



# Introduction to Linux for Network Engineers

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# Overview of UNIX/GNU/Linux

## » In the beginning...

- MULTICS and Bell Labs
- From B to C
- Space travel
- UNICS to UNIX
- The university effect

## » Linux/GNU overview

- Richard Stallman/1983
- Linus Torvalds/1991
- Linux/GNU

# Overview of UNIX/GNU/Linux

## » Linux Distributions (FREE)

- Fedora/SUSE/Mint/Ubuntu/CentOS/FreeBSD/OpenBSD
- Mac OS X (Mach Kernel/Free BSD)
- IEEE and POSIX

## » Downloading/Installing Linux

- How do I get Linux?
- Mac OS X (Terminal)
- Installing a Linux VM (CentOS)

# Linux Operating System Overview

## » Linux software architecture

- The Linux kernel
- System calls
- Device drivers
- Interprocess communication (IPC)
- Graphical user interface (GUI)
- Linux shells
- Terminal (XTerm / Konsole)
- Applications and utilities

# Questions?

# The Linux Tool Box (Utilities)

## » Basic Linux utilities

- **ls**
- **passwd**
- **man / info / apropos**
- **w / who**
- **whereis / which / find**
- **date**
- **id**
- **script**
- **uname**
- **chsh**
- **uptime**
- **last**

# The Linux Tool Box (Utilities)

## » Linux utilities for working with files

- **cat/tac**
- **more / less** (and how less is more than more, more or less!)
- **head / tail**
- **sort / cut / uniq**
- **diff / diff3 / patch**
- **file**
- **echo**
- **tar**
- **mkdir / rmdir**
- **rm** (and how “**rm -rf \***” can be hazardous to your job security)
- **cp**
- **chmod / chown / chgrp**
- **umask**
- **tee**
- **wc**
- **stat**

# The Linux Tool Box (Utilities)

## » Linux filesystem navigation utilities

- **pwd**
- **cd**

## » Linux communication utilities

- **write**
- **talk**
- **mesg**

## » Linux compression utilities

- **compress**
- **uncompress**
- **zcat**
- **gzip**
- **bzip2**
- **bzcat**
- **bzgrep**



# The Linux Tool Box (Utilities)

## » Linux email utilities

- **mailx**
- Email aliases
- Customizing your email environment
  - ~/.mailrc file

# Questions?

# The GNU/Linux Filesystem

## » The hierarchical model

- The root directory
- Your home directory
- Your current working directory

## » File types

- Simple/ordinary files
- Directory files
- Named pipe (FIFO)
- Link file
- Special file (device)

# The GNU/Linux Filesystem

## » Filesystem pathnames

- Absolute pathnames
- Relative pathnames
- . and ..

## » File security

- Permission classes (user, group, other)
- Symbolic notation (rwx)
- Numeric notation (777)
- Symbolic mode
- Octal mode
- Access control lists (ACLs)

## » Links

- Symbolic/soft links
- Hard links

# The vi/vim Editors

## » Basic editing

- Opening and closing files
- Saving and discarding edits
- Editing files
- Cursor control
- Yanking and putting
- Substitution and replacement

## » Advanced editing

- Executing Linux commands within vi/vim
- Getting back to your Shell command line
- Customizing your vi/vim environment (~/.exrc and ~/.vimrc)
- File saving commands

# Questions?

# The Interactive Bash Shell

## » The command line

- Syntax
- Executing and processing the command line
- Standard input / output
- Screen as a file
- Screen / keyboard as standard input / output

## » Redirection

- Redirecting standard output
- Redirecting standard input
- Appending standard output
- Redirecting standard error and /dev/null

# The Interactive Bash Shell

## » Pipes and filters

- Manipulating the I/O stream
- Redirecting output in multiple directions

## » Job control

- Foreground and background processes
- The ampersand “&” character
- Suspending processes



# The Interactive Bash Shell

## » Shell metacharacters

- \$
- &
- \*
- ^
- |
- ;
- ?
- !
- >
- <
- >>
- (
- “
- ( )
- [ ]
- { }
- Metacharacters vs. regular expressions

# The Interactive Bash Shell

## » Bash shell customization

- ~/.bash\_profile
- ~/.bashrc
- ~/.bash\_logout
- **set** and **shopt**
- Functions
- Aliases

# Regular Expressions – An Introduction

## » Standard regular expressions

- ^
- \*
- .
- \$
- [ ]
- [a-b]
- [^]
- \< \>
- \

## » Extended regular expressions

- ?
- +
- { }
- |
- ( )

# Regular Expressions – An Introduction

## » The **grep / sed / awk** family of utilities

- **grep**
- **egrep**
- **fgrep**
- **sed**
- **awk**
- **gawk**
- **nawk**

# Questions?

# Linux Networking

## » Network utilities

- **ping**
- **traceroute**
- **ftp**
- **scp**
- **ssh**
- **dig**
- **host**
- **whois**
- **telnet**
- **ifconfig**

## » Network files and directories

- `/etc/hosts`
- `/etc/nsswitch.conf`
- `/etc/sysconfig/network-scripts/`
- `/etc/resolv.conf`

# Linux System Administration

## » Core administration concepts

- The “root” user
- **sudo** and the /etc/sudoers file

## » Software maintenance

- Software updates
- **yum, rpm,** and **apt-get**

## » User and group administration

- **useradd** and **userdel**
- **groupadd**
- /etc/passwd
- /etc/shadow

# Linux System Administration

## » System operation

- Booting the system
- System run levels
- System modes
- Rebooting the system
- **systemctl** vs. /etc/inittab
- Root password recovery
- Task automation via the **crontab** file
- Log files
- System health check with vmstat and top

## » System security

- SELinux
- **setenforce**, **getenforce**, and /etc/selinux/config
- TCP wrappers ( /etc/hosts.allow and /etc/hosts.deny )



# Errata

## » Summary

- Final review and summary
- Feedback
- Closing remarks

# Thank You!