Introduction to Linux Workshop 1

The George Washington University
SEAS Computing Facility

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Logging In

The lab computers will authenticate with your NetID and password. Please log into the computer you are sitting at.

Course Goals

- The goal of this tutorial is to provide hands-on training basics of using Linux via the command line.
- It addresses people who have no previous experience with Unix-like systems, or who know a few commands but would like to know more.
- Session 1:
  - Using Linux text editors to create documents
  - Commands
  - Manipulating Files
  - Linux Environment

Introduction – Flavors of Linux at GWU

- Debian/Ubuntu
  - User friendly, most popular for workstations and Windows replacement machines
  - Uses APT package manager
- Fedora/Redhat/CentOS
  - Enterprise friendly, most popular for servers and datacenters
  - Uses YUM and RPM package managers
- SuSE
  - Enterprise and user friendly, popular in Europe
  - Uses YaST (Yet another Software Tool) package manager

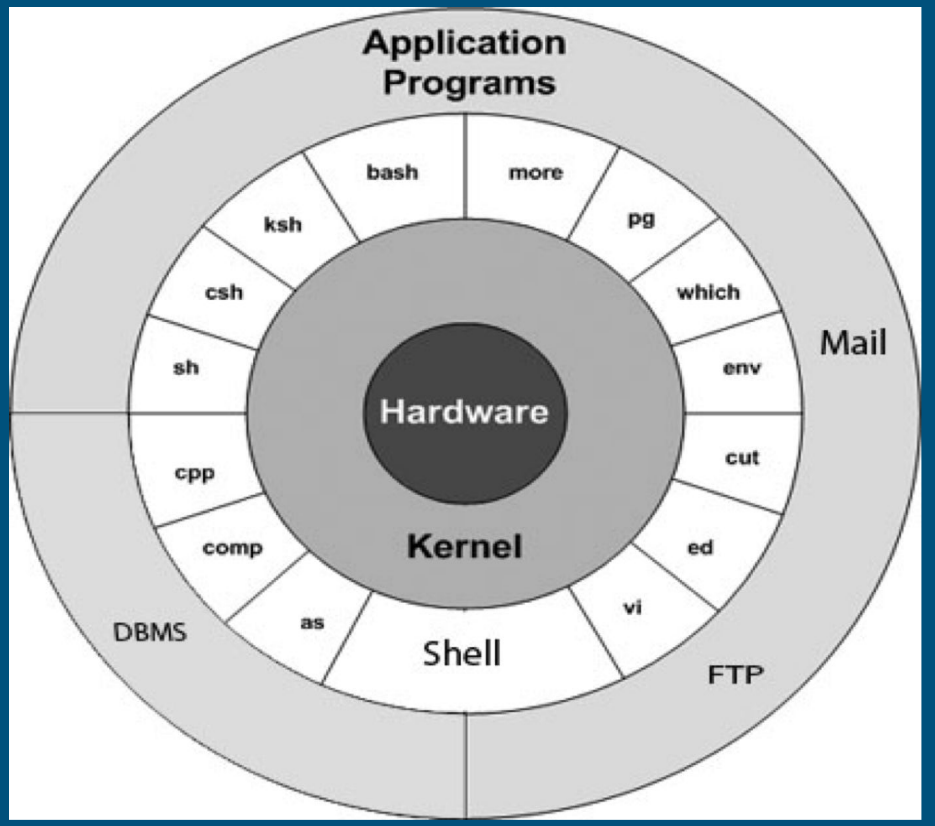
Introduction – Software vs Operating System

All Linux systems generally contain the following two types of software:

- Operating system
  - For the computer
  - Liaison between computer and user
- Applications
  - Compiled applications - Matlab, Cadence, etc.
  - Programming applications - Python, C, C++, Java, etc.

Introduction – Linux Components

- Kernel: The heart of the operating system
  - It interacts with hardware.
  - Memory management, task scheduling and file management.
- Shell: The utility that processes your requests. the shell interprets the command and calls the program that you want.
- Commands and Utilities:
  - eg: cp, mv, cat and grep etc.
- Files and Directories:
  - All data in UNIX is organized into files.
  - All files are organized into directories.
  - These directories are organized into a tree-like structure called the filesystem.



Introduction – Rules to Live By

- Linux is case sensitive
  - Always try to use lower case
- Enter = execute, be careful what you do!
- ^ = control key
  - Many commands require CTRL+ <another key>
- TAB = the TAB key will autocomplete commands or file paths if possible
- No spaces! NO SPACES!

Commands

- The man command
- nano Text Editor
- Command Structure
- Special Features

Commands – The FIRST command

- man
  - A magical command that will tell you all about other commands
  - usage: man <name of command you want to know about>
  - man will show a description of the command you are looking up and all of the switches and options for the command
  - Scroll slowly using down, up arrows
  - Scroll down a page at a time using space bar (down), “b” (up)
  - Return to the beginning by hitting the “g” key, exit using the “q” key
- Exercise:
  - Type: "man cp" (no quotes) and read about the copy command

Command – nano Text Editor

```
type: nano <filename>.txt
```

- edit and modify your text file
- use command on the bottom of the window to save and exit
- Exercise:
  - Creating and Opening Files
  - Save and Exit
  - Copying, Cutting and Pasting

Command – nano Text Editor

Copying, Cutting and Pasting

- **Copy**, **Cut** and **Paste** a single line
  - Alt+6, Ctrl+K and Ctrl+U
  - Move multiple lines
  - Multiple Ctrl+K followed by on Ctrl+U
- Highlighting
  - Ctrl+6 or Alt-A at beginning, move to end

Commands – Command Structure

command -option argument

command

- Name of the program you want to run

-option

- not always required
- provides different behavior than the default
- You can have more than one argument and bundle them together
  - -option1 –option2 or “-option1option2”

argument

- What the command acts upon, usually a filename
- There can be more than one argument
- Sometimes is not required

All commands are executed when you press the Enter key.

Commands – Special Features

Can combine several commands on one line - separate with semicolons

Example:

cd $HOME; mkdir TestDir; cd TestDir; touch testfile.txt

Commands – Special Features

The pipe character: |

- usually above the enter key
- Uses the output of one command and inputs it into a second command

Example:

ls $HOME | grep test

Commands – Special Features

> and >>

Redirects output to a file

- > overwrites an existing file or creates a new file
- >> appends an existing file, or creates a new file

Example:

ls > dir.txt

ls >> dir_append.txt (run this command twice)

Commands Exercise

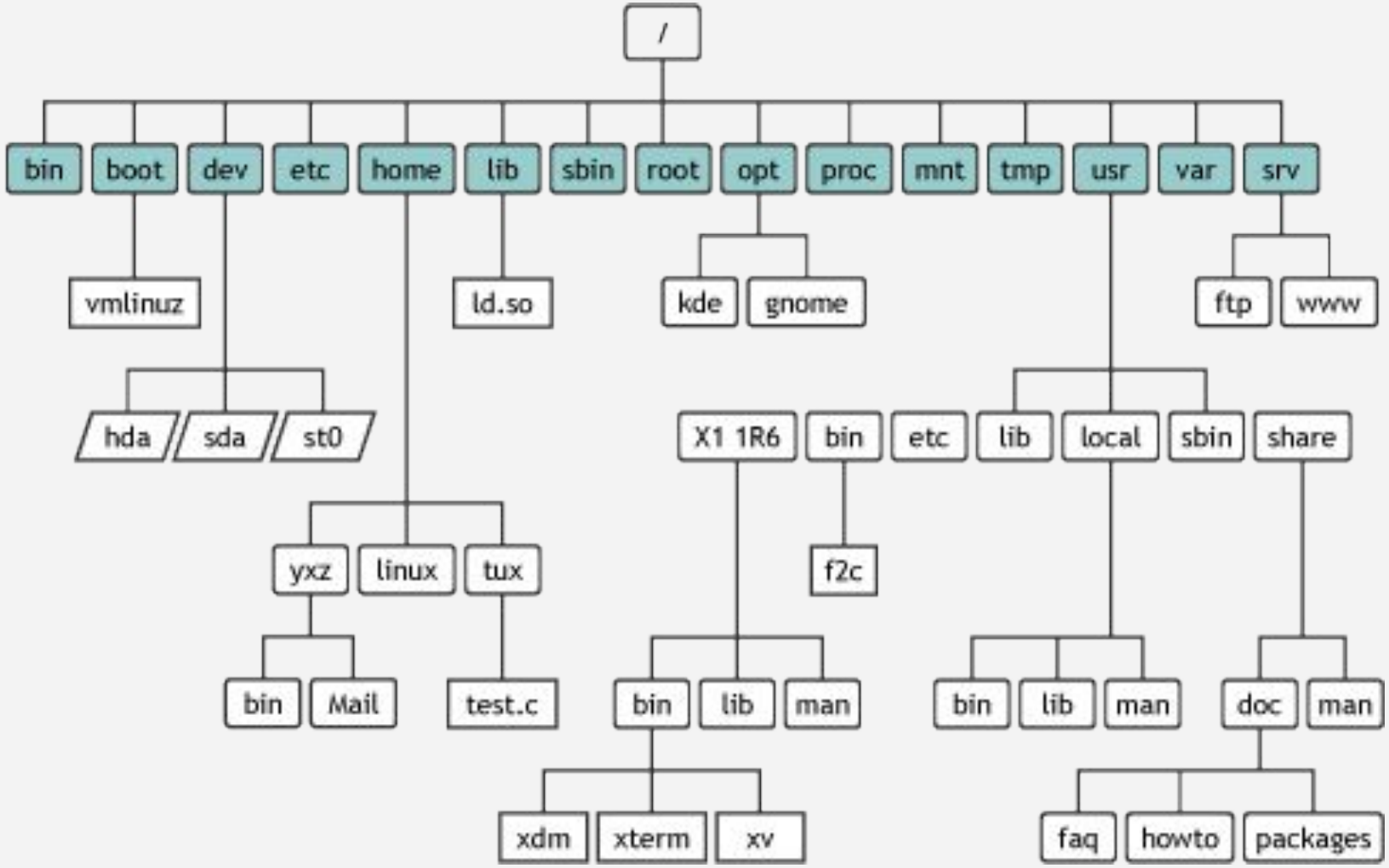
Run these commands and take note of the output:

date
cal 2019
cal 3 2019
who
whoami
echo This is a test!
CLEAR
clear
history

Files and Directories

- File Structure
- Concepts
- Best Practices
- Manipulation
- Search and Wildcards

Files and Directories - File Structure



Files and Directories - Concepts

Pathname

- A path through the directory system
- *pwd* shows current path

/ - the forward slash

- Represents the very bottom (root) of the file system
- acts as a divider in between directories on the file system

Files and Directories – Getting Around

- pwd: Print Working Directory, shows you where you are
- . versus .. : Your current directory versus the directory one level above
- The ~ character: Shortcut your home directory
- ls: list current path contents
- ls –la: list all details of the current path in long form
- cd: change directory

```
bash-4.4$ cd /absolute/path
bash-4.4$ cd path/relative/to/where/I/am
```

Files and Directories Exercise

- Use ”cd” to move around the file system
- cd to the root of the filesystem
- Type ls
- cd to your home directory. There are two ways to do this. Use both

```
cd $HOME

cd ~
```

Files and Directories – Best Practices

- When naming a file or folder, no spaces! No Spaces! **NO SPACES!**
- Do not use periods except to identify file extensions
  - good: testfile.txt
  - bad:
    - te.st.fil.e.t.xt (This name is valid but will confuse you sooner or later)
    - This is my very special filename I want to remember.txt
- Avoid special characters
  - – / \ ‘ “ ; - ? [ ] ( ) ~ ! $ { } < >
- Use file names that help identify the file.
  - good: myresume.doc
  - bad: 1234.doc

Files and Directories – Manipulation

- Create new directories using “mkdir” command
- Create new files using text editors, output redirection, or the “touch” command

nano new_file

ls -al > pwd_contents

touch mytouchtestfile.txt

echo "This is my touch test file text" >> mytouchtestfile.txt

Files and Directories - Manipulation

Methods to view text files

cat filename

more filename

less filename

Files and Directories - Manipulation

To move or rename a file or directory, use the “mv” command

Move a file to another directory:

mv filename dirname

Move a directory to another directory:

mv src_dir target_dir

Rename a file:

mv filename newfilename

Rename a directory:

mv src_dir target_dir

Files and Directories - Manipulation

Copy files from one location to another using the “cp” command

Copy a file:

cp filename target_dir

Copy multiple files:

cp filename1 filename2 target_dir

Copy a directory:

cp -R dirname target_dir

Copy multiple directories:

cp -R dirname1 dirname2 target_dir

Files and Directories - Manipulation

Delete files/directories using the “rm” command

Delete a file:

rm filename

Delete multiple files at once:

rm filename1 filename2

Delete a directory:

rm -r dirname

Delete multiple directories at once:

rm -r dirname1 dirname2

Files and Directories - Search and Wildcards

Wildcards can be used to list or find files that meet criteria

* : A **wildcard** is a character that can be used as a substitute for any of a class of characters in a search

Examples:

ls *

ls list *

ls username*

ls *username

Files and Directories - Search and Wildcards

grep recognizes patterns in file names or text files and returns files or lines that match the pattern.

grep <pattern> filename.txt

*ls -la * | grep <pattern>*

- *grep -Ril <pattern>* will find text pattern inside any file
- Use quotes if looking for a pattern with a space

find searches a file path for filenames that match a pattern

- *find ~/* find all files in home directory
- *find ~/ -name *.html* find all html files in home directory (case sensitive)

Linux Environment

Variables
Configuration Files
Aliases

Linux Environment - Variables

Environment variables hold values about your current linux environment, like your text color, home directory location, etc.

printenv: shows your currently defined environment variables

- $PATH and $HOME are two important variables
  - $PATH: list of locations with executables visible systemwide
  - Add locations to $PATH with ”export”: ***export PATH=$PATH:/path/new***
- Is $PWD a variable?

unset : command to remove a variable

- unset THISISMYVAR

Linux Environment - Configuration Files

.profile: stores commands and variable definitions you want every time you log into a shell session. Considered a system wide file

.bashrc: the same as .profile but it only runs when logging into a BASH session. Considered a local file

Linux Environment - Aliases

Use the “alias” command to create command aliases (shortcuts) for commands that are too long to type repeatedly

- Print a list of aliases: *alias -p*
- Create a new alias: *alias new_ls='ls -las'*
- Remove an alias: *unalias new_ls*

Add aliases to your .profile or .bashrc to use them every time you login.

Exercise 4. Linux Environment

- Find the value of your $USER variable with printenv

Test your .bashrc file

- add “ls -la” to your .bashrc
- add “export MYTESTVAR=HELLO” to your .bashrc
- Close the terminal window and then open a new one
- Type "printenv"
- Confirm you can see your new variable

Questions or Requests