



i n v e n t



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Introduction to Linux for HP-UX System Administrators

HP-ux 11

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Seminar Agenda

- Introduction
- Disk Partitioning Tutorial
- System Installation
- Boot Managers – LILO and GRUB
- Booting and Startup
- Hardware Configuration and Troubleshooting
- File System Layout
- Software Installation and Update
- System Administration Tasks
- Building The Linux Kernel and Modules
- Dynamic Kernel Moduels
- Configuring Your Sound Card
- Configuring X-Windows
- Miscellaneous Redhat Configuration Tools
- System Installation with Kickstart
- Miscellaneous Linux Cool Stuff



HP-UX:
UNIX
for the Enterprise





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Warning!

This seminar is intended for HP-UX administrators that have little or no experience with Linux. If you have just spent a week in Linux boot-camp, then the contents of this seminar will be too basic for you.



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Introduction

What is Linux?

What is a Linux Distribution?

Linux Versioning

What is Open Source?

Getting Help and Software





What is Linux?

- When we say “Linux”, we are really talking about three things:
 - An open source kernel, written by Linus Torvalds (Linux)
 - A set of open source tools from the “Free Software Foundation”, the GNU tools
 - A system “structure”, philosophy, and installation tool(s)
- Linux is Unix, like HP-UX, but has differences that we need to consider as HP-UX system administrators
- This is not an exhaustive tutorial, just some of the things that I have run into during my exposure to Linux, with an HP-UX administration slant
- This seminar is based on the RedHat Linux 7.2 and 7.3 *distribution*, there are many others (SuSE, Debian, ...)



What is a Linux Distribution?

- A particular version of the kernel
 - RedHat 7.3 is based on the 2.4.18-3 kernel
- A particular set of packages and a package manager
 - May be in Redhat Package Manager (RPM) format
 - May be in Debian (Deb) format
 - May be tar-balls or source packages
- A set of installation tools
 - Disk partitioning
 - System installation
- “Value Added”
 - Update
 - Support
 - Documentation





Explaining Linux Versioning

- The Linux kernel and most packages follow a similar versioning scheme
- Kernel Version = MajorRelease.MinorRelease.Step
 - Odd minor-release kernels are “development”
 - Even minor-release kernels are “stable”
 - Minor release numbers are incremented with patches
 - Example “2.4.18-3” is a stable kernel
- Packages use a similar scheme (more later on this)
 - red-carpet-1.3.3-4.ximian.1.i386.rpm
 - gdb-5.2-2.i386.rpm
 - ethereal-0.9.4-0.7.3.0.i386.rpm



What is Open Source?

- Software protected by the GNU General Public License (GPL) or similar license schemes
- There are multiple versions of the GPL and other “open-source” license schemes
- From /usr/src/linux2.4/Documentation/COPYING:

“Also note that the only valid version of the GPL as far as the kernel is concerned is this particular version of the license (ie v2, not v2.2 or v3.x or whatever), unless explicitly otherwise stated.”

-- Linus Torvalds



What is Open Source?

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, **the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.** This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our **General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.**

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it. **For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have.** You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software. [...]

from: /usr/src/linux2.4/Documentation/COPYING © 1989, 1991 Free Software Foundation, Inc.



Getting Help and Software?

- Open Source software is available from a *lot* of places. I tend to frequent:
 - <http://www.rpmfind.net>
 - <http://www.sourceforge.net>
- Documentation and HOWTOs can tend to be out of date. The Redhat site is good for Redhat specific documentation and has pointers to other sites
- There are lots of news groups and chat channels devoted to all aspects of Linux and GNU applications
- There are formal support channels available for Linux: HP, Redhat, etc.



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Disk Partitioning Tutorial

Floppy Disk Format
The Master Boot Record (MBR)
Partition Layout for a Hard Disk
Devices for Primary Partitions
Devices for Extended Partitions



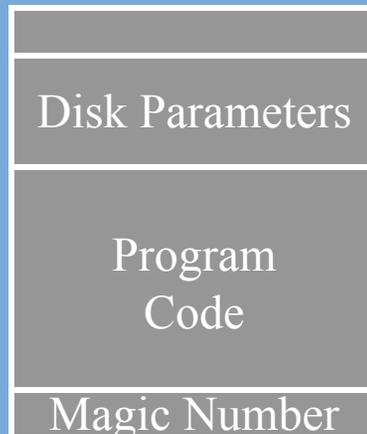


Data Layout for a Floppy Disk

Boot Sector



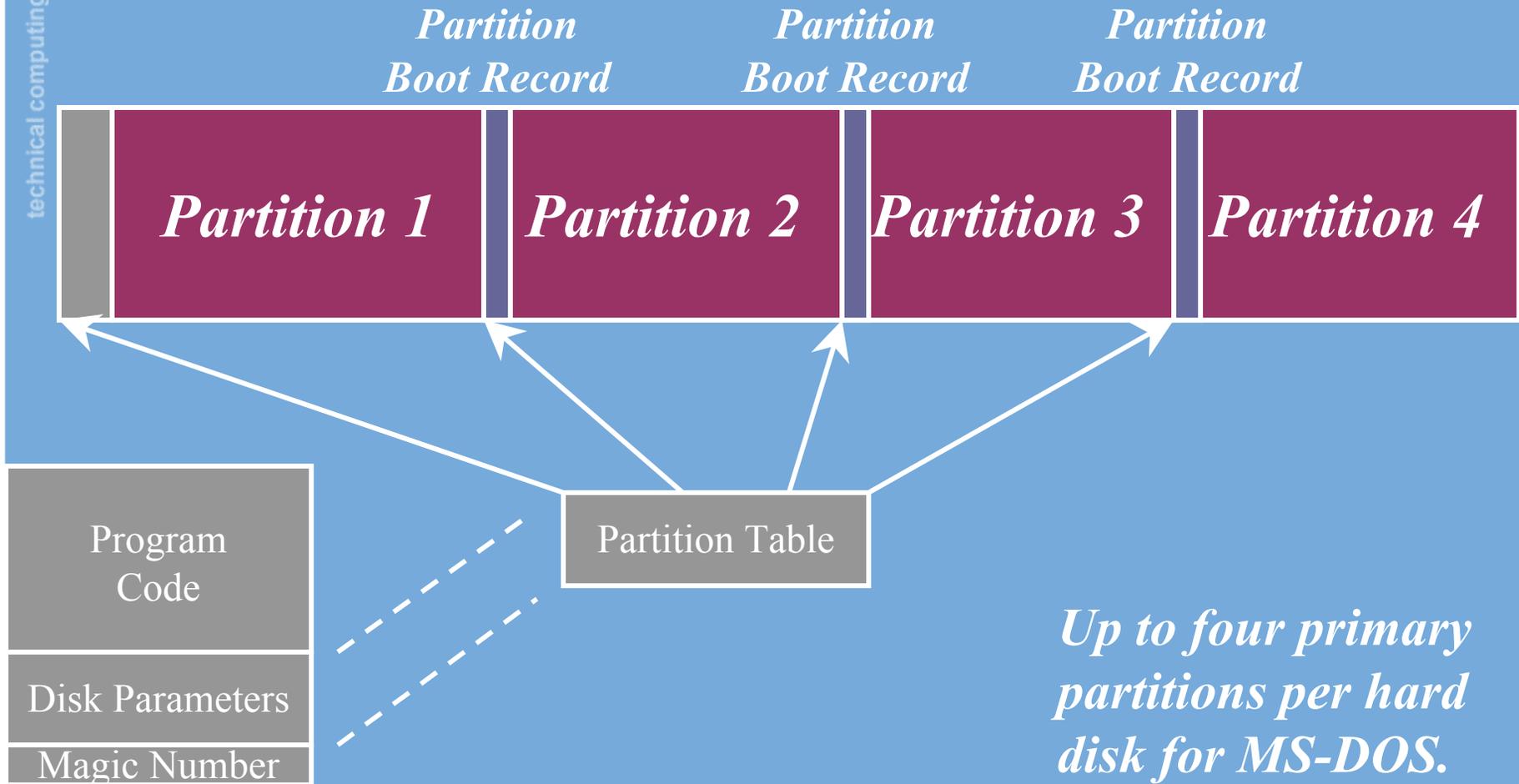
*MS-DOS
Boot Sector*





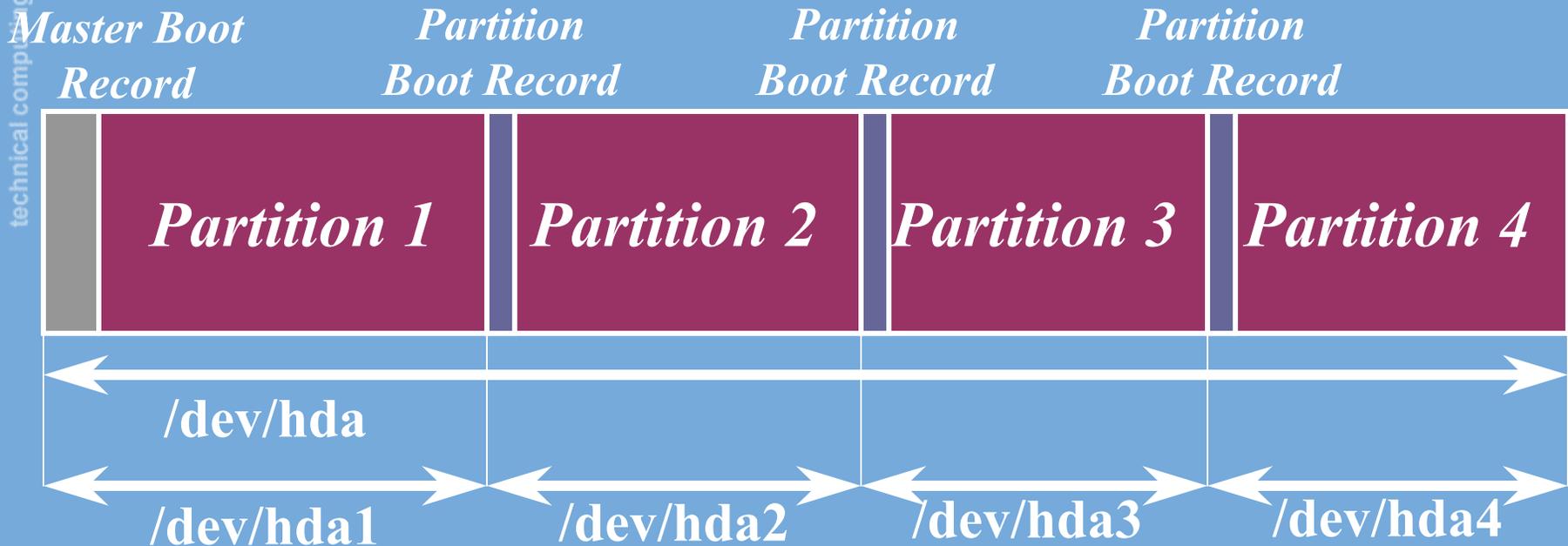
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Data Layout for a Hard Disk (without extended partitions)





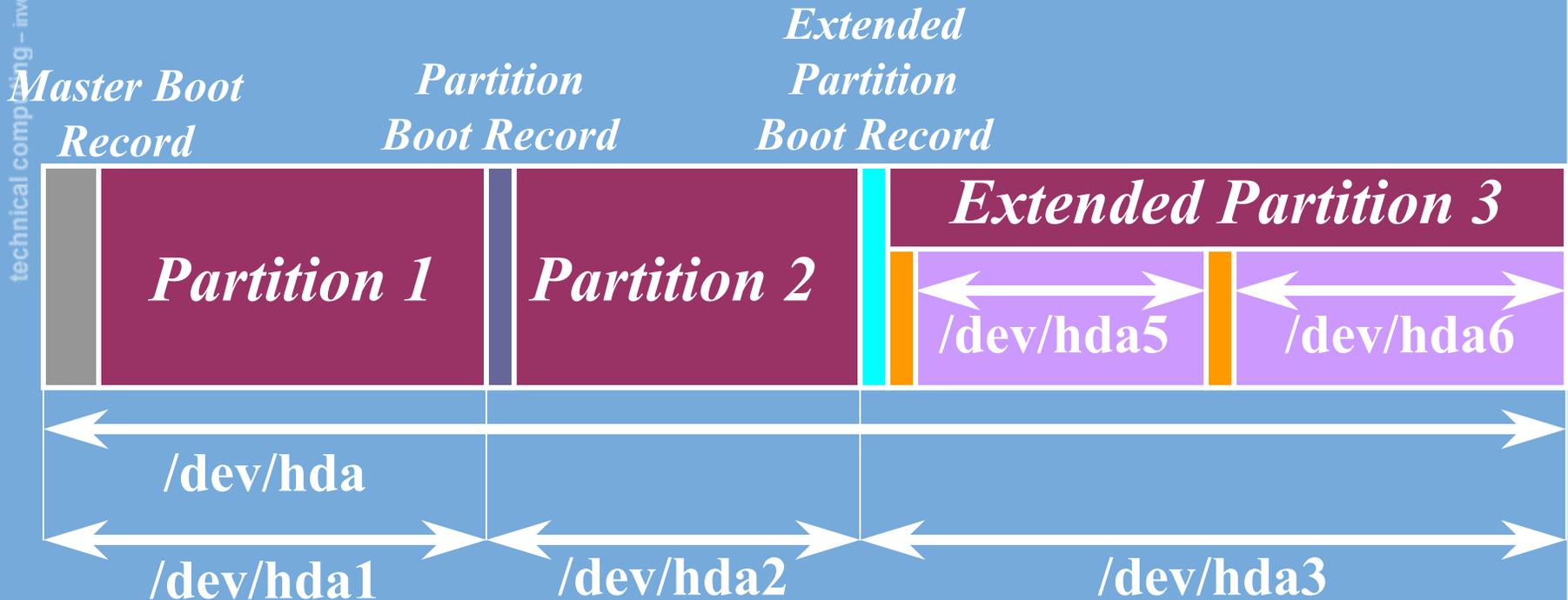
Data Layout for an IDE Hard Disk (without extended partitions)



Note that each partition is accessible as if it were an independent device with its own boot sector. Linux creates devices for this configuration as shown.



Data Layout for an IDE Hard Disk (with extended partitions)



If more than four partitions are needed, one primary partition is divided into an extended partition containing several logical partitions. Note that the partition tables of the logical partitions are not accessible as the first block of some device.



Partition Table from My Laptop

```
# fdisk /dev/hda
```

The number of cylinders for this disk is set to 1559.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:

- 1) software that runs at boot time (e.g., old versions of LILO)
- 2) booting and partitioning software from other Oses
(e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p

Disk /dev/hda: 240 heads, 63 sectors, 1559 cylinders
Units = cylinders of 15120 * 512 bytes

Device	Boot	Start	End	Blocks	Id	System
/dev/hda1	*	1	5	37768+	83	Linux
/dev/hda2		6	109	786240	82	Linux swap
/dev/hda3		110	1559	10962000	83	Linux



Lessons Learned About Multi-Boot Systems

- If you have an NTFS file system, then it must be in the first partition on the disk (example order: Windows NT/XP, Windows 98, /boot, FAT16)
- All bootable partitions must be within 1023 cylinders of the start of the drive
- Windows will only boot if within the first 4 GB of the disk
- There can be only one active/visible partition unless you use a boot manager like BootMagic
- Bootable partitions must be on IDE disk 0 or SCSI disk 0
- Only four primary partitions per disk
- NT does not know how to read FAT32 file systems, XP does
- If your first drive is SCSI or RAID, Linux may not have the drivers built into the kernel, so you **MUST** configure an initial RAM disk image containing the dynamically loadable kernel modules (more later)



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Redhat Linux System Installation



Booting the Install Media

Partitioning the Disk

Installing the Boot Loader

Configuring the Network

Configuring the Firewall

Options

Picking Packages

Installing Packages

Video Configuration

Boot Disk Creation

X-Windows Configuration

Reboot



System Installation

- HP-UX
 - CD-ROM or dvd
 - Ignite-UX (network)
- Software Distribution Utilities (SDU)
- Graphical or text-based installation tool
- Three main phases:
 - Configure disk layout
 - Install system filesets
 - Configure subsystems



- Redhat Linux
 - CD-ROM or floppy
 - Kickstart (network)
- Redhat Package Manager (RPM)
- Graphical or text-based (VGA) installation tool
- Three main phases:
 - Partition the disk
 - Install system packages
 - Configure subsystems



Booting the Installation Media

Welcome to Red Hat Linux 7.2!

- To install or upgrade Red Hat Linux in graphical mode, press the <ENTER> key.
- To install or upgrade Red Hat Linux in text mode, type: text <ENTER>.
- To enable low resolution mode, type: lowres <ENTER>. Press <F2> for more information about low resolution mode.
- To disable framebuffer mode, type: nofb <ENTER>. Press <F2> for more information about disabling framebuffer mode.
- To enable expert mode, type: expert <ENTER>. Press <F3> for more information about expert mode.
- To enable rescue mode, type: linux rescue <ENTER>. Press <F5> for more information about rescue mode.
- If you have a driver disk, type: linux dd <ENTER>.
- Use the function keys listed below for more information.

[F1-Main] [F2-General] [F3-Expert] [F4-Kernel] [F5-Rescue]

boot: _



Selecting the Default Language

Online Help

Language Selection

Choose the language you would like to use during this Red Hat Linux installation.

Language Selection



What language would you like to use during the installation process?

- Czech
- Danish
- English**
- French
- German
- Icelandic
- Italian
- Japanese
- Korean
- Norwegian
- Russian
- Slovenian
- Spanish
- Swedish
- Ukrainian

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Configuring the Keyboard

Online Help

Keyboard Configuration

Choose your exact keyboard model if it is listed. If you cannot find an exact match, choose the closest *Generic* match (for example, Generic 101-key PC).

Hint: A 101-key keyboard is a generic keyboard. A 104-key or 105-key keyboard is a keyboard designed to work with MS Windows 95 and features Windows-specific keys.

Choose the layout type for your keyboard (for

Keyboard Configuration

 Which model keyboard is attached to the computer?

Model

- Generic 102-key (Intl) PC
- Generic 104-key PC
- Generic 105-key (Intl) PC**
- Genius Comfy KB-16M
- HP Internet

Layout

- Thai
- Turkish
- U.S. English**
- U.S. English w/ deadkeys
- U.S. English w/ISO9995-3

Dead Keys

- Disable dead keys
- Enable dead keys**

Test your selection here:

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Configuring the Mouse

Online Help

Mouse Configuration

Choose the correct mouse type for your system.

Do you have a PS/2, Bus or serial mouse? (Hint: If the connector your mouse plugs into is round, it is a PS/2 or a Bus mouse; if rectangular, it is a serial mouse.)

Try to find an exact match. If an exact match cannot be found, choose one which is compatible with yours. Otherwise, choose the appropriate *Generic* mouse type.

Mouse Configuration

 Which model mouse is attached to the computer?

- ALPS GlidePoint (PS/2)
- ▷ ASCII
- ATI Bus Mouse
- ▼ Generic
 - 2 Button Mouse (PS/2)
 - 2 Button Mouse (USB)
 - 2 Button Mouse (serial)
 - 3 Button Mouse (PS/2)**
 - 3 Button Mouse (USB)
 - 3 Button Mouse (serial)
- ▷ Genius
- ▷ Kensington
- ▷ Logitech
- ▷ MM

Port	Device
ttyS0	/dev/ttyS0 (COM1 under DOS)
ttyS1	/dev/ttyS1 (COM2 under DOS)
ttyS2	/dev/ttyS2 (COM3 under DOS)
ttyS3	/dev/ttyS3 (COM4 under DOS)

Emulate 3 Buttons

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Welcome to Redhat Installation

Online Help

Welcome to Red Hat Linux

Welcome! This installation process is outlined in detail in the *Red Hat Linux Installation Guide* available from Red Hat, Inc.. Please read through the entire manual before you begin this installation process.

HTML and PDF copies of the manual are available online at <http://www.redhat.com>. There is also an HTML

Welcome



redhat.
Linux 7.2

© 1995-2001 Red Hat, Inc.

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Selecting Installation Type

Online Help

Install Options

Choose whether you would like to perform a full installation or an upgrade.

A full installation will destroy any previously saved information on the selected partitions.

An upgrade will preserve existing Red Hat Linux system data.

If you want to perform a full installation, you must choose the class (or type) of the installation. Your options (Workstation, Server, Laptop, Custom),

Installation Type

   Install

 Workstation

 Server

 Laptop

 Custom

   Upgrade Existing System

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Selecting a Laptop Installation

Online Help

Install Options

Choose whether you would like to perform a full installation or an upgrade.

A full installation will destroy any previously saved information on the selected partitions.

An upgrade will preserve existing Red Hat Linux system data.

If you want to perform a full installation, you must choose the class (or type) of the installation. Your options (Workstation, Server, Laptop, Custom)

Installation Type

-    Install
-  Workstation
-  Server
-  Laptop
-  Custom

-    Upgrade Existing System

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Disk Partitioning: Choose Tool

Online Help

Choosing Your Partitioning Strategy

One of the largest obstacles for a new user during a Linux installation is partitioning. Red Hat Linux makes this process much simpler by providing an option for automatic partitioning.

By selecting automatic partitioning, you will not have to use partitioning tools to assign mount points, create partitions, or allocate space for your installation.

Disk Partitioning Setup

Automatic Partitioning sets up your partitioning based on your installation type. You also can customize the resulting partitions to meet your needs.

The manual disk partitioning tool, Disk Druid, allows you to set up your partitions in an interactive environment. You can set the filesystem types, mount points, size and more in this easy to use, powerful interface.

fdisk is the traditional, text-based partitioning tool offered by Red Hat. Although it is not as easy to use, there are cases where fdisk is preferred.

- Have the installer automatically partition for you
- Manually partition with Disk Druid
- Manually partition with fdisk [experts only]

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Disk Partitioning: Disk Druid

Online Help

Choosing Your Partitioning Strategy

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Have the installer automatically partition for you

Manually partition with Disk Druid

Manually partition with fdisk [experts only]

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Disk Partitioning: Empty Disk

Online Help

Partitions

Choose where you would like Red Hat Linux to be installed.

If you do not know how to partition your system, please read the section on partitioning in the *Red Hat Linux Installation Guide*.

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

If you just finished partitioning with `fdisk`, you must define *mount*

Disk Setup

Drive /dev/sda (Geom: 510/255/63) (Model: VMware, VMware Virtual)

Free
4000 MB

New Edit Delete Reset Make RAID

Device	Start	End	Size (MB)	Type	Mount Point	Format
[-] /dev/sda						
└ Free	1	510	4001	Free space		

Back Next



Disk Partitioning: Creating /boot

Online Help | Disk Setup

Partitions

Choose where you want to install Red Hat Linux to be installed.

If you do not know how to partition your system, please read the section on partitioning in the *Red Hat Linux Installation Guide*.

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

If you just finished partitioning with fdisk, you must define mount

Mount Point: /boot

Filesystem Type: ext3

Allowable Drives: sda: VMware, VMware Virtual

Size (MB): 32

Additional Size Options

- Fixed size
- Fill all space up to (MB): 32
- Fill to maximum allowable size

Force to be a primary partition

Check for bad blocks

Reset | Make RAID

Mount Point	Format

OK | Cancel

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Disk Partitioning: /boot Created

Online Help

Partitions

Choose where you would like Red Hat Linux to be installed.

If you do not know how to partition your system, please read the section on partitioning in the *Red Hat Linux Installation Guide*.

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

If you just finished partitioning with `fdisk`, you must define *mount*

Disk Setup

Drive `/dev/sda` (Geom: 510/255/63) (Model: VMware, VMware Virtual)

Free
3969 MB

[New](#) [Edit](#) [Delete](#) [Reset](#) [Make RAID](#)

Device	Start	End	Size (MB)	Type	Mount Point	For
- /dev/sda						
/dev/sda1	1	4	31	ext3	/boot	Yes
Free	5	510	3969	Free space		

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Disk Partitioning: Format Choices

Partitions

Choose where you would like Red Hat Linux to be installed.

If you do not know how to partition your system, please read the section on partitioning in the *Red Hat Linux Installation Guide*.

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

If you just finished partitioning with `fdisk`, you must define `mount`

Mount Point:

Filesystem Type:

Allowable Drives:

Size (MB):

Additional Size Options:

- Fixed size
- Fill all space up to (MB): 1
- Fill to maximum allowable size

Force to be a primary partition

Check for bad blocks

OK Cancel

Mount Point	Format
/boot	Yes

Reset Make RAID

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Disk Partitioning: Swap Created

Online Help

Partitions

Choose where you would like Red Hat Linux to be installed.

If you do not know how to partition your system, please read the section on partitioning in the *Red Hat Linux Installation Guide*.

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

If you just finished partitioning with `fdisk`, you must define *mount*

Disk Setup

Drive `/dev/sda` (Geom: 510/255/63) (Model: VMware, VMware Virtual)

sda2	Free
509 MB	3459 MB

New Edit Delete Reset Make RAID

Device	Start	End	Size (MB)	Type	Mount Point	For
- /dev/sda						
- /dev/sda1	1	4	31	ext3	/boot	Yes
- /dev/sda2	5	69	510	swap		Yes
- Free	70	510	3459	Free space		

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Disk Partitioning: Creating /

Online Help
Disk Setup

Partitions

Choose where you want to install Red Hat Linux to be installed.

If you do not know how to partition your system, please read the section on partitioning in the *Red Hat Linux Installation Guide*.

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

If you just finished partitioning with `fdisk`, you must define `mount`

Mount Point:

Filesystem Type:

Allowable Drives:

Size (MB):

Additional Size Options:

Fixed size

Fill all space up to (MB):

Fill to maximum allowable size

Force to be a primary partition

Check for bad blocks

	Mount Point	Format
	/boot	Yes
	space	Yes



Disk Partitioning: Final Configuration

Online Help

Partitions

Choose where you would like Red Hat Linux to be installed.

If you do not know how to partition your system, please read the section on partitioning in the *Red Hat Linux Installation Guide*.

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

If you just finished partitioning with `fdisk`, you must define *mount*

Disk Setup

Drive `/dev/sda` (Geom: 510/255/63) (Model: VMware, VMware Virtual)

sda2 509 MB	sda3 3459 MB
----------------	-----------------

[New](#) [Edit](#) [Delete](#) [Reset](#) [Make RAID](#)

Device	Start	End	Size (MB)	Type	Mount Point	Format
- /dev/sda						
-/dev/sda1	1	4	31	ext3	/boot	Yes
-/dev/sda2	5	69	510	swap		Yes
-/dev/sda3	70	510	3459	ext3	/	Yes

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Boot Loader Selection and Installation

Online Help

Boot Loader Installation

New to Red Hat Linux 7.2, GRUB is a software boot loader that can be used to start Red Hat Linux on your computer. It can also start other operating systems, such as Windows 9x. Here, you'll be asked how (or whether) you want to configure a boot loader and which one (GRUB or LILO).

Choose which boot loader you want to install. If you would rather use the legacy boot loader, LILO, make sure it is selected

Boot Loader Configuration

Please select the boot loader that the computer will use. GRUB is the default boot loader. However, if you do not wish to overwrite your current boot loader, select "Do not install a boot loader."

Use GRUB as the boot loader
 Use LILO as the boot loader
 Do not install a boot loader

Install Boot Loader record on:

/dev/sda Master Boot Record (MBR)
 /dev/sda1 First sector of boot partition

Kernel Parameters:

Force use of LBA32 (not normally required)

Partition: /dev/sda3 Type:ext3
 Default boot image

Boot label:

Default	Device	Partition type	Boot label
<input checked="" type="checkbox"/>	/dev/sda3	ext3	Red Hat Linux

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GRUB Password Initialization

Online Help

GRUB Password

Now that you have chosen to install GRUB as your boot loader, you should create a password to protect your system. Users can pass options to the kernel which can compromise your system security.

To enhance your system security, you should select *Use a Grub Password*.

Once selected, enter in a password and then confirm it.

Boot Loader Password Configuration

A boot loader password prevents users from passing arbitrary options to the kernel. For highest security, we recommend setting a password, but this is not necessary for more casual users.

Use a GRUB Password?

Password:

Confirm:

Please enter password

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Network Parameter Configuration

Online Help

Network Configuration

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

If you do not have DHCP client access or are

Network Configuration

eth0 |

Configure using DHCP

Activate on boot

IP Address:

Netmask:

Network:

Broadcast:

Hostname:

Gateway:

Primary DNS:

Secondary DNS:

Ternary DNS:

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Firewall Installation and Configuration

Online Help

Medium Security -
Choosing **Medium Security** will not allow your system to have access to certain resources. By default, access to the following resources are not allowed:

- ports lower than 1023 - these are the standard reserved ports, used by most system services, such as FTP, SSH, telnet, and HTTP.
- NFS server port (2049)
- the local X Window System

Firewall Configuration

Please choose your security level:

High Medium No firewall

Use default firewall rules

Customize

Trusted devices: eth0

Allow incoming:

- DHCP
- SSH
- Telnet
- WWW (HTTP)
- Mail (SMTP)
- FTP

Other ports:

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Additional Language Installation

Online Help

Language Support Selection

Select a language to use as the default language. The default language will be the language used on your Red Hat Linux system once installation is complete. If you choose to install other languages, it is possible to change the default language after the installation.

Red Hat Linux can alternately install and support several languages. To use more than one language on

Additional Language Support

Choose the default language for this system:

Choose additional languages you would like to use on this system:

<input type="checkbox"/> English (Botswana)	Select all
<input type="checkbox"/> English (Canada)	
<input type="checkbox"/> English (Denmark)	Reset
<input type="checkbox"/> English (Great Britain)	
<input type="checkbox"/> English (Hong Kong)	
<input type="checkbox"/> English (Ireland)	
<input type="checkbox"/> English (New Zealand)	
<input type="checkbox"/> English (Philippines)	
<input type="checkbox"/> English (Singapore)	
<input type="checkbox"/> English (South Africa)	
<input checked="" type="checkbox"/> English (USA)	
<input type="checkbox"/> English (Zimbabwe)	
<input type="checkbox"/> Estonian	
<input type="checkbox"/> Faroese (Faroe Islands)	
<input type="checkbox"/> Finnish	
<input type="checkbox"/> French (Belgium)	
<input type="checkbox"/> French (Canada)	
<input type="checkbox"/> French (France)	
<input type="checkbox"/> French (Luxemburg)	
<input type="checkbox"/> French (Switzerland)	
<input type="checkbox"/> Galician (Spain)	

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Setting the Time Zone

Online Help

Time Zone Selection

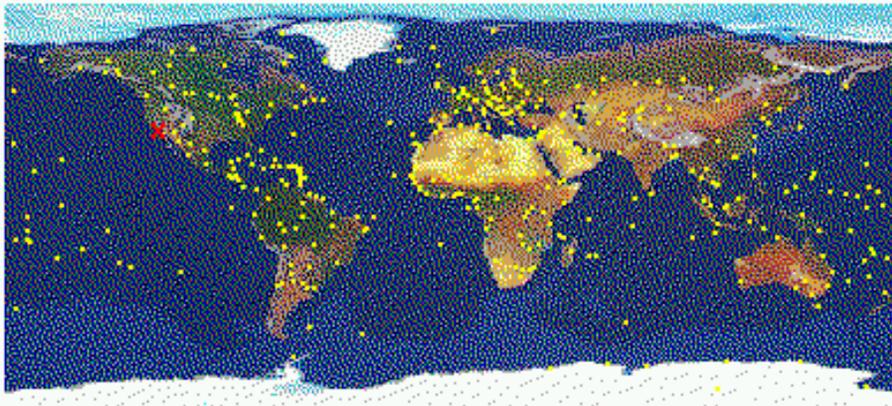
You can set your time zone either by selecting your computer's physical location, or by your time zone's offset from Universal Coordinated Time (also known as UTC).

Notice the two tabs at the top of the screen. The first tab offers you the ability to configure by location. With this option, you can choose your view. In choosing **View**, your options are: World, North America, South America, Pacific Rim, Europe,

Time Zone Selection

Location **UTC Offset**

View: **World** System clock uses UTC 



America/Jujuy	Jujuy (JY)
America/Juneau	Alaska Time - Alaska panhandle
America/Kentucky/Monticello	Eastern Time - Kentucky - Wayne
America/La_Paz	
America/Lima	
America/Los_Angeles	Pacific Time

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Setting Initial Accounts

Online Help

Account Configuration

Note: Setting up a root account and password is one of the most important steps during your installation. Your root account enables you to install packages, upgrade RPMs and do most system maintenance. Logging in as root gives you complete control of your system and is very powerful.

Use the root account *only* for administration. Create a non-root account for your general use and **su -** to gain root access when

Account Configuration

Enter the password for the root user (administrator) of this system.

Root Password:

Confirm:

Root password accepted.

Add a New User

User Name:

Full Name:

Password:

Confirm:

User password is too short.

Other users of this system can use their personal login accounts. If you need to use this system as a regular user, you need to use this additional user.

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Setting Initial Accounts Completed

Online Help

Account Configuration

Note: Setting up a root account and password is one of the most important steps during your installation. Your root account enables you to install packages, upgrade RPMs and do most system maintenance. Logging in as root gives you complete control over your system and is very powerful.

Use the root account *only* for administration. Create a non-root account for your general use and **su -** to gain root access when

Account Configuration

 Enter the password for the root user (administrator) of this system.

Root Password:

Confirm:

Root password accepted.

 Additional accounts can be created for other users of this system. Such accounts could be for a personal login account, or for other non-administrative users who need to use this system. Use the <Add> button to enter additional user accounts.

Account Name	Full Name	
rlucke	Rob Lucke	<input type="button" value="Add"/>
		<input type="button" value="Edit"/>
		<input type="button" value="Delete"/>



Choosing Package Groups

Online Help

Selecting Package Groups

Select the package (application) groups that you want to install. To select a package group, click on the check box beside it.

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

Package Group Selection

-  GNOME
-  KDE
-  Software Development
-  Games and Entertainment

Select individual packages

Total install size: 869M

? Hide Help

? Release Notes

◀ Back

▶ Next



Choosing the Video Interface

Online Help

Video Configuration

Although, the installation program probes to determine the best video card for your system, you can choose another video card if needed.

Once you have selected your video card, choose the amount of video RAM present on your card.

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

Graphical Interface (X) Configuration

In most cases your video hardware can be probed to automatically determine the best settings for your display.

If the probed settings do not match your hardware, select the correct hardware settings below:

- ▶ **Generic**
- ▶ Other
- ▶ 3DLabs
- ▶ ABit
- ▶ AOpen
- ▶ ASUS
- ▶ ATI
- ▶ Actix
- ▶ Ark Logic
- ▶ Avance Logic
- ▶ Compaq
- ▶ Canopus
- ▶ Cardex
- ▶ Chaintech
- ▶ Chips & Technologies
- ▶ Cirrus
- ▶ Creative Labs
- ▶ DFI

Video card RAM: [▲ ▼]

Skip X Configuration

? Hide Help ? Release Notes ◀ Back ▶ Next



Video Card Selected

Online Help

Video Configuration

Although, the installation program probes to determine the best video card for your system, you can choose another video card if needed.

Once you have selected your video card, choose the amount of video RAM present on your card.

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

Graphical Interface (X) Configuration

In most cases your video hardware can be probed to automatically determine the best settings for your display.

If the probed settings do not match your hardware, select the correct hardware settings below:

- Generic
 - Generic 3DLabs
 - Generic 8514
 - Generic I128
 - Generic Mach32
 - Generic Mach64
 - Generic Mach8
 - Generic P9000
 - Generic S3
 - Generic S3V
 - Generic SVGA**
 - Generic W32
- Other
- 3DLabs
- ABit
- AOpen
- ASUS
- ATI

Video card RAM:

Skip X Configuration



Installation Point of No Return

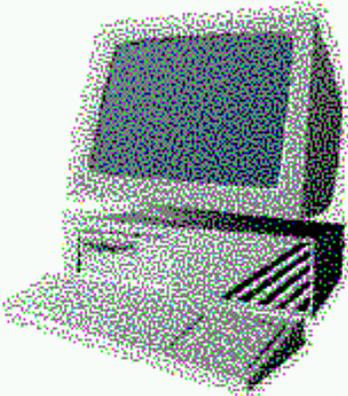
Online Help

About to Install

Caution: Once you click **Next**, the installation program will begin writing the Red Hat Linux operating system to your hard drive. This process cannot be undone. If you have decided not to install Red Hat Linux, this is the last point at which you can abort the installation process.

To abort this installation, remove all Red Hat Linux media, and press your computer's **Reset** button or reset using **Control-Alt-Delete**.

About to Install



Click next to begin installation of Red Hat Linux.

A complete log of your installation will be in `/tmp/install.log` after rebooting your system. You may want to keep this file for later reference. A kickstart file representing the choices you have made will be in `/root/anaconda-ks.cfg`.

 Hide Help

 Release Notes

 Back

 Next



File System Formatting

Online Help

Installing Packages

We have gathered all the information needed to install Red Hat Linux on your system. It may take a while to install everything, depending on how many packages need to be installed.

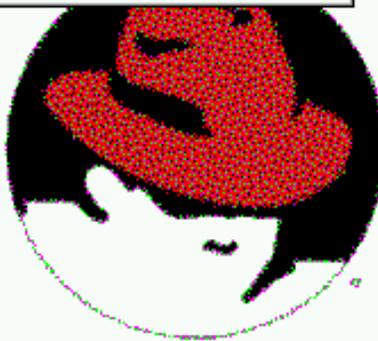
Installing Packages

Package:
Size:
Summary:

Package Progress:
Total Progress:

Status	Packages	Size	Time
Total	0	0 M	0:00:00
Completed	0	0 M	0:00:00
F	0	0 M	0:00:00

Formatting / filesystem...



redhat

Hide Help Release Notes Back Next



Transfer Installation Image

Online Help

Installing Packages

We have gathered all the information needed to install Red Hat Linux on your system. It may take a while to install everything, depending on how many packages need to be installed.

Installing Packages

Package:
Size:
Summary:

Package Progress:
Total Progress:

Status	Packages	Size	Time
Total	0	0 M	0:00:00
Completed	0	0 M	0:00:00
		0 M	0:00:00

Transferring install image to hard drive...

**redhat**

Hide Help Release Notes Back Next



Install Packages: Start

Online Help

Installing Packages

We have gathered all the information needed to install Red Hat Linux on your system. It may take a while to install everything, depending on how many packages need to be installed.

Installing Packages

Package: glibc-common-2.2.4-13
Size: 125,096 KBytes
Summary: Common binaries and locale data for glibc.

Package Progress:

Total Progress:

Status	Packages	Size	Time
Total	397	873 M	0:00:00
Completed	0	0 M	0:00:00
Remaining	0	0 M	0:00:00



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Hide Help

Release Notes

Back

Next



Install Packages: Continuing

Online Help

Installing Packages

We have gathered all the information needed to install Red Hat Linux on your system. It may take a while to install everything, depending on how many packages need to be installed.

Installing Packages

Package: perl-5.6.0-17
Size: 27,040 KBytes
Summary: The Perl programming language.

Package Progress:

Total Progress:

Status	Packages	Size	Time
Total	397	873 M	0:50:04
Completed	31	149 M	0:08:35
Remaining	366	724 M	0:41:28



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Hide Help

Release Notes

Back

Next



Install Packages: CDROM Swap

Online Help

Installing Packages

We have gathered all the information needed to install Red Hat Linux on your system. It may take a while to install everything, depending on how many packages need to be installed.

Installing Packages

Package: tetex-fonts-1.0.7-30
Size: 28,600 KBytes
Summary: The font files for the TeX text formatting system.

Package Progress:
Total Progress:

Status	Packages	Size	Time
		873 M	1:31:10
		703 M	1:13:24
		170 M	0:17:46

 Please insert disc 2 to continue.



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Create Boot Floppy

Online Help

Boot Disk Creation

Insert a blank, formatted diskette into your floppy drive, and click **Next** to continue.

Boot Disk Creation



The boot disk allows you to boot your Red Hat Linux system from a floppy diskette.

Please remove any diskettes from the floppy drive and insert a blank diskette. All data will be ERASED during creation of the boot disk.

Skip boot disk creation

? Hide Help

? Release Notes

◀ Back

▶ Next



Choose Video Display Parameters

The screenshot shows a Windows-style dialog box titled "Monitor Configuration". On the left, there is an "Online Help" pane with the heading "Monitor Selection". The main area on the right is a tree view of monitor options. The option "Generic High Frequency SVGA, 1024x768 @ 70 Hz" is selected and highlighted in blue. Below the tree view, there are input fields for "Horizontal Sync" (31.5-57.0 kHz) and "Vertical Sync" (50-70 Hz), along with a "Restore original values" button. At the bottom, there are buttons for "Hide Help", "Release Notes", "Back", and "Next".

Online Help

Monitor Selection

The installation program will now attempt to detect your monitor to determine your machine's best display settings. If the monitor cannot be detected, choose the monitor that best matches the model attached to this computer from the monitors listed.

You may also enter the horizontal and vertical synchronization ranges for your monitor. These values can be found in the documentation for your display. Be careful when

Monitor Configuration

- Unprobed Monitor
 - Unprobed Monitor
- Generic
 - Generic 8514 Compatible, 1024x768 @ 87 Hz interlaced (no 800x600 @ 60 Hz)
 - Generic Extended Super VGA, 800x600 @ 60 Hz, 640x480 @ 60 Hz
 - Generic High Frequency SVGA, 1024x768 @ 70 Hz**
 - Generic Laptop Display Panel 1024x768
 - Generic Laptop Display Panel 1280x1024
 - Generic Laptop Display Panel 1400x1050
 - Generic Laptop Display Panel 1600x1200
 - Generic Laptop Display Panel 640x480
 - Generic Laptop Display Panel 800x600
 - Generic Monitor, 1280x1024 @ 60 Hz
 - Generic Monitor, 1280x1024 @ 74 Hz
 - Generic Monitor, 1280x1024 @ 76 Hz
 - Generic Monitor, 1600x1200 @ 70 Hz
 - Generic Monitor, 1600x1200 @ 76 Hz
 - Generic Non-Interlaced SVGA, 1024x768 @ 60 Hz, 800x600 @ 60 Hz
 - Generic Standard VGA, 640x480 @ 60 Hz
 - Generic Super VGA, 1024x768 @ 87 Hz interlaced, 800x600 @ 60 Hz
 - Generic Super VGA, 800x600 @ 56 Hz
- ADI
- AOC

Horizontal Sync: 31.5-57.0 kHz
Vertical Sync: 50-70 Hz

Restore original values

Hide Help Release Notes Back Next



X-Windows Server Configuration

Online Help

Custom X Configuration

Choose the correct color depth and resolution for your X configuration. Click **Test Setting** to try out this configuration. If you do not like what you are presented with while testing, click **No** to choose another resolution.

Color Depth is the number of distinct colors that can be represented by a piece of hardware or software.

Screen Resolution is the number of dots

Customize Graphics Configuration



Color Depth:

Screen Resolution:

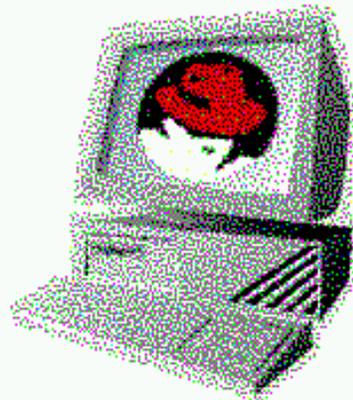
Please choose your login type:

Graphical Text



Install Complete, Reboot

Congratulations



Congratulations, your Red Hat Linux installation is complete.

Remove any floppy diskettes you used during the installation process and press <Enter> to reboot your system.

If you created a boot disk to use to boot your Red Hat Linux system, insert it before you press <Enter> to reboot.

For information on errata (updates and bug fixes), visit <http://www.redhat.com/errata>.

Information on using and configuring your system is available in the Red Hat Linux manuals at <http://www.redhat.com/support/manuals>.

 Show Help

 Release Notes

 Back

 Exit



Lessons Learned about Installation and Booting

- **Always make a boot disk!**
- GRUB is a good boot manager and replaces LILO ...
- GRUB understands file systems structure and is not dependent on offset like LILO (don't have to re-run it every change you make)
- Make a GRUB boot/installation disk, too!
- **Always make a boot disk!**
- You can place the /boot partition into a small partition on the first IDE/SCSI drive and still mount the Linux root partition from elsewhere
- Note that SCSI disk 0 has the LOWEST priority in the SCSI chain, so the PC BIOS has things a little backwards ...
- **ALWAYS MAKE A BOOT DISK!**



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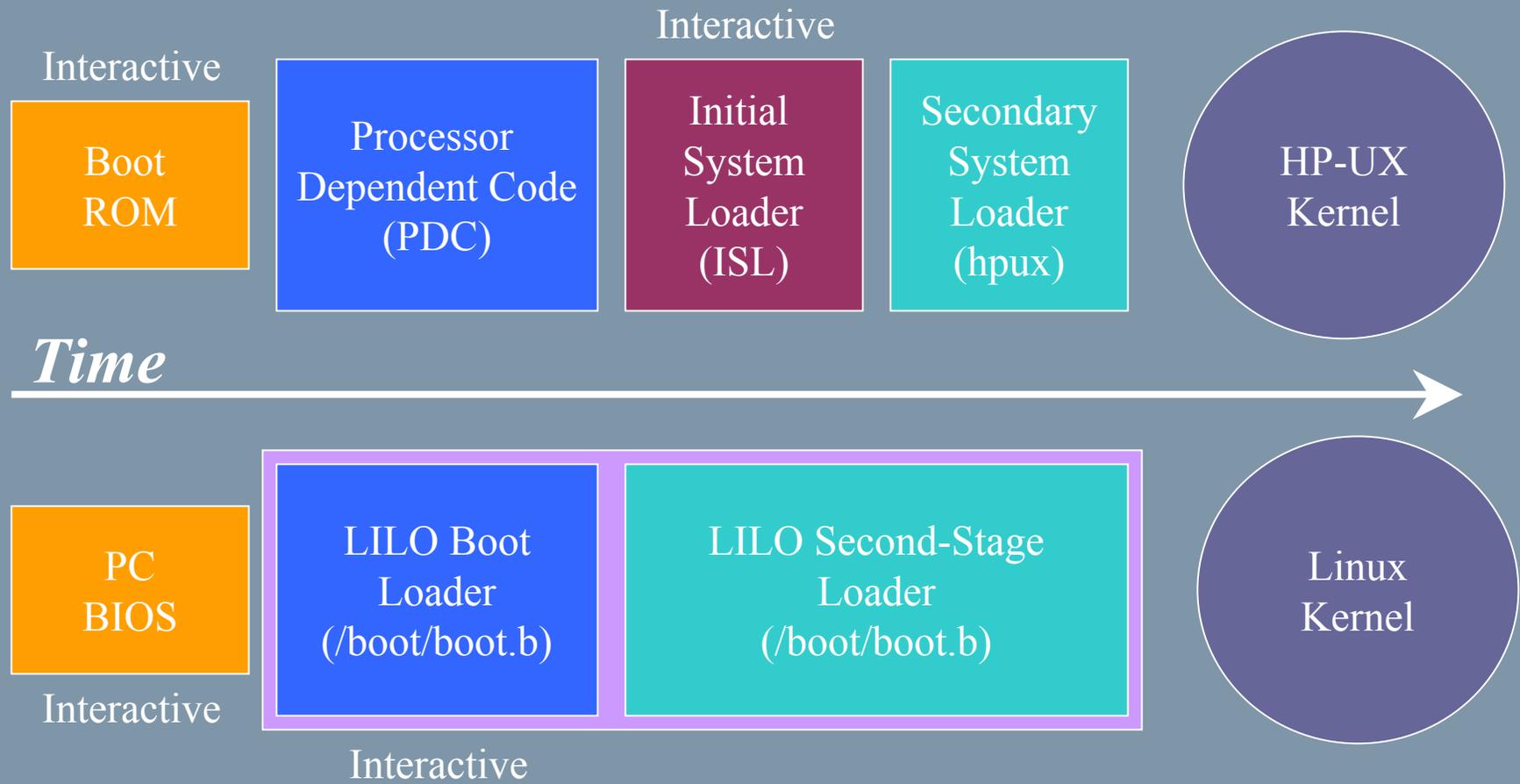
Boot Loaders

LILO
GRUB



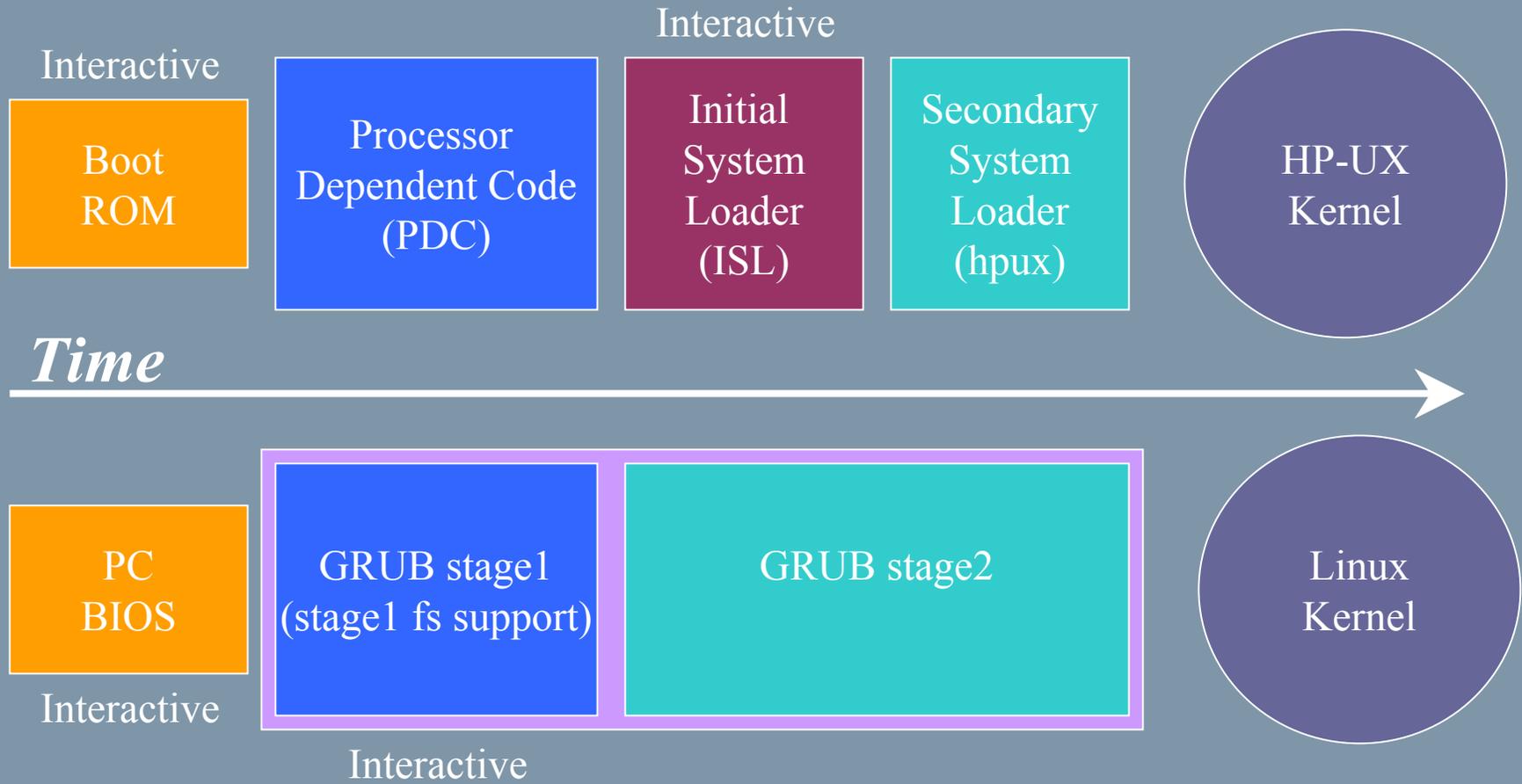


Comparing the HP-UX and LILO Boot Sequences





Comparing the HP-UX and GRUB Boot Sequences





Linux LILO Tips

- LILO is not the only way to boot a Linux system (thank goodness)
- Other Linux boot managers (GRUB, bootactv, loadlin, etc.)
- Commercially available boot managers (i.e. BootMagic, System Commander, etc.)
- Windows NT/XP boot manager
 - “dd if=/dev/hda of=/tmp/linux.bs bs=512 count=1”
 - Move “linux.bs” to Windows NT “root” and configure into “boot.ini” file
- The important thing to remember: whatever boot manager is in control must be able to find and access the boot sector containing LILO’s loader
- If your system’s hard drive configuration does not meet the Linux booting requirements, then you can boot from a floppy disk
- If your system is ONLY Linux, then things are much simpler!



GRand Unified Bootloader (GRUB) Tips

- /usr/share/grub/i386-redhat contains the “raw” GRUB installation files
- /boot/grub contains grub boot files, including grub.conf:

```
default=0
timeout=10
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Linux (2.4.18-3)
    root (hd0,0)
    kernel /vmlinuz-2.4.18-3 ro root=/dev/hda3
    initrd /initrd-2.4.18-3.img
```

- > “info grub”
will invoke documentation for grub, including installation instructions and examples (info takes some getting used to)
- More on GRUB later (boot examples)
- GRUB supports ext2, ext3, xfs, reiserfs, fat, minix, jfs, vstafs, ffs



Example LILO Configuration File

/boot/lilo.conf

```
boot      = /dev/fd0                # Specify boot device
delay     = 10                     # Wait 10 seconds
message  = bootmessage            # Text prompt
read-only                          # Mount root RO

label = linux_up                    # Uniprocessor
    image = vmlinuz-2.2.12-20
    initrd = initrd-2.2.12-20.img
    root   = /dev/hda5

label = linux_smp                  # Multi-processor
    image=vmlinuz-2.2.12-20smp
    initrd = initrd-2.2.12-20smp.img
    root   = /dev/hda5

label = linux_old                  # Last week's kernel
    image = vmlinuz_old
    initrd = initrd-2.2.12-20old.img
    root   = /dev/hda5
```



Example GRUB Configuration File

/boot/grub/grub.conf

```
# grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE: You have a /boot partition. This means that
#     all kernel and initrd paths are relative to /boot/, eg.
#     root (hd0,0)
#     kernel /vmlinuz-version ro root=/dev/hda3
#     initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=10
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Linux (2.4.18-3)
    root (hd0,0)
    kernel /vmlinuz-2.4.18-3 ro root=/dev/hda3
    initrd /initrd-2.4.18-3.img
```



Booting the Kernel

- If properly configured, LILO will present you with a menu of kernels to boot
- Type Ctrl-X to get a text-mode boot prompt
- In text-mode, the TAB key will display possible boot targets
- LILO can boot Windows systems as well as Linux systems
- Run LILO “lilo -v -v -t “ to see all output and TEST the configuration, if something is wrong your system may not boot (time for the boot floppy you made...)
- Be CAREFUL when running LILO, you can inadvertently overwrite the MBR on multi-boot systems when all you want to do is change the BR in the /boot partition!



More Lessons About LILO

- When you update a kernel, you must re-run LILO
- You should uninstall LILO before “decommissioning” a system, especially if LILO is installed in the MBR
- The default configuration file for LILO is */etc/lilo.conf*
- You can build a “mini” boot partition on a floppy, either by hand or using the “/sbin/mkbootdisk” command
- The LILO command may be run on a mounted disk by specifying the “-r <directory>” option, which will do a “chroot” to that directory
- Examine the “mkbootdisk” script for examples of what is needed to build a bootable floppy disk
- With the proper symbolic links and naming conventions, you can have a very flexible way to try new kernel configurations



GRUB Boot Menu

GRUB version 0.90 (638K lower / 162816K upper memory)

Red Hat Linux (2.4.7-10)

Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the
commands before booting, or 'c' for a command-line.



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GRUB Boot Entries for Linux

GRUB version 0.90 (638K lower / 162816K upper memory)

```
root (hd0,0)
kernel /vmlinuz-2.4.7-10 ro root=/dev/sda3
initrd /initrd-2.4.7-10.img
```

Use the ↑ and ↓ keys to select which entry is highlighted. Press 'b' to boot, 'e' to edit the selected command in the boot sequence, 'c' for a command-line, 'o' to open a new line after ('O' for before) the selected line, 'd' to remove the selected line, or escape to go back to the main menu.



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GRUB Editing (boot single user mode)

```
[ Minimal BASH-like line editing is supported. For the first word, TAB lists possible command completions. Anywhere else TAB lists the possible completions of a device/filename. ESC at any time exits. ]
```

```
grub edit> kernel /vmlinuz-2.4.7-10 ro root=/dev/sda3 single
```



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GRUB Ready to Boot Single User

GRUB version 0.90 (638K lower / 162816K upper memory)

```
root (hd0,0)
kernel /vmlinuz-2.4.7-10 ro root=/dev/sda3 single
initrd /initrd-2.4.7-10.img
```

Use the ↑ and ↓ keys to select which entry is highlighted. Press 'b' to boot, 'e' to edit the selected command in the boot sequence, 'c' for a command-line, 'o' to open a new line after ('O' for before) the selected line, 'd' to remove the selected line, or escape to go back to the main menu.



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Creating/Using GRUB Boot Floppy

- Being able to boot grub independently of the OS can sometimes save your system (especially multi-boot)
- To create a GRUB boot disk (will destroy floppy data!):
 - Insert floppy disk
 - “cd /usr/share/grub/i386-redhat”
 - “dd if=stage1 of=/dev/fd0 bs=512 count=1”
 - “dd if=stage2 of=/dev/fd0 bs=512 seek=1”
- You can then boot grub from the floppy and guess at the root device:
 - “root (hd0,0)”
 - “find /grub/grub.conf”
- GRUB will return the device it finds the file on, so you know that is /boot – set it to the root device
- “configfile /grub/grub.conf” will grab the menu from /boot/grub (and you may be off and running ...)



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System Booting and Startup





Modifying Kernel Parameters at Run Time

- The “sysctl” command may be used to set or examine the parameters that affect system behavior, either at boot or “real-time”
- “sysctl –a” List all parameters
- “sysctl –w <parameter>=<value>” Set a parameter
- “sysctl –p [<file>]” Load from file or /etc/sysctl.conf
- Many drivers and modules also allow setting values through the /proc file system:

```
echo “213458” > /proc/sys/net/core/rmem_default
```

```
echo “546789” > /proc/sys/net/core/rmem_max
```

changes the default socket buffer memory pool size and maximum size, respectively, for all sockets on the system.



Listing Kernel Parameters with “sysctl”

```
> sysctl -a
```

```
[...]
```

```
net.core.rmem_default = 65535
net.core.wmem_default = 65535
net.core.rmem_max = 65535
net.core.wmem_max = 65535
vm.max-readahead = 127
vm.min-readahead = 3
vm.max_map_count = 65536
vm.page-cluster = 3
vm.pagetable_cache = 25          50
vm.kswapd = 512          32      8
vm.overcommit_memory = 0
vm.bdflush = 400          0       0  500  3000  60       0       0
vm.freepages = 1055      2304    3072
kernel.overflowgid = 65534
kernel.overflowuid = 65534
```

```
[...]
```



Contents of the /boot Directory

System.map System.map-2.4.18-3	→	System.map-2.4.18-3
vmlinuz vmlinuz-2.4.18-3	→	vmlinuz-2.4.18-3
kernel.h		
initrd.img initrd-2.4.18-3.img	→	initrd-2.4.18-3.img
module-info module-info-2.4.18-3	→	module-info-2.4.18-3
grub system.map e2fs_stage1_5 fat_stage1_5 ffs_stage1_5 grub.conf jfs_stage1_5 menu.lst minix_stage1_5 reiser_stage1_5 spash.xpm.gz stage1 stage2 vstafs_stage1_5 xfs_stage1_5	→	./grub.conf



HP-UX: UNIX For the Enterprise

Comparison of HP-UX and Linux SYSVR4 System Startup



- The world starts with “init”
 - /etc/rc.config.d contains startup data
 - /etc/rc script performs system startup
 - /etc contains startup directories init.d and rc*.d
 - /sbin/init.d contains scripts that are linked into /sbin/rc*.d
 - Each run level has an associated directory that contains startup and shutdown links for each subsystem
 - The directory for each intervening run-level is “executed” on run-level change
- The world starts with “init”
 - /etc/sysconfig and scripts contain startup data
 - /etc/rc, /etc/rc.local, and /etc/rc.sysinit perform startup
 - /etc/init.d and /etc/rc*.d are linked into /etc/rc.d/
 - /etc/rc.d/init.d contains scripts that are linked into /etc/rc*.d
 - Each run level has an associated directory that contains startup and shutdown links for each subsystem
 - Only the directory for the current run-level is “executed” when run-levels are changed



Inittab and Run-Level Comparison

HP-UX: UNIX for the Enterprise

- HP-UX Init run levels
 - 0 halt
 - 1 Single-user mode
 - 2 Full multi-user
 - 3 X11
 - 4 Used?
- The “init:3:initdefault:” line in /etc/inittab controls the default level
- The “who -r” command returns the current value of init’s run level
- No shell information about run-level is available by default
- “init <level>” will change the run level



- Linux Init run levels:
 - 0 halt
 - 1 Single-user mode
 - 2 Multi-user without NFS
 - 3 Full multi-user
 - 4 Unused (really?)
 - 5 X11
 - 6 Reboot
- The “id:5:initdefault:” line in /etc/inittab controls default level
- The “runlevel” command returns previous level and current level (N=none) “N 5”
- Run-level information is available in two shell environment variables: \${RUNLEVEL} and \${PREVLEVEL}
- “init <level>” will change the run level



Enabling Linux Boot-Time Services

- Each file in /etc/init.d contains a special comment line that resembles:
`# chkconfig: 2345 80 30`
from the /etc/init.d/sendmail file.
- This comment tells the “chkconfig” command how to enable the associated service.
- “chkconfig” will create links in runlevels 2, 3, 4, and 5 with S80sendmail and K30sendmail (Start and Kill)
- “chkconfig sendmail on” will create the links but not start the service
- “chkconfig sendmail off” will remove the links but not stop the service
- “chkconfig –list” will show all services and their status, including services handled by xinetd
- “chkconfig –list sendmail” will show a status line like (on, off):

sendmail	0:off	1:off	2:on	3:off	4:off	5:off	6:off
sendmail	0:off	1:off	2:on	3:on	4:on	5:on	6:off



Starting, Stopping, and Restarting Services

- The “service” command will start, stop, or restart a service.
- “service –status-all” will return the current status of all services (may take a while ...)
- “service <service> stop” will stop the service
- “service <service> start” will start the service
(Note: /var/run has files containing PIDs for running processes)
- “service <service> restart” will stop and then start the service
- Neat, huh? Wish that HP-UX did this? 8^)



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Hardware Configuration Troubleshooting



Output From Dmesg
Kudzu and Hardware Detection
Listing PCI Devices
The /proc Filesystem
XFree86 Logs
Network Interface Status



Determining Hardware Configuration

- Linux supports quite a bit of common hardware, but not everything is -always- supported
- Whenever something does not get detected, the first step is to find out what is there
- For PCI cards and adapters, “lspci” will display devices
- For ISA cards, “pnpdump” will display plug-and-play devices on the system
- The “dmesg” command and /var/log/messages will display the hardware discovery process during boot
- The “kudzu” command is used at boot to discover new devices, you can also run it interactively (see /etc/sysconfig/hwconf)
- The /proc file system can also be a help in determining what Linux has and has not discovered (CPU, RAM, SCSI, USB, etc.)



Output From /var/log/dmesg (my laptop)

[...]

Serial driver version 5.05c (2001-07-08) with MANY_PORTS MULTIPORT SHARE_IRQ SERIAL_PCI ISAPNP enabled
ttyS00 at 0x03f8 (irq = 4) is a 16550A

Real Time Clock Driver v1.10e

block: 736 slots per queue, batch=184

Uniform Multi-Platform E-IDE driver Revision: 6.31

ide: Assuming 33MHz system bus speed for PIO modes; override with idebus=xx

PIIX4: IDE controller on PCI bus 00 dev 39

PIIX4: chipset revision 1

PIIX4: not 100% native mode: will probe irqs later

ide0: BM-DMA at 0xfc0-0xfc7, BIOS settings: hda:DMA, hdb:pio

ide1: BM-DMA at 0xfc8-0xfcf, BIOS settings: hdc:DMA, hdd:pio

hda: IBM-DARA-212000, ATA DISK drive

hdc: TOSHIBA DVD-ROM SD-C2302, ATAPI CD/DVD-ROM drive

ide0 at 0x1f0-0x1f7,0x3f6 on irq 14

ide1 at 0x170-0x177,0x376 on irq 15

blk: queue c035e6a4, I/O limit 4095Mb (mask 0xffffffff)

hda: 23579136 sectors (12073 MB) w/418KiB Cache, CHS=1559/240/63, UDMA(33)

ide-floppy driver 0.99.newide

Partition check:

hda: hda1 hda2 hda3

Floppy drive(s): fd0 is 1.44M

FDC 0 is a post-1991 82077

[...]



Output From Kudzu: /etc/sysconfig/hwconf (my laptop)

```
-
class: MOUSE
bus: PSAUX
detached: 0
device: psaux
driver: genericps/2
desc: "Generic Mouse (PS/2)"
-
class: AUDIO
bus: PCI
detached: 0
driver: maestro
desc: "ESS Technology|ES1978 Maestro 2E"
vendorId: 125d
deviceId: 1978
subVendorId: 103c
subDeviceId: 000a
pciType: 1
-
class: CDROM
bus: IDE
detached: 0
device: hdc
driver: ignore
desc: "TOSHIBA DVD-ROM SD-C2302"
-
class: VIDEO
bus: PCI
detached: 0
driver: Card:ATI Rage Mobility
desc: "ATI|Rage Mobility P/M AGP 2x"
vendorId: 1002
deviceId: 4c4d
subVendorId: 103c
subDeviceId: 000a
pciType: 1
```



Output From “lspci” (my laptop)

```
00:00.0 Host bridge: Intel Corporation 440BX/ZX - 82443BX/ZX Host bridge (rev 03)
00:01.0 PCI bridge: Intel Corporation 440BX/ZX - 82443BX/ZX AGP bridge (rev 03)
00:04.0 CardBus bridge: Texas Instruments PCI1225 (rev 01)
00:04.1 CardBus bridge: Texas Instruments PCI1225 (rev 01)
00:07.0 Bridge: Intel Corporation 82371AB PIIX4 ISA (rev 02)
00:07.1 IDE interface: Intel Corporation 82371AB PIIX4 IDE (rev 01)
00:07.2 USB Controller: Intel Corporation 82371AB PIIX4 USB (rev 01)
00:07.3 Bridge: Intel Corporation 82371AB PIIX4 ACPI (rev 03)
00:08.0 Multimedia audio controller: ESS Technology ES1978 Maestro 2E (rev 10)
00:11.0 PCI bridge: Intel Corporation 82380FB (rev 01)
01:00.0 VGA compatible controller: ATI Technologies Inc Rage Mobility P/M AGP 2x (rev 64)
02:07.0 Ethernet controller: 3Com Corporation 3cSOHO100-TX Hurricane (rev 30)
02:08.0 CardBus bridge: Texas Instruments PCI1220 (rev 02)
02:08.1 CardBus bridge: Texas Instruments PCI1220 (rev 02)
02:0c.0 IDE interface: CMD Technology Inc PCI0646 (rev 07)
02:0d.0 SCSI storage controller: Symbios Logic Inc. (formerly NCR) 53c810 (rev 23)
```



The /proc Filesystem

(my laptop)

\$ cat /proc/meminfo

```
total: used: free: shared: buffers: cached:
Mem: 394321920 382668800 11653120 0 6033408 285745152
Swap: 805101568 5754880 799346688
MemTotal: 385080 kB
[...]
```

\$ cat /proc/interrupts

```
CPU0
0: 3033373 XT-PIC timer
1: 33173 XT-PIC keyboard
2: 0 XT-PIC cascade
3: 2 XT-PIC serial
4: 6 XT-PIC serial
8: 4530290 XT-PIC rtc
10: 47720 XT-PIC usb-uhci, Texas Instruments PCI1225, Texas Instruments PCI1225 (#2),
eth0, ESS Maestro 2E
12: 222483 XT-PIC PS/2 Mouse
14: 124376 XT-PIC ide0
15: 236857 XT-PIC ide1
NMI: 0
ERR: 3
```



XFree86 Logs

(my laptop)

Module Loader present

Markers: (--) probed, (**) from config file, (==) default setting,
(++) from command line, (!!) notice, (II) informational,
(WW) warning, (EE) error, (NI) not implemented, (??) unknown.

(==) Log file: "/var/log/XFree86.0.log", Time: Wed Jul 24 11:39:11 2002
(==) Using config file: "/etc/X11/XF86Config-4"
(==) ServerLayout "XFree86 Configured"
(**) |-->Screen "Screen0" (0)
(**) | |-->Monitor "Generic High Frequency SVGA, 1024x768 @ 70 Hz"
(**) | |-->Device "ATI Rage 128"
(**) |-->Input Device "Mouse0"
(**) |-->Input Device "Keyboard0"
(**) Option "XkbLayout" "us"
(**) XKB: layout: "us"
(==) Keyboard: CustomKeycode disabled
(**) FontPath set to "unix/:7100"
(==) RgbPath set to "/usr/X11R6/lib/X11/rgb"
(==) ModulePath set to "/usr/X11R6/lib/modules"
(--) using VT number 7

[...]



Network Interface Status

(my laptop)

```
# mii-tool -v eth0
```

```
eth0: negotiated 100baseTx-FD, link ok
product info: TDK 78Q2120 rev 3
basic mode:  autonegotiation enabled
basic status: autonegotiation complete, link ok
capabilities: 100baseTx-FD 100baseTx-HD 10baseT-FD 10baseT-HD
advertising: 100baseTx-FD 100baseTx-HD 10baseT-FD 10baseT-HD
link partner: 100baseTx-FD 100baseTx-HD 10baseT-FD 10baseT-HD flow-control
```

```
# cat /etc/sysconfig/network
```

```
NETWORKING=yes
GATEWAYDEV="eth0"
DHCPDARGS="-H -D -d -c /etc/firewall/gShield.rc"
FORWARD_IPV4="no"
HOSTNAME="gandolf.nsr.hp.com"
```

```
# cat /etc/sysconfig/network-scripts/ifcfg-eth0
```

```
DEVICE="eth0"
ONBOOT="yes"
BOOTPROTO="dhcp"
IPADDR=""
NETMASK=""
```



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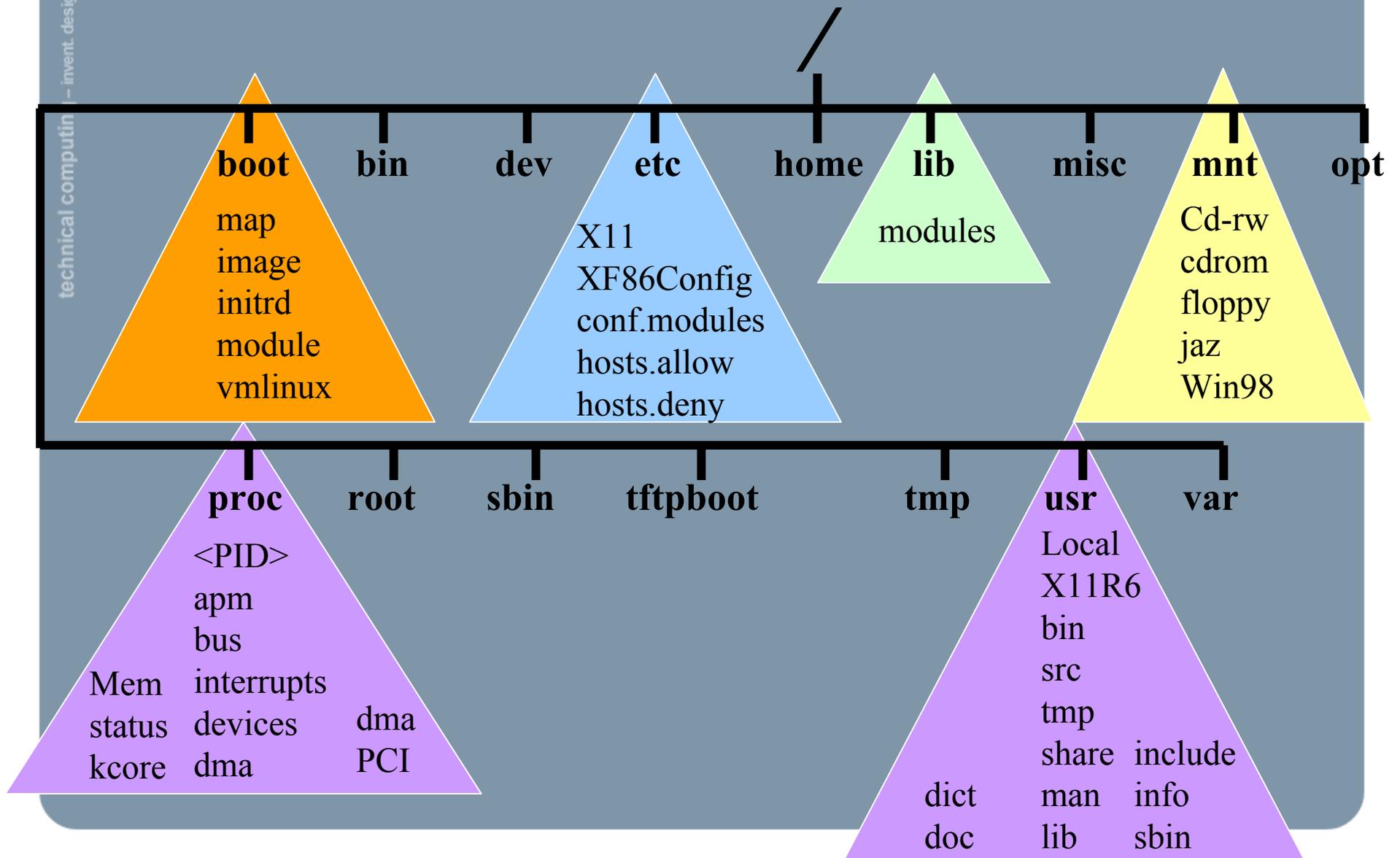
File System Layout





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Basic Linux File-system Structure





Example Device Files

(My home server system)

<i><u>Description</u></i>	<i><u>Use</u></i>	<i><u>Device Name</u></i>
IDE Drive 1	Win98/Linux	/dev/hda
Windows partition	Windows 98	/dev/hda1
Linux partition	/boot	/dev/hda2
NEC CD-ROM stacker		/dev/hdc
HP R/W CD-ROM		/dev/hdd
Floppy drive		/dev/fd0
SCSI address 0	swap	/dev/sda1
SCSI address 0	Linux /	/dev/sda5
SCSI address 1	Linux /aux	/dev/sdb1
SCSI address 1	swap	/dev/sdb5



Example Device Files (Continued)

<i>Description</i>	<i>Use</i>	<i>Device Name</i>
SCSI address 2	Linux /vmdata1	/dev/sdc1
SCSI address 2	swap	/dev/sdc5
SCSI address 3	Linux /vmdata2	/dev/sdd1
SCSI address 3	swap	/dev/sdd5
SCSI address 4	HP Photo scanner	/dev/sge
SCSI address 5	HP 6200C scanner	/dev/sgf
SCSI address 6	JAZ 1 GB drive	/dev/sde4
COM1	V.90 modem	/dev/ttyS0
Parallel port	HP P1000 printer	/dev/lp0



Example /etc/fstab File for Example Hardware

```
/dev/sda5    /          ext2    defaults    1 1
/dev/hda2    /boot      ext2    defaults    1 2
/dev/sdb1    /aux1      ext2    defaults    1 2
/dev/sdc1    /vmdata1   ext2    defaults    1 2
/dev/sdd1    /vmdata2   ext2    defaults    1 2
/dev/sda1    swap       swap    pri=1       0 0
/dev/sdb5    swap       swap    pri=1       0 0
/dev/sdc5    swap       swap    pri=1       0 0
/dev/sdd5    swap       swap    pri=1       0 0
/dev/fd0     /mnt/floppy ext2    owner,noauto 0 0
/dev/cdrom   /mnt/cdrom iso9660 owner,noauto,ro 0 0
/dev/hdd     /mnt/cd-rw  iso9660 noauto,ro    0 0
/dev/sde4    /mnt/jaz   vfat    fat=16      0 0
/dev/hda1    /mnt/Win98 vfat    fat=32      0 0
none        /proc      proc    defaults    0 0
none        /dev/pts   devpts  gid=5,mode=620 0 0
```



Interesting File-system Side Trips

- `/etc/pam.d` directory containing PAM config
- `/etc/profile.d` directory containing shell profiles
- `/etc/logrotate.d` directory controlling log rotation
 - `/usr/sbin/logrotate` command
 - `/etc/logrotate.conf`
- `/etc/rc.d` directory containing startup scripts
- `/proc` directory containing system/process information
 - `/proc/bus/usb` directory containing usb device information
 - `/proc/bus/pci` directory containing pci device information



Example /proc File System Contents

```
1/      1402/  1475/  1587/  1756/  1781/  1792/  4/      763/  bus/      ide/      mdstat    slabinfo
1014/   1438/   1488/   1589/   1757/   1782/   1793/   5/      8/      cmdline  interrupts meminfo   stat
1056/   1461/   1543/   1591/   1758/   1783/   1794/   536/   846/   cpuinfo  iomem     misc      swaps
1078/   1462/   1557/   1592/   1760/   1784/   1825/   541/   879/   devices  ioports   modules   sys/
1099/   1463/   1569/   1594/   1762/   1785/   1828/   561/   90/    dma      irq/      mounts@   sysvipc/
1167/   1464/   1571/   1595/   1764/   1786/   183/    590/   900/   driver/  kcore     mtrr      tty/
12/     1465/   1579/   1598/   1766/   1787/   1971/   6/     950/   execdomains kmsg     net/      uptime
1241/   1466/   1581/   1599/   1768/   1789/   2/      7/     968/   fb       ksyms    partitions version
1354/   1467/   1583/   1749/   1770/   1790/   2014/   702/   986/   filesystems loadavg   pci       vmnet/
1371/   1474/   1585/   1755/   1772/   1791/   3/      722/   apm     fs/      locks     self@
```

PROC (5)

PROC (5)

Linux Programmer's Manual

NAME

proc - process information pseudo-filesystem

DESCRIPTION

/proc is a pseudo-filesystem which is used as an interface to kernel data structures rather than reading and interpreting **/dev/kmem**. Most of it is read-only, but some files allow kernel variables to be changed.



Example /proc/1 (PID 1) File System Contents

```
-r--r--r--      1 root      root          0 Jul 29 22:46 cmdline
lrwxrwxrwx      1 root      root          0 Jul 29 22:46 cwd -> /
-r-----       1 root      root          0 Jul 29 22:46 environ
lrwxrwxrwx      1 root      root          0 Jul 29 22:46 exe -> /sbin/init
dr-x-----     2 root      root          0 Jul 29 22:46 fd
-r--r--r--      1 root      root          0 Jul 29 22:46 maps
-rw-----       1 root      root          0 Jul 29 22:46 mem
-r--r--r--      1 root      root          0 Jul 29 22:46 mounts
lrwxrwxrwx      1 root      root          0 Jul 29 22:46 root -> /
-r--r--r--      1 root      root          0 Jul 29 22:46 stat
-r--r--r--      1 root      root          0 Jul 29 22:46 statm
-r--r--r--      1 root      root          0 Jul 29 22:46 status
```



An Interesting Redhat-ism

- `/etc/pam.d` directory containing PAM config
 - `/etc/profile.d` directory containing shell profiles
 - `/etc/logrotate.d` directory controlling log rotation
 - `/etc/rc.d` directory containing runlevel definitions
 - `/etc/init.d` directory containing service scripts
 - `/etc/xinetd.d` directory containing inetd service definitions
- These directories make it easy for packages to install and remove themselves from the system without affecting other packages
 - Typical service installation might:
 - Add service script to `/etc/init.d`
 - Run `chkconfig` to create links in `/etc/rc*.d`
 - Add service information to `/etc/xinetd.d`
 - Add log processing to `/etc/logrotate.d`
 - This is **very** manageable once you catch the paradigm!



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Software Installation and Update





The RedHat Package Manager (RPM)

- Installation and update of software on Linux (at least the RedHat distributions) is done via the “rpm” command
- Packages contain binaries, configuration information and scripts, and PGP signatures for verification
- The system keeps a database of all installed packages, their revisions, and their dependencies
- To find out what packages are installed, “rpm –qa”
- To install and/or update a package,
“rpm –Uvh <package>”
- The kernel, libraries, and applications may be updated LIVE! (including glibc)



The RedHat Package Manager (RPM)

```
# rpm -q --whatprovides /bin/l  
fileutils-4.1-10
```

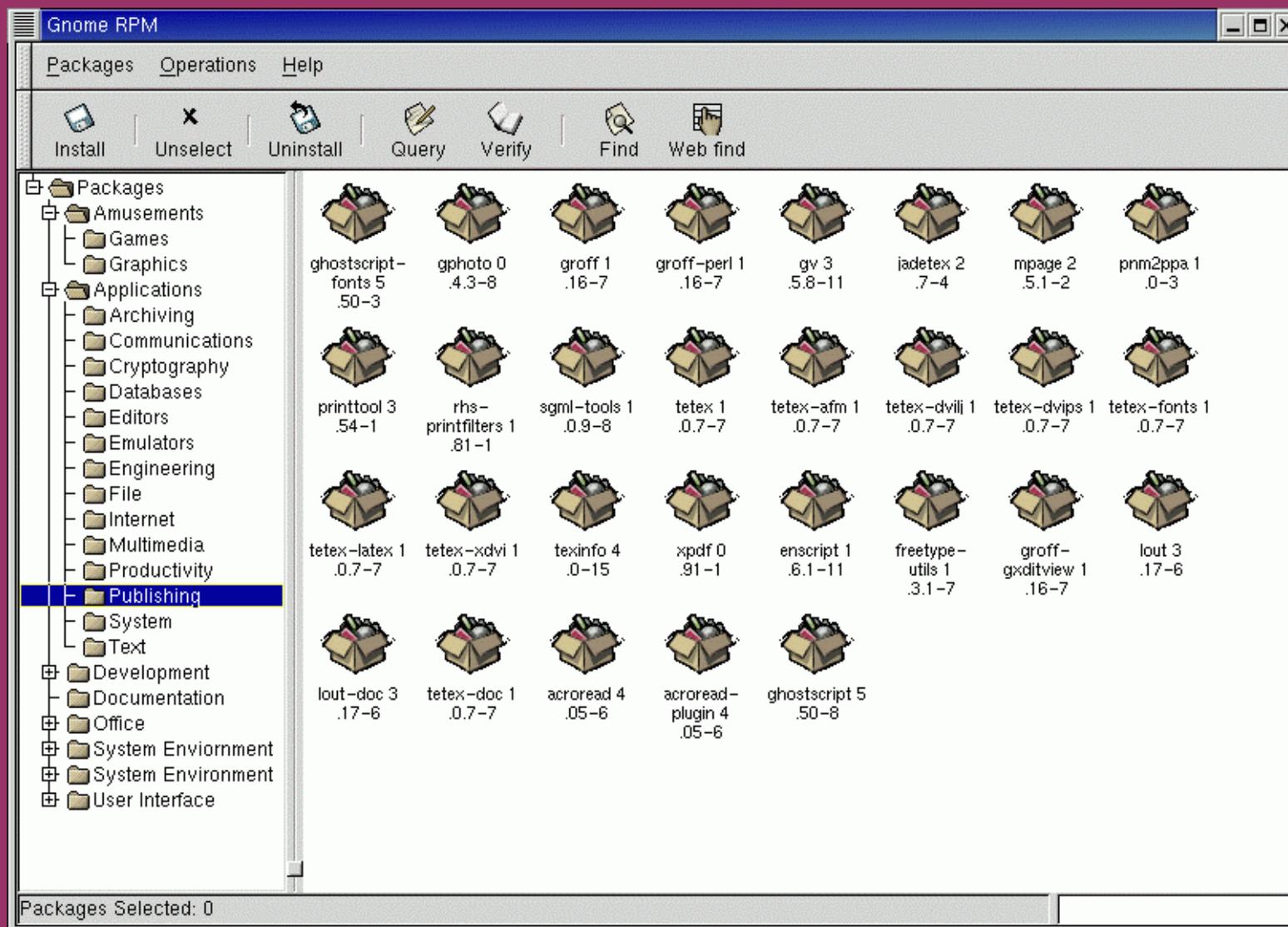
```
# rpm -qa | grep real  
ethereal-0.9.4-0.7.3.0  
ethereal-gnome-0.9.4-0.7.3.0
```

```
# rpm --checksig RealPlayer-8.0-1.i386.rpm  
RealPlayer-8.0-1.i386.rpm: md5 OK
```

```
# rpm -q --filesbypkg ethtool  
ethtool          /usr/sbin/ethtool  
ethtool          /usr/share/doc/ethtool-1.5  
ethtool          /usr/share/doc/ethtool-1.5/AUTHORS  
ethtool          /usr/share/doc/ethtool-1.5/COPYING  
ethtool          /usr/share/doc/ethtool-1.5/ChangeLog  
ethtool          /usr/share/doc/ethtool-1.5/INSTALL  
ethtool          /usr/share/doc/ethtool-1.5/NEWS  
ethtool          /usr/share/doc/ethtool-1.5/README  
ethtool          /usr/share/man/man8/ethtool.8.gz
```

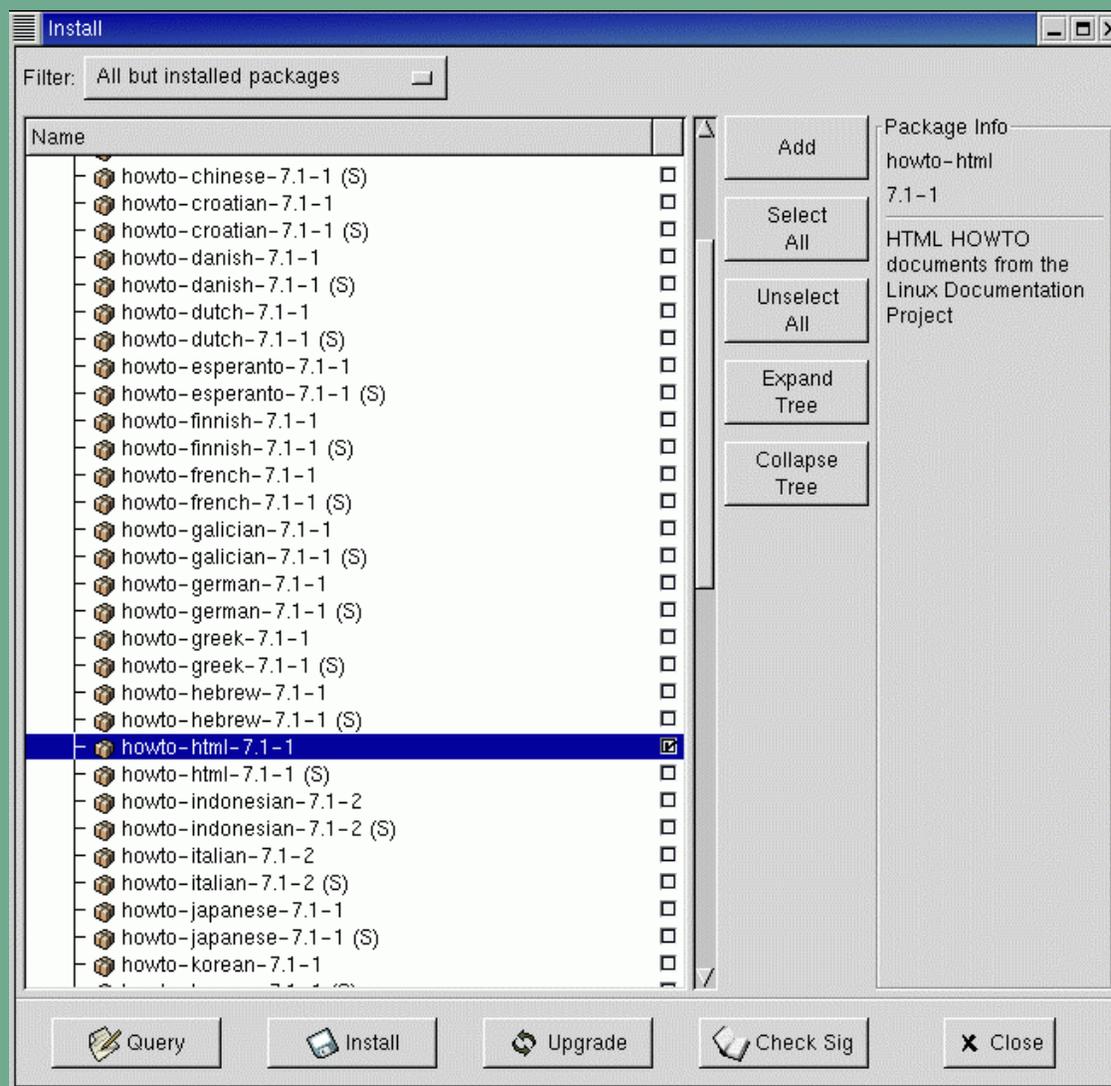


The GNOME Interface to RPM, “gnorpm”



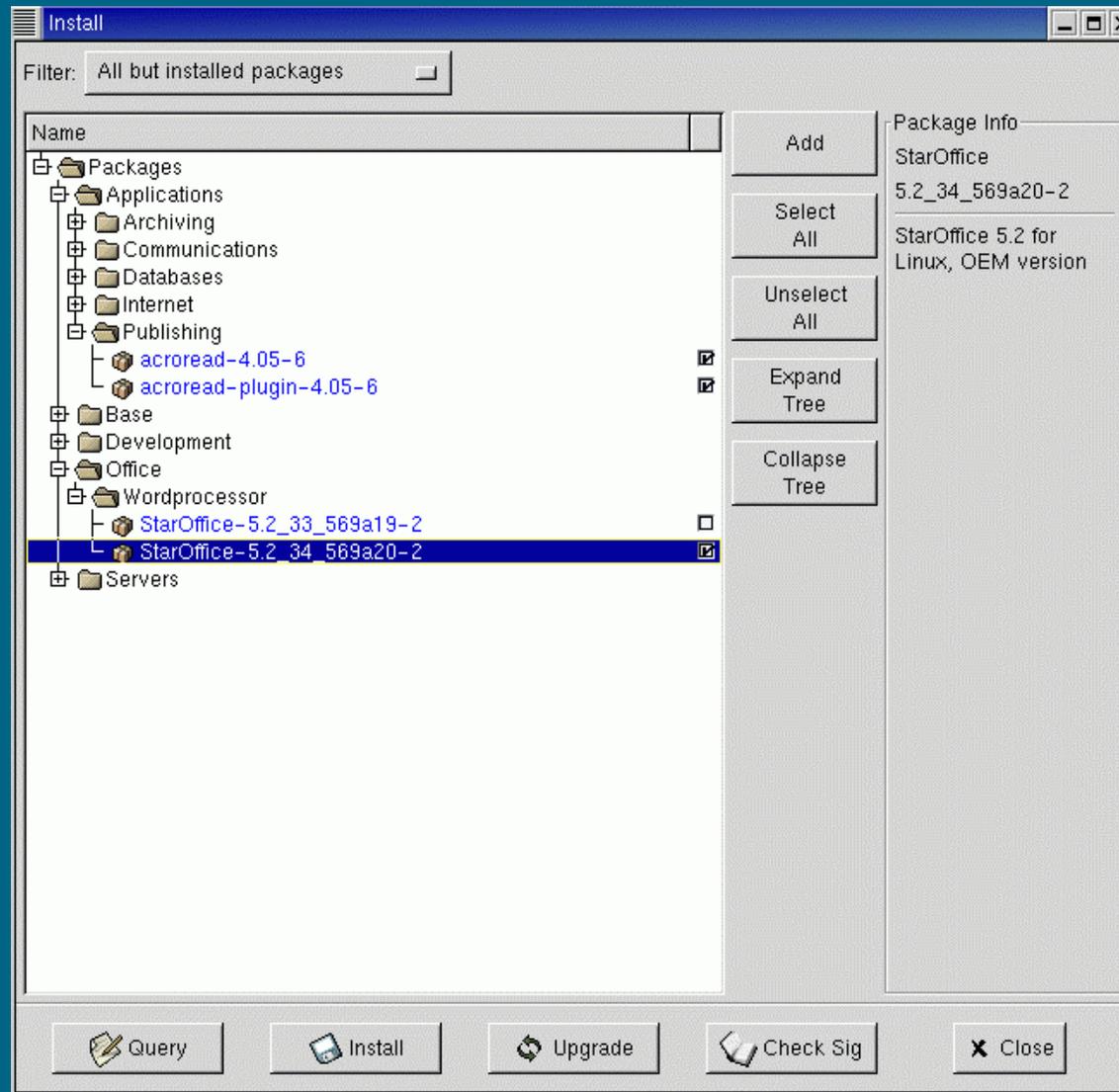


Installation With “gnorpm”





Update With “gnorpm”





RedHat Update Manager, “up2date”

- RedHat provides an automated way of keeping your system packages up to date, the “up2date” command
- For 90 days after purchase, or if you buy support, you may connect to the RedHat FTP server with this tool
- All updated packages are presented in a graphical interface, and you may select the ones you want
- The packages are downloaded and installed
- Packages are stored in /var/spool/up2date if you select the “keep after installation” option and are removed otherwise
- “up2date –update” will download all matching packages and update your system



Interesting Software for Linux

- JAVA at <http://www.blackdown.org>
- StarOffice from Sun Microsystems on RedHat Deluxe Workstation CD-ROM
- Real Player on RedHat Deluxe Workstation CD-ROM
- Vmware at <http://www.vmware.com>
- Netscape (4.76 and 6.0) at <http://www.netscape.com/netscape>
- Iomega drivers at <http://www.iomega.com>
- XV X-windows image viewer at <http://www.trilon.com/xv/xv.html>
- Other applications at <http://freshmeat.net>



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General System Administration Tasks





Linux Password Management

- **Shadow password file is the default, no passwords are available to casual users**
 - Too much password data kept to go into here ...
 - **rob:x:1000:100:/home/rob:/bin/bash**
 - **chage** **Change user expiration information**
 - **pwck** **Check password integrity**
 - **grpck** **Check group integrity**
- **/etc/passwd /etc/passwd- /etc/group /etc/group-**
- **/etc/shadow (mode 400, root:root)**
- **/etc/gshadow (mode 400, root:root)**
- **passwd -> pwconv -> shadow**
- **shadow -> pwunconv -> passwd**
- **group -> grconv -> gshadow**
- **gshadow -> grunconv -> group**



Linux Security

- Linux, by default is set up with more security features enabled than HP-UX “out of the box”
- You will not be able to log in as “root” except at the console
- Telnet in as a “normal” user, then “su -” to “root”, but you must **HAVE** a user configured besides “root” ... Remember this at system installation time!
- Check out `/etc/hosts.allow` and `/etc/hosts.deny` to configure machines that can access your Linux box
- Check out `/etc/xinetd.d` for configuration files for FTP, telnet, and other services
- For NFS to function, any firewall must permit access to the portmap service
- FTP is disabled by default



Linux Security Ipchains/Iptables

- Linux has two TCP/IP firewall services, Iptables and Ipchains, named after the commands that control the rule sets
- The installation process allows you to choose a firewall configuration, but uses the older Ipchains
- Iptables is much more flexible
- I use a firewall generation tool named “gShield” that builds rule sets for Iptables – answer some questions and you’re off and dropping
- The gShield firewall is updated each time the DHCP client daemon, “dhcpcd” is run
- Note that you must use either Iptables or Ipchains, but not both -- they are mutually exclusive (and you will get error messages)
- The “Linux Firewalls” book explains the operation of both services, with a concentration on the newer Iptables



Linux Security Ipchains/Iptables

- “service ipchains stop”
- “chkconfig ipchains off”
- “chkconfig iptables on”
- “service iptables start”
- You are now ready to define firewall rules with the “ipchains” command
- See next slide for example fragment.



Linux Iptables Command Example

```
#!/bin/bash
```

```
IPTABLES=$( which iptables )  
# Create a new rule chain to handle key rotation requests that  
# come in on port 500 udp/tcp (isakmp) from the VPN system  
# Log any packets that are either accepted or rejected.  
{IPTABLES} -N ISAKMP  
{IPTABLES} -F ISAKMP  
{IPTABLES} -A ISAKMP --source ${NAIATLGW1} -j ACCEPTnLOG  
{IPTABLES} -A ISAKMP --source ${NAIATLGW2} -j ACCEPTnLOG  
{IPTABLES} -A ISAKMP -j DROPnLOG  
{IPTABLES} -N IPSEC  
{IPTABLES} -F IPSEC  
{IPTABLES} -A IPSEC --source ${NAIATLGW1} -j ACCEPTnLOG  
{IPTABLES} -A IPSEC --source ${NAIATLGW2} -j ACCEPTnLOG  
{IPTABLES} -A IPSEC -j DROPnLOG  
# Insert rules in the INPUT chain to intercept port 500 (isakmp)  
# key rotation packets and port 50/51 IPSEC packets  
{IPTABLES} -I INPUT 21 --protocol tcp --dport isakmp -j ISAKMP  
{IPTABLES} -I INPUT 21 --protocol udp --dport isakmp -j ISAKMP  
{IPTABLES} -I INPUT 21 --protocol tcp --dport 50 -j ISAKMP  
{IPTABLES} -I INPUT 21 --protocol tcp --dport 51 -j ISAKMP  
{IPTABLES} -I INPUT 21 --protocol udp --dport 50 -j ISAKMP  
{IPTABLES} -I INPUT 21 --protocol udp --dport 51 -j ISAKMP  
###  
###
```



Linux Security

- The “inetd” process is replaced by “xinetd”
- The configuration file for xinetd is in /etc/xinetd.conf
- The /etc/xinetd.d directory (specified in xinetd.conf) contains individual files that enable or disable services.

```
# default: on
# description: The telnet server serves telnet sessions; it uses
# unencrypted username/password pairs for authentication.
service telnet
{
    flags                = REUSE
    socket_type = stream
    wait                 = no
    user                 = root
    server               = /usr/sbin/in.telnetd
    log_on_failure       += USERID
}
```



Making Boot Disks Manually (if you foolishly skipped the install step)

- Boot floppies can save your system if something goes wrong.
- Use the “mkbootdisk” command to create a bootable floppy from your kernel and modules.
- The boot floppy will enable you to mount the root directory in single use mode and possibly repair problems.
- An example command to make a boot floppy for my laptop is:

```
mkbootdisk –device /dev/fd0 2.4.18-3
```



Examining the “initrd.img” File

- The initrd.img file contains a file system image with modules needed by the kernel to access the root file system (this solves a chicken and egg problem)
- The initrd.img file might contain SCSI modules, RAID modules, ext3 journaling modules, or any other module essential to booting (I.e. not built into the kernel)
- The initrd.img file also contains a linuxrc file to load modules for the kernel
- The initrd.img may be examined by:
 - “zcat /boot/initrd-2.4.18-3.img > /tmp/myimg”
 - “mkdir /tmp/image”
 - “mount -o loop /tmp/myimg /tmp/image”
 - “cd /tmp/image”



Examining the “initrd.img” File

- The initrd.img file system contains:

`bin/ dev/ etc/ lib/ linuxrc* loopfs/ proc/ sbin@ sysroot/`

- Under the lib directory, my initrd.img contains the “jbd.o” and “ext3.o” modules
- The “linuxrc” script contains:

```
#!/bin/nash
echo "Loading jbd module"
insmod /lib/jbd.o
echo "Loading ext3 module"
insmod /lib/ext3.o
echo Mounting /proc filesystem
mount -t proc /proc /proc
echo Creating root device
mkrootdev /dev/root
echo 0x0100 > /proc/sys/kernel/real-root-dev
echo Mounting root filesystem
mount --ro -t ext3 /dev/root /sysroot
umount /proc
pivot_root /sysroot /sysroot/initrd
```



Building Device Files

- Linux comes pre-configured with “standard” device files, but sometimes more are needed
- To build device files, use “/dev/MAKEDEV”, which will handle major and minor numbers properly
- ttys{0-63} TTY devices
- fd{0-7} Floppy disks
- loop Loopback devices
- sd[a-z] SCSI disks
- sg[a-h], sg[0-7] Generic SCSI devices
- Etc. See man page for MAKEDEV



Miscellaneous System Administration Tasks

- Make initial RAM-disk images for your system with the “mkinitrd –fv initrd-<kernel_version>.img <kernel_version>” command
- Examine DHCP parameters in the /etc/dhcpd directory
/etc/dhcpd/dhcpd-eth0.info
- Using “ls –color=auto” in a shell alias will cause the ls command to display files in color, based on their mode and type
- You can cut and paste from text-mode and VGA graphics windows
- Disk striping is easy with configuration data in /etc/raidtab and the “mkraid” command. You can select a number of RAID modes and behaviors that are automatically enabled at system boot. The “raidstart” and “raidstop” commands enable and disable the multiple disk (MD) device. Once the devices are configured, you may build the file system of your choice.
- Don’t forget SAMBA and SWAT for exporting SMB/CIFS file systems!
- Linux can mount lots of different file systems and even has LVM!



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Building The Linux Kernel





Building The Linux Kernel

- **Note: Redhat Linux is compiled for maximum compatibility, for an i386 processor! Later distributions *may* have CPU optimizations available**
- **To build the kernel:**
 - **cd /usr/src/linux2.4** (a link to the current version)
 - **Build the configurator:**
 - make xconfig (X-windows configurator tool)
 - make menuconfig (VGA mode configurator tool)
 - **Save the current configuration to a file!**
 - The current configuration is kept in /usr/src/linux2.4/.config
 - The default Redhat configurations are kept in /usr/src/linux/configs
 - **Make changes using the configurator**
 - **Save new configuration to a file!**
 - **Build the kernel** (Be prepared for a wait ...)
 - make deps (build dependencies)
 - make bzImage (a compressed kernel)
 - make modules (if you are using them)



Building the Linux Kernel

(continued)

- **Back up the current module information!**
- **Backup the current kernel and system files!**
- **Always make a boot disk! (/sbin/mkbootdisk)**
- **make modules_install (install new modules)**
- **Move kernel and other system files from /usr/src/linux/arch/i386/boot, this will be called “bzImage”**
 - Can use /sbin/installkernel or /sbin/new-kernel-package
- **Run LILO to update map information (offset into partition for kernel file) in boot record (not necessary with GRUB, just modify the /boot/grub/grub.conf file)**
- **Reboot and test**
- **Naming conventions are important**
 - **Add a “test” label to the boot configuration file?**
 - **With links and “generic” boot configuration labels, you can implement a relatively fail-safe way of installing new kernels**



Building The Linux Kernel

(continued)

- **Tip**: The `/usr/src/linux2.4/Makefile` contains lines like the following:

```
VERSION = 2
PATCHLEVEL = 4
SUBLEVEL = 18
EXTRAVERSION = -3
```

- To keep from screwing up your current installation when building a new kernel and associated modules, change the `EXTRAVERSION` variable to something like

```
“EXTRAVERSION=-3custom”
```

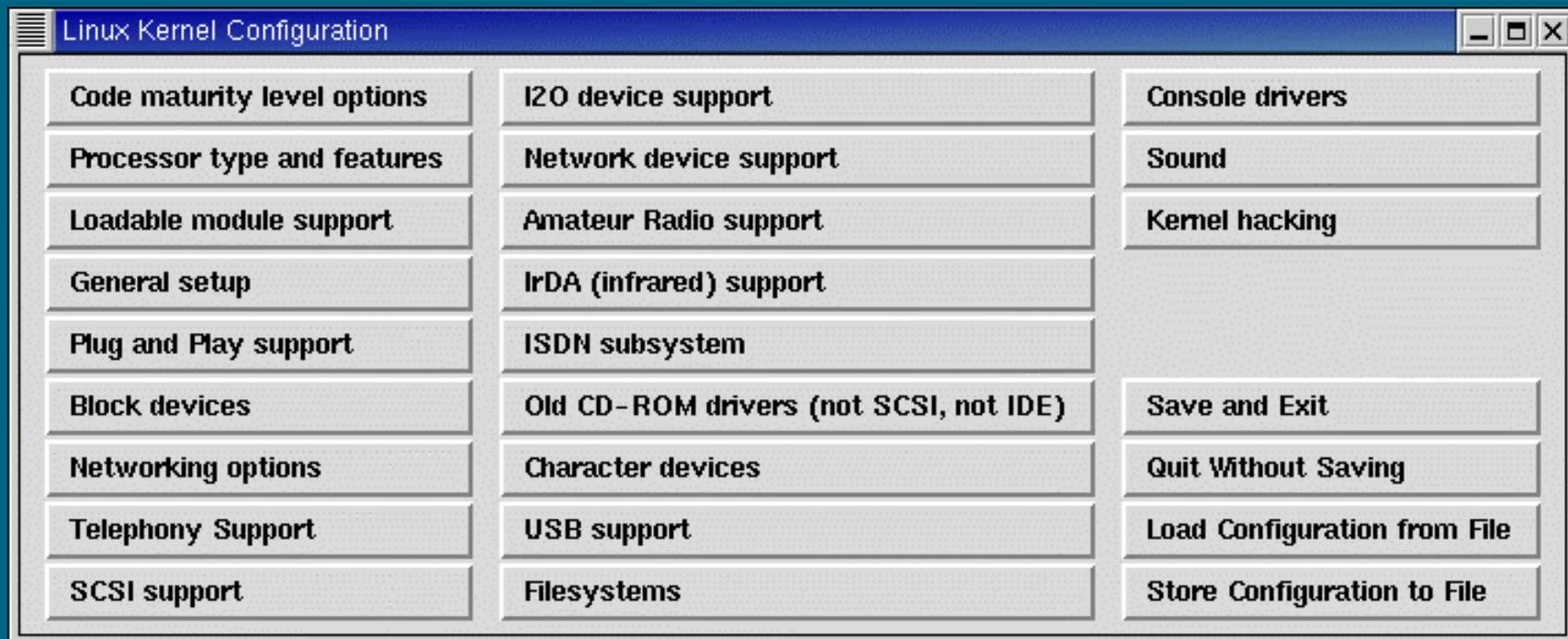
- This will allow you to keep your modules, `initrd`, and kernel separate from your working version (`/usr/lib/modules-2.4.18-3custom`, `/boot/vmlinux-2.4.18-3custom`, `/boot/initrd-2.4.18-3custom`, etc.)

- **Tip**: If you have more than one CPU, you can type `“make -j <N> bzimage modules”` to run N simultaneous compile jobs



Linux Kernel Configuration Tool

- “cd /usr/src/linux2.4”; make xconfig
- Remember to load/save the configuration changes if you want to keep them across rebuilds





Linux Kernel Configuration Tool

Option	y	m	n	Description	Help
Quota support	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Quota support	Help
Kernel automounter support	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Kernel automounter support	Help
ADFS filesystem support (read only) (EXPERIMENTAL)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	ADFS filesystem support (read only) (EXPERIMENTAL)	Help
Amiga FFS filesystem support	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Amiga FFS filesystem support	Help
Apple Macintosh filesystem support (experimental)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Apple Macintosh filesystem support (experimental)	Help
DOS FAT fs support	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	DOS FAT fs support	Help
MSDOS fs support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	MSDOS fs support	Help
UMSDOS: Unix-like filesystem on top of standard MSDOS filesystem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	UMSDOS: Unix-like filesystem on top of standard MSDOS filesystem	Help
VFAT (Windows-95) fs support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	VFAT (Windows-95) fs support	Help
ISO 9660 CDROM filesystem support	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	ISO 9660 CDROM filesystem support	Help
Microsoft Joliet CDROM extensions	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Microsoft Joliet CDROM extensions	Help
Minix fs support	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Minix fs support	Help
NTFS filesystem support (read only)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	NTFS filesystem support (read only)	Help
NTFS read-write support (DANGEROUS)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	NTFS read-write support (DANGEROUS)	Help
OS/2 HPFS filesystem support (read only)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	OS/2 HPFS filesystem support (read only)	Help
/proc filesystem support	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	/proc filesystem support	Help
/dev/pts filesystem for Unix98 PTYs	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	/dev/pts filesystem for Unix98 PTYs	Help
QNX4 filesystem support (read only) (EXPERIMENTAL)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	QNX4 filesystem support (read only) (EXPERIMENTAL)	Help
QNX4FS write support (DANGEROUS)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	QNX4FS write support (DANGEROUS)	Help

Main Menu Next Prev



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Dynamic Kernel Modules





Linux Dynamic Kernel Modules

- When configuring a kernel, you have the choice to build things in (monolithic) or to dynamically load modules (slower) but much easier ...
- The “lsmod” command lists all loaded modules and their current state
- The startup operation (kudzu) will detect hardware and load the proper module (usually) for any *supported* hardware
- At boot time, the startup process runs “depmod -a”, which builds a dependency list for all modules
- The /etc/modules.conf file contains commands for the module commands “insmod” and “modprobe”
- Unused modules are unloaded by a cron job which executes “rmmod -a”
- Modules are located under “/lib/modules/<kernel_rev>”
- Modules are generally **not** compatible across kernel revisions!
- The kernel is smart enough to locate the proper modules to match its version, provided they are in the standard location (/lib/modules)



Linux Dynamic Kernel Modules Commands

lsmod

Module	Size	Used by	Tainted: PF
maestro	30144	1 (autoclean)	
soundcore	6692	2 (autoclean) [maestro]	
vmnet	23616	8	
parport_pc	18724	0	
parport	34208	0 [parport_pc]	
vmmon	22836	6	
ipt_TOS	1952	17 (autoclean)	
ipt_state	1536	2 (autoclean)	
ipt_REJECT	4096	8 (autoclean)	
ipt_LOG	4736	9 (autoclean)	
ipt_limit	1952	3 (autoclean)	
iptable_nat	21012	0 (autoclean) (unused)	
ip_contrack	21164	2 (autoclean) [ipt_state iptable_nat]	
iptable_mangle	3136	1 (autoclean)	
iptable_filter	2752	1 (autoclean)	
ip_tables	13984	10 [ipt_TOS ipt_state ipt_REJECT ipt_LOG ipt_limit iptable_nat iptable_mangle iptable_filter]	
serial_cs	5344	0 (unused)	
3c59x	28520	1	
ds	8608	2 [serial_cs]	
yenta_socket	12384	2	
pcmcia_core	50752	0 [serial_cs ds yenta_socket]	
ide-cd	30272	1 (autoclean)	
cdrom	32192	0 (autoclean) [ide-cd]	
usb-uhci	24484	0 (unused)	
usbcore	73152	1 [usb-uhci]	
ext3	67136	2	
jbd	49400	2 [ext3]	



/etc/modules.conf

```
# cat /etc/modules.conf
```

```
alias                parport_lowlevel    parport_pc
alias                sound-slot-0         maestro
post-install         sound-slot-0         /bin/aumix-minimal -f /etc/.aumixrc -L >/dev/null 2>&1 || :
pre-remove           sound-slot-0         /bin/aumix-minimal -f /etc/.aumixrc -S >/dev/null 2>&1 || :
alias                usb-controller      usb-uhci
alias                eth0                3c59x
```

```
# ls -al /lib/modules/2.4.18-3
```

```
total 300
drwxr-xr-x  5 root  root   4096 Jul 29 17:02 .
drwxr-xr-x  3 root  root   4096 Jul 29 16:58 ..
lrwxrwxrwx  1 root  root    31 May 19 23:25 build -> ../../usr/src/linux-2.4.18-3
drwxr-xr-x  8 root  root   4096 May 19 23:25 kernel
drwxr-xr-x  2 root  root   4096 Jun 27 04:51 misc
-rw-r--r--  1 root  root  89026 Jul 15 09:15 modules.dep
-rw-r--r--  1 root  root    31 Jul 15 09:15 modules.generic_string
-rw-r--r--  1 root  root   147 Jul 15 09:15 modules.ieee1394map
-rw-r--r--  1 root  root   8257 Jul 15 09:15 modules.isapnpmap
-rw-r--r--  1 root  root    29 Jul 15 09:15 modules.parportmap
-rw-r--r--  1 root  root  60859 Jul 15 09:15 modules.pcimap
-rw-r--r--  1 root  root    24 Jul 15 09:15 modules.pnpbiosmap
-rw-r--r--  1 root  root  91181 Jul 15 09:15 modules.usbmap
drwxr-xr-x  2 root  root   4096 May 19 23:25 pcmcia
```



Other Dynamic Module Commands

- “ksyms” List exported module symbols
- “insmod” install module (low level)
- “modprobe” install module and dependencies (high level)
- “rmmod” remove module
- “depmod” create module dependencies
- “lsmod” list installed modules



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HP-UX and Linux Commands





Basic HP-UX and Linux Command Differences

HP-UX: UNIX for the Enterprise

- swapinfo
- chown root:root /root_home
- rm
- ll
- bdf
- lanscan

- Note: Many Linux commands support both the “-v” option style and the GNU “--verbose” option style. Check the man page for the command for details



```
swapon -s  
chown root.root /dev/fd0  
rm -f      (defaults to “safe”)  
alias ll='ls -al'  
df  
ifconfig
```



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Configuring Your Sound Card





Sound Configuration Utility “sndconfig”

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.

Introduction

sndconfig is a configuration tool for sound cards.

A probe will now be performed for any PnP cards that will be automatically configured.

Report bugs to sound-list@redhat.com

Ok

Cancel

<Tab>/<Alt-Tab> between elements ; Use <Enter> to edit a selection



Sound Configuration: Probing for Sound Hardware

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.

Probe Results

No PnP or PCI sound cards were found in your system. Please select your card type from the following list.

Ok

<Tab>/<Alt-Tab> between elements ; Use <Enter> to edit a selection



Sound Configuration: Selecting the Card Type

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.

Card Type

Please select your card:

- PSS (Orchid SW32, Cardinal DSP16)
- S3 SonicVibes
- Sound Blaster**
- Sound Blaster Pro
- Sound Blaster 16
- Sound Blaster AWE32/64
- Sound Blaster Live!
- Trident 4D-Wave NX/DX

↑
█

█
↓

Ok **Cancel**

<Tab>/<Alt-Tab> between elements ; Use <Enter> to edit a selection



Sound Configuration: Device Parameters

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.

Card Settings

Please adjust the settings below to match the dip switch settings on your sound card.

I/O PORT	IRQ	DMA
<input type="text" value="0x220"/> <input type="text" value="0x240"/>	<input type="text" value="3"/> <input type="text" value="5"/>	<input type="text" value="1"/>

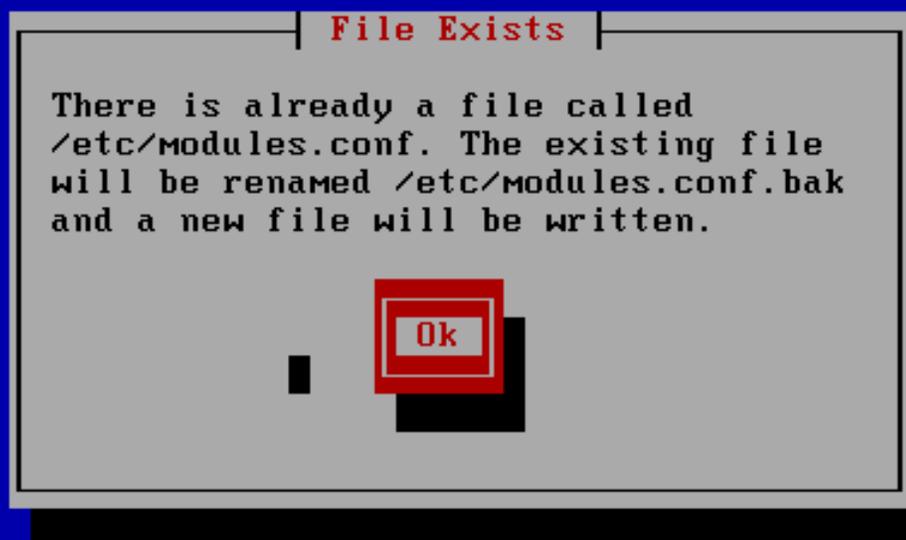
<Tab>/<Alt-Tab> between elements ; Use <Enter> to edit a selection



Sound Configuration: Loading the Module

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.



<Tab>/<Alt-Tab> between elements ; Use <Enter> to edit a selection



Sound Configuration: Playing Sample Sound

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.

Sound Card Test

A sound sample will now be played to determine if your sound card has been correctly configured.



<Tab>/<Alt-Tab> between elements ; Use <Enter> to edit a selection



Sound Configuration: Verifying Operation

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.

Test Result	
Were you able to hear the sample?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No

<Tab> / <Alt-Tab> between elements ; Use <Enter> to edit a selection



Sound Configuration: Verifying the MIDI Interface

Sound Configuration Utility 0.57

(C) 2000 Red Hat, Inc.



<Tab>/<Alt-Tab> between elements ; Use <Enter> to edit a selection



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Configuring X-Windows





X Configuration: The “Xconfigurator” Utility

Xconfigurator 4.4.3 - (C) 2000 Red Hat Software and others

Welcome

This program will create a basic XF86Config file, based on menu selections you make.

The XF86Config file usually resides in /usr/X11R6/lib/X11 or /etc/X11. A sample XF86Config file is supplied with XFree86; it is configured for a standard VGA card and monitor with 640x480 resolution.

You can either take the sample XF86Config as a base and edit it for your configuration, or let this program produce a base XF86Config file for your configuration and fine-tune it. Refer to /usr/X11R6/lib/X11/doc/README.Config for a detailed



<Tab>/<Alt-Tab> between elements ; <Space> selects ; <F12> next screen



X Configuration: Select Adapter Type

Xconfigurator 4.4.3 - (C) 2000 Red Hat Software and others

Choose a Card

Pick a Card from the list below (Or choose "Unlisted Card" at the bottom of the list if your card isn't listed):

ATI Rage Mobility	ATI-Mach64	↑
ATI Rage Mobility P	ATI-Mach64	#
ATI Ultra Plus	ATI-Mach32	█
ATI Video Boost	ATI-Mach64	█
ATI Video Charger	ATI-Mach64	█
ATI Video Xpression	ATI-Mach64	█
ATI Video Xpression+	ATI-Mach64	█
ATI WinBoost	ATI-Mach64	█
ATI WinBoost with AT&T 20C408 RAMDAC	ATI-Mach64	↓

Ok

Back

<Tab>/<Alt-Tab> between elements ; <Space> selects ; <F12> next screen



X Configuration: Select Monitor Type

Xconfigurator 4.4.3 - (C) 2000 Red Hat Software and others

Monitor Setup

What type of monitor do you have? If you would rather specify the sync frequencies of your monitor, choose "Custom" from the list.

- HP A1295A 24-inch Display
- HP A4033A 21-inch Display
- HP A4331A 20-inch Display**
- HP A4576A (P1100) 21-inch Display
- HP D1187A 20-inch Display
- HP D1188A 20-inch Display
- HP D1192A VGA Monochrome 14-inch Display

↑
█

█
↓

Ok **Back**

<Tab>/<Alt-Tab> between elements ; <Space> selects ; <F12> next screen



X Configuration: Probe for Display Memory

Xconfigurator 4.4.3 - (C) 2000 Red Hat Software and others

Screen Configuration

Xconfigurator now needs to setup the default resolution and color depth. Most modern PCI video cards can be probed, and Xconfigurator will automatically determine the best video mode/color depth possible for your system. There is a chance, however, this could lock up your system. If you would prefer to give the required information instead of having it probed, answer "Don't Probe" to the following question.

Don't Probe

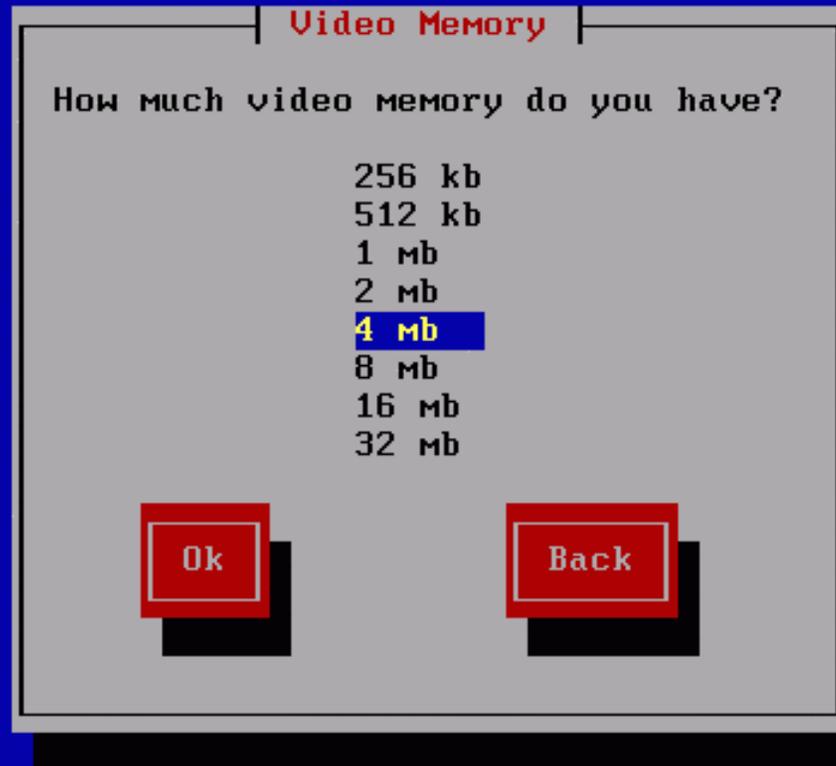
Probe

<Tab>/<Alt-Tab> between elements ; <Space> selects ; <F12> next screen



X Configuration: Verifying Display Memory

Xconfigurator 4.4.3 – (C) 2000 Red Hat Software and others



<Tab>/<Alt-Tab> between elements ; <Space> selects ; <F12> next screen



X Configuration: Select Clock Chip

Xconfigurator 4.4.3 – (C) 2000 Red Hat Software and others

Clockchip Configuration

Which Clockchip do you have?

- No Clockchip Setting (recommended)**
- Chrontel 8391
- ICD2061A and compatibles (ICS9161A, DCS2824)
- ICS2595
- ICS5342 (similar to SDAC, but not completely compatible)
- ICS5341
- S3 GenDAC (86C708) and ICS5300 (autodetected)
- S3 SDAC (86C716)

↑ # ↓

Ok **Back**

<Tab>/<Alt-Tab> between elements ; <Space> selects ; <F12> next screen



X Configuration: Probe for Clock Settings

Xconfigurator 4.4.3 – (C) 2000 Red Hat Software and others

Probe for Clocks

Do you want to run 'X -probeonly' now?

It is possible that the hardware detection routines in the server somehow cause the system to crash and the screen to remain blank. If this is the case, skip this step the next time. The server may need a Ramdac, ClockChip or special option (e.g. "nolinear" for S3) to probe and start-up correctly.

Probe

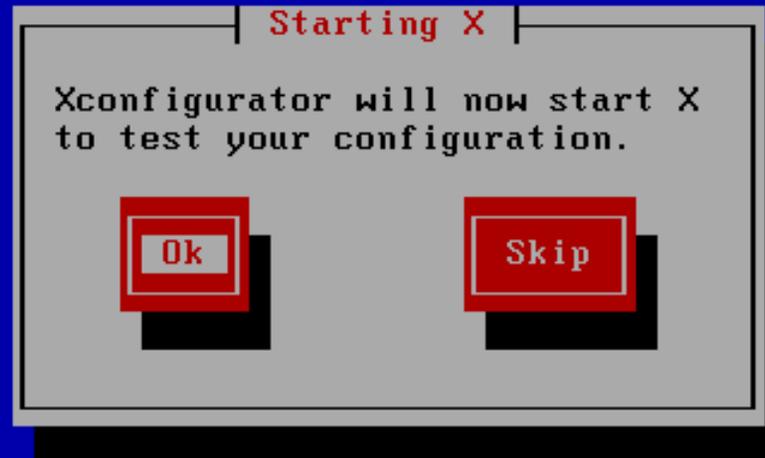
Skip

<Tab>/<Alt-Tab> between elements ; <Space> selects ; <F12> next screen



X Configuration: Testing the Settings

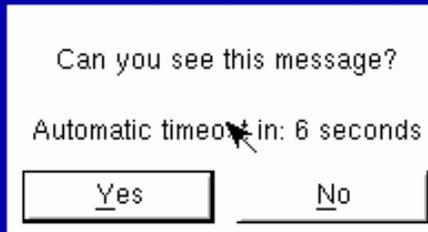
Xconfigurator 4.4.3 – (C) 2000 Red Hat Software and others



<Tab>/<Alt-Tab> between elements : <Space> selects : <F12> next screen



X Configuration: Successful Startup





X Configuration: Automatic X Startup?

Xconfigurator can set up your computer to automatically start X upon booting. Would you like X to start when you reboot?

Yes

No





X Configuration: Configuration File Written

Configuration file has been written. Take a look at it before running 'startx'. Note that the XF86Config file must be in one of the directories searched by the server (e.g. /etc/X11/XF86Config) in order to be used. Within the server press ctrl, alt and '+' simultaneously to cycle video resolutions. Pressing ctrl, alt and backspace simultaneously immediately exits the server (use if the monitor doesn't sync for a particular mode).

For further configuration, refer to
`/usr/X11R6/lib/X11/doc/README.Config`.

OK





X Configuration Tips

- Find out as much as you can about your display and monitor hardware before starting the configuration
- Wait until *after* you have successfully verified X-Windows operation to make graphical login the default
- Boot in run-level 3, then use “startx” to test your configuration
- Modify /etc/inittab to make the X run-level the default after verification
- To kill the X-server, Ctrl-Alt-Backspace
- If you selected more than one display depth, you can cycle between them with Ctrl-Alt-+
- There are more than one virtual displays on the X-server, you can get to them with Ctrl-Alt-F[1-8]
- The configuration file is /etc/X11/XF86Config (version 3.3.6) or /etc/X11/XF86Config-4 (version 4.X.X)



up2date

Register with Red Hat Network



Now for the first time ever, information, updates, and services that enhance the security and reliability of your Red Hat Linux systems are available to you in one place-- Red Hat Network. Check out these benefits:

- Red Hat Linux information, updates, and services specific to your systems
- Fast access and proactive delivery of updates (security errata, bug fixes, enhancements)
- The latest news from Red Hat when new products and services are available

Joining is easy-- just follow this three step process:

Step 1: Review the Red Hat privacy policy

Step 2: Register a user account with Red Hat.

- a. This registration program can take care of that for you
- b. You can also register an account by going to <https://rhn.redhat.com/newlogin.pxt>

Step 3: Register a system profile on Red Hat Network

Click on the "Next" button to register now, or click "Cancel" to banish this program forever.

◀ Back

▶ Next

✕ Cancel



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Miscellaneous Redhat Linux Configuration Tools





“netconfig”

netconfig 0.8.11 (C) 1999 Red Hat, Inc.

Configure TCP/IP

Please enter the IP configuration for this machine. Each item should be entered as an IP address in dotted-decimal notation (for example, 1.2.3.4).

Use dynamic IP configuration (BOOTP/DHCP)

IP address:

Netmask:

Default gateway (IP):

Primary nameserver:

<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen



“authconfig”

authconfig 4.2.8 - (c) 1999-2001 Red Hat, Inc.

Authentication Configuration

Use Shadow Passwords

Use MD5 Passwords

Use LDAP Authentication Use TLS

Server: _____
Base DN: _____

Use Kerberos 5

Realm: _____
KDC: _____
Admin Server: _____

Use SMB Authentication

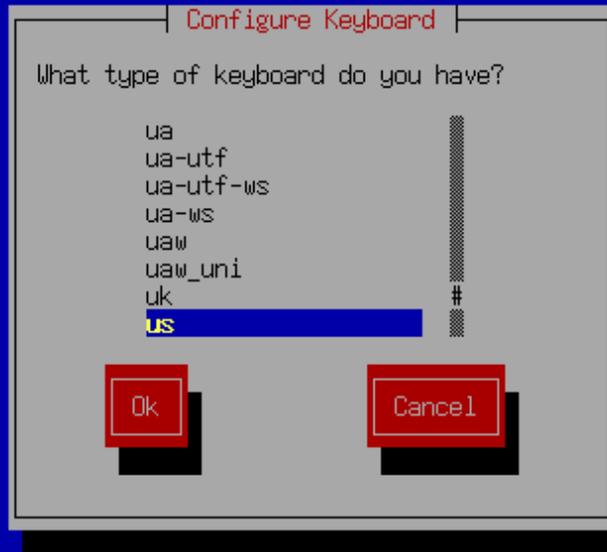
Workgroup: _____
Servers: _____

<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen



“kbdconfig”

kbdconfig 1.9.15 – (C) 1999-2001 Red Hat, Inc.

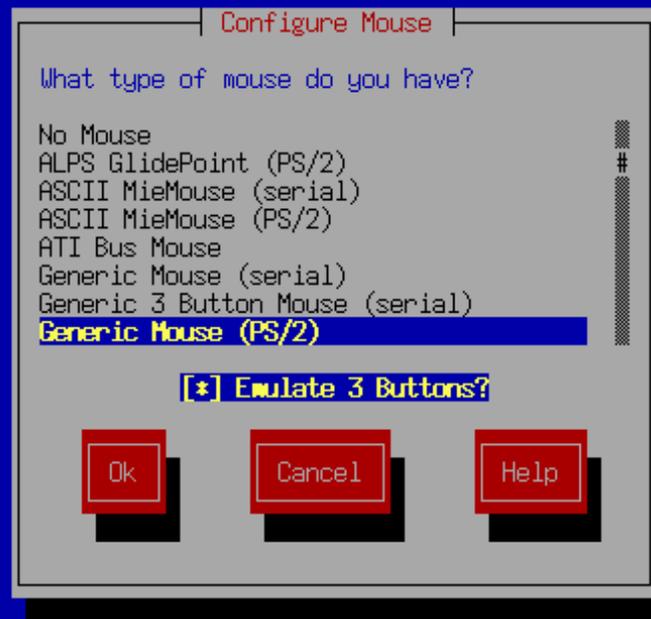


<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen



“mouseconfig”

mouseconfig 4.25 - (C) 2000 Red Hat, Inc.

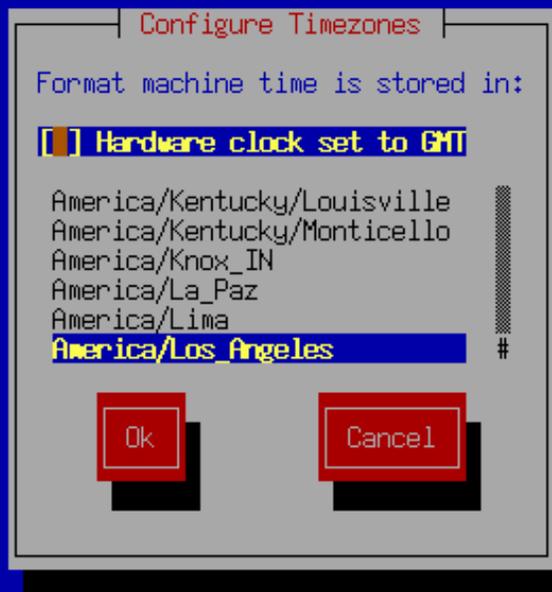


<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen



“timeconfig”

timeconfig 3.2.7 - (C) 2002 Red Hat, Inc.



<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen



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Network Installation with Kickstart



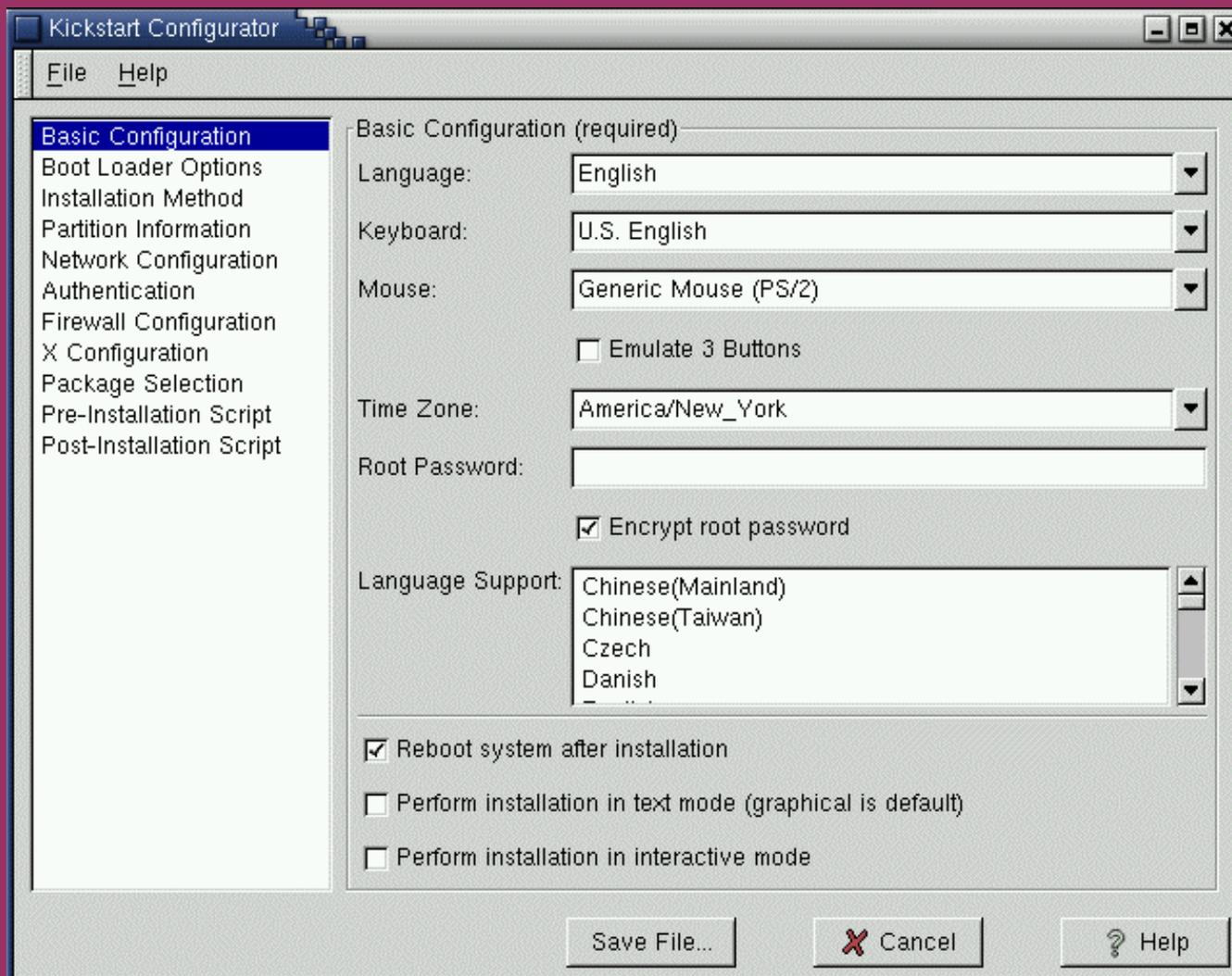


Kickstart

- Kickstart can allow you to do interactive network installs via FTP, HTTP, or NFS
- Systems may boot from floppy, DHCP, or other network boot protocols.
- Normal installation writes a `/root/anaconda-ks.cfg` file that contains all of the choices made during system installation
- Use that file or “ksconfig” to make the Kickstart control file
- Copy the Redhat CD-ROM installation disks to the Kickstart server and make them available to Kickstart
- A complete Kickstart tutorial is beyond the scope of this session.
- There are “HowTos” available for Kickstart on Linux community web sites.



“ksconfig”





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Miscellaneous Linux Stuff





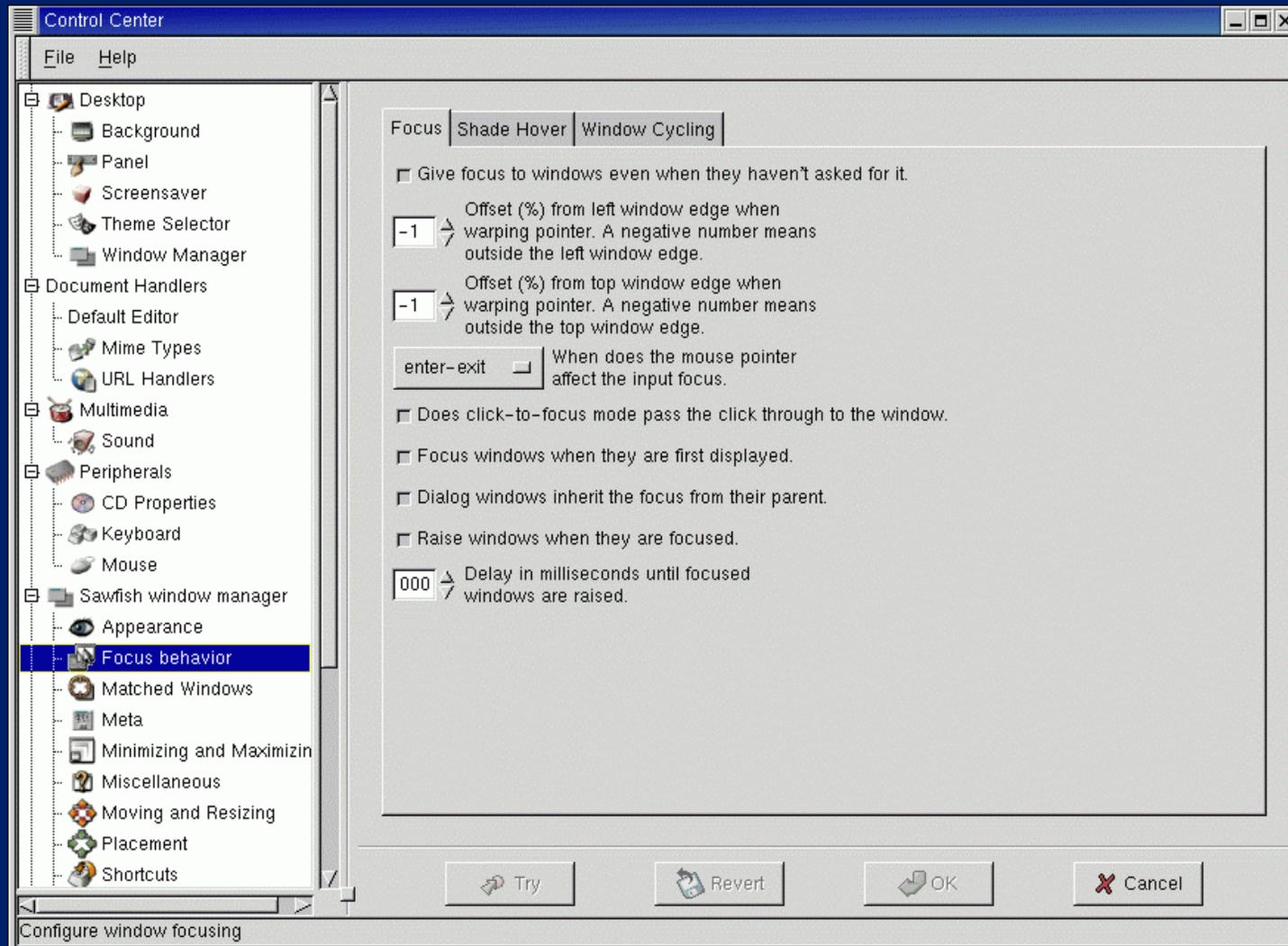
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Linux Running Windows via VMware



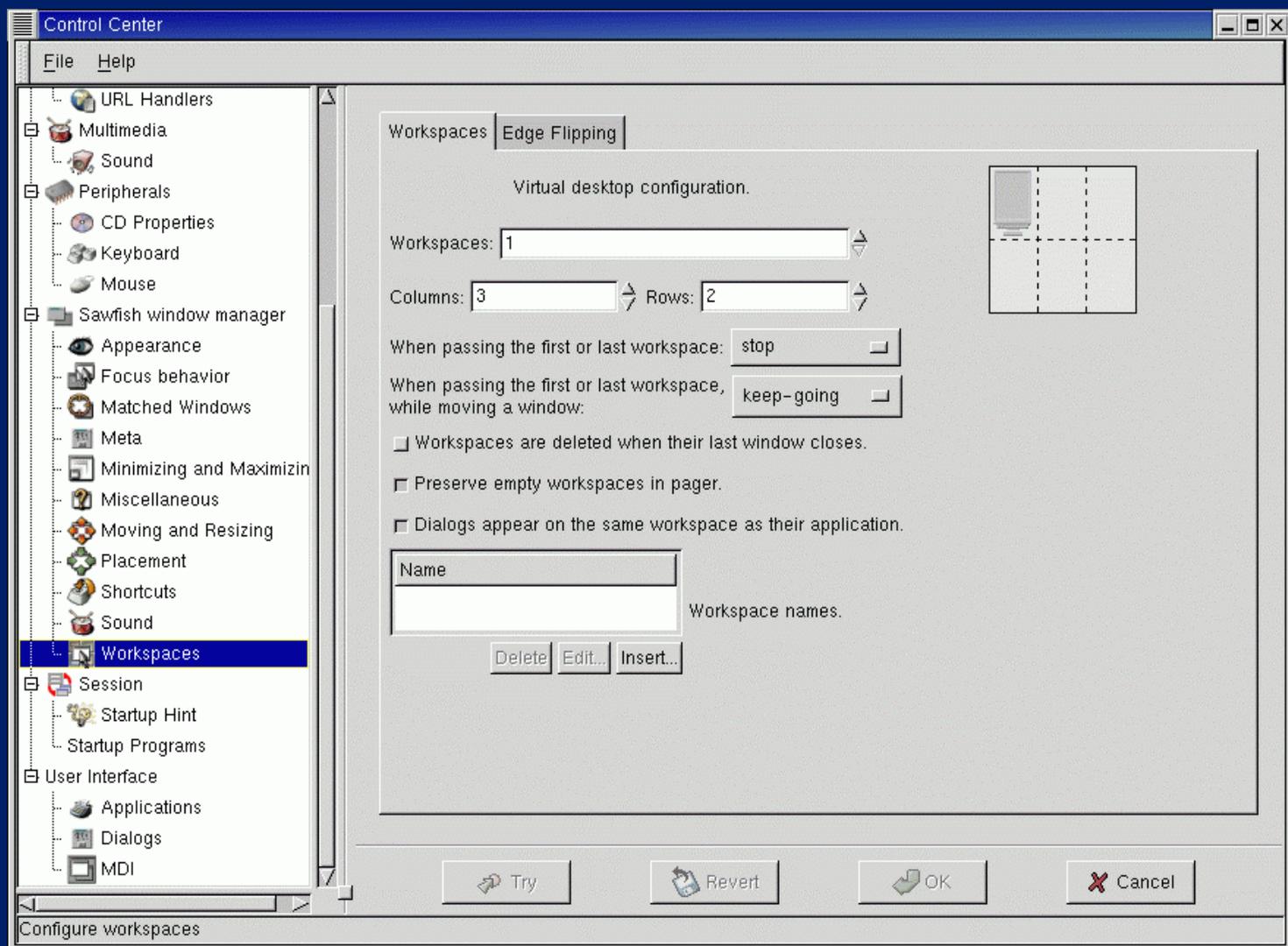


Configuring GNOME Mouse Focus Behavior





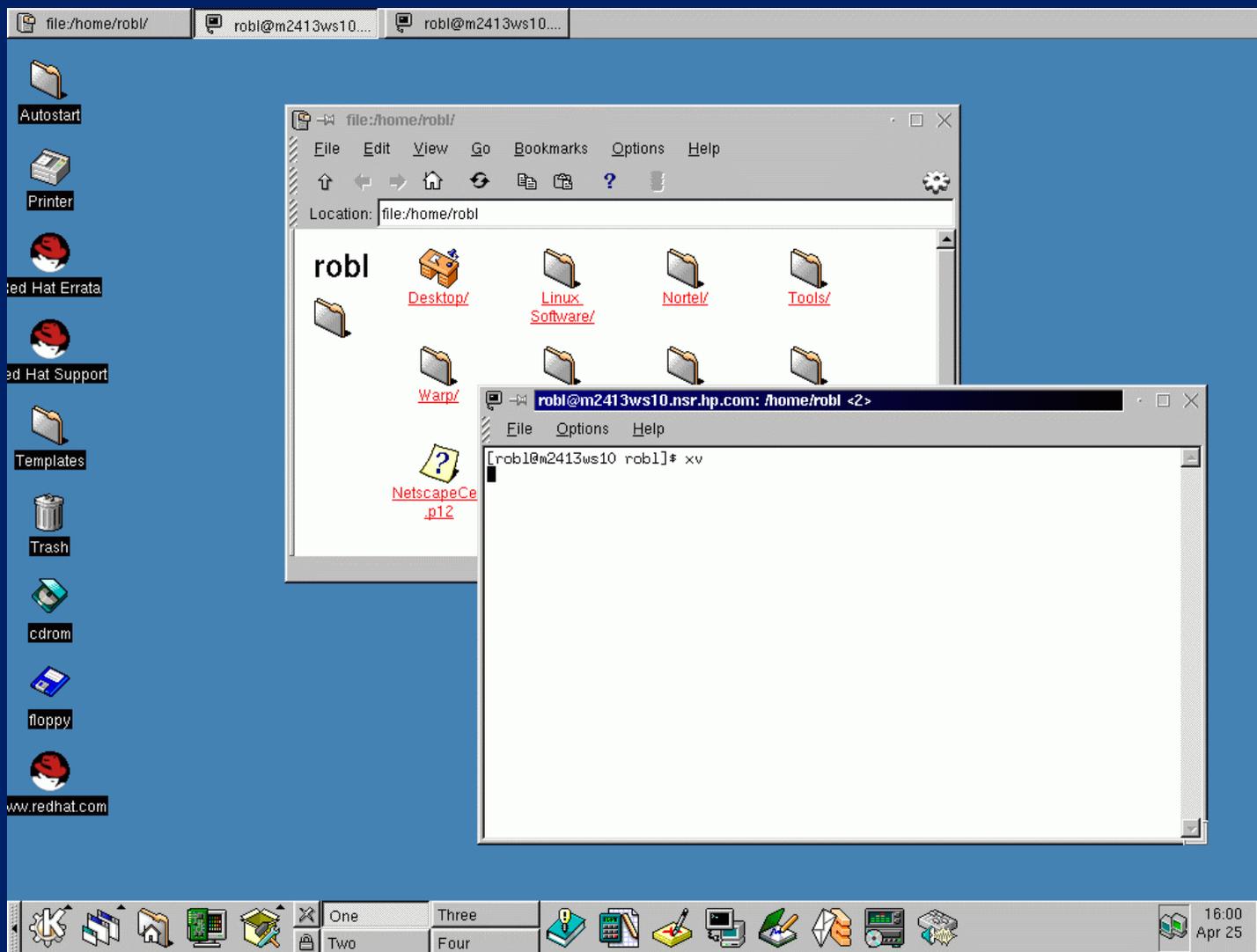
Configuring GNOME Workspaces





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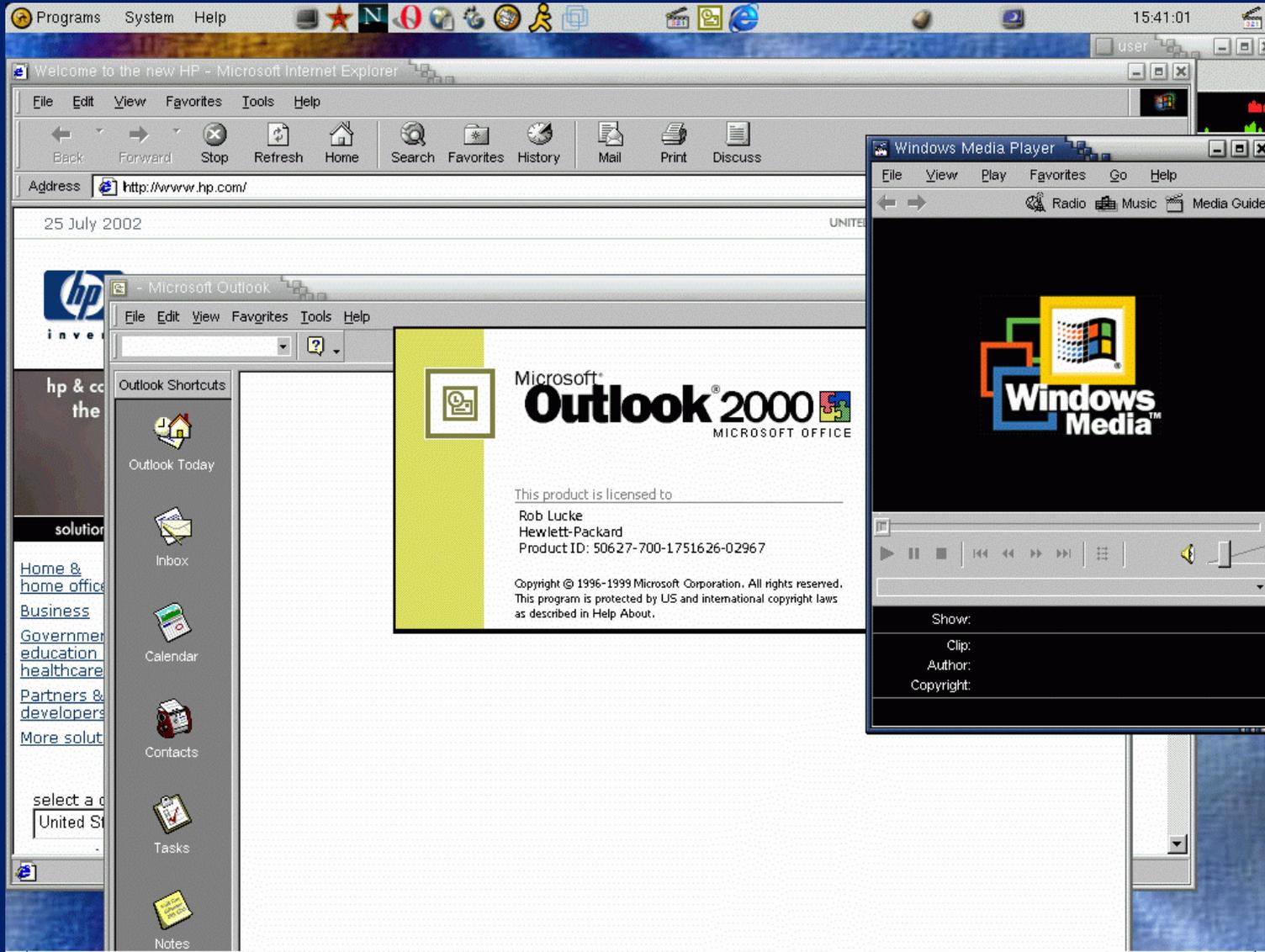
KDE Desktop





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CrossOver Office on Ximian GNOME





i n v e n t