



Linux for Mainframers



Laura Knapp
Technical Evangelist
1-919-224-2205
Laura@lauraknapp.com
www.lauraknapp.com



Agenda



Background

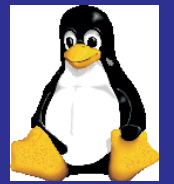
Installing Linux

Major Components of Linux

Resources



History



Fastest growing operating system today

**Unix-like operating system
Named after Linus Torvalds
Linus + Unix = Linux**

**Renowned for speed and
reliability**

**Runs on many different kinds
of hardware**

**Why are there special releases for the mainframe?
To support the mainframe devices
Mainframe folks can't handle frequent releases**

Several vendors sell very affordable "distributions"

And it's FREE to download





Continued Innovation



Linus Torvalds originated

Open source code

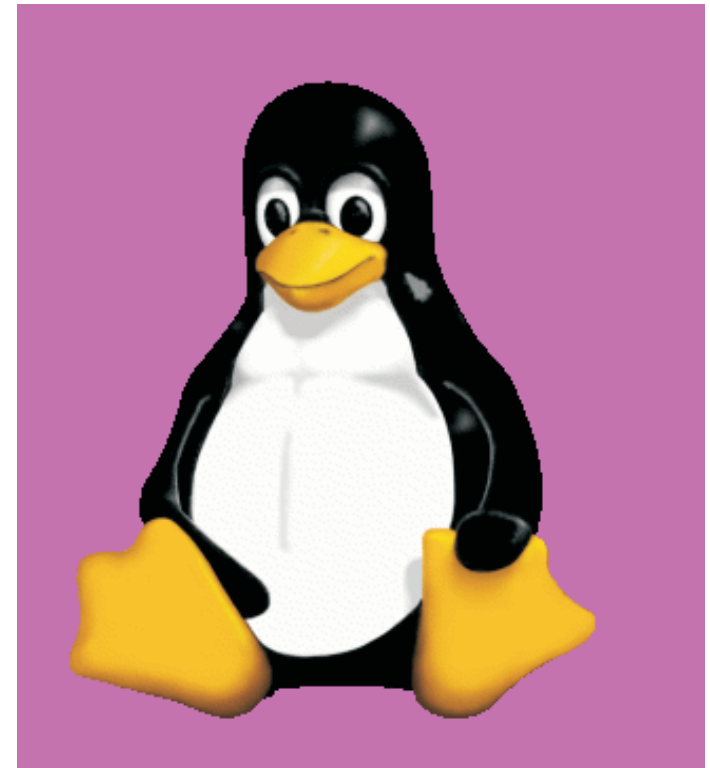
Posted on Internet: October 5, 1991

Linux 1.0 in 1994 and Linux 2.2 in 1999

Today -- runs on 7-10 million computers

Thousands of programmers

**Moving beyond the "enthusiast phase"
into small businesses, ISPs, and
into the corporate IS world**





How do you Get Linux



The Linux Home Page at Linux Online - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail

Address <http://www.linux.org/> Go Links

Google Search Web Search Site News PageRank Page Info Up Highlight



Linux Online!
<http://www.linux.org>

Advertisement

AMAZON.COM NOW OFFERS **new and used** PRODUCTS

Now you can save even more with used products!

Books
Electronics
DVDs
And Much More!

amazon.com
and you're done!
CLICK HERE
Sell your stuff too!

View all of our sponsors.

Register

Login:

Passwd:

Login

Applications

Documentation

Distributions

Download

General Info

Book Store

Courses

News

What is Linux?

Linux is a free Unix-type operating system originally created by Linus Torvalds with the assistance of developers around the world. Developed under the [GNU General Public License](#), the source code for Linux is freely available to everyone. Click on the link below to find out more about the operating system that is causing a revolution in the world of computers. [more](#)

Linux in the News

- [SuSE offers Linux for Opteron](#)
- [MS legal threat details Foxpro on Linux demo](#)
- [Legislating Open Source](#)
- [Stiff opposition details open-source measure](#)
- [Cryptographers sound warnings on Microsoft security plan](#)

Featured Book

Red Hat is in the top 3 of best selling Linux distributions on the market. It is readily available either by purchase or by download. Due to its name recognition, novices to Linux often choose it for their initiation in the Linux world. Bill Ball's *Red Hat Linux 3 Unleashed* covers installation and configuration of this popular distribution. The book will show you administration techniques for a Red Hat system so your machine is secure and reliable. [more](#)



[One click link](#)

Buy from 

Top Five Linux Books:

- [Red Hat Linux 7.3 Bible](#)



Users of Linux



Linux Journal - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://www2.linuxjournal.com/cgi-bin/frames.pl?r-toc.html> Go Links >>

search

contact us

linux journal
Magazine
Free Trial Issue
Subscribe!
Advertising
LJ Store

about linux
What is Linux?
How to Get Linux
Linux Enterprise

resources
Help Desk
User Groups (GLUE)
Career Center
Speakers Bureau
Special Events
Software Wishlist
Discussions
Links

other lj sites
Embedded Linux Journal
No-Frames Site
LJ Interactive
Linux Gazette
Linux Bazaar

An **SSC** Publication

**embedded
linux
journal**
FREE ISSUE!

Privacy Statement

linuxjournal
The Premier Linux Magazine

linux resources

About Linux
[What is Linux?](#) "Where did it come from? Where is it going?"

Where to Get Linux
[About Linux Distributions](#) There's more than one way to run a PC--and more than one Linux.
[Linux Distributions](#) A survey of some of the more popular versions of Linux.

Help Desk
[Getting Help with Linux](#) Ask questions. Get answers.
[Man pages](#) Linux's own on-line manual.
[Linux Links](#) Some places worth visiting for more Linux history and information.
[Software Wish List](#) What you want that Linux doesn't have--yet.
[Pre-configured Linux systems](#) Links to hardware and pre-configured Linux systems.

Linux Documentation Project
[LDP Home Page](#) Headquarters of the documentation project.
[HOWTOs](#) A collection of the more popular Linux primers.
[Linux Development Projects](#) Geeks at Work: Some of the builds, ports and other hacks-in-progress.
[Linux Software Map](#) An on-going survey of available Linux software.

How to Find Linux Users
[GLUE](#): Groups of Linux Users Everywhere
[Discussions](#) All Linux talk, all the time.
[Internet Relay Chat \(IRC\)](#) Linux and open-source conversation in real time.

Linux Enterprise
[Linux Enterprise](#) "How can I convince my boss that Linux is the solution to our business needs?"
[Career Center](#) Job opportunities in Linux are exploding. Find one, or post an opportunity, here.
[Special Events](#) Upcoming conferences, meetings and other Linux get-togethers.
[Speaker's Bureau](#) Need a knowledgeable Linux person for your event?

Linux On-Line Publications
[Linux Gazette](#) A cooperative publication of Linux users.
[Slashdot](#) The leading tech talk/conversation site on the Web.
[Freshmeat](#) Open Source community projects-in-progress.
[Linux Today](#) Find links to breaking news in the Linux industry.
[Linux Weekly News](#) Linux news and commentary.
[Linux World](#) More Linux news and commentary.

Internet



What's in a Distribution?



Linux kernel

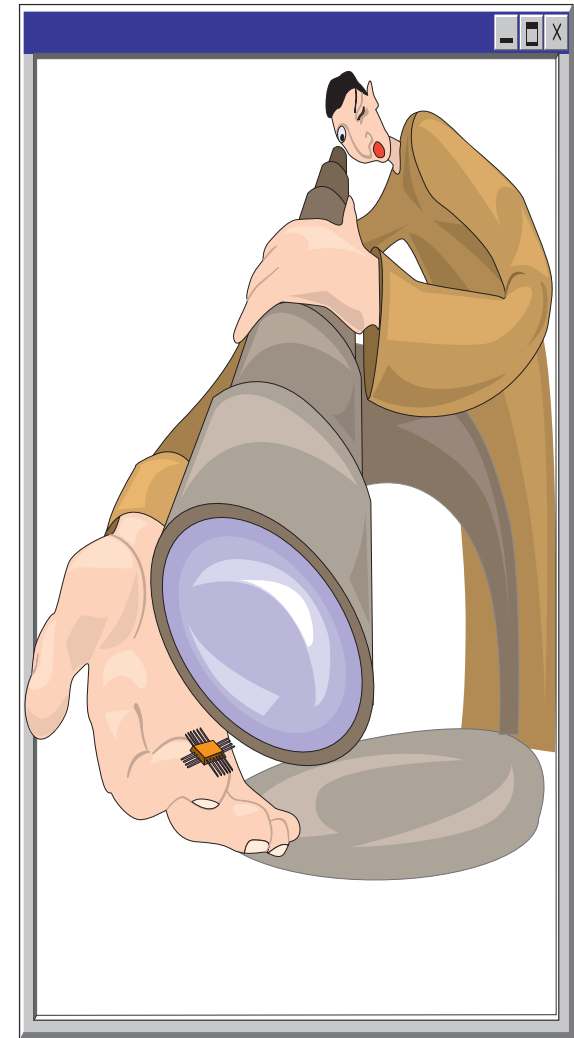
X Window system and window Managers like GNOME and KDE

Web servers, e-mail servers, FTP server

Installation & system configuration support

Third-party applications

Development tools



UNITED **LINUX**



CALDERA
systems

TURBOLINUX





What's in an Enterprise Distribution?



Key Features

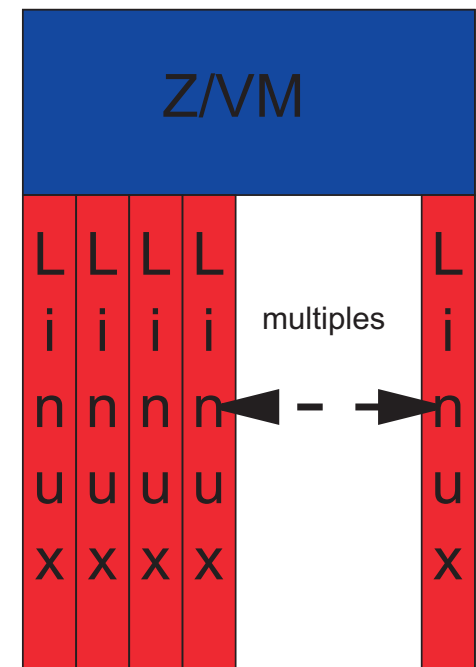
- 2.4.9 kernel (31 bit)
- gcc 2.95.3
- glibc 2.2.4
- ext3 journaling file system
- large file support with SW RAID
- support for lcs network interfaces

Supported Hardware

- IBM S/390 Parallel Enterprise Server
- G5: 9672-Rn6, 9672-Yn6
- G6: 9672-Xn7, 9672-Zn7
- IBM Multiprise 3000 Server - 7060-nnn
- IBM zSeries 900 and 800 servers (in 31 and 64 bit mode)

Minimum Requirements

- Memory - 64 MB minimum (128 MB recommended)
- Disk - 2 DASD partitions of at least 2 GB each



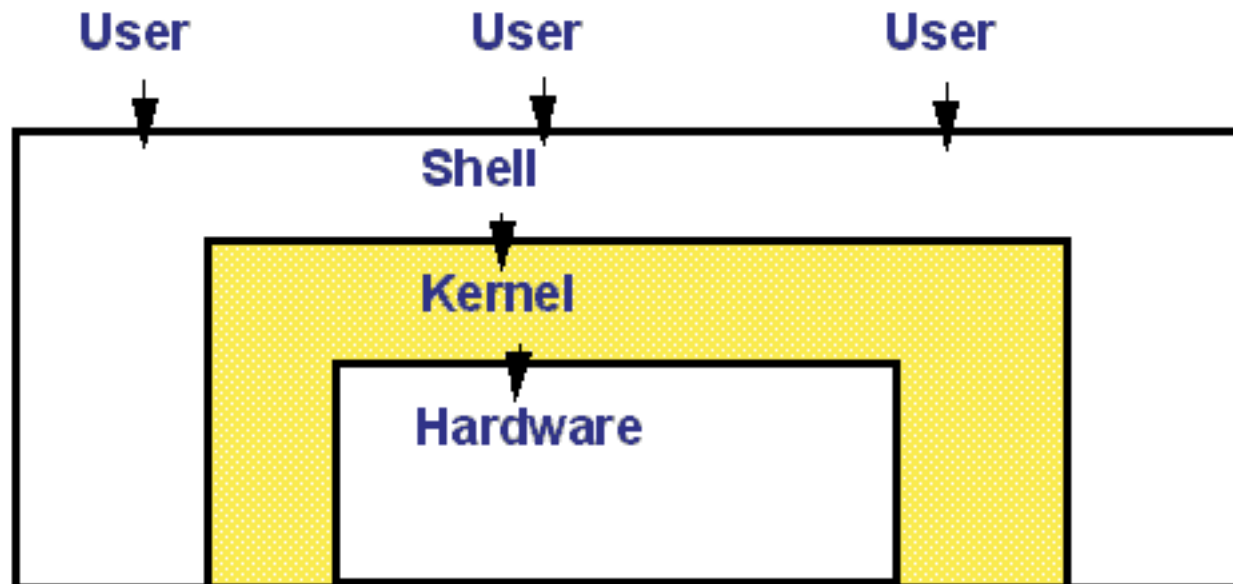


Linux Structure



UNIX-like

- **kernel:** the part of the operating system that interacts with the hardware
- **shell:** the part of the operating system that interacts with the user

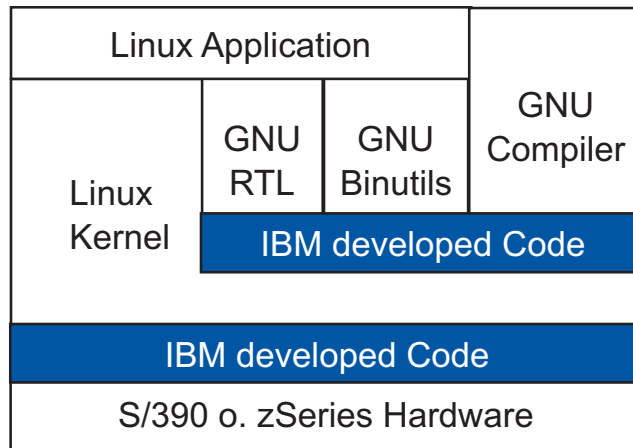




Linux Structure on the Mainframe



- Pure Linux, an ASCII environment
- Exploits IBM zSeries and S/390 hardware, including IEEE floating point, HiperSockets, ...
- Design Principals
 - ▶ No changes on Linux - not a unique version of Linux
 - ▶ No changes on Look & Feel for Linux on zSeries
 - ▶ No replacement for any other IBM ^ operating system

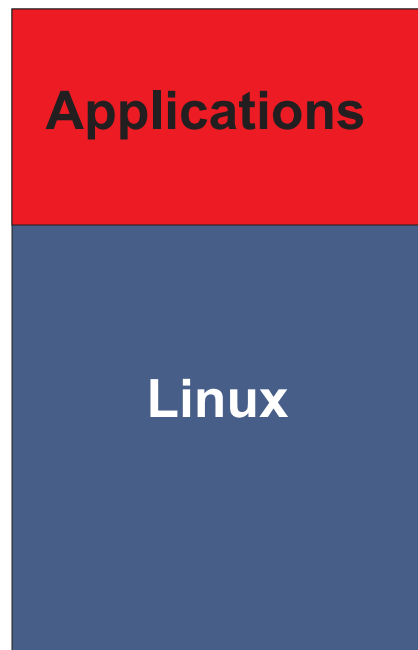


Delta vs. Linux on other platforms < 1%

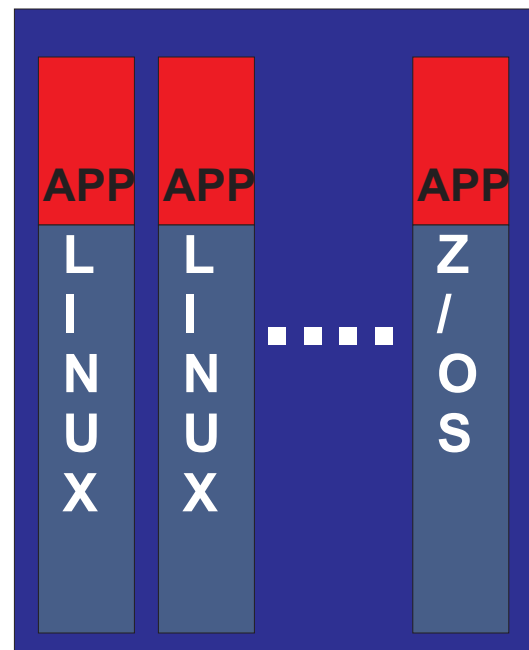
Linux is Linux



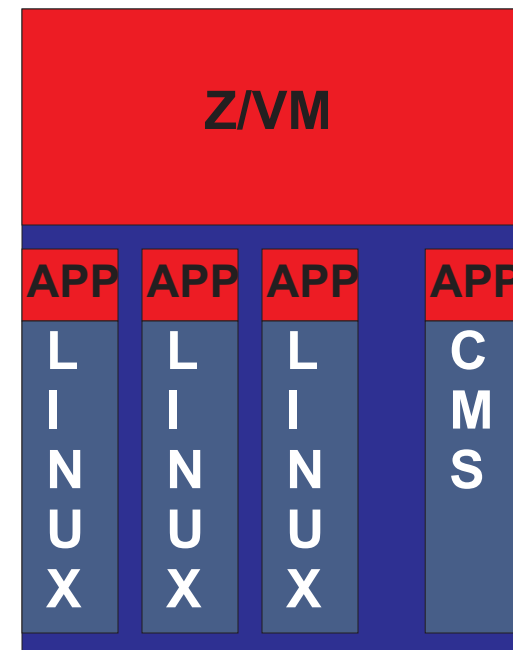
Linux Mainframe Implementations



Zseries Native



Zseries LPAR
(Up to 15 LPARs)



Zseries z/VM
Guest



Agenda



Background

Installing Linux

Major Components of Linux

Resources



Native zSeries Installation



- Build 390 Tapes from distribution Cd's**
- Transfer files from desktop to z/OS**
- Have userid capable of submitting JCL**
- Copy code and create 390 tapes**
- Have authority to vary devices on/off**
- Have access to a tape drive**
- Have access to HMC**

<http://linux390.marist.edu>

SG244-987 Linux for OS/390

- 1) Build IPLable tape from code**
- 2) Load your Linux partition using tape**
- 3) Format DASD and create file system**
- 4) Uncompress files on file system**
- 5) Customize files on file system**
- 6) Create and activate swap system**
- 7) ReIPL from DASD**

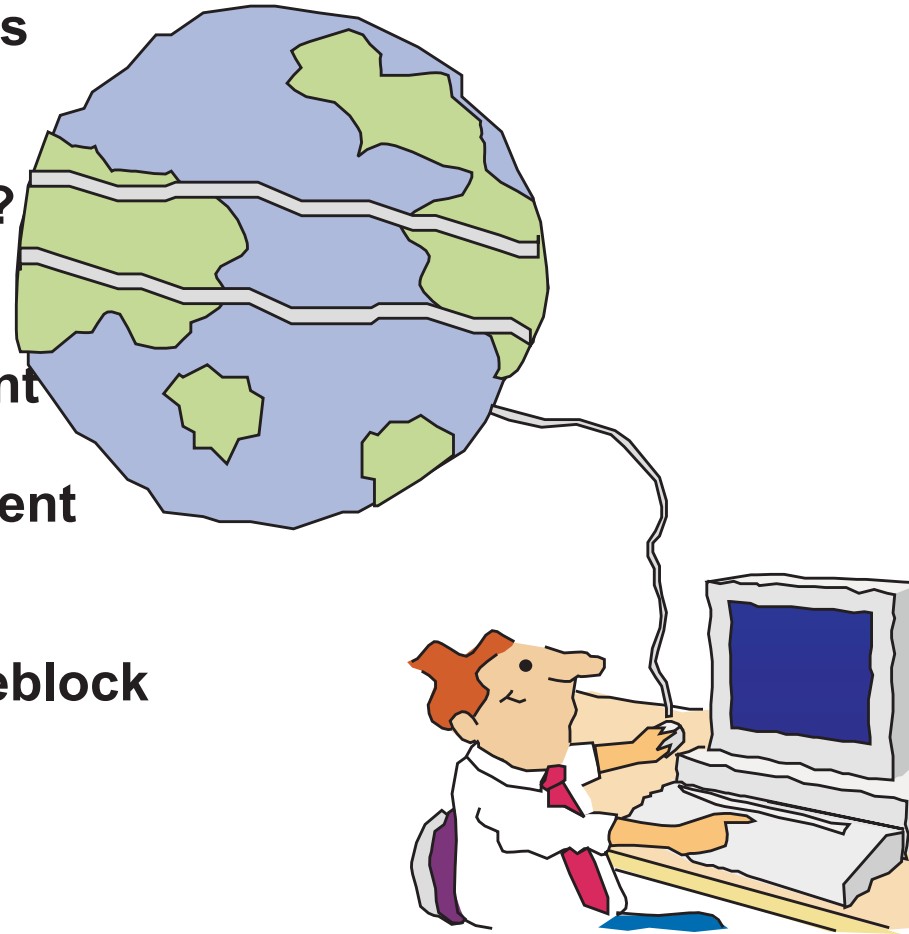




Z/VM Installation



- 1) Decide on installation items
Reader or tape?
(Reader is easier)
Which disk drives to user?
- 2) Prepare VM to run Linux
by setting up VM environment
- 3) Prepare network environment
- 4) Obtain binary fiels
- 5) Copy the files to VM and reblock
- 6) Create the initial Kernel
- 7) Boot the linux kernel
- 8) Install the root file system
- 9) Configure





Linux System Administration



Install software

Define user accounts

Configure peripheral devices

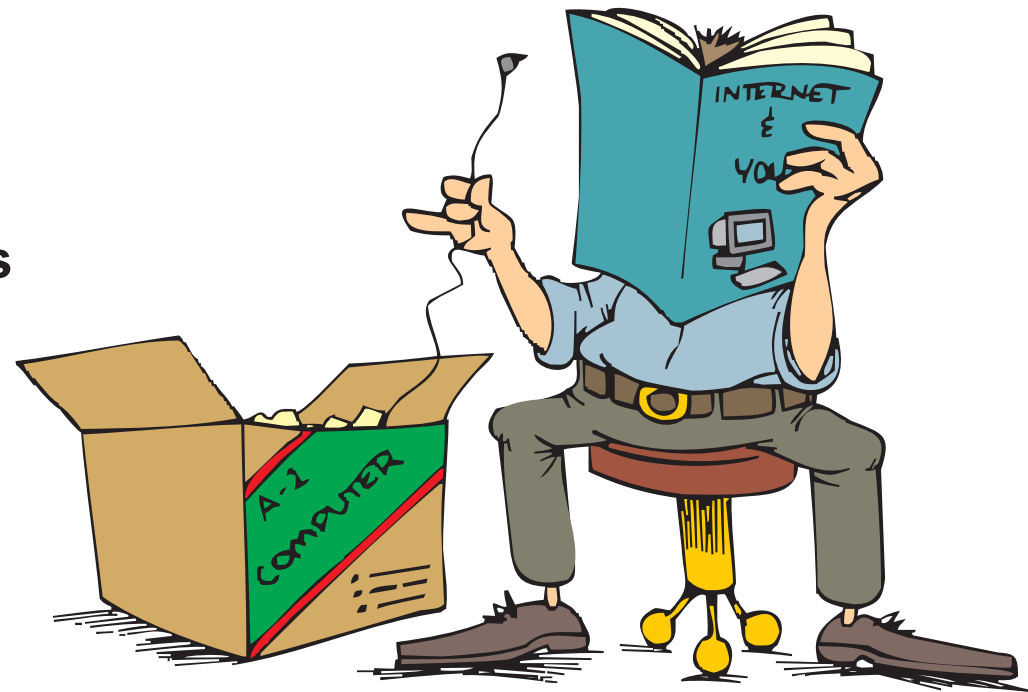
Allocate disk storage

Back up data

Monitor performance

Determine/solve system problems

and so on....





Networking Linux



Configure and support TCP/IP

Use networking commands for remote log on, remote execution, and file transfer

Do basic troubleshooting of network problems

Support LAN attached printers

Determine Network Problems

Implement NFS

Configure Apache web server

Configure Samba





Agenda



Background

Installing Linux

Major Components of Linux

Resources



Core Components



Kernal

File system

Shell

Network

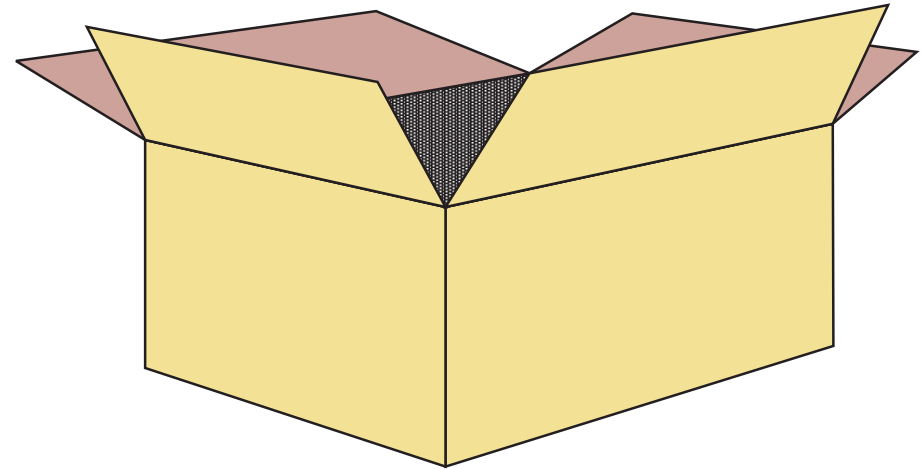
Text processing

Programming

System Mangement

Online documentation

Graphical Interface



We will use the command line interface for most examples



Login and Logout



Telnet to the new system

```
telnet 10.10.10.1
```

You are prompted for userid and password

```
suse390 login: root  
password:
```

root is an administrative userid - use sparingly

Prompt will appear indicating that the login was successful

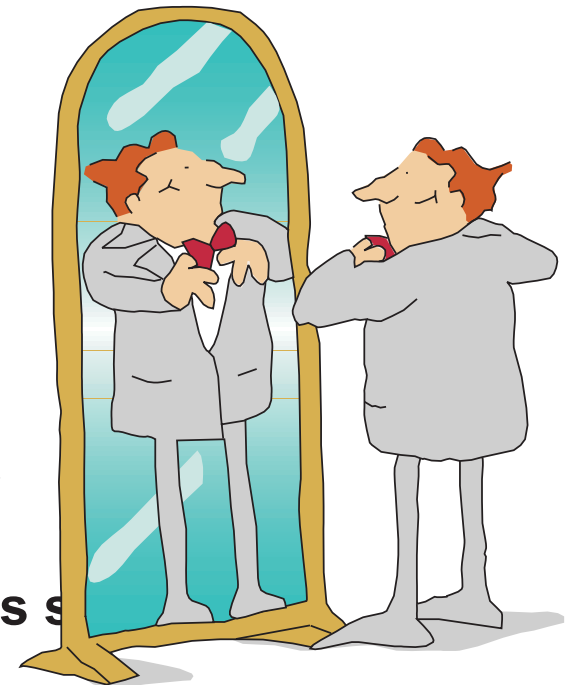
```
suse390: #
```

Logout

```
# <ctrl d>  
# exit  
# logout
```

Shutdown

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





Common Directory



User

`/bin`
`/boot`
`/dev`
`/disks`
`/etc`
`/home`
`/lib`
`/mnt`
`/opt`
`/proc`
`/root`
`/sbin`
`/tmp`
`/usr`
`/var`



Files can be of type

Ordinary

Text or code data

No particular internal format

Directory

A table of contents

A list of the files within
that directory

Special Files

Represent hardware or
logical devices

Found in directory called `/dev`
For example: `/dev/lp0`



File Permissions



For an ordinary file:

- r** read can look at the contents of the file
- w** write can change or delete the contents of a file
- x** execute can execute the file as a command
(r also needed)

For a directory:

- r** read can find out what files are in directory
- w** write can create and remove files from directory
(x also needed)
- x** execute has the permission to be in directory



```
drwxrwxr-x 2 team01 staff 1024 Aug 12 10:16 c  
-rwxr-xr-x 2 team01 staff 1024 Feb 18 09:55 doc
```



Changing File Permissions



File and directory permissions can be specified in the symbolic syntax or as an octal number:

`chmod mode filename`

[a u g o] [+ = -] [r w x]

a = all, u = owner, g = group, o = others

+ = add, = = clear permissions,

- = remove permission

r = read, w = write, x = execute



	User	Group	Other
Symbolic notation	rwX	rw-	r-x
Binary	111	110	101
	4+2+1	4+2+0	4+0+1
Octal	7	6	5

Setting file permissions drives everyone crazy



Command Format



Command Option(s) argument(s)

#mail -f mailbox

#passwd

#pwdadm

While graphical interfaces now resemble windows.....many

Linux administrators use the command interface

Keyboard shortcuts

<ctrl-c> terminates command

<ctrl-d> end of line

<ctrl-s> terminates output to the screen

<ctrl-q> resumes output to the screen

<ctrl-u> erases the entire line

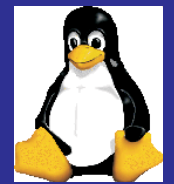
<arrow up> previous command

<shift page up> look at output of previous commands





Documentation and Information



There is no accepted directory structure between the distributions
Expect differences (even between releases)

Use the *man* command to read the
page of commands

Manual pages are normally stored
in */usr/man*

Most files stored in 'gz' or 'tar' format
- compressed files

Info command is an alternate way to
read manuals

Information stored in */user/info*

Frequently asked questions (FAQ)

Information stored in */user/doc/faq*





vi editor



Full-screen editor

Two modes of operation

command
text

Utilizes one-letter command

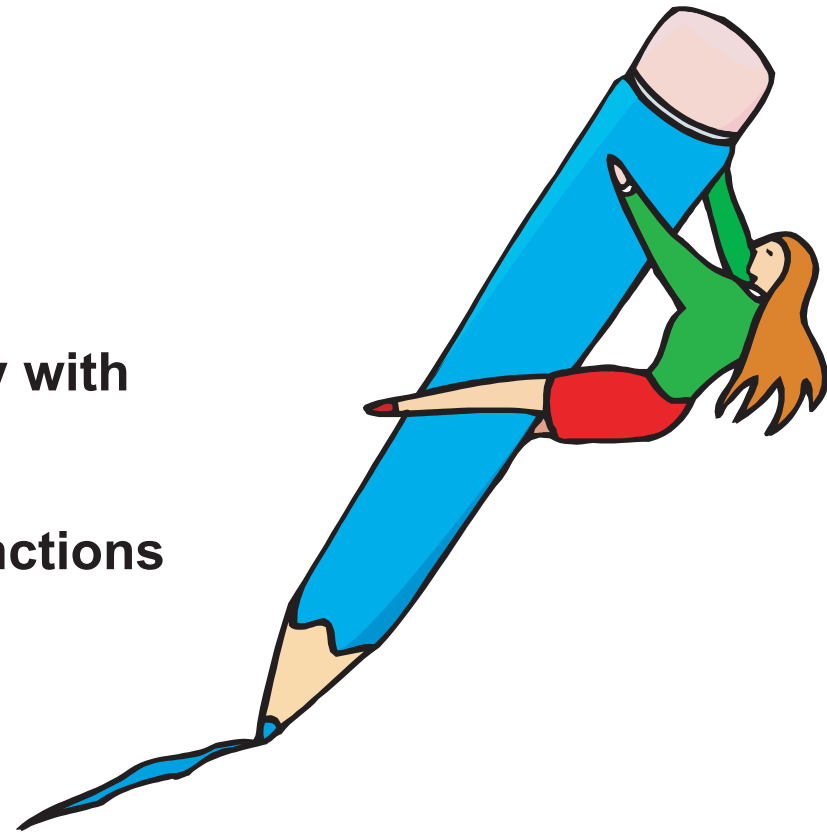
Does not format text

Flexible search and replace facility with
pattern matching

Allows for user-defined editing functions
using macros

#vi filename

type :help iccf for information
type :q to exit
type :help online help
type :help version6 for version information





vi editor Commands



Options entered in the vi session change the behavior of the vi editor:

:set all
:set autoindent/noautoindent
:set number/nonumber
:set list/nolist
:set showmode/noshowmode
:set tabstop=x
:set ignorecase/noignorecase
:set wrapmargin=x



Options can be stored in `$HOME/.exrc`
Macros can be written and new commands created

To delete a single character	x
To delete to the end of the current word	dw
To delete to the end of the lined	\$
To delete to the start of the lined	0
To delete the whole lined	d
To delete a range of lines	:20,40d
Replace text by overtyping	Rnewtext



The Shell



User interface to Linux
Command interpreter
Enables multiple tasks
Comprehensive programming language

Default in Linux: bash (Bourne Again Shell)

Other shells available: csh, tcsh, pdksh,
ash, sash, zsh

Metacharacters are characters that the shell
interprets as having a special meaning.

Examples:

< > | ; ! ? * [] \$ \ " ' ` ~ ()

Wildcards are a subset of metacharacters that are used to search
for and match file patterns.

Examples:

? * [] [-]

Many users now using windows-like graphical interfaces





Controlling Processes



The ps command displays process status information

ps jf

```
PPID PID ... TTY STAT UID TIME COMMAND
  1 374 ...  1 S   500 0:00 -bash
 374 569 ...  1 S   500 0:00 \_ bash
 569 572 ...  1 R   500 0:01 \_ find /
 369 575 ...  1 R   500 0:00 \_ ps jf
```



ps has a number of command line options:

- a shows all processes
- u shows user names instead of UID
- x kernel processes

Foreground Processes

#ls -l Invoked by simply typing a command at the command line.

Background Processes

#ls -l & Invoked by putting an "&" at the end of the command line



Controlling Processes

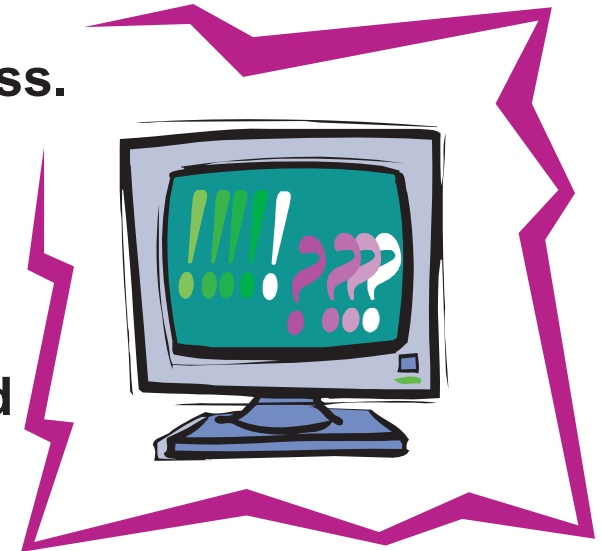


Foreground process

ctrl-c Interrupt key, cancels a foreground process.
After the interrupt, the system returns
the prompt on the screen

kill Sometimes the kill command is used to
terminate foreground processes

fg resume suspended task in the foreground



Background process

kill The kill command is the only way to terminate background processes

<ctrl-z> suspends foreground task

job slists background or suspended jobs

bg resume suspended task in the background

Specify a job number for bg, fg and kill using %job



Shell Defaults



```
/etc/profile  
/etc/bashrc  
#HOME/.bash_profile  
#HOME/.bashrc  
#HOME/.bash_logout
```

Sample /etc/profile

```
PATH=$PATH:/usr/X11R6/bin  
PS1="[\u@\h \W]\\$ "
```

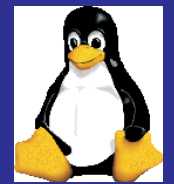
```
if [ `id -gn` = `id -un` -a `id -u` -gt 14 ]; then  
    umask 002  
else  
    umask 022  
fi
```

```
USER=`id -un`  
MAIL="/var/spool/mail/$USER"  
export PATH PS1 USER MAIL
```





Shell *bash* Samples



Sample `bash_profile`

```
# Get the aliases and functions
if [ -f ~/.bashrc ] ;
then
  ~/.bashrc
fi
# User specific environment and startup programs
PATH=$PATH:$HOME/bin
BASH_ENV=$HOME/.bashrc
export PATH BASH_ENV
```

Sample `bashrc`

```
# User specific aliases and functions
alias lsd='ls -FlA | grep ^d'
alias lsf='ls -lA | grep -v ^d'
alias lst='ls -lAt | head'
alias history='\history 10'
alias r='fc -s'
set -o vi
# Source global definitions
if [ -f /etc/bashrc ] ;
then
  ./etc/bashrc
fi
```





Linux Utilities



The **find** command is used to recursively search directories for files with particular characteristics

The **grep** command is used to select entire lines containing a particular pattern

The **head** and **tail** commands are used to view specific lines in a file

The **sort** command sorts the contents of a file by the options specified

Find out where you can find commands with **type**, **which** and **whereis**

The **gzip**, **zcat** and **gunzip** commands can be used to create and work with compressed files





Linux Compression



```
#ls -l file1
```

```
-rw-rw-r-- 1 team01 team01 32031 Apr 6 23:40 file1
```

```
# gzip -v file1
```

```
file1:89.9% -- replaced with file1.gz
```



```
# ls -l file1.gz
```

```
-rw-rw-r-- 1 team01 team01 3265 Apr 6 23:40 file1.gz
```

```
# zcat file1
```

(output is the same as the output of the cat command with the uncompressed file)

```
# gunzip file1
```

```
# ls -l file1
```

```
-rw-rw-r-- 1 team01 team01 32031 Apr 6 23:40 file1
```

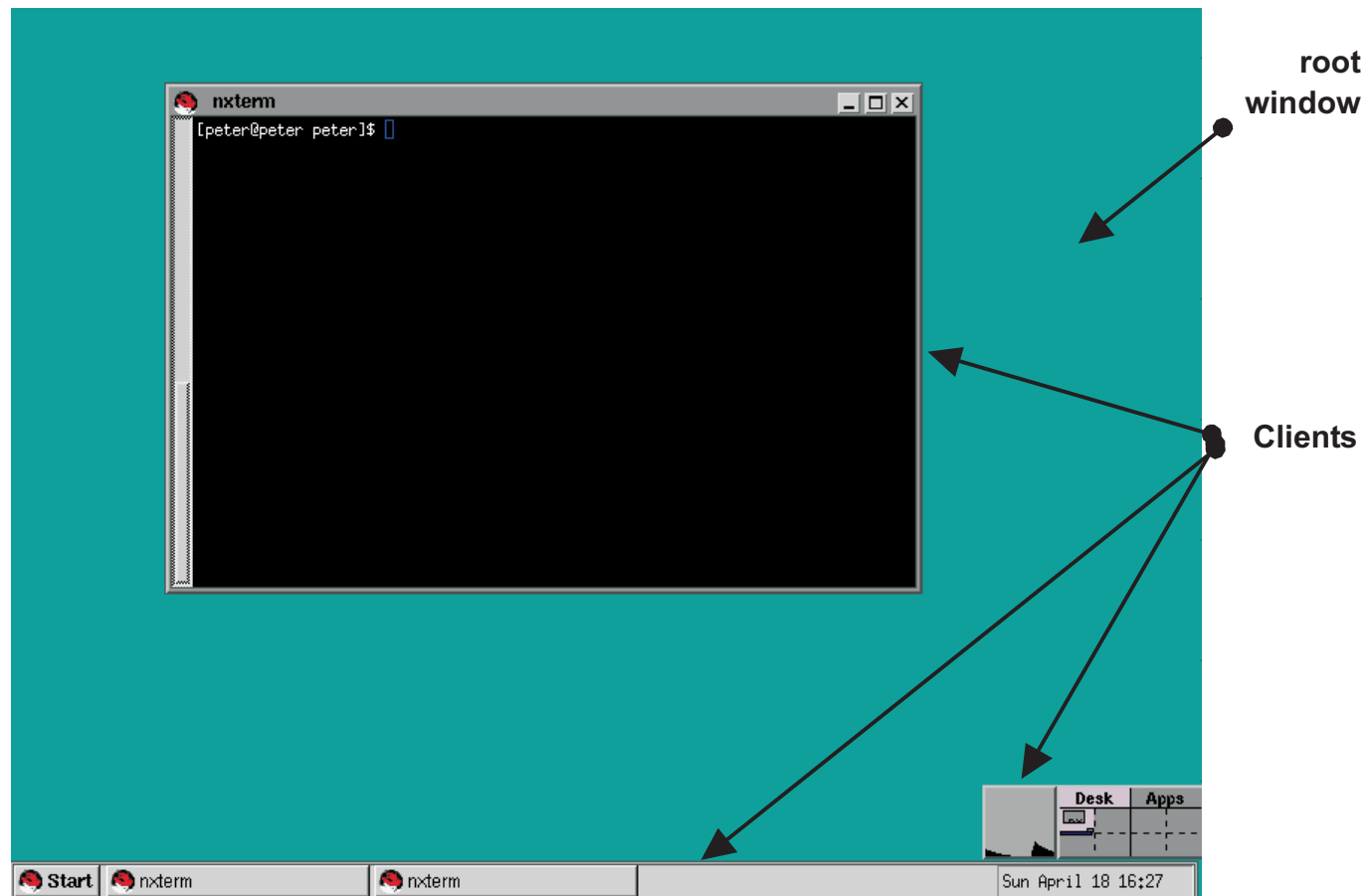


Linux Xwindows



Network-based graphics system developed at MIT in 1984
Freely available from the X-Consortium
XFree86 in the X Window implementation used in Linux
Enables you to run graphical applications

\$ startx





Linux Xwindows



Each X Server:

Controls one keyboard, one mouse and one or more screens

Allows simultaneous access by several clients

Performs basic graphic operations

Provides information such as fonts and colors

Routes keyboard and mouse input to the correct clients

X clients are the applications themselves which the user runs under the X Window system

Some examples of X clients are programs such as:

`nxterm`, `xterm`, `xclock`, `xcalc`, `xman`, `xedit`, `xlsfont`

X clients can be started from the command line or from special startup files

Most X clients share the same options for specifying attributes such as foreground color, background color, display name, window geometry and font



LinuxConf



Powerful system administration tool - must be root to use

Created by Jacques Gelinas

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

Uses tree structure to change configuration data

Four interface modes:

Command line

Useful when writing scripts

Character-cell

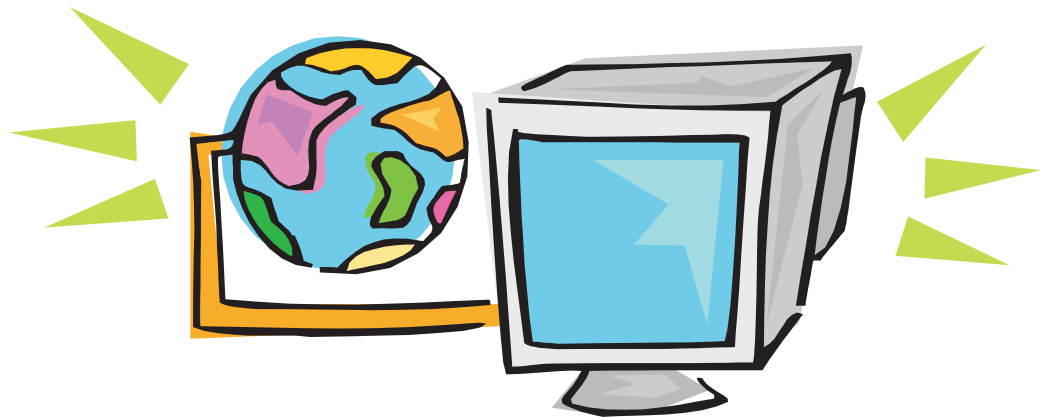
Interactive, text based

X Window based

Interactive, GUI

Web-based

For remote system administration



Logged to [/var/log/netconf.log](#)



LinuxConf Command Line



Very practical in scripts

Examples:

```
# linuxconf --status  
# userconf --adduser tux1 tux1  
"Tux" /bin/bash  
# netconf --setgateway 10.0.0.1  
# fsconf --check
```

```
# cd /bin  
# ls -l fsconf userconf netconf  
lrwxrwxrwx 1 root root 14 Jul 15 16:36 fsconf -> /bin/linuxconf  
lrwxrwxrwx 1 root root 14 Jul 15 16:36 netconf -> /bin/linuxconf  
lrwxrwxrwx 1 root root 14 Jul 15 16:36 userconf -> /bin/linuxconf
```





LinuxConf Cell Interface



Linuxconf 1.14 (subrev 4)

```

- Config
- Networking
  Client tasks
  Basic host information
  Name server specification (DNS)
- Routing and gateways
  Defaults
  other routes to networks
  other routes to hosts
  routes to alternate local nets
  the routed daemon
  Host name search path
  Network Information System (NIS)
  IPX interface setup
  PPP/SLIP/PLIP
- Server tasks
```



Quit

Act/Changes

Help



LinuxConf Xwindows Interface



gnome-linuxconf

- Virtual hosts
- Misc
 - Information about other host:
 - Information about other netw
 - Linuxconf network access
- Users accounts
 - Normal
 - User accounts
 - Group definitions
 - Change root password
 - Special accounts
 - PPP accounts
 - SLIP accounts via normal lo
 - UUCP accounts
 - POP accounts (mail only)
 - Virtual POP accounts (mail
 - Email aliases
 - user aliases
 - virtual domain user aliases
 - Policies
 - Password & account policie
 - Available user shells
 - Available PPP shells
 - Available SLIP shells

Users accounts

You can edit, add, or delete users
Select [Add] to add a new definition

Account	Name	Uid	Group
ftp	FTP User	14	ftp
games	games	12	users
gopher	gopher	13	gopher
lp	lp	4	lp
mail	mail	8	mail
news	news	9	news
operator	operator	11	root
tux1	Tux the Penguin	501	tux1
wouter	Wouter Liefing	500	wouter
xf	X Font Server	100	xf

Quit Add Help

Quit Act/Changes Help



LinuxConf Web Interface



Disabled by default

To enable:

Config; Networking;
Misc; Linuxconf network
access

To access:

Enter `http://<host>:98/`
as URL in any browser

The screenshot shows a Netscape browser window titled "Netscape: pentium.perklaan.nl:Users accounts". The address bar shows the URL "http://127.0.0.1:98/html:". The page content includes the title "Users accounts", a link to "Linuxconf 1.14 (subrev 4) User account configurator", and a message: "You can edit, add, or delete users select [Add] to add a new definition". Below this is a table of user accounts:

Account	Name	Uid	Group
ftp	FTP User	14	ftp
games	games	12	users
gopher	gopher	13	gopher
lp	lp	4	lp
mail	mail	8	mail
news	news	9	news
operator	operator	11	root
tux1	Tux the Penguin	501	tux1
wouter	Wouter Liefing	500	wouter
xfs	X Font Server	100	xfs

At the bottom of the page, there are two buttons: "Add" and "Help". The browser status bar shows "100%" zoom and various system icons.



Red Hat Package Manager (RPM)



Used to install/deinstall packages with .rpm file

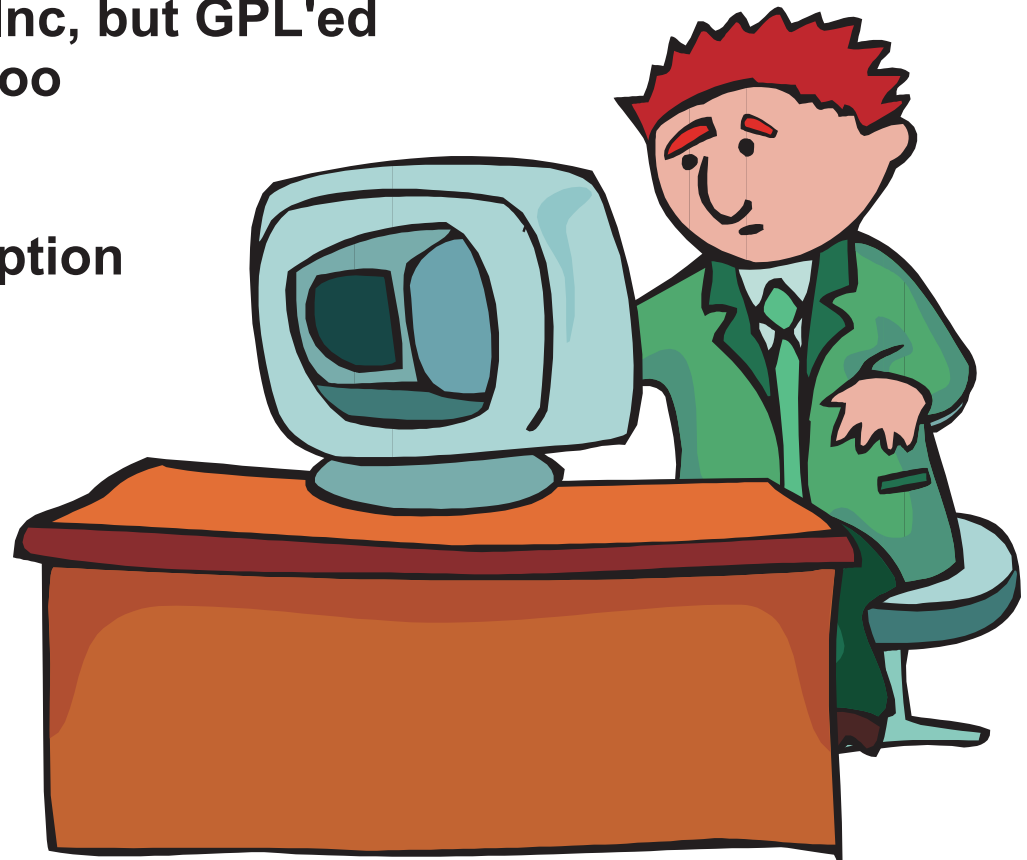
Developed by Red Hat Software Inc, but GPL'ed
Other Linux distributions use it too

Uses .rpm files which contain
Package name, version, description
Dependency information
The program files itself
Pre- and post install scripts

RPM database ([/var/lib/rpm](#))
contains database of installed
packages

Five basic modes

- Installing
- Freshening and Upgrading
- Uninstalling
- Querying
- Verifying





RPM Command Line



Installs, freshens or upgrades an RPM

Freshen: only install if an older RPM was installed

Upgrade: always install, but uninstall older RPM first

Basic syntax:

```
rpm -i package-filename.rpm
```

```
rpm -F package-filename.rpm
```

```
rpm -U package-filename.rpm
```

-vverbose

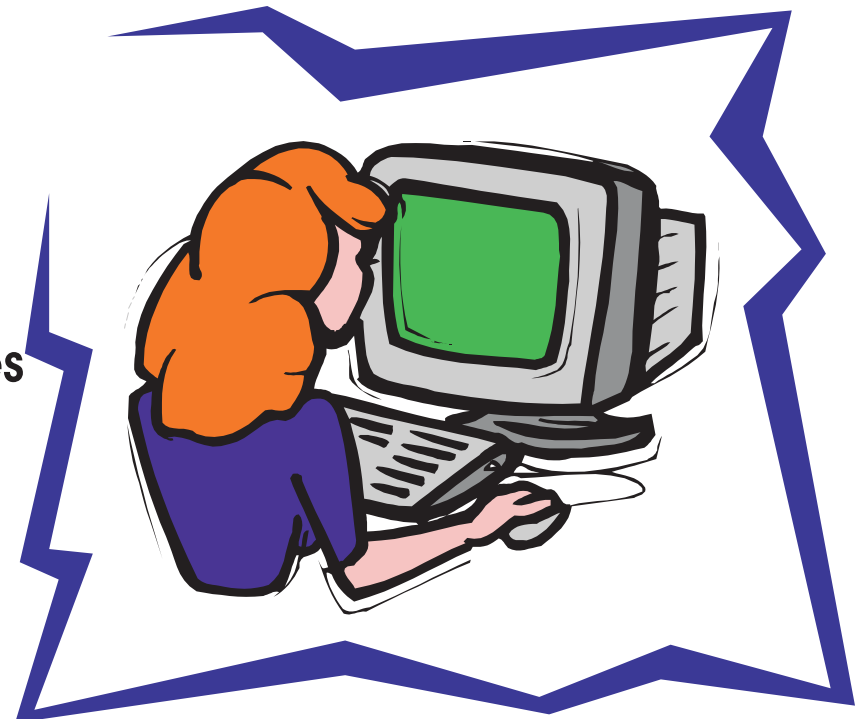
-h print 50 hash marks

-nodeps don't check dependencies

When upgrading, old configuration files are saved with extension

.rpm_{save}

Package-filenames may also be specified as URLs



Uninstalls an RPM

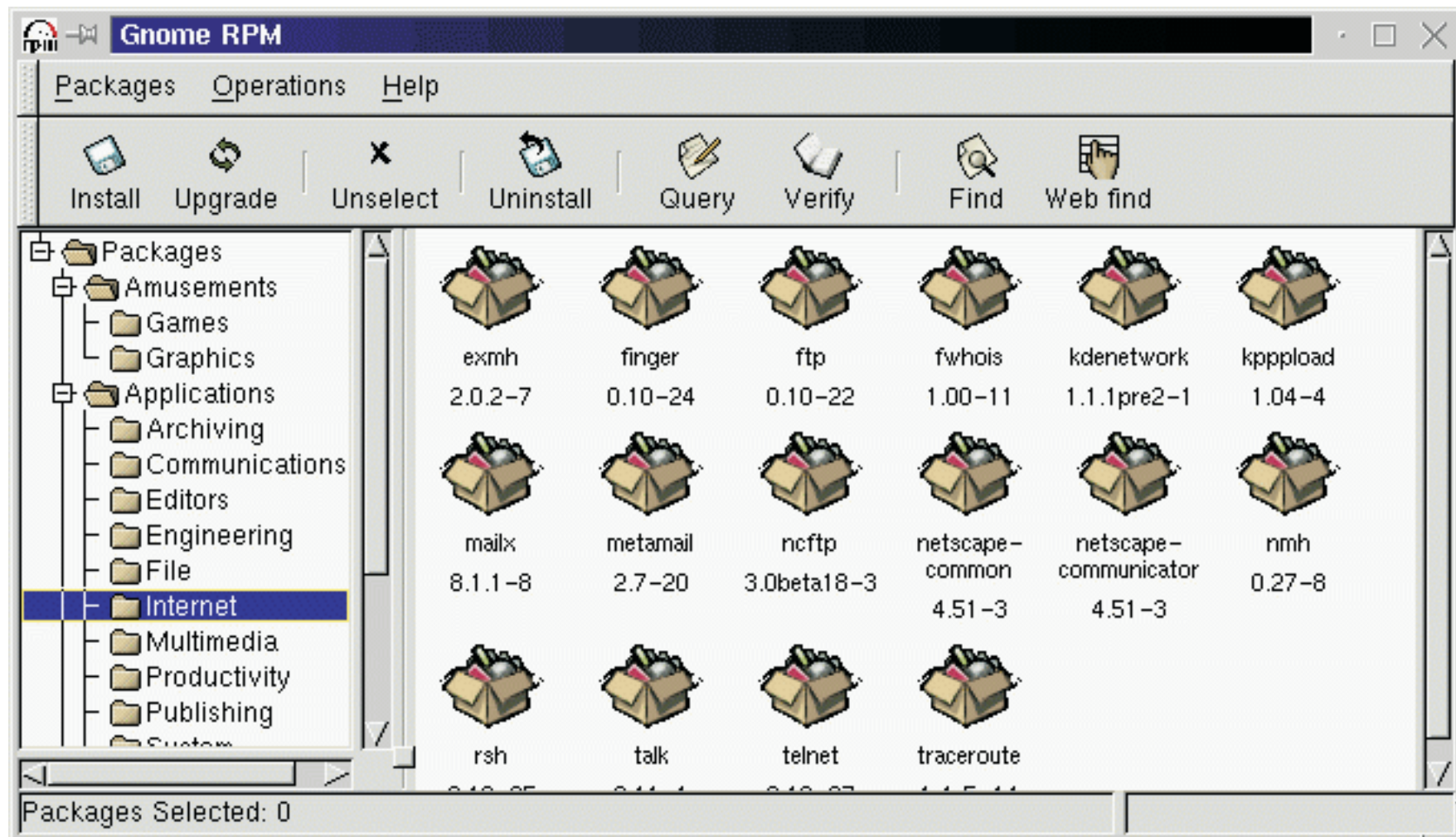
Basic syntax:

```
rpm -e package-name
```

-nodepsignore any dependency breaks



RPM Graphical Interface





Windows Emulation



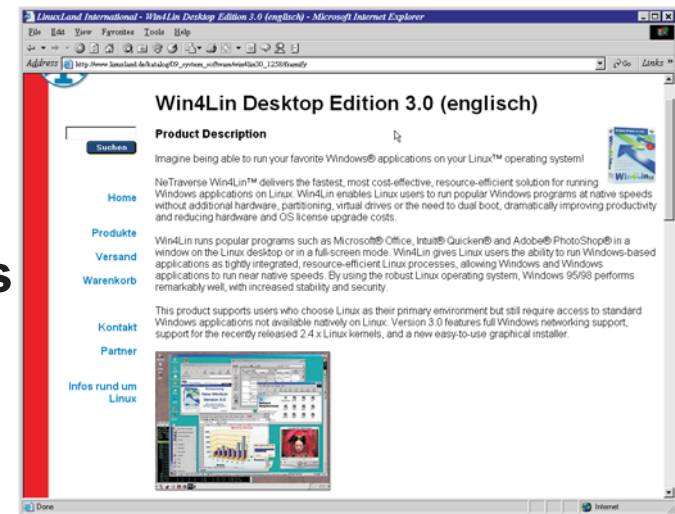
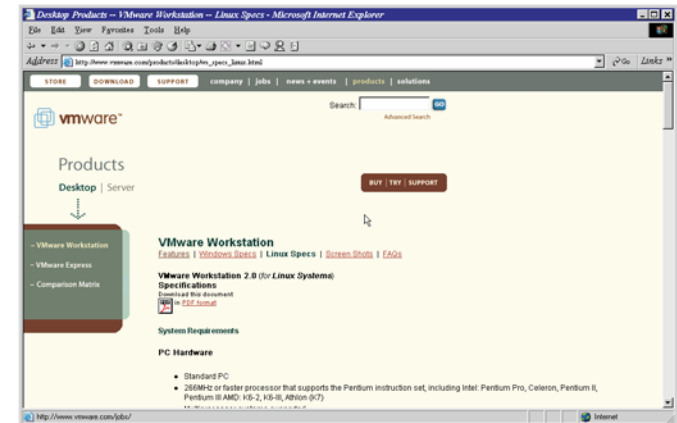
dosEMU runs older DOS applications.

WABI environment runs 16-bit MS windows applications

WINE emulator for 32-bit MS windows applications

VMWare delivers a flexible and safe computing environment by providing multiple virtual computers on a single PC

Win4LIN runs 32 bit MS windows applications





Summary



Discussed the history of Linux

Described the options for installation on the mainframe

Investigated some of the basic functions

Don't expect all distributions to be alike

Lots of options

Interfaces still in flux, but one exists to suite every taste

Mainframe versions designed to support needs of a mainframe world





Agenda



Background

Installing Linux

Major Components of Linux

Resources



Resources



Kernel source : <ftp.kernel.org>, <ftp.funet.fi>

Network tools: <ftp.uk.linux.org>

Network applications: <ftp.uk.linux.org>

Linux Networking: secretagent.com/doc/howto/NET-3-HOWTO-6.html

Mailing list:

To: majordomo@vger.rutgers.edu

Subject: Subscription

Message: subscribe linux-net

Linux Networking newsgroup:

<comp.os.linux.networking>

Linux online: www.linux.org

Linux documentation:

metalab.unc.edu/mdw/index.html

Linux international : www.li.org

Linux businesses: www.linux-business.com

Linux resources: www.linuxresources.com

General: www.linux.com

Linux journal: www.linuxjournal.com

Linux news: linuxtoday.com

Open Source Community: slashdot.org

Linux software: www.linuxbase.com

