Yggdrasil Plug-and-Play Linux

The 75,000+ files in this complete plug-and-play operating system include:

- Linux 1.1 kernel supporting most popular CDROM drives (see hardware list on back).
- An easy-to-use installation script, plus a graphical user interface for system configuration.
- *The X Window System:* X11R6 Xfree86 3.0 (see hardware list on back), Xlib/Xt X windows libraries, the Tcl/Tk programming language and toolkit, the Xview 3.2 OpenLook(tm) toolkit, InterViews C++ toolkit.
- The Andrew System version 6.3, including the **ez** editor for easy creation and reading of documents with imbedded images, equations, spreadsheets, hypertext links, and many other media types.
- *Ethernet Networking* with TCP/IP, RPC and other Internet protocols.
- Games: asteroids, battle zone, chess, mille bornes, othello, pool, shogi, solitaire, tetris, and connect four.
- *Multimedia:* viewers for JPEG, GIF, TIFF and other image formats, MPEG video, support for many sound cards.
- *Text editors:* the elvis vi clone, GNU Emacs, and Lucid GNU Emacs.
- *Desktop Publishing:* TEX, LaTeX, and groff typesetting packages with X previewers, and ghostscript, a postscript interpreter for X windows, faxes and a variety of printers.
- *Telecommunications:* Z-modem, Taylor UUCP, mail reader, threaded USENET news reader, with support for reading MIME multimedia messages with imbedded images, full motion video and sound.
- The Postgres 4.1 remote database system.
- *Programming Languages:* GNU C++, GNU ANSI C, GNU Ada94, FORTRAN-to-C and Pascal-to-C translators, and Prolog.
- *Enhanced development environment:* GNU debugger, bison, flex, GNU make, the GNU Coverage Tool, Revision Controls System, Concurrent Version System, GNATS, and berkeley yacc.
- System V-style shared memory and interprocess communication.
- *File Systems:* a filesystem with long file names, symbolic links, and FIFO's, System V, Xenix, Coherent, Minix, NFS, DOS, HPFS (Read Only), and ISO9660/Rock Ridge CDROM filesystems.
- *Emulators:* a BIOS emulator that can run DOS, an experimental ELF loader, and a snapshot of a WABI Windows emulator under development.

Plug-and-Play Linux: Fall 1994

Cover art by Greg Long and Michaelangelo.

GENERAL LINUX CONSULTING (United States only):
1-900-446-6075, extension 835 ("TEK"), $2.95/minute.
11am-noon,1pm-5pm Pacific Time.
At this rate, it costs about ten to twenty dollars
to get an answer to a typical question.

See chapter 8 for trouble shooting instructions.

1 About This Manual

This manual will guide you through the installation of the Yggdrasil Plug-and-Play Linux on your computer and will explain how to access the online documentation on the CDROM. The online documentation explains how to configure and use the many software packages that comprise this distribution.

If you are new to unix-like systems, you may want to pick up a copy of *Unix For People*, available from Lurnix (Berkeley, California). For books on specific software facilities, consider the *Nutshell* series of books, printed by O'Reilly and Associates. You may also want to buy some of the manuals printed by the Free Software Foundation (Cambridge, Massachusetts).

For information specific to Linux, Yggdrasil sells the *The Linux Bible*, a manual the size of a phonebook that includes *Linux Installation and Getting Started*, *Networking Administrator's Guide*, *Kernel Hacker's Guide*, and over a dozen "How To" guides. A portion of sales of *The Linux Bible* by Yggdrasil goes to the Linux Documentaion Project to help produce even more and even better documentation. The texts that comprise the Linux Bible are available on line on the Plug-and-Play Linux CDROM.

However, you do not need any supplemental manuals or even this manual to run Plug-and-Play Linux. The system is designed to be sufficiently straightforward to use so that if you just plug it and reboot your machine, you should be able to find what you need just by exploring.

With this manual, you should have received a copy of the Fall 1994 Plug-and-Play Linux CDROM and a 3.5" boot floppy. If you need a 5.25" boot floppy, you can follow the instructions at the end of the trouble shooting chapter, or you can call us and we'll send you one for free. If you have not received these items, take this book back to where you bought it.

If you have any problems during the installation please see the chapter on troubleshooting.

2   Installation

2.1   Instructions For The Impatient

Go for it! Insert the CDROM and the boot floppy, and reset your computer. Plug-and-Play Linux will run directly from the CDROM and the boot floppy.

After the operating system boots, you will see a page describing some useful pre-installed user names that you may want to use to explore the system. As long as you don't do anything that writes to your hard disk, it is almost impossible to do anything that would harm your computer or your copy of Plug-and-Play Linux, since neither the CDROM nor the floppy disk is writable.

The built-in user name `install` runs the installation program, which provides a page or more of detailed instructions for every step of the installation process.

2.2   Booting the CDROM

```
 ----------------------------------------------------------------
|                                                                |
| System Configuration  (C)  Copyright 1985-1991, Megatrends Inc., |
|_____ |
| Main Processor     : 80486       | Base Memory Size   : 640 KB  |
| Numeric Processor : Present      | Ext. Memory Size   : 7424 KB |
| Floppy Drive A:    : 1.2MB, 5.25''| Hard disk C: type  : None   |
| Floppy Drive B:    : None        | Hard disk D: type  : None    |
| Display Type       : VGA/PGA/EGA | Serial Port(s)     : 3F8     |
| ROM BIOS Date      : 07/07/91    | Parallel Ports(s)  : 378     |
|_____|_____ |

256KB CACHE MEMORY

LILO
```

Although your screen will probably look different, when you first boot your computer you should see some information printed by your BIOS. After inserting the CDROM and the boot floppy and resetting your computer, the first message from Plug and Play Linux that you see should be a screenful of options followed by 'LILO boot:'. Do not type anything at this point. Instead, after a brief interval, the boot loader will automatically load a kernel from the floppy disk which will eventually mount the CDROM. Your screen should look something like:

```
LILO
Hit RETURN or wait 30 seconds to load Yggdrasil Plug-and-Play Linux.

BOOT-TIME OPTIONS (for advanced users or undetected hardware)
IDE drive on IBM PS1 or ValuePoint          hd=cylinders,heads,sectors
BIOS-less Future Domain TMC-8xx             tmc8xx=mem_address,interrupt
BIOS-less Seagate ST02                      st0x=mem_address,interrupt
BIOS-less Trantor T128B                     t128=mem_address,interrupt
Gerenic ncr5380 (e.g., Trantor T130):      ncr5380=port,interrupt,dma_channel
BIOS-less Adaptec AIC-6260 controllers      aha152x=port,interrupt,scsi_id,1
  (such as Adaptec 1510, 152x, Soundblaster-SCSI)
Ethernet card           ether=interrupt,io_port,mem_start,mem_end,interface
Alternate root                             root=/dev/device_name
Alternate bus mouse IRQ                     bmouse=interrupt

WARNING: Many drivers are unsupported and experimental.  The manual's
back cover lists supported hardware.

EXAMPLE: to boot with a Trantor T130 in its default configuration
and change the root device to partition 2 of the first IDE disk
(The ncr5380 is offset 8 bytes from the 0x350 default port on the T130):

        boot: linux ncr5380=0x358,254,-1 root=/dev/hda2

boot: _
```

Had you typed something at the 'boot:' prompt, you would have been
able to tell the boot loader to boot one of your other disk partitions, such
as a DOS or OS/2 partition, instead of the floppy. If you accidentally type
something, you can delete the characters that you type with the BACKSPACE
key, and then make the boot loader continue with its default behavior by
just hitting RETURN to the 'boot:' prompt.

2.3 Watching LILO load the kernel

'LILO' is the name of the boot loader. Different phases of the boot loader
print each of the four letters in L I L O, so you can actually monitor the
phases of the loading process as the loader's name is spelled out.

The LILO boot loader will load and start the Linux kernel. One of
the first things that the Linux kernel does when it starts is to attempt to
determine your machine's hardware configuration. If you ever think that the
kernel is not communicating with a particular device on your system, one of
the first things that you should do is check the boot message to see if the
kernel notices anything anomolous.

You should see messages like the following when the kernel is detecting
your hardware configuration. Probably you will see a few more messages

than this, because this particular screen came from a minimally configured
machine.

If you have problems at this point, there is a section on LILO in the
troubleshooting chapter.

```
Uncompressing Linux...done.

Now booting the kernel.



LILO Loading linux
Kernel arguments: BOOT_IMAGE=linux root=802 ramdisk=1025
Console: colour EGA+ 80x25, 8 virtual consoles
Serial driver version 3.99a with AST_FOURPORT enabled
tty00 at 0x03f8 (irq = 4) is a 16450
lp_init: lp1 exists, using polling driver
Calibrating delay loop.. ok - 19.97 BogoMips
Memory: 14416k/16384k available (936k kernel code, 384k reserved, 648k data)
This processor honours the WP bit even when in supervisor mode. Good.
Floppy drive(s): fd0 is 1.44M
Swansea University Computer Society Net2Debugged [1.30]
IP Protocols: ICMP, UDP, TCP
PPP: version 0.1.2 (4 channels)
TCP compression code copyright 1989 Regents of the University of California
PPP line discipline registered.
SLIP: version 0.7.5 (4 channels)
CSLIP: code copyright 1989 Regents of the University of California
NE*000 ethercard probe at 0x300: 00 80 ad 07 8a 01
eth0: NE2000 found at 0x300, using IRQ 12.
ne.c:v0.99-15k 3/3/94 Donald Becker (becker@super.org)
...
```

If your CDROM drive is non-SCSI, you may see a number of error mes-
sages as Linux tries to figure out what kind of CDROM drive you have by
trial and error. You can safely ignore these errors.

If everything is more or less as it should be, then the system will come
up and you will be able to log in. The login screen for the CDROM will look
like this:

```
~~~~~~              ~~~~ ~~ ~~~~~         ~~~~ LGX: Yggdrasil's Plug-and-Play
   ~~              ~~    ~~~   ~~            ~  Linux GNU and X-Windows
   ~~              ~~     ~~   ~~            ~  Operating System
   ~~             ~~~           ~~    ~
   ~~             ~~~            ~~   ~  Fall 1994
   ~~            ~~~             ~~ ~
   ~~            ~~~               ~~  Yggdrasil Computing, Incorporated
   ~~            ~~~    ~~~~       ~~  San Jose, CA USA
   ~~            ~~~    ~~~     ~ ~~
   ~~            ~~~    ~~~    ~   ~~  General Linux Consulting:
   ~~            ~~~    ~~~   ~     ~~  1-900-446-6075 ext. 835 ("TEK")
   ~~        ~   ~~~    ~~   ~      ~~  $2.95/minute, USA only
   ~~        ~    ~~~   ~~   ~      ~~  11am-noon,1pm-5pm Pacific
~~~~~~~~~~~~~~    ~~~~~~  ~~~~      ~~~~~
The following user names have been installed:

      demo    runs a demonstration under X windows

   install   runs a script to install the system on your hard disk

     guest   is an unprivileged user account for exploring the system

      root   is the superuser account for system administration.

linux login:
```

At this point, you may want to try out the different user names that have been set up on the system. The demo account is particularly interesting, since it gives a feel for many of the capabilities of the system. However, this manual will proceed to discuss the `install` account, because it is the only account that you need to use to install Plug-and-Play Linux.

2.4 Running the installation script

One of the user names that comes preconfigured on the CDROM is `install`. When you want to install the system on your hard disk, log in with this user name. After logging in as `install`, the next screen that you see should be the following:

```
This script installs a ten megabyte Plug-and-Play Linux configuration
on your hard disk, installing everything execept "/usr".  This
involves partitioning your hard disk, and designating a partition for
the root filesystem, and optionally, partitions for swap and /home
(personal directories).

Be sure to allocate space for any optional software components that
you may want to install later.  See the manual for the sizes and
descriptions of optional software components.

If you create a /home partition it will be easier for you to install
subsequent CDROM distributions, since you will be able to erase your
old root partition without effecting your /home partition.  Remember
to leave some free space for /tmp and, if you are not creating
separate /home partition, to leave space for you home directory.
Also, your swap partition cannot be larger than 128 megabytes.

You must specify the hard drive to partition.  For standard hard disk,
drive 1 is /dev/hda and drive 2 is /dev/hdb.  SCSI disk drives
follow a similar naming scheme: /dev/sda is drive 1, /dev/sdb is
drive 2, and so on.  When you are done partitioning, type 'done' at
the prompt.  To abort the installation now, type 'abort'.

Drive to partition (/dev/hda|/dev/hdb|/dev/sda|/dev/sdb|done|abort):
```

At this point you may want to pause to consider what type of installation you want. You don't have to decide now, but deciding what kind of an installation you want to do will help you decide how much space you want to allocate when you partition your hard disk.

If you select one of the smaller basic configurations, you can do fine tuning of you configuration later by installing specific packages. For a list of optional software packages, their sizes, and ways to install them from X windows or from the command line, see section 2.14 ("Optional Software Packages").

2.5 Partitioning Your Hard Disk

Under the hard disk format used by Linux, DOS and all other PC operating systems that are compatible at this level, a hard disk can be partitioned into as many as four separate contiguous ranges of disk space, called *primary partitions*. If you need more partitions, there is a format that defines an *extended partition* which is a primary partition that can be divided into subpartitions called *logical drives*. Logical drives and extended partitions are treated as individual block devices under Linux, although it is possible to address the disk as a whole. For example, the first IDE hard disk is **/dev/hda**, and its primary partitions are **/dev/hda1** through **/dev/hda4**. Logical drives start at **/dev/hda5**.

To install Plug-and-Play Linux on your hard disk, you need to have an
unused area of your hard disk on which you can create a new partition. It
is not enough simply to have space in a DOS partition which you are not
using. There is an untest program on the CDROM named '/fips11.zip'
that purports to be able to shrink a DOS "FAT" file system partition non-
destructively. Use this program at your own risk. You are strongly advised
to back up your DOS partition before running fips. For more information
on fips read the documentation included in the zip file.

Hard disks under Linux are traditionally named with an alphabetic char-
acter rather than with a number. For example, the first IDE hard disk is
/dev/hda, the second IDE hard disk is /dev/hdb. Similarly, the first SCSI
hard disk is /dev/sda, the second SCSI hard disk is /dev/sdb, and so on.

For the most part, you will be using partitions within your disk drives
rather than entire drives. The next step in the installation procedure is
to create those partitions within your hard disk. You should create one
partition which is big enough to hold the configuration that you select. You
may also want to create a separate partition to hold your personal files.
That way, when you update your system to the next release, you can quickly
replace the root partition in its entirety without losing any of your personal
files.

We reccomend at least 40 MB in the root partition for a minimal system
which is not dependent on the CDROM, 100 MB for a fucntional installation
which includes X and many usefull packages, 300 MB to install all major
system components and 1000 MB to install everything including source code.

In addition, you may want to allocate a swap partition if you want to
run programs that use a lot of memory on machines that do not have much
RAM. If your system has 4 MB of RAM or less, then **you must allocate a
swap partition in order for the installation process to have enough memory
to make your filesystems**.

The prompt is asking you for the name of a disk drive. When you select a
disk drive, you will be put into the Linux cfdisk program for creating disk
partitions within that drive.

For example, you might select drive /dev/hda. Then, you would be
put into cfdisk, where you might allocate, say, 235 megabytes for primary
partition 1, which you might use as your root partition for the complete
installation configuration. After you had partitioned your hard disk, this
first partition would be /dev/hda1.

Note that this is the first point in the installation script when you actually
write to the hard disk. Actually, nothing is written until you exit from the
cfdisk program with the "W" command, so it is safe to go into the cfdisk
program just to try it out, as long as you make sure that you only look
and don't change anything. You can also run the cfdisk program from the

regular command line outside of the installation script if you're logged in as
root.

Sometimes when you change the disk geometry with `cfdisk`, it is neces-
sary to reboot so the kernel can safely adjust to the new disk partitioning.
Normally when you do the installation from CDROM, it will not be neces-
sary to reboot, but, if it is necessary to reboot, the installation script will
detect this, will tell you, and will automatically do the reboot for you if you
want. In any case, when you select a disk to partition, you will be put into
the `cfdisk` program, which will look something like the following.

```
                          cfdisk 0.8 BETA

                      Disk Drive: /dev/sda
              Heads: 64   Sectors per Track: 32   Cylinders: 1717

   Name         Flags        Part Type    FS Type              Size (MB)
 ---------------------------------------------------------------------------
   /dev/sda1    NC           Primary      Linux                   375.00
   /dev/sda2                 Primary      Linux                  1025.00
   /dev/sda3                 Primary      Linux                   270.00
   /dev/sda4                 Primary      Linux                    47.00







   Command [bdhmpqtuW?]:
   n - Create NEW partition.         d - DELETE partition.
   q -- QUIT without updating.       W -- WRITE partition table to disk.
   ? -- More extensive help.
```

If you did have to reboot after running `cfdisk`, you will have to log in as
`install` again and skip through the previous steps.

This phase of the installation process is where you designate which parti-
tions will be used for what. The first step is to select a swap partition if you
are going to use one. You select the swap partition first so that it can be
used if you need more virtual memory than your machine's physical memory
can hold when you make the filesystem:

```
Now it is time to designate which partitions will be used for which
purpose.  Here is a list of partitions that linux is aware of:

The number of cylinders for this disk is set to 1717.
This is larger than 1024, and may cause problems with some software.

Disk /dev/sda: 64 heads, 32 sectors, 1717 cylinders
Units = cylinders of 2048 * 512 bytes

   Device Boot   Begin    Start      End  Blocks   Id  System
/dev/sda1             1        1      375  383999+  83  Linux native
/dev/sda2           376      376     1400 1049600   83  Linux native
/dev/sda3          1401     1401     1670  276480   83  Linux native
/dev/sda4          1671     1671     1717   48128   83  Linux native

For a reminder of the partitions available, type 'list' at any of the
prompts.  If you don't wish to specify a partition, select 'none'.

Choose a swap partition (optional) [none]:
```

If you designate a swap partition, that partition must be between 40 kilobytes and 128 megabytes in size.

Again, if your system has 4MB of RAM or less, then **you must allocate a swap partition in order for the installation process to have enough memory to make your filesystems**.

For a single user system, we recommended that the swap partion be large enough to give a total virtual memory size (RAM+swap) of at least 16 MB, possibly up to 32 MB. Unlike many other operating systems, Linux does not require that you have as much swap space as RAM.

Now tell the system which partition you want to use for the root, and optionally, for /home.

```
For a reminder of the partitions available, type 'list' at any of the
prompts.  If you don't wish to specify a partition, select 'none'.

Choose a swap partition (optional) [none]:
Root partition [/dev/hda1]:
/home partition [none]:
```

Now the installation script actually installs the base ten megabyte system on your hard disk. Later, after you have done the installation and rebooted, you can use the `control-panel` command under X windows to install other software components.

```
Mounting root partition...

Installing files...
.Xdefaults
.bash_history
.bashrc
.calendar
.emacs
.xmfmrc
bin/
bin/basename
bin/bash
bin/cat
bin/chgrp
bin/chmod
...
```

This copying process can easily take long enough for the screen blanker to take effect. As the installation script says, to wake up the screen saver, hit a key on the keyboard that does not send a character (e.g.,ALT, SHIFT or CTRL). That way, you won't send characters that later parts of the installation script might misinterpret.

A double speed CDROM drive can theoretically transfer one megabyte every three seconds. A regular speed CDROM drive takes at least six seconds per megabyte. Filesytem performance will actually be substantially slower than the theoretical maximum speed of the CDROM drive. You may want to find something to do to pass the time, such as leafing through the rest of this manual. Indeed, if you know something about unix-like operating systems, there is a good chance that you got to this point in the installation script without reading this manual and that you are only now reading this paragraph because you've been browsing through this manual while wondering how long this part of the installation process will take.

Fortunately, the rest of the installation is quick. Eventually, the file copying will end and you should see something like the following.

2.6 Naming Your System

```
...
var/lib/X11/config/Xserver
var/lib/X11/config/Xconfig.middle
var/lib/X11/config/Xconfig
var/lib/config/Xconfig.8514
var/tmp/
vmlinux
Installation of files complete.

What would you like to name your system? [linux]:
```

If you are on the internet, you should provide your complete internet host
name to this prompt (e.g., linuxbox.mycompany.com).

2.7 Installing LILO

```
What would you like to name your system? [linux]: hal9000

Generating /etc/rc.local...

Generating /etc/fstab...
Configuring kernel...
Added linux

The kernel image lives in the file "/vmlinux" on your root partition.
If you ever change /vmlinux, you "lilo" before rebooting or halting your
system.   OTHERWISE, YOUR SYSTEM MAY NOT BE ABLE TO REBOOT FROM DISK.

The lilo boot loader can take over the master boot record of your
hard disk.  This means that lilo will be the first thing that comes
up when you boot your hard disk.  If you don't type anything to the
"boot: " prompt within five seconds, it will boot linux.  Otherwise, you
can type the name of any primary partition on your first four seven
SCSI disks or first four IDE disks, and lilo will boot from that
partition (e.g., you could type "hda1" to boot DOS if your primary
DOS partition is on /dev/hda1).

Should the Linux boot loader take over the master boot record of your
bootable hard disk (y/n)? [y]:
```

In almost all cases, you should answer "y" to this question. When LILO
takes over your master boot record, it is configured to prompt you and allow
you to select another partition to boot. As a result, having LILO take
over your master boot record does not lock you out of your other operating
systems. You should answer "n" to this question if you would prefer to

use another operating system's boot loader (for example, the OS/2 boot manager) or if your root partition is not on one of the first two drives on your computer, because LILO needs to use your machine's BIOS ROM routines, which can only access the first two drives.

If you ever want to replace the LILO master boot record with the DOS master boot record, you can do so by using the DOS `fdisk` command with the undocumented `/MBR` option:

```
fdisk /mbr
```

If you answer "n" to the question about having LILO take over your master boot record and you've now changed your mind, do the following as root after you've installed your system and booted it:

1. Edit the '`/etc/liloo.conf`', and change the line of the form `boot=/dev/hdb1` to `boot=/dev/hda` if you have at least one IDE drive (in this example, '`/dev/hdb1`' is assumed to be your root partition). If all of your drives are SCSI, change the `boot=`... line to `boot=/dev/sda` instead of `boot=/dev/hda`. You are telling LILO to write to the master boot record of your first hard disk, not necessarily the disk on which you've installed Plug-and-Play Linux.

2. Run the '`lilo`' command.

2.8 Making A Boot Diskette

An alternative to booting from the hard disk is to create a bootable floppy. You should probably make such a floppy in any case, just to be safe. You can make such a boot floppy simply by copying the kernel ('`/vmlinux`') directly onto a blank floppy diskette (e.g., `dd if=/vmlinux of=/dev/fd0` or `cp /vmlinux /dev/fd0`). The kernel format is designed so that it also happens to be the image of a bootable floppy. Note that the kernel that is installed on your hard disk has a few bytes that changed from the kernel on the CDROM. These bytes which tell the kernel where the root partition is. If you want to create a boot floppy from the kernel on your hard disk and you can only boot from the CDROM for some reason, here is how to do it (*root* is your root partition on the hard disk, e.g., `/dev/hdb2`):

```
mount root /mnt
dd if=/mnt/vmlinux of=/dev/fd0
sync
umount /mnt
```

For your convenience, the installation script prompts you at this point to create a boot floppy. You probably want to keep such a floppy around in any case.

```
You should now have a useable filesystem on your disk.   In case
you ever run into problems booting from your hard disk, now would
be a good time to make a boot floppy that mounts your hard disk.
The installation script can make a boot floppy for you now if you
have a blank formatted diskette handy.

Make boot diskette now? y
669+1 records in
669+1 records out
Done.

To make a hard disk in the future (after you have booted from the CDROM
drive) type "dd if=/vmlinux of=/dev/fd0" to the root shell.


[ press return to continue ]
```

2.9 Booting Your New System

That about wraps it up. Now all you have to do is boot your new sys-
tem. Since you probably want to reboot immediately, the installation script
prompts you for this too. If you have not done so already, be sure to remove
the Plug-and-Play Linux boot floppy from your drive before you reboot.

```
That completes the installation.   Now would be a good time to
try booting your newly installed system.

If you want to try booting your system from the hard disk, shut down
the system (log in as root, issue the "halt" command, and wait for the
message that it is okay to turn the power off), remove the floppy disk
if there is one in the drive and reset the computer.

When you start X windows with the "xinit" command for the first time,
you will automatically be prompted for X configuration information.
Once you have started X windows, you can make some other system
configuration changes by running the "control-panel" program as
root.  (Do a "control-panel &" from a root shell in an xterm window.)

Reboot the system now (y/n)? [n]:
```

2.10 Creating an account for yourself

Once you have installed the system, you will probably want to create an
account for yourself. You can create a new account quite easily from the

graphical control panel; however, if you wish, you may create an account for yourself manually now.

First, log in as root and add a line for your login name in '`/etc/passwd`'. An '`/etc/passwd`' line consists of six colon-separated fields. The first field is the login name. The second field is the encrypted password. An empty encrypted password field means that a password is not needed in order to log into the account. When you create an account, you normally create it without a password and then add a password by logging into the account and using the "passwd" command. An asterisk ("*") means that no password is valid. The third field is the numeric user ID for the account, which should normally be a number unique to the account. User ID 0 is the superuser. The fourth field is the file group ID for your account. You can add more groups to the account by listing the account in the last field of the appropriate line in '`/etc/group`'. People who are authorized to do system administration are supposed to belong to group 0, so group 0 is a logical choice for your account's primary group. The fifth field is the personal name information associated with the account. The sixth field is your account's home directory. It is common to put one's home directory under /home. The seventh field is your shell.

Your '`/etc/passwd`' line should look something like this:

```
smith::600:0:John Smith:/home/smith:/bin/bash
```

To give John Smith a password type

```
passwd smith
```

After you have created your username by editing '`/etc/passwd`', create your home directory, copying the guest account's configuration files, and making yourself the owner of it:

```
cp -r ~guest ~smith
chown -R smith ~smith
```

2.11 The X Window System

2.11.1 The X Configuration Script

When you run `xinit` for the first time, you will be prompted for X configuration information. The information that you provide will normally be enough to enable the X server to start automatically.

Here is what you should see the first time you run `xinit`, or if you run `xinit` after having deleted the files in '`/var/lib/X11/config`'.

```
It appears that you have not yet configured X windows. This script
will configure X windows for the system. You can safely abort this
script at any time by hitting CONTROL-C.

        If you are using a Microsoft bus mouse, a Logitech bus mouse, an
ATI bus mouse or any other type of bus mouse, enter "busmouse" to the
following questions.  The keywords "logitech" "microsoft", "mmseries",
etc.  Refer to different types of SERIAL MICE.  If you answer
"busmouse", the question following this one will ask you which type of
bus mouse you have.

Mouse type
Choices: busmouse psmouse logitech microsoft mmseries mouseman mousesystems
Mouse type [microsoft] -->
```

Here is a more detailed description of what these keywords mean:

busmouse   Any bus mouse. Specify this keyword even if your bus mouse is
                made by Logitech or Microsoft.

psmouse   Any ps/2 compatible mouse.

logitech   Logitech *serial* mouse only. Do not use the keyword to refer to
                the Logitech "MouseMan" series of serial mouse. Instead specify
                mouseman. You can often tell what type of Logitech serial mouse
                you have by looking for markings on the bottom of the mouse.

microsoft
                Microsoft *serial* mouse.

mmseries   Perhaps this keyword is synonymous with mouseman?

mouseman   Logitech "MouseMan" serial mice.

mousesystems
                A serial mouse from MouseSystems.

The next step after selecting your mouse is to select the device through
which it is connected. You will now be prompted for the mouses device. If
you specified a serial mouse or a psmouse the display will look like:

```
Serial port for mouse
Choices: ttyS0 ttyS1 ttyS2 ttyS3 psmouse
Serial port for mouse [ttyS0] -->
```

Choose psaux if you have a psmouse. If you have a busmouse the device
name is most likely the type of mouse.

If you specified a serial mouse, you will also be prompted for the baud
rate of you mouse. Almost all serial mice run at 1200 baud.

```
Mouse baud rate
Choices: 1200 9600
Mouse baud rate  [1200] -->
```

Having taken care of the input side of the X server, the configuration script moves on to ask you about your display. If you have a VGA card and you think that you are using one of the X server's supported chipsets, then you might as well select AUTODETECT_SVGA and see if the server can correctly infer your video chipset. That way, you might not have to reconfigure X if you change video cards in the future.

```
Type of video card
Choices: AUTODETECT_SVGA ati clgd5420, clgd5422 clgd5424 clgd5426
clgd5428 clgd6205 clgd6215 clgd6225 clgd6235 clgd543x cpq_avga et3000
et4000 mach64 mach32 mach8 pvga hercules ibm8514 monochrome_vga ncr77c22
ncr77c22e oti067 oti077 pvga1 s3_generic s3_mmio_928 std_vga16
tvga8800cs tvga8900b tvga8900c tvga8900cl tvga9000 wd90c00 wd90c10
wd90c30 wd90c31
Type of video card [AUTODETECT] -->
```

Here is what the different keywords mean:

AUTODETECT_SVGA

You have one of the supported VGA chipsets, but you'll let the server attempt to sense which one. If your video chipset is not supported, then specifying AUTODETECT_SVGA won't help you. Instead, you'll have to use std_vga or monochrome_vga, which theoretically supports all VGA cards at 640x480. Also note that you cannot specify AUTODETECT_SVGA in place of hercules, S3, monochrome-vga, Mach8, Mach32, Mach64 or ibm8514, because these selections use different X servers.

ati   ATI VGA Wonder XL, ATI Ultra Pro, and possibly other ATI

clgd5420, clgd5422, clgd5424, clgd5426, clgd5428
clgd543x, clgd6205, clgd6215, clgd6225, clgd6235

Cirrus Logic VGA chips and graphics accelerators.

cpq_avga   Compaq AVGA

et3000
et4000   Tseng Labs ET3000, ET4000 and ET4000/W32 chips.

mach64   Cards based on the ATI Mach-64 accelerator chip.

mach32   Cards based on the ATI Mach-32 accelerator chip (for example, ATI Ultra Pro).

mach8   Cards based on the ATI Mach-8 accelerator chip.

gvga   Genoa VGA

hercules   720x350 monochrome Hercules card.

ibm8514   8514-compatible graphics accelerators. The X server does not
           currently take advantage of the graphics acceleration. If you
           have an ATI Mach-series card, try specifying AUTODETECT_SVGA
           to "ati" rather than 8514. The 8514 server only supports reso-
           lutions up to 1024x768, while you can go up to 1152x900 with
           the regular VGA server. Also, the 8514 server does not appear
           to be any faster than the regular VGA server.

monochrome_vga
           Theoretically, this server works with any VGA display, at least
           at 640x480. However, it is only monochrome.

ncr77c22
ncr77c22e
           NCR VGA chips

oti067

oti077   Oak Oti-67 and Oti-77 graphics chips. If you have an Oti-087,
           specify the Oti-77 and your system should work.

pvga1   Western Digital "Paradise" VGA card.

s3_generic
s3_mmio_928
           S3 Corporation (formerly Silicon Subsystems) graphics acceler-
           ators. Use s3_generic if you aren't sure which type of S3 chip
           you have.

std_vga16
           Any standard VGA display at 640x480 resolution in 16 colors.

tvga8800cs
tvga8900b
tvga8900c
tvga8900cl
tvga9000   Trident VGA chips.

wd90c00
wd90c10
wd90c30
wd90c31   Western Digital's 90c00, 90c10, and 90c30 graphics accelerators.

WARNING: All cards made by Diamond use a nonstandard mechanism
for selecting the video clock, which Diamond refuses to disclose without a
signed nondisclosure agreement. Consequently, if you have a Diamond card,
you may not be able to use it, even if it uses one of the supported chipsets.

'/usr/bin/freq' is a program that allegedly allows one to set the clocks on a Diamond card. Look in '/usr/src/unsupported/diamond' for more information on trying to make Diamond cards work with the X server. We recommend you avoid Diamond hardware due to its proprietary nature. We do not expect to ever support any Diamond Hardware.

The next question is intended for unusual cases where the X server incorrectly guesses the speeds of your VGA card's video clocks.

```
        The X server can usually guess the oscillator speeds of your
VGA card.  However, if the X server makes a mistake, you can force
the server to see a specific set of video clocks by entering the clocks
here.  Order is significant.  Use "0" for any oscillators that the X
server should not use.  If you don't know of problems with your X server
determining your video card's clock speeds, then just hit the RETURN
key here.

VGA clocks []:
```

Unless you know that the X server does not work without the VGA clocks being specified, hit RETURN here.

```
                              WARNING

Because the color X server uses 8 bit pixels, you must have 2
megabytes of video memory on your video card if you select a maximum
resolution of 1280x1024i or 1280x1024.  If you have only one megabyte
of video RAM, you will have to settle for 1152x900, assuming that
your card and monitor can go that fast.


What is the maximum resolution that you want to use for your video
card and monitor?  (The "i" suffix means "interlaced only.")

Maximum resolution
Choices: 640x480 800x600 1024x768i 1024x768 1152x900 1280x1024i 1280x1024
Maximum resolution [1024x768] -->
```

Currently, the X servers do not seem to support more than a megabyte of RAM, although the VGA X server has options for it which apparently do not work. For this reason, the X configuration script provides an 1152x900 resolution so that you take some advantage of video cards that go fast enough to do 1280x1024 non-interlaced, such as the ATI Ultra Pro.

```
microsoft "/dev/ttyS0"
BaudRate 1200
vga256
Modes "1024x768" "1024x768i" "800x600" "640x480"

NOTE TO CDROM USERS:
        If you are running X from an especially slow CDROM drive, the
X server may time out the first time that you run it.  If the X server
times out, try running it again, because, this time, most of the
blocks that need to be read from the CDROM will already be in RAM.
In any case, running X from the CDROM will be extremely slow initially,
but will accelerate over a few minutes as the code that you are using
migrates from the CDROM to RAM.


Hit RETURN to continue.
```

As it says, hit RETURN.

```
    ****************************************************************
    NOTE: To unconfigure X, delete the files in /var/lib/X11/config.
    ****************************************************************


        To switch between video modes use <Ctrl>-<Alt>-<Numeric +>
        To switch in the other direction use <Ctrl>-<Alt>-<Numeric ->
        To kill the server in use <Ctrl>-<Alt>-<Backspace>

Hit RETURN to start X server or CONTROL-C to abort -->
```

The information provided in the above screen is quite useful. You may need to cycle through video resolutions if your monitor has trouble with your maximum resolution. Also, CTRL ALT BACKSPACE is an extremely useful feature of the X server.

2.11.2 Unconfiguring X

At some point, you may want to make the X configuration script run again (e.g., you have switched video cards or there is something that you would like to configure differently). You can make the X configuration script run the next time you run xinit by deleting the configuration files that the configuration script creates in '/var/lib/X11/config':

                    rm -f /var/lib/X11/config/*

You have to be root for this command to work.

2.11.3 Advanced X Configuration: The Xconfig File

Skip this section if you are not a VGA wizard. For more information on this topic look in '`/usr/doc/howto/XFree86-HOWTO`'.

Although the basic X installation script should be sufficient to start the X server, you may want to understand the format of the file '`/var/lib/X11/config/Xconfig`' in order to use some of the more advanced features of the X server, such as having a large virtual screen, or being able to tell the X server the speed of your video card's oscillators, instead of having the X server attempt to measure them (since the X server sometimes gets them wrong).

When the X server comes up, it will attempt to measure the speed of the different oscillators on your VGA card. These measurements are fairly inaccurate and vary each time you run the X server. If you know the speeds of the different oscillator clocks on your VGA card, you can list them by adding a "Clocks" line to the file '`/var/lib/X11/config/Xconfig`'. Bear in mind that order is significant and you should include a zero for any oscillator that you don't want the X server to use. If you do decide to add a "clocks" line to your Xconfig file, chances are that you will make a mistake at some point and end up in a situation where the X server is running but you cannot see the display. If you ever find yourself stuck in the X server, typing `Ctrl-Alt-Backspace` will cause the server to exit gracefully.

The configuration of the X server is controlled by '`/usr/lib/X11/Xconfig`', which is a symbolic link to '`/var/lib/X11/config/Xconfig`'. By editing '`/var/lib/X11/config/Xconfig`', you can configure the server to use your mouse and, generally, to drive your VGA card at whatever resolution and speed you want.

The Xconfig file follows a standard unix convention that a pound sign indicates that the rest of the line is a comment. With that understanding, it should become clear by inspection how to change options like the mouse configuration or the font path.

Configuring the video is a bit more arcane. You'll need to consult your video card manual and possibly your monitor manual. (Yes, the video configuration scheme ought to be changed.)

Start by uncommenting the right "Chipset" line in your Xconfig file, depending on what chipset your VGA card uses.

The "Modes" line in the Xconfig file controls which resolutions the X server will try to support. When the X server is running, you can cycle forward through the different modes with `Ctrl-Alt-Numeric +` or backwards with `Ctrl-Alt-Numeric −`.

This is where you have to consult your video card manual. In order to support a particular resolution, the X server will look for video timing information corresponding to a particular resolution and a particular video

oscillator frequency. The "Clocks" line in the Xconfig file lists, in order, the speeds of each oscillator on the VGA card. Use a 0 for any oscillator that you don't want the X server to use. If there is not a "Clocks" line in the Xconfig file, then the X server will attempt to figure out the speeds of each oscillator. Unfortunately, the X server usually gets this wrong, especially at high oscillator speeds. Nevertheless, the X server often comes close and the X server prints the clock speeds when it initializes, so its worth running the X server like this and immediately exitting with `Ctrl-Alt-Backspace` to see what the server thought the oscillator speeds were.

If there is already a listed combination oscillator speeds and video timing for the particular resolutions that you want to run, then you're done.

Otherwise, you'll have to create your own line of video timing information. After each resolution is a list of video timing values. Then there are four increasing numbers that control the horizontal timing information, each of which must be a multiple of eight. The first number is the horizontal resolution. It represents the count of oscillator cycles from the beginning of the time the beam activates to the time the beam goes off.

The second number is the number of cycles from the time the beam activates to the beginning of the horizontal sync pulse. The third number is the number of cycles from the time the beam activates to the end of the horizontal sync pulse. The fourth number is the number of cycles from the time the beam activates to the time the beam activates for the next line.

The next four numbers are the vertical timing information. Instead of being measured in vertical oscillator periods, they are measured in units of the amount of time that it takes to display one horizontal line of video (beam active to beam active). The first number is equal to the vertical resolution; the second number indicates when to turn the vertical sync pulse on; the third number indicates when to turn it off; and the fourth number indicates when to start displaying the next frame.

Armed with this information and your monitor manual, you should be able to not only get the X server working at a standard resolution, but you should be able to adjust the timing information to get a faster refresh rate or to create a custom video resolution.

2.12 The Control Panel

To complete your system installation, you may want to configure other aspects of your system, such as your printer and your ethernet. With other systems, this process would entail editing a number of configuration files and learning about a number of networking configuration commands. With Plug-and-Play Linux, this process has been made somewhat easier by the `control-panel` command.

You must be logged in as root and running X windows in order to use the control panel. The control panel is particularly useful for printer configuration because, if you have a non-postscript printer that the GhostScript postscript emulator supports, the printer control panel will automatically arrange to pipe any postscript files that you print with the `lpr` command through GhostScript, so that it will appear that you have a postscript printer. You must have the `ghostscript` component installed for PostScript rendering if your printer does not have PostScript built in. Also, if you have the TEX optional software component installed, `lpr -d` will print `.DVI` files by converting them to PostScript and then printing them just the same way it would print a normal PostScript file.

2.13 Optional Software Packages

2.13.1 How To Install

You can install optional software packages in one of two ways.

1. Invoke the `control-panel` command as root, and press the `Optional software packages` button to bring up a graphical control panel for installing additional software components.

2. Use the `install_component` command as root. You do not have to be running X windows to use this command. You must have the Plug-and-Play Linux CD mounted on '`/system_cd`' to use this command. Here is an example of how one would install the GNU C compiler (`gcc`) using a Panasonic/Matsushita/Lasermate ("SoundBlaser Pro") CDROM drive.

```
mount /dev/matsushita_cd /system_cd
install_component gcc
umount /system_cd
```

The above example assumes that the Linux CD is not automatically mounted when you boot your computer. If it is do not type the lines that begin with `mount` or `umount`.

Type `install_component` without any arguments for brief usage message.

2.13.2 What To Install

Here is a list of the packages that comprise this version of Plug-and-Play Linux and their sizes.

andrew (29 megabytes)

> The Andrew System, including the ez editor for easy creation and reading of documents with imbedded images, equations, spreadsheets, hypertext links, and many other media types.

comm (3 megabytes)

> uucp, news, inn, trn 3.2

devtools (4.5 megabytes)

> gdb: the GNU Debugger, DLL tools: dynamically loadable library tools for Linux, (b)yacc: parser generater, flex: lexical analyzer generator, gct: the GNU coverage tool, rcs: revision control system, cvs: concurrent version system, gnats: bug tracking software with a graphical user interface (tkgants), DejaGnu: regression testing software from Cygnus Support.

emacs (15.7 megabytes)

> Emacs from the Free Software Foundation with support for multiple windows and scrollbars under the X window system. Also runs without the window system.

games (4.22 megabytes)

> asteroids, blockade, xtetris, xtank...

gcc (20.5 megabytes)

> Version 2.4.5 of the GNU ANSI C and C++ compiler and binutils 1.9l

ghostscript (4.7 megabytes)

> Ghostscript 2.6.1 patch level 4: A free PostScript clone written by Peter Deutsch of Aladdin Enterprises.

interviews (28.423 megabytes)

> The InterViews 3.1 C++ toolkit for the X window system. InterViews will probably be replaced in this distribution by the forthcoming C++ toolkit from the X Consortium when X11R6 is released.

isdn (0.16 megabytes)

> This is an experimental ISDN driver, but it requires some proprietary firmware and presumably a particular ISDN card in order to work. It is included in Plug-and-Play Linux only as a snapshot of an interesting thing that somebody is doing with Linux.

kernsrc (7.1 megabytes)

> /usr/src/linux: The source tree for the Linux kernel.

lemacs (24.057 megabytes)
> Lucid GNU Emacs 19.6 from Lucid. A version of GNU Emacs enhanced with a nicer user interface. Only runs under the X window system.

mailers (1.5 megabytes)
> Fancy character-based mailers: Elm and Pine. Pine includes the pico editor.

mansrc (7.5 megabytes)
> /usr/man/man*: groff sources for the manual pages.

misc-doc (17 megabytes)
> More on-line documentation

motif (15 megabytes)
> Motif 1.2.3 from the Open Software Foundation. Motif is proprietary software and costs $149.95 per CPU. When you attempt to install Motif, you will be prompted for a license key. At that time, call Yggdrasil at 408-261-6630 with your American Express, Optima Card, VISA or Mastercard and we will issue you a license key.

mule (11.3 megabytes)
> MUltiLingual gnu Emacs. Emacs with Asian Language support. You'll have to do your own font configuration with this release.

networking (1.6 megabytes)
> TCP/IP Internet utilities: ftp, rsh, rlogin, etc.

pbm (3 megabytes)
> PBM (10 Dec. 1991 release): A collection of filter programs for manipulating and converting between still graphical images. Supports GIF, TIFF, JPEG, xwd, group 3 fax and other formats.

postgres (4.1 megabytes)
> Postgres 4.1: A remote database system developed by Michael Stonebraker's research group at the University of California, Berkeley.

sources (470 megabytes)
> Sources for the entire system (/usr/src), except for the kernel and X11 sources: 282 megabytes.

tex (8 megabytes)
> The TeX typesetting system and X preview, written by Professor Donald Knuth of Stanford University.

usrbin (118 megabytes)

> Over 350 programs, including f2c fortran-to-C convert, p2c pascal-to-C convert, prolog, term program for proxy IP over a serial line, texi2roff, diff, sound support, and GNU-troff.

x11src (180 megabytes)

> Source code for the X window system, 136 megabytes.

xf (4.4 megabytes)

> XF-2.3 user interface builder for the Tk toolkit and Tcl programming language.

xprogs (37.5 megabytes)

> xbiff, xcalc, ico, xwd...

xview (9.6 megabytes)

> The Xview 3.0 OpenLook C toolkit for the X window system from Sun Microsystems, plus the Slingshot 2.0 extensions and the UIT user interface toolkit. Sun has recently agreed to switch from the OpenLook user interface style to a Motif-like user interface, so this toolkit may disappear in the future.

Whatever software you do not install is still accessible through symbolic links that point to appropriate locations under the directory `/system_cd`. All you have to do is mount the Plug-and-Play Linux CDROM under `/system_cd`. By default, `/system_cd` is not mounted automatically unless you asked the install script to mount if for you. You can change what filesystems are mounted at boot time by adding or deleting an entry in '`/etc/fstab`' after you've completed the installation. (Do a `man fstab` after installation for information on the format of `/etc/fstab`.)

2.14 Remounting the CDROM

At some point in the future, you may want to remount the CDROM in order to install additional software packages, to browse other files that you do not want to keep on your hard disk, or to recover from some an accident with `rm`. The `mount` command can be used to mount the CDROM and the `umount` command can be used to unmount the CDROM when you are done. You must be the superuser (for example, logged in as root) to use these commands. You can learn how to use `mount` and `umount` with the `man mount` and `man umount` commands, but the syntax for `mount` and `umount` is fairly simple:

> `mount` *device mount-point*
>
> ...
>
> `umount` *device*

The *mount point* is a directory that you specify where the CDROM will appear when in it is mounted. The mount point must exist before you use the `mount` command. The *device* is the device that you are mounting. Here are the possible choices for CDROM's:

'`/dev/cdrom`'
'`/dev/cdrom0`'
'`/dev/cdrom1`'
'`/dev/cdrom2`'
'`/dev/cdrom3`'
'`/dev/cdrom4`'
'`/dev/cdrom5`'
'`/dev/cdrom6`'
'`/dev/cdrom7`'

> SCSI CDROM drives. '`/dev/cdrom`' is the first SCSI CDROM drive; which is also '`/dev/cdrom0`'. '`/dev/cdrom1`' through '`/dev/cdrom7`' refer to subsequent CDROM drives or subsequent CDROM platters on a multi-platter CDROM drive.

'`/dev/dos_cd0`'
'`/dev/dos_cd1`'

> The CDROM drive accessed through MSCDEX. To use this device, you have to have the MSCDEX drivers for your CDROM installed under DOS and then you have to boot Linux from DOS.

'`/dev/idecd`'

> IDE CDROM. Currently, the IDE CDROM drive must be configured as a slave drive (in other words, as the second device on the IDE bus).

'`/dev/mitsumi_cd`'

> A Mitsumi CDROM drive. Your Mitsumi CDROM drive should be located at port 0x300 and should use IRQ 11, although the driver seems to work even if the IRQ doesn't match.

'`/dev/sbpro_cd`'
'`/dev/sbpro_cd1`'
'`/dev/sbpro_cd2`'
'`/dev/sbpro_cd3`'

> A CDROM drive that has the type of interface used by the SoundBaster Pro and SoundBlaster 16 ASP sound cards, although this device also supports drives attached through the standard controller card that you often get when you buy these drives separately, such as the Toptek "universal CDROM controller." Drives with this interface are sold under at least the Kotobuki, LaserMate, Matsushita, and Panasonics labels. The new double speed Panasonic CR-562 is also supported by this driver.

'`/dev/sonycd_31a`'
> The Sony CDU-31A CDROM drive, used either with its standard controller or with the sound card in the MediaVision Fusion-16 kit.

'`/dev/sonycd_535`'
> The Sony 531 and 535 CDROM drives.

3 Online Documentation

Your principal source for information on the thousand-plus programs that comprise Plug-and-Play Linux is the online documentation. The online documentation can be divided into four categories:

1. "manual pages" provided with each program, which are accessible through the `man` command.

2. manuals and other large documents in '`/usr/doc`' and '`/usr/info`', which can be printed with `lpr` or searched with `grep`. Files in '`/usr/info`' can also be viewed with the `info` command.

3. documentation built into programs

4. source code You can find the source code for a particular program by using the `whence` command.

3.1 Manual Pages

Many programs in Plug-and-Play Linux include a page or two of online documentation which is accessible by the `man` command. Type `man` followed by the name of the system facility that you are interested in to learn about that facility. For example, type `man man` to learn about the `man` command. If `man` does not have anything under the keyword that you give it, use the `apropos` command to see if the keyword appears in the synopses that describe other commands.

3.2 Larger Online Documentation

The directories '`/usr/info`' and '`/usr/doc`' contain more substantial documentation. In addition, the source tree for some programs also have supplemental documentation and '`README`' files.

Of particular interest, '`/usr/doc/FAQS`' and '`/usr/doc/howtos`' contain files with answers to lists of *Frequently Asked Questions*. The files contain the collective wisdom of many Linux users who have probably asked the very questions that you may be asking yourself about any particular system facility. These files deal not only with questions related to common problems, but also often explain more general issues about why certain facilities are set up the way they are or what the current state of the art is for certain Linux facilities. If you have a question about a system facility, a way to start investigating it is to '`cd`' into '`/usr/doc/howtos`' and use `grep` to search these files for keywords that might be relevant to your questions. (Do a `man grep` to learn more about grep.)

If you want a more structured introduction to the various system facilities, you may want to look at the "guide" subdirectories of '`/usr/doc`'. These

subdirectories contain guides that are designed to provide a step-by-step introduction to different aspects of using the system. You may notice that these subdirectories have files that have copies of the guides in a number of different formats. You can figure out what format these files are in from each file's extensions:

'`.dvi`'   You can view the file under X with `xdvi` or convert it to PostScript for printing with `dvips`.

'`.gz`'

'`.z`'

'`.Z`'   Compressed. Use `zcat` to type the uncompressed file, or use `uncompress` to uncompress the file on disk (this will not work if the directory that you are in is on the CDROM). The '`.Z`' extension is an older compression format, but these programs understand both formats. The standard extension name for the new format was recently changed from '`.z`' to '`.gz`', which is why you will see both extensions used.

'`.ps`'   Postscript. You can view this file under X windows with `ghostsview`, or print it if you have configured your printer, and your printer either has PostScript built in or is one that GhostScript knows how to drive.

'`.tar`'   a `tar` archive which may contain several files. Only the source directories used to make the documentation are stored as tar files, so if you're doing something that requires you to look at these files, you should already know all about the `tar` command. However, the `tar` command is quite useful, since almost all software distributed on the net is distributed in tar archives. Do a `man tar` to learn more about tar.

'`.tgz`'   This is short for .tar.gz. It indicates a tar archive that has also been compressed.

'`.txt`'   Text.

One last item of note in '`/usr/doc`' is the BBS list. You may want to look through the BBS list to fine computer bulletin boards where you can communicate with other Linux users.

3.3 Documentation Built Into Programs

Many of the programs in Plug-and-Play Linux have some documentation built into them. For example, `bash`, the default shell, has a `help` command. For interactive programs, try commands like '?', 'h', 'help', 'doc'. In EMACS, you can get help with the `CTRL-h` key, although this will probably

be rebound to `META H` in the next release of Plug-and-Play Linux so that
`BACKSPACE` will work properly across serial connections. In unix-like oper-
ating systems, there is a convention that when programs are invoked with
arguments that they do not understand, they print a "usage:" line before
exiting, which gives a synopsis of how to use the program. Some programs
also recognize a "-help" or "help" argument as a standard way of evoking
this response. Here is an example of invoking help.

```
linux# man --help
usage: man [-adfhkwlV] [section] [-M path] [-P pager] [-S list]
           [-m system] [-p string] [-t [-T device]] name/file ...
-a --all                    find all matching entries.
-d --debug                  produce debugging info.
-f --whatis                 same as whatis(1).
-k --apropos                same as apropos(1).
-w --where --location       print location of man page(s) only.
-l --local-file             use manpage argument as local filename.
-t --troff                  use troff to format pages to stdout.
-T --troff-device device    use troff with selected device.
-M --manpath path           set search path for manual pages to 'path'.
-P --pager pager            use program 'pager' to display pages.
-S --sections list          use colon separated section list.
-m --systems system         search for man pages on alternate system(s).
-p --preprocessor string    string tells which preprocessors to run.
                              e - [n]eqn(1)    p - pic(1)    t - tbl(1)
                              g - grap(1)      r - refer(1)  v - vgrind(1)
-V --version                show version.
-h --help                   show this usage message.
```

3.4 Source Code

Often if you look at the source code to a program, you will be able to
discern more subtle aspects of a program's behavior. You may also find
useful comments and or other additional documentation in the source tree.
You may want to try the `whence` command, which looks through the file
'`/usr/src/install.log`' to attempt to figure out how a particular file was
installed. Here is an example of how to use `whence` to figure out where the
source code for the `ls` command is:

```
% whence ls
/bin/ls: linux dynamically linked not stripped
install /usr/src/utilities/fileutils-3.9/src/ls /bin/ls
```

Not all programs can be traced with the whence command, so you may have to search through the '`/usr/src`' tree for some things manually. Also, be sure that the file that you are trying to track down with `whence` is not a shell script, which is source code to begin with.

Once you have determined where your program came from, you may want to find its component name in '`/usr/src/components`'. In the future, we may implement a bug tracking system that categorizes bugs according to the component names listed in this file. We already have the following mail aliases for each component, although most of these aliases are currently empty.

> *component*-bugs@yggdrasil.com
>
> *component*-questions@yggdrasil.com
>
> *component*-answers@yggdrasil.com
>
> *component*-developers@yggdrasil.com

If you need instructions on joining any of these mailing lists or if you want to redirect one of the mailing lists to a mailing list that you run, send mail to majordomo@yggdrasil.com for instructions on how to do this.

Here is a list of the components currently defined in '`/usr/src/components`'.

> acct adagio admutil ae agrep aha152x aha1542 aha1740 andrew appres archie at at1700 atixl_busmouse atp autoconf auto_box bash bbgopher bc beach_ball Berk bind binfmt_coff binfmt_elf binutils bison bitmap blk_dev_hd blk_dev_sd blk_dev_sonycd535 blk_dev_sr blk_dev_xd bootpd busmouse bwnfsd byacc capture cbzone cdu31a checker chr_dev_sg chr_dev_st CLX console cpio cron cvs dc de600 dejagnu diamond diffutils dll dosemu dosfsck dos_utils e2fsprogs editres el1 el2 el3 elm elvis emacs ext2_fs ext_fs f2c fdformat fdisk fdomain file fileutils find finger fingerd flex floppy fromto ftape ftp ftpd gas gawk gcc gct gdb gdbm genhd getty_ps ghostscript gic glib gmp gn gnat gnats gnuchess gnugo gnuplot gnushogi gpc grep groff gzip g_NCR5380 hd hfs host hpfs_fs hplan ical ico ifs in2000 inet inetd InetEmul inn iso9660_fs ispell kbd keyboard lance ld.so lemacs less lha libc libg++ lilo linux listres ll_rw_blk lmscd lp lpd m4 mailx majordomo make man math_emulation max_16m maze mem metamail mgetty midifiles minicom minix_fs mitsumi_cd mkdosfs mkisofs mm modgetty more msdos_fs mslaved ms_busmouse mule ncompress ncurses ne2000 net nfsd nfs_fs nls nntpd oclock oldX oleo p2c pas16 patch pbmplus pcnfsd pcsndriv pcspeaker perl pine ping plip poeigl popd postgres printer procps proc_fs profile psmouse pty puzzle pwdutils quota ramdisk rcp rcs realpath real_lp_filter reve rlogin rlogind routed rpc rsh rshd ruptime rwho rwhod sbpcd scsi scsi_7000fasst scsi_aha152x scsi_aha1542

scsi_aha1740 scsi_constants scsi_future_domain scsi_generic_ncr5380
scsi_in2000 scsi_pas16 scsi_seagate scsi_t128 scsi_ultrastor sdbm
seagate sed selection serial server setfdprm shellutils slip smail
smalltalk sonycd535 sound sox spider syslogd sysvipc sysv_fs t128
talk talkd tape_qic02 tar tcpd tcsh telnet term TeX texi2roff texinfo
textutils tftp tftpd time tk tkgnats tpqic02 tput twm ultra ultrastor
update util uucp uuencode viewres vt wabi wavplay wd7000 wd80x3
wdiff X x11perf xaster Xau xauth Xaw xbiff xboard xcalc xclip-
board xclock xcmsdb xcmstest xconsole xd xditview xdm Xdmcp
xdos xdpyinfo xedit xev xeyes xfd xfontsel xgas xgc xhost xia_fs
xinit xkill xlander xload xlogo xlsatoms xlsclients xlsfonts xmag
xman xmh xmille xmodmap Xmu xpipeman xpm xpool xpr xprop
xrdb xrefresh xrisk XSBprolog xset xsetroot xshogi xstdcmap Xt
xtank xterm xtetris xvier xwd xwininfo xwud zlibc zmodem

   With these techniques for accessing online documentation, you should be
able to navigate the plethora of programs which are Plug-and-Play Linux.
With over a thousand programs on the CDROM, there is a lot to explore.
You might want to do an `ls` on 'bin', '/usr/bin' and other directories in
your PATH (viewable with the `echo $PATH` command), to get an idea of
what is out there. The following chapter will suggest a few features that you
won't want to miss.

4 Some Interesting Features

This chapter exists to point out a few of the more interesting features of
Plug-and-Play Linux. This chapter is not essential reading. You can read
this chapter at your leisure.

4.1 Preconfigured Electronic Mail

If your machine does not have an ethernet interface and you attempt to
send electronic mail to an internet address (for example, `adam@netcom.com`),
your Plug-and-Play Linux distribution is preconfigured to transfer the mail
by UUCP to the Yggdrasil bulletin board for delivery to the internet. Of
course, people cannot send you mail back, but it is a convenient way to send
mail to the internet. By default, your machine's UUCP queue is processed
every fifteen minutes.

4.2 Multimedia Electronic Mail

Try logging into the `guest` account and starting X-windows with
the `xinit` command. Once you have X-windows running, try running
`/usr/packages/andrew/bin/readmessages` to read multimedia electronic
mail. The guest account and every new account that is created with the
graphical control panel has an Andrew email message in its mail box that
talks about how to use the Andrew system. The message contains some
text, some hypertext links and a picture of Saturn. This facility is not just
a spiffy looking demo. It is multimedia email software that you can use on
a day-to-day basis.

4.3 Transparent Decompression

If you compress a file with `gzip`, it creates a smaller file with a '`.gz`'
extension. There is a facility in Plug-and-Play Linux to make the '`.gz`'
files look like they are not compressed. When you read them, the `gunzip`
decompressor is automatically invoked. The '`/usr/src`' source tree on the
CDROM uses this facility. To turn on transparent decompression type:

```
export LD_LIBRARY_PATH=/lib/compressed
```

To turn off transparent decompression type:

```
unset LD_LIBRARY_PATH
```

4.4 Sound

By default, the kernel is configured to look for a Soundblaster-compatible sound card on IRQ 7, and a Media Vision Pro Audio Spectrum 16 card on IRQ 10. As always, you have a choice between configuring your cards to match the expectations of the kernel and rebuilding the kernel to match your cards. If you want to rebuild the kernel, note that the IRQ numbers for the sound cards are controlled by the top level Makefile (look for the string "SBC_IRQ").

You may also want to rebuild the kernel if you have a Gravis Ultrasound card or an MPU-401. The kernel source has drivers for these sound cards, but they are not configured into the standard kernel because they cause systems with certain hardware configurations to hang during the boot process. See the section "Rebuilding the Kernel" for more information on how to reconfigure and rebuild your kernel.

You can use the `splay` program to play ".snd" sound files. By default, splay plays 8-bit monophonic sound, but it has options to play stereo ("-S") and to play other 12-bit or 16-bit sound samples ("-b"). Type `splay -help` for a synopsis.

You can also synthesize instrumental music with `fmplay`. Before using `fmplay`, you must load instruments onto your sound board with the `sbiset` command. The file '`/usr/packages/sound/fm/setall`' will install 128 instruments on your sound board. You may want to run '`/usr/packages/sound/fm/setall`' and then use fmplay on the sample MIDI files in '`/usr/packages/sound/fm/midifile`'.

There is also a `midplay` program which is like `fmplay`, except that it plays MIDI files directly over the MIDI interface on your sound card.

4.5 Image viewer

Plug-and-Play includes the ImageMagic tools for manipulating images. Of particular interest is the `display` program, which can display a variety of image formats under X windows, including JPEG, GIF and many others. We include ImageMagic instead of xv because the ImageMagic software is more powerful, has better dithering algorithms and is free, while xv is shareware.

4.6 The MPEG video player

The MPEG video player is '`/usr/bin/X11/mpeg_play`'. Type `mpeg_play -help` for more information on mpeg_play and look in '`~demo`' for two sample MPEG files, birdisba.mpg and hulahoop.mpg.

4.7 Ghostscript: the GNU postscript emulator

Ghostscript is a postscript emulator that can draw to an X window, a number of printers, or to data files in a number of formats, including fax file formats. You can get a brief synopsis of how to use ghostscript and what devices are supported with the command `gs -help`. There is documentation on ghostscript in /usr/lib/ghostscript/doc.

If you want to look at postscript in an X window, check out `ghostview`, which is a program that uses ghostscript to allow you to browse a postscript file in an X window.

4.8 Tcl, Tk, Wish, and Expect

Tcl is a scripting language ("tool command language") written by Professor John Ousterhout at UC Berkeley. Tcl is accessible as a library /usr/lib/libtcl.a, which other programs can use. The Tcl README file suggests some sources of information on Tcl:

> For an introduction to the facilities provided by Tcl, your best bet is to retrieve the partial draft of the Tcl/Tk book, which is available for FTP from the standard Tcl/Tk release directories. Another possibility is to see the paper "Tcl: An Embeddable Command Language", in the Proceedings of the 1990 Summer USENIX Conference. A copy of that paper is also available in Postscript form in the distribution directory. However, the paper corresponds to a much earlier version of Tcl (approximately version 3.0), so some details of the paper may not be correct anymore and there are many new features not described in the paper.

Tk is a toolkit that allows one to quickly write X-windows programs in Tcl. Wish is an interpreter for Tk. Using wish seems to be the typical way that people learn to use Tk and Tcl. You can invoke `wish` as a command and play with it.

You can read about Tk and wish in Professor John Ousterhout's paper, "An X11 Toolkit Based on the Tcl Language" in the Winter 1991 USENIX conference proceedings. The source code for the hypertext, barchart and graph extensions to Tk is in /usr/src/usr.bin/graph-1.0.

Getting away from X, expect is a system written in Tcl by Don Libes that "performs programmed dialogue with other interactive programs." Expect scripts in /usr/bin include archie, weather, rftp, and kibitz. The expect README file suggests some sources of information on expect:

> The implementation, philosophy, and design of expect are discussed in "expect: Curing Those Uncontrollable Fits of Interaction", Proceedings of the Summer 1990 USENIX Conference, Anaheim, CA,

June 11-15, 1990. Examples and discussion, specifically aimed at
system administrators, are in "Using expect to Automate System
Administration Tasks", Proceedings of the 1990 USENIX Large
Systems Administration Conference (LISA) IV, Colorado Springs,
CO, October 17-19, 1990. A comprehensive paper of example
scripts is "expect: Scripts for Controlling Interactive Programs",
Computing Systems, Vol. 4, No. 2, University of California Press
Journals, 1991. Regression and conformance testing is discussed
in "Regression Testing and Conformance Testing Interactive Pro-
grams", Proceedings of the Summer 1992 USENIX Conference, San
Antonio, TX, June 8-12, 1992. An explanation of some of the more
interesting source code to Expect itself is in Chapter 36 ("Expect")
of "Obfuscated C and Other Mysteries", John Wiley & Sons, 1993.
A paper on connecting multiple interactive programs together us-
ing Expect is "Kibitz - Connecting Multiple Interactive Programs
Together", Software - Practice & Experience, to appear.

4.9 The Andrew System

The Andrew System is a multimedia system, consisting of applications
and a toolkit. The most useful application is `ez`. `ez` is an editor for easy
creation and reading of documents with imbedded images, equations, spread-
sheets, hypertext links, and many other media types. When you're running
X windows, `ez /usr/packages/andrew/doc/AtkTour/Media` will invoke the
`ez` editor with a file that shows most of the built-in Andrew media types.
This file is part of a tour of the Andrew system, which you can access with
the command `ez /usr/packages/andrew/doc/AtkTour/Tour`. You can get
topic-specific help on andrew with the `/usr/packages/andrew/bin/help`
comand. Note that you have to type in the full path name, because the
command 'help' by itself will invoke the help function that is built into the
Bourne Again Shell. Finally, try `/usr/packages/andrew/bin/messages` to
send and receive multimedia mail. `messages` reads mail in a format that is
slightly different from the format used by most mailers. Use `eatmail` to con-
vert your spooled mail to Andrew format. Be warned that there is currently
no facility for converting your mail back.

If you are running either the `fvwm` or `twm` window managers in the default
configuration, then you can also invoke these commands from the menus
that are invoked when you click on the root window (the root window is the
background area of the screen, i.e., the area that is not covered by any other
window).

4.10 X Windows Games: Asteroids, Battlezone, Chess, Connect Four, Lunar Lander, Mille Bornes, Othello, Pool, Shogi, Solitaire, Xtank.

The easiest way to invoke one of the X windows games is to use the built in root menus mentioned in the last paragraph of the section "The Andrew System." If you want to know exactly what the file names of these programs are, do a `ls /usr/games/bin`.

4.11 TCP/IP, NFS, and your ethernet adapter

You can configure TCP/IP networking with the `control-panel` command when you're logged in as root under X windows. To unconfigure TCP/IP, delete the file /etc/rc.net and reboot. If you are on a network running TCP/IP, you should be able to mount and unmount NFS filesystems in the same way that you would on any other workstation:

```
mount -t nfs hostname:/remotefilesystem /local_mountpoint
```

```
umount /local_mountpoint
```

4.12 Other useful programs

There are many other useful programs that you might want to try. For example, the TEX typesetting system (the command name is `tex`) complete with xdvi for viewing the DVI format output in an X window and dvips for converting the DVI format output to PostScript.

For telecommunications, there is cu and, for uploading, z-modem. The zmodem commands are `rz` and `sz`). If you want to use upload with zmodem, you can do so by starting the sz command on the remote machine, suspending cu (with ~ Ctrl-Z) and then running rz with its standard input and output redirected to the modem, for example:

```
rz < /dev/ttyS1 > /dev/ttyS1
```

5 Joining the Internet

The internet connects local area networks all over the world so that any computer on the internet can talk to any other computer on the internet as easily as it could talk to a computer on the same ethernet cable.

If you have access to an ethernet that is already linked to the internet, you can configure your machine to be on the internet by using the "configure networking" button on the graphical control panel (use the `control-panel` command). If you do not already have access to an internet-connected network, you may want to consider subscribing to a commercial internet access provider.

5.1 Types Of Internet Connectivity

Currently, the NovaLink service is the only one that comes bundled with Plug-and-Play Linux. However, Plug-and-Play Linux supports a number of other ways of connecting to the internet. In general, the types of internet connectivity available fall into four categories:

1. Dial-Up indirect internet access
2. Dial-Up internet shell access
3. UUCP connectivity
4. direct internet connections

5.1.1 Dial-up Indirect Internet Access

Many computer bulletin board systems allow you to dial into their systems and exchange electronic mail through the internet (for example, "info@yggdrasil.com"). You can dial into the machine with `tip`, `minicom`, or some other telecommunications program and then use that company's machine to deal with the internet. Because these machines are not directly on the internet, you can only access a few non-interactive services such as electronic mail or usenet news. If you have this level of access, you may actually be able to use an email interface to FTP by sending mail to ftp-mail@gatekeeper.dec.com. This level of connectivity may be enough if you only want to occasionally send electronic mail.

5.1.2 Dial-up Internet Shell Access

This is a type of service that NovaLink and a growing number of other companies offer. The machine that you dial into is actually on the internet. More and more service providers are now putting their machines directly on the internet. Mail and news are generally transported much more quickly

between machines on the internet than they are between machines that are out in the provinces. More importantly, you can access a variety of internet services beyond electronic mail and news.

One of the most useful interactive internet services is `ftp`. If you ever have access to the internet, you might want to check out the following linux archives, which are accessible by anonymous FTP. An anonymous FTP site is one that allows FTP connections from anyone who specifies "anonymous" when prompted for a login name by FTP.

```
Site: ftp.wustl.edu, Directory: systems/linux
Site: sunsite.unc.edu, Directory: pub/Linux
Site: nic.funet.fi, Directory: pub/OS/Linux
```

5.1.3 UUCP Connectivity

With UUCP connectivity, you do not have direct access to the internet, but you can exchange electronic mail or usenet news with other sites. Most internet connectivity providers also offer UUCP service. You can use the "configure UUCP" screen on the graphical control panel (use the `control-panel` command) to do simple UUCP configuration. With UUCP service, you do not have direct access to the interactivity of the internet, but you can send and receive mail directly on your computer. UUCP is complementary to internet shell access. It is reasonable to subscribe to one, the other, or both of these types of services. In fact, some service providers try to bundle UUCP connectivity and internet shell access together.

5.1.4 Direct Internet Connections

You can put your machine directly on the internet through a modem or other serial device. The protocol used to encapsulate the internet packets that your machine transmits will be either SLIP ("serial line internet protocol"), CSLIP ("compressed SLIP"), or PPP ("point to point protocol"). The Linux kernel in Plug-and-Play Linux supports all three of these protocols, but the program for configuring serial line internet protocols, `dip`, only supports SLIP and CSLIP right now. Do a `man dip` for more information on dip.

Naturally, everybody would like to have a direct internet connection. With a direct internet connection you can use all of the internet protocols, offer your own services, run X-windows applications across the internet and so on.

Unfortunately, service providers tend to charge a lot more for direct internet connections than for other services because internet connections tend to be used so much that internet providers basically have to dedicate a new modem and new phone line for each new SLIP customer, and there tends to be a lot more set-up work involved. Also, be warned that the internet

protocols were not designed for consumer modems, so it pays to have a fast modem. 9600bps modems provide frustrating performance, 14.4kbps is the minimum for tolerable performance for character-based applications. Hopefully, the 28.8kpbs modems that are just now starting to appear will be more responsive.

5.1.5 High Speed Internet Connections

At the very top of the hierarchy of internet connectivity are the high speed internet connections. With these connections, you buy a router that has an ethernet port on one end and a special adapter that connects to another box that connects to a special kind of phone line on the other end. 56kpbs lines or ISDN (56kbps-144kbps) cost a few thousand dollars to set up and a few hundred dollars a month in phone bills and internet service. The next step up is T1 (1.44Mbps), which ends up costing about $15,000 to set up and about $1,000 a month in phone bills and internet service. After T1 there are DS3 (45Mbps) and a variety of experimental services at even higher speeds. Yggdrasil currently has a T1 connection.

To connect a Plug-and-Play Linux machine to the internet through one of these services, just connect the Plug-and-Play Linux machine to the ethernet and use the "configure-networking" screen of the graphical control panel (use the `control-panel` command) to configure your machine's address and other parameters.

5.2 Some Free Internet Access

Yggdrasil wants to promote internet connectivity. To that end, we have made a joint marketing agreement to provide some free access to NovaLink, a service by Inner Circle Technologies. If this experiment is successful, we would like to make similar agreements with other carriers. If you know other internet carriers that might be interested in either using Plug-and-Play Linux to promote their services or selling Plug-and-Play Linux to their customers, please encourage them to contact us.

This release of Plug-and-Play Linux comes with a free month of dial-up internet shell access from NovaLink, capped at $40. The person subscribing must be over 18, and **must authorize credit card payment** for all services after the first month and for charges above $40 of the first month. If you do not cancel after the first month, you will start being billed for your usage, but it is perfectly OK to sign up, use less than $40 of service in the first month and then cancel.

NovaLink's phone numbers are in Massachusetts, but you can also reach NovaLink through a variety of data networks that can save you long distance charges. If you want to call NovaLink locally, their modem numbers are:

Worcester   (508) 754-4009

Northborough
          (508) 393-7954

Marlborough
          (508) 460-1760

Cambridge
          (617) 497-3922

If you want to use a dial data network to dial in, NovaLink has a list of some of the access numbers for the CompuServe Packet Network, which is on the Plug-and-Play Linux CDROM in '`/usr/doc/nova-phones`'. For more access numbers, you will have to contact the companies running these data networks. Here are the surcharges for dialing in through these data networks. ("CPN" stands for CompuServe Packet Network.) Since these carriers are not offering a sample of their services for free the way NovaLink is, **these surcharges are not covered by the $40 of free NovaLink service**.

```
CPN (Continental USA)                          $ 1.80/hour
CPN (Canada/Alaska/Hawaii/Puerto Rico)         $ 4.20/hour
CPN (United Kingdom)                           $10.80/hour
CPN (Western Europe other than UK)             $11.40/hour
InfoNet Euro-Connect (Certain European Cities) $13.20/hour
FENICS-2 (Japan)                               $20.20/hour
InfoNet World-Connect (Asia, Africa & Others)  $30.20/hour
SprintNet (USA, weekends and 6PM-6AM weekdays) $ 2.40/hour
SprintNet (USA, all other times)               $ 8.40/hour
```

If you do not cancel by the end of the first month, NovaLink will charge a one-time $12.95 deferred initiation fee. From then on, you are charged, $9.95 each month (including the second month) and you get five hours of connect time. Additional time is charged at $1.80/hour.

The $40 free service cap works out to a maximum of 21 hours and 41 minutes of free connect time ($9.95 for the first five hours and $30.05 at $1.80 per hour). Again, this free time does not cover access surcharges for use of a phone data network to dial in.

To sign up, fill out the Internet Response Card that is included with Plug-and-Play Linux, tape it shut and mail it. It is important that you tape, staple or otherwise seal the response card because your credit card number is on the card. By signing the card, you are agreeing to the terms and conditions set forth in the next section.

Here is how to contact NovaLink:

```
NovaLink Information Service
Inner Circle Technology, Inc.
79 Boston Turnpike #409
Shrewsbury, MA 01545
phone (800) 274-2814
```

`fax (508) 793-2037`

5.3 TERMS AND CONDITIONS FOR USE OF NOVALINK

1. NovaLink ("Service") consists of the online databases, products, games, software, bulletin boards, file libraries and other online services provided by Inner Circle Technologies, Inc. under the name NovaLink.

2. You ("Subscriber") agree to pay all charges incurred by your account in accordance with the terms and prices contained in the NovaLink Rate Schedule then in effect. By accessing the Service, you reaffirm your authorization to Inner Circle Technologies, Inc. to secure payment in accordance with the method of payment you have selected.

3. THE SERVICE IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MER- CHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER INNER CIRCLE TECHNOLGOEIS, ITS EMPLOYEES, INVESTORS, AGENTS, SUBCONTRACTORS NOR ITS INFOR- MATION PROVIDERS WILL BE LIABLE TO YOU FOR ANY DAMAGES, INCLUDING LOST PROFITS OR LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, ARIS- ING OUR OF ACCESS TO, OR INABILITY TO GAIN ACCESS TO, THE SERVICE.

4. Subscriber's right to access the Service is not transferrable and subject to any limitations imposed by Inner Circle Technologies, Inc. Subscriber agrees that they are over the age of (18), and that use of the account by individuals under the age of eighteen (18) is the sole responsibility of the subscriber.

5. Subscriber agrees to indemnify Inner Circle Technologies, Inc. for any and all use of the Service.

6. From time to time Inner Circle Technologies, Inc. may propose mod- ifications to this agreement through publication on the bulletin board maintained on NovaLink(tm) and through individual electronic mail. Any continued use by you of the NovaLink five business days after you have been notified of such a proposed modification shall evidence your acceptance of the proposed modification to this agreement.

7. This agreement shall be governed by the laws of the Commonwealth of Massachusetts. Any cause of action of Subscriber with respect to the Service must be instituted in the Commonwealth of Massachusetts.

8. This agreement, as modified from time to time by procedure described in Section 6 abvoe, shall constitute the entirety of the agreement between the parties.

6 Last Minute Additions

It is possible that there may be last minute additions made to your release
of Plug-and-Play Linux after the manual went to print. These last minute
changes might include, for example, a new version of the kernel with patches
to the source tree. If there are any such changes, they will be documented
on the floppy disk in the file 'README'. To access this file, insert the Plug-
and-Play Linux boot floppy in your first floppy drive and type:

```
mount /dev/fd0 /mnt
more /mnt/README
umount /dev/fd0
```

If there is no README file, then there were no last minute additions.

7 Hardware Compatibility

7.1 Hardware Requirements

System   RAM: 4MB (8MB without swap partition), CPU: 386 or above, Bus: ISA, EISA, PCI, or localbus.

Disk   IDE, RLL, MFM, ESDI, SCSI **with supported SCSI controller**. Configurations range from 0 to 1,028 megabytes of disk. Configurations without the source tree that can run without the CDROM range from 35 to 300 megabytes. Hard disk can be shared with other operating systems on separate partitions.

Tape   SCSI tape **with supported SCSI controller**. **Experimental (i.e., unsupported)** driver for floppy tape.

CDROM   Sony 531, 535, CDU-31A, SoundBlaster-compatible CDROM's, Mitsumi, any SCSI CDROM **with supported SCSI controller**, **Experimental** drivers for ide based CDROM drives and for any MSCDEX compatible CDROM (by booting through dos).

SCSI   Adaptec 154x, and 174x in enhanced mode, Bustek 542B, Future Domain 8xx, or 16xx, other controllers based on the TMC-950 chip, Ultrastor. **Experimental** drivers for Trantor, Always in-2000, Adaptec AIC 6260 chip (151x/152x boards), Seagate ST-01/ST02, MediaVision and Creative Labs sound cards, controllers based on the NCR53C810 chipset, and the Adaptec 27xx series.

Video   (For X windows.) 640x480 16-colors for any VGA card, 256 colors and resolutions up to 1280x1024 (for sufficiently fast hardware) for the following chipsets: S3 801/805/911/924/928, 8514, Tseng ET3000/ET4000, Oak oti-067/077/087, Western Digital 90c00/90c10/90c30/90c31, Genoa, ATI Mach8/Mach32/Mach64, Trident 8900b/c/cl/cs, Cirrus Logic 5420/5422/5426/62x5, NCR 77c22/77c22e, or Compaq AVGA. Hercules monochrome. Note: Diamond cards not supported.

Sound   Adlib, SoundBlaster, MediaVision, and compatibles. Installable Gravis Ultrasound and MPU-401 drivers are also included. PC speaker is used if sound card is not present.

Ethernet   Novell NE1000/NE2000/NE2100, 3Com 3c501, 3c503, 3c505, 3c509, 3c579, AT1500, AT1700, D-Link DE600 and DE620 pocket adapters and ethernet II, AT-LAN-TEC/RealTek pocket adapter, Artisoft LANtastic AE-2, Alta Combo, Cabletron,

Ansel 3200, Apricot 82596, AT1700, AT1500, Digital DE100, DE200, DE202, DE422 and EtherWORKS, Cabletron E2100, Intel EtherExpress, Zenith Z-Note, Hewlett-Packard 27245, 27247, 27250, J2405A, and PCLAN, Western Digital 8003 and 8013, other 8390-based ethernet cards.

7.2 Hard-To-Change Configuration Requirements

Here is a chart of supported configurations for common PC hardware devices. Parenthesized numbers indicate default values. Bracketed numbers indicate values that are not supported under the current Linux kernel.

```
                        IO ports         IRQ           DMA          BIOS
Serial Lines:
(These can be changed at runtime with the setserial program)
ttyS0 (COM1:)           3f8              4             --           --
ttyS1 (COM2:)           2f8              3             --           --
ttyS2 (COM3:)           3e8              4             --           --
ttyS3 (COM4:)           2e8              3             --           --

Parallel Ports
par0 (hercules port)    3bc-???          ?
par1 (LPT1:)            378-37f          7
par2 (LPT2:)            278-27f          5

Floppy disks:
fd0, fd1                3f0-3f7          6             2
fd2, fd3                370-377          10            3
```

	IO ports	IRQ	DMA	BIOS
SCSI controllers:				
Adaptec 1542B	334,(330),[234]	9,10,(11)	7,6	(dc000),cc000
	[230],[134],[130]	12,14,15	(5),0	d8000,c8000
Adaptec 1740B	(Given by EISA)	9,10,11,		
		0,14,15		
Seagate STxx*/		[*],[3]		(ca000),c8000,
Future Domain 8xx/		5,[7]		ce000,de00
TMC-950				
Ultrastor 14F/24F/34F	(330),340,	15,14,	5,6,7,0	[none],c4000,
	[310],230,240,	11,10		c8000,cc000,
	210,130,140			d0000,d4000,
				dc000,d8000
Western Digital	350	15	6	any
7000FASST				
Always IN-2000	220,200,110,100	any	unused	
Proprietary CDROM interfaces:				
Mitsumi	300,320,340	11	unused	----
Soundblaster Pro	(220),240	unused	unused	
Panasonic/Lasermaster	300,310	unused	unused	
Sony cdu31a	(340),360	unused	unused	
	320,330			
Sony cdu31a + Fusion16	1f88	unused	unused	
Sony 535 or Sony 531	340	unused	unused	
Sound cards:				
Adlib/Soundblaster	220	7	1	
ProAudioSpectrum-16	388	5	3	
MPU	330	6	unused	
Ethernet cards:				
NE-2000 clones	(300),320	12		(disabled),
	340,360			c8000,cc000,
	340,360			d0000, d4000,
				d8000, dc000
3Com 3c503/16	250,280,2a0,	2,(3),	(1),	cc000,dc000,
	2e0,(300),	4,5	2,3	d8000,(c8000),
	310,330,350			disabled

*By default the Seagate ST01 and ST02 controllers are configured to not use any IRQ. You must configure the card to use IRQ 5 by connecting pins F and G on the jumper labelled "EFG."

7.3 More Readily Changed Configuration Requirements

The Linux kernel will automatically detect and adapt to the configurations of most of the devices in your computer. However, some of the newer or more obscure device drivers in the kernel do not yet have the ability to detect and adapt to all possible combinations of IO ports, interrupt lines, and DMA channels. Instead some particular setting for these device drivers is chosen.

The following chart lists the PC hardware which has to be configured in specific ways in order to be used by the Linux kernel.

The particular configurations have been chosen to match the default settings that the devices have when they are shipped from the factory. The one exception to this rule is the Seagate ST02 IRQ number, where the factory setting is no IRQ but where the kernel requires one.

The "factory defaults" policy has the unfortunate consequence of making it impossible to use certain combinations of hardware without recompiling the kernel. For example, IRQ 5 is used by the STxx/FD-8xx/TMC-950 SCSI controller, the Mitsumi CDROM drive and bus mice. In order to use two or more of these devices in the same machine, you must change the appropriate declarations in the kernel source tree and recompile a new kernel. The last column of the chart identifies the location of the declaration of the interrupt request (IRQ) number.

```
                        IO port    IRQ    DMA     defined in
                                                  /usr/src/linux/...


SCSI controllers:
Seagate STxx*/                     5**             kernel/blk_drv/scsi/seagate.c
Future Domain 8xx/                                     line 51
TMC-950
Western Digital         350        15      6      kernel/blk_drv/scsi/wd7000.h
  7000FASST                                            line 30




Proprietary CDROM interfaces:
Mitsumi                 300,320,340 11*            include/linux/mcd.h
                                                      line 25
Sony 535 or Sony 531    340                       kernel/blk_drv/sony535.c
                                                      line 112


Sound cards:
Adlib/Soundblaster      220        7       1      kernel/chr_drv/sound/local.h
                                                      line 15

ProAudioSpectrum-16     388        10      3         same file


Bus mice                           5***           include/linux/busmouse.h
                                                      line 29
```

```
the boot: prompt.
```

*By default the Seagate ST01 and ST02 controllers are configured to not use any IRQ. You must configure the card to use IRQ 5 by connecting pins F and G on the jumper labelled "EFG."

**The Mitsumi driver will work even if it cannot allocate IRQ 11.

***The Bus mouse IRQ can also be changed by typing linux busmouse=irq at

7.4 Device Files

This section provides a list of the files in /dev to assist you in interfacing various hardware components.

MAKEDEV
> MAKEDEV, the only plain text file in /dev, is a shell script for creating device files that don't already exist. Given the name of a device, MAKEDEV will attempt to create it.

atimouse   See /dev/mouse.

audio, dsp, sequencer
> Used for playing and synthesizing sounds on sound cards, or playing sounds through the PC speaker if a sound card is not present.

cdrom, cdrom0, cdrom1, cdrom2,...
> SCSI CDROM drives. /dev/cdrom is a symbolic link to /dev/cdrom0, the first drive.

console   Where to send messages for the operator of the computer. Normally this is the same as the first virtual terminal, /dev/tty0

core   Related to /dev/ram.

cua0, cua1, cua2,...
> Serial lines. These are the same as /dev/ttyS0, /dev/ttyS1..., except that only one file descriptor at a time is allowed to open the same device when the serial lines are accessed this way.

dsp   See /dev/audio.

fd   Symbolic link to /proc/sef/fd. Opening /dev/fd/n connects to file descriptor n of the calling process.

fd0, fd0D360, etc. (fd0*)
fd1, etc. (fd1*)
> Floppy disk drives. /dev/fd0 and /dev/fd1 will automatically adjust to the type of floppy disk in the drive, although you still

need to configure the correct floppy drive type in your com-
puter's CMOS RAM. The other floppy disk device files force
the kernel to use a particular floppy disk format instead of sens-
ing the format of the media in the drive. You will probably
never directly use floppy disk devices other than /dev/fd0 and
/dev/fd1.

ftape   "Floppy tape", tape drives that connect to the floppy disk port,
such as the Archive or Conner units. Support for these drives
is still experimental. That is to say, floppy tape drives are not
supported hardware.

full   Like /dev/null, except that /dev/null blocks on attempts to read
it, rather than returning an end-of-file condition.

hda, hda1, hda2, etc. (hda*)
hdab, hdb1, hdb2, etc. (hdb*)
IDE, MFM, RLL or ESDI hard disks. /dev/hda refers to the
entire first disk drive, while /dev/hda1 refers to the primary
partition #1 of that drive. There are four primary partition
slots on a hard disk. /dev/hda5 and above refer to logical drives
of extended partitions, which are a mechanism for dividing a
single primary partition into subpartitions.

kmem   Kernel virtual memory.

logitech_mouse
See /dev/mouse.

mem   Same as /dev/ram.

midi   Some sort of music industry standard device for connecting
things like synthesizer keyboards to a computer. Supported by
some sound cards.

mitsumi_cd
Mitsumi interface CDROM drive.

mixer   Part of the sound interface.

modem   A symbolic link to whichever serial port the modem is attached
to, normally ttyS1 (COM2:).

mouse, logitech_mouse, msmouse, psmouse
Bus mice.

net   Used by the route command in networking software.

nst0, nst1 See st0.

null   The null device. Reading from this device produces an end of
file. Writing to this device produces no result. The characters

are simply accepted by the device and thrown away. See also /dev/full.

matsushita_cd, matsushita_cd0, matsushita_cd1,...
The "SoundBlaster Pro" compatible CDROM's made by Katobuki, LaserMate, Matsushita, Panasonic, and others. These devices used to be named "sbpro_cd*", but lately Creative Labs has released versions of the SoundBlaster Pro that have Sony CDU-31A or Mitsumi CDROM interfaces. These other interfaces are also supported by Plug-and-Play Linux, but through the /dev/sonycd_31a and /dev/mitsumi_cd devices, respectively.

par0, par1, par2
Parallel ports. par0 is the parallel port on Hercules monochrome cards. par1 is the first parallel port on serial/parallel cards, and par2 is the second parallel port on serial/parallel cards.

philips_cd Philips/LMSI cm205 CDROM drives made before July 1993. There is currently no driver for cm205's made after July 1993 or cm206's. This experimental driver is disabled in the kernel shipped with this release because it appears to prevent the Sony 535 CDROM driver from working. The file '/bootflpy.phl' on the CDROM is an image of a boot **low density** 3.5" boot floppy with this driver enabled. You can use 'RAWRITE.EXE' on the CDROM under MSCDEX to make a boot floppy from this file.

port A special device for speaking directly to CPU IO ports.

psmouse See /dev/mouse.

ptyp0, ptyp1, etc. (pty*)
Pseudo-terminal devices. Pseudo-terminals are a design error of most unix-like operating systems, including Linux. Ideally, abstractions like "controlling terminal" and "line discipline" should be applicable to all streams, not just terminal devices. Unfortunately, for now, you still need pseudo terminals under Linux in order do things like remotely logging into Linux machines from the internet.

ram The physical memory of the computer.

ramdisk A section of the computer's physical memory that has been reserved for use as a block device. The size of this region is normally zero and is fixed at boot time. The kernel on Plug-and-Play Linux boot diskette reserves a one megabyte RAMdisk so that it can have a small writable filesystem available, since the CDROM is not writable. The installation script sets the RAMdisk size to zero for the kernel that it installs on your hard disk.

rmt0, rmt16, rmt8, tape-reset
> Raw magnetic tape? Remote magnetic tape?

sda, sda1, sda2, sdb, sdb1, etc. (sd*)
> SCSI disks. See /dev/hda for an explanation of drive letters and partition numbers.

sequencer   See /dev/audio

socket   Used by some of the networking code.

sonycd_31a
> Sony CDU-31A CDROM drive.

sonycd_535
> Sony 535 or 531 CDROM drive.

st0, st1
nst0, nst1   SCSI tape drives. nst0 and nst1 are the same as st0 and st1, respectively, except that they do not automatically rewind the tape after every operation.

stderr, stdin, stdout
> Symbolic links to /dev/fd/0 /dev/fd/1 and /dev/fd/2 respectively.

tape-reset   Related to /dev/rmt*.

tty   Connects to the controlling terminal of whatever process opened it. Processes that do not have a controlling terminal get an error if they attempting to open /dev/tty.

tty1, tty2, tty3, tty4
> The four virtual consoles that you use when you are not running X windows. Use <ALT>-F1, <ALT>-F2, etc. to switch between them.

ttyS0, ttyS1, ttyS2, ttyS3
> The standard serial ports.

ttyS4-ttyS15
> More serial ports that you can use if you have a supported multiport serial IO card.

ttyp0, ttyp1...
ttyq0, ttyq1..
ttyr0, ttyr1..
ttys0, ttys1..
> Pseudo-terminals used by telnet, rlogin, and other programs.

xda, xda1, xda2, xda3, xda4
xdb, xdb1, xdb2, xdb3, xdb4
> PC XT disk drives. You have to rebuild the kernel to support these disks.

zero   Stream of null bytes.

8 Trouble Shooting

8.1 "Kernel Panic: Unable to Mount Root"

Make sure that you have a supported CDROM drive. If you have a SCSI CDROM drive, make sure that you have a supported SCSI controller. If you do not have a supported SCSI controller, you might want to buy a cheap 8-bit SCSI controller like the Future Domain 850 **with BIOS**, which sells for about $60.

If your cdrom is not directly supported by Linux, you can use the new MSCDEX drivers by first booting dos, mounting the CDROM under MSCDEX, `cd` to the CDROM drive. Then type `runlinux`. These drivers call the MSCDEX device drivers, so they should allow you to use any CDROM drive if you have installed it's MSCDEX drivers and if you have run Linux from under DOS.

Unfortunately, not all MSCDEX CDROM drivers are as well behaved as they should be. If using `runlinux` does not work, and you do have a directly supported CDROM drive and a supported controller, proceed to the next section.

8.2 Isolating Hardware-Related Problems

If there is even the slightest chance that your problem is hardware related, please follow the instructions in this section. If your system "works fine under DOS", even if you are sure that your system is properly configured, please follow these instructions anyhow.

1. Make sure that the power cables are securely plugged into your peripherals. This has been a common problem.

2. Remove all nonessential hardware. In cases where you cannot boot the system, removing all nonessential hardware means removing everything except the video card and the floppy disk controller.

3. After removing all nonessential hardware try to boot the system. You should eventually get the message "kernel panic unable to mount root" because the boot floppy cannot find a CDROM drive.

4. Add the CDROM drive and try booting again. The system should come up. If it doesn't, recheck the previous section, entitled "kernel panic: Unable to mount root." Otherwise, make sure that your CDROM drive is at a supported IO address.

5. Retry after adding other components until you have determined the component that causes the problem to occur. At this point, carefully check the hardware components for IO port conflicts, memory address

conflicts, interrupt ("IRQ") conflicts, and DMA channel conflicts. Also make sure that the device is configured as specified in the Hardware Compatibility chapter.

If you have access to a system that is running Linux correctly, then you may also want to try swapping hardware back and forth between the systems to see which hardware component evokes the problem.

8.3 Recording Hardware Problems

If your hardware is properly configured and still has problems, then once you have determined what minimal hardware configuration elicits the problem that you are experiencing, record that hardware configuration in as much detail as possible. Try to record the make and model of each card in your computer and its hardware configuration information, such as IRQ, IO address, memory address, and DMA channel. If you do this before you call to report the problem, there is a better chance that we will be able to reproduce your problem and fix it in the next release of Plug-and-Play Linux. However, we still want you to report any bugs that you find, even if you are unable to provide us with the information which can make the bug fixing process more efficient.

8.4 Interrupt and Other Conflicts

If you are experiencing a problem with a device freezing after a few seconds of use, or a device not being recognized, you might have two devices using the same interrupt ("IRQ") line. Other ways in which collisions can occur are DMA channels, IO ports and memory addresses. You may want to make a chart of your PC's hardware configuration to make sure that you do not have any of these conflicts.

8.5 Common SCSI Problems

8.5.1 Bus Timeouts

If you have more than one peripheral on your SCSI bus, and you are getting SCSI timeout errors, it may be a result of your drive not disconnecting from the SCSI bus as quickly as it is supposed to when it receives an "asynchronous disconnect" command.

Asynchronous disconnect allows your computer to tell your CDROM to read a sector, and while the CDROM is reading the sector, disconnect from the CDROM drive and give the hard disk some things to do. Unfortunately,

if your CDROM drive does not respond to the asynchronous disconnect command as quickly as it is supposed to, the CDROM drive clobbers the command that was supposed to go to your hard disk, your computer waits for the hard disk to respond, and eventually times out, since the hard disk never received the command. This was a problem with a number of early SCSI CDROM drives, especially the Texel dm3021 and some Texel dm3024's, although a number of other drives allegedly had this problem too. If you own a Texel dm3024, you might want to check with Texel to make sure that your drive's firmware is sufficiently up to date.

If the SCSI timeouts occur while running mkfs and your computer has a turbo switch, you may be able to solve the problem by putting your computer into its slowest mode for the duration of the mkfs.

8.5.2 System Hangs

If your system boots to the point where your SCSI controller is detected and then hangs, or your system runs for a little while and then hangs, you may have a SCSI device that does not correctly handle non-zero logical unit numbers.

In theory, each device on the SCSI bus can have up to eight logical unit numbers or LUNs. These eight devices might, for example, be independently addressable platters on a CDROM changer. Most devices only have a single unit, normally unit 0. Unfortunately, some devices lock up when they are queried about their other logical units. Linux has a "black list" of such devices, but that list is far from complete. You can force Linux to address only the first LUN of each SCSI device, by specifying the following argument at boot time:

```
boot: linux max_scsi_luns=1
```

If this solves your problem, send us the exact values that the SCSI driver prints out for the vendor, product and version of your SCSI device so that we can add the malfunctioning device to the SCSI black list.

8.5.3 Undetected Controller

If you have a supported SCSI controller and Linux fails to detect it, see the next section ("Forcing Hardware Detection").

8.6 Forcing Hardware Detection

Normally, the Linux kernel automatically detects whatever hardware you have. However, there are situations where the kernel cannot reliably check for the existence of certain hardware configurations or where it is both easy

and dangerous to incorrectly activate a device driver for a device that is not actually present.

For these situations, you can specify additional options to the lilo "boot: " that direct the kernel's behavior at boot time. You can make lilo add these arguments every time you boot by specifying an "append= " line in '/etc/lilo.conf'. For example:

```
timeout=50
prompt
install = /boot/boot.b
boot= /dev/sda
compact
#delay = 0        # optional, for systems that boot very quickly
vga = normal      # force sane state
ramdisk = 0       # paranoia setting
root = current    # use "current" root
image = /vmlinux
  label = linux
  read-only
  append="linux tmc8xx=0xCA00,5"
```

8.6.1 BIOS-less SCSI Controllers

You can skip this section if you are not using a Seagate ST0x, Future Domain TMC-8xx, Trantor T128, T128F, T228, or T130, or the Adaptec 151x/152x controller. If you are using one of these controllers that has a BIOS ROM on it and if the controller is successfully detected by the default boot procedure, then you also can skip this section. Note that the TMC-8xx and Seagate controllers are 8-bit controllers; if your Future Domain controller is a 16-bit card, then you have a TMC-16xx controller, and you too should skip this section.

There is one situation where you do need to type something to the 'boot:' prompt in order to load Plug-and-Play Linux for the first time. When the Linux kernel attempts to detect a SCSI controller that uses the TMC-950 chip, such as the TMC-8xx or the Seagate ST0x, it looks for particular strings in BIOS ROM. If your controller does not have a BIOS ROM, or if it uses a BIOS ROM that does not have one of the strings that Linux expects where Linux expects it, then you need to tell the kernel where your controller is and what interrupt the controller uses. The syntax for providing this information via the boot prompt is as follows (which line you use depends on which controller you have):

```
boot: linux ncr5380=port, interrupt, dma_channel
boot: linux t128=mem_address, interrupt
boot: linux aha152x=port, interrupt, scsi_id, 1
boot: linux tmc8xx=mem_address, interrupt
boot: linux st0x=mem_address, interrupt
```

To use ROMless Trantor T128 controller set to the factory defaults, you would type:

```
boot: linux t128=0xCC000,0
```

For the Trantor T130B, use the generic ncr5380 driver and add 8 to the port number. For example, if your card is set to 0x350 (the default), enter this at the lilo prompt:

```
boot: linux ncr5380=0x358,254,-1
```

An Adaptec 1510 is apparently an Adaptec 1522 without the BIOS ROM, so just use the "aha152x=" syntax to force recognition of an Adaptec 1510. *scsi_id* should be the scsi id of the controller, normally 7. This procedure should work with other SCSI controllers that use the Adaptec AIC-6260 chip such as motherboards that have this chip built in. For example, to use the SCSI version of the Creative Labs' SoundBlaster sound card in its default configuration, you would type:

```
boot: linux aha152x=0x340,11,7,1
```

To use ROMless TMC-850 controller set to the factory defaults, you would type:

```
boot: linux tmc8xx=0xCA00,5
```

8.6.2 Forcing Hard Disk Detection

The following option will force the kernel to recognize and believe that the first IDE, MFM or ESDI disk has the geometry that you specify.

```
boot: linux hd=
```
$cylinders, heads, sectors$

8.6.3 Forcing Ethernet Detection

The following option will force the kernel to recognize an ethernet board with the interrupt, IO port and memory range that you specify.

```
boot: linux ether=
```
$interrupt, io\_port, mem\_start, mem\_end, interface\text{-}name$

interface-name refers to the name of your networking interface. It is the same name that is used by the **route** command. Here are the names used to identify various ethernet cards:

dl0   D-Link DL600 ethernet card.

le0   AT1500 and NE2100 cards. Some NE2100 cards must be specified for the kernel at boot time.

eth0   8390-compatible cards such as the 3com 3c503, Western Digital WD80x3, HPLAN cards, and NE-2000 compatibles.

8.7 Software Feature Not Working

Make sure that you have installed the software component that you are trying to use. You must have install the `Andrew` component from the graphical control panel or from the installation script to be able to invoke the Andrew EZ editor from the root menu.

8.8 LILO Booting Problems

The Linux loader, LILO, produces cryptic error messages which are explained in the documentation written by Werner Almesberger and is included on the CDROM. To find them type `whence lilo` and look in the 'doc' subdirectory of the `lilo` source diretory for the complete documentation.

For convience part of that documentation has been reproduced and ammended without permission.

When `LILO` loads itself, it display the word "LILO". Each letter is printed before or after performing some specific action. If `LILO` fails at some point, the letters printed so far can be used to idnetify the problem. This is describe in more detail in the `LILO` documentation.

Note that some hex digits may be inserted after the first "L" if a transient disk problem occurs. Unless `LILO` stops at that point, generatin and endless stream of error codes, such hex digits do not indicate a severe problem.

(nothing)
No part of `LILO` has been loaded. `LILO` either isn't installed or the partion on which its boot sector is located isn't active.

Lerror...
The first stage boot loader has been loaded and started, but it can't load the second stage boot loader. The two-digit error codes indicate the type of problem (see below). This condition usually indicates a media failure or a geometry mismatch.

LI
The first stage boot loader was able to load the second stage boot loader, but has failed to execute it. This can either be caused by a geometry mismatch or by moving '`/boot/boot.b`' without running the map installer.

LIL
The second stage boot loader has been started, but it can't load the descriptor table from the map file. This is typically caused by a media failure or by a geometry mismatch.

LIL?
The second stage boot loader has been loaded at an incorrect address. This is typically caused by a subtle geometry mismatch or by moving '`/boot/boot.b`' without running the map installer.

`LIL-`	The descriptor table is corrupt. This can either be caused by a geometry mismatch or by moving '`/boot/map`' wihtout running the map installer.
`LILO`	All parts of LILO habe been successfully loaded.

8.8.1 Disk Error Codes

If the `BIOS` signals an error when `LILO` is trying to load a boot image, the respective error code is displayed. The following `BIOS` error codes are known:

`0x00`	Internal error. This code is generated by the sector read routine of the `LILO` boot loader whenever an internal inconsistency is detected. This might be caused by corrupte file, try re-building the map file.
`0x02`	Address mark not found. This usually indicates a media problem. Try again several times.
`0x04`	Sector not found. This typically indicates a geometry mismatch. If you are booting a disk you made yourself, make sure that the disk you are using was formatted for the correct amount of data.
`0x06`	Change line active. This should be a transient error, try again.
`0x0c`	Invalid media. This could be cause by using a bad disk. Try again.
`0x10`	CRC error. A media error has been detected. If you continue to get this error make a new boot disk.
`0x20`	Controller error.
`0x40`	Seek failure. This might be a media problem. If you continue to get this error make a new boot disk.
`0x80`	Disk timeout. The disk or the drive isn't ready. If this occurs on your floppy then you might not have closed the door or the cables might not be connected properly. This can also mean that your `BIOS` does not support long reads. If this is the case rerun `LILO` without the compact option in '`/etc/lilo.conf`'.

8.8.2 Other Lilo Problems

For some unknown reasons, `LILO` may fail on some systems with AMI BIOS if the "Hard Disk Type 47 RAM area" is set to "0:300" instead of "DOS 1K".

8.9 Errata

Although your system should run smoothly for the most part, there are, unfortunately, a few known bugs.

1. Printing does not work under the Andrew system.

2. If you have a Microsoft bus mouse, the kernel will think that you also have a Logitech bus mouse and an ATI bus mouse. This bug is harmless.

3. If you have an Ultrastor controller, you must physically reset the machine (e.g., by pressing the RESET button or turning the machine off and on) when you reboot, otherwise the Ultrastor will not be detected.

4. Some other hardware combinations also hang on a warm reboot like the Ultrastor. This problem with other hardware combinations appears to be intermittent and may be dependent on having a certain brands of NE-2000 clone ethernet boards.

5. doc, the InterViews text editor, sets default page height to 1 line. This is probably related to the bug that caused doc to internally think that the default number of columns was "1t" instead of "1." Declaring a "t" unit with a conversion factor of 1.0 seems to have worked around this problem, but the single-line document height problem may have the same root cause.

8.10 Rebuilding the kernel

If you ever want to rebuild the kernel, here is how to do it.

```
cd /usr/src/linux
make config
make
```

At the make config step, you will be prompted with dozens of questions about how you want the kernel configured. Fortunately, these questions have sensible defaults. The last part of the configuration process, when you are asked to configure the soundboard support, can be a little tricky. The standard Plug-and-Play Linux kernel is shipped with Gravis Ultrasound and MPU-401 sound support turned off, and all other sound features turned on, with all DMA and IRQ's set to their default values. Gravis and MPU-401 support is deactivated because having support for these soundcards will sometimes cause a kernel to hang if these soundcards are not present. Here is an example of configuring the sound drivers as they are in Plug-and-Play Linux:

```
make[1]: Entering directory '/usr/src/linux/drivers/sound'
Compiling Sound Driver v 2.4 for Linux

Configuring the sound support

Do you want to include full version of the sound driver (n/y) ? n
Do you want to DISABLE the Sound Driver (n/y) ?n
The SoundBlaster, AdLib and ProAudioSpectrum
cards cannot be installed at the same time

Select at most one of them:
        - ProAudioSpectrum 16
        - SoundBlaster / SB Pro
          (Could be selected with PAS16 also
          since there is a SB emulation on it)
        - AdLib

Don't enable SoundBlaster if you have GUS at 0x220!

  ProAudioSpectrum 16 support (n/y) ? y
  SoundBlaster support (n/y) ? y

The following cards should work with any other cards.
CAUTION! Don't enable MPU-401 if you don't have it.
  Gravis Ultrasound support (n/y) ? n
  MPU-401 support (NOT for SB16) (n/y) ? n

Select one or more of the following options
  digitized voice support (y/n) ? y
  MIDI interface support (y/n) ? y
  FM synthesizer (YM3812/OPL-3) support (y/n) ? y

IRQ number for SoundBlaster?
The IRQ adress is defined by the jumpers on your card and
7 is the factory default. Valid values are 9, 5, 7 and 10.
Enter the value: 7
SoundBlaster IRQ set to 7

IRQ number for ProAudioSpectrum?
The recommended value is the IRQ used under DOS.
Please refer to the ProAudioSpectrum User's Guide.
The default value is 10.
Enter the value: 10
ProAudioSpectrum IRQ set to 10

DMA number for ProAudioSpectrum?
The recommended value is the DMA channel under DOS.
Please refer to the ProAudioSpectrum User's Guide.
The default value is 3
Enter the value: 3

ProAudioSpectrum DMA set to 3

Select the DMA buffer size (4096, 16384, 32768 or 65536 bytes)
65536 is recommended value for this configuration.
Enter the value: 65536
The DMA buffer size set to 65536
The sound driver is now configured.
make[1]: Leaving directory '/usr/src/linux/drivers/sound'
mv .config~ .config
#
```

The `make` step will eventually create the file /usr/src/linux/zImage, which is the image of a bootable floppy and is also the same type of kernel image in /vmlinux. Whenever you overwrite /vmlinux, be sure to run the command `lilo` before you reboot, otherwise the new kernel may not be able to boot from your hard disk.

8.10.1 Kernel Enhancements

The Linux kernel that comes with Plug-and-Play Linux is an enhanced version of the base Linux 1.1 kernel. The unmodified source code for the original Linux 1.1 kernel are in '`/usr/src/unused/linux-1.1.tar`'. Here is a list of enhancements that are in the Plug-and-Play Linux kernel. Hopefully, these enhancements will eventually be integrated into the base linux kernel distribution.

1. '`/usr/src/linux/zBoot/misc.c`' memory usage improved to enable booting larger kernels.

2. snapshot of compressed log structured filesystem under development in '`/usr/src/linux/fs/log`' (not used).

3. PC speaker sound driver version 0.6

4. PC speaker sound driver modified to use regular sound driver's major device number and to be deactivated when regular sound driver is present (not doing this could otherwise hang some systems).

5. Sony 535 CDROM driver version 0.5

6. Philips/LMSI cm205 cdrom driver version 0.3. This driver only works with Philips drives made before July 1993, and is not configured in the kernel distributed with Plug-and-Play Linux.

7. IN-2000 scsi driver version 0.3

8. Made in2000 driver use check_region() and snarf_region(). These subroutines should be given more descriptive names such as allocate_io_ports() and are_io_ports_allocated().

9. LaserMate/Matsushita/Panasonic cdrom drive probe is quieter at boot time.

10. Mitsumi driver has longer timeouts, supports multiple IO addresses and works even when it cannot get the interrupt (IRQ) line that it wants.

11. inherited file system version 0.5

12. If the kernel cannot mount root, it will try the various CDROM devices. (Grep for ALT_ROOTS in '`/usr/src/linux/init/main.c`')

13. A new drivers which use call backs to the 16-bit Real Mode BIOS and an MSCDEX CDROM to access otherwise unussported CDROM drives and hard disks, and to other BIOS service requests.

8.11 Making a new boot floppy

The Plug-and-Play Linux CDROM includes images of both 3.5" and 5.25" boot floppies. You should have received a 3.5" boot floppy with Plug-and-Play Linux, but if that floppy was damaged or if you need to make a 5.25" boot floppy, here is how to do it. The floppy images are in the top level directory of the CDROM and are named '`bootflpy.3in`' and '`bootflpy.5in`'. You can also retrieve the boot floppy images over the internet by anonymous FTP to yggdrasil.com.

The 3.5" floppy disk is a low density image, **you must use low density media to make a 3.5" boot floppy**.

8.11.1 Making a boot floppy from DOS

To make a boot floppy from DOS, mount the CDROM under MSCDEX and `cd` to the CDROM drive. In the top level directory of the CDROM, you will find a program '`RAWRITE.EXE`'. Run this program to copy '`bootflpy.3in`' or '`bootflpy.5in`' to a formatted diskette in your floppy drive. The 3.5 inch floppy must be formatted to 720K and the 5.25 inch floppy must be formatted to 1.2Meg.

8.11.2 Making a boot floppy from Linux

To make a boot floppy from a machine already running Linux, mount the CDROM, and then `cp` the appropriate file ('`bootflpy.5in`' or '`bootflpy.3in`') to the floppy disk drive, '`/dev/fd0`'. Make sure there is a formatted floppy alread in the drive.

If you have problems making a boot floppy and you are experiencing trouble, we will send you one for free.

9 Third Party Support

In the proprietary software world, an individual or organization that wants to become a technical support vendor can be impeded by lack of access to source code or essentially taxed through source license fees. In contrast, in the free software world, source access is generally available to anyone, and there are no licensing fees that subordinate one company to another, so support services are likely to be available on a more competitive basis.

If you would like to be listed in the next Plug-and-Play Linux manual as a third party support vendor for the Yggdrasil CDROM distributions, send a brief synopsis and contact information about your business to:

> Yggdrasil Computing, Incorporated
> Third Party Support Services
> 4880 Stevens Creek Blvd., Suite 205
> San Jose, California 95129-1034
> United States of America
> (408)261-6630, fax(408)261-6631
> support@yggdrasil.com

The following individuals or organizations are offering support services related to the Yggdrasil Linux/GNU/X distribution.

9.1 ACTCOM - Active Communication Ltd.

> 14 Pinsker Street
> Haifa 32715
> Israel
>
> Phone: +972-4-326857
> Fax: +972-4-231211
> Mail: office@actcom.com

Services:
- Unix and communications consultants
- Internet communications services
- CDROM supplier

9.2 Aladdin Enterprises

(name will probably change in the next 2 months)
P.O. box 60264
Palo Alto, CA 94306
voice 415-322-0103
fax 415-322-1734
e-mail ghost@aladdin.com
Contact: L. Peter Deutsch

Background:
Aladdin Enterprises is the developer of Ghostscript and the
owner of the Ghostscript copyright.

Services:

- Commercial Ghostscript, including support, upgrades, and
  alternative licensing.

- Small-scale consulting and contract work in connection with
  Ghostscript and other PostScript-language-related technology.

9.3 Bitbybit

        Kluyverweg 2a
        2629 HT Delft
        The Netherlands
        phone **+31** 15 682569
fax **+31** 15 682569
        bitbybit@runner.knoware.nl

Background:
        Founded in mid-1992. Specialized in Object-Oriented Database
        Systems. Staff of 6 people.   Members of the company have
        contributed to the Linux Kernel and have ported software
        to Linux.

Services:
        Installation, support, system administration, software
        development, scheduling systems, database interoperability.

Rates:
        DFL 75 - DFL 175 per engineering hour

9.4 ClearVu Technical Writing Services

95 Clearview Drive
Christiansburgh, VA 24073
(703) 382-5697

Contact:
Thomas Dunbar
tdunbar@vtaix.cc.vt.edu

Background:
ClearVu is a technical typesetting company that has expanded
into building and installing customized Linux-based
typesetting systems.

Services:
Customized systems for in-house typesetting of technical
materials using Linux together with TEX and miscellaneous
special utilities.

Rates:
Hardware prices vary with market.
Installation and technical support: $30 per hour.

9.5 Complete Computing Solutions of New England, Inc.

> 31 Syracuse Road
> Nashua, NH 03060
> (603) 880-0482
> fax: 889-6154
> USENET: decvax!bhjat!ccs

Contact:
> Burt Janz, President
> USENET: decvax!bhjat!bhj
> Compuserve 75210,3671

Services:
> Custom software design, engineering, and productization;
> limited custom hardware design and prototyping; consulting; training.

Rates:
> $30 to $100 per hour - mutual negotiation and required staff
> determines final rate.

Background:
> CCS New England is staffed by software professionals with
> over 80 years in accumulated expertise. Custom software
> produced includes: custom X servers, graphic image converters,
> cross-platform capable products, network protocol
> implementations, specialized digital/communications hardware
> design, etc. Products are typically produced for OEMs.

9.6 Crynwr Software

11 Grant Street
Potsdam, NY 13676
(315) 268-1925
fax (315) 268-9201

Contact:
Russell Nelson
nelson@crynwr.com

Services:
Creation and support of Linux network drivers.

Background:
Crynwr Software has been selling support for free software since
1991. The particular software is entitled the Crynwr Packet
Driver Collection (formerly the Clarkson packet driver
collection).

9.7 Free Software Association Of Germany

Heimatring 19
W-6000 Frankfurt/Main 70
Germany
Phone/Fax: **++49-69-6312083**
BBS: **++49-69-6312934**
fsag@eurom.fsag.incom.de
fsag, 2:247/14 FidoNet

Contact:
Michaela Merz

Services:
Support

Rates:
1 - 8 hours: DM 150/hour
- 16 hours: DM 130/hour
- 32 hours: DM 110/hour
over 32 hours: DM 90/hour

Free support available for private users and some organizations.

9.8 Lasermoon Limited

Lasermoon Ltd
2a Beaconsfield Road
Fareham
Hants
PO16 0QB
United Kingdom

+44 329 826444   voice
+44 329 825936   fax

info@lasermoon.co.uk

Services:
- Networking and comms
- Unix device drivers
- Novell device drivers
- GUI's and embedded systems
- CD-ROM software distribution
- European distributor of the Linux Journal

9.9 LEMIS - Lehey Microcomputer Systems

Schellnhausen 2
W-6324 Feldatal
Germany

Phone: 06637/1488
Fax: 06637/1489
Modem: 06637/1553
Mail: lemis%lemis@germany.eu.net

Modem: The system understands V.22 (bis), V.32 (bis),
MNP5 and V.42 (bis). Log in as guest, password Guest.

Services:

LEMIS (Lehey Microcomputer Systems) specialises in
system-level support for UNIX and similar operating systems.
Services include design and installation consulting, ports,
software support, electronic mail connectivity and supply of
PC hardware and UNIX-based software. Support contracts are
available.

9.10 MB Associates

Domaine de La Grangeasse
05800 Saint-Firmin, FRANCE
+33 9255-2184, voice/fax

Contact:
Michel R. Barthelemy
mb@tsmotel.gatelink.fr.net

Background:
Team with extensive knowledge of system
and network design & programming

Services:
System-level support and training for Novell,
Linux and other Unix-like operating systems.
Customized systems design & production.
Design & Installation consulting.
E-Mail and networking technologies consulting.

9.11 MCO Zagreb

Hbarska 1B
41000 Zagreb
Croatia
+385 41 612 285
evening modem +385 41 615 556
fax +385 41 533 902

Contact:
Dragomir Milivojevic

Services:
Technical support, custom programming.

Rates:
DM 20 per hour for 1 person
DM 30 per hour for 2 person team

9.12 NeoSoft Corporation

>   3408 Mangum
>   Houston, Texas 77092
>   (713) 684-5969
>   fax (713) 684-5922

Contact:
>   Ellyn Mustard
>   ellyn@neosoft.com

Services:
>   Custom programming and support for Tcl and Tk.

Rates:
> $2500 for a year of commercial support, including 20 hours
>   of consultation, and installation of all new TclX releases
>   during the support period.

Backgrond:
>   NeoSoft developed and maintains extended tcl (TclX), which is
>   part of the Yggdrasil Plug-and-Play Linux distribution. The company also
>   sells routers and internet connectivity services in Houston,
>   Texas and St. Louis, Missouri.

9.13 Shallow Water Software

PO Box 410
Simpsonville, MD
(410) 997-8584

Contact:

Peter C. Olsen, P.E.

Services:

consulting, systems configuration, system maintenance, and custom software design for small businesses and professionals.

Rates:

$25 - $125 per engineering hour.
Free or discounted support for schools and non-profit organizations.

Background:

Previous work includes the operations research model used by the Coast Guard to measure the amount of work required to clean up the Exxon Valdez oil spill, a draft National Strategy for Civil Aviation Security done for the Secretary of Transportation, now under review by the FAA, and a Community Development Master Plan for Governors Island, New York, among other projects.

9.14 Signum Support AB

Box 2044
S-580 02 Linkoping
SWEDEN

Contact:
info@signum.se
fax: +46 (0)13 214700
phone: +46 (0)13 214600

Services:
Software packages ready to install with telephone/email
    support and quarterly updates.
Regular support contracts.
Printed manuals.
Installation, modification, misc support on an hourly rate.
Software development projects.

Specialties:
GNU development environment.
Plug-and-Play Linux Linux.
SunOS 4 and Solaris 2.
Email and news software.
Software for system security.
Software version control: RCS+CVS.
Software for image processing and computer graphics

Background:
Signum Support was founded in 1992 by 6 persons, all with
extensive knowledge in system maintenance and systems
programming. The company provides support for free
software, and does software development based on hourly
rates or fixed rates.

Rates
For source code and binaries of single programs, get our
    free catalog.
Consulting 450 SEK/hour and up.

9.15 John B. Thiel

18830 NW Rock Creek Circle #242
Portland, OR 97229
(503) 645-0839
Mail: jbthiel@cse.ogi.edu

Services:
Support, tutoring, design consultation, and custom development
on Linux and other free software (device drivers to applications).

Platforms:
Linux, Unix, X-Windows, OS/2, Dos/Windows

Relevant proficiencies:
C, Lisp, i86 asm
Unix system administration
Standard Unix software development tools/methodologies
More or less familiar with wide variety of other languages
and interfaces, e.g., SQL, Postcript, Perl, Awk, Rexx, etc.

Background:
Computer Science graduate studies (ongoing)
Electrical Engineering undergraduate
12 years computer experience; Linux since Aug, 1992.

9.16 Virtual World Information Systems

(508) 793-9568

Contact:
    Lawrence Foard
    lfoard@world.std.com

Services:
- Consulting,
- Device driver development,
- Software porting,
- Application development and customization
- Kernel modifications,
-
    Custom hardware design, including FPGA, PAL and circuit board
    manufacturing with in-house facilities.

Rates:
    $30-$50 per engineering hour.
    Fixed price bids available.

9.17 XIS Solutions

> Box 1459, SIUE
> Edwardsville, IL 62026-1459
> (618) 692-2943
> fax (618) 692-1420

Contact:
> Changyong Cao
> changyoc@daisy.siue.edu

XIS (X-related Information Systems) is an employee owned
consulting business providing services for the distribution,
installation, and support of various information systems. In
addition to the support of Linux and XFree, XIS is known to be
one of the few which distribute and support GRASS/LINUX – a
geographic information system for processing raster and vector
based spatial data and remotely sensed images. Our customers
include goverment agencies, universities, small business, and
students. Our staff include two Ph.D's in geographic
information systems with more than three years of experience
managing Sun and Intergraph workstations as well as teaching
geographic information system courses.

Our objective is to meet the needs of the rapid
development of the geographic information system industry, to
provide high quality services at reasonable price, and to
facilitate the practical application of Linux and related
systems.

Currently XIS provides on-site services (in addition
to the mail order service) in the following regions:

St. Louis, MO
New Orleans, LA
Jackson, MS

10 Support Services from Yggdrasil

10.1 Free Services

In general, any support that does not require human intervention from Yggdrasil is free. We maintain an anonymous FTP site with customer information: ftp.yggdrasil.com. If you do not have FTP access but you can send email to the internet, you may be able to perform FTP access by sending email to ftpmail@gatekeeper.dec.com.

Of course, you can also submit trouble reports for free by fax, email, or postal mail. Please submit well-researched trouble reports so that we can fix them in subsequent releases. If you find a way to fix the problem, that's even better and we will send your information back to the appropriate people in the free software community.

On the other hand, if you want us to give your bug report priority or your technical support need is tutorial in nature, then you should use one of our commercial support services listed below. For example, if you want to have somebody talk you through the process of installing your system, setting up an internet connection or partitioning your disk in some unusual way, you should use the consulting hotline. By recovering the costs of these services, we are able to hire more linux hackers to scale to the demand for technical support.

10.2 Commercial Services

Yggdrasil offers the following commercial support services:

- Consulting Hotline
- Personal Technical Support
- Business Technical Support
- Releases On Demand
- General Technical Services
- Development Contracts

10.2.1 Consulting Hotline

US only: 1-900-446-6075, extension 835 ("TEK"), $2.95 per minute, 11am-noon,1pm-5pm pacific time. Call (408) 261-6630 to have this service billed to your credit card or directly to your company (if you have an established account) instead of to your phone bill.

On an experimental basis, we are currently also offering technical support at \$25 per call. You must select this option at the beginning of your call.

You should use this service if you have a question which is tutorial in nature and you think that it would be a more efficient or more reliable use of your time than "RTFM" ("Reading The Manual"). For example, you might want to use this line if you want if you have a question about a specific emacs command or you want somebody to talk you through the process of installing some new kernel modification that you picked up from the net.

Anyone can use our consulting hotline, even users of other Linux distributions or people with general unix-related questions. So, tell your friends!

10.2.2 Personal Technical Support

With our 1-hour/1-year *Personal Technical Support* minicontract, you can call the consulting hot line for free or have us fix bugs off-line for you. Personal Technical Support is not transferable between users, but it does cover any Linux distribution that you use for a one year period, even one that isn't from Yggdrasil. So, your investment is relatively safe.

The \$100 price covers one year or one hour of consulting and engineering, whichever comes first. If you need more technical support, you can renew your contract for another engineering hour for \$100.

10.2.3 Business Technical Support

Yggdrasil will fix Plug-and-Play Linux bugs and implement temporary workarounds as necessary to minimize and hopefully eliminate any downtime due to Plug-and-Play Linux problems. Traditional Support prices are quoted individually, generally in units of one year, and are loosely based on the following formula:

$$(\text{machines + contact people + users[including contact people]})$$
$$\text{X \$60/month}$$

For example, technical support for a single-user machine would be calculated as follows:

$$(1 \text{ machine + 1 contact person + 1 user}) \text{ X \$60/month} = \text{\$180/month}$$
$$\text{X 12 months/year} = \text{\$2160/year}$$

10.2.4 Releases On Demand

For \$500, Yggdrasil will fix the Plug-and-Play Linux problem of your choice and send you a new gold "one off" CDROM with the problem fixed.

10.2.5 General Technical Services

Is there anything else that you want us to do to help? Do you need some documentation written? Perhaps you want a special device driver or some other new functionality implemented. For these types of miscellaneous projects, you can rent our time for $300 per engineering hour. Personal Technical Support and Business Technical Support services cost a lot less per hour because they improve future software releases and are often a purchase requirement for potential customers. So, our pricing for General Technical Services is not subsidized by as large of an expected effect on present and future sales.

All software that Yggdrasil Computing develops under this service is covered by either the GNU General Public License or the GNU Library General Public License.

10.2.6 Fixed Price Development Contracts

Yggdrasil can submit bids for free software development projects, starting at $5,000. Fixed price bids are computed on the basis of $400 per estimated engineering hour.

11 Copyrights and Acknowledgements

11.1 University of California Copyright

Some of the software in Plug-and-Play Linux is covered by the following copyright notice:

11.2 The GNU General Public License

Many parts of Plug-and-Play Linux, including this manual are covered by the following license.

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also meet all of these conditions:

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or in part contains or is derived from the Program or any part thereof, to
be licensed as a whole at no charge to all third parties under the terms of
this License.

c) If the modified program normally reads commands interactively when
run, you must cause it, when started running for such interactive use in
the most ordinary way, to print or display an announcement including an
appropriate copyright notice and a notice that there is no warranty (or else,
saying that you provide a warranty) and that users may redistribute the
program under these conditions, and telling the user how to view a copy of
this License. (Exception: if the Program itself is interactive but does not
normally print such an announcement, your work based on the Program is
not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifi-
able sections of that work are not derived from the Program, and can be
reasonably considered independent and separate works in themselves, then
this License, and its terms, do not apply to those sections when you dis-
tribute them as separate works. But when you distribute the same sections
as part of a whole which is a work based on the Program, the distribution
of the whole must be on the terms of this License, whose permissions for
other licensees extend to the entire whole, and thus to each and every part
regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your
rights to work written entirely by you; rather, the intent is to exercise the
right to control the distribution of derivative or collective works based on
the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

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ously your obligations under this License and any other pertinent obligations,
then as a consequence you may not distribute the Program at all. For ex-
ample, if a patent license would not permit royalty-free redistribution of the
Program by all those who receive copies directly or indirectly through you,
then the only way you could satisfy both it and this License would be to
refrain entirely from distribution of the Program.

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END OF TERMS AND CONDITIONS

Appendix: How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the program's name and a brief idea of what it does.> Copyright (C) 19yy <name of author>

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The hypothetical commands 'show w' and 'show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than 'show w' and 'show c'; they could even be mouse-clicks or menu items—whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

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<signature of Ty Coon>, 1 April 1989 Ty Coon, President of Vice

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library. If this is what you want to do, use the GNU Library General Public License instead of this License.

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Many of the programs in Plug-and-Play Linux are covered by copyrights of the Massachusetts Institute of Technology, Digital Equipment Corporation, Sun Microsystems, and many many other companies and individuals. Yggdrasil is grateful to the many organizations and individuals who have made Plug-and-Play Linux possible, although this paragraph does not imply endorsement by any of those entities.

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Note that much of the software that comprises Plug-and-Play Linux, while free, requires that any derivatives works also be freely redistributable. Simply using Plug-and-Play Linux to develop a program does not make it a derivative work of software covered by such restrictions.

12 What does *Yggdrasil* mean and how do you pronounce it?

The *Y* in *Yggdrasil* is pronounced like a short *i*. All of the vowels are short and the *g*'s are hard. *Yggdrasil* is pronounced "Ig dra sil," and rhymes with "Clearasil." The State of California rejected the name "Yggdrasil Corporation" on the grounds that it was not sufficiently unique, which is why the company is named "Yggdrasil Computing, Incorporated."

Yggdrasil is the name of the world tree in Norse mythology. The roots of Yggdrasil reached into the underworld, and its branches supported the heavens. This symbolism is intended to illustrate the mission of Yggdrasil Computing, Incorporated: to provide infrastructure to support the free software world.

13 Other Interesting CDROM's

If you bought a CDROM drive for the purpose of running Plug-and-Play Linux, you may now be looking for other interesting CDROM titles to run with your CDROM drive. Here are a couple of companies that make other interesting freeware CDROM's that you may be interested in.

InfoMagic, Inc.
Post Office Box 338
Pennington NJ 08534
(609) 683-5501
fax (609) 683-1342

Prime Time Freeware
370 Altair Way, Suite 150
Sunnyvale, CA 94086
(408) 433-9662
fax (408) 433-0727

Walnut Creek CDROM
1547 Palos Verdes Mall #260
Walnut Creek, CA 94596
(510) 674-0783
fax (510) 674-0821

14 Direct Sales Order Form

Plug-and-Play Linux is produced quarterly by Yggdrasil Computing, Incorporated. If you would like a subscription to Plug-and-Play Linux, please fill out the following page and mail your order to:

Yggdrasil Computing, Incorporated
End User Sales
4880 Stevens Creek, Suite 205
San Jose, California 95129-1034
United States of America

You can also fax your order to (408) 261-6631, or order by telephone, 24 hours a day, 365 days a year, (408) 261-6630, toll free: (800) 261-6630.

14.1 Update Subscriptions

You can use the direct sales order form to order update subscriptions. In order to avoid duplication, update subscriptions begin with the issue after the one that is current when your order is received.

14.2 Motif

The direct sales order form includes a line for ordering Motif. This line is for orders of unencrypted copies of Motif on separate media.

Your copy of Plug-and-Play Linux includes a locked copy of OSF/Motif. You must call us to unlock your copy of Motif. OSF/Motif is proprietary software. The price is $149.95 **per CPU**.

When you buy OSF/Motif from Yggdrasil, US$5 of the price of each license is donated to the development of a free Motif clone, and you get the following simple no-nonsense license statement instead of one of those ridiculous shrink wrap license "agreements."

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1 year update subscription (4 releases)     ____   X   $99.95  = $_____


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The Linux Bible (800 pages: kernel hacking,  ____  X   $39.95  = $_____
 networking, installation, over a dozen "How To" guides, and more!)
OSF/Motif for Linux                         ____   X  $149.95  = $_____


Prime Time Freeware for unix                ____   X   $59.95  = $_____


Personal Technical Support                  ____   X  $100.00  = $_____
(1 year/1 engineering hour)
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Table of Contents