CS 35L

Software Construction Laboratory

Lecture 1

8th January, 2019

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."

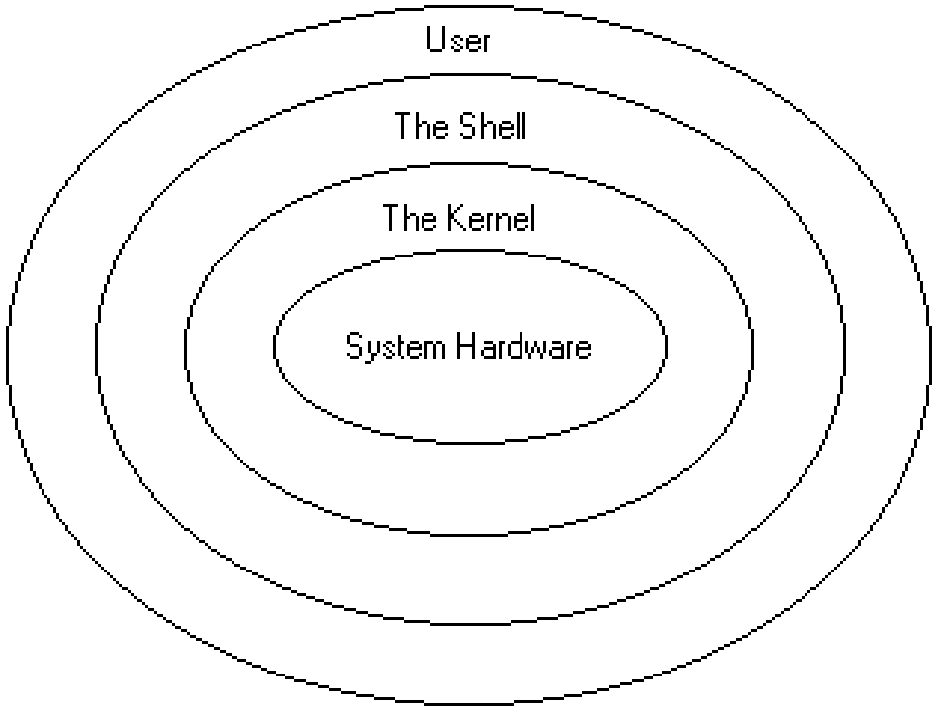
What is open source software?

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

- Examples
  - Firefox
  - Android
  - Apache

GNU/Linux

- **Kernel**: core of OS
  - 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**



Linux vs. Unix

Linux

- Linux was made by a student called Linus Torvalds in 1991
- Mostly Free
- Open Source
- Linux can be installed on a variety of computer hardware

Unix

- Unix was first developed for multi-user and multi-tasking in mid-1970's in BELL Labs by AT&T, GE and MIT
- Unix is mostly used by Sun as Solaris, HP-UX, AIX, etc
- Unix supports fewer file systems compared to Linux

Which Linux for this course?

Ubuntu Most popular

- Frequently updated, fixed release cycle (6 months)

Seas net servers(recommended):

- lnxsrv.seas.ucla.edu (*lnxsrv06*, *lnxsrv07*, *or lnxsrv09*)
- Username: SEAS ID
- Password: SEAS password
- On Windows: putty
- On Mac: terminal (https://www.seasnet.ucla.edu/lnxsrv/)

Command Line Interface vs. Graphical User Interface

CLI

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

GUI

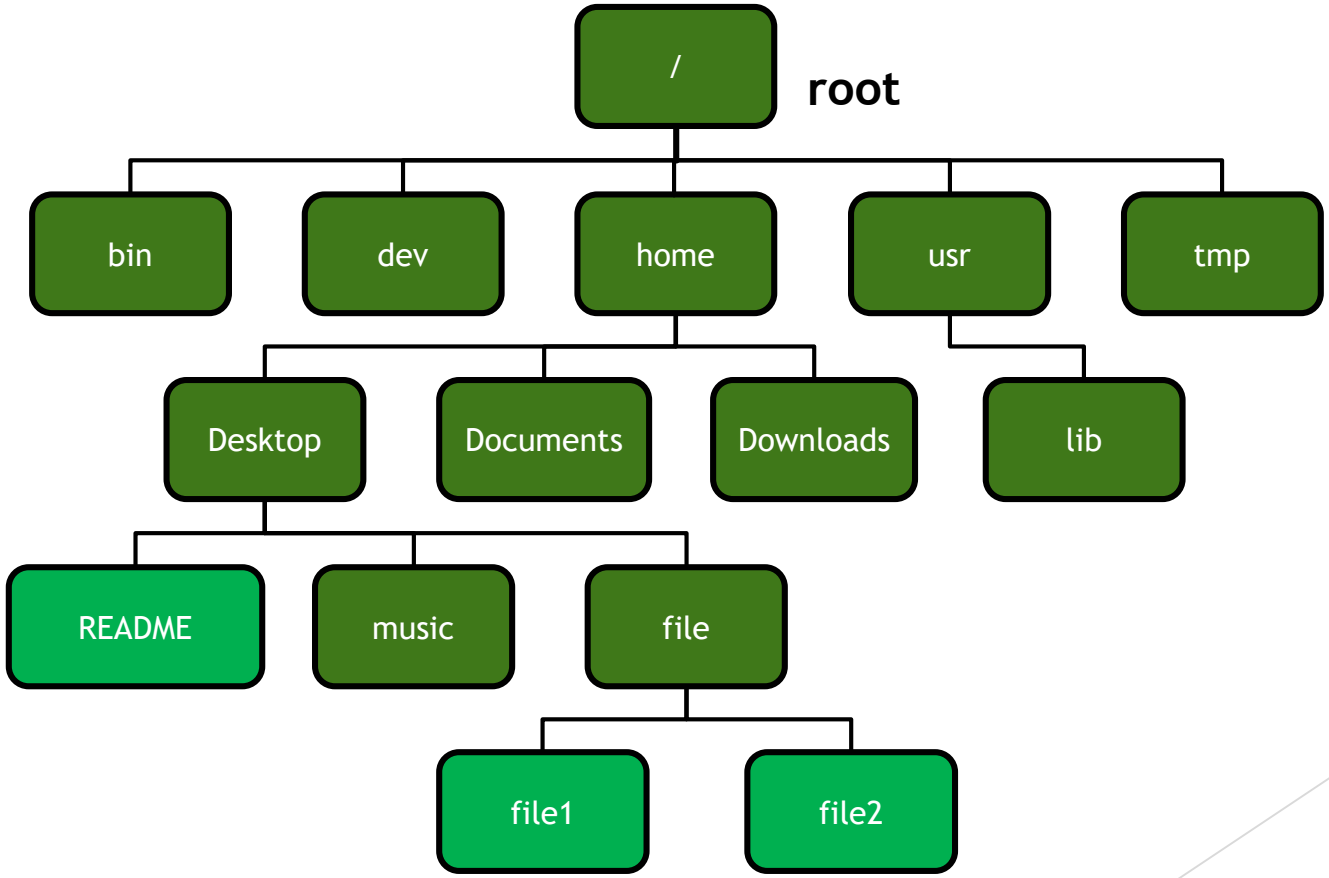
- Intuitive
- Limited control
- Easy multitasking
- Bulky remote access

Files and Processes

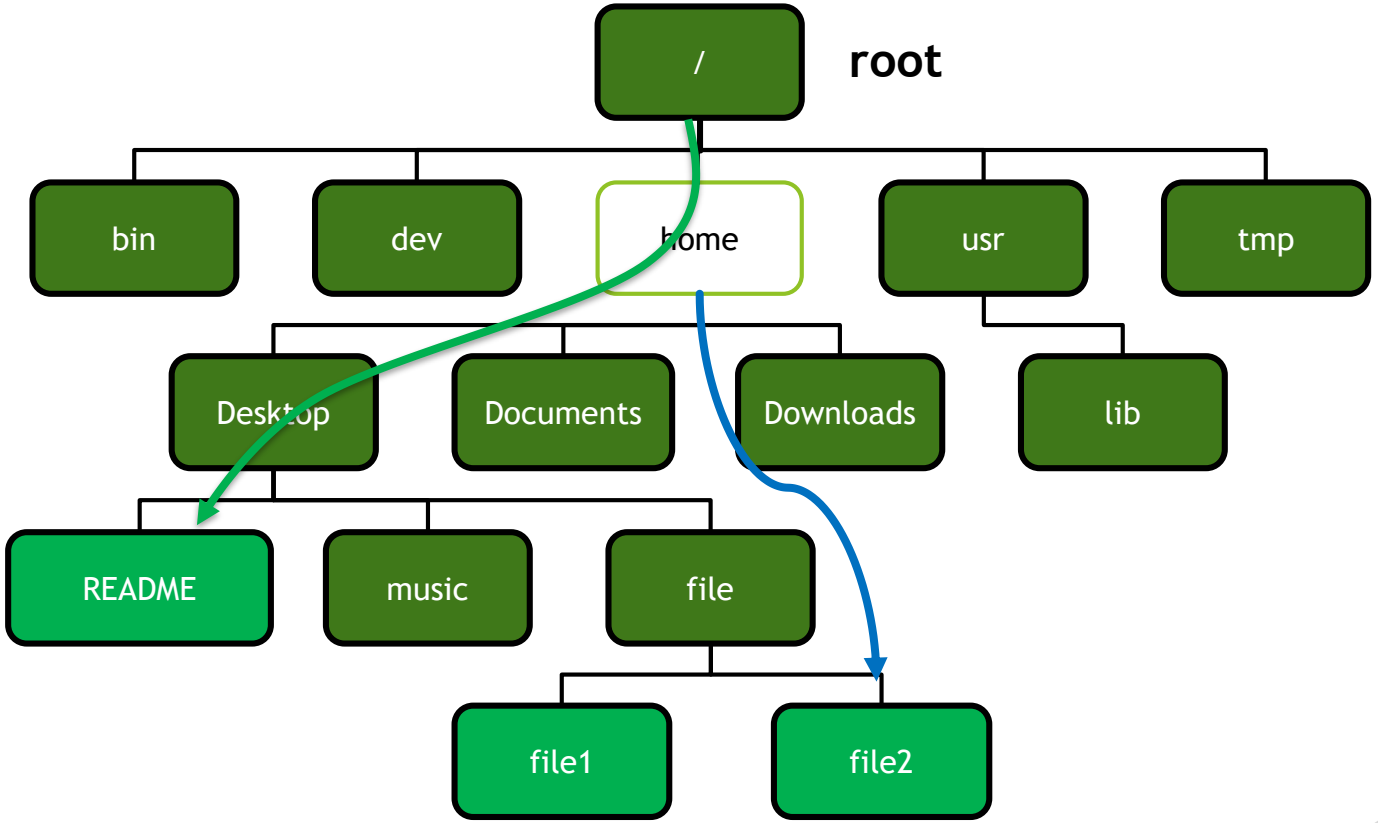
- Everything is either a **process** or a **file**:
  - **Process:** an executing program identified by PID
  - **File:** collection of data
    - A document
    - Text of program written in high-level language
    - Executable
    - Directory
    - Devices

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: Shell

- **<up arrow>**: previous command
- **<tab>**: auto-complete
- **!!**: replace with previous command
- **!! [*str*]**: append previous command with str

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>
    - Hit “q” to get out of man page
    - Try
      - man ls
      - man cd
      - man man

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
  - Careful! This command deletes file permanently!
- **mkdir**: make a directory
- **rmdir**: remove an empty directory
- **ls**: list contents of a directory
  - a: list all files including hidden ones
  - l: show long listing including permission info
  - s: show size of each file, in blocks

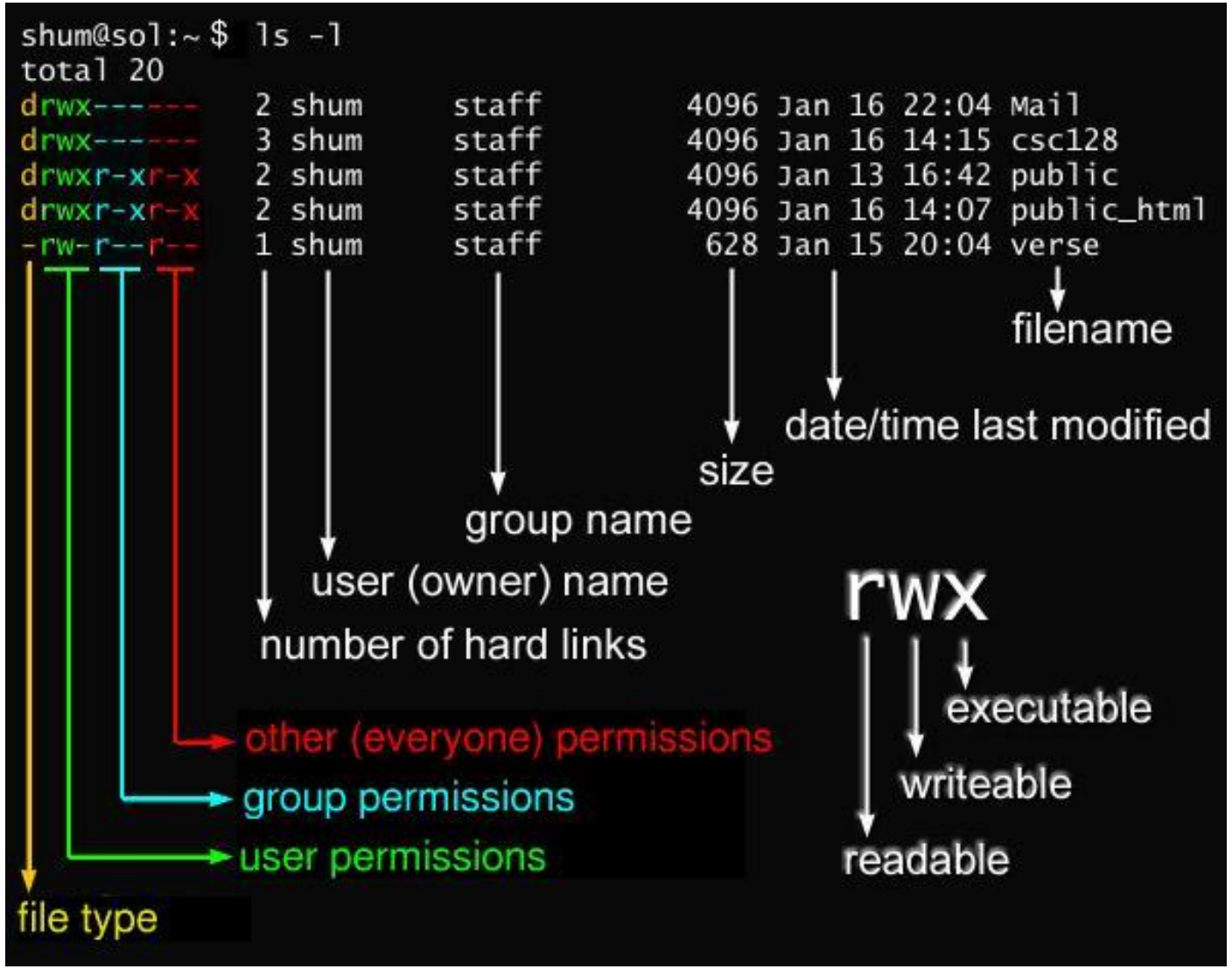
The Link Command

- **ln**: create a link
- Symbolic Link
  - ln –s <filename> <linkname>
- Hard Links
  - Hard links: point to physical data/inode
  - ln –T <filename> <linkname>
- Example

Redirection Operators

- > file
  - Writes stdout to a file
- >> file
  - Appends stdout to a file
- < file
  - Use contents of a file as stdin

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 file (e.g: directory, symbolic link)
- -perm: permission of file
- -name: name of file
- -user: owner of file
- -maxdepth: how many levels below to go into

The Wildcards

- ?: 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 ~/Documents –name “*.txt”
  - find . –name “a?.txt”
  - find . –name “[abc]1.txt”
  - find ~/ -type f –name a*

`wh...` Commands

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

Look these up:

- cat
- echo
- head
- tail
- ps
- kill
- sort

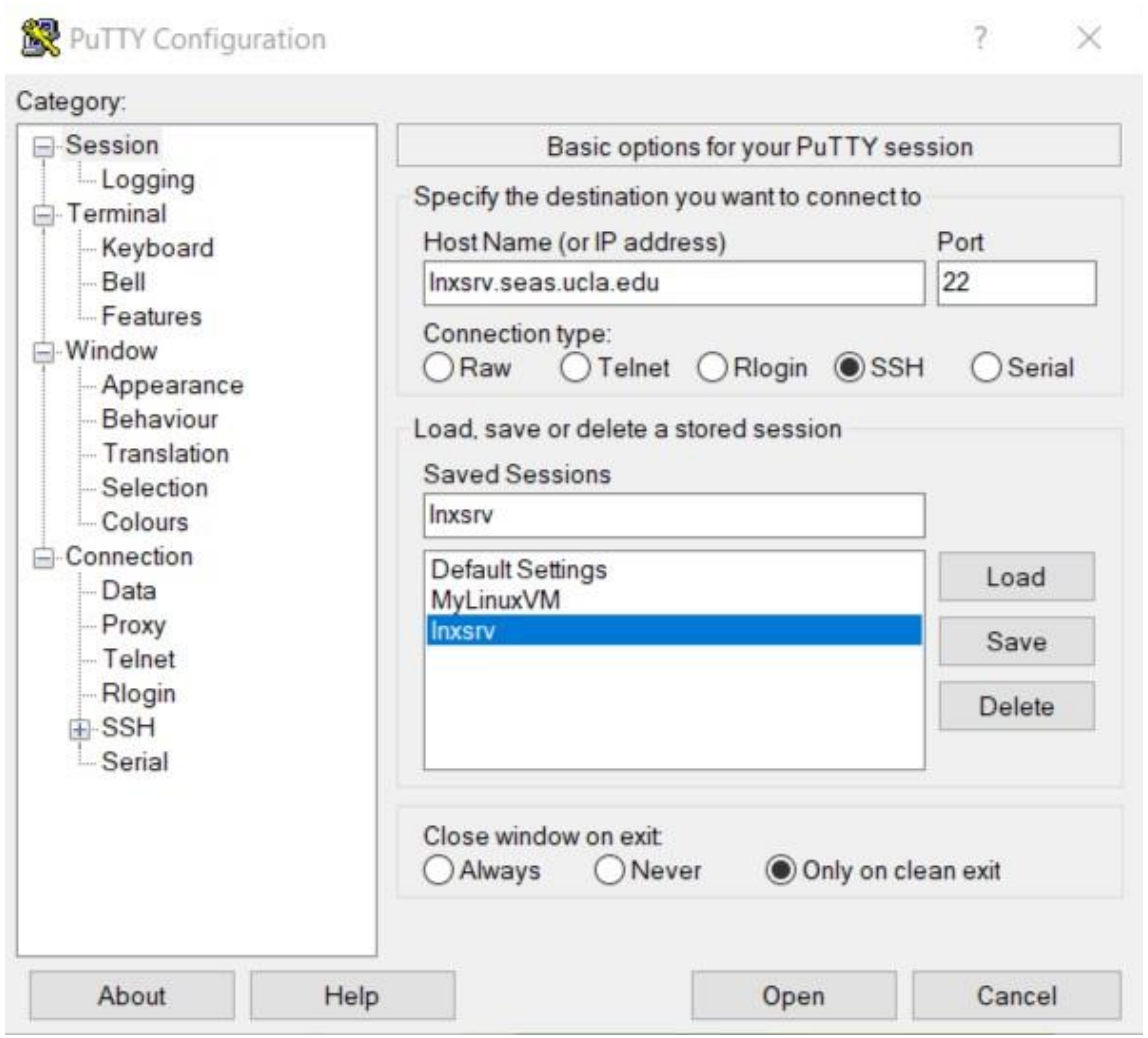
Connecting to SEAS from OS X or Linux

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

Connecting to SEAS from Windows

- Putty
  - Recommended
  - Small and easy to use
  - 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
lnxsrv.seas.ucla.edu
22
Connection type:
Raw
Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
lnxsrv
Default Settings
MyLinuxVM
lnxsrv
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Help
Open
Cancel

Assignment 1 Tips

- ans1.txt is specifically for LABORATORY section
- Format of the answers should be as shown below:
  - 1. Here is the command to solve question 1
    - Short description of the command used above
  - 2. Here is the command to solve question 2
    - Short description of the command used above
  - 3. Here is the command to solve question 3
    - Short description of the command used above

Assignment 1 Tips

- key1.txt is specifically for HOMEWORK section
- Format of the answers should be as shown below:
  - 1.1
    - 1. C-x s c a v M-x
    - 2. C-f e n g r C-e
  - 1.2
    - 1. C-x s c a v M-x
    - 2. C-a e n g r C-e
- No description of commands required in the HOMEWORK section
- **Kindly upload both ans1.txt and key1.txt on CCLE**