

CS100: Software Tools & Technologies Lab I

Introduction

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Outline

- Why?
- What?
- How?

Why?

- Learning a language (C/Python) is not enough!
- Many day-to-day requirements
 - ❑ Avoiding repetitive tasks
 - ❑ Perform complex tasks with simple line commands/code
 - ❑ Freedom from maintaining code
 - ❑ Effective writing tools, etc.
 - ❑ Interviews!
- **Goals:**
 - ❑ To empower by learning some of the popular tools
 - ❑ Make yourself more productive
 - ❑ Good hands on experience

Motivating Examples

■ Automation

We need to change the name convention of one million files:

24-09-2007-picturename.jpg

should be

2007-09-24-picturename.jpg

Motivating Examples

■ Automation

List the number of lines in all the txt file in the current directory?

How can you restrict a particular user only read all the audio files?

Motivating Examples

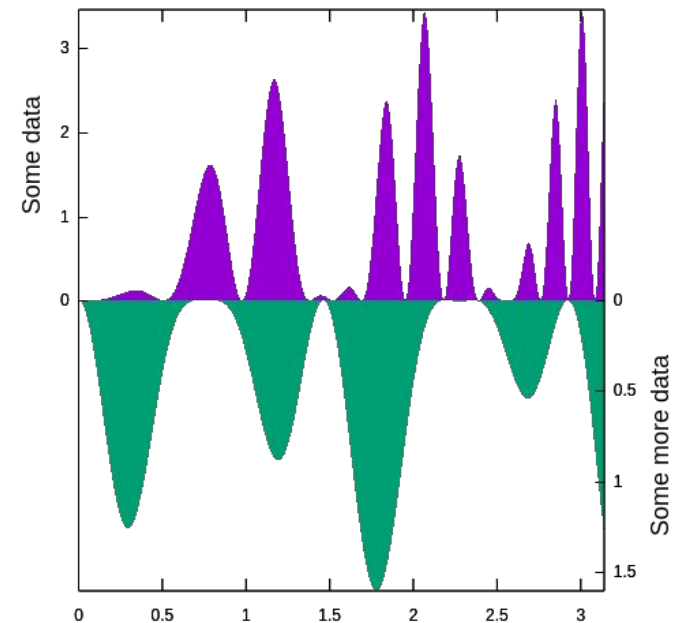
- Code Maintenance
 - ❑ Made mistakes -- Rollback?
 - ❑ Collaboration?
 - ❑ How to work another release
 - ❑ Work from another machine?



Motivating Examples

■ Data visualization

A	B	C	D
DATE	NotionalAmounts	GrossCreditExposure	GrossMarketValues
30/06/199	72106521.77	1202805	2562152.803
31/12/199	80276622.05	1328580	3209463.957
30/06/199	81420274.61	1119372	2609693.198
31/12/199	88156431.71	1023011	2793954.52
30/06/200	93959822.42	936961	2554920.528
31/12/200	95150854.68	1080349	3161552.443
30/06/200	99648589.78	1019132	3041485.503
31/12/200	111058769.9	1170902	3783434.112
30/06/200	127372621.6	1316794	4444507.456
31/12/200	141513417.2	1510743	6352466.101

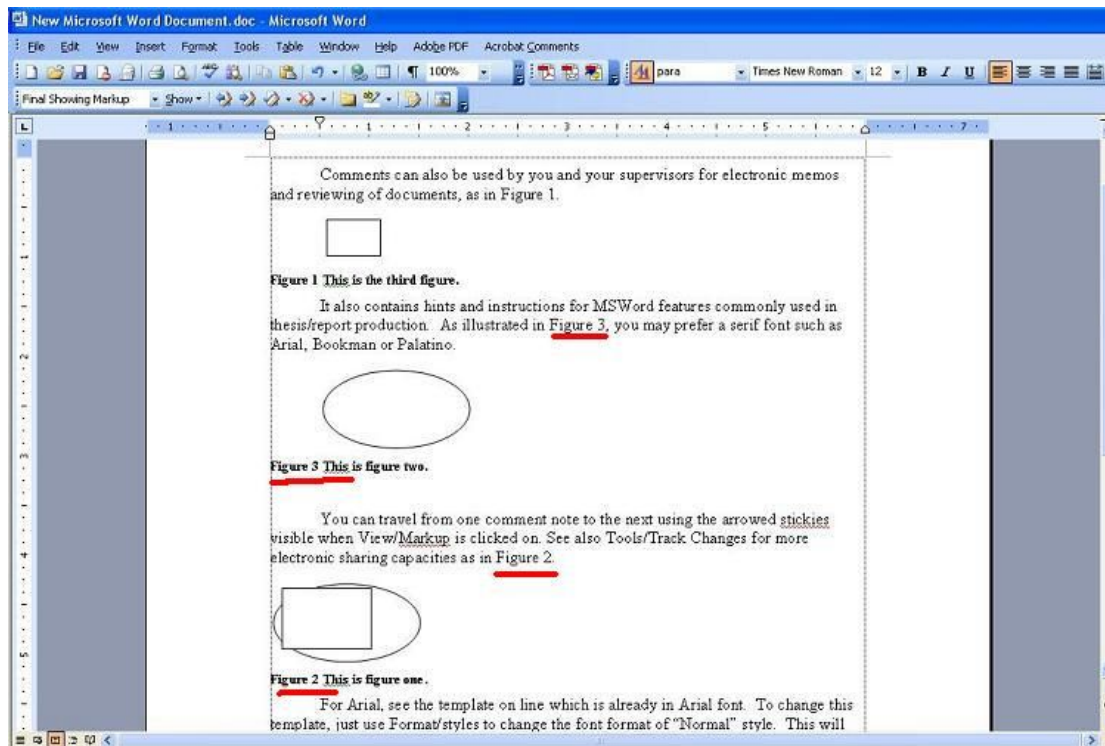


Designing Websites

- Designing websites not just with static data
- Static website
 - ❑ Mostly the content remains same or changes less frequently
 - ❑ School or organization website
 - ❑ Personal websites, etc
- Dynamic website and content
 - ❑ AIMS
 - ❑ Reservation system
 - ❑ Library management system, etc.

Document Preparation

- Word documents are not effective for making good technical reports/research documents.



What?

- Popular Tools and Techniques
 - Linux commands
 - Shell scripting
 - Website designing tools: HTML and PHP
 - LaTeX: Document preparation
 - Version control: Github
 - Plotting: Gnuplot
- Hands on experience

How?

Mode of Teaching

- Theory Classes
- Labs: Practice problems
- Labs: Exams

Distribution (Tentative)

Topic	Theory Class	Lab Practice	Lab Exams
Linux Commands and VIM	2	1	
Shell Scripting, AWK	1	1	1 (includes Linux commands as well)
Version Control	1	1	1
Web programming (HTML and PHP)	2	1	1
LaTeX	1	1	1
Gnuplot	1	1	1
Total	8	6	5

Labs: Practice Sessions

- Practice problems will be provided to solve
- TAs and Instructor will assist you for any difficulty
- Take it as an opportunity to clear your misconceptions/doubts
- Internet will be ON
- You must submit your solution when you are done

Labs: Exams

- No assistance will be provided
- Internet will be OFF
- You must submit your solution when you are done

Assignments

- Practical oriented
- Involves coding
- Approximately 1 Assignment on each topic
- Try to submit it in time. Extension will not possible.

Course Logistics: Evaluation Scheme (Tentative)

Evaluation

Class Participation

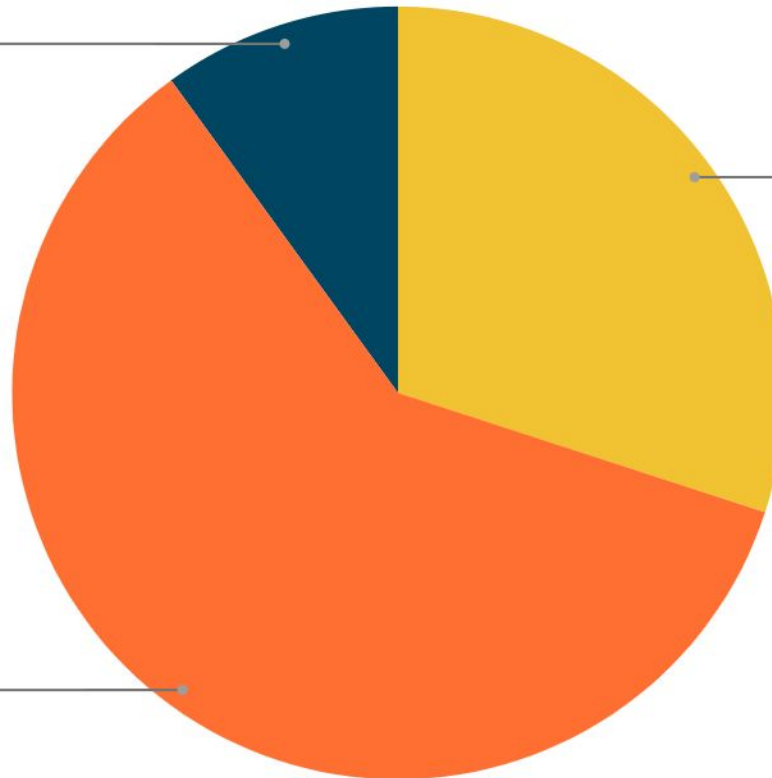
10.0%

Lab exams

30.0%

Assignment

60.0%



Course Logistics

- Class participation
 - ❑ 0% - 50%: 0 Marks
 - ❑ >50%: Marks will be awarded out of 10 accordingly.
 - ❑ Example:
 - Total sessions: 16
 - #sessions attended = 7 (<50%), marks = 0
 - #sessions attended = 10 (62.5%), marks = 2.5 ($2 \cdot 10 / 8$)
- Policy:
 - ❑ Penalty for late submission: 20% for each day
 - ❑ Acknowledge all the sources
 - ❑ **Penalty for cheating**

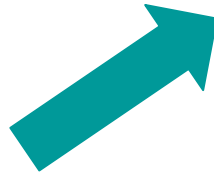
Course Logistics

- Lecture Hours:
 - ❑ Tuesday 10:00 am - 11:20 am
 - ❑ Wednesday 10:00 am - 11:20 am
 - ❑ Saturday 11:30 am - 12:50 pm
- Course Website: Canvas platform
 - ❑ Lecture notes
 - ❑ Assignment submissions
 - ❑ Lab practice problems
 - ❑ Lab exams
 - ❑ Discussions
 - ❑ Marks

References

- Will be uploaded on Canvas
 - 📄 Lecture notes
 - 📄 Reference material

Course Logistics



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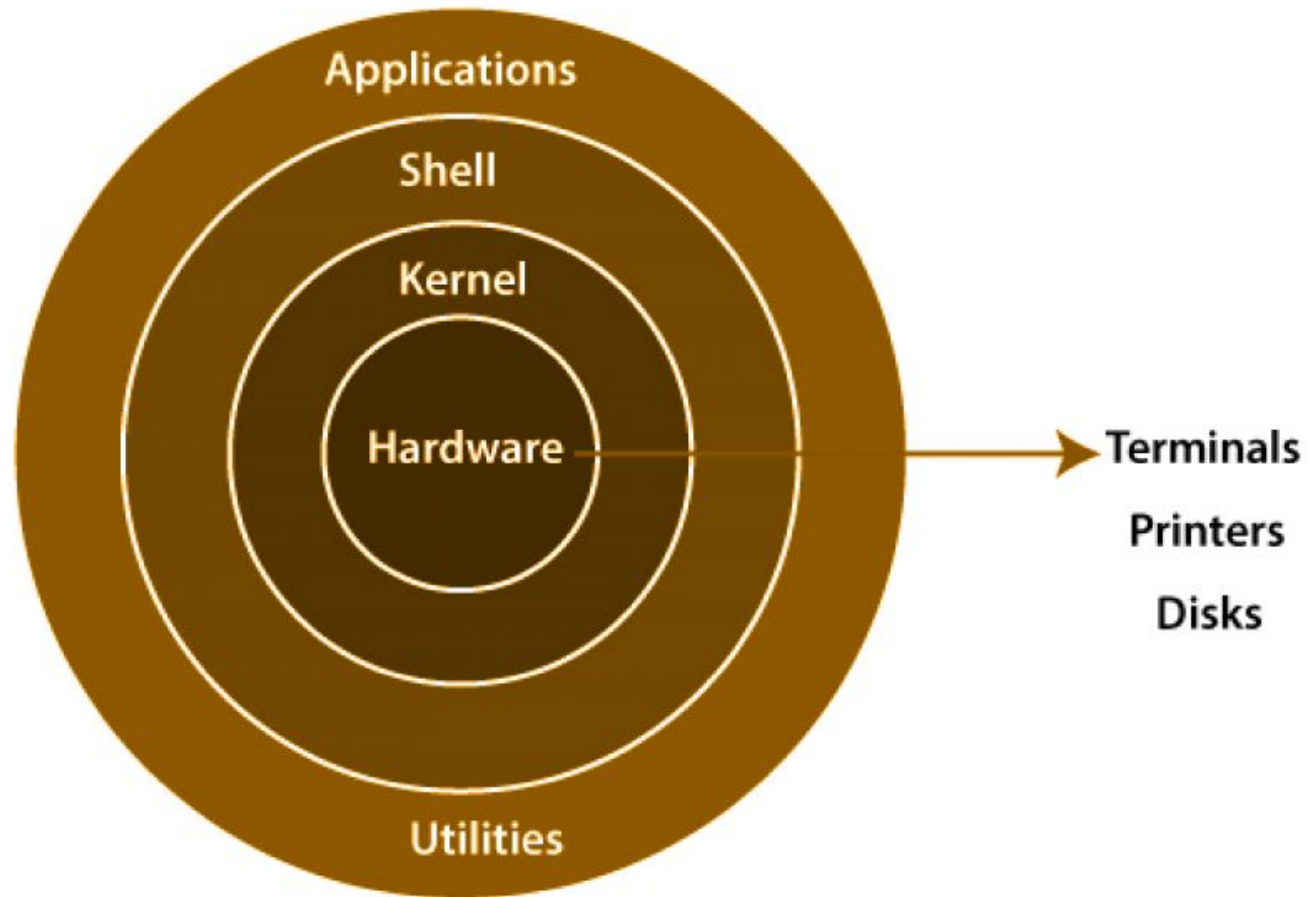
CANVAS

Linux Tools and Shell Scripting

Why Linux?

- Open source
- Secure
- Free!
- Customizable
- Stable
- Academia & Research
- Industry

Architecture



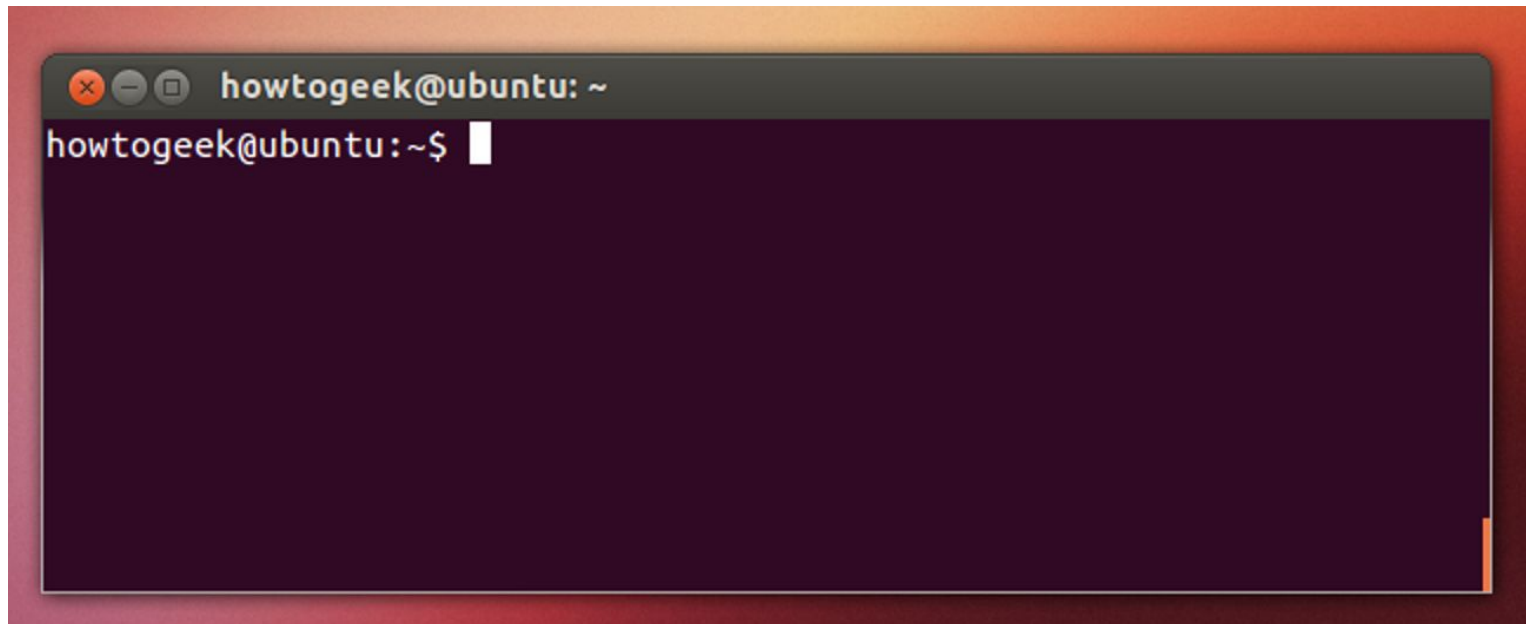
Shells

- A shell is a program that allows the user to interact with the Linux system:
 - ❑ read user's input and parses it
 - ❑ evaluates special characters
 - ❑ setup pipes, redirections, and background processing
 - ❑ find and setup programs for execution

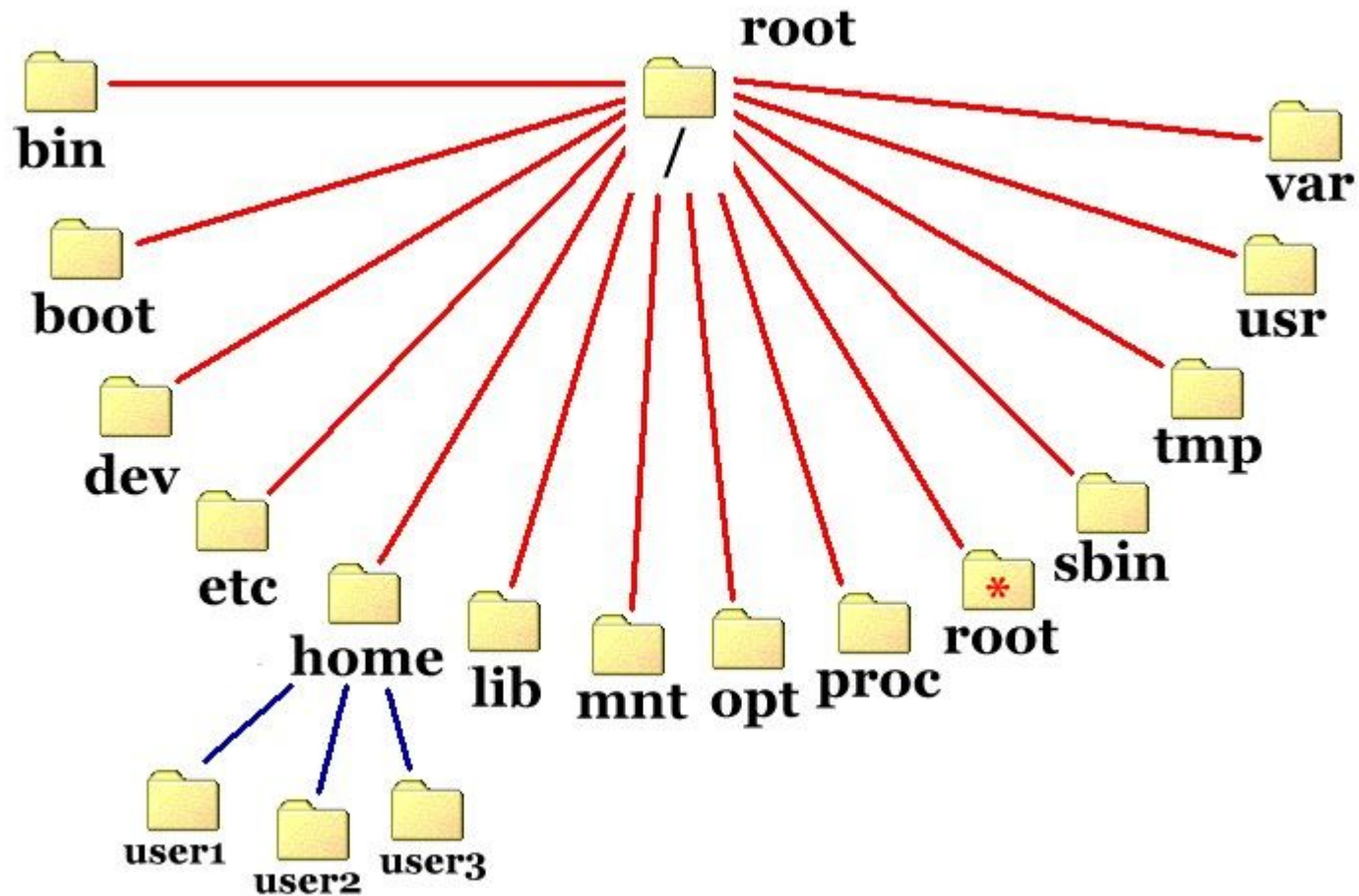
Shells

- There are primarily two “families” of unix shells:
 - Bourne shell (AT&T) sh \Rightarrow bash
 - C shell (Berkley) csh
 - We focus on bash: easy syntax and default in many systems

Linux Terminal



File system Hierarchy



File system Hierarchy

- Single global “root” directory / (regardless of how
- many disks/volumes you have)
- Files and directories are case sensitive
 - `abc.txt` != `ABC.txt`
- Directories are separated by / instead of \ in windows
 - Linux: `/home/user1/Documents/cs100/`
 - Windows: `D:\Documents\cs100\`
- “Hidden” files begin with “.”: `.file`

File system Hierarchy

- **/dev**: Hardware devices can be accessed here
- **/lib**: Stores libraries, along with /usr/lib, /usr/local/lib, etc.
- **/mnt**: Frequently used to mount disk drives
- **/usr**: Mostly user-installed programs and their related files
- **/etc**: System-wide settings
- **/bin**: System programs
- **/usr/bin**: Most user programs
- **/usr/local/bin**: A few other user programs

User files

- Your files can be found in your home directory, usually located at

`/home/username`

- Your home directory can also be access using the special character

`~`

Current working directory

- Just type `pwd`
 - Prints the full path of the current directory
 - Handy when you get lost
 - Important variable for scripts

ls

- ls [Flags] [Files]
 - Lists directory contents (including subdirectories)
 - Works like the dir command from DOS
 - Options
 - -l : lists detailed file/directory information
 - -a : lists hidden files

Change Directory (cd)

- `cd [directory name]`
 - changes directory to [directory name]
 - If not given a destination defaults to the user's home directory
 - takes both absolute (`cd /home/user1/cs2043`) and relative (`cd cs2043`) paths

File Paths

- Absolute path
 - location of a file or folder starting at /
- Relative Path
 - location of a file or folder beginning at the current directory

Relative Path Shortcuts

- Shortcuts:

- ~ - current user's home directory
- . - the current directory (is useful)
- .. - the parent directory of the current directory

- Example:

- If we start in `/usr/local/src`, then
 - `cd` \Rightarrow `/home/hussam`
 - `cd .` \Rightarrow `/usr/local/src`
 - `cd ..` \Rightarrow `/usr/local`

Creating New files and Directories

- touch [FILENAME]
- mkdir [DIRNAME]
 - Can use relative/absolute paths to make directories outside the current directory

File Deletion

- Unlike in window, once you delete a file (from the command line) there is no easy way to recover the file.
- `rm [flags] <filename>`
 - Removes the file called <filename>
 - Using wildcards (more on this later) you can remove multiple files
 - `rm *` - removes every file in the current directory
 - `rm *.jpg` - removes every .jpg file in the current directory
 - `rm -i filename` - prompt before deletion

Directory Deletion

- By default, `rm` cannot remove directories.
- `rmdir [flags] <directory>`
 - Removes an empty directory
 - Throws an error if the directory is not empty.
- To delete a directory and all its subdirectories, we pass `rm` the flag `-r` (for recursive)
 - `rm -r /home/user1/oldstuff`



Copying Files

- `cp [flags] <file> <destination>`
 - Copies a file from one location to another
 - To copy multiple files you can use wildcards (such as `*`)
 - To copy a complete directory use `cp -r <src> <dest>`
- Example: What does the following command do?
 - `cp *.mp3 /Music/`

Moving

- `mv [flags] <source> <destination>`
 - Moves a file or directory from one place to another
 - Also used for renaming, just move from <oldname> to <newname>

Quick Review

- **ls** - list directory contents
- **cd** - change directory
- **pwd** - print working directory
- **rm** - remove file
- **rmdir** remove directory
- **cp** - copy file
- **mv** - move file

Manual for each command

- `man <command_name>`
 - ❑ Brings up the manual page (manpage) for the selected command
 - ❑ Unlike Web search, manpages are system-specific
 - ❑ Gives a pretty comprehensive list of all possible options/parameters
 - ❑ Use `/<keyword>` to perform a keyword search in a manpage
 - ❑ The n-key jumps to successive search results

Assignment-0 (Not for submission)

- Go through online tutorial for installing your choice of linux OS on your laptop.
 - If you are installing ubuntu, use the latest version with LTS
 - You can use dual boot (both windows and linux)
- Experiment with different commands that we discussed today

References

- Miscellaneous resources from internet
- Lecture notes from
<https://www.cs.cornell.edu/courses/cs2043/2014sp/>



Thank you!