Linux Introduction

Session 1

Free Open Source Software (FOSS)

Open source: software and source code available to all

- The freedom to distribute software and source code
- The ability to modify and create derived works
- Integrity of author's code

The Free Software Foundation and the Four Freedoms
http://www.gnu.org/philosophy/free-sw.html
A program is free software if the program's users have the four essential freedoms:

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Linux Origins

1983/4: The GNU Project and the Free Software Foundation
Creates open source version of UNIX utilities
Creates the General Public License (GPL)
Software license enforcing open source principles

Richard Stallman (RMS) – *From Wikipedia*

> *Stallman launched the GNU Project in September 1983 to create a Unix-like computer operating system composed entirely of free software. With this, he also launched the free software movement. He has been the GNU project's lead architect and organizer, and developed a number of pieces of widely used GNU software including, among others, the GNU Compiler Collection, the GNU Debugger and the GNU Emacs text editor. In October 1985 he founded the Free Software Foundation.*

Free as in Freedom http://oreilly.com/openbook/freedom/

Free Software Foundation: A non-profit organisation that manages the the GNU Project.
http://fsf.org.in/

1991: Linus Torvalds
Finnish college student in 1991
Creates open source, UNIX-like kernel, released under the GPL
Ports some GNU utilities, solicits assistance online
Today:
Linux kernel + GNU utilities = complete, open source,
UNIX-like operating system

Packaged for targeted audiences as distributions

Linux Distributions

Linux distributions are OSes based on the Linux kernel
Red Hat Enterprise Linux

- Stable, thoroughly tested software
- Professional support services
- Centralized management tools for large networks

The Fedora Project

- More, newer applications
- Community supported (no official Red Hat support)
- For personal systems

CentOS

http://www.centos.org/

Ubuntu, SuSE ….

Linux principles

- Everything is a file (including hardware)
- Small, single-purpose programs
- Ability to chain programs together to perform complex tasks
- Avoid captive user interfaces
- Configuration data stored in text

Linux Usage Basics

Logging in to a Linux System

- Two types of login screens: virtual consoles (text-based) and graphical logins (called display managers)
- Login using login name and password
- Each user has a home directory for personal file storage

Switching between virtual consoles and the graphical environment

A typical Linux system will run six virtual consoles and one graphical console

- Server systems often have only virtual consoles
- Desktops and workstations typically have both

Switch among virtual consoles by typing: Ctrl-Alt-F[1-6]
Access the graphical console by typing Ctrl- Alt-F7

Elements of the X Window System

The X Window System is Linux's graphical subsystem
Xorg is the particular version of the X Window System used by Red Hat

- Open source implementation of X

Look and behavior largely controlled by the desktop environment
Two desktop environments provided by Red Hat:

- GNOME: the default desktop environment
- KDE: an alternate desktop environment

Starting the X server

- On some systems, the X server starts automatically at boot time
- Otherwise, if systems come up in virtual consoles, users must start the X server manually
  - Log into a virtual console and run startx
  - The X server appears on Ctrl-Alt-F7

Changing Your Password

passwd
root user
Do not login as root unless necessary
Normal (unprivileged users) potential to do damage is more limited

su - creates new shell as root
sudo command runs command as root
Requires prior configuration by a system- administrator
id shows information on the current user

Running Commands

Commands have the following syntax:
command options arguments

Each item is separated by a space
Options modify a command's behavior
Single-letter options usually preceded by -
Can be passed as -a -b -c or -abc
Full-word options usually preceded by --
Example: --help
Arguments are filenames or other data needed by the command
Multiple commands can be separated by ;

Some basic commands

date
cal
ls
cat
less
more

Getting Help

No Need to memorise everything

Many levels of help

- whatis
- command --help
- man and info
- /usr/share/doc/
- Documentation by Distribution

The **whatis** Command

- Displays short descriptions of commands
- Uses a database that is updated nightly
- Often not available immediately after install

The --help Option

- Displays usage summary and argument list
- Used by most, but not all, commands
  - eg: date –help

Reading Usage Summaries

- Printed by --help, man and others
- Used to describe the syntax of a command
  - Arguments in [] are optional
  - Arguments in CAPS or <> are variables
  - Text followed by ... represents a list
  - x|y|z means "x or y or z"
  - -abc means "any mix of -a, -b or -c"

The **man** Command

- Provides documentation for commands
- Almost every command has a man "page"
- Pages are grouped into "chapters"
- Collectively referred to as the Linux Manual
- man [<chapter>] <command>

Navigating **man** Pages

While viewing a man page

- Navigate with arrows, PgUp, PgDn
- /text searches for text
- n/N goes to next/previous match
- q quits

Searching the Manual

- man -k keyword lists all matching pages
- Uses whatis database

The **info** Command

- Similar to **man**, but often more in-depth
- Run **info** without args to list all page
- **info** pages are structured like a web site
    - Each page is divided into "nodes"
    - Links to nodes are preceded by *
    - info [command]

Navigating **info** Pages , while viewing an info page

- Navigate with arrows, PgUp, PgDn
- Tab moves to next link
- Enter follows the selected link
- n/p /u goes to the next/previous/up-one node
- s text searches for text (default: last search)
- q quits info

Extended Documentation

- The /usr/share/doc directory
    - Subdirectories for most installed packages
    - Location of docs that do not fit elsewhere
        - Example configuration files
        - HTML/PDF/PS documentation
        - License details

Red Hat (or specific distribution) Documentation

- Available on docs CD or Red Hat website
    - Installation Guide
    - Deployment Guide
    - Virtualization Guide

Exercise:

See the man/info pages of the following linux commands:

pwd, cd, ls, cp, mv, rm, mkdir, rmdir, file, cat, less, slocate

Session 2

Linux Filesystem

Files and directories are organized into a single-rooted inverted tree structure
Filesystem begins at the root directory, represented by a lone / (forward slash) character.

- Names are case-sensitive
- Paths are delimited by /

Some Important Directories

Home Directories: /root,/home/username
User Executables: /bin, /usr/bin, /usr/local/bin
System Executables: /sbin, /usr/sbin, / usr/local/sbin
Other Mountpoints: /media, /mnt
Configuration: /etc
Temporary Files: /tmp
Kernels and Bootloader: /boot
Server Data: /var, /srv
System Information: /proc, /sys
Shared Libraries: /lib, /usr/lib, /usr/ local/lib

Current Working Directory

Each shell and system process has a current working directory (cwd)

pwd

Displays the absolute path to the shell's cwd

File and Directory Names

Names may be up to 255 characters
All characters are valid, except the forward- slash
It may be unwise to use certain special characters in file or directory names
Some characters should be protected with quotes when referencing them
Names are case-sensitive

- Example: MAIL, Mail, mail, and mAiL
- Again, possible, but may not be wise

Absolute and Relative Pathnames

Absolute pathnames

Begin with a forward slash
Complete "road map" to file location
Can be used anytime you wish to specify a file name

Relative pathnames

Do not begin with a slash
Specify location relative to your current working directory
Can be used as a shorter way to specify a file name

Changing Directories

cd changes directories
To an absolute or relative path:

cd /home/hari/work
cd project/docs

To a directory one level up:

cd ..

To your home directory:

cd

To your previous working directory:

cd -

Listing Directory Contents

Lists the contents of the current directory or a specified directory

Usage:

ls [options] [files_or_dirs]

Example:

- ls -a (include hidden files)
- ls -l (display extra information)
- ls -R (recurse through directories)
- ls -ld (directory and symlink information)

Copying Files and Directories

cp - copy files and directories

Usage:

cp [options] file destination

More than one file may be copied at a time if the destination is a directory:

cp [options] file1 file2 dest

Copying Files and Directories: The Destination

- If the destination is a directory, the copy is placed there
- If the destination is a file, the copy overwrites the destination
- If the destination does not exist, the copy is renamed

Moving and Renaming Files and Directories

mv - move and/or rename files and directories

Usage:

mv [options] file destination

More than one file may be moved at a time if the destination is a directory:

mv [options] file1 file2 destination

Destination works like cp

Creating and Removing Files

touch - create empty files or update file timestamps

rm - remove files

Usage:

rm [options] <file>...

Example:

- rm -i file (interactive)
- rm -r directory (recursive)
- rm -f file (force)

Creating and Removing Directories

- mkdir creates directories
- rmdir removes empty directories
- rm -r recursively removes directory trees

Moving and Copying in Nautilus

Drag-and-Drop

Drag: Move on same filesystem, copy on different filesystem

Drag + Ctrl: Always copy

Drag + Alt: Ask whether to copy, move or create symbolic link (alias)

Context menu

Right-click to rename, cut, copy or paste

Determining File Content

Files can contain many types of data

Check file type with file before opening to determine appropriate command or application to use

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file [options] <filename>...
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