Linux Lecture 4

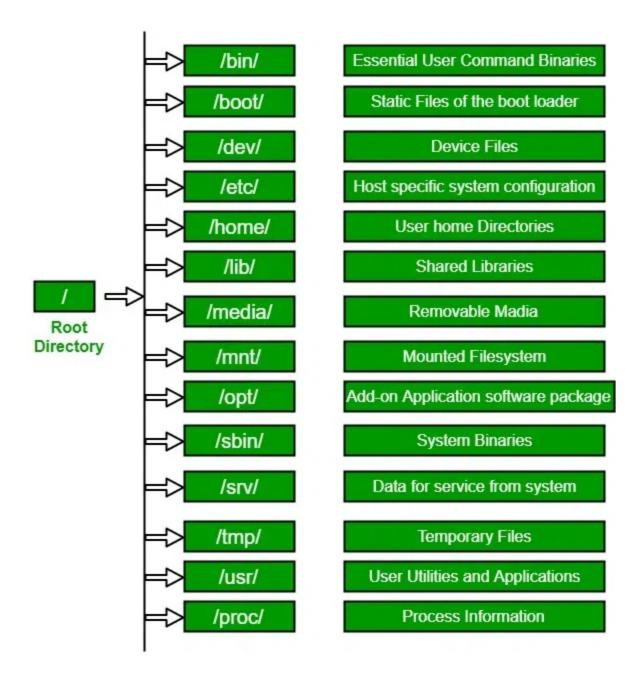|		
	/bin/	Essential User Command Binaries
	/boot/	Static Files of the boot loader
	/dev/	Device Files
	/etc/	Host specific system configuration
	/home/	User home Directories
	/lib/	Shared Libraries
/ (Root Directory)	/media/	Removable Madia
	/mnt/	Mounted Filesystem
	/opt/	Add-on Application software package
	/sbin/	System Binaries
	/srv/	Data for service from system
	/tmp/	Temporary Files
	/usr/	User Utilities and Applications
	/proc/	Process Information

Source: https://www.geeksforgeeks.org/linux-file-hierarchy-structure/

Linux File System Structure :-
1. /bin :- bin - stands for binary.s

Binary is a file which contains the compiled source code.
We can also call it as executable. because it can be executed on the computer.
/bin is a sub-directory of the root directory in Unix/Linux OS.
this directory contains basic commands which is enough for the minimal system function
ex :- ls, cat, cp

2. /sbin : system binaries or super user binaries. This folder contains commands which are required
for changing system properties.
Ex:- adduser,reboot,shutdown

3. /boot: The contents are mostly Linux kernel files and bootloaderfiles(files needed to start up the
operating system)

4. /dev : This contains device files
This file represents your speaker device,keyboard

5. /etc :- it contains all system related configuration files in here or in its sub-directories
A "configuration file" is defined as a local file used to control the operation of a program;it cannot be an
executable binary.
Ex:- adduser.conf, theme config

6. /cdrom :- directory is a standard practice to mount cd, but not necessary. We use media and mnt
to mount anything these days

7. /home :- The home directory can be said as a personal working space for all the users except root. There
is a separate directory for every user. For example, two users 'jitendra' and 'jack' will have directories like
"/home/jitendra" and "/home/jack"

8. /lib :-
directory contains those shared library files needed to boot the system and run the commands in the
filesystem,
ie. by binaries in /bin and /sbin
Only the shared libraries required to run binaries in /bin and /sbin will be here

Difference between lib, lib32, lib64, libx32

lib :- architecture independent files.

lib32 :- for 32 bit architecture libraries

lib64 :- for 64 bit architecture libraries

libx32 :- for 64 bit architecture libraries but the pointer size is 32 bit,

Normally software using the x86-64 instruction set uses 64-bit pointer size.

9. /media :- When you connect a removable media such as USB disk, SD card or DVD, a directory is
automatically created under the /media directory for them. You can access the content of the removable
media from this directory.

10. /mnt – Mount directory
This is similar to the /media directory but instead of automatically mounting the removable
media, mnt is
used by system administrators to manually mount a filesystem

11. /opt – Optional software
Traditionally, the /opt directory is used for installing/storing the files of third-party applications that are
not available from the distribution's repository.
In the old days, "/opt" was used by UNIX vendors like AT&T, Sun, DEC and 3rd-party vendors to hold
"Option" packages; i.e. packages that you might have paid extra money for.
/proc :- It contains useful information about the processes that are currently running.
It could be used for obtaining information about a system, we can also edit the config files related to
kernel here.

12. /root :- it works as the home directory of the root user. So instead of /home/root, the home of root is
located at /root. root directory (/) is different from root user directory.

13. /tmp :- this directory holds temporary files. Many applications use this directory to store
temporary files.
You can even use a directory to store temporary files.
the contents of the /tmp directories are deleted when your system restarts. Some Linux system also
delete old files automatically so don' store anything important here.

14. /var :- stores system-generated variable data files. This includes spool directories and files, administrative
and logging data, cache, transient and temporary files.

Ex :- /var/spool contains data which is awaiting some kind of later processing
15. /run :- runtime variable data. The purposes of this directory were once served by /var/run, system may
use both

16. /srv :- This directory gives users the location of data files for a particular service.
For example, if you run a HTTP or FTP server, it's a good practice to store the website data in the /srv
directory.
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directory.

17. /usr :- User System Resources. in '/usr' go all the executable files, libraries, source of most of the system
programs. For this reason, most of the files contained therein is read only (for the normal user).
why /usr/bin , /usr/sbin ?

18. /sys :- allows you to get information about the system and its components (mostly attached and installed
hardware) in a structured way.
Ex:- device, kernel, firmware

19. /snap :- The /snap directory is, by default, where the files and folders from installed snap packages appear
on your system.

Types of Files in Linux:-
In Linux everything is treated as File.
All files are divided into 3 types
1) Normal or Ordinary files:
These files contain data. It can be either text files (like abc.txt) OR binary files (like images, videos etc).
2) Directory Files:
These files represent directories.
In windows, we can use folder terminology where as in linux we can use directory terminology.
Directory can contains files and sub directories.
3) Device Files:
In Linux, every device is represented as a file. By using this file we can communicate with that device.
Note: short-cut commands to open and close terminal
ctrl+alt+t ➔ To open terminal
ctrl+d ➔ To close terminal

```
prachi9124@Linux:~$ cd .
prachi9124@Linux:~$ cd ..
prachi9124@Linux:/home$ cd
prachi9124@Linux:~$ cd ~
prachi9124@Linux:~$ cd ..
prachi9124@Linux:/home$ cd ~
prachi9124@Linux:~$ cd -
/home
prachi9124@Linux:/home$ cd /

prachi9124@Linux:/$

/home
```

Commands

Cd :-

1) Every directory implicitly contains 2 directories . and ..
. Represents Current Directory
.. Represents Parent Directory

2) $ cd .
Changes to Current Directory (Useless)

(Prachy9124)

3) $ cd ..
Changes to Parent Directory (home)

4) $cd
If we are not passing any argument, then changes to user home directory.

5) $ cd ~   (Directly to home dir instead of parent)
~ Means User Home Directory.
It will Changes to User Home Directory.

6) $ cd -
- Means Previous Working Directory.
It will Changes to Previous Working Directory.

7) $ cd /
It will change to the root directory. (/)

8) cd "My Song" or cd My\ song
For Directories with spaces.

9) cd dir1/dir2/dir3 or cd ../dir1/dir2 or cd /home/user/dir2
For moving multiple directories

Pwd :-

pwd stands for Print Working Directory.
It prints the path of the working directory, starting from the root.
Options:
-L : Works the same as pwd and prints Symbolic Link.
-P: works the same as /bin/pwd and prints physical link.

```
prachi9124@Linux:~$ pwd
/home/prachi9124
prachi9124@Linux:~$ pwd -P
/home/prachi9124
prachi9124@Linux:~$ pwd -L
/home/prachi9124
```

ls :-

We can use ls command to list out all files and directories present in the given directory.
We can get manual documentation for any command by using man.
man ls
It provides complete information about ls command.
Syntax: `ls [option] [file/directory]`

Various options of ls Command:

Options	Description
-l	known as a long format that displays detailed information about files and directories.
-a	Represent all files Include hidden files and directories in the listing.
-t	Sort files and directories by their last modification time, displaying the most recently modified ones first.
-r	known as reverse order which is used to reverse the default order of listing.
-S	Sort files and directories by their sizes, listing the largest ones first.
-R	List files and directories recursively, including subdirectories.
-i	known as inode which displays the index number (inode) of each file and directory.
-g	known as group which displays the group ownership of files and directories instead of the owner.
-h	Print file sizes in human-readable format (e.g., 1K, 234M, 2G).
-d	List directories themselves, rather than their contents.

1) ls
It will display all files and directories according to alphabetical order of names.

2) ls -r
It will display all files and directories in reverse of aplhabetical order.

3) ls | more or ls -1
To display content line by line
(To come out we have to use q)

4)ls -l
To display long listing of files

The first character represents the type of file.
d = Directory File
- = Normal File
l = Link File
c = Character Special File
b = Block Special File
s = Socket File
Note: c, b, s are representing system files and mostly used by super user (also known as

root user or admin user)

Field 1 – File Permissions: Next characters specifyes the files permission. Every 3 characters specify read, write, execute permissions for user(root), group and others respectively in order. Taking the above example, -rw-rw-r– indicates read-write permission for user(root), read permission for group, and no permission for others respectively. If all three permissions are given to user(root), group and others, the format looks like -rwxrwxrwx

Field 2 – Number of links: Second field specifies the number of links for that file. In this example, 1 indicates only one link to this file.

Field 3 – Owner: Third field specifies owner of the file. In this example, this file is owned by username 'maverick'.

Field 4 – Group: Fourth field specifies the group of the file. In this example, this file belongs to" maverick' group.

Field 5 – Size: Fifth field specifies the size of file in bytes. In this example, '1176' indicates the file size in bytes.

Field 6 – Last modified date and time: Sixth field specifies the date and time of the last modification of the file. In this example, 'Feb 16 00:19' specifies the last modification time of the file.

Field 7 – File name: The last field is the name of the file. In this example, the file name is 1.c.

5) ls -t
To display all files based on last modified date and time. Most recent is at top and old are at bottom.
6) ls -rt
To display all files based on reverse of last modified date and time. Old files are at top and recent files are at bottom.
7) ls -a
a means all
To display all files including hidden files. Here . and .. also will be displayed.
8) ls -A
A means almost all
To display all files including hidden files except . and ..
9)) ls -h
display in human readable format
10) ls -R
R means Recursive.

It will list all files and directories including sub directory contents also. By default ls will display only direct contents but not sub directory contents.

Eg: All the following commands are equal

$ ls -l -t -r

$ ls -l -t -r

$ ls -t -r -l

$ ls -l -r -t

$ ls -ltr

$ ls -trl

Which Command will make a Long listing of all the Files in our System including Hidden Files, sorted by Modification Date (Oldest First)?

ls -lat