ispell-catalan (Version 3.1.20, 4,339K)**

Catalan `ispell` files.

### **ispell-czech (Version 3.1.20, 2,631K)**

Czech `ispell` files.

### **ispell-danish (Version 3.1.20, 1,607K)**

Danish `ispell` files.

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**ispell-dicts (Version 3.1.20, 27,049K)**

Dictionaries for generating ispell files.

**ispell-dutch (Version 3.1.20, 3,120K)**

Dutch ispell files.

**ispell-esperanto (Version 3.1.20, 983K)**

Esperanto ispell files.

**ispell-french (Version 3.1.20, 1,502K)**

French ispell files.

**ispell-german (Version 3.1.20, 3,592K)**

German ispell files.

**ispell-greek (Version 3.1.20, 2,057K)**

Greek ispell files.

**ispell-italian (Version 3.1.20, 1,654K)**

Italian ispell files.

**ispell-norwegian (Version 3.1.20, 2,511K)**

Norwegian ispell files.

**ispell-polish (Version 3.1.20, 4,227K)**

Polish ispell files.

**ispell-portuguese (Version 3.1.20, 1,165K)**

Portuguese ispell files.

**ispell-russian (Version 3.1.20, 8,320K)**

Russian ispell files.

**ispell-spanish (Version 3.1.20, 2,813K)**

Spanish ispell files.

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**ispell-swedish (Version 3.1.20, 790K)**

Swedish ispell files.

**less (Version 340, 154K) (B)**

The less utility is a text file browser that resembles more, but has more capabilities. Less allows you to move backwards in the file as well as forwards. Since less doesn't have to read the entire input file before it starts, less starts up more quickly than text editors (for example, vi).

You should install less because it is a basic utility for viewing text files, and you'll use it frequently.

**m4 (Version 1.4, 120K) (G K S)**

A GNU implementation of the traditional UNIX macro processor. M4 is useful for writing text files which can be logically parsed, and is used by many programs as part of their build process. M4 has built-in functions for including files, running shell commands, doing arithmetic, etc. The autoconf program needs m4 for generating configure scripts, but not for running configure scripts.

Install m4 if you need a macro processor.

**mawk (Version 1.2.2, 131K)**

Mawk is a version of the awk programming language. Awk interprets a special-purpose programming language to do quick text pattern matching and reformatting. Mawk improves on awk in certain ways and can sometimes outperform gawk, the standard awk program for Linux. Mawk conforms to the POSIX 1003.2 (draft 11.3) definition of awk.

You should install mawk if you use awk.

**rgrep (Version 0.98.7, 17K)**

The rgrep utility can recursively descend through directories as it greps for the specified pattern. Note that this ability does take a toll on rgrep's performance, which is somewhat slow. Rgrep will also highlight the matching expression.

Install the rgrep package if you need a recursive grep which can highlight the matching expression.

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**sed (Version 3.02, 68K) (B)**

The sed (Stream EDitor) editor is a stream or batch (non-interactive) editor. Sed takes text as input, performs an operation or set of operations on the text and outputs the modified text. The operations that sed performs (substitutions, deletions, insertions, etc.) can be specified in a script file or from the command line.

**textutils (Version 2.0, 1,292K) (B)**

A set of GNU utilities for modifying the contents of files, including programs for splitting, joining, comparing and modifying files.

## A.4 Development

This section contains packages of interest to programmers. Red Hat Linux comes with a very powerful and rich set of tools for the programmer, so there are several different subsections here.

### A.4.1 Debuggers

This section contains a number of packages that make it easier to find bugs in a program.

**gdb (Version 4.18, 1,418K) (G K S)**

Gdb is a full featured, command driven debugger. Gdb allows you to trace the execution of programs and examine their internal state at any time. Gdb works for C and C++ compiled with the GNU C compiler gcc.

If you are going to develop C and/or C++ programs and use the GNU gcc compiler, you may want to install gdb to help you debug your programs.

**lslk (Version 1.19, 35K)**

Lslk is a lock file lister. Lslk attempts to list all of the locks on the executing system's local files (i.e., on the active inodes).

Install lslk if you need a utility for listing file locks.

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**lsof (Version 4.45, 578K) (B)**

Lsof's name stands for LiSt Open Files, and it does just that. It lists information about files that are open by the processes running on a UNIX system.

**ltrace (Version 0.3.6, 75K)**

Ltrace is a debugging program which runs a specified command until the command exits. While the command is executing, ltrace intercepts and records both the dynamic library calls called by the executed process and the signals received by the executed process. Ltrace can also intercept and print system calls executed by the process.

You should install ltrace if you need a sysadmin tool for tracking the execution of processes.

**strace (Version 3.99.1, 117K) (G K S)**

The strace program intercepts and records the system calls called and received by a running process. Strace can print a record of each system call, its arguments and its return value. Strace is useful for diagnosing problems and debugging, as well as for instructional purposes.

Install strace if you need a tool to track the system calls made and received by a process.

**sysreport (Version 1.0, 12K)**

Sysreport is a utility for gathering information about your systems hardware and configuration for diagnostic and debugging. Its purpose is to aid Support Technicians and Developers by getting a "snapshot" of your current systems layout.

**xxgdb (Version 1.12, 103K) (G K)**

Xxgdb is an X Window System graphical interface to the GNU gdb debugger. Xxgdb provides visual feedback and supports a mouse interface for the user who wants to perform debugging tasks like the following: controlling program execution through breakpoints, examining and traversing the function call stack, displaying values of variables and data structures, and browsing source files and functions.

Install the xxgdb package if you'd like to use a graphical interface with the GNU gdb debugger. You'll also need to have the gdb package installed.

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## A.4.2 Languages

This section lists the packages containing various programming languages.

### **compat-egcs (Version 5.2, 2,096K)**

This package includes a compiler that can be used to generate binaries that will run on older Red Hat Linux systems (namely Red Hat Linux 5.2, or glibc 2.0.X based systems). This package includes the C compiler and required compiler libraries for those systems.

### **compat-egcs-c++ (Version 5.2, 3,219K)**

This package includes a compiler that can be used to generate binaries that will run on older Red Hat Linux systems (namely Red Hat Linux 5.2, or glibc 2.0.X based systems). This package includes the C++ compiler and libraries for those older systems.

### **compat-egcs-g77 (Version 5.2, 2,104K)**

This package includes a compiler that can be used to generate binaries that will run on older Red Hat Linux systems (namely Red Hat Linux 5.2, or glibc 2.0.X based systems). This package includes the Fortran 77 compiler and libraries for those older systems.

### **compat-egcs-objc (Version 5.2, 1,490K)**

This package includes a compiler that can be used to generate binaries that will run on older Red Hat Linux systems (namely Red Hat Linux 5.2, or glibc 2.0.X based systems). This package includes the Objective C compiler and libraries for those older systems.

### **cpp (Version 1.1.2, 135K) (G K S)**

Cpp (or ccpp) is the GNU C-Compatible Compiler Preprocessor. Cpp is a macro processor which is used automatically by the C compiler to transform your program before actual compilation. It is called a macro processor because it allows you to define macros, abbreviations for longer constructs.

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The C preprocessor provides four separate functionalities: the inclusion of header files (files of declarations that can be substituted into your program); macro expansion (you can define macros, and the C preprocessor will replace the macros with their definitions throughout the program); conditional compilation (using special preprocessing directives, you can include or exclude parts of the program according to various conditions); and line control (if you use a program to combine or rearrange source files into an intermediate file which is then compiled, you can use line control to inform the compiler about where each source line originated).

You should install this package if you are a C programmer and you use macros.

### **egcs (Version 1.1.2, 3,528K) (G K S)**

The egcs package contains the GNU Compiler Collection: cc, gcc and egcs. You'll need this package in order to compile C/C++ code.

### **egcs-c++ (Version 1.1.2, 5,913K) (G K)**

This package adds C++ support to the GNU C compiler. It includes support for most of the current C++ specification, including templates and exception handling. It does include the static standard C++ library and C++ header files; the library for dynamically linking programs is available separately.

### **egcs-g77 (Version 1.1.2, 4,642K)**

The egcs-g77 package provides support for compiling Fortran 77 programs with the GNU gcc compiler.

You should install egcs-g77 if you are going to do Fortran development and you would like to use the gcc compiler. You will also need gcc, which is included in the egcs package.

### **egcs-objc (Version 1.1.2, 1,973K)**

Egcs-objc provides Objective C support for the GNU C compiler (gcc). Mainly used on systems running NeXTSTEP, Objective C is an object-oriented derivative of the C language.

Install egcs-objc if you are going to do Objective C development and you would like to use the gcc compiler. You'll also need gcc, which is included in the egcs package.

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**expect (Version 5.28, 739K) (G K S)**

Expect is a tcl extension for automating interactive applications such as telnet, ftp, passwd, fsck, rlogin, tip, etc. Expect is also useful for testing the named applications. Expect makes it easy for a script to control another program and interact with it.

Install the expect package if you'd like to develop scripts which interact with interactive applications. You'll also need to install the tcl package.

**gnome-objc (Version 1.0.2, 665K)**

This package installs basic libraries you must have to use GNOME programs that are built with Objective C.

GNOME is the GNU Network Object Model Environment. It's a powerful, pleasing, easy to use and configure environment for your computer.

**guile (Version 1.3, 1,029K) (G)**

GUILE (GNU's Ubiquitous Intelligent Language for Extension) is a library implementation of the Scheme programming language, written in C. GUILE provides a machine-independent execution platform that can be linked in as a library during the building of extensible programs.

Install the guile package if you'd like to add extensibility to programs that you are developing.

**itcl (Version 3.0.1, 4,252K)**

[incr Tcl] is an object-oriented extension of the Tcl language. It was created to support more structured programming in Tcl. Tcl scripts that grow beyond a few thousand lines become extremely difficult to maintain. This is because the building blocks of vanilla Tcl are procedures and global variables, and all of these building blocks must reside in a single global namespace. There is no support for protection or encapsulation.

[incr Tcl] introduces the notion of objects. Each object is a bag of data with a set of procedures or "methods" that are used to manipulate it. Objects are organized into "classes" with identical characteristics, and classes can inherit functionality from one another. This object-oriented paradigm adds another level of organization on top of

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the basic variable/procedure elements, and the resulting code is easier to understand and maintain.

**jikes (Version 1.02, 2,612K)**

The IBM Research Jikes compiler translates Java source files to bytecode. Features include strict adherence to the language specification, extremely fast compile speed, and a sophisticated dependence analysis that allows incremental compilation and automatic makefile generation.

The release of the source in December 1998 initiated one of IBM's first efforts in the open source arena, and since that time Jikes has been maintained and refined using the open source development model. See <http://ibm.com/research/jikes> for further information.

**kaffe (Version 1.0.b4, 1,977K)**

Kaffe is a free virtual machine designed to execute Java(TM) bytecode. Kaffe can be configured in two modes. In the first mode, it operates as a pure bytecode interpreter (not unlike Javasoft's machine). In the second mode, it performs "just-in-time" code conversion from the abstract code to the host machine's native code. The second mode will ultimately allow execution of Java code at the same speed as standard compiled code, while also maintaining the advantages and flexibility of code independence.

Install the kaffe package if you need a Java virtual machine.

**p2c (Version 1.22, 697K)**

P2c is a system for translating Pascal programs into the C language. P2c accepts input source files in certain Pascal dialects: HP Pascal, Turbo/UCSD Pascal, DEC VAX Pascal, Oregon Software Pascal/2, Macintosh Programmer's Workshop Pascal and Sun/Berkeley Pascal. P2c outputs a set of .c and .h files which make up a C program equivalent to the original Pascal program. The C program can then be compiled using a standard C compiler, such as gcc.

Install the p2c package if you need a program for translating Pascal code into C code.

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**p2c-devel (Version 1.22, 25K)**

The p2c-devel package contains the files necessary for development of the p2c Pascal to C translation system.

Install the p2c-devel package if you want to do p2c development.

**perl (Version 5.00503, 16,127K) (B)**

Perl is a high-level programming language with roots in C, sed, awk and shell scripting. Perl is good at handling processes and files, and is especially good at handling text. Perl's hallmarks are practicality and efficiency. While it is used to do a lot of different things, Perl's most common applications (and what it excels at) are probably system administration utilities and web programming. A large proportion of the CGI scripts on the web are written in Perl. You need the perl package installed on your system so that your system can handle Perl scripts.

**pygnome (Version 1.0.4, 2,278K)**

PyGNOME is an extension module for python that gives you access to the base GNOME libraries. This means you have access to more widgets, simple configuration interface, metadata support and many other features.

Install pygnome if you need Python bindings for the GNOME libraries.

**pygtk (Version 0.6.2, 2,399K)**

PyGTK is an extension module for Python that gives you access to the GTK+ widget set. Just about anything you can write in C with GTK+ you can write in Python with PyGTK (within reason), but with all of Python's benefits. PyGTK provides an object-oriented interface at a slightly higher level than the C interface. The PyGTK interface does all of the type casting and reference counting that you'd have to do yourself using the C API.

Install pygtk if you need Python bindings for the GTK+ widget set.

**pygtk-libglade (Version 0.6.2, 179K)**

This module contains a wrapper for the libglade library. Libglade is a library similar to the pyglade module, except that it is written in C (so is faster) and is more complete.

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**python (Version 1.5.2, 6,401K) (B G K S)**

Python is an interpreted, interactive, object-oriented programming language often compared to Tcl, Perl, Scheme or Java. Python includes modules, classes, exceptions, very high level dynamic data types and dynamic typing. Python supports interfaces to many system calls and libraries, as well as to various windowing systems (X11, Motif, Tk, Mac and MFC).

Programmers can write new built-in modules for Python in C or C++. Python can be used as an extension language for applications that need a programmable interface. This package contains most of the standard Python modules, as well as modules for interfacing to the Tix widget set for Tk and RPM.

Note that documentation for Python is provided in the python-docs package.

**tcl (Version 8.0.5, 5,519K) (G K S)**

Tcl is a simple scripting language designed to be embedded into other applications. Tcl is designed to be used with Tk, a widget set, which is provided in the tk package. This package also includes tclsh, a simple example of a Tcl application.

If you're installing the tcl package and you want to use Tcl for development, you should also install the tk and tclx packages.

**tclx (Version 8.0.5, 1,954K) (G K S)**

TclX is a set of extensions which make it easier to use the Tcl scripting language for common UNIX/Linux programming tasks. TclX enhances Tcl support for files, network access, debugging, math, lists, and message catalogs. TclX can be used with both Tcl and Tcl/Tk applications.

Install TclX if you are developing applications with Tcl/Tk. You'll also need to install the tcl and tk packages.

**tix (Version 4.1.0.6, 2,733K) (G K S)**

Tix (Tk Interface Extension), an add-on for the Tk widget set, is an extensive set of over 40 widgets. In general, Tix widgets are more complex and more capable than the widgets provided in Tk. Tix widgets include a ComboBox, a Motif-style FileSelectBox, an MS Windows-style FileSelectBox, a PanedWindow, a Notebook, a hierarchical list, a directory tree and a file manager.

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Install the tix package if you want to try out more complicated widgets for Tk. You'll also need to have the tcl and tk packages installed.

#### **tk (Version 8.0.5, 5,290K) (G K S)**

Tk is a X Windows widget set designed to work closely with the tcl scripting language. It allows you to write simple programs with full featured GUI's in only a little more time then it takes to write a text based interface. Tcl/Tk applications can also be run on Windows and Macintosh platforms.

#### **tkinter (Version 1.5.2, 695K) (G K S)**

The Tkinter (Tk interface) program is an graphical user interface for the Python scripting language.

You should install the tkinter package if you'd like to use a graphical user interface for Python programming.

#### **umb-scheme (Version 3.2, 1,211K) (G)**

UMB Scheme is a public domain implementation of the Scheme programming language. Scheme is a statically scoped and properly tail-recursive dialect of the Lisp programming language, designed with clear and simple semantics and a minimal number of ways to form expressions.

Install the umb-scheme package if you need an implementation of the Scheme programming language.

### **A.4.3 Libraries**

This section contains packages of the various libraries. Some libraries are required for normal system operation, while others are only needed if you will be using their features in a program you're writing.

#### **ImageMagick-devel (Version 4.2.9, 1,728K)**

Image-Magick-devel contains the static libraries and header files you'll need to develop ImageMagick applications. ImageMagick is an image manipulation program.

If you want to create applications that will use ImageMagick code or APIs, you'll need to install ImageMagick-devel as well as ImageMagick. You don't need to install it if you just want to use ImageMagick, however.

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**ORBit-devel (Version 0.4.94, 1,408K)**

This package contains the header files, libraries and utilities necessary to write programs that use CORBA technology. If you want to write such programs, you'll also need to install the ORBit package.

**XFree86-devel (Version 3.3.5, 7,897K) (G K)**

XFree86-devel includes the libraries, header files and documentation you'll need to develop programs which run as X clients. XFree86-devel includes the base Xlib library as well as the Xt and Xaw widget sets.

Install XFree86-devel if you are going to develop programs which will run as X clients.

**Xaw3d-devel (Version 1.3, 657K) (G K)**

Xaw3d is an enhanced version of the MIT Athena widget set for the X Window System. Xaw3d adds a three-dimensional look to those applications with minimal or no source code changes. Xaw3d-devel includes the header files and static libraries for developing programs that take full advantage of Xaw3d's features.

You should install Xaw3d-devel if you are going to develop applications using the Xaw3d widget set. You'll also need to install the Xaw3d package.

**apache-devel (Version 1.3.9, 340K)**

The apache-devel package contains the source code for the Apache Web server and the APXS binary you'll need to build Dynamic Shared Objects (DSOs) for Apache.

If you are installing the Apache Web server, and you want to be able to compile or develop additional modules for Apache, you'll need to install this package.

**audiofile-devel (Version 0.1.7, 98K)**

Libraries, include files and other resources you can use to develop audiofile applications.

**bind-devel (Version 8.2.1, 1,292K)**

The bind-devel package contains all the include files and the library required for DNS (Domain Name Service) development for BIND versions 8.x.x.

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You should install `bind-devel` if you want to develop `bind` DNS applications. If you install `bind-devel`, you'll also need to install `bind`.

#### **cdrecord-devel (Version 1.8a25, 250K)**

The `cdrecord` distribution contains a SCSI user level transport library. The SCSI library is suitable to talk to any SCSI device without having a special driver for it.

`Cdrecord` may be easily ported to any system that has a SCSI device driver similar to the `scg` driver.

#### **compat-libs (Version 5.2, 2,282K) (G K S)**

This package includes a number of run-time libraries that are compiled on Red Hat Linux 5.2. This package is required if you want to do development for Red Hat Linux 5.2 and other `glibc 2.0` based systems.

#### **compat-glibc (Version 5.2, 4,331K) (G K S)**

This package contains the version 2.0.7 of the GNU C library for compiling binaries that will run on Red Hat Linux 2.0 and other `glibc 2.0.x` Linux based systems. This package includes the runtime libraries.

#### **control-center-devel (Version 1.0.7pre, 37K)**

The `control-center-devel` package contains the development environment needed for creating the 'capplets' used in the GNOME Control Center.

If you're interested in developing capplets for the GNOME control center, you'll want to install this package. If you use the GNOME desktop, but not developing applications, you don't need to install this package.

#### **e2fsprogs-devel (Version 1.15, 261K)**

`E2fsprogs-devel` contains the libraries and header files needed to develop second extended (`ext2`) filesystem-specific programs.

You should install `e2fsprogs-devel` if you want to develop `ext2` filesystem-specific programs. If you install `e2fsprogs-devel`, you'll also want to install `e2fsprogs`.

#### **esound-devel (Version 0.2.13, 50K)**

The `esound-devel` Libraries, include files and other resources you can use to develop `Esound` applications.

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Install `esound-devel` if you want to develop Esound applications.

**faces-devel (Version 1.6.1, 22K) (G K)**

Faces-devel contains the faces program development environment, (i.e., the static libraries and header files).

If you want to develop Faces applications, you'll need to install faces-devel. You'll also need to install the faces package.

**fnlib-devel (Version 0.4, 35K)**

The fnlib-devel package contains headers, static libraries and documentation for Fnlib development.

Install fnlib-devel if you want to develop Fnlib applications.

**freetype-devel (Version 1.2, 511K)**

This package is only needed if you intend to develop or compile applications which rely on the FreeType library. If you simply want to run existing applications, you won't need this package.

**gd-devel (Version 1.3, 7K) (G K)**

These are the development libraries and header files for gd, the .gif graphics library.

If you're installing the gd graphics library, you must install gd-devel.

**gdbm-devel (Version 1.8.0, 81K) (G K)**

Gdbm-devel contains the development libraries and header files for gdbm, the GNU database system. These libraries and header files are necessary if you plan to do development using the gdbm database.

Install gdbm-devel if you are developing C programs which will use the gdbm database library. You'll also need to install the gdbm package.

**gedit-devel (Version 0.5.4, 8K)**

gEdit is a small but powerful text editor for the GNOME GUI desktop. This package allows you to develop plug-ins that work within gEdit.

Install gedit-devel if you want to write plug-ins for gEdit.

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**gimp-devel (Version 1.0.4, 262K)**

Static libraries and header files for writing GIMP plugins and extensions.

**glib-devel (Version 1.2.3, 311K) (G K)**

Static libraries and header files for the support library for the GIMP's X libraries, which are available as public libraries. GLIB includes generally useful data structures.

**glibc-devel (Version 2.1.2, 33,558K) (G K S)**

The glibc-devel package contains the header and object files necessary for developing programs which use the standard C libraries (which are used by nearly all programs). If you are developing programs which will use the standard C libraries, your system needs to have these standard header and object files available in order to create the executables.

Install glibc-devel if you are going to develop programs which will use the standard C libraries.

**glibc-profile (Version 2.1.2, 31,129K)**

The glibc-profile package includes the GNU libc libraries and support for profiling using the gprof program. Profiling is analyzing a program's functions to see how much CPU time they use and determining which functions are calling other functions during execution. To use gprof to profile a program, your program needs to use the GNU libc libraries included in glibc-profile (instead of the standard GNU libc libraries included in the glibc package).

If you are going to use the gprof program to profile a program, you'll need to install the glibc-profile program.

**gmp-devel (Version 2.0.2, 318K)**

The static libraries, header files and documentation for using the GNU MP arbitrary precision library in applications.

If you want to develop applications which will use the GNU MP library, you'll need to install the gmp-devel package. You'll also need to install the gmp package.

---

**gnome-core-devel (Version 1.0.10pre, 95K)**

The `gnome-core-devel` package contains the libraries and header files for creating panels for the GNOME GUI desktop environment.

If you're developing GNOME panels, you'll need to install `gnome-core-devel`.

**gnome-games-devel (Version 1.0.2, 42K)**

This package installs the libraries and files needed to develop some GNOME games.

**gnome-libs-devel (Version 1.0.17pre, 7,720K)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of GUI applications and desktop tools to be used in conjunction with a window manager for the X Window System. The `gnome-libs-devel` package includes the libraries and include files that you will need to develop GNOME applications.

You should install the `gnome-libs-devel` package if you would like to develop GNOME applications. You don't need to install `gnome-libs-devel` if you just want to use the GNOME desktop environment.

**gnome-objc-devel (Version 1.0.2, 899K)**

Libraries, include files and other files you can use to develop Objective C GNOME applications.

If you're interested in developing GNOME applications, you should install this package.

**gnome-pim-devel (Version 1.0.9, 38K)**

Files needed to develop apps which interact with `gnome-pim` applications via CORBA.

**gpm-devel (Version 1.17.9, 28K) (G K)**

The `gpm-devel` program contains the libraries and header files needed for development of mouse driven programs. This package allows you to develop text-mode programs which use the mouse.

Install `gpm-devel` if you need to develop text-mode programs which will use the mouse. You'll also need to install the `gpm` package.

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**gtk+-devel (Version 1.2.3, 2,468K) (G K)**

The gtk+-devel package contains the static libraries and header files needed for developing GTK+ (GIMP ToolKit) applications. The gtk+-devel package contains glib (a collection of routines for simplifying the development of GTK+ applications), GDK (the General Drawing Kit, which simplifies the interface for writing GTK+ widgets and using GTK+ widgets in applications), and GTK+ (the widget set).

Install gtk+-devel if you need to develop GTK+ applications. You'll also need to install the gtk+ package.

**guile-devel (Version 1.3, 963K)**

The guile-devel package includes the libraries, header files, etc., that you'll need to develop applications that are linked with the GUILE extensibility library.

You need to install the guile-devel package if you want to develop applications that will be linked to GUILE. You'll also need to install the guile package.

**imlib-devel (Version 1.9.7, 561K)**

The header files, static libraries and documentation needed for developing Imlib applications. Imlib is an image loading and rendering library for X11R6.

Install the imlib-devel package if you want to develop Imlib applications. You'll also need to install the imlib and imlib\_cfgeditor packages.

**inn-devel (Version 2.2.1, 1,765K)**

The inn-devel package contains the INN (InterNetNews) library, which several programs that interface with INN need in order to work (for example, newsgate and tin).

If you are installing a program which must interface with the INN news system, you should install inn-devel.

**kdelibs-devel (Version 1.1.2, 5,763K)**

This package includes the header files you will need to compile applications for KDE. Also included is the KDE API documentation in HTML format for easy browsing.

**kudzu-devel (Version 0.15, 66K) (G K)**

The kudzu-devel package contains the libkudzu and libmodules libraries, which are libraries used for hardware probing and configuration.

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**libghttp-devel (Version 1.0.4, 45K)**

Libraries and includes files you can use for libghttp development

**libglade-devel (Version 0.5, 331K)**

The libglade-devel package contains the libraries, include files, etc., that you can use to develop libglade applications.

**libgr-devel (Version 2.0.13, 320K) (G K)**

The libgr-devel package contains the header files and static libraries, etc., for developing programs which can handle the various graphics file formats supported by the libgr library.

Install libgr-devel if you want to develop programs for handling the graphics file formats supported by the libgr library. You'll also need to have the libgr package installed.

**libgtop-devel (Version 1.0.2, 326K)**

Install this package if you wish to develop applications that access information on system statistics such as CPU and memory usage.

**libjpeg-devel (Version 6b, 233K) (G K)**

The libjpeg-devel package includes the header files and static libraries necessary for developing programs which will manipulate JPEG files using the libjpeg library.

If you are going to develop programs which will manipulate JPEG images, you should install libjpeg-devel. You'll also need to have the libjpeg package installed.

**libpcap (Version 0.4, 125K)**

Libpcap provides a portable framework for low-level network monitoring. Libpcap can provide network statistics collection, security monitoring and network debugging. Since almost every system vendor provides a different interface for packet capture, the libpcap authors created this system-independent API to ease in porting and to alleviate the need for several system-dependent packet capture modules in each application.

Install libpcap if you need to do low-level network traffic monitoring on your network.

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**libpng-devel (Version 1.0.3, 485K) (G K)**

The libpng-devel package contains the header files and static libraries necessary for developing programs using the PNG (Portable Network Graphics) library.

If you want to develop programs which will manipulate PNG image format files, you should install libpng-devel. You'll also need to install the libpng package.

**libtermcap-devel (Version 2.0.8, 12K) (G K)**

This package includes the libraries and header files necessary for developing programs which will access the termcap database.

If you need to develop programs which will access the termcap database, you'll need to install this package. You'll also need to install the libtermcap package.

**libtiff-devel (Version 3.4, 1,614K) (G K)**

This package contains the header files and static libraries for developing programs which will manipulate TIFF format image files using the libtiff library.

If you need to develop programs which will manipulate TIFF format image files, you should install this package. You'll also need to install the libtiff package.

**libungif-devel (Version 4.1.0, 271K) (G K)**

This package contains the static libraries, header files and documentation necessary for development of programs that will use the libungif library to load and save GIF format image files.

You should install this package if you need to develop programs which will use the libungif library functions for loading and saving GIF format image files. You'll also need to install the libungif package.

**libxml-devel (Version 1.4.0, 264K)**

This packages contains the libraries, include and other files you can use to develop libxml applications.

**linuxconf-devel (Version 1.16r1.3, 3,768K) (G K)**

Linuxconf is an extremely capable system configuration tool. It provides a variety of interfaces through which you can configure your Linux system and manage a large proportion of the system's operations.

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This package provides the components necessary for developing Linuxconf modules outside of the linuxconf source tree and/or developing stand-alone utilities using the linuxconf interface toolkit.

Install linuxconf-devel if you want to develop Linuxconf modules. You must also have linuxconf installed.

**ncurses-devel (Version 4.2, 7,298K) (G K)**

The header files and libraries for developing applications that use the ncurses CRT screen handling and optimization package.

Install the ncurses-devel package if you want to develop applications which will use ncurses.

**newt-devel (Version 0.50, 131K) (G K)**

The newt-devel package contains the header files and libraries necessary for developing applications which use newt. Newt is a development library for text mode user interfaces. Newt is based on the slang library.

Install newt-devel if you want to develop applications which will use newt.

**openldap-devel (Version 1.2.7, 320K)**

This package includes the development libraries and header files needed for compiling applications that use LDAP internals. Install this package only if you plan to develop or will need to compile customized LDAP clients.

**pciutils-devel (Version 2.0, 42K)**

This package contains a library for inspecting and setting devices connected to the PCI bus.

**pilot-link-devel (Version 0.9.0, 1,635K) (K)**

This package contains the development headers that are used to build the pilot-link package. It also includes the static libraries necessary to build static pilot apps.

**postgresql-devel (Version 6.5.1, 802K) (S)**

This package contains the header files and libraries needed to compile applications which will directly interact with a PostgreSQL server.

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Install this package if you want to develop applications which will interact with a PostgreSQL server.

**python-devel (Version 1.5.2, 3,766K)**

The Python programming language's interpreter can be extended with dynamically loaded extensions and can be embedded in other programs. This package contains the header files and libraries needed to do these types of tasks.

Install python-devel if you want to develop Python extensions. The python package will also need to be installed. You'll probably also want to install the python-docs package, which contains Python documentation.

**qt-devel (Version 2.0.1, 20,217K)**

Contains the files necessary to develop applications using Qt: header files, the Qt meta object compiler, man pages, HTML documentation and example programs. See <http://www.troll.no> for more information about Qt, or `file:/usr/doc/qt-devel-2.0.1/index.html` for Qt documentation in HTML.

**qt1x-devel (Version 1.44, 5,660K)**

Contains the files necessary to compile applications using Qt 1.x. This library is compiled for backwards compatibility with legacy applications only; new applications should be compiled against Qt version 2 or later.

**readline-devel (Version 2.2.1, 250K) (G K)**

The readline library will read a line from the terminal and return it. Use of the readline library allows programmers to provide an easy to use and more intuitive interface for users.

If you want to develop programs which will use the readline library, you'll need to have the readline-devel package installed. You'll also need to have the readline package installed.

**rpm-devel (Version 3.0.3, 570K) (G K)**

This package contains the RPM C library and header files. These development files will simplify the process of writing programs which manipulate RPM packages and

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databases. These files are intended to simplify the process of creating graphical package managers or any other tools that need an intimate knowledge of RPM packages in order to function.

This package should be installed if you want to develop programs that will manipulate RPM packages and databases.

**slang-devel (Version 1.2.2, 1,192K) (G K)**

This package contains the S-Lang extension language static libraries and header files which you'll need if you want to develop S-Lang based applications. Documentation which may help you write S-Lang based applications is also included.

Install the slang-devel package if you want to develop applications based on the S-Lang extension language.

**sox-devel (Version 12.16, 204K)**

This package contains the library needed for compiling applications which will use the SoX sound file format converter.

Install sox-devel if you want to develop applications which will use SoX.

**svgalib-devel (Version 1.4.0, 769K) (G K)**

The svgalib-devel package contains the libraries and header files needed to build programs which will use the SVGAlib low-level graphics library.

Install the svgalib-devel package if you want to develop applications which will use the SVGAlib library.

**ucd-snmp-devel (Version 4.0.1, 414K)**

The ucd-snmp-devel package contains the development libraries and header files for use with the UCD-SNMP project's network management tools.

Install the ucd-snmp-devel package if you would like to develop applications for use with the UCD-SNMP project's network management tools. You'll also need to have the ucd-snmp and ucd-snmp-utils packages installed.

**w3c-libwww-devel (Version 5.2.8, 1,653K)**

Static libraries and header files for libwww, which are available as public libraries.

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**xmms-devel (Version 0.9.1, 38K)**

The static libraries and header files needed for building plug-ins for the Xmms MP3 player.

**xpm-devel (Version 3.4k, 276K) (G K)**

The xpm-devel package contains the development libraries and header files necessary for developing applications which will use the XPM library. The XPM library is used by many programs for displaying pixmaps in the X Window System.

Install the xpm-devel package if you want to develop applications using the XPM pixmap library. You'll also need to install the xpm package.

**zlib-devel (Version 1.1.3, 165K) (G K)**

The zlib-devel package contains the header files and libraries needed to develop programs that use the zlib compression and decompression library.

Install the zlib-devel package if you want to develop applications that will use the zlib library.

## A.4.4 System

This section lists the packages containing system-level development tools.

**kernel-headers (Version 2.2.12, 3,018K) (G K S)**

Kernel-headers includes the C header files for the Linux kernel. The header files define structures and constants that are needed for building most standard programs and are also needed for rebuilding the kernel.

**kernel-source (Version 2.2.12, 50,055K)**

The kernel-source package contains the source code files for the Linux kernel. These source files are needed to build most C programs, since they depend on the constants defined in the source code. The source files can also be used to build a custom kernel that is better tuned to your particular hardware, if you are so inclined (and you know what you're doing).

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### A.4.5 Tools

This section contains packages that provide the usual assortment of tools that programmers require.

#### **ElectricFence (Version 2.1, 44K) (G K S)**

If you know what `malloc()` violations are, you'll be interested in ElectricFence. ElectricFence is a tool which can be used for C programming and debugging. It uses the virtual memory hardware of your system to detect when software overruns `malloc()` buffer boundaries, and/or to detect any accesses of memory released by `free()`. ElectricFence will then stop the program on the first instruction that caused a bounds violation and you can use your favorite debugger to display the offending statement.

This package will install ElectricFence, which you can use if you're searching for a debugger to find `malloc()` violations.

#### **autoconf (Version 2.13, 580K) (G K S)**

GNU's Autoconf is a tool for configuring source code and Makefiles. Using Autoconf, programmers can create portable and configurable packages, since the person building the package is allowed to specify various configuration options.

You should install Autoconf if you are developing software and you'd like to use it to create shell scripts which will configure your source code packages. If you are installing Autoconf, you will also need to install the GNU m4 package.

Note that the Autoconf package is not required for the end user who may be configuring software with an Autoconf-generated script; Autoconf is only required for the generation of the scripts, not their use.

#### **automake (Version 1.4, 866K) (G K S)**

Automake is an experimental Makefile generator. Automake was inspired by the 4.4BSD `make` and include files, but aims to be portable and to conform to the GNU standards for Makefile variables and targets.

You should install Automake if you are developing software and would like to use its capabilities of automatically generating GNU standard Makefiles. If you install Automake, you will also need to install GNU's Autoconf package.

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**bin86 (Version 0.4, 73K) (G K S)**

The bin86 package provides an assembler and linker for real mode 80x86 instructions. You'll need to have this package installed in order to build programs that run in real mode, including LILO and the kernel's bootstrapping code, from their sources.

You should install bin86 if you intend to build programs that run in real mode from their source code.

**binutils (Version 2.9.1.0.23, 5,168K) (B G K S)**

Binutils is a collection of binary utilities, including ar (for creating, modifying and extracting from archives), nm (for listing symbols from object files), objcopy (for copying and translating object files), objdump (for displaying information from object files), ranlib (for generating an index for the contents of an archive), size (for listing the section sizes of an object or archive file), strings (for listing printable strings from files), strip (for discarding symbols), c++filt (a filter for demangling encoded C++ symbols), addr2line (for converting addresses to file and line), and nlmconv (for converting object code into an NLM).

Install binutils if you need to perform any of these types of actions on binary files. Most programmers will want to install binutils.

**bison (Version 1.28, 161K) (G K S)**

Bison is a general purpose parser generator which converts a grammar description for an LALR context-free grammar into a C program to parse that grammar. Bison can be used to develop a wide range of language parsers, from ones used in simple desk calculators to complex programming languages. Bison is upwardly compatible with Yacc, so any correctly written Yacc grammar should work with Bison without any changes. If you know Yacc, you shouldn't have any trouble using Bison (but you do need to be very proficient in C programming to be able to use Bison). Many programs use Bison as part of their build process. Bison is only needed on systems that are used for development.

If your system will be used for C development, you should install Bison since it is used to build many C programs.

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**blt (Version 2.4g, 3,966K)**

BLT is an extension to the Tk toolkit. BLT's most useful feature is the provision of more widgets for Tk, but it also provides more geometry managers and miscellaneous other commands. Note that you won't need to do any patching of the Tcl or Tk source files to use BLT, but you will need to have Tcl/Tk installed in order to use BLT.

If you are programming with the Tk toolkit, you should install BLT. You will need to have Tcl/Tk installed.

**byacc (Version 1.9, 54K) (G K S)**

Byacc (Berkeley Yacc) is a public domain LALR parser generator which is used by many programs during their build process.

If you are going to do development on your system, you will want to install this package.

**cdecl (Version 2.5, 80K) (G K S)**

The cdecl package includes the cdecl and c++decl utilities, which are used to translate English to C or C++ function declarations and vice versa.

You should install the cdecl package if you intend to do C and/or C++ programming.

**compat-binutils (Version 5.2, 3,566K)**

This package includes the binutils required by the Red HAt Linux 5.2 backwards compatibility kit. Binutils is a collection of binary utilities, including ar (for creating, modifying and extracting from archives), nm (for listing symbols from object files), objcopy (for copying and translating object files), objdump (for displaying information from object files), ranlib (for generating an index for the contents of an archive), size (for listing the section sizes of an object or archive file), strings (for listing printable strings from files), strip (for discarding symbols), c++filt (a filter for demangling encoded C++ symbols), addr2line (for converting addresses to file and line), and nbncnv (for converting object code into an NLM).

Install this package if you will be developing programs that need to run on Red Hat Linux 5.2 or other glibc 2.0.x based systems.

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**cproto (Version 4.6, 85K) (G K S)**

Cproto generates function prototypes and variable declarations from C source code. Cproto can also convert function definitions between the old style and the ANSI C style. This conversion will overwrite the original files, however, so be sure to make a backup copy of your original files in case something goes wrong. Since cproto uses a Yacc generated parser, it shouldn't be confused by complex function definitions as much as other prototype generators) because it uses a Yacc generated parser.

Cproto will be useful for C programmers, so install cproto if you are going to do any C programming.

**ctags (Version 3.2, 146K) (G K S)**

Ctags generates an index (or tag) file of C language objects found in C source and header files. The index makes it easy for text editors or other utilities to locate the indexed items. Ctags can also generate a cross reference file which lists information about the various objects found in a set of C language files in human readable form. Exuberant Ctags improves on ctags because it can find all types of C language tags, including macro definitions, enumerated values (values inside enum{...}), function and method definitions, enum/struct/union tags, external function prototypes, typedef names and variable declarations. Exuberant Ctags is far less likely to be fooled by code containing #if preprocessor conditional constructs than ctags. Exuberant ctags supports output of emacs style TAGS files and can be used to print out a list of selected objects found in source files.

Install ctags if you are going to use your system for C programming.

**cvs (Version 1.10.6, 3,114K) (G K S)**

CVS means Concurrent Version System; it is a version control system which can record the history of your files (usually, but not always, source code). CVS only stores the differences between versions, instead of every version of every file you've ever created. CVS also keeps a log of who, when and why changes occurred, among other aspects.

CVS is very helpful for managing releases and controlling the concurrent editing of source files among multiple authors. Instead of providing version control for a

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collection of files in a single directory, CVS provides version control for a hierarchical collection of directories consisting of revision controlled files.

These directories and files can then be combined together to form a software release.

Install the `cvs` package if you need to use a version control system.

### **diffstat (Version 1.27, 13K)**

The `diff` command compares files line by line. `Diffstat` reads the output of the `diff` command and displays a histogram of the insertions, deletions and modifications in each file. `Diffstat` is commonly used to provide a summary of the changes in large, complex patch files.

Install `diffstat` if you need a program which provides a summary of the `diff` command's output. You'll need to also install `diffutils`.

### **flex (Version 2.5.4a, 302K) (G K S)**

The `flex` program generates scanners. Scanners are programs which can recognize lexical patterns in text. `Flex` takes pairs of regular expressions and C code as input and generates a C source file as output. The output file is compiled and linked with a library to produce an executable. The executable searches through its input for occurrences of the regular expressions. When a match is found, it executes the corresponding C code. `Flex` was designed to work with both `Yacc` and `Bison`, and is used by many programs as part of their build process.

You should install `flex` if you are going to use your system for application development.

### **gettext (Version 0.10.35, 902K) (G K S)**

The GNU `gettext` package provides a set of tools and documentation for producing multi-lingual messages in programs. Tools include a set of conventions about how programs should be written to support message catalogs, a directory and file naming organization for the message catalogs, a runtime library which supports the retrieval of translated messages, and stand-alone programs for handling the translatable and the already translated strings. `Gettext` provides an easy to use library and tools for creating, using, and modifying natural language catalogs and is a powerful and simple method for internationalizing programs.

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If you would like to internationalize or incorporate multi-lingual messages into programs that you're developing, you should install gettext.

**glade (Version 0.5.1, 885K)**

GLADE is a free user interface builder for GTK+ and GNOME, released under the GNU General Public License (GPL). GLADE can produce C source code; C++, Ada95, Python and Perl support is also available, via external tools which process the XML interface description files output by GLADE. GLADE supports most GTK+ 1.2 widgets. Support for styles, however, is not complete.

Install glade if you need an interface builder for GTK+ and GNOME.

**gperf (Version 2.7, 122K)**

Gperf is a perfect hash function generator written in C++. Simply stated, a perfect hash function is a hash function and a data structure that allows recognition of a key word in a set of words using exactly one probe into the data structure.

Install gperf if you need a program that generates perfect hash functions.

**libtool (Version 1.3.3, 876K)**

The libtool package contains the GNU libtool, a set of shell scripts which automatically configure UNIX and UNIX-like architectures to generically build shared libraries. Libtool provides a consistent, portable interface which simplifies the process of using shared libraries.

If you are developing programs which will use shared libraries, you should install libtool.

**make (Version 3.77, 259K) (G K S)**

A GNU tool for controlling the generation of executables and other non-source files of a program from the program's source files. Make allows users to build and install packages without any significant knowledge about the details of the build process. The details about how the program should be built are provided for make in the program's makefile.

The GNU make tool should be installed on your system because it is commonly used to simplify the process of installing programs.

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**patch (Version 2.5, 100K) (G K S)**

The patch program applies diff files to originals. The diff command is used to compare an original to a changed file. Diff lists the changes made to the file. A person who has the original file can then use the patch command with the diff file to add the changes to their original file (patching the file).

Patch should be installed because it is a common way of upgrading applications.

**pmake (Version 2.1.33, 1,031K) (G K S)**

Make is a GNU tool which allows users to build and install programs without any significant knowledge of the build process. Details about how the program should be built are included in the program's Makefile. Pmake is a particular version (BSD 4.4) of make. Pmake supports some additional syntax which is not in the standard make program. Some Berkeley programs have Makefiles written for pmake.

Pmake should be installed on your system so that you will be able to build programs which require using pmake instead of make.

**pmake-customs (Version 2.1.33, 982K)**

Customs is a remote execution facility for PMake. Customs is designed to run on a network of machines with a consistent, shared filesystem. Customs requires Sun RPC in order to use XDR (eXternal Data Representation) routines for logging functions.

A single server is designated as the master agent and is additionally responsible for noting when a machine goes down, from which machines any given machine will accept jobs and parcelling out available machines to requesting clients. The job of master is not given to any one machine but, rather, is decided among the active agents whenever the previous master dies.

Clients are provided to: - alter the availability criteria for the local machine (importquota) - find the status of all registered hosts on the net (reginfo). - abort, restart or ping any customs agent on the network (ctrl). - export a command from the shell (export). - accept log information from all hosts on the net (logd).

**rcs (Version 5.7, 536K) (G K S)**

The Revision Control System (RCS) is a system for managing multiple versions of files. RCS automates the storage, retrieval, logging, identification and merging of

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file revisions. RCS is useful for text files that are revised frequently (for example, programs, documentation, graphics, papers and form letters).

The rcs package should be installed if you need a system for managing different versions of files.

## A.5 Documentation

This section lists packages that contain a variety of Linux-related information. There is a lot of good information here; unless you are low on disk space, you should install these packages. (Note, however, that you probably don't need all the HOWTO packages; in most cases howto and howto-html will probably suffice.)

### **XFree86-doc (Version 3.3.5, 10,799K)**

XFree86-doc provides a great deal of documentation, in PostScript format, on the various X APIs, libraries, and other interfaces. If you need low level X documentation, you will find it here. Topics include the X protocol, the ICCCM window manager standard, ICE session management, the font server API, etc.

### **bash2-doc (Version 2.03, 2,275K)**

This is a separate documentation package for the GNU Bourne Again shell.

### **faq (Version 6.0, 1,164K)**

The faq package includes the text of the Frequently Asked Questions (FAQ) about Linux from the SunSITE website (<http://sunsite.unc.edu/pub/Linux/docs/faqs/linux-faq/Linux-FAQ>). The Linux FAQ is a great source of information about Linux.

Install faq if you'd like to read the Linux FAQ off your own machine.

### **gimp-manual (Version 1.0.0, 17,979K)**

The gimp-manual package contains the GIMP (GNU Image Manipulation Program) User Manual (GUM) in HTML format. The GUM is a complete guide for using the GIMP (GNU Image Manipulation Program). Please note that the HTML version of the GUM is less refined than the other versions, which can be obtained at <ftp://manual.gimp.org/pub/manual/>. The GUM is provided there in HTML (for viewing the GUM online), in PostScript(TM) and PDF formats (for printing) and in FrameMaker

format (the original source code of the document, for people who would like to contribute to the GUM).

**gnome-users-guide (Version 1.0.6, 8,272K) (G)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of GUI applications and desktop tools to be used in conjunction with a window manager for the X Window System. The `gnome-users-guide` package will install the Users' Guide for the GNOME Desktop Environment on your computer.

You should install this package if you are going to use GNOME and you need a quick, handy reference.

**helptool (Version 2.4, 23K) (G K S)**

The `helptool` provides a unified graphical user interface for searching through many of the help sources available (including man pages and GNU texinfo documents).

Install `helptool` if you'd like to use it to search for help files. You'll need to have the X Window System installed to use the `helptool`.

**howto (Version 6.0, 11,103K)**

Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux. Linux HOWTOs are a great source of practical information about your system. The latest versions of these documents are located at <http://sunsite.unc.edu/linux>.

Install the `howto` package if you'd like to be able to access the Linux HOWTO documentation from your own system.

**howto-chinese (Version 6.0, 13,445K)**

The `howto-chinese` package contains the Linux HOWTO documents that have been translated into Chinese. Linux HOWTOs are detailed documents describing a specific aspect of configuring or using Linux.

Install the `howto-chinese` package if you'd like to use the Linux HOWTO documentation in Chinese. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

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**howto-croatian (Version 6.0, 1,897K)**

The howto-chinese package contains the Linux HOWTO documents that have been translated into Croatian. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-croatian package if you'd like to use the Linux HOWTO documentation in Croatian. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the howto package).

**howto-french (Version 6.0, 29,195K)**

This package contains the Linux HOWTO documents that have been translated into French. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-french package if you'd like to use the Linux HOWTOs in French. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the howto package).

**howto-german (Version 6.0, 22,361K)**

This package contains the Linux HOWTO documents that have been translated into German. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-german package if you'd like to use the Linux HOWTOs in German. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the howto package).

**howto-greek (Version 6.0, 7,712K)**

This package contains the Linux HOWTO documents that have been translated into Greek. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-greek package if you'd like to use the Linux HOWTOs in Greek. Please note that not all of the HOWTOs have been translated. If you need to have

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a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

**howto-html (Version 6.0, 12,824K)**

This package contains the Linux HOWTO documents in HTML format, so they can be viewed with a web browser. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the `howto-html` package if you'd like to view the Linux HOWTOs with your web browser off your own machine, or if you'd like to provide the HTML HOWTOs from your web server.

**howto-indonesian (Version 6.0, 8,491K)**

This package contains the Linux HOWTO documents that have been translated into Indonesian. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the `howto-indonesian` package if you'd like to use the Linux HOWTOs in Indonesian. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

**howto-italian (Version 6.0, 21,596K)**

This package contains the Linux HOWTO documents that have been translated into Italian. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the `howto-italian` package if you'd like to use the Linux HOWTOs in Italian. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

**howto-japanese (Version 6.0, 11,888K)**

This package contains the Linux HOWTO documents that have been translated into Japanese. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

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Install the `howto-japanese` package if you'd like to use the Linux HOWTOs in Japanese. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

#### **howto-korean (Version 6.0, 19,242K)**

This package contains the Linux HOWTO documents that have been translated into Korean. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the `howto-korean` package if you'd like to use the Linux HOWTOs in Korean. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

#### **howto-polish (Version 6.0, 9,474K)**

This package contains the Linux HOWTO documents that have been translated into Polish. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the `howto-polish` package if you'd like to use the Linux HOWTOs in Polish. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

#### **howto-serbian (Version 6.0, 37K)**

This package contains the Linux HOWTO documents that have been translated into Serbian. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the `howto-serbian` package if you'd like to use the Linux HOWTOs in Serbian. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

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**howto-sgml (Version 6.0, 9,767K)**

The howto-sgml package contains the Linux HOWTO documents in SGML format. The SGML format documents are the “source” files. Other file formats (text, PostScript(TM), DVI, HTML) are translated from the SGML documents. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-sgml package if you’d like to use the Linux HOWTO documents in SGML format.

**howto-slovenian (Version 6.0, 3,791K)**

This package contains the Linux HOWTO documents that have been translated into Slovenian. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-slovenian package if you’d like to use the Linux HOWTOs in Slovenian. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you’ll need to install the English version (the howto package).

**howto-spanish (Version 6.0, 7,739K)**

This package contains the Linux HOWTO documents that have been translated into Spanish. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-spanish package if you’d like to use the Linux HOWTOs in Spanish. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you’ll need to install the English version (the howto package).

**howto-swedish (Version 6.0, 4,009K)**

This package contains the Linux HOWTO documents that have been translated into Swedish. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the howto-swedish package if you’d like to use the Linux HOWTOs in Swedish. Please note that not all of the HOWTOs have been translated. If you need

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to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

### **howto-turkish (Version 6.0, 816K)**

This package contains the Linux HOWTO documents that have been translated into Turkish. Linux HOWTOs are detailed documents which describe a specific aspect of configuring or using Linux.

Install the `howto-turkish` package if you'd like to use the Linux HOWTOs in Turkish. Please note that not all of the HOWTOs have been translated. If you need to have a complete set of HOWTOs, you'll need to install the English version (the `howto` package).

### **indexhtml (Version 6.0.1, 18K) (G K S)**

The `indexhtml` package contains the HTML page and graphics for a welcome page shown by your Web browser, which you'll see after you've successfully installed Red Hat Linux.

The Web page provided by `indexhtml` tells you how to register your Red Hat software and how to get any support that you might need.

### **install-guide (Version 3.2, 1,373K)**

The `install-guide` contains the Linux Documentation Project (LDP) Getting Started Guide in HTML format. The LDP Getting Started Guide is intended to be an installation manual and an entry-level guide to Linux. If you're installing the Red Hat Linux operating system, you should ignore the installation instructions included here and instead use Red Hat's Installation Guide.

You should install the `install-guide` package if you'd like to use the LDP's Getting Started Guide in HTML format using your web browser off your own machine, or if you'd like to provide the LDP's Getting Started Guide on your web server.

### **kernel-doc (Version 2.2.12, 2,555K)**

This package contains documentation files from the kernel source. Various bits of information about the Linux kernel and the device drivers shipped with it are documented in these files.

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You'll want to install this package if you need a reference to the options that can be passed to Linux kernel modules at load time.

**lpg (Version 0.4, 1,739K)**

The lpg package includes a generic guide for programming on Linux systems, in HTML format. You may want to check the Linux Documentation Project's website at <http://sunsite.unc.edu/LDP/> for more information and possible updates to the programming guide.

If you'd like to view the Linux programming guide using your web browser from files on your own machine, or if you'd like to provide it from your web server, you should install the lpg package.

**man-pages (Version 1.26, 11,244K) (G K S)**

A large collection of man pages (documentation) from the Linux Documentation Project (LDP). The man pages are organized into the following sections: Section 1, user commands (intro only); Section 2, system calls; Section 3, libc calls; Section 4, devices (e.g., hd, sd); Section 5, file formats and protocols (e.g., wtmp, /etc/passwd, nfs); Section 6, games (intro only); Section 7, conventions, macro packages, etc. (e.g., nroff, ascii); and Section 8, system administration (intro only).

**nag (Version 1.0, 1,217K)**

The nag package contains the Linux Documentation Project's Network Administrators' Guide. The NAG covers the wide world of Linux networking, including TCP/IP, UUCP, SLIP, DNS, mail systems, NNTP and news systems, and NFS. Be sure to check the LDP's website at <http://sunsite.unc.edu/linux/ldp.html> for possible updates to the NAG.

Install the nag package if you'd like to use the LDP's Network Administrators' Guide off your own machine.

**python-docs (Version 1.5.2, 2,938K)**

The python-docs package contains documentation on the Python programming language and interpreter. The documentation is provided in ASCII text files and in LaTeX source files.

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Install the python-docs package if you'd like to use the documentation for the Python language.

**rhl-alpha-install-addend-en (Version 6.1, 200K)**

The rhl-alpha-install-addend-en package contains the Red Hat Linux 6.0 Alpha Installation Addendum document in HTML format.

Install the rhl-alpha-install-addend-en package if you'd like to use an HTML version of the Alpha Installation Addendum loaded on your own machine.

**rhl-getting-started-guide-en (Version 6.1, 709K)**

The rhl-getting-started-guide-en contains the Red Hat Linux 6.0 Getting Started Guide document in HTML format.

Install the rhl-getting-started-guide-en package if you'd like to use an HTML version of the Getting Started Guide loaded on your own machine.

**rhl-install-guide-en (Version 6.1, 2,428K)**

The rhl-install-guide-en package contains the Red Hat Linux 6.0 Installation Guide in HTML format. An online copy of the Red Hat Linux 6.0 Installation Guide is available from the Red Hat Software web page at <http://www.redhat.com>.

Install the rhl-install-guide-en package if you would like to use an HTML version of the Installation Guide from your own machine.

**sag (Version 0.6, 644K)**

The Linux Documentation Project's System Administrators' Guide, provided in HTML format. This document provides a generic guide to Linux system administration. Check the Linux Documentation Project's website at <http://sunsite.unc.edu/LDP/ldp.html> for other formats of this document or for any updates.

Install the sag package if you'd like to use the HTML version of the LDP's System Administrators' Guide on your own machine.

**sendmail-doc (Version 8.9.3, 1,360K)**

The sendmail-doc package contains documentation about the Sendmail Mail Transport Agent (MTA) program, including release notes, the Sendmail FAQ and a few

papers written about Sendmail. The papers are provided in PostScript(TM) and troff formats.

Install the `sendmail-doc` package if you need documentation about Sendmail.

### **specspo (Version 6.1, 1,351K)**

The `specspo` package contains the portable object catalogues used to internationalize Red Hat packages.

## **A.6 System Environment**

This section lists packages that provide basic system functionality to your Red Hat Linux system.

### **A.6.1 Base**

This section contains the packages that are considered basic to every Red Hat Linux system. You will normally not see them during the installation process, but they're included here for your information.

#### **MAKEDEV (Version 2.5, 34K) (B)**

The `/dev` directory contains important files which correspond to the hardware on your system, such as sound cards, serial or printer ports, tape and CD-ROM drives and more. `MAKEDEV` is a script which helps you create and maintain the files in your `/dev` directory.

These are the files needed to install `MAKEDEV`.

#### **SysVinit (Version 2.77, 168K) (B)**

The `SysVinit` package contains a group of processes that control the very basic functions of your system. `SysVinit` includes the `init` program, the first program started by the Linux kernel when the system boots. `Init` then controls the startup, running and shutdown of all other programs.

#### **adjtimex (Version 1.3, 23K)**

`Adjtimex` is a kernel clock management program, which the superuser may use to correct any drift in the system's clock. Users can use `adjtimex` to view the time variables.

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**authconfig (Version 1.8, 27K) (B)**

Authconfig is a terminal mode program for setting up Network Information Service (NIS) and shadow (more secure) passwords on your system. Authconfig also configures the system to automatically turn on NIS at system startup.

**basesystem (Version 6.0, 0K) (B)**

Basesystem defines the components of a basic Red Hat Linux system (for example, the package installation order to use during bootstrapping). Basesystem should be the first package installed on a system, and it should never be removed.

**chkconfig (Version 1.0.7, 84K) (B)**

Chkconfig is a basic system utility. It updates and queries runlevel information for system services. Chkconfig manipulates the numerous symbolic links in /etc/rc.d, so system administrators don't have to manually edit the symbolic links as often.

**chkfontpath (Version 1.5, 19K) (G K S)**

This is a simple terminal mode program for configuring the directories in the X font server's path. It is mostly intended to be used 'internally' by RPM when packages with fonts are added or removed, but it may be useful as a stand-alone utility in some instances.

**control-panel (Version 3.11, 175K) (G K S)**

The Red Hat control panel is an X program launcher for the X Window System. Both convenient and pleasing, the Red Hat control panel allows you easy access to numerous X-based system administration tools included in your Red Hat Linux system.

Eventually, you'll want to work with many of your system administration tools; this package helps you locate and launch many of them.

**crontabs (Version 1.7, 4K) (B)**

The crontabs package contains root crontab files. Crontab is the program used to install, uninstall or list the tables used to drive the cron daemon. The cron daemon checks the crontab files to see when particular commands are scheduled to be executed. If commands are scheduled, it executes them.

Crontabs handles a basic system function, so it should be installed on your system.

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**dev (Version 2.7.8.2, 45K) (B)**

The Red Hat Linux operating system uses file system entries to represent devices (CD-ROMs, floppy drives, etc.) attached to the machine. All of these entries are in the /dev tree (although they don't have to be). This package contains the most commonly used /dev entries.

The dev package is a basic part of your Red Hat Linux system and it needs to be installed.

**e2fsprogs (Version 1.15, 1,159K) (B)**

The e2fsprogs package contains a number of utilities for creating, checking, modifying and correcting any inconsistencies in second extended (ext2) filesystems. E2fsprogs contains e2fsck (used to repair filesystem inconsistencies after an unclean shutdown), mke2fs (used to initialize a partition to contain an empty ext2 filesystem), debugfs (used to examine the internal structure of a filesystem, to manually repair a corrupted filesystem or to create test cases for e2fsck), tune2fs (used to modify filesystem parameters) and most of the other core ext2fs filesystem utilities.

You should install the e2fsprogs package if you need to manage the performance of an ext2 filesystem.

**eject (Version 2.0.2, 46K) (B)**

The eject program allows the user to eject removable media (typically CD-ROMs, floppy disks or Iomega Jaz or Zip disks) using software control. Eject can also control some multi-disk CD changers and even some devices' auto-eject features.

Install eject if you'd like to eject removable media using software control.

**etcskel (Version 2.0, 2K) (B)**

The etcskel package is part of the basic Red Hat system. Etcskel provides the /etc/skel directory's files. These files (.Xdefaults, .bash\_logout, .bash\_profile, .bashrc) are then placed in every new user's home directory when new accounts are created.

**fake (Version 1.1.2, 193K)**

fake is a simple utility designed to enable the switching in of backup servers by bringing up an additional interface and using arp spoofing to take over the ip address. Either additional physically or logical interfaces can be used.

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**filesystem (Version 1.3.5, 84K) (B)**

The filesystem package is one of the basic packages that is installed on a Red Hat Linux system. Filesystem contains the basic directory layout for a Linux operating system, including the correct permissions for the directories.

**genromfs (Version 0.3, 12K)**

Genromfs is a tool for creating romfs filesystems, which are lightweight, read-only filesystems supported by the Linux kernel.

**heartbeat (Version 0.4.1, 223K)**

Heartbeat is a tool that communicates between the nodes of a cluster, sending out timed "heartbeats" to ensure that every node in the cluster is actually alive and healthy. These heartbeats can be sent via: - unadorned serial links arranged in a ring topology - UDP/IP heartbeats over ethernet (or similar) - PPP/UDP using a serial ring topology like the first case

**info (Version 3.12h, 254K) (B)**

The GNU project uses the texinfo file format for much of its documentation. The info package provides a standalone TTY-based browser program for viewing texinfo files.

You should install info, because GNU's texinfo documentation is a valuable source of information about the software on your system.

**initscripts (Version 4.41, 232K) (B)**

The initscripts package contains the basic system scripts used to boot your Red Hat system, change run levels, and shut the system down cleanly. Initscripts also contains the scripts that activate and deactivate most network interfaces.

**ipchains (Version 1.3.9, 549K) (G K S)**

Linux IP Firewalling Chains is an update to (and hopefully an improvement upon) the normal Linux Firewalling code, for 2.0 and 2.1 kernels. It lets you do things like firewalls, IP masquerading, etc.

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**ipvsadm (Version 1.1, 17K)**

ipvsadm is a utility to administer the IP virtual server services offered by the Linux kernel with virtual server patch. The virtual server alters kernel routing tables to masquerade actual servers to appear as a single virtual server.

**isapnptools (Version 1.18b, 237K) (B)**

The isapnptools package contains utilities for configuring ISA Plug-and-Play (PnP) cards/boards which are in compliance with the PnP ISA Specification Version 1.0a. ISA PnP cards use registers instead of jumpers for setting the board address and interrupt assignments. The cards also contain descriptions of the resources which need to be allocated. The BIOS on your system, or isapnptools, uses a protocol described in the specification to find all of the PnP boards and allocate the resources so that none of them conflict.

Note that the BIOS doesn't do a very good job of allocating resources. So isapnptools is suitable for all systems, whether or not they include a PnP BIOS. In fact, a PnP BIOS adds some complications. A PnP BIOS may already activate some cards so that the drivers can find them. Then these tools can unconfigure them or change their settings, causing all sorts of nasty effects. If you have PnP network cards that already work, you should read through the documentation files very carefully before you use isapnptools.

Install isapnptools if you need utilities for configuring ISA PnP cards.

**kbdconfig (Version 1.9.2.1, 60K) (B)**

The kbdconfig utility is a terminal mode program which provides a simple interface for setting the keyboard map for your system. You need keyboard maps to use any keyboard other than the US default keyboard. Kbdconfig will load the selected keymap before exiting and configure your machine to use that keymap automatically after rebooting.

You should install kbdconfig if you need a utility for changing your keyboard map.

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**ld.so (Version 1.9.5, 247K) (B)**

This package contains the shared library configuration tool, ldconfig, which is required by many packages. It also includes the shared library loader and dynamic loader for Linux libc 5.

**ldconfig (Version 1.9.5, 223K) (B)**

Ldconfig is a basic system program which determines run-time link bindings between ld.so and shared libraries. Ldconfig scans a running system and sets up the symbolic links that are used to load shared libraries properly. It also creates a cache (/etc/ld.so.cache) which speeds the loading of programs which use shared libraries.

**lilo (Version 0.21, 1,095K) (B)**

LILLO (Linux LOader) is a basic system program which boots your Linux system. LILO loads the Linux kernel from a floppy or a hard drive, boots the kernel and passes control of the system to the kernel. LILO can also boot other operating systems.

**logrotate (Version 3.3, 53K) (B)**

The logrotate utility is designed to simplify the administration of log files on a system which generates a lot of log files. Logrotate allows for the automatic rotation, compression, removal and mailing of log files. Logrotate can be set to handle a log file daily, weekly, monthly or when the log file gets to a certain size. Normally, logrotate runs as a daily cron job.

Install the logrotate package if you need a utility to deal with the log files on your system.

**losetup (Version 2.9u, 9K) (B)**

Linux supports a special block device called the loop device, which maps a normal file onto a virtual block device. This allows for the file to be used as a "virtual file system" inside another file. Losetup is used to associate loop devices with regular files or block devices, to detach loop devices and to query the status of a loop device.

**mailcap (Version 2.0.2, 34K) (B)**

The mailcap file is used by the metamail program. Metamail reads the mailcap file to determine how it should display non-text or multimedia material. Basically, mailcap

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associates a particular type of file with a particular program that a mail agent or other program can call in order to handle the file.

Mailcap should be installed to allow certain programs to be able to handle non-text files.

### **man (Version 1.5g, 219K) (B)**

The man package includes three tools for finding information and/or documentation about your Linux system: man, apropos and whatis. The man system formats and displays on-line manual pages about commands or functions on your system. Apropos searches the whatis database (containing short descriptions of system commands) for a string. Whatis searches its own database for a complete word.

The man package should be installed on your system because it is the primary way to find documentation on a Linux system.

### **mingetty (Version 0.9.4, 32K) (B)**

The mingetty program is a lightweight, minimalist getty program for use only on virtual consoles. Mingetty is not suitable for serial lines (you should use the mgetty program instead for that purpose).

### **mkbootdisk (Version 1.2.1.1, 5K) (B)**

The mkbootdisk program creates a standalone boot floppy disk for booting the running system. The created boot disk will look for the root filesystem on the device mentioned in /etc/fstab and includes an initial ramdisk image which will load any necessary SCSI modules for the system.

### **mkinitrd (Version 2.1, 8K) (B)**

Mkinitrd creates filesystem images for use as initial ramdisk (initrd) images. These ramdisk images are often used to preload the block device modules (SCSI or RAID) needed to access the root filesystem.

In other words, generic kernels can be built without drivers for any SCSI adapters which load the SCSI driver as a module. Since the kernel needs to read those modules, but in this case it isn't able to address the SCSI adapter, an initial ramdisk is used. The initial ramdisk is loaded by the operating system loader (normally LILO) and is available to the kernel as soon as the ramdisk is loaded. The ramdisk image loads the

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proper SCSI adapter and allows the kernel to mount the root filesystem. The `mkinitrd` program creates such a ramdisk using information found in the `/etc/conf.modules` file.

### **mkkickstart (Version 1.3, 5K)**

The `mkkickstart` program writes a kickstart description from the host machine. The kickstart description can then be used, during a CD-ROM or NFS installation, to automatically build that machine's configuration of Red Hat Linux on one or more other machines.

Install `mkkickstart` if you want to use the kickstart method to automatically install Red Hat Linux.

### **mktemp (Version 1.5, 8K) (B)**

The `mktemp` utility takes a given file name template and overwrites a portion of it to create a unique file name. This allows shell scripts and other programs to safely create and use `/tmp` files.

Install the `mktemp` package if you need to use shell scripts or other programs which will create and use unique `/tmp` files.

### **mount (Version 2.9u, 134K) (B)**

The `mount` package contains the `mount`, `umount`, `swapon` and `swapoff` programs. Accessible files on your system are arranged in one big tree or hierarchy. These files can be spread out over several devices. The `mount` command attaches a filesystem on some device to your system's file tree. The `umount` command detaches a filesystem from the tree. `Swapon` and `swapoff`, respectively, specify and disable devices and files for paging and swapping.

### **mouseconfig (Version 4.1, 219K) (B)**

`Mouseconfig` is a text-based mouse configuration tool. `Mouseconfig` sets up the files and links needed for configuring and using a mouse on a Red Hat Linux system. The `mouseconfig` tool can be used to set the correct mouse type for programs like `gpm`, and can be used with `Xconfigurator` to set up the mouse for the X Window System.

### **net-tools (Version 1.53, 556K) (B)**

The `net-tools` package contains the basic tools needed for setting up networking: `arp`, `rarp`, `ifconfig`, `netstat`, `ethers` and `route`.

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**nss\_ldap (Version 85, 98K)**

This package includes two LDAP access clients: `nss_ldap` and `pam_ldap`.

`nss_ldap` is a set of C library extensions which allows X.500 and LDAP directory servers to be used as a primary source of aliases, ethers, groups, hosts, networks, protocol, users, RPCs, services and shadow passwords (instead of or in addition to using flat files or NIS).

`pam_ldap` is a module for Linux-PAM that supports password changes, V2 clients, Netscapes SSL, `ypldapd`, Netscape Directory Server password policies, access authorization, crypted hashes, etc.

**ntsysv (Version 1.0.7, 23K) (B)**

`ntsysv` updates and queries runlevel information for system services. `ntsysv` relieves system administrators of having to directly manipulate the numerous symbolic links in `/etc/rc.d`.

**pam (Version 0.68, 598K) (B)**

PAM (Pluggable Authentication Modules) is a system security tool which allows system administrators to set authentication policy without having to recompile programs which do authentication.

**pam\_ldap (Version 36, 106K)**

This is `pam_ldap`, a pluggable authentication module that can be used with linux-PAM. This module supports password changes, V2 clients, Netscapes SSL, `ypldapd`, Netscape Directory Server password policies, access authorization, crypted hashes, etc.

**passwd (Version 0.61, 28K) (B)**

The `passwd` package contains a system utility (`passwd`) which sets and/or changes passwords, using PAM (Pluggable Authentication Modules).

To use `passwd`, you should have PAM installed on your system.

**pwdb (Version 0.59, 440K) (B)**

The `pwdb` package contains `libpwdb`, the password database library. `Libpwdb` is a library which implements a generic user information database. `Libpwdb`

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was specifically designed to work with Linux's PAM (Pluggable Authentication Modules). Libpwnb allows configurable access to and management of security tools like `/etc/passwd`, `/etc/shadow` and network authentication systems including NIS and Radius.

**quota (Version 1.66, 79K) (B)**

The quota package contains system administration tools for monitoring and limiting users' and or groups' disk usage, per filesystem.

**raidtools (Version 0.90, 142K)**

The raidtools package includes the tools you need to set up and maintain a software RAID device (using two or more disk drives in combination for fault tolerance and improved performance) on a Linux system. It only works with Linux 2.2 kernels and later, or with a 2.0 kernel specifically patched with newer RAID support.

Install raidtools if you need to set up RAID on your system.

**redhat-logos (Version 1.0.6, 519K) (B)**

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**redhat-release (Version 6.0.59, 0K) (B)**

Red Hat Linux release file

**rootfiles (Version 5.2, 1K) (B)**

The rootfiles package contains basic required files that are placed in the root user's account. These files are basically the same as the files found in the etcskel package, which are placed in regular users' home directories.

**rpm (Version 3.0.3, 2,722K) (B)**

The Red Hat Package Manager (RPM) is a powerful command line driven package management system capable of installing, uninstalling, verifying, querying, and updating software packages. Each software package consists of an archive of files along with information about the package like its version, a description, etc.

**setup (Version 2.0.5, 16K) (B)**

The setup package contains a set of very important system configuration and setup files, such as passwd, group, profile and more.

You should install the setup package because you will find yourself using its many features for system administration.

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**shadow-utils (Version 980403, 584K) (B)**

The shadow-utils package includes the necessary programs for converting UNIX password files to the shadow password format, plus programs for managing user and group accounts. The pwconv command converts passwords to the shadow password format. The pwunconv command unconverts shadow passwords and generates an npasswd file (a standard UNIX password file). The pwck command checks the integrity of password and shadow files. The lastlog command prints out the last login times for all users. The useradd, userdel and usermod commands are used for managing user accounts. The groupadd, groupdel and groupmod commands are used for managing group accounts.

**shaper (Version 2.2.12, 22K)**

The Shaper program configures and adjusts traffic shaper bandwidth limiters. Traffic shaping means setting parameters or limit to which network traffic should conform--setting limitations on bandwidth consumption.

To use Shaper, you must have also installed the kernel which supports the shaper module (kernel versions 2.0.36 or later and late 2.1.x kernels).

Install the shaper package if you want to set traffic bandwidth parameters, and if you have the appropriate kernel.

**termcap (Version 9.12.6, 424K) (B)**

The termcap package provides the /etc/termcap file. /etc/termcap is a database which defines the capabilities of various terminals and terminal emulators. Certain programs use the /etc/termcap file to access various features of terminals (the bell, colors, and graphics, etc.).

**tmpwatch (Version 2.0, 10K) (B)**

The tmpwatch utility recursively searches through specified directories and removes files which have not been accessed in a specified period of time. Tmpwatch is normally used to clean up directories which are used for temporarily holding files (for example, /tmp). Tmpwatch ignores symlinks, won't switch filesystems and only removes empty directories and regular files.

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**utempter (Version 0.5.1, 21K) (B)**

Utmpeter is a utility which allows some non-privileged programs to have required root access without compromising system security. Utmpeter accomplishes this feat by acting as a buffer between root and the programs.

**util-linux (Version 2.9w, 1,370K) (B)**

The util-linux package contains a large variety of low-level system utilities that are necessary for a Linux system to function. Among many features, Util-linux contains the fdisk configuration tool and login program.

**vixie-cron (Version 3.0.1, 59K) (B)**

The vixie-cron package contains the Vixie version of cron. Cron is a standard UNIX daemon that runs specified programs at scheduled times. Vixie cron adds better security and more powerful configuration options to the standard version of cron.

**yp-tools (Version 2.3, 162K) (G K S)**

The Network Information Service (NIS) is a system which provides network information (login names, passwords, home directories, group information) to all of the machines on a network. NIS can enable users to login on any machine on the network, as long as the machine has the NIS client programs running and the user's password is recorded in the NIS passwd database. NIS was formerly known as Sun Yellow Pages (YP).

This package's NIS implementation is based on FreeBSD's YP and is a special port for glibc 2.x and libc versions 5.4.21 and later. This package only provides the NIS client programs. In order to use the clients, you'll need to already have an NIS server running on your network. An NIS server is provided in the ypserv package.

Install the yp-tools package if you need NIS client programs for machines on your network. You will also need to install the ypbind package on every machine running NIS client programs. If you need an NIS server, you'll need to install the ypserv package on one machine on the network.

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## A.6.2 Daemons

This section contains packages for all the daemons available for your Red Hat Linux system. Daemons are programs that run automatically, and perform various system functions for you.

### **XFree86-xfs (Version 3.3.5, 529K) (G K S)**

XFree86-xfs contains a font server for XFree86. Xfs can serve fonts to remote X servers. The remote system will be able to use all fonts installed on the font server, even if they are not installed on the remote computer.

### **am-utils (Version 6.0.1, 1,441K)**

Am-utils includes an updated version of Amd, the popular BSD automounter. An automounter is a program which maintains a cache of mounted filesystems. Filesystems are mounted when they are first referenced by the user and unmounted after a certain period of inactivity. Amd supports a variety of filesystems, including NFS, UFS, CD-ROMS and local drives.

You should install am-utils if you need a program for automatically mounting and unmounting filesystems.

### **anonftp (Version 2.8, 1,540K) (S)**

The anonftp package contains the files you need in order to allow anonymous FTP access to your machine. Anonymous FTP access allows anyone to download files from your machine without having a user account. Anonymous FTP is a popular way of making programs available via the Internet.

You should install anonftp if you would like to enable anonymous FTP downloads from your machine.

### **apache (Version 1.3.9, 2,383K) (S)**

Apache is a powerful, full-featured, efficient and freely-available Web server. Apache is also the most popular Web server on the Internet.

Install the apache package if you need a Web server.

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**apmd (Version 3.0beta9, 89K) (B)**

APMD is a set of programs for controlling the Advanced Power Management daemon and utilities found in most modern laptop computers. APMD can watch your notebook's battery and warn users when the battery is low. APMD is also capable of shutting down the PCMCIA sockets before a suspend.

Install the apmd package if you need to control the APM system on your laptop.

**at (Version 3.1.7, 64K) (B)**

At and batch read commands from standard input or from a specified file. At allows you to specify that a command will be run at a particular time (now or a specified time in the future). Batch will execute commands when the system load levels drop to a particular level. Both commands use /bin/sh to run the commands.

You should install the at package if you need a utility that will do time-oriented job control. Note: you should use crontab instead, if it is a recurring job that will need to be repeated at the same time every day/week/etc.

**autofs (Version 3.1.3, 128K)**

Autofs controls the operation of the automount daemons. The automount daemons automatically mount filesystems when you use them and unmount them after a period of inactivity. Filesystems can include network filesystems, CD-ROMs, floppies and others.

Install this package if you want a program for automatically mounting and unmounting filesystems. If your Red Hat Linux machine is on a network, you should install autofs.

**bdflush (Version 1.5, 10K) (B)**

The bdflush process starts the kernel daemon which flushes dirty buffers back to disk (i.e., writes all unwritten data to disk). This helps to prevent the buffers from growing too stale.

Bdflush is a basic system process that must run for your system to operate properly.

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**bind (Version 8.2.1, 4,824K) (S)**

BIND (Berkeley Internet Name Domain) is an implementation of the DNS (Domain Name System) protocols. BIND includes a DNS server (named), which resolves host names to IP addresses, and a resolver library (routines for applications to use when interfacing with DNS). A DNS server allows clients to name resources or objects and share the information with other network machines. The named DNS server can be used on workstations as a caching name server, but is generally only needed on one machine for an entire network. Note that the configuration files for making BIND act as a simple caching nameserver are included in the caching-nameserver package.

Install the bind package if you need a DNS server for your network. If you want bind to act a caching name server, you will also need to install the caching-nameserver package.

**bootparamd (Version 0.10, 18K)**

The bootparamd process provides bootparamd, a server process which provides the information needed by diskless clients in order for them to successfully boot. Bootparamd looks first in /etc/bootparams for an entry for that particular client; if a local bootparams file doesn't exist, it looks at the appropriate Network Information Service (NIS) map. Some network boot loaders (notably Sun's) rely on special boot server code on the server, in addition to the RARP and TFTP servers. This bootparamd server process is compatible with SunOS bootparam clients and servers which need that boot server code.

You should install bootparamd if you need to provide boot information to diskless clients on your network.

**caching-nameserver (Version 6.0, 3K) (S)**

The caching-nameserver package includes the configuration files which will make bind, the DNS name server, act as a simple caching nameserver. Many users on dialup connections use this package along with bind for such a purpose.

If you would like to set up a caching name server, you'll need to install the caching-nameserver package; you'll also need to install bind.

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**cleanfeed (Version 0.95.7b, 107K) (S)**

Cleanfeed is an automatic spam filter for Usenet news servers and routers (INN, Cyclone, Typhoon, Breeze and NNTPRelay). Cleanfeed is highly configurable, easily modified and very fast. It can be configured to block binary posts to non-binary newsgroups, to cancel already-rejected articles, and to reject some spamming from local users.

Install the cleanfeed package if you need a spam filter for a Usenet news server.

**comsat (Version 0.15, 18K)**

The biff client and comsat server are an antiquated method of asynchronous mail notification. Although they are still supported, most users use their shell's MAIL variable (or csh shell's mail variable) to check for mail, or a dedicated application like xbiff, xmailbox, or the GNOME mail check applet. If the comsat service is not enabled, biff won't work and you'll need to use something else.

You may want to install biff if you'd like to be notified when mail arrives. However, you should probably check out the more modern methodologies of mail notification instead.

**dhcp (Version 2.0, 276K)**

DHCP (Dynamic Host Configuration Protocol) is a protocol which allows individual devices on an IP network to get their own network configuration information (IP address, subnetmask, broadcast address, etc.) from a DHCP server. The overall purpose of DHCP is to make it easier to administer a large network. The dhcp package includes the DHCP server and a DHCP relay agent.

You should install dhcp if you want to set up a DHCP server on your network. You will also need to install the pump package, which provides the DHCP client daemon, on client machines.

**dhcpcd (Version 1.3.17pl5, 335K)**

dhcpcd is an implementation of the DHCP client specified in draft-ietf-dhc-dhcp-09 (when -r option is not specified) and RFC1541 (when -r option is specified).

It gets the host information (IP address, netmask, broadcast address, etc.) from a DHCP server and configures the network interface of the machine on which it is

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running. It also tries to renew the lease time according to RFC1541 or draft-ietf-dhc-dhcp-09.

### **esound (Version 0.2.13, 213K) (G K S)**

Esound, the Enlightened Sound Daemon, is a server process that mixes several audio streams for playback by a single audio device. For example, if you're listening to music on a CD and you receive a sound-related event from ICQ, the two applications won't have to jockey for the use of your sound card.

Install esound if you'd like to let sound applications share your audio device.

### **gated (Version 3.5.10, 2,434K)**

GateD is a modular software program consisting of core services, a routing database, and protocol modules which support multiple routing protocols (RIP versions 1 and 2, DCN HELLO, OSPF version 2, EGP version 2, BGP versions 2 through 4). GateD is designed to handle dynamic routing with a routing database built from the information exchanged by routing protocols.

Install gated if you need a routing daemon.

### **gpm (Version 1.17.9, 265K) (B)**

Gpm provides mouse support to text-based Linux applications like the emacs editor, the Midnight Commander file management system, and other programs. Gpm also provides console cut-and-paste operations using the mouse and includes a program to allow pop-up menus to appear at the click of a mouse button.

Gpm should be installed if you intend to use a mouse with your Red Hat Linux system.

### **imap (Version 4.5, 1,596K)**

The imap package provides server daemons for both the IMAP (Internet Message Access Protocol) and POP (Post Office Protocol) mail access protocols. The POP protocol uses a "post office" machine to collect mail for users and allows users to download their mail to their local machine for reading. The IMAP protocol provides the functionality of POP, but allows a user to read mail on a remote machine without downloading it to their local machine.

Install the imap package if you need a server to support the IMAP or the POP mail access protocols.

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**inews (Version 2.2.1, 75K) (G K S)**

The inews program is used by some news programs (for example, inn and trn) to post Usenet news articles to local news servers. Inews reads an article from a file or standard input, adds headers, performs some consistency checks and then sends the article to the local news server specified in the inn.conf file.

Install inews if you need a program for posting Usenet articles to local news servers.

**inn (Version 2.2.1, 6,658K) (S)**

INN (InterNetNews) is a complete system for serving Usenet news and/or private newsfeeds. INN includes innd, an NNTP (NetNews Transport Protocol) server, and nnrpd, a newsreader that is spawned for each client. Both innd and nnrpd vary slightly from the NNTP protocol, but not in ways that are easily noticed.

Install the inn package if you need a complete system for serving and reading Usenet news. You may also need to install inn-devel, if you are going to use a separate program which interfaces to INN, like newsgate or tin.

**intimed (Version 1.10, 210K)**

The intimed package contains a server (in.timed), which keeps networked machines' clocks correctly synchronized to the server's time.

Install intimed if you need a network time server.

**knfsd (Version 1.4.7, 165K) (G K S)**

This is the \*new\* kernel NFS server and related tools. It provides a much higher level of performance than the traditional Linux user-land NFS server.

**lpr (Version 0.41, 182K) (G K S)**

The lpr package provides the basic system utility for managing printing services. Lpr manages print queues, sends print jobs to local and remote printers and accepts print jobs from remote clients.

If you will be printing from your system, you'll need to install the lpr package.

**mars-nwe (Version 0.99p17, 610K) (S)**

The mars\_nwe (MARTin Stover's NetWare Emulator) package enables Linux to provide both file and print services for NetWare clients (i.e., providing the services of

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a Novell NetWare file server). Mars\_nwe allows the sharing of files between Linux machines and Novell NetWare clients, using NetWare's native IPX protocol suite.

Install the mars\_nwe package if you need a Novell NetWare file server on your Red Hat Linux system.

### **mcserv (Version 4.5.39pre1, 19K)**

The Midnight Commander file management system will allow you to manipulate the files on a remote machine as if they were local. This is only possible if the remote machine is running the mcserv server program. Mcserv provides clients running Midnight Commander with access to the host's file systems.

Install mcserv on machines if you want to access their file systems remotely using the Midnight Commander file management system.

### **mod\_perl (Version 1.21, 1,830K)**

Mod\_perl incorporates a Perl interpreter into the Apache web server, so that the Apache web server can directly execute Perl code. Mod\_perl links the Perl runtime library into the Apache web server and provides an object-oriented Perl interface for Apache's C language API. The end result is a quicker CGI script turnaround process, since no external Perl interpreter has to be started.

Install mod\_perl if you're installing the Apache web server and you'd like for it to directly incorporate a Perl interpreter.

### **netkit-base (Version 0.10, 63K) (G K S)**

The netkit-base package contains the basic networking tools ping and inetd. The ping command sends a series of ICMP protocol ECHO\_REQUEST packets to a specified network host and can tell you if that machine is alive and receiving network traffic. Inetd listens on certain Internet sockets for connection requests, decides what program should receive each request, and starts up that program.

The netkit-base package should be installed on any machine that is on a network.

### **nscd (Version 2.1.2, 34K)**

Nscd caches name service lookups and can dramatically improve performance with NIS+, and may help with DNS as well. Note that you can't use nscd with 2.0 kernels

because of bugs in the kernel-side thread support. Unfortunately, `nscd` happens to hit these bugs particularly hard.

Install `nscd` if you need a name service lookup caching daemon, and you're not using a version 2.0 kernel.

### **openldap (Version 1.2.7, 4,046K)**

OpenLDAP is an open source suite of LDAP (Lightweight Directory Access Protocol) applications and development tools. The suite includes a stand-alone LDAP server (`slapd`), a stand-alone LDAP replication server (`slurpd`), libraries for implementing the LDAP protocol, and utilities, tools, and sample clients.

Install `openldap` if you need LDAP applications and tools.

### **php (Version 3.0.12, 696K)**

PHP is an HTML-embedded scripting language. PHP attempts to make it easy for developers to write dynamically generated web pages. PHP also offers built-in database integration for several commercial and non-commercial database management systems, so writing a database-enabled web page with PHP is fairly simple. The most common use of PHP coding is probably as a replacement for CGI scripts. The `mod_php` module enables the Apache web server to understand and process the embedded PHP language in web pages.

This package contains PHP. If you use applications which specifically rely on PHP/FI (PHP v2 and earlier), you should instead install the PHP/FI module contained in the `phpfi` package. If you're just starting with PHP, you should install this package. You'll also need to install the Apache web server.

### **php-imap (Version 3.0.12, 614K)**

This is a dynamic shared object (DSO) for Apache that will add IMAP support to PHP3. If you need to have IMAP support for PHP3 applications, you will need to install this package in addition to the main `php` package.

### **php-manual (Version 3.0.12, 2,610K)**

Comprehensive documentation for PHP3, viewable through any web browser.

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**php-pgsql (Version 3.0.12, 25K)**

This is a dynamic shared object (DSO) for Apache that will add PostgreSQL database support to PHP3. If you need back-end support for PostgreSQL, you should install this package in addition to the main php package.

**phpfi (Version 2.0.1, 676K)**

PHP is an HTML-embedded scripting language. PHP attempts to make it easy for developers to write dynamically generated web pages. PHP also offers built-in database integration for several commercial and non-commercial database management systems, so writing a database-enabled web page with PHP is fairly simple. The most common use of PHP coding is probably as a replacement for CGI scripts. The `mod_php` module enables the Apache web server to understand and process the embedded PHP language in web pages.

This package contains PHP/FI, or PHP version 2.01. Unless you use applications which specifically rely on PHP/FI, you should instead install the php package, which contains PHP 3 or later. PHP is an improved and more capable update to PHP/FI.

**pidentd (Version 3.0.7, 118K) (G K S)**

The `pidentd` package contains `identd`, which implements the RFC1413 identification server. `Identd` looks up specific TCP/IP connections and returns either the user name or other information about the process that owns the connection.

Install `pidentd` if you need to look up information about specific TCP/IP connections.

**portmap (Version 4.0, 53K) (G K S)**

The `portmapper` program is a security tool which prevents theft of NIS (YP), NFS and other sensitive information via the `portmapper`. A `portmapper` manages RPC connections, which are used by protocols like NFS and NIS.

The `portmap` package should be installed on any machine which acts as a server for protocols using RPC.

**ppp (Version 2.3.9, 371K) (G K S)**

The `ppp` package contains the PPP (Point-to-Point Protocol) daemon and documentation for PPP support. The PPP protocol provides a method for transmitting datagrams over serial point-to-point links.

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The `ppp` package should be installed if your machine need to support the PPP protocol.

**procmail (Version 3.13.1, 281K) (B)**

The `procmail` program is used by Red Hat Linux for all local mail delivery. In addition to just delivering mail, `procmail` can be used for automatic filtering, presorting and other mail handling jobs. `Procmail` is also the basis for the `SmartList` mailing list processor.

**pump (Version 0.7.1, 74K) (B)**

DHCP (Dynamic Host Configuration Protocol) and BOOTP (Boot Protocol) are protocols which allow individual devices on an IP network to get their own network configuration information (IP address, subnetmask, broadcast address, etc.) from network servers. The overall purpose of DHCP and BOOTP is to make it easier to administer a large network.

`Pump` is a combined BOOTP and DHCP client daemon, which allows your machine to retrieve configuration information from a server. You should install this package if you are on a network which uses BOOTP or DHCP.

**routed (Version 0.10, 39K) (G K S)**

The `routed` routing daemon handles incoming RIP traffic and broadcasts outgoing RIP traffic about network traffic routes, in order to maintain current routing tables. These routing tables are essential for a networked computer, so that it knows where packets need to be sent.

The `routed` package should be installed on any networked machine.

**rusers (Version 0.15, 55K) (G K S)**

The `rusers` program allows users to find out who is logged into various machines on the local network. The `rusers` command produces output similar to `who`, but for the specified list of hosts or for all machines on the local network.

Install `rusers` if you need to keep track of who is logged into your local network.

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**rwall (Version 0.10, 18K)**

The rwall command sends a message to all of the users logged into a specified host. Actually, your machine's rwall client sends the message to the rwall daemon running on the specified host, and the rwall daemon relays the message to all of the users logged in to that host. The rwall daemon is run from /etc/inetd.conf and is disabled by default on Red Hat Linux systems (it can be very annoying to keep getting all those messages when you're trying to play Quake--I mean trying to get some work done).

Install rwall if you'd like the ability to send messages to users logged in to a specified host machine.

**rwho (Version 0.15, 34K) (G K S)**

The rwho command displays output similar to the output of the who command (it shows who is logged in) for all machines on the local network running the rwho daemon.

Install the rwho command if you need to keep track of the users who are logged in to your local network.

**samba (Version 2.0.5a, 4,885K) (S)**

Samba provides an SMB server which can be used to provide network services to SMB (sometimes called "Lan Manager") clients, including various versions of MS Windows, OS/2, and other Linux machines. Samba uses NetBIOS over TCP/IP (NetBT) protocols and does NOT need NetBEUI (Microsoft Raw NetBIOS frame) protocol.

Samba-2 features an almost working NT Domain Control capability and includes the new SWAT (Samba Web Administration Tool) that allows samba's smb.conf file to be remotely managed using your favourite web browser. For the time being this is being enabled on TCP port 901 via inetd.

Please refer to the WHATSNEW.txt document for fixup information. This binary release includes encrypted password support. Please read the smb.conf file and ENCRYPTION.txt in the docs directory for implementation details.

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NOTE: Red Hat Linux 5.X Uses PAM which has integrated support for Shadow passwords. Do NOT recompile with the SHADOW\_PWD option enabled. Red Hat Linux has built in support for quotas in PAM.

### **sendmail (Version 8.9.3, 527K) (B)**

The Sendmail program is a very widely used Mail Transport Agent (MTA). MTAs send mail from one machine to another. Sendmail is not a client program, which you use to read your e-mail. Sendmail is a behind-the-scenes program which actually moves your e-mail over networks or the Internet to where you want it to go.

If you ever need to reconfigure Sendmail, you'll also need to have the sendmail.cf package installed. If you need documentation on Sendmail, you can install the sendmail-doc package.

### **sendmail-cf (Version 8.9.3, 503K)**

This package includes the configuration files which you'd need to generate the sendmail.cf file distributed with the sendmail package. You'll need the sendmail-cf package if you ever need to reconfigure and rebuild your sendmail.cf file. For example, the default sendmail.cf file is not configured for UUCP. If someday you needed to send and receive mail over UUCP, you'd need to install the sendmail-cf package to help you reconfigure Sendmail.

Install the sendmail-cf package if you need to reconfigure your sendmail.cf file.

### **squid (Version 2.2.STABLE4, 1,912K)**

Squid is a high-performance proxy caching server for Web clients, supporting FTP, gopher, and HTTP data objects. Unlike traditional caching software, Squid handles all requests in a single, non-blocking, I/O-driven process. Squid keeps meta data and especially hot objects cached in RAM, caches DNS lookups, supports non-blocking DNS lookups, and implements negative caching of failed requests.

Squid consists of a main server program squid, a Domain Name System lookup program (dnsserver), a program for retrieving FTP data (ftpget), and some management and client tools.

Install squid if you need a proxy caching server.

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**sysklogd (Version 1.3.31, 112K) (B)**

The sysklogd package contains two system utilities (syslogd and klogd) which provide support for system logging. Syslogd and klogd run as daemons (background processes) and log system messages to different places, like sendmail logs, security logs, error logs, etc.

**tcp\_wrappers (Version 7.6, 271K) (G K S)**

The tcp\_wrappers package provides small daemon programs which can monitor and filter incoming requests for systat, finger, ftp, telnet, rlogin, rsh, exec, tftp, talk and other network services.

Install the tcp\_wrappers program if you need a security tool for filtering incoming network services requests.

**tftp (Version 0.15, 34K) (G K S)**

The Trivial File Transfer Protocol (TFTP) is normally used only for booting diskless workstations. The tftp package provides the user interface for TFTP, which allows users to transfer files to and from a remote machine. This program and TFTP provide very little security, and should not be enabled unless it is expressly needed. The TFTP server is run from /etc/inetd.conf, and is disabled by default on Red Hat Linux systems.

**timed (Version 0.10, 71K) (G K S)**

The timed package contains the timed daemon and the timedc program for controlling the timed program. Timed synchronizes its host machine's time with the time on other local network machines. The timedc program is used to control and configure the operation of timed.

Install the timed package if you need a system for keeping networked machines' times in synchronization.

**ucd-snmp (Version 4.0.1, 1,878K) (G K S)**

SNMP (Simple Network Management Protocol) is a protocol used for network management (hence the name). The UCD-SNMP project includes various SNMP tools: an extensible agent, an SNMP library, tools for requesting or setting information from SNMP agents, tools for generating and handling SNMP traps, a version of the netstat

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command which uses SNMP, and a Tk/Perl mib browser. This package contains the `snmpd` and `snmptrapd` daemons, documentation, etc.

Install the `ucd-snmp` package if you need network management tools. You will probably also want to install the `ucd-snmp-utils` package, which contains UCD-SNMP utilities.

### **wu-ftpd (Version 2.5.0, 436K) (S)**

The `wu-ftpd` package contains the `wu-ftpd` FTP (File Transfer Protocol) server daemon. The FTP protocol is a method of transferring files between machines on a network and/or over the Internet. `Wu-ftpd`'s features include logging of transfers, logging of commands, on the fly compression and archiving, classification of users' type and location, per class limits, per directory upload permissions, restricted guest accounts, system wide and per directory messages, directory alias, `cdpath`, filename filter and virtual host support.

Install the `wu-ftpd` package if you need to provide FTP service to remote users.

### **wvdial (Version 1.40, 124K) (G K S)**

`WvDial` automatically locates and configures modems and can log into almost any ISP's server without special configuration. You need to input the username, password, and phone number, and then `WvDial` will negotiate the PPP connection using any mechanism needed.

Install `wvdial` if you need a utility to configure your modem and set up a PPP connection.

### **xntp3 (Version 5.93, 973K)**

The Network Time Protocol (NTP) is used to synchronize a computer's time with another reference time source. The `xntp3` package contains utilities and daemons which will synchronize your computer's time to Coordinated Universal Time (UTC) via the NTP protocol and NTP servers. `Xntp3` includes `ntpdate` (a program for retrieving the date and time from remote machines via a network) and `xntpd` (a daemon which continuously adjusts system time).

Install the `xntp3` package if you need tools for keeping your system's time synchronized via the NTP protocol.

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**ypbind (Version 3.3, 34K) (G K S)**

The Network Information Service (NIS) is a system which provides network information (login names, passwords, home directories, group information) to all of the machines on a network. NIS can enable users to login on any machine on the network, as long as the machine has the NIS client programs running and the user's password is recorded in the NIS passwd database. NIS was formerly known as Sun Yellow Pages (YP).

This package provides the ypbind daemon. The ypbind daemon binds NIS clients to an NIS domain. Ypbind must be running on any machines which are running NIS client programs.

Install the ypbind package on any machines which are running NIS client programs (included in the yp-tools package). If you need an NIS server, you'll also need to install the ypserv package to a machine on your network.

**ypserv (Version 1.3.7, 301K)**

The Network Information Service (NIS) is a system which provides network information (login names, passwords, home directories, group information) to all of the machines on a network. NIS can enable users to login on any machine on the network, as long as the machine has the NIS client programs running and the user's password is recorded in the NIS passwd database. NIS was formerly known as Sun Yellow Pages (YP).

This package provides the NIS server, which will need to be running on your network. NIS clients do not need to be running the server.

Install ypserv if you need an NIS server for your network. You'll also need to install the yp-tools and ypbind packages onto any NIS client machines.

**A.6.3 Kernel**

This section contains packages related to your Red Hat Linux system's kernel. This part of the Linux operating system is central to all system operations.

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**kernel (Version 2.2.12, 10,756K) (B)**

The kernel package contains the Linux kernel (vmlinuz), the core of your Red Hat Linux operating system. The kernel handles the basic functions of the operating system: memory allocation, process allocation, device input and output, etc.

**kernel-BOOT (Version 2.2.12, 6,300K)**

This package includes a trimmed down version of the Linux kernel. This kernel is used on the installation boot disks only and should not be used for an installed system, as many features in this kernel are turned off because of the size constraints.

**kernel-ibcs (Version 2.2.12, 61K)**

The kernel-ibcs package allows you to run programs in the iBCS2 (Intel Binary Compatibility Standard, version 2) and related executable formats. iBCS is a standard for binary portability between UNIX and UNIX-like systems.

**kernel-pcmcia-cs (Version 2.2.12, 587K) (B)**

Many laptop machines (and some non-laptops) support PCMCIA cards for expansion. Also known as "credit card adapters," PCMCIA cards are small cards for everything from SCSI support to modems. PCMCIA cards are hot swappable (i.e., they can be exchanged without rebooting the system) and quite convenient to use. The kernel-pcmcia-cs package contains a set of loadable kernel modules that implement an applications program interface, a set of client drivers for specific cards and a card manager daemon that can respond to card insertion and removal events by loading and unloading drivers on demand. The daemon also supports hot swapping, so that the cards can be safely inserted and ejected at any time.

Install the kernel-pcmcia-cs package if your system uses PCMCIA cards.

**kernel-smp (Version 2.2.12, 10,531K)**

This package includes a SMP version of the Linux kernel. It is required only on machines with two or more CPUs, although it should work fine on single-CPU boxes.

Install the kernel-smp package if your machine uses two or more CPUs.

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**kernel-utils (Version 2.2.12, 98K)**

The kernel-utils package contains ksymoops, a utility that can be used for decrypting the kernel's OOPS output.

**modutils (Version 2.1.121, 851K) (B)**

The modutils packages includes the kerneld program for automatic loading of modules under 2.0 kernels and unloading of modules under 2.0 and 2.2 kernels, as well as other module management programs. Examples of loaded and unloaded modules are device drivers and filesystems, as well as some other things.

**A.6.4 Libraries**

This section lists packages that contain various libraries. These libraries are used by other program to support various functions, such as image manipulation, compatibility with older binary program formats, and screen handling.

**ORBit (Version 0.4.94, 979K) (G K S)**

ORBit is a high-performance CORBA (Common Object Request Broker Architecture) ORB (object request broker). It allows programs to send requests and receive replies from other programs, regardless of the locations of the two programs. CORBA is an architecture that enables communication between program objects, regardless of the programming language they're written in or the operating system they run on.

You will need to install this package if you want to run programs that use the ORBit implementation of CORBA technology.

**Xaw3d (Version 1.3, 292K) (G K S)**

Xaw3d is an enhanced version of the MIT Athena Widget set for the X Window System. Xaw3d adds a three-dimensional look to applications with minimal or no source code changes.

You should install Xaw3d if you are using applications which incorporate the MIT Athena widget set and you'd like to incorporate a 3D look into those applications.

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**XFree86-libs (Version 3.3.5, 2,061K) (G K S)**

XFree86-libs contains the shared libraries that most X programs need to run properly. These shared libraries are in a separate package in order to reduce the disk space needed to run X applications on a machine without an X server (i.e., over a network).

If you are installing the X Window System on your machine, you will need to install XFree86-libs. You will also need to install XFree86, one or more of the XFree86 fonts packages, Xconfigurator and X11R6-contrib. If you are going to develop applications that run as X clients, you will also need to install XFree86-devel.

**audiofile (Version 0.1.7, 184K) (G K S)**

Library to handle various audio file formats. Used by the esound daemon.

**cracklib (Version 2.7, 74K) (B)**

CrackLib tests passwords to determine whether they match certain security-oriented characteristics. You can use CrackLib to stop users from choosing passwords which would be easy to guess. CrackLib performs certain tests:

- \* It tries to generate words from a username and gecostats entry and checks those words against the password;
- \* It checks for simplistic patterns in passwords;
- \* It checks for the password in a dictionary.

CrackLib is actually a library containing a particular C function which is used to check the password, as well as other C functions. CrackLib is not a replacement for a passwd program; it must be used in conjunction with an existing passwd program.

Install the cracklib package if you need a program to check users' passwords to see if they are at least minimally secure. If you install CrackLib, you'll also want to install the cracklib-dicts package.

**cracklib-dicts (Version 2.7, 226K) (B)**

The cracklib-dicts package includes the CrackLib dictionaries. CrackLib will need to use the dictionary appropriate to your system, which is normally put in /usr/dict/words. Cracklib-dicts also contains the utilities necessary for the creation of new dictionaries.

If you are installing CrackLib, you should also install cracklib-dicts.

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**fnlib (Version 0.4, 352K) (G)**

Fnlib is a library that provides full, scalable 24 bit color font rendering abilities for the X Window System.

**freetype (Version 1.2, 833K) (G K S)**

The FreeType engine is a free and portable TrueType font rendering engine. It has been developed to provide TT support to a great variety of platforms and environments. Note that FreeType is a library, not a stand-alone application, though some utility applications are included.

**gd (Version 1.3, 314K) (B)**

Gd is a graphics library for drawing .gif files. Gd allows your code to quickly draw images (lines, arcs, text, multiple colors, cutting and pasting from other images, flood fills) and write out the result as a .gif file. Gd is particularly useful in web applications, where .gifs are commonly used as inline images. Note, however, that gd is not a paint program.

Install gd if you are developing applications which need to draw .gif files. If you install gd, you'll also need to install the gd-devel package.

**gdbm (Version 1.8.0, 28K) (B)**

Gdbm is a GNU database indexing library, including routines which use extensible hashing. Gdbm works in a similar way to standard UNIX dbm routines. Gdbm is useful for developers who write C applications and need access to a simple and efficient database or who are building C applications which will use such a database.

If you're a C developer and your programs need access to simple database routines, you should install gdbm. You'll also need to install gdbm-devel.

**gimp-libgimp (Version 1.0.4, 168K) (G K)**

Libraries used to communicate between The GIMP and other programs which may function as "GIMP plugins".

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**glib (Version 1.2.3, 322K) (B G)**

Glib is a handy library of utility functions. This C library is designed to solve some portability problems and provide other useful functionality which most programs require.

Glib is used by GDK, GTK+ and many applications. You should install Glib because many of your applications will depend on this library.

**glib10 (Version 1.0.6, 56K) (G K S)**

The glib package contains a useful library of utility functions, which are necessary for the successful operation of many different programs on your Red Hat Linux system.

**glibc (Version 2.1.2, 26,835K) (B)**

The glibc package contains standard libraries which are used by multiple programs on the system. In order to save disk space and memory, as well as to make upgrading easier, common system code is kept in one place and shared between programs. This particular package contains the most important sets of shared libraries: the standard C library and the standard math library. Without these two libraries, a Linux system will not function. The glibc package also contains national language (locale) support and timezone databases.

**gmp (Version 2.0.2, 116K) (B)**

The gmp package contains GNU MP, a library for arbitrary precision arithmetic, signed integers operations, rational numbers and floating point numbers. GNU MP is designed for speed, for both small and very large operands. GNU MP is fast for several reasons: It uses fullwords as the basic arithmetic type, it uses fast algorithms, it carefully optimizes assembly code for many CPUs' most common inner loops and it generally emphasizes speed over simplicity/elegance in its operations.

Install the gmp package if you need a fast arbitrary precision library.

**gnome-audio-extra (Version 1.0.0, 2,659K) (G)**

This package contains extra sound files useful for customizing the sounds that the GNOME desktop environment makes.

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**gnome-libs (Version 1.0.17pre, 2,529K) (G K S)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of GUI applications and desktop tools to be used in conjunction with a window manager for the X Window System. The gnome-libs package includes libraries that are needed to run GNOME.

**gtk+ (Version 1.2.3, 2,039K) (G K S)**

The gtk+ package contains the GIMP ToolKit (GTK+), a library for creating graphical user interfaces for the X Window System. GTK+ was originally written for the GIMP (GNU Image Manipulation Program) image processing program, but is now used by several other programs as well.

If you are planning on using the GIMP or another program that uses GTK+, you'll need to have the gtk+ package installed.

**gtk+10 (Version 1.0.6, 1,162K) (G K S)**

The X libraries originally written for the GIMP, which are now used by several other programs as well.

This RPM is a set of compatibility libraries needed to run applications linked against the 1.0 series of gtk+ and glib.

**gtk-engines (Version 0.6, 12,661K) (G)**

The gtk-engines package contains shared objects and configuration files that implement a number of GTK+ theme engines. Theme engines provide different looks for GTK+, so that it can resemble other toolkits or operating systems. The gtk-engines package contains graphical engines for various GTK+ toolkit themes, including Notif, Redmond95, Pixmap and Metal (swing-like).

**imlib (Version 1.9.7, 437K) (G K S)**

Imlib is a display depth-independent image loading and rendering library. Imlib is designed to simplify and speed up the process of loading images and obtaining X Window System drawables. Imlib provides many simple manipulation routines which can be used for common operations.

Install imlib if you need an image loading and rendering library for X11R6. You may also want to install the imlib-cfgeditor package, which will help you configure Imlib.

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**imlib-cfgeditor (Version 1.9.7, 333K) (G)**

The imlib-cfgeditor package contains the imlib\_config program, which you can use to configure the Imlib image loading and rendering library. imlib\_config can be used to control how Imlib uses color and handles gamma corrections, etc.

If you're installing the imlib package, you should also install imlib\_cfgeditor.

**kdelibs (Version 1.1.2, 4,986K) (K)**

Libraries for the K Desktop Environment: KDE Libraries included: kdecopre (KDE core library), kdeui (user interface), kfm (file manager), khtmlw (HTML widget), kfile (file access), kspell (spelling checker), jscript (javascript), kab (addressbook), kimgio (image manipulation), mediatool (sound, mixing and animation).

**kdesupport (Version 1.1.2, 2,198K) (K)**

Support Libraries for the K Desktop Environment, but not part of it.

Libraries included: QwSpriteField, js (javascript), uulib, mimelib, rdb; depending on the Red Hat release, libraries gdbm jpeg and gif are either also included, or the versions supplied by Red Hat are required.

This package also provides extra KDE support for Red Hat Linux: a script "usekde" that users can run to set up KDE as their default desktop (which is also done automatically when a new user is created), and scripts for activating the KDE X Display Manager "kdm" to replace "xdm".

**libPropList (Version 0.8.3, 111K)**

The purpose of PL is to closely mimic the behavior of the property lists used in the GNUstep/OPENSTEP (they're formed with the NSString, NSData, NSArray and NSDictionary classes) and to be duly compatible.

PL enables programs that use configuration or preference3 files to make these compatible with GNUstep/OPENSTEP's user defaults handling mechanism, without needing to use Objective-C or GNUstep/ OPENSTEP themselves.

**libc (Version 5.3.12, 5,365K) (B)**

Older Linux systems (including all Red Hat Linux releases between 2.0 and 4.2, inclusive) were based on libc version 5. The libc package includes the libc5 libraries

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and other libraries based on libc5. With these libraries installed, old applications which need them will be able to run on your glibc (libc version 6) based system.

The libc package should be installed so that you can run older applications which need libc version 5.

### **libelf (Version 0.6.4, 76K)**

The libelf package contains a library for accessing ELF object files. Libelf allows you to access the internals of the ELF object file format, so you can see the different sections of an ELF file.

Libelf should be installed if you need access to ELF object file internals.

### **libhttp (Version 1.0.4, 88K) (G K S)**

Library for making HTTP 1.1 requests.

### **libglade (Version 0.5, 226K) (G)**

The libglade library allows you to load user interfaces which are stored externally into your program. This allows for alteration of the interface without recompilation of the program. The interfaces can also be edited with GLADE. Currently libglade supports all of the widgets in current releases, keyboard accelerators and automatic signal connection.

### **libgr (Version 2.0.13, 235K) (G K S)**

The libgr package contains a library of functions which support programs for handling various graphics file formats, including .pbm (portable bitmaps), .pgm (portable graymaps), .pnm (portable anymaps), .ppm (portable pixmaps) and others.

### **libgtop (Version 1.0.2, 445K) (G)**

A library that fetches information about the running system such as CPU and memory usage, active processes and more.

On Linux systems, this information is taken directly from the /proc filesystem while on other systems a server is used to read that information from other /dev/kmem, among others.

### **libgtop-examples (Version 1.0.2, 1,054K)**

Install this package for a set of programs that are examples of developing with libgtop.

**libjpeg (Version 6b, 239K) (G K S)**

The libjpeg package contains a library of functions for manipulating JPEG images, as well as simple client programs for accessing the libjpeg functions. Libjpeg client programs include cjpeg, djpeg, jpegtran, rdjpgcom and wrjpgcom. Cjpeg compresses an image file into JPEG format. Djpeg decompresses a JPEG file into a regular image file. Jpegtran can perform various useful transformations on JPEG files. Rdjpgcom displays any text comments included in a JPEG file. Wrjpgcom inserts text comments into a JPEG file.

**libjpeg6a (Version 6a, 137K)**

This package is a library of functions that manipulate jpeg images, along with simple clients for manipulating jpeg images.

This version of the package includes only a library that is needed for preserving the backwards compatibility with previous releases of Red Hat Linux.

**libpng (Version 1.0.3, 270K) (G K S)**

The libpng package contains a library of functions for creating and manipulating PNG (Portable Network Graphics) image format files. PNG is a bit-mapped graphics format similar to the GIF format. PNG was created to replace the GIF format, since GIF uses a patented data compression algorithm.

Libpng should be installed if you need to manipulate PNG format image files.

**libstdc++ (Version 2.9.0, 3,427K) (B K)**

The libstdc++ package contains a snapshot of the EGCS Standard C++ Library v3, an ongoing project to implement the ISO 14882 Standard C++ library.

**libtermcap (Version 2.0.8, 58K) (B)**

The libtermcap package contains a basic system library needed to access the termcap database. The termcap library supports easy access to the termcap database, so that programs can output character-based displays in a terminal-independent manner.

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**libtiff (Version 3.4, 568K) (G K S)**

The libtiff package contains a library of functions for manipulating TIFF (Tagged Image File Format) image format files. TIFF is a widely used file format for bitmapped images. TIFF files usually end in the .tif extension and they are often quite large.

The libtiff package should be installed if you need to manipulate TIFF format image files.

**libungif (Version 4.1.0, 80K) (G K S)**

The libungif package contains a shared library of functions for loading and saving GIF format image files. The libungif library can load any GIF file, but it will save GIFs only in uncompressed format (i.e., it won't use the patented LZW compression used to save "normal" compressed GIF files).

Install the libungif package if you need to manipulate GIF files. You should also install the libungif-progs package.

**libxml (Version 1.4.0, 687K) (G K S)**

This library allows you to manipulate XML files.

**libxml10 (Version 1.0.0, 153K) (G K S)**

The libxml package contains the XML library version 1.0, which allows you to manipulate XML files. XML (eXtensible Markup Language) is a data format for structured document interchange via the Web.

This package is provided as a backwards compatibility package for older application that might exist on your system but have not been recompiled yet for the new library version.

**ncurses (Version 4.2, 2,628K) (B)**

The curses library routines are a terminal-independent method of updating character screens with reasonable optimization. The ncurses (new curses) library is a freely distributable replacement for the discontinued 4.4BSD classic curses library.

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**ncurses3 (Version 1.9.9e, 330K)**

The curses library routines are a terminal-independent method of updating character screens with reasonable optimization. The ncurses (new curses) library is a freely distributable replacement for the discontinued 4.4BSD classic curses library.

**newt (Version 0.50, 148K) (B)**

Newt is a programming library for color text mode, widget based user interfaces. Newt can be used to add stacked windows, entry widgets, checkboxes, radio buttons, labels, plain text fields, scrollbars, etc., to text mode user interfaces. This package also contains the shared library needed by programs built with newt, as well as a /usr/bin/dialog replacement called whiptail. Newt is based on the slang library.

**popt (Version 1.4, 54K) (G K)**

Popt is a C library for parsing command line parameters. Popt was heavily influenced by the getopt() and getopt\_long() functions, but it improves on them by allowing more powerful argument expansion. Popt can parse arbitrary argv[] style arrays and automatically set variables based on command line arguments. Popt allows command line arguments to be aliased via configuration files and includes utility functions for parsing arbitrary strings into argv[] arrays using shell-like rules.

Install popt if you're a C programmer and you'd like to use its capabilities.

**pythonlib (Version 1.23, 243K) (G K S)**

The pythonlib package contains Python code used by a variety of Red Hat Linux programs. Pythonlib includes code needed for multiframe listboxes and entry widgets with non-standard keybindings, among other things.

**qt (Version 2.0.1, 3,766K) (K)**

Qt is a GUI software toolkit. Qt simplifies the task of writing and maintaining GUI (graphical user interface) applications for X Windows.

Qt is written in C++ and is fully object-oriented. It has everything you need to create professional GUI applications. And it enables you to create them quickly.

Qt is a multi-platform toolkit. When developing software with Qt, you can run it on the X Window System (Unix/X11) or Microsoft Windows NT and Windows 95/98. Simply recompile your source code on the platform you want.

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This package contains the shared library needed to run Qt applications, as well as the README files for Qt.

**qt1x (Version 1.44, 2,083K) (K)**

Qt is a GUI software toolkit. Qt simplifies the task of writing and maintaining GUI (graphical user interface) applications for X Windows.

This library provides backwards compatibility for those applications linked against Qt 1.x. For more information about Qt, see the new Qt version 2 packages.

**readline (Version 2.2.1, 251K) (B)**

The readline library reads a line from the terminal and returns it, allowing the user to edit the line with standard emacs editing keys. The readline library allows programmers to provide an easy to use and more intuitive interface for users.

If you want to develop programs that will use the readline library, you'll also need to install the readline-devel package.

**slang (Version 1.2.2, 250K) (B)**

S-Lang is an interpreted language and a programming library. The S-Lang language was designed so that it can be easily embedded into a program to provide the program with a powerful extension language. The S-Lang library, provided in this package, provides the S-Lang extension language. S-Lang's syntax resembles C, which makes it easy to recode S-Lang procedures in C if you need to.

**svglib (Version 1.4.0, 828K) (G K)**

The svglib package provides the SVGLib low-level graphics library for Linux. SVGLib is a library which allows applications to use full screen graphics on a variety of hardware platforms. Many games and utilities use SVGLib for their graphics.

You'll need to have the svglib package installed if you use any of the programs which rely on SVGLib for their graphics support.

**w3c-libwww (Version 5.2.8, 2,182K)**

Libwww is a general-purpose Web API written in C for Unix and Windows (Win32). With a highly extensible and layered API, it can accommodate many different types of applications including clients, robots, etc. The purpose of libwww is to provide

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a highly optimized HTTP sample implementation as well as other Internet protocols and to serve as a testbed for protocol experiments.

**words (Version 2, 411K) (B)**

The words file is a dictionary of English words for the /usr/dict directory. Programs like ispell use this database of words to check spelling.

**xpm (Version 3.4k, 60K) (G K S)**

The xpm package contains the XPM pixmap library for the X Window System. The XPM library allows applications to display color, pixmapped images, and is used by many popular X programs.

**zlib (Version 1.1.3, 61K) (B)**

The zlib compression library provides in-memory compression and decompression functions, including integrity checks of the uncompressed data. This version of the library supports only one compression method (deflation), but other algorithms may be added later, which will have the same stream interface. The zlib library is used by many different system programs.

## A.6.5 Shells

This section lists packages that provide a wide variety of shells for your Red Hat Linux system.

**ash (Version 0.2, 367K) (B)**

The ash shell is a clone of Berkeley's Bourne shell. Ash supports all of the standard sh shell commands, but is considerably smaller than bash. The ash shell lacks some features (for example, command-line histories), but needs a lot less memory.

You should install ash if you need a lightweight shell with many of the same capabilities as the bash shell.

**bash (Version 1.14.7, 545K) (B)**

Bash is a GNU project sh-compatible shell or command language interpreter. Bash (Bourne Again shell) incorporates useful features from the Korn shell (ksh) and the C shell (csh). Most sh scripts can be run by bash without modification.

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Bash offers several improvements over sh, including command line editing, unlimited size command history, job control, shell functions and aliases, indexed arrays of unlimited size and integer arithmetic in any base from two to 64. Bash is ultimately intended to conform to the IEEE POSIX P1003.2/ISO 9945.2 Shell and Tools standard.

Bash is the default shell for Red Hat Linux. You should install bash because of its popularity and power. You'll probably end up using it.

### **bash2 (Version 2.03, 1,169K)**

Bash is a GNU project sh-compatible shell or command language interpreter. Bash (Bourne Again shell) incorporates useful features from the Korn shell (ksh) and the C shell (csh). Most sh scripts can be run by bash without modification.

Bash offers several improvements over sh, including command line editing, unlimited size command history, job control, shell functions and aliases, indexed arrays of unlimited size and integer arithmetic in any base from two to 64. Bash is ultimately intended to conform to the IEEE POSIX P1003.2/ISO 9945.2 Shell and Tools standard.

### **mc (Version 4.5.39pre1, 1,085K) (G K)**

Midnight Commander is a visual shell much like a file manager, only with many more features. It is a text mode application, but it also includes mouse support if you are running GPM. Midnight Commander's coolest features are its abilities to FTP, view tar and zip files, and to poke into RPMs for specific files.

### **pdksh (Version 5.2.14, 418K)**

The pdksh package contains PD-ksh, a clone of the Korn shell (ksh). The ksh shell is a command interpreter intended for both interactive and shell script use. Ksh's command language is a superset of the sh shell language.

Install the pdksh package if you want to use a version of the ksh shell.

### **sash (Version 3.3, 418K) (B)**

Sash is a simple, standalone, statically linked shell which includes simplified versions of built-in commands like ls, dd and gzip. Sash is statically linked so that it can work without shared libraries, so it is particularly useful for recovering from certain types

of system failures. Sash can also be used to safely upgrade to new versions of shared libraries.

### **sh-utils (Version 2.0, 398K) (B)**

The GNU shell utilities are a set of useful system utilities which are often used in shell scripts. The sh-utils package includes `basename` (to remove the path prefix from a specified pathname), `chroot` (to change the root directory), `date` (to print/set the system time and date), `dirname` (to remove the last level or the filename from a given path), `echo` (to print a line of text), `env` (to display/modify the environment), `expr` (to evaluate expressions), `factor` (to print prime factors), `false` (to return an unsuccessful exit status), `groups` (to print the groups a specified user is a member of), `id` (to print the real/effective uid/gid), `logname` (to print the current login name), `nice` (to modify a scheduling priority), `nohup` (to allow a command to continue running after logging out), `pathchk` (to check a file name's portability), `printenv` (to print environment variables), `printf` (to format and print data), `pwd` (to print the current directory), `seq` (to print numeric sequences), `sleep` (to suspend execution for a specified time), `stty` (to print/change terminal settings), `su` (to become another user or the superuser), `tee` (to send output to multiple files), `test` (to evaluate an expression), `true` (to return a successful exit status), `tty` (to print the terminal name), `uname` (to print system information), `users` (to print current users' names), `who` (to print a list of the users who are currently logged in), `whoami` (to print the effective user id), and `yes` (to print a string indefinitely).

### **tcsh (Version 6.08.00, 488K) (B)**

Tcsh is an enhanced but completely compatible version of csh, the C shell. Tcsh is a command language interpreter which can be used both as an interactive login shell and as a shell script command processor. Tcsh includes a command line editor, programmable word completion, spelling correction, a history mechanism, job control and a C language like syntax.

### **zsh (Version 3.0.5, 956K)**

The zsh shell is a command interpreter usable as an interactive login shell and as a shell script command processor. Zsh resembles the ksh shell (the Korn shell), but includes many enhancements. Zsh supports command line editing, built-in spelling

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correction, programmable command completion, shell functions (with autoloading), a history mechanism and more.

Install the `zsh` package if you'd like to try out a different shell.

## A.7 User Interface

This section lists packages that make your interactions with your Red Hat Linux system more efficient and pleasant.

### A.7.1 Desktops

This section lists packages containing various window managers (and related files). Unlike other graphical user interfaces on other operating systems, your Red Hat Linux system lets you choose which window manager you'd like to run on top of X. The packages in this section let you choose from several window manager styles.

#### **AfterStep (Version 1.7.142, 4,488K)**

The AfterStep window manager combines convenient, useful features with the attractive look of the NEXTSTEP(R) interface. NEXTSTEP(R)-style features include the title bar, title buttons, borders, icons and menus. The most prominent addition to the interface is AfterStep's Wharf, a customized version of the GoodStuff panel (an `fvwm` window manager bar of application icons). AfterStep's Wharf is a free-floating application loader which can swallow running programs and contain folders of more applications. AfterStep also includes easy to use 'look' files, so you can share your desktop appearance.

You need to install AfterStep if you want to use the AfterStep window manager. You should also install AfterStep and try it out if you haven't decided which X Window System window manager you want to use, or just to keep your window management options open.

#### **AfterStep-APPS (Version 990812, 958K)**

The AfterStep-APPS package includes a group of applications for use with the AfterStep window manager. Applications in this package include an Advanced Power Management system monitor for laptops (`asapm`), a CPU load monitor (`ascpu`), a simple state machine (`asexec`), a filesystem monitor (`asfsm`), a CPU load monitor for

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use with the PROC filesystem (asload), a mail checker (asmail), a memory utilization monitor (asmem), a volume controller knob for the /dev/mixer device (asmix), a volume controller for various sound inputs (asmixer), a modem status monitor (asmodem), an analog clock (astime), and a color VT102 emulator (aterm).

Install AfterStep-APPS if you're planning to use the AfterStep window manager.

### **AnotherLevel (Version 0.9, 288K)**

AnotherLevel is a custom configuration of the popular fvwm2 window manager. Fvwm stands for (?) virtual window manager. You can fill in the blank for the 'f': fast, flexible, friendly and fabulous all could apply. This window manager is based on TheNextLevel desktop configuration, created by Greg J. Badros, which won the 1996 Red Hat Desktop Contest.

AnotherLevel is designed to be easily configured by the user.

### **WindowMaker (Version 0.60.0, 3,909K)**

Window Maker is an X11 window manager which emulates the look and feel of the NeXTSTEP (TM) graphical user interface. It is relatively fast, feature rich and easy to configure and use. Window Maker is part of the official GNU project, which means that Window Maker can interoperate with other GNU projects, such as GNOME.

Window Maker allows users to switch themes 'on the fly,' to place favorite applications on either an application dock, similar to AfterStep's Wharf or on a workspace dock, a 'clip' which extends the application dock's usefulness.

You should install the WindowMaker package if you use Window Maker as your window manager or if you'd like to try using it. If you do install the WindowMaker package, you may also want to install the AfterStep-APPS package, which includes applets that will work with both the AfterStep and Window Maker window managers.

### **control-center (Version 1.0.7pre, 1,375K) (G)**

GNOME (the GNU Network Object Model Environment) is an attractive and easy-to-use GUI desktop environment. The control-center package provides the GNOME Control Center utilities, which allow you to setup and configure your system's GNOME environment (things like the desktop background and theme, the screensaver, the window manager, system sounds, mouse behavior, etc.).

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If you're installing GNOME, you'll need to install control-center.

### **enlightenment (Version 0.15.5, 3,854K) (G)**

Enlightenment is an X Window System window manager that is designed to be powerful, extensible, configurable and attractive. It is one of the more graphically intense window managers.

Enlightenment goes beyond managing windows by providing a useful and appealing graphical shell from which to work. It is open in design and instead of dictating a policy, allows the user to define their own policy, down to every last detail.

Install enlightenment if you want to use a powerful and configurable window manager.

### **enlightenment-conf (Version 0.15, 386K) (G)**

The enlightenment-conf package contains a configuration tool for configuring the Enlightenment window manager. Enlightenment can be configured in many different ways, so you'll want to install this configuration tool if you plan to use Enlightenment.

### **fvwm (Version 1.24r, 573K) (G K S)**

FVWM (the F stands for whatever you want, but the VWM stands for Virtual Window Manager) is a window manager for the X Window System. FVWM was derived from the twm window manager. FVWM is designed to minimize memory consumption, to provide window frames with a 3D look, and to provide a simple virtual desktop. FVWM can be configured to look like Motif.

Install the fvwm package if you'd like to use the FVWM window manager. If you install fvwm, you'll also need to install fvwm2-icons.

### **fvwm2 (Version 2.2.2, 1,732K) (G K S)**

FVWM2 (the F stands for whatever you want, but the VWM stands for Virtual Window Manager) is an improved version of the FVWM window manager for the X Window System and shares the same characteristics as FVWM.

Install the fvwm2 package if you'd like to use the FVWM2 window manager. If you install fvwm2, you'll also need to install fvwm2-icons.

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**fvwm2-icons (Version 2.2.2, 408K) (G K S)**

The fvwm2-icons package contains icons, bitmaps and pixmaps used by the FVWM and FVWM2 X Window System window managers.

You'll need to install fvwm2-icons if you are installing fvwm and/or fvwm2.

**gmc (Version 4.5.39pre1, 3,199K) (G)**

GMC (GNU Midnight Commander) is a file manager based on the terminal version of Midnight Commander, with the addition of a GNOME GUI desktop front-end. GMC can FTP, view TAR and compressed files and look into RPMs for specific files.

Install gmc if you're installing GNOME and you'd like to use the Midnight Commander file manager with it.

**gnome-core (Version 1.0.10pre, 3,513K) (G)**

GNOME (GNU Network Object Model Environment) is a user-friendly set of GUI applications and desktop tools to be used in conjunction with a window manager for the X Window System. The gnome-core package includes the basic programs and libraries that are needed to install GNOME.

**kdebase (Version 1.1.2, 16,119K) (K)**

Core applications for the K Desktop Environment. Included are: kdm (replacement for xdm), kwm (window manager), kfm (filemanager, web browser, ftp client, ...), konsole (xterm replacement), kpanel (application starter and desktop pager), kaudio (audio server), kdehelp (viewer for kde help files, info and man pages), kthememgr (system for managing alternate theme packages) plus other KDE components (kcheckpass, kikbd, kvt, kscreensaver, kcontrol, kfind, kfontmanager, kmenuedit, kappfinder).

**kdebase-lowcolor-icons (Version 1.1.2, 274K)**

The default icons in KDE 1.1.2 are color intensive, and can quickly use up all available colors on an 8 bit (256 color) display. Please install this package if you have such a display adapter to achieve more efficient allocation of colors when KDE displays icons.

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**switchdesk (Version 1.7.0, 90K) (G K S)**

The Desktop Switcher is a tool which enables users to easily switch between various desktop environments that they have installed. The tool includes support for GNOME, KDE, and AnotherLevel. Support for different environments on different computers is available, as well as setting a "global default."

**switchdesk-gnome (Version 1.7.0, 11K) (G)**

Provides the desktop switching tool with a GNOME look and feel.

**switchdesk-kde (Version 1.7.0, 22K) (K)**

Provides the desktop switching Tool with a KDE look and feel.

**wmakerconf (Version 2.1, 1,165K)**

Wmakerconf is a GTK+ based graphical user interface configuration tool for the Window Maker window manager. Wmakerconf supports all Window Maker attributes. Wmakerconf provides a font selection browser, a pixmap preview browser, a color selection dialog, a shortcut dialog, and a file selection dialog. Wmakerconf also provides tooltips in multiple languages.

If you use the Window Maker window manager, you should probably install the wmakerconf package, because it will make configuration a little easier.

**wmconfig (Version 0.9.7, 54K) (G K S)**

The wmconfig program is a helper program which provides output for use in configuring window managers. Wmconfig will produce a list of menu definitions for a specified X window manager (currently, FVWM2, FVWM95, AfterStep, MWM, IceWM and KDE are supported). Wmconfig's output can be placed into your .rc file or you can use the output for other configuration purposes.

**xfm (Version 1.3.2, 706K) (G K)**

Xfm is a file manager for the X Window System. Xfm supports moving around the directory tree, multiple windows, moving/copying/deleting files, and launching programs.

Install xfm if you would like to use a graphical file manager program.

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## A.7.2 X

This section lists packages related to the X Window System. If you'd like your Red Hat Linux system to have a spiffy graphical user interface, this is where you'll need to look. Since there are so many X-related packages, we've divided them into subsections to make it easier to browse.

### **X11R6-contrib (Version 3.3.2, 474K) (G K S)**

If you want to use the X Window System, you should install X11R6-contrib. This package holds many useful programs from the X Window System, version 11, release 6 contrib tape. The programs, contributed by various users, include listres, xbiff, xedit, xeyes, xcalc, xload and xman, among others.

You will also need to install the XFree86 package, the XFree86 package which corresponds to your video card, one or more of the XFree86 fonts packages, the Xconfigurator package and the XFree86-libs package.

Finally, if you are going to develop applications that run as X clients, you will also need to install XFree86-devel.

### **XFree86-100dpi-fonts (Version 3.3.5, 1,228K)**

The XFree86-100dpi-fonts package contains a set of 100 dpi font used on most Linux systems. If you're going to use the X Window System and you have a high resolution monitor capable of 100 dpi, you should install XFree86-100dpi-fonts. This package contains a set of 100 dpi fonts used on most Linux systems.

If you are installing the X Window System, you will also need to install the XFree86 package, the XFree86 package corresponding to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. If you need to display certain fonts, you may also need to install other XFree86 fonts packages.

And finally, if you are going to develop applications that run as X clients, you will also need to install the XFree86-devel package.

### **XFree86 (Version 3.3.5, 14,572K) (G K S)**

The X Window System provides the base technology for developing graphical user interfaces. Simply stated, X draws the elements of the GUI on the user's screen and

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builds methods for sending user interactions back to the application. X also supports remote application deployment--running an application on another computer while viewing the input/output on your machine. X is a powerful environment which supports many different applications, such as games, programming tools, graphics programs, text editors, etc. XFree86 is the version of X which runs on Linux, as well as on other platforms.

This package contains the basic fonts, programs and documentation for an X workstation. However, this package doesn't provide the program which you will need to drive your video hardware. To control your video card, you'll need the particular X server package which corresponds to your computer's video card.

If you want to install the X Window System on your machine, you'll need to install the XFree86 package. In addition, you will need to install the XFree86 package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. You may also need to install one of the XFree86 fonts packages.

And finally, if you are going to develop applications that run as X clients, you will also need to install XFree86-devel.

### **XFree86-75dpi-fonts (Version 3.3.5, 1,060K) (G K S)**

XFree86-75dpi-fonts contains the 75 dpi fonts used on most X Window Systems. If you're going to use the X Window System, you should install this package, unless you have a monitor which can support 100 dpi resolution. In that case, you may prefer the 100dpi fonts available in the XFree86-100dpi-fonts package.

To install the X Window System, you will need to install the XFree86 package, the XFree86 package corresponding to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

Finally, if you are going to develop applications that run as X clients, you will also need to install the XFree86-devel package.

### **XFree86-ISO8859-2 (Version 1.0, 77K)**

If you use the X Window System and you want to display Central European fonts, you should install the XFree86-ISO8859-2 package.

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This package contains a full set of Central European fonts, in compliance with the ISO 8859-2 standard.

You may also need to install one or more other XFree86 fonts packages.

To install the X Window System, you will need to install the XFree86 package, the XFree86 package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

Finally, if you are going to develop applications that run as X clients, you will also need to install XFree86-devel.

#### **XFree86-ISO8859-2-100dpi-fonts (Version 1.0, 1,003K)**

The XFree86-ISO8859-2-100dpi-fonts package includes Central European (ISO 8859-2) fonts, in 100 dpi resolution, for the X Window System.

If you need to display the special characters used by Central European languages on your X Window System, and your monitor can support 100 dpi resolution, you should install the XFree86-ISO8859-2-100dpi-fonts package. You may need to install one or more of the other XFree86 fonts packages, as well. To install the X Window System, you will need to install the XFree86 package, the XFree86 video card package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. If you're going to develop applications which run as X clients, you'll also need to install XFree86-devel.

#### **XFree86-ISO8859-2-75dpi-fonts (Version 1.0, 877K)**

The XFree86-ISO8859-2-75dpi-fonts package contains a set of Central European language fonts in 75 dpi resolution for the X Window System. If you have a high resolution monitor capable of supporting 100 dpi, you should install the 100 dpi version of this package instead.

If you are installing the X Window System and you need to display Central European language characters in 75 dpi resolution, you should install this package. You may also need to install one or more of the other XFree86 fonts packages as well. To install the X Window System, you will need to install the XFree86 package, the XFree86 video card package that corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. If you are going to develop applications that will run as X clients, you will also need to install XFree86-devel.

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**XFree86-ISO8859-2-Type1-fonts (Version 1.0, 1,905K)**

The XFree86-ISO8859-2-Type1-fonts package contains Central European Type 1 fonts for the X Window System. This set of fonts is known as the ulT1mo (or ultimo) collection. All of the included fonts are copyrighted to their authors and freeware. Original fonts were taken from the Internet or CDs.

If you need to display Central European language fonts on your X Window System, you should install the XFree86-ISO8859-2-Type1-fonts package. You may need to also install one or more of the other XFree86 fonts packages. To install the X Window System, you will need to install the XFree86 package, the XFree86 video card package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. Finally, if you are going to develop applications that will run as X clients, you'll need to install XFree86-devel.

**XFree86-ISO8859-7 (Version 1.0, 293K)**

If you use the X Window System and you want to display Greek fonts, you should install the XFree86-ISO8859-7 package.

This package contains a full set of Greek fonts, in compliance with the ISO 8859-7 standard.

You may also need to install one or more other XFree86 fonts packages.

To install the X Window System, you will need to install the XFree86 package, the XFree86 package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

Finally, if you are going to develop applications that run as X clients, you will also need to install XFree86-devel.

**XFree86-ISO8859-7-100dpi-fonts (Version 1.0, 313K)**

The XFree86-ISO8859-7-100dpi-fonts package includes Greek Language (ISO 8859-7) fonts, in 100 dpi resolution, for the X Window System.

If you need to display the special characters used by the Greek language on your X Window System, and your monitor can support 100 dpi resolution, you should install the XFree86-ISO8859-7-100dpi-fonts package. You may need to install one or more of the other XFree86 fonts packages, as well. To install the X Window System, you

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will need to install the XFree86 package, the XFree86 video card package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. If you're going to develop applications which run as X clients, you'll also need to install XFree86-devel.

#### **XFree86-ISO8859-7-75dpi-fonts (Version 1.0, 625K)**

The XFree86-ISO8859-2-75dpi-fonts package contains a set of Greek language fonts in 75 dpi resolution for the X Window System. If you have a high resolution monitor capable of supporting 100 dpi, you should install the 100 dpi version of this package instead.

If you are installing the X Window System and you need to display Greek language characters in 75 dpi resolution, you should install this package. You may also need to install one or more of the other XFree86 fonts packages as well. To install the X Window System, you will need to install the XFree86 package, the XFree86 video card package that corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. If you are going to develop applications that will run as X clients, you will also need to install XFree86-devel.

#### **XFree86-ISO8859-7-Type1-fonts (Version 1.0, 1,124K)**

The XFree86-ISO8859-7-Type1-fonts package contains Greek language Type 1 fonts for the X Window System. This set of fonts is known as the hellas collection. All of the included fonts are copyrighted to their authors and freeware. Original fonts were taken from the Internet or CDs.

If you need to display Greek language fonts on your X Window System, you should install the XFree86-ISO8857-2-Type1-fonts package. You may need to also install one or more of the other XFree86 fonts packages. To install the X Window System, you will need to install the XFree86 package, the XFree86 video card package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. Finally, if you are going to develop applications that will run as X clients, you'll need to install XFree86-devel.

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**XFree86-ISO8859-9-100dpi-fonts (Version 2.1.2, 1,142K)**

The XFree86-ISO8859-9-100dpi-fonts package contains a set of Turkish language fonts in 100 dpi resolution and in accordance with the ISO8859-9 standard for the X Window System.

If you need to display Turkish language fonts for the X Window System, and your monitor is capable of supporting 100 dpi resolution, you should install this package. You may also need to install one or more of the other XFree86 fonts packages. To install the X Window System, you will need to install the XFree86 package, the XFree86 video card package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

If you are going to develop applications that will run as X clients, you will also need to install XFree86-devel.

**XFree86-ISO8859-9 (Version 2.1.2, 84K)**

The XFree86-ISO8859-9 package contains Turkish language (ISO8859-9) terminal fonts, modmaps for the Q and F style of Turkish keyboard mappings and a simple utility for changing the modmap.

If you need to display Turkish language fonts on your X Window System, or if you need a to use the Q and F style keyboard mappings, you should install the XFree86-ISO8859-9 package. You may also need to install other XFree86 font packages. If you're installing the X Window System, you'll need to install the XFree86 package, the XFree86 video card package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. If you're going to develop applications that run as X clients, you will also need to install XFree86-devel.

**XFree86-ISO8859-9-75dpi-fonts (Version 2.1.2, 1,032K)**

The XFree86-ISO8859-9-75dpi-fonts package contains a set of Turkish language (ISO8859-9) fonts in 75 dpi resolution for the X Window System.

If you need to display Turkish language fonts on your X Window System, you should install this package. If your monitor is capable of supporting 100 dpi resolution, you should instead install the 100 dpi font package. You may also need to install one or

more of the other XFree86 fonts packages. If you're installing the X Window System, you need to install the XFree86 package, the XFree86 video card package which corresponds to your video card, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. Finally, if you are going to develop applications that will run as X clients, you will also need to install XFree86-devel.

#### **XFree86-cyrillic-fonts (Version 3.3.5, 301K)**

The XFree86-cyrillic-fonts package includes the Cyrillic fonts included with XFree86 3.3.2 and higher.

If you use a language that requires the Cyrillic character set, you should install XFree86-cyrillic-fonts.

#### **gdm (Version 2.0beta2, 320K) (G)**

Gdm (the GNOME Display Manager) is a highly configurable reimplementa-tion of xdm, the X Display Manager. Gdm allows you to log into your system with the X Window System running and supports running several different X sessions on your local machine at the same time.

#### **gqview (Version 0.7.0, 206K) (G)**

GQview is a browser for graphics files. Offering single click viewing of your graphics files. Includes thumbnail view, zoom and filtering features. And external editor support.

#### **kterm (Version 6.2.0, 154K)**

The kterm package provides a terminal emulator for the Kanji Japanese character set. Install kterm if you need a Kanji character set terminal emulator. You'll also need to have the X Window System installed.

#### **rxvt (Version 2.6.1, 485K) (G K S)**

Rxvt is a color VT102 terminal emulator for the X Window System. Rxvt is intended to be an xterm replacement for users who don't need the more esoteric features of xterm, like Tektronix 4014 emulation, session logging and toolkit style configurability. Since it doesn't support those features, rxvt uses much less swap space than xterm uses. This is a significant advantage on a machine which is serving a large number of X sessions.

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The rxvt package should be installed on any machine which serves a large number of X sessions, if you'd like to improve that machine's performance.

### **urw-fonts (Version 1.1, 2,160K) (G K S)**

Free versions of the 35 standard PostScript fonts. With newer releases of ghostscript quality versions of the standard 35 Type 1 PostScript fonts are shipped. They were donated and licenced under the GPL by URW. The fonts.dir was specially made to match the original Adobe names of the fonts, e.g. Times, Helvetica etc. With X, LaTeX, or Ghostscript, these fonts are a must to have!

### **x3270 (Version 3.1.1.6, 561K)**

The x3270 program opens a window in the X Window System which emulates the actual look of an IBM 3278/3279 terminal, commonly used with mainframe applications. x3270 also allows you to telnet to an IBM host from the x3270 window.

Install the x3270 package if you need to access IBM hosts using an IBM 3278/3279 terminal emulator.

### **xinitrc (Version 2.4.1, 9K) (G K S)**

The xinitrc package contains the xinitrc file, a script which is used to configure your X Window System session or to start a window manager.

The xinitrc package should be installed if you use the X Window System.

## **A.7.3 X Hardware Support**

This section lists packages containing part of XFree86, a freely available version of the X Window System. In order to use X, you must install an X server capable of driving your Red Hat Linux system's video card. As you can see, XFree86 has a number of servers from which to choose.

### **XFree86-3DLabs (Version 3.3.5, 2,219K)**

XFree86-3DLabs is the X server for cards built around 3DLabs GLINT and PERMEDIA chipsets, including the GLINT 500TX with IBM RGB526 RAMDAC, the GLINT MX with IBM RGB526 and IBM RGB640 RAMDAC, the PERMEDIA with IBM RGB526 RAMDAC, and the PERMEDIA 2 (classic, 2a, 2v).

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If you are installing the X Window System and the video card in your system is mentioned above, you need to install XFree86-3DLabs. You will also need to install the XFree86 package, one of the XFree86 fonts packages, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

Finally, if you are going to be developing applications that run as X clients, you will also need to install XFree86-devel.

#### **XFree86-8514 (Version 3.3.5, 1,750K)**

The XFree86-8514 package contains the X server for older IBM 8514 video cards, or compatibles from a company such as ATI.

If you are installing the X Window System and your video card is an older IBM 8514 or compatible, you should install XFree86-8514. You will also need to install the XFree86 package, one or more of the XFree86 fonts packages, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

If you are going to develop applications that run as X clients, you will also need to install the XFree86-devel package.

#### **XFree86-AGX (Version 3.3.5, 1,932K)**

The XFree86-AGX package contains the X server for AGX-based cards, such as the Boca Vortex, Orchid Celsius, Spider Black Widow and Hercules Graphite.

If you are installing the X Window System and the video card in your system is an AGX, you'll need to install XFree86-AGX. You will also need to install the XFree86 package, one or more of the XFree86 fonts packages, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

Finally, if you are going to develop applications that run as X clients, you will also need to install the XFree86-devel package.

#### **XFree86-FBDev (Version 3.3.5, 2,008K)**

The XFree86-FBDev package contains an X server for the generic frame buffer device. This X server is usually the only choice for SPARC machines, but also has some special capabilities that make it useful on Intel platforms, especially laptops.

First, this X server can be used as a generic driver for a chipset that does not yet have an Open Source driver (note that it will be un-accelerated). Secondly, this X server

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"speaks" VESA protocols, so it will produce the exact timing needed by projection systems. This feature is handy for using your laptop to display a presentation on a projection system on the road. Your regular X server may or may not be in synch with the projection system, but the FBDev X server will always work. Thirdly, this X server can produce a larger display, at a higher resolution, for consoles on laptops.

### **XFree86-I128 (Version 3.3.5, 2,189K)**

XFree86-I128 is the X server for the Number Nine Imagine 128 and similar video cards.

If you are installing the X Window System and the video card in your system is a Number Nine Imagine 128 or similar, you'll need to install XFree86-I128. You'll also need to install the XFree86 package, one or more of the XFree86 fonts packages, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package.

If you're going to be developing applications which run as X clients, you'll also need to install the XFree86-devel package.

### **XFree86-Mach32 (Version 3.3.5, 1,893K)**

XFree86-Mach32 is the X server package for video cards built around ATI's Mach32 chip, including the ATI Graphics Ultra Pro and Ultra Plus.

If you are installing the X Window System and the video card in your system is based on the Mach32 chip, you need to install XFree86-Mach32. You will also need to install the following packages: XFree86, one or more of the XFree86 fonts packages, X11R6-contrib, Xconfigurator and XFree86-libs. If you are going to develop applications that run as X clients, you will also need to install XFree86-devel.

### **XFree86-Mach64 (Version 3.3.5, 2,018K)**

XFree86-Mach64 is the server package for cards based on ATI's Mach64 chip, such as the Graphics Xpression, GUP Turbo, and WinTurbo cards. Note that this server is known to have problems with some Mach64 cards. Check <http://www.xfree86.org> for current information on updating this server.

If you are installing the X Window System and the video card in your system is based on the Mach64 chip, you need to install XFree86-Mach64. You will also need to install the XFree86 package, one or more of the XFree86 fonts packages, the X11R6-

contrib package, the Xconfigurator package and the XFree86-libs package. And, finally, if you are going to be developing applications that run as X clients, you will also need to install XFree86-devel.

#### **XFree86-Mach8 (Version 3.3.5, 1,762K)**

XFree86-Mach 8 is the X server for video cards built around ATI's Mach8 chip, including the ATI 8514 Ultra and Graphics Ultra.

If you are installing the X Window System and the video card in your system is based on the Mach8 chip, you need to install XFree86-Mach8. You will also need to install the XFree86 package, one or more of the XFree86 fonts packages, the X11R6-contrib package, the Xconfigurator package and the XFree86-libs package. And, finally, if you are going to be developing applications that run as X clients, you will also need to install XFree86-devel.

#### **XFree86-Mono (Version 3.3.5, 2,065K)**

XFree86-Mono is a generic monochrome (two color) server for VGA cards. XFree86-Mono will work for nearly all VGA compatible cards, but will only support a monochrome display.

If you are installing the X Window System and your VGA card is not currently supported, you should install and try either XFree86-Mono or XFree86-VGA16, depending upon the capabilities of your display. You will also need to install XFree86, one or more of the XFree86 fonts packages, X11R6-contrib, Xconfigurator and XFree86-libs. If you're going to develop applications that run as X clients, you will also need to install XFree86-devel.

#### **XFree86-P9000 (Version 3.3.5, 1,952K)**

XFree86-P9000 is the X server for video cards built around the Weitek P9000 chip, such as most Diamond Viper cards and the Orchid P9000 card.

If you are installing the X Window System and you have a Weitek P9000 based video card, you should install XFree86-P9000. You will also need to install XFree86, one or more of the XFree86 fonts packages, X11R6-contrib, Xconfigurator and XFree86-libs. If you're going to develop applications that run as X clients, you will also need to install XFree86-devel.

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**XFree86-S3 (Version 3.3.5, 2,438K)**

XFree86-S3 is the X server for video cards based on S3 chips, including most Number Nine cards, many Diamond Stealth cards, Orchid Fahrenheits, the Miro Crystal 8S, most STB cards, and some motherboards with built-in graphics accelerators (such as the IBM ValuePoint line). Note that if you have an S3 ViRGE based video card, you'll need XFree86-S3V instead of XFree86-S3.

If you are installing the X Window System and you have a video card based on an S3 chip, you should install XFree86-S3. You will also need to install XFree86, one or more of the XFree86 fonts packages, X11R6-contrib, Xconfigurator and XFree86-libs. If you are going to develop applications that will run as X clients, you will also need to install XFree86-devel.

**XFree86-S3V (Version 3.3.5, 2,167K)**

XFree86-S3V is the X server for video cards based on the S3 ViRGE chipset.

If you are installing the X Window System and your video card is based on an S3 ViRGE chip, you should install XFree86-S3V. You will also need to install XFree86, one or more of the XFree86 fonts packages, X11R6-contrib, Xconfigurator and XFree86-libs. If you're going to develop applications that run as X clients, you will also need to install XFree86-devel.

**XFree86-SVGA (Version 3.3.5, 3,201K)**

An X server for most simple frame buffer SVGA devices, including cards built from ET4000 chips, Cirrus Logic chips, Chips and Technologies laptop chips, Trident 8900 and 9000 chips, and Matrox chips. It also works for Diamond Speedstar, Orchid Kelvins, STB Nitros and Horizons, Genoa 8500VL, most Actix boards, and the Spider VLB Plus. This X server works for many other chips and cards, so try this server if you are having problems.

**XFree86-VGA16 (Version 3.3.5, 1,966K)**

XFree86-VGA16 is a generic 16 color server for VGA boards. XFree86-VGA16 will work on nearly all VGA style graphics boards, but will only support a low resolution, 16 color display.

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If you are installing the X Window System and your VGA video card is not specifically supported by another X server package, you should install either XFree86-Mono or XFree86-VGA16, depending upon your display's capabilities. You will also need to install the following packages: XFree86, one or more of the XFree86 fonts packages, X11R6-contrib, Xconfigurator and XFree86-libs.

If you are going to develop applications that run as X clients, you will also need to install XFree86-devel.

### **XFree86-W32 (Version 3.3.5, 1,805K)**

XFree86-W32 is the X server for cards built around ET4000/W32 chips, including the Genoa 8900 Phantom 32i, the Hercules Dynamite, the LeadTek WinFast S200, the Sigma Concorde, the STB LightSpeed, the TechWorks Thunderbolt, and the ViewTop PCI.

If you are installing the X Window System and your video card is based on the ET4000/W32 chipset, you should install the XFree86-W32 package. You will also need to install the following packages: XFree86, one or more of the XFree86 fonts packages, X11R6-contrib, Xconfigurator and XFree86-libs.

If you're going to develop applications that run as X clients, you will also need to install XFree86-devel.

### **XFree86-XF86Setup (Version 3.3.5, 597K)**

XF86Setup is a graphical user interface configuration tool for setting up and configuring XFree86 servers. XF86Setup can configure video settings, keyboard layouts, mouse types, etc. XF86Setup can't be used with non-VGA compatible video cards, with fixed-frequency monitors, or with OS/2.

Install XF86Setup if you have used it before and prefer to keep using it to configure your X server. If you do not have a preference for XF86Setup, you should instead install and use Xconfigurator, Red Hat's graphical user interface configuration tool for the X Window System.

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**XFree86-Xnest (Version 3.3.5, 1,224K)**

Xnest is an X Window System server which runs in an X window. Xnest is actually a client of the real X server, which manages windows and graphics requests for Xnest, while Xnest manages the windows and graphics requests for its own clients.

You will need to install Xnest if you require an X server which will run as a client of your real X server (perhaps for testing purposes).

**XFree86-Xvfb (Version 3.3.5, 2,712K)**

Xvfb (X Virtual Frame Buffer) is an X server that is able to run on machines with no display hardware and no physical input devices. Xvfb emulates a dumb framebuffer using virtual memory. Xvfb doesn't open any devices, but behaves otherwise as an X display. Xvfb is normally used for testing servers. Using Xvfb, the mfb or cfb code for any depth can be exercised without using real hardware that supports the desired depths. Xvfb has also been used to test X clients against unusual depths and screen configurations, to do batch processing with Xvfb as a background rendering engine, to do load testing, to help with porting an X server to a new platform, and to provide an unobtrusive way of running applications which really don't need an X server but insist on having one.

If you need to test your X server or your X clients, you may want to install Xvfb for that purpose.

**Xconfigurator (Version 4.2.7, 690K) (G K S)**

Xconfigurator is a full-screen, menu-driven program which walks you through setting up your X server. Xconfigurator is based on the sources for xf86config, a utility from XFree86.

You should install Xconfigurator if you are installing the X Window System.

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## B General Parameters and Modules

This appendix is provided to illustrate *some* of the possible parameters that may be needed by certain drivers. It should be noted that, in most cases, these additional parameters are unnecessary. Also included is a list of network hardware and the associated modules required by that hardware.

Please keep in mind that if a device you are attempting to use requires one of these parameters, and support for that device is *not* compiled into the kernel, the traditional method of adding the parameter to the LILO boot command will not work. Drivers loaded as modules require that these parameters are specified when the module is loaded. The Red Hat Linux installation program gives you the option to specify module parameters when a driver is loaded.

### B.1 A Note About Kernel Drivers

During installation of Red Hat Linux, there are some limits placed on the filesystems and other drivers supported by the kernel. However, after installation there is support for all filesystems available under Linux. At install time the modularized kernel has support for (E)IDE devices, (including ATAPI CD-ROM drives), SCSI adapters, and network cards. Additionally, all mice, SLIP, CSLIP, PPP, PLIP, FPU emulation, console selection, ELF, SysV IPC, IP forwarding, firewalling and accounting, reverse ARP, QIC tape and parallel printers, are supported.

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Because Red Hat Linux supports installation on many different types of hardware, many drivers (including those for SCSI adapters, network cards, and many CD-ROMs) are not built into the Linux kernel used during installation; rather, they are available as **modules** and loaded as you need them during the installation process. If necessary, you will have the chance to specify options for these modules at the time they are loaded, and in fact these drivers will ignore any options you specify for them at the `boot :` prompt.

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After the installation is complete you may want to rebuild a kernel that includes support for your specific hardware configuration. See Section 2.8, *Building a Custom Kernel* for information on building a customized kernel. Note that, in most cases, a custom-built kernel is not necessary.

## B.2 CD-ROM Module Parameters

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### Please Note

Not all of the cards that are listed are supported. Please check the hardware compatibility list on Red Hat's World Wide Web site at <http://www.redhat.com/support/docs/hardware.html> to make sure your card is supported.

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One of the more commonly used parameters, the `hdX=cdrom` parameter, *can* be entered at the boot prompt, as it deals with support for IDE/ATAPI CD-ROMs, which is part of the kernel.

In the tables below, most modules without any parameters listed are either able to auto-probe to find the hardware, or require you to manually change settings in the module source code, and recompile.

**Table B-1 Hardware Parameters**

| Hardware   | Module               | Parameters                 |
|--|----------------------|----------------------------|
| ATAPI/IDE CD-ROM Drives  |                      | <code>hdX=cdrom</code>     |
| Aztech CD268-01A, Orchid CD-3110, Okano/Wearnes CDD110, Conrad TXC, CyCDROM CR520, CyCDROM CR540 (non-IDE) | <code>aztcd.o</code> | <code>aztcd=io_port</code> |

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| Hardware  | Module      | Parameters  |
|---|-------------|---|
| Sony CDU 31A or 33A CD-ROM  | cdu31a.o    | cdu31a=io_port,IRQ[,PAS]<br>cdu31a_port=base_addr<br>cdu31a_irq=irq   |
| Philips/LMS CDROM drive 206 with cm260 host adapter card  | cm206.o     | cm206=io_port,IRQ   |
| Goldstar R420 CD-ROM  | gscd.o      | gscd=io_port  |
| ISP16, MAD16, or Mozart sound card CD-ROM interface (OPTi 82C928 and OPTi 82C929) with Sanyo/Panasonic, Sony, or Mitsumi drives | isp16.o     | isp16=io_port, IRQ,<br>dma,drive_type<br>isp16_cdrom_base=io_port<br>isp16_cdrom_irq=IRQ<br>isp16_cdrom_dma=dma<br>isp16_cdrom_type= drive_type |
| Mitsumi CD-ROM, Standard  | mcd.o       | mcd=io_port,IRQ   |
| Mitsumi CD-ROM, Experimental  | mcdx.o      | mcdx=io_port_1, IRQ_1,<br>io_port_n, IRQ_n  |
| Optics storage 8000 AT CD-ROM "Dolphin" drive; Lasermate CR328A   | optcd.o     | optcd=io_port   |
| SB Pro 16 compatible  | sbpcd.o     | sbpcd=io_port,sb_pro_Setting  |
| Sanyo CDR-H94A  | sjcd.o      | sjcd=io_port sjcd_base=io_port  |
| Sony CDU-535 & 531 (some Procomm drives)  | sonycd535.o | sonycd535=io_port   |

Here are some examples of these modules in use:

**Table B-2 Hardware Parameters Configuration Examples**

| <b>Configuration</b>   | <b>Example</b>                                 |
|--|--|
| ATAPI CD-ROM, jumpered as master on 2nd IDE channel  | hdc=cdrom                                      |
| non-IDE Mitsumi CD-ROM on port 340, IRQ 11   | mcd=0x340,11                                   |
| Three non-IDE Mitsumi CD-ROM drives using the experimental driver, io ports 300, 304, and 320 with IRQs 5, 10 and 11 | mcdx=0x300,5,0x304,10,0x320,11                 |
| Sony CDU 31 or 33 at port 340, no IRQ  | cdu31=0x340,0 cdu31_port=0x340<br>cdu31a_irq=0 |
| Aztech CD-ROM at port 220  | aztcd=0x220                                    |
| Panasonic-type CD-ROM on a SoundBlaster interface at port 220  | sbpcd=0x230,1                                  |
| Phillips/LMS cm206 and cm260 at IO 340 and IRQ 11  | cm206=0x340,11                                 |
| Goldstar R420 at IO 300  | gscd=0x300                                     |
| Mitsumi drive on a MAD16 soundcard at IO Addr 330 and IRQ 1, probing DMA   | isp16=0x330,11,0,Mitsumi                       |
| Sony CDU 531 at IO address 320   | sonycd535=0x320                                |

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**Please Note**

Most newer Sound Blaster cards come with IDE interfaces. For these cards, you do not need to use sbpcd parameters, only use hdx parameters.

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## B.3 SCSI parameters

Table B-3 SCSI Parameters

| Hardware  | Module       | Parameters  |
|---|--------------|---|
| NCR53c810/820/720,<br>NCR53c700/710/700-66                  | 53c7,8xx.o   |   |
| AM53/79C974 PC-SCSI<br>Driver Qlogic PCI-Basic              | AM53C974.o   | AM53C974=host-scsi-id,<br>target-scsi-id,max-rate,<br>max-offset                            |
| Most Buslogic (now<br>Mylex) cards with "BT"<br>part number | BusLogic.o   | BusLogic_Options=op-<br>tion,option,... (See<br>README.BusLogic<br>in ...drivers/scsi/)     |
|   | NCR53c406a.o | ncr53c406a=io_port[,<br>IRQ[, FASTPIO]]<br>ncr53c406a io=io_port<br>irq=IRQ fastpio=FASTPIO |
| Advansys SCSI Cards   | advansys.o   |   |
| Adaptec AHA 152x  | aha152x.o    | aha152x=io_base, IRQ,<br>scsi_id, reconnect, parity   |
| Adaptec AHA 1542  | aha1542.o    | aha1542=io_base,bu-<br>son,busoff,dmaspeed  |
| Adaptec AHA 1740  | aha1740.o    |   |

| Hardware   | Module    | Parameters     |
|--|-----------|----------------|
| Adaptec AHA-274x,<br>AHA-284x, AHA-29xx,<br>AHA-394x, AHA-398x,<br>AHA-274x, AHA-274xT,<br>AHA-2842, AHA-2910B,<br>AHA-2920C,<br>AHA-2930/U/U2,<br>AHA-2940/W/U/UW/AU/<br>U2W/U2/U2B/<br>U2BOEM, AHA-<br>2944D/WD/UD/UWD,<br>AHA-2950U2/W/B,<br>AHA-3940/U/W/UW/<br>AUW/U2W/U2B,<br>AHA-3950U2D,<br>AHA-3985/U/W/UW,<br>AIC-777x, AIC-785x,<br>AIC-786x, AIC-787x,<br>AIC-788x , AIC-789x,<br>AIC-3860 | aic7xxx.o | aic7xxx=string |
| Data Technology Corp<br>DTC3180/3280   | dtc.o     |                |

| Hardware   | Module     | Parameters  |
|--|------------|---|
| DTP SCSI host adapters (EATA/DMA)<br>PM2011B/9X ISA,<br>PM2021A/9X ISA,<br>PM2012A, PM2012B,<br>PM2022A/9X EISA,<br>PM2122A/9X,<br>PM2322A/9X, SmartRAID<br>PM3021, PM3222,<br>PM3224        | eata.o     | eata=port0,port1,port2,...<br>options eata<br>io_port=port0,port1,port2,...<br>option=value |
| DTP SCSI Adapters<br>PM2011, PM2021,<br>PM2041, PM3021,<br>PM2012B, PM2022,<br>PM2122, PM2322,<br>PM2042, PM3122,<br>PM3222, PM3332,<br>PM2024, PM2124,<br>PM2044, PM2144,<br>PM3224, PM3334 | eata_dma.o |   |
| DTP EATA-PIO boards  | eata_pio.o |   |

| Hardware  | Module      | Parameters   |
|---|-------------|--|
| Future Domain<br>TMC-16x0- based cards<br>TMC-1800, TMC-18C50,<br>TMC-18C30, TMC-<br>36C70, Future Domain<br>TMC-1650, TMC-1660,<br>TMC-1670, TMC-1680,<br>TMC-1610M/MER/MEX,<br>TMC-3260 (PCI),<br>Quantum ISA-200S,<br>ISA-250MG, Adaptec<br>AHA-2920A (PCI) (NOT<br>AHA-2920C) | fdomain.o   | fdomain=io_base, IRQ[,<br>ADAPTER_ID]  |
| NCR5380 and NCR53c400<br>cards  | g_NCR5380.o | ncr5380=io_port,IRQ,dma<br>ncr53c400=io_port,IRQ<br>ncr5380 io=io_port<br>irq=IRQ dma=dma<br>ncr53c400 io=io_port<br>irq=IRQ |
| GDT ISA/EISA/PCI Disk<br>Array Controller   | gdth.o      | gdth=IRQ0,IRQ1,IRQ2,...<br>options:values  |
| IOMEGA MatchMaker<br>parallel port SCSI adapter   | imm.o       |  |
| Always IN2000 ISA<br>SCSI card  | in2000.o    | in2000=setup_string:value<br>in2000 setup_string=value   |
| Initio INI-9X00U/UW<br>SCSI host adapters   | initio.o    |  |
| AMI MegaRAID 418,<br>428, 438, 466, 762   | megaraid.o  |  |

| Hardware   | Module      | Parameters  |
|--|-------------|---|
| NCR SCSI controllers with 810/810A/815/825/825A/860/875/876/895 chipsets | ncr53c8xx.o | ncr53c8xx=option1:value1,option2:value2,...<br>ncr53c8xx="option1:value1 option2:value2..." |
| Pro Audio Spectrum/Studio 16   | pas16.o     | pas16=port,irq  |
| IOMEGA PPA3 parallel port SCSI host adapter                              | ppa.o       |   |
| Perceptive Solutions PSI-240I EIDE                                       | psi240i.o   |   |
| QLogic Fast SCSI FASXXX ISA/VLB/PCMCIA                                   | qlogicfas.o |   |
| QLogic ISP2100 SCSI-FCP  | qlogicfc.o  |   |
| QLogic ISP1020 Intelligent SCSI cards IQ-PCI, IQ-PCI-10, IQ-PCI-D        | qlogicisp.o |   |
| Seagate ST01/ST02  | seagate.o   | controller_type=1<br>base_address=base_addr<br>irq=irq                                      |
| Future Domain TMC-885, TMC-950   | seagate.o   | controller_type=2<br>base_address=base_addr<br>irq=irq                                      |

| Hardware  | Module      | Parameters  |
|---|-------------|---|
| Cards with the sym53c416 chipset                          | sym53c416.o | sym53c416=PORT-BASE[,IRQ] sym53c416 io=PORTBASE irq=IRQ                                 |
| Trantor T128/T128F/T228 SCSI Host Adapter                 | t128.o      |   |
| Tekram DC390 and other AMD53C974A based PCI SCSI adapters | tmcsim.o    | tmcsim=ID,SPEED   |
| UltraStor 14F/34F SCSI host adapters (14F, 24F, 34F)      | u14-34f.o   | u14-34f=io_port1,io_port2,... io_port10 u14-34f io_port=io_port1,io_port2,... io_port10 |
| UltraStor 14F, 24F, and 34F                               | ultrastor.o |   |
| WD7000-FASST2,WD7000-ASC,WD7000-AX/MX/EX                  | wd7000.o    | wd7000=IRQ,dma,io_port wd7000 io=io_port irq=IRQ dma=dma                                |

Here are some examples of these modules in use:

**Table B-4 SCSI Parameters Configuration Examples**

| Configuration                                  | Example                                       |
|--|---|
| Adaptec AHA1522 at port 330, IRQ 11, SCSI ID 7 | aha152x=0x330,11,7                            |
| Adaptec AHA1542 at port 330                    | bases=0x330                                   |
| Future Domain TMC-800 at CA000, IRQ 10         | controller_type=2 base_address=0xca000 irq=10 |

When a parameter has commas, make sure you do *not* put a space after a comma.

## B.4 Ethernet parameters

Table B-5 Ethernet Module Parameters

| Hardware  | Module   | Parameters   |
|---|----------|--|
| 3Com 3c501  | 3c501.o  | 3c501=io_port,IRQ  |
| 3Com 3c503 and 3c503/16   | 3c503.o  | 3c503=io_port,IRQ 3c503<br>io=io_port_1,io_port_n<br>irq=IRQ_1,IRQ_n                           |
| 3Com EtherLink Plus<br>(3c505)  | 3c505.o  | 3c505=io_port,IRQ,DMA<br>3c505<br>io=io_port_1,io_port_n<br>irq=IRQ_1,IRQ_2<br>dma=dma_1,dma_n |
| 3Com EtherLink 16   | 3c507.o  | 3c507=io_port,IRQ 3c507<br>io=io_port irq=IRQ  |
| 3Com EtherLink III  | 3c509.o  | 3c509=IRQ  |
| 3Com ISA EtherLink<br>XL "Corkscrew"  | 3c515.o  |  |
| 3Com EtherLink PCI<br>III/XL Vortex (3c590,<br>3c592, 3c595, 3c597)<br>Boomerang (3c900,<br>3c905, 3c595) | 3c59x.o  |  |
| Apricot 680x0 VME,<br>82596 chipset   | 82596.o  | 82596=IRQ 82596<br>irq=IRQ   |
| Ansel Communications<br>AC3200 EISA   | ac3200.o | ac3200=io_port,IRQ<br>ac3200<br>io=io_port_1,io_port_n<br>irq=IRQ_1,IRQ_n                      |

| Hardware  | Module   | Parameters   |
|---|----------|--|
| Alteon AceNIC Gigabit Ethernet driver   | acenic.o | acenic=trace,link acenic trace=trace link=val  |
| Allied Telesis AT1700   | at1700.o | at1700=io_port,IRQ<br>at1700 io=io_port irq=IRQ  |
| Tangent ATB-II, Novel NL-10000, Daystar Digital LT-200, Dayna DL2000, DaynaTalk PC (HL), COPS LT-95, Farallon PhoneNET PC II, III   | cops.o   | cops=io_port,IRQ cops io=io_port irq=IRQ   |
| Modular driver for the COSA or SRP synchronous serial card  | cosa.o   | cosa=io_port,IRQ,dma   |
| Crystal LAN CS8900/CS8920   | cs89x0.o | cs89x0=io_port,IRQ,ME-<br>DIA_TYPE cs89x0<br>io=io_port irq=IRQ me-<br>dia=TYPE            |
| EtherWORKS DE425 TP/COAX EISA, DE434 TP PCI, DE435/450 TP/COAX/AUI PCI DE500 10/100 PCI Kingston, LinkSys, SMC8432, SMC9332, Znyx31[45], and Znyx346 10/100 cards with DC21040 (no SROM), DC21041[A], DC21140[A], DC21142, DC21143 chipsets | de4x5.o  | de4x5=io_port de4x5<br>io=io_port de4x5<br>args='ethX[fdx]<br>autosense=ME-<br>DIA_STRING' |



| Hardware  | Module      | Parameters   |
|---|-------------|--|
| D-Link DE-600 Ethernet Pocket Adapter   | de600.o     |  |
| D-Link DE-620 Ethernet Pocket Adapter   | de620.o     | de620 io=io_port irq=IRQ<br>bnc=1 utp=1                        |
| DIGITAL DEPCA & EtherWORKS DEPCA, DE100, DE101, DE200 Turbo, DE201Turbo DE202 Turbo TP/BNC, DE210, DE422 EISA | depca.o     | depca=io_port,IRQ depca<br>io=io_port irq=IRQ                  |
| Digi Intl. RightSwitch SE-X EISA and PCI  | dgrs.o      |  |
| Cabletron E2100 series ethercards   | e2100.o     | e2100=io_port,IRQ e2100<br>io=io_port irq=IRQ                  |
| Intel i82595 ISA EtherExpressPro10/10+ driver   | eeepro.o    | eeepro=io_port,IRQ,mem<br>eeepro io=io_port irq=IRQ<br>mem=mem |
| Intel i82557/i82558 PCI EtherExpressPro driver  | eeepro100.o |  |
| Intel EtherExpress 16 (i82586)  | eeexpress.o | eeexpress=io_port,IRQ<br>eeexpress io=io_port<br>irq=IRQ       |
| SMC EtherPower II 9432 PCI (83c170/175 EPIC series)   | epic100.o   |  |
| Racal-Interlan ES3210 EISA Network Adapter  | es3210.o    | es3210=io_port,IRQ,mem<br>es3210 io=io_port irq=IRQ<br>mem=mem |

| Hardware  | Module         | Parameters  |
|---|----------------|---|
| ICL EtherTeam 16i/32  | eth16i.o       | eth16i=io_port,mediatype<br>eth16i ioaddr=io_port<br>mediatype=type                   |
| EtherWORKS 3 (DE203, DE204 and DE205)   | ewrk3.o        | ewrk=io_port,IRQ ewrk<br>io=io_port irq=IRQ   |
| Fujitsu FMV-181/182/183/184   | fmv18x.o       | fmv18x=io_port,IRQ<br>fmv18x io=io_port<br>irq=IRQ                                    |
| Modular driver for the Control Hostess SV11   | hostess_sv11.o | hostess_sv11=io_port,<br>IRQ, DMABIT<br>hostess_sv11 io=io_port<br>irq=IRQ dma=DMABIT |
| HP PCLAN/plus   | hp-plus.o      | hp-plus=io_port,IRQ<br>hp-plus io=io_port irq=IRQ                                     |
| HP LAN Ethernet   | hp.o           | hp=io_port,IRQ hp<br>io=io_port irq=IRQ   |
| 100VG-AnyLan Network Adapters HP J2585B, J2585A, J2970, J2973, J2573 Compex ReadyLink ENET100-VG4, FreedomLine 100/VG | hp100.o        | hp100=io_port,name<br>hp100 hp100_port=io_port<br>hp100_name=name                     |
| IBM Token Ring 16/4   | ibmtr.o        | ibmtr=io_port,IRQ,mem<br>ibmtr io=io_port irq=IRQ<br>mem=mem                          |

| Hardware  | Module     | Parameters   |
|---|------------|--|
| AMD LANCE/PCnet<br>Allied Telesis AT1500, HP<br>J2405A, NE2100, NE2500  | lance.o    | lance=io_port,IRQ,dma<br>lance<br>io=io_port_1,io_port_n<br>irq=IRQ_1,IRQ_2<br>dma=dma_1,dma_n |
| Mylex LNE390 EISA cards<br>(LNE390A, LNE390B)   | lne390.o   | lne390=io_port,IRQ,mem<br>lne390 io=io_port irq=IRQ<br>mem=mem                                 |
|   | ltpc.o     | ltpc=io_port,IRQ ltpc<br>io=io_port irq=IRQ  |
| NE1000 / NE2000<br>(non-pci)  | ne.o       | ne=io_port,IRQ ne<br>io=io_port irq=IRQ  |
| PCI NE2000 cards<br>RealTEk RTL-8029,<br>Winbond 89C940, Compex<br>RL2000, KTI ET32P2,<br>NetVin, NV5000SC, Via<br>82C926, SureCom NE34 | ne2k-pci.o |  |
| Novell NE3210 EISA<br>Network Adapter   | ne3210.o   | ne3210=io_port,IRQ,mem<br>ne3210 io=io_port irq=IRQ<br>mem=mem                                 |
| MiCom-Interlan NI5010<br>ethercard  | ni5010.o   | ni5010=io_port,IRQ<br>ni5010 io=io_port irq=IRQ  |
| NI5210 card (i82586<br>Ethernet chip)   | ni52.o     | ni52=io_port,IRQ ni52<br>io=io_port irq=IRQ  |
| NI6510, ni6510<br>EtherBlaster  | ni65.o     | ni65=io_port,IRQ,dma<br>ni65 io=io_port irq=IRQ<br>dma=dma                                     |

| Hardware   | Module        | Parameters  |
|--|---------------|---|
| AMD PCnet32 and AMD PCnetPCI   | pcnet32.o     |   |
| RedCreek Communications PCI  | rcpci.o       |   |
| RealTek cards using RTL8129 or RTL8139 Fast Ethernet chipsets  | rtl8139.o     |   |
| Sangoma S502/S508 multi-protocol FR  | sdla.o        |   |
| Sangoma S502A, ES502A, S502E, S503, S507, S508, S509   | sdladv.o      |   |
| SysKonnect Token Ring ISA/PCI Adapter, TR4/16(+) ISA or PCI, TR4/16 PCI, and older SK NET TR4/16 ISA cards | sktr.o        | sktr=io_port,IRQ,mem<br>sktr io=io_port irq=IRQ<br>mem=mem          |
| SMC Ultra and SMC EtherEZ ISA ethercard (8K, 83c790)   | smc-ultra.o   | smc-ultra=io_port,IRQ<br>smc-ultra io=io_port<br>irq=IRQ            |
| SMC Ultra32 EISA Ethernet card (32K)   | smc-ultra32.o |   |
| SMC 9000 series of Ethernet cards  | smc9194.o     | smc9194=io_port,IRQ<br>smc9194 io=io_port<br>irq=IRQ ifport=[0,1,2] |

| Hardware   | Module  | Parameters   |
|--|---------|--|
| Compaq Netelligent 10/100 TX PCI UTP Compaq Netelligent 10 T PCI UTP Compaq Integrated NetFlex 3/P Compaq Netelligent Dual 10/100 TX PCI UTP Compaq Netelligent Integrated 10/100 TX UTP Compaq Netelligent 10/100 TX Embedded UTP Compaq Netelligent 10 T/2 PCI UTP/Coax Compaq Netelligent 10/100 TX UTP Compaq NetFlex 3/P Olicom OC-2325, OC-2183, OC-2326 | tlan.o  | tlan=io_port,IRQ,alui,debug tlan io=io_port irq=IRQ Other<br>Module Options:<br>speed=10Mbps,100Mbps<br>debug=0x0[1,2,4,8] aui=1<br>duplex=[1,2] |
| Digital 21x4x Tulip PCI Ethernet cards SMC EtherPower 10 PCI(8432T/8432BT) SMC EtherPower 10/100 PCI(9332DST) DEC EtherWorks 100/10 PCI(DE500-XA) DEC EtherWorks 10 PCI(DE450) DEC QSILVER's, Znyx 312 etherarray Allied Telesis LA100PCI-T Danpex EN-9400, Cogent EM110   | tulip.o |  |

| Hardware  | Module                   | Parameters  |
|---|--------------------------|---|
| VIA Rhine PCI Fast Ethernet cards with either the VIA VT86c100A Rhine-II PCI or 3043 Rhine-I D-Link DFE-930-TX PCI 10/100 | <code>via-rhine.o</code> |   |
| AT&T GIS (nee NCR) WaveLan ISA Card   | <code>wavelan.o</code>   | <code>wavelan=[IRQ,0],io_port,NWID</code>   |
| WD8003 and WD8013 "compatible" ethercards   | <code>wd.o</code>        | <code>wd=io_port, IRQ, mem,mem_end wd io=io_port irq=IRQ mem=mem mem_end=end</code> |
| Packet Engines Yellowfin  | <code>yellowfin.o</code> |   |
| G-NIC PCI Gigabit Ethernet adapter  |                          |   |
| Z8530 based HDLC cards for AX.25  | <code>z85230.o</code>    |   |

Here are some examples of these modules in use:

**Table B-6 Ethernet Parameter Configuration Examples**

| Configuration   | Example   |
|---|---|
| NE2000 ISA card at IO address 300 and IRQ 11                          | <code>ne=0x300,11 ether=0x300,11,eth0</code>                  |
| Wavelan card at IO 390, autoprobe for IRQ, and use the NWID to 0x4321 | <code>wavelan=0,0x390,0x4321 ether=0,0x390,0x4321,eth0</code> |

## B.4.1 Using Multiple Ethernet Cards

You can use multiple Ethernet cards in one machine. If each card uses a different driver (e.g., a 3c509 and a DE425), you simply need to add `alias` (and possibly `options`) lines for each card to `/etc/conf.modules`. See Section 3.2.2, *Kernel Daemon Configuration* for more information.

If any two Ethernet cards use the same driver (e.g., two 3c509's or a 3c595 and a 3c905), you will need to either give the two card addresses on the driver's `options` line (in the case of ISA cards), or (for PCI cards) simply add one `alias` line for each card.

<http://metalab.unc.edu/LDP/HOWTO/Ethernet-HOWTO.html> For more information about using more than one Ethernet card, see the *Linux Ethernet-HOWTO* at <http://metalab.unc.edu/LDP/HOWTO/Ethernet-HOWTO.html>. If you installed the `howto` package when you installed Red Hat Linux, you can find it in the file `/usr/doc/HOWTO/Ethernet-HOWTO`.





## C 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 so many people purchasing computers featuring preinstalled operating systems, relatively few people understand how partitions work. This chapter attempts to explain how disk partitions work so you'll find your Red Hat Linux installation is as simple as possible.

If you're reasonably comfortable with disk partitions, you could skip ahead to Section C.1.4, *Making Room For Red Hat Linux* for more information on the process of freeing up disk space to prepare for a Red Hat Linux 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's important to know a bit about the underlying hardware; unfortunately, it's easy to become bogged down in details. Therefore, let's use a simplified diagram of a disk drive to help us explain what goes on "under the hood." Figure C-1, *An Unused Disk Drive* shows a brand-new, unused disk drive.

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

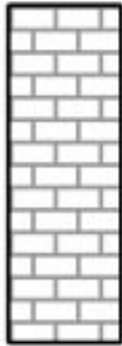


Not much to look at, is it? But if we're talking about disk drives on a basic level, it will do. Let's say that we'd like to store some data on this drive. As things stand now, it won't work. There's something we need to do first...

### **C.1.1 It's Not What You Write, it's How You Write It**

The old-timers in the audience probably got this one of the first try. We need to **format** the drive. Formatting (usually known as "making a **filesystem**" in Linux parlance) writes information to the drive, creating order out of the empty space in an unformatted drive.

Figure C-2 Disk Drive with a Filesystem



As Figure C-2, *Disk Drive with a Filesystem* implies, the order imposed by a filesystem involves some tradeoffs:

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

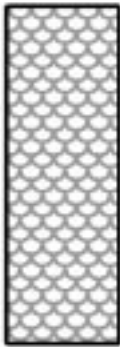
Given that filesystems make things like directories and files possible, these tradeoffs are usually seen as a small price to pay.

It's also worth noting that there is no single, universal filesystem; as Figure C-3, *Disk Drive with a Different Filesystem* shows, a disk drive may have one of many different filesystems written on it. As you might guess, different filesystems tend

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

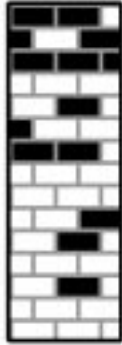
to be incompatible; that is, an operating system that supports one filesystem (or a handful of related filesystem types) may not support another. This last statement is not a hard-and-fast rule, however. For example, Red Hat Linux supports a wide variety of filesystems (including many commonly used by other operating systems), making data interchange easy.

**Figure C–3 Disk Drive with a Different Filesystem**



Of course, writing a filesystem to disk is only the beginning. The goal of this process is to actually *store* and *retrieve* data. Let's 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, *Disk Drive with Data Written to It* shows, 14 of the previously-empty inodes are now holding data. We cannot determine how many files reside on this drive; it may be as few as one or as many as 14, as all files use at least one inode. Another important point to note is that the used inodes do not have to form a contiguous region; used and unused inodes 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 continued to change over time. In particular, they changed in one specific way -- they got bigger. Not bigger in size, but bigger in capacity. And it was this additional capacity that drove a change in the way disk drives were used.

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

As disk drive capacities soared, some people started wondering if having all that space in one big chunk wasn't 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 filesystems were never designed to support larger drives. Or the filesystems *could* support larger drives, but the overhead imposed by the filesystem became excessive.

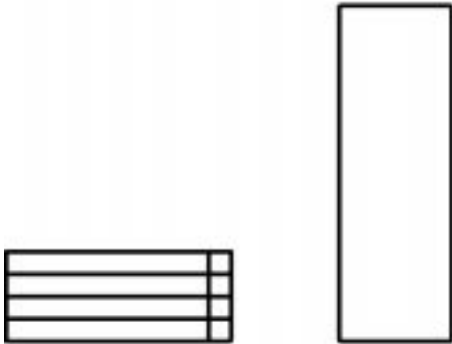
The solution to this problem was to divide disks into **partitions**. Each partition can be accessed as if it was a separate disk. This is done through the addition of a **partition table**.

---

#### **Please 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 filesystem or user data. But for clarity, we'll keep it separate in our diagrams.

---

**Figure C–5 Disk Drive with Partition Table**

As Figure C–5, *Disk Drive with Partition Table* 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's 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's because the

meaning of the partition type is a bit vague. Some operating systems use the partition type to denote a specific filesystem 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, *Partition types* contains a listing of some popular (and obscure) partition types, along with their numeric values.

**Table C–1 Partition types**

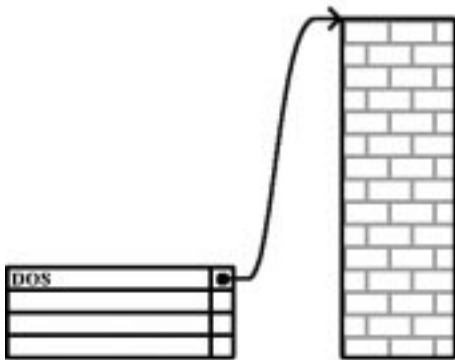
| Partition Type       | Value | Partition Type     | Value |
|----------------------|-------|--------------------|-------|
| Empty                | 00    | Novell Netware 386 | 65    |
| DOS 12-bit FAT       | 01    | PIC/IX             | 75    |
| XENIX root           | 02    | Old MINIX          | 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    |



| Partition Type     | Value | Partition Type | Value |
|--------------------|-------|----------------|-------|
| Microport          | 52    | DOS R/O        | e3    |
| GNU HURD           | 63    | DOS secondary  | f2    |
| Novell Netware 286 | 64    | BBT            | ff    |

Now you might be wondering how all this additional complexity is normally used. See Figure C–6, *Disk Drive With Single Partition* for an example.

**Figure C–6 Disk Drive With Single Partition**



That's right -- in many cases there is but a single partition spanning the entire disk, essentially duplicating the pre-partitioned days of yore. The partition table has only one entry used, and it points to the start of the partition.

We've labeled this partition as being of type "DOS," although as you can see from Table C–1, *Partition types*, that's a bit simplistic, but adequate for the purposes of this discussion. This is a typical partition layout for most newly purchased computers with some version of Windows pre-installed.

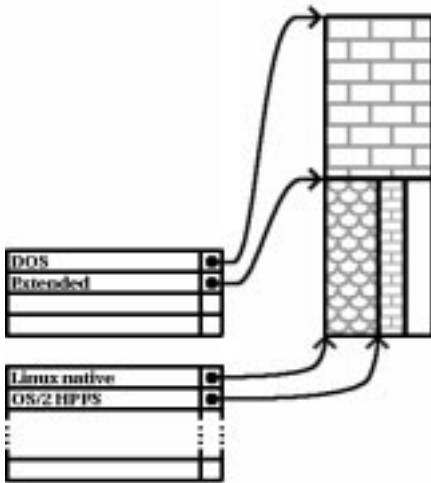
### C.1.3 Partitions within Partitions – An Overview of Extended Partitions

Of course, in 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, *Partition types*, there is an "Extended" partition type; it is this partition type that is at the heart of extended partitions. Here's how it works.

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, *Disk Drive With Extended Partition* 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've discussed partitions in general, let's see how to use this knowledge to get Red Hat Linux installed.

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

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's look at each scenario in order.

---

**Please Note**

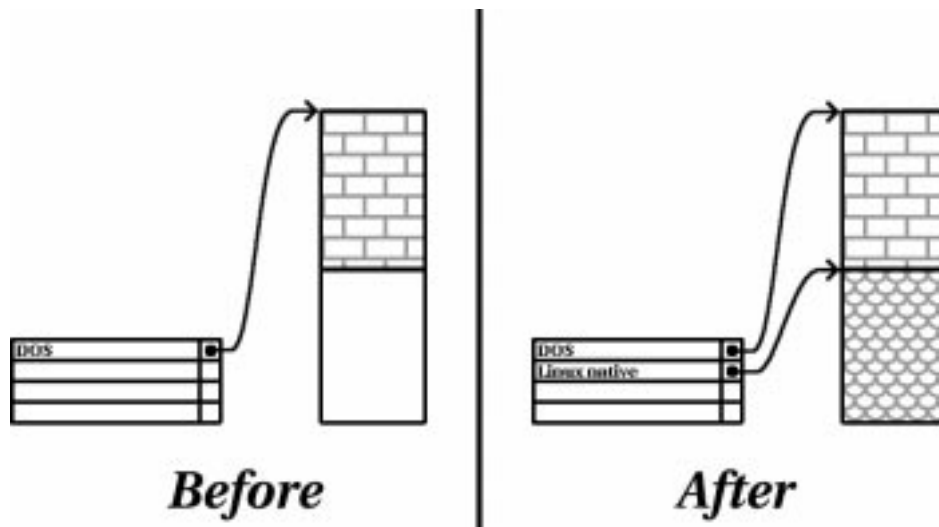
Please keep in mind that the following illustrations are simplified in the interest of clarity, and do not reflect the exact partition layout that you will encounter when actually installing Red Hat Linux.

---

### 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, *Disk Drive with Unpartitioned Free Space* 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.

---

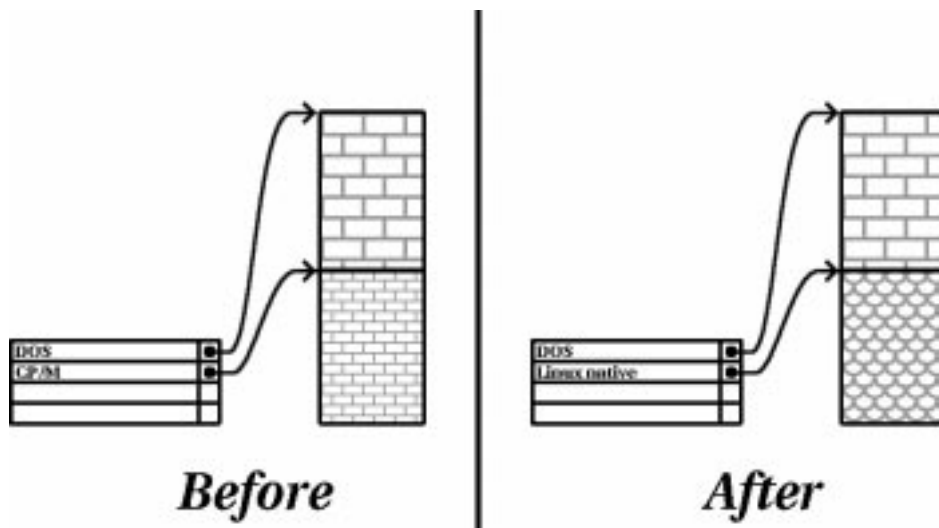
In any case, you can simply create the necessary partitions from the unused space. Unfortunately, this scenario, although very simple, is not very likely (unless you've just purchased a new disk just for Red Hat Linux).

Let's move on to a slightly more common situation.

### Using Space From An Unused Partition

In this case, maybe you have one or more partitions that you just don't use any longer. Perhaps you've dabbled with another operating system in the past, and the partition(s) you've dedicated to it never seem to be used anymore. Figure C-9, *Disk Drive With an Unused Partition* 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'll first need to delete the partition, and then create the appropriate Linux partition(s) in its place. You can either delete the partition using DOS `fdisk`, or you'll be given the opportunity to do so during a custom-class installation.

## Using Free Space From An Active Partition

This is the most common situation. It is also, unfortunately, the hardest to work with. The main problem is that, even if you have enough free space, it's presently allocated to a partition that is 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:

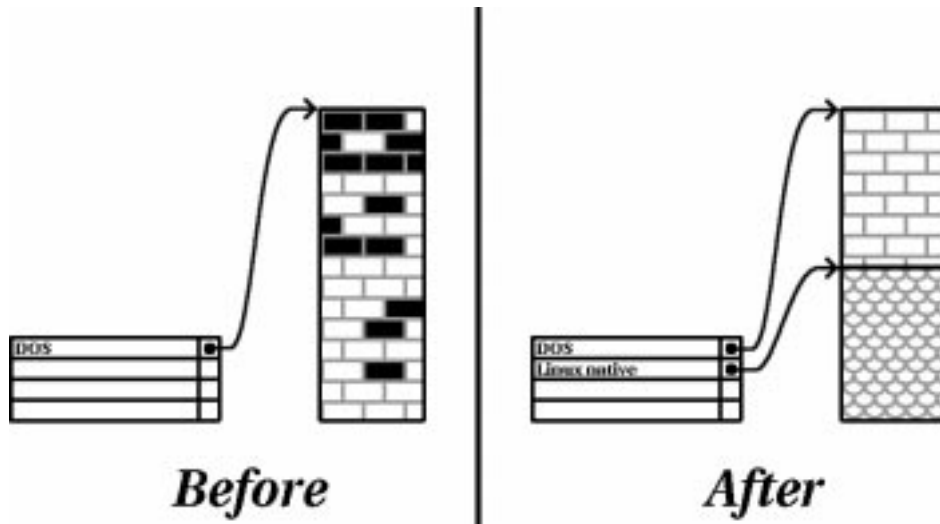
### Destructive Repartitioning

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 complete 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. Note also that if there was an operating system of some type installed on that partition, it will need to be reinstalled as well.

After creating a smaller partition for your existing software, you can reinstall any software, restore your data, and continue with your Red Hat Linux installation. Figure C-10, *Disk Drive Being Destructively Repartitioned* shows this being done.

---

Figure C–10 Disk Drive Being Destructively Repartitioned



As Figure C–10, *Disk Drive Being Destructively Repartitioned* 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'll 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:

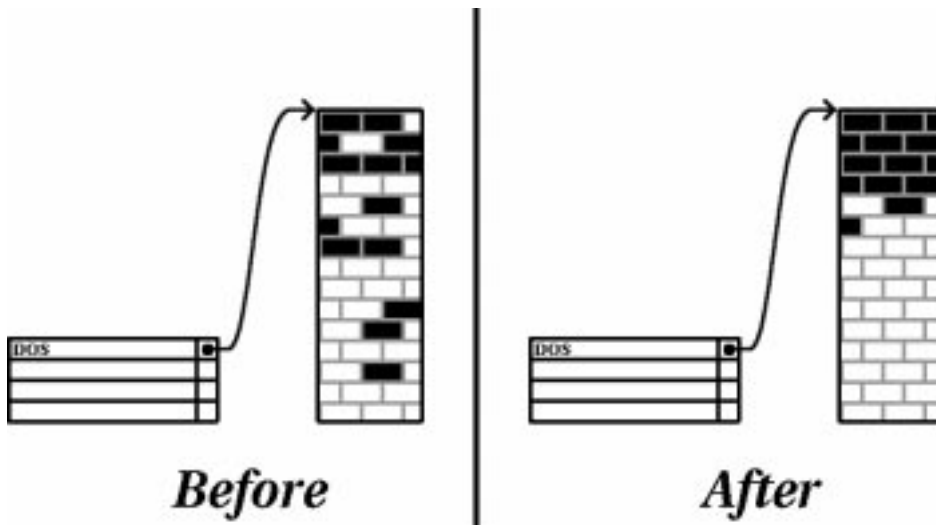
- Compress existing data
- Resize partition
- Create new partition(s)

Let's take a look at each step in a bit more detail.

### Compress existing data

As Figure C–11, *Disk Drive Being Compressed* 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



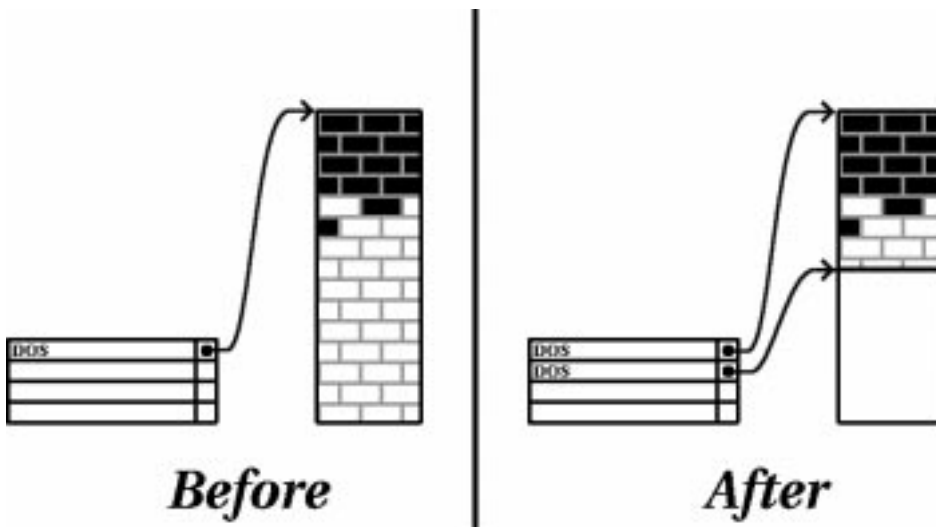
This step is crucial; without it, it is possible that the location of your data could prevent the partition from being resized to the extent desired. Note also that, for one reason or another, some data cannot be moved. If this is the case (and it restricts the size of your new partition(s)), you may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



### Resize partition

Figure C–12, *Disk Drive with Partition Resized* shows the actual resizing process. While the actual end-product 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

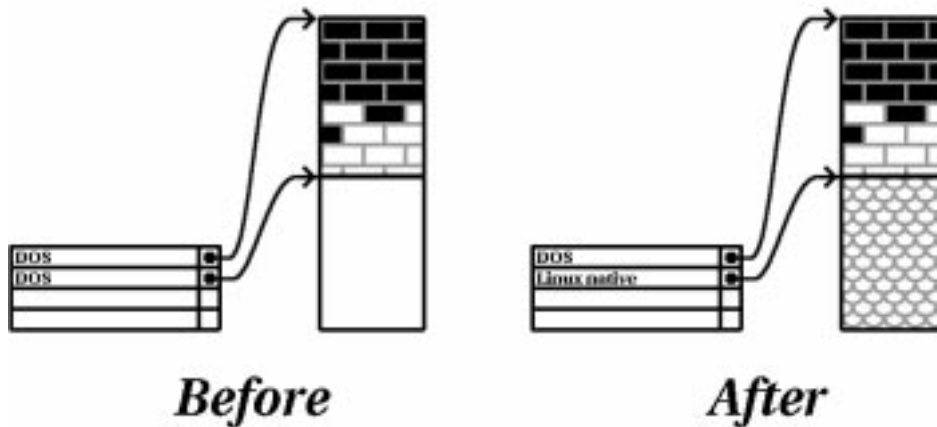


It's important to understand what the resizing software you use does with the newly freed space, so that you can take the appropriate steps. In the case we've illustrated, it would be best to simply delete the new DOS partition, and create the appropriate Linux partition(s).

### 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'll need to delete the partition that was created during the resizing process. Figure C–13, *Disk Drive with Final Partition Configuration* shows this being done.

Figure C-13 Disk Drive with Final Partition Configuration




---

### Intel

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

---

As a convenience to our customers, we provide the `fixps` utility. This is a freely available program that can resize FAT (File Allocation Table) partitions. It's included on the Red Hat Linux/Intel CD-ROM in the `dosutils` directory.

---

**Please Note**

Many people have successfully used `fips` to repartition their hard drives. 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 whatsoever 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/Intel 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, you should delete the newly created partition, either by using `fdisk` under your current operating system, or while setting up partitions during a custom-class 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're used to the "C drive" way of referring to hard disks and their partitions. In the DOS/Windows world, here is how partitions are named:

- 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 "C".
-

- The drive letter can then be used to refer to that partition as well as the filesystem contained on that partition.

Red Hat Linux 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/xyN`

Here's 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'll 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. E.g., `/dev/hda3` is the third primary or extended partition on the first IDE hard disk; `/dev/sdb6` is the second logical partition on the second SCSI hard disk.

---

---

**Please 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. Of course, this doesn't 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're setting up the partitions Red Hat Linux requires.

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

If your Red Hat Linux partitions will be sharing a hard disk with partitions used by other operating systems, most of the time you'll 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 CD in the `doc/HOWTO` and `doc/HOWTO/mini` directories. In particular, the Mini-HOWTOs whose names start with `Linux+` are quite helpful.

---

**Intel**

If Red Hat Linux/Intel will coexist on your machine with OS/2, you must create your disk partitions with the OS/2 partitioning software---otherwise, OS/2 may not recognize the disk partitions. During the installation, do not create any new partitions, but do set the proper partition types for your Linux partitions using the Linux `fdisk`.

---

### 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: If you have more than one partition, each partition gets a "drive letter." You then use the drive letter to refer to files and directories on a given partition.

This is entirely different from how Red Hat 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/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, for example, `/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, 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's 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 create the following partitions:

---

- A swap partition -- Swap partitions are used to support virtual memory. If your computer has 16 MB of RAM or less, you *must* create a swap partition. Even if you have more memory, a swap partition is still recommended. The minimum size of your swap partition should be equal to your computer's RAM, or 16 MB (whichever is larger).

- 

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### Intel

The following partition is specific to Red Hat Linux/Intel installations.

A `/boot` partition -- The partition mounted on `/boot` contains the operating system kernel, along with a few other files used during the bootstrap process. Due to the limitations of most PC BIOSes, creating a small partition to hold these files is a good idea. This partition should be no larger than 16MB.

---

### Please Note

Make sure you read Section C.1.9, *One Last Wrinkle: Using LILO* -- the information there applies to the `/boot` partition!

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### Alpha

The following partition is specific to Red Hat Linux/Alpha installations.

A MILO partition -- Alpha owners that will be using MILO to boot their systems should create a 2MB DOS partition where MILO can be copied after the installation is complete. We recommend using `/dos` as the mount point.

---

- A root partition -- The root partition is where `/` (the root directory) resides. In this partitioning layout, all files (except those stored in `/boot`) reside on the root partition. Because of this, it's in your best interest to maximize the size of your root partition. A 600MB root partition will permit the equivalent of a workstation-class installation (with *very* little free space), while a 1.5GB root partition will let you install every package.

### C.1.9 One Last Wrinkle: Using LILO

LILO (the LInux LOader) is the most commonly used method to boot Red Hat Linux on Intel-based systems. An operating system loader, LILO operates "outside" of any operating system, using only the Basic I/O System (or BIOS) built into the computer hardware itself. This section describes LILO's interactions with PC BIOSes, and is specific to Intel-compatible computers.

#### BIOS-Related Limitations Impacting LILO

LILO is subject to some limitations imposed by the BIOS in most Intel-based computers. Specifically, most BIOSes can't access more than two hard drives and they can't access any data stored beyond cylinder 1023 of any drive. Note that some recent BIOSes do not have these limitations, but this is by no means universal.

All the data LILO needs to access at boot time (including the Linux kernel) are located in the `/boot` directory. If you follow the partition layout recommended above, or you are performing a workstation- or server-class install, the `/boot` directory will be in a small, separate partition. Otherwise, it will reside in the root partition. In either

---



case, the partition in which `/boot` resides must conform to the following guidelines if you are going to use LILO to boot your Red Hat Linux system:

### **On First Two IDE Drives**

If you have 2 IDE (or EIDE) drives, `/boot` must be located on one of them. Note that this two-drive limit also includes any IDE CD-ROM drives on your primary IDE controller. So, if you have one IDE hard drive, and one IDE CD-ROM on your primary controller, `/boot` must be located on the first hard drive *only*, even if you have other hard drives on your secondary IDE controller.

### **On First IDE or First SCSI Drive**

If you have one IDE (or EIDE) drive and one or more SCSI drives, `/boot` must be located either on the IDE drive or the SCSI drive at ID 0. No other SCSI IDs will work.

### **On First Two SCSI Drives**

If you have only SCSI hard drives, `/boot` must be located on a drive at ID 0 or ID 1. No other SCSI IDs will work.

### **Partition *Completely* Below Cylinder 1023**

No matter which of the above configurations apply, the partition that holds `/boot` must be located entirely below cylinder 1023. If the partition holding `/boot` straddles cylinder 1023, you may face a situation where LILO will work initially (because all the necessary information is below cylinder 1023), but will fail if a new kernel is to be loaded, and that kernel resides above cylinder 1023.

As mentioned earlier, it is possible that some of the newer BIOSes may permit LILO to work with configurations that don't meet our guidelines. Likewise, some of LILO's more esoteric features may be used to get a Linux system started, even if the configuration doesn't meet our guidelines. However, due to the number of variables involved, Red Hat cannot support such extraordinary efforts.

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**Please Note**

Disk Druid as well as the workstation- and server-class installs take these BIOS-related limitations into account.

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## D Redundant Array of Independent Disks (RAID)

### D.1 What is RAID?

The basic idea behind RAID is to combine multiple small, inexpensive disk drives into an array of disk drives which yields performance exceeding that of one large and expensive drive. Additionally, this array of drives will appear to the computer as a single logical storage unit or drive.

It is a method whereby information is spread across several disks, using techniques such as disk striping (RAID Level 0) and disk mirroring (RAID level 1) to achieve redundancy, lower latency and/or higher bandwidth for reading and/or writing, and recoverability from hard-disk crashes.

Fundamental to RAID is "striping," a method of combining the space on multiple hard drives into a single logical drive for the operating system. Striping involves breaking down the total space on each drive into small "chunks." These "chunks" can be as small as 4k or as large as several megabytes (although testing shows that a 32k or 64k "chunk" size is often optimal). These chunks are then interleaved on the constituent disks to create a "stripe." For example, the first "chunk" on each hard disk would be combined into a single "stripe," the second "chunk" on each into another, and so on. In this way, the total size of the logical drive is the size of all the constituent drives added together.

#### D.1.1 RAID: Hardware vs. Software

There are two possible approaches to RAID: Hardware RAID and Software RAID.

##### Hardware RAID

The hardware based system manages the RAID subsystem independently from the host and presents to the host only a single disk per RAID array.

An example of a hardware RAID device would be one that connects to a SCSI controller and presents the RAID arrays as a single SCSI drive. An external RAID box moves all RAID handling "intelligence" into a controller that is sitting in the external

---

disk subsystem. The whole subsystem is connected to the host via a normal SCSI controller and appears to the host as a single disk.

RAID controllers also come in the form of cards that *act* like a SCSI controller to the operating system, but handle all of the actual drive communications themselves. In these cases, you plug the drives into the RAID controller just like you would a SCSI controller, but then you add them to the RAID controller's configuration and the operating system never knows the difference.

### Software RAID

Software RAID implements the various RAID levels in the kernel disk (block device) code. It also offers the cheapest possible solution: not only are expensive disk controller cards or hot-swap chassis not required, but software RAID works with cheaper IDE disks as well as SCSI disks. With today's fast CPUs, software RAID performance excels against hardware RAID.

The MD driver in the Linux kernel is an example of a RAID solution that is completely hardware independent. The performance of a software-based array is very dependent on the server CPU performance and load.

### D.1.2 Why you should use RAID

- Speed
- Increased storage capacity
- Increased efficiency in recovering from a disk failure

### D.1.3 New Features of RAID

RAID has been rewritten as part of the 2.2 kernel and many changes have been made. Because there are so many changes, it is difficult to list them all. Briefly, some changes are:

- Threaded rebuild process
  - Fully kernel-based configuration
  - Arrays can be moved between Linux boxes without reconstruction
-

- Array reconstruction is backgrounded using idle system resources
- Hot-swappable drive support
- Automatic CPU detection to take advantage of certain CPU optimizations

### Levels and linear support

Of the more notable changes to RAID is the addition of levels 0, 1, 4, 5 and linear support. These RAID types act as follows:

- *Level 0* -- RAID level 0, often called "striping," is a performance-oriented striped data mapping technique. That means the data being written to the array is broken down into strips and striped across the member disks of the array. This allows high I/O performance at low inherent cost but provides no redundancy.
  - *Level 1* -- RAID level 1, or "mirroring," has been used longer than any other form of RAID. Level 1 provides redundancy by writing identical data to each member disk of the array, leaving a "mirrored" copy on each disk. Mirroring remains popular due to its simplicity and high level of data availability. Level 1 operates with two or more disks that may use parallel access for high data-transfer rates when reading, but more commonly operate independently to provide high I/O transaction rates. Level 1 provides very good data reliability and improves performance for read-intensive applications but at relatively high cost.
  - *Level 4* -- Level 4 uses parity concentrated on a single disk drive to protect data. It's better suited to transaction I/O rather than large file transfers. Because the dedicated parity disk represents an inherent bottleneck, level 4 is seldom used without accompanying technologies such as write back caching.
  - *Level 5* -- The most common type of RAID. By distributing parity across some or all of an array's member disk drives, RAID level 5 eliminates the write bottleneck inherent to level 4. The only bottleneck it has is the parity calculation process. With modern CPUs and software RAID, that isn't even a very big bottleneck. As with level 4, the result is asymmetrical performance, with reads substantially outperforming writes. Level 5 is often used with caching to reduce the asymmetry.
-



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