CS 35L Software Construction Lab

Fall 2018
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Lab 3

Introduction to Linux

Week 1

Outline

- **Overview of Linux**
- **Basic commands for Linux**
- The vim and Emacs editor

CLI vs. GUI

Client (CLI)

- Steep learning curve
- Pure control (e.g., scripting)
- Cumbersome multitasking
- Speed: Hack away at keys
- Convenient remote access

Graphics User Interface (GUI)

- Intuitive
- Limited Control
- Easy multitasking
- Limited by pointing
- Bulky remote access

Which Linux for this course?

Ubuntu Linux Distribution

- Most popular
- Frequently updated, fixed release cycle (6 months)
- Simple installation and booting
- Nice set of pre-installed packages

Seasnet servers:

- Red Hat

GNU/Linux

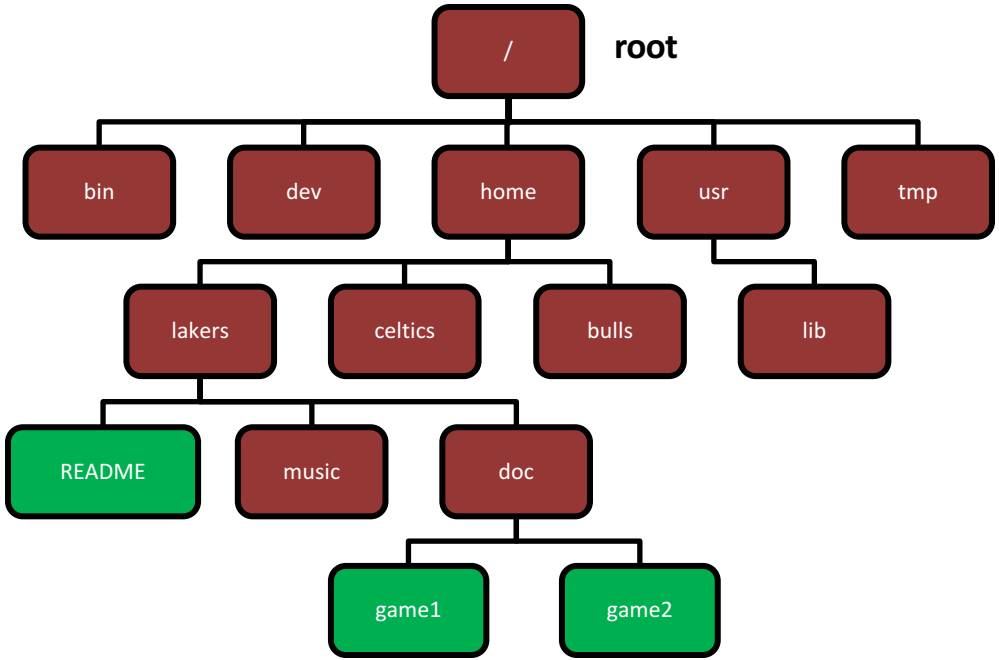
- Open-source operating system
  - **Kernel**: core of operating system
    - Allocates time and memory to programs
    - Handles file system and communication between software and hardware
  - **Shell**: interface between user and kernel
    - Interprets commands user types in
    - Takes necessary action to cause commands to be carried out
  - **Programs**

Files and Processes

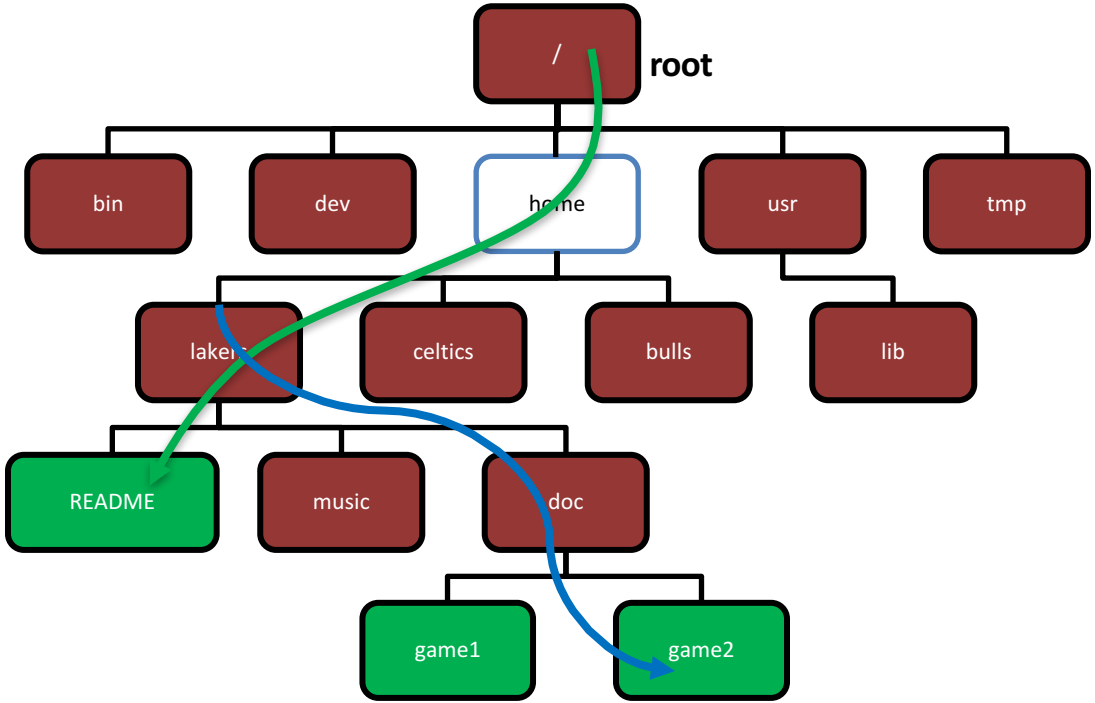
- Everything is either a **process** or a **file**:
  - **Process**: an executing program identified by PID
  - **File**: collection of data
    - A document
    - Text of program written in high-level language
    - Executable
    - Directory
    - Devices

Linux File System Layout

- Tree structured hierarchy



Absolute Path vs. Relative Path



Current directory: home

The Basics: Moving Around

- Lost?
  - man: get manual or man pages
- **pwd**: print working directory
- **cd**: change working directory
- **~**: home directory
- **.**: current directory
- **/**: root directory, or directory separator
- **..**: parent directory

The Basics: Look These Up

- cat
- head
- tail
- du
- ps
- kill
- diff
- cmp
- wc
- sort

Use **man** command!

e.g. man cat

The Basics: History

- <up arrow>: previous command
- <tab>: auto-complete
- !!: replace with previous command
- ![*str*]: refer to previous command with str
- ^[*str*]: replace with command referred to as str

The Basics: Dealing with Files

- The basics continued…
  - mv: move a file (no undos!)
  - cp: copy a file
  - rm: remove a file
  - mkdir: make a directory
  - rmdir: remove a directory
  - ls: list contents of a directory
    - -d: list only directories
    - -a: list all files including hidden ones
    - -l: show long listing including permission info
    - -s: show size of each file, in blocks

The Basics: File Name Matching

- ?: matches any single character in a filename
- *: matches one or more characters in a filename
- []*:* matches any one of the characters between the brackets. Use '-' to separate a range of consecutive characters. i.e. [1-9][a-z]

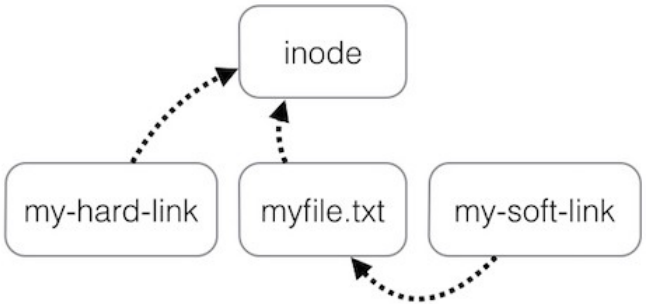
Detailed usage will be covered in Regular Expression (Week 2)

The Basics: Redirection

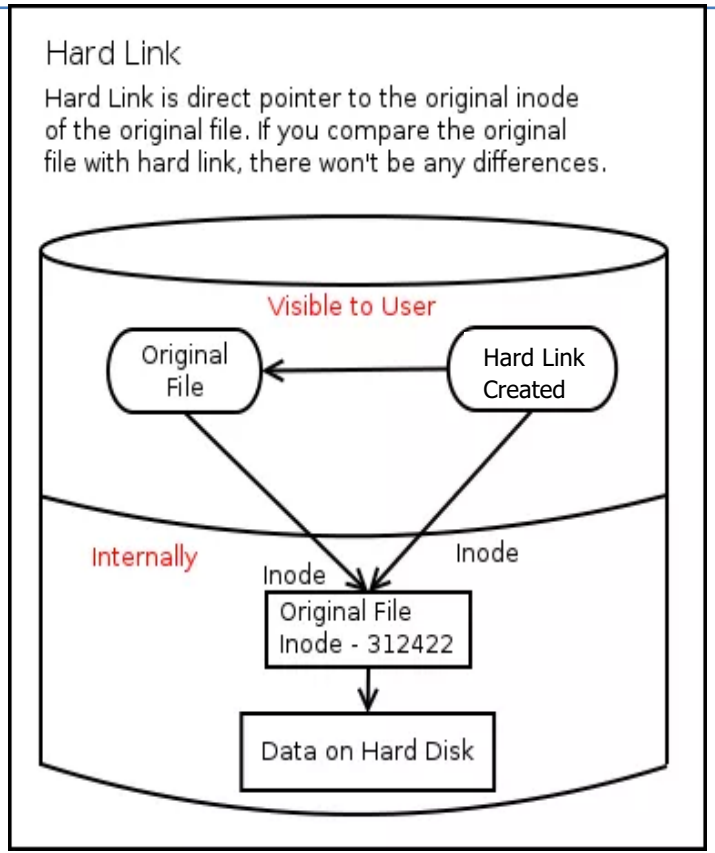
- > *file*: write stdout to a file
- >> *file*: append stdout to a file
- < *file*: use contents of a file as stdin

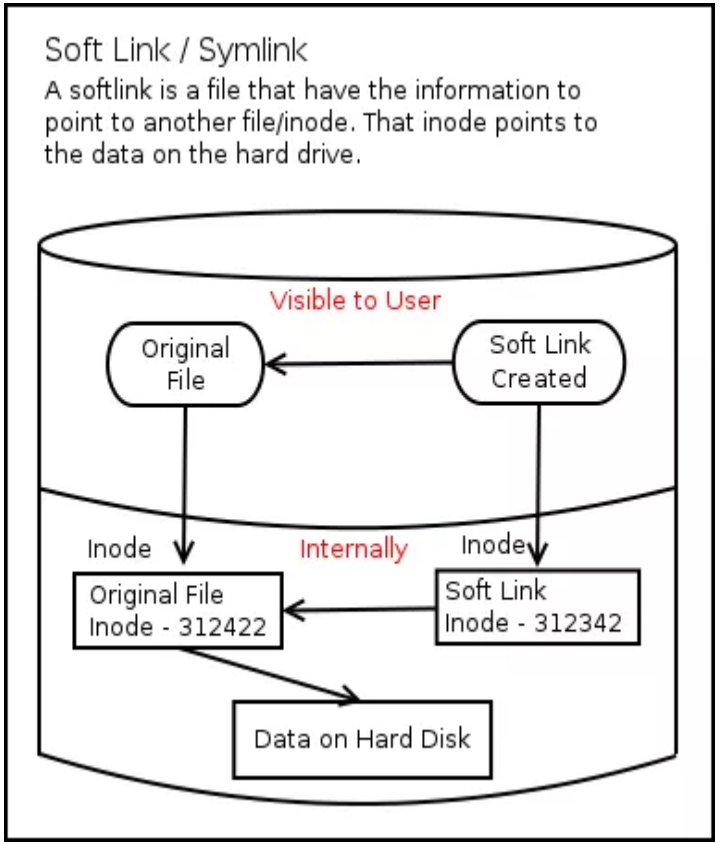
The Basics: Changing File Attributes

- **touch**: update access & modification time to current time
  - touch *filename*
  - touch -t 201101311759.30 *filename*
    - Change filename's access & modification time to (year 2011 January day 31 time 17:59:30)
- **ln**: create a link
  - Hard links: point to physical data
  - Soft links aka symbolic links (-s): point to a file



Hard link vs Soft link





The Basics: chmod

- chmod
  - read (r), write (w), executable (x)
  - User, group, others

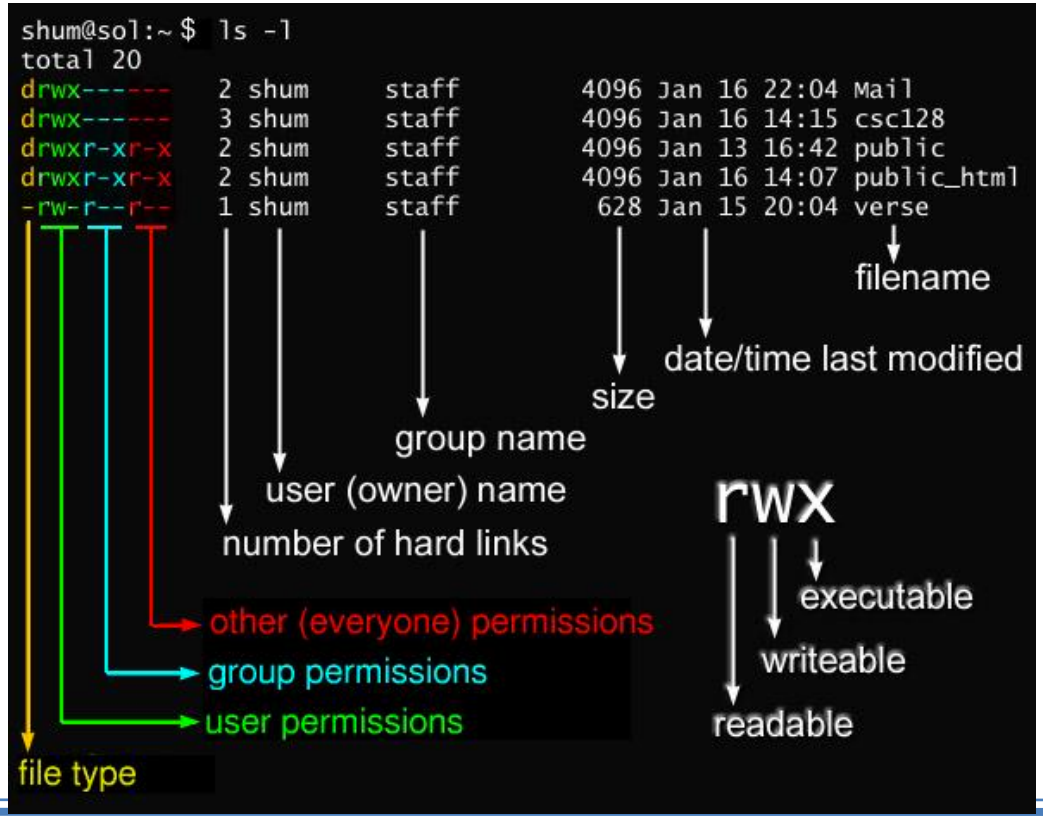
Reference	Class	Description
u	user	the owner of the file
g	group	users who are members of the file's group
o	others	users who are not the owner of the file or members of the group
a	all	all three of the above, is the same as *ugo*

The Basics: chmod (symbolic)

Operator	Description
+	adds the specified modes to the specified classes
-	removes the specified modes from the specified classes
=	the modes specified are to be made the exact modes for the specifi ed classes

Mode	Name	Description
r	read	**r**ead a file or list a directory's contents
w	write	**w**rite to a file or directory
x	execute	e**x**ecute a file or recurse a directory tree

Linux File Permissions



Special Permissions

- sticky bit (o+t)
  - On shared directories, it locks files within the directory from being modified/deleted by users other than the file creator, owner of the directory, or root, even if others have write permissions (Example: /tmp)
- setuid, setgid (u+s, g+s)
  - “set user ID upon execution”
  - Run an executable with the permissions of the executable’s owner or group

The basics: dealing with process

- Process: An instance of a computer program in execution
- ps
  - List processes that are currently running
- kill
  - Terminate a certain process
  - Usage
    - kill PID

```
[root@tecmint ~]# ps
  PID TTY          TIME CMD
 2232 pts/0    00:00:00 bash
 2256 pts/0    00:00:00 ps
[root@tecmint ~]#
```

The Basics: find

- -type: type of a file (e.g,, directory, symbolic link)
- -perm: permission of a file
- -name: name of a file
- -prune: don’t descend into a directory
- -o: or
- -ls: list current file

`find` Examples

- Examples
  - find . -name my*
  - find . -name my* -type f
  - find / -type f -name myfile –print

The Basics

- First: learn to use man command!
- Supplement materials: Linux command cheat sheet

  http://www.rain.org/~mkummel/unix.html
- Online document:

  http://www.linuxdevcenter.com/cmd/

Assignment 1 is available

- Check: http://web.cs.ucla.edu/classes/fall18/cs35L/assign/assign1.html
- Deadline:

  11:55 PM on Oct 6th, 2018

Lab1: hints

- For lab questions(ans1.txt)
  - Answer 15 questions using natural language
  - For each question, list all the commands used to solve it
  - Give some explanations about your choice of commands
  - Will be graded manually