CS 35L-4 Software Construction Laboratory

Isha Verma

General class details

- Class website - http://web.cs.ucla.edu/classes/winter17/cs35L/
- Syllabus - http://web.cs.ucla.edu/classes/winter17/cs35L/syllabus.html
- Grading - 50% assignments, 50% final (Final on March 22 3-6 PM)
- 10 assignments (2 parts - Lab and HW)
- Late penalty - $2^{\#\text{late days}-1}$ 1% for 1 day late, 2% for 1-2 days late,etc
- Piazza for questions - piazza.com/ucla/winter2017/cs35l/home
- Office hours - Wednesday 2-4 PM BH 2432

What's this class about?

"Fundamentals of commonly used **software tools** and environments, particularly **open-source** tools to be used in upper division computer science courses."

What is open source software?

- Source code is publicly available
- Anyone is allowed to modify the source code

- Examples
  - Linux
  - Android
  - Firefox

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**

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

Options

- SEAS Server
  - lnxsrv.seas.ucla.edu
  - Username: SEAS ID
  - Password: SEAS password
  - On windows: putty

- On your computer
  - Install or try Ubuntu
  - Run with Windows (https://wiki.ubuntu.com/WubiGuide)

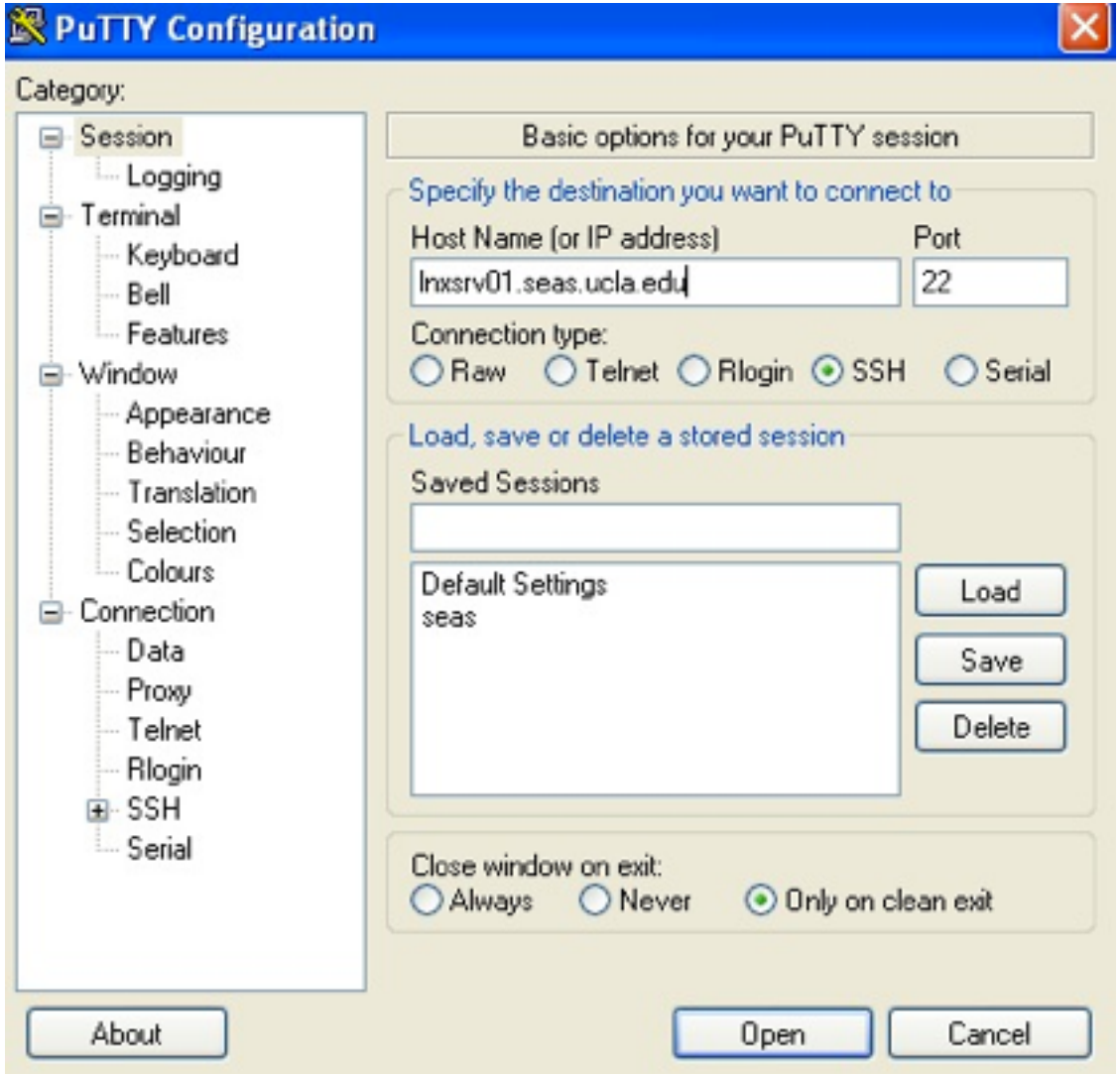
- Virtual Machine
  - VMWare
  - Virtual Box

- Live CDs on BH3760 Computers

Connecting to SEAS from Windows

- Putty
  - Recommended
  - Small and easy to use
  - Homepage: http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html
  - Download: http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe
  - Host name: lnxsrv.seas.ucla.edu
  - User name: your SEAS user name

Putty


PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Host Name (or IP address)
Port
lnxsrv01.seas.ucla.edu
22
Connection type:
Raw
Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
Default Settings
seas
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Open
Cancel

Connecting to SEAS from OS X or Linux

- Terminal
  - $ ssh username@lnxsrv.seas.ucla.edu
  - Username = your SEAS user name

Command Line Interface vs. Graphical User Interface

CLI

- Steep learning curve
- Pure control (e.g., scripting)
- Cumbersome multitasking
- Convenient remote access

GUI

- Intuitive
- Limited control
- Easy multitasking
- Bulky remote access

The Basics: Shell

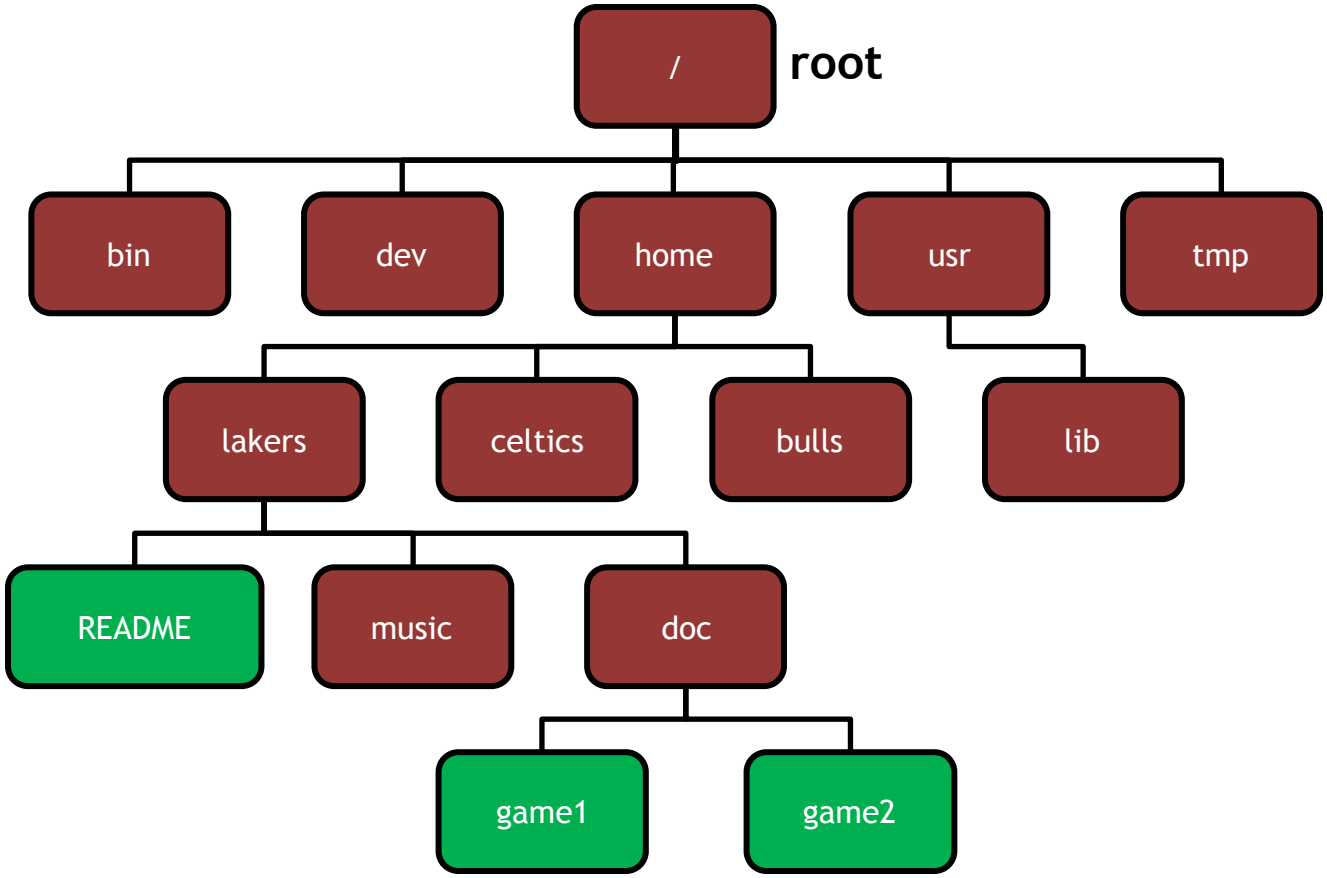
- **<up arrow>**: previous command
- **<tab>**: auto-complete
- **!!**: replace with previous command
- **![*str*]**: refer to previous command with str
- **^[*str*]**: replace with command referred to as str

Files and Processes

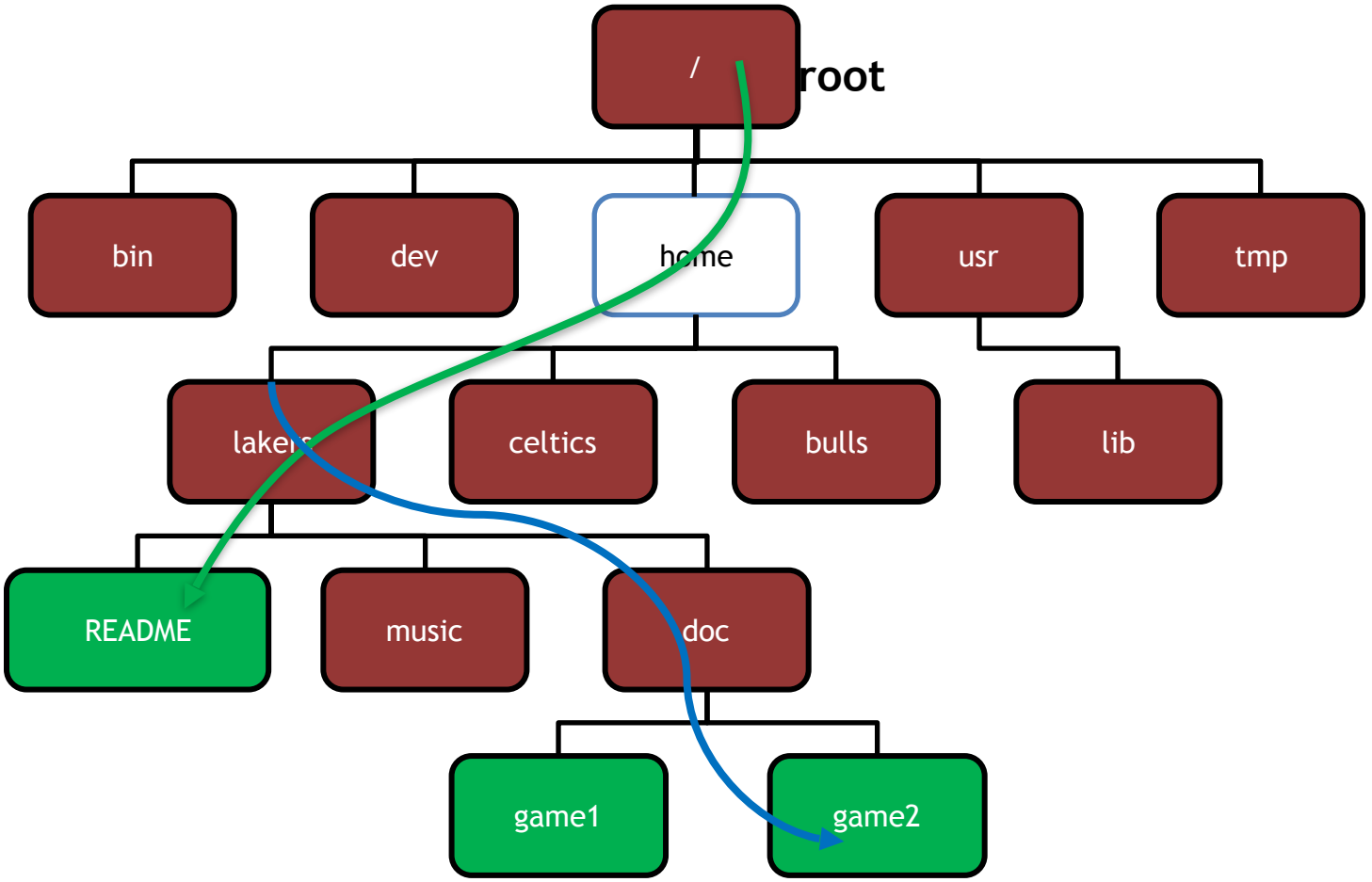
- Everything is either a **process** or a **file**:
  - **Process**: an executing program identified by PID
  - **File**: collection of data
    - A document
    - Text of program written in high-level language
    - Executable
    - Directory
    - Devices

Linux File System Layout

- Tree structured hierarchy



Absolute Path vs. Relative Path



Current directory: home

The Basics: Moving Around

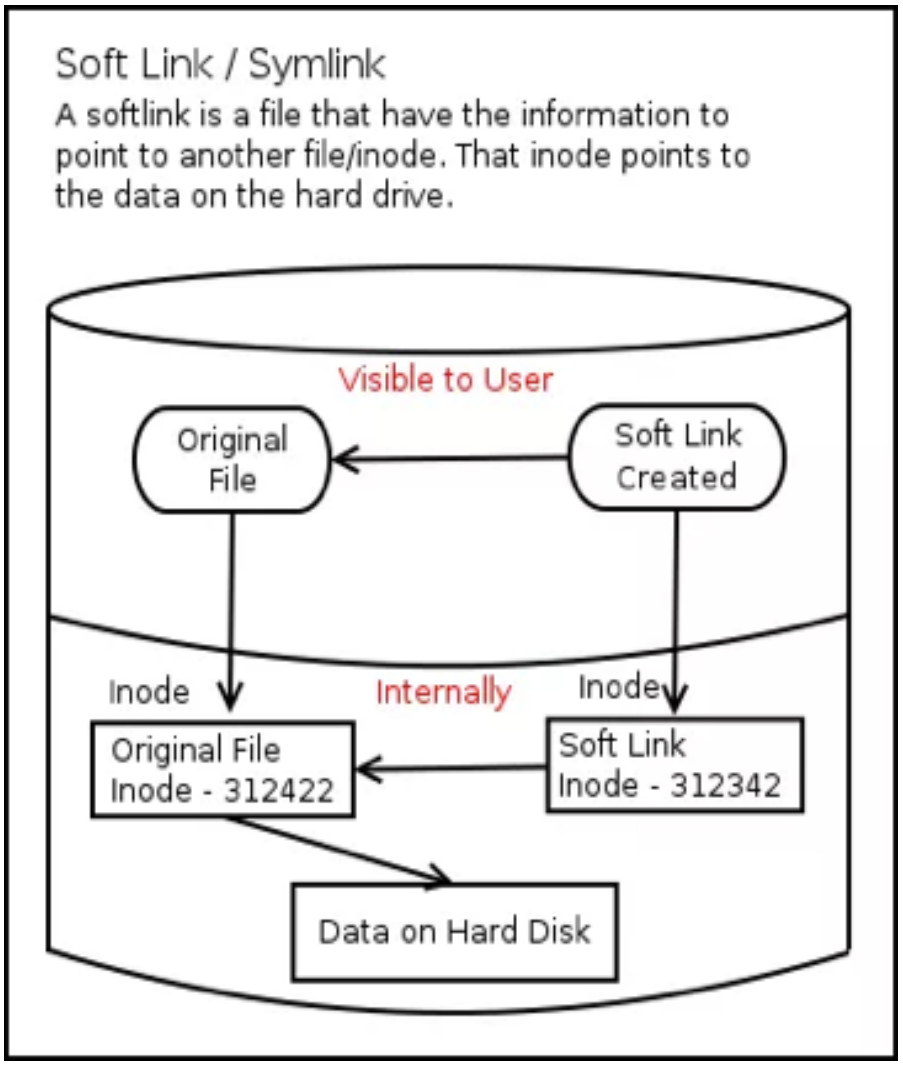
- **pwd**: print working directory
- **cd**: change directory
  - ~ home directory
  - . current directory
  - / root directory, or directory separator
  - .. parent directory

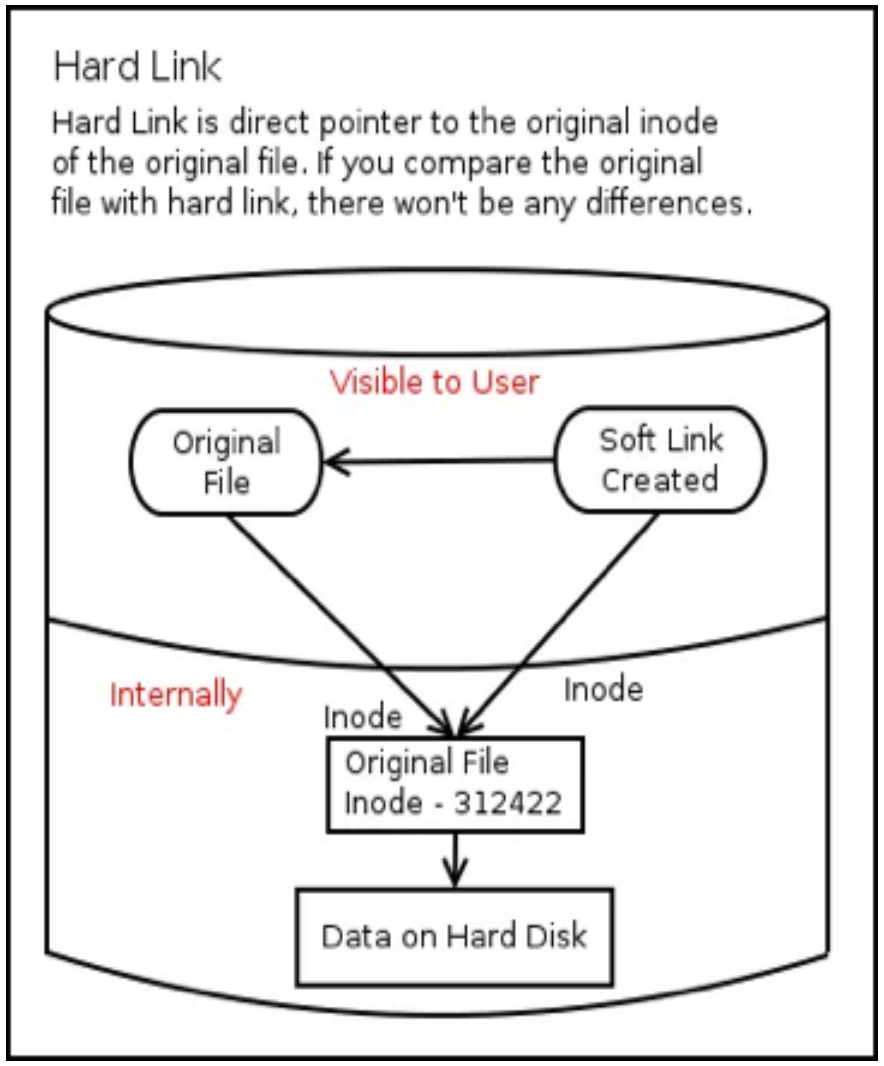
The Basics: Dealing with Files

- **mv**: move/rename a file
- **cp**: copy a file
- **rm**: remove a file
  - r: remove directories and their contents recursively
- **mkdir**: make a directory
- **rmdir**: remove an empty 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: Changing File Attributes

- **ln**: create a link
  - Hard links: point to physical data
  - Soft links aka symbolic links (-s): point to a file
- **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)





- Read more here - http://www.theunixschool.com/2012/03/soft-links-hard-links-all-about-inodes.html

- Create two files

  $ touch blah1 $ touch blah2
- Fill contents into the files and print them

  $ echo "Cat" > blah1 $ echo "Dog" > blah2

  $cat blah1; cat blah2

  Cat

  Dog
- Create links

  $ ln blah1 blah1-hard $ ln -s blah2 blah2-soft $ ls –l

  blah1 blah1-hard blah2 blah2-soft -> blah2
- Change the original file

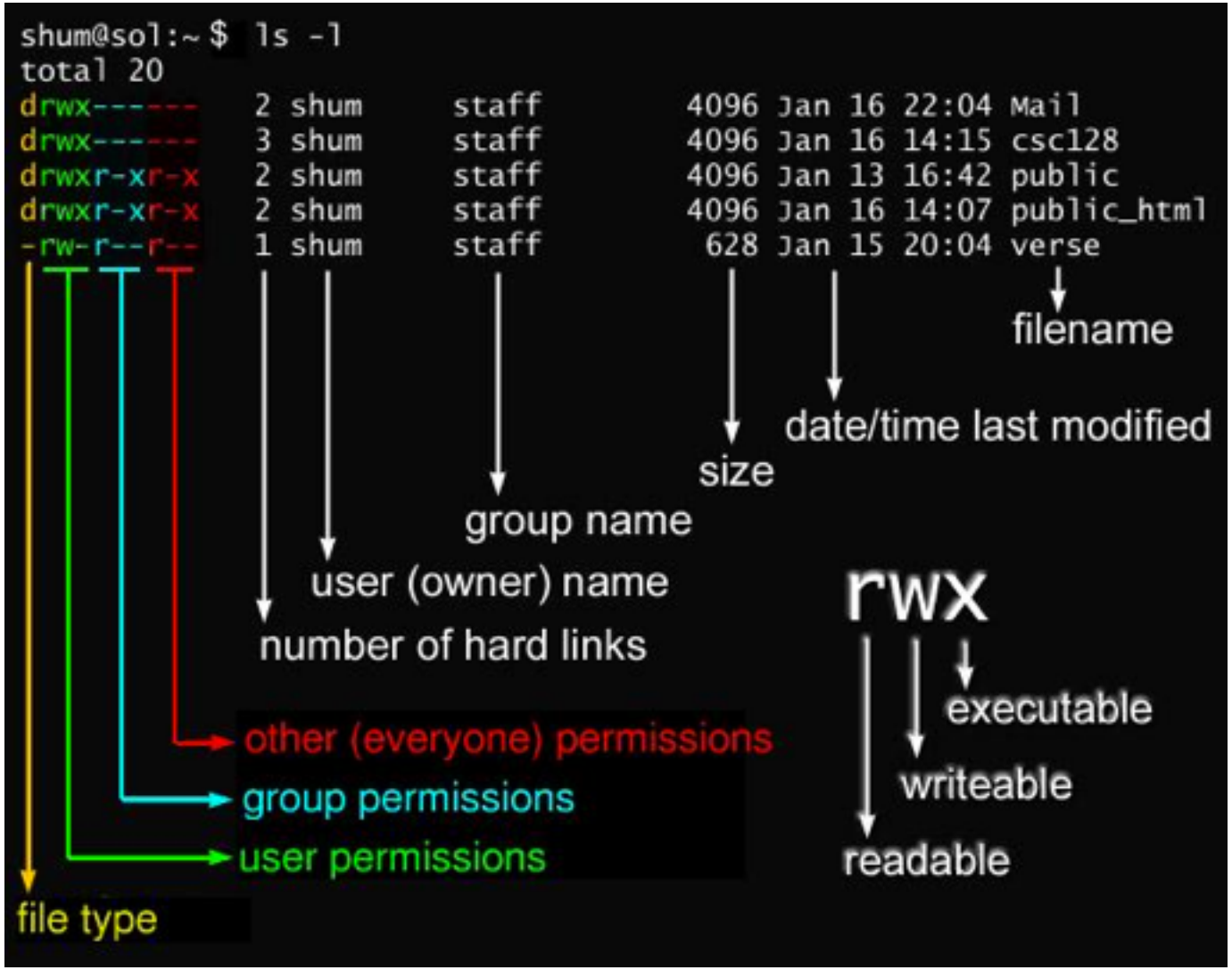
  $ mv blah1 blah1-new $ cat blah1-hard

  Cat

  $ mv blah2 blah2-new $ cat blah2-soft

  cat: blah2-soft: No such file or directory

Linux File Permissions



Linux File Permissions

- 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 specified 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

The Basics: chmod (numeric)

#	Permission
7	full
6	read and write
5	read and execute
4	read only
3	write and execute
2	write only
1	execute only
0	none

- Usage

– chmod ["references"]["operator"]["modes"] "file1" ...
Example: **chmod** ug+rw mydir, **chmod** a-w myfile,
Example: **chmod** ug=rx mydir, **chmod** 664 myfile

The Basics: find

- -type: type of a file (e.g: directory, symbolic link)
- -perm: permission of a file
- -name: name of a file
- -user: owner of a file
- -maxdepth: how many levels to search

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.

`find` Examples

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

pipes

- A pipe is a form of redirection that is used to send the output of one program to another program for further processing.
- Redirection is the transferring of standard output to some other destination, such as another program or a file.
- Example: ls | wc -l

man

- Extensive documentation that comes preinstalled with almost all substantial Unix and Unix-like operating systems
- Usage
  - read a manual page for a Linux command
    - **man** <command_name>
    - **man** section command_name
    - 1 User Commands 2 System Calls 3 C Library Functions 4 Devices and Special Files 5 File Formats and Conventions 6 Games et. al. 7 Miscellanea 8 System Administration tools and Daemons
    - Hit “q” to get out of man page

`wh...` Commands

- `whatis` <command>: returns Name section of man page
- `whereis` <command>: locates the binary, source, and manual page files for a command

Assignment 1

- Hints for first 10 questions:
  1. man man
  2. which
  3. find
  4. readlink
  5. man chmod
  6. man find
  7. find
  8. whereis, man find
  9. find, sort
  10. localedef

Assignment 1 – Example ans1.txt

ans1.txt is specifically for LABORATORY section

- 1. Here is the answer to question 1
- 2. Here is the answer to question 2
- 3. Here is the answer to question 3
- …..

Assignment 1 – Example key1.txt

key1.txt is specifically for HOMEWORK section

1. C-s H E L L O W O R L D
2. C-s H T M L
3. C-d
4. C-n
5. M-x goto-line Enter 1 2 3 Enter