

Lab# 1

Linux Environment, Introduction to CLI and File & Directory Management

Learning Outcomes:

- Understand the Linux file system and directory hierarchy.
- Navigate and manipulate files and directories.
- Know the root directory, home directory, and paths.

Linux System Components:

What is a Shell?

It refers to a special user program or an environment that provides a user with an interface for using the services of the operating system. A shell executes various programs on the basis of the input that a user provides.

What is a Kernel?

A kernel is basically the core and the heart of an OS (Operating system). It functions to manage the operations of the hardware and the computer. A kernel basically acts as a bridge between any user and the various resources offered by a system by accessing the various resources of a computer, such as the I/O devices, CPU, and various other resources.

Files:

Mechanism - store information

Two modes of storing information

- File
 - Directories
-
- File
 - Store information
 - File attributes:
 - **Read** - "r"; allows - read, nothing can be changed
 - **Write** - "w"; allows - written to and changed.
 - **Execute** - "x"; allows - executed by users or the operating system

The significant operations which can be performed on files are given below:

- Create

- Delete
- Open
- Close
- Read
- Write
- Rename
- Get Attributes
- Set Attributes

Directories:

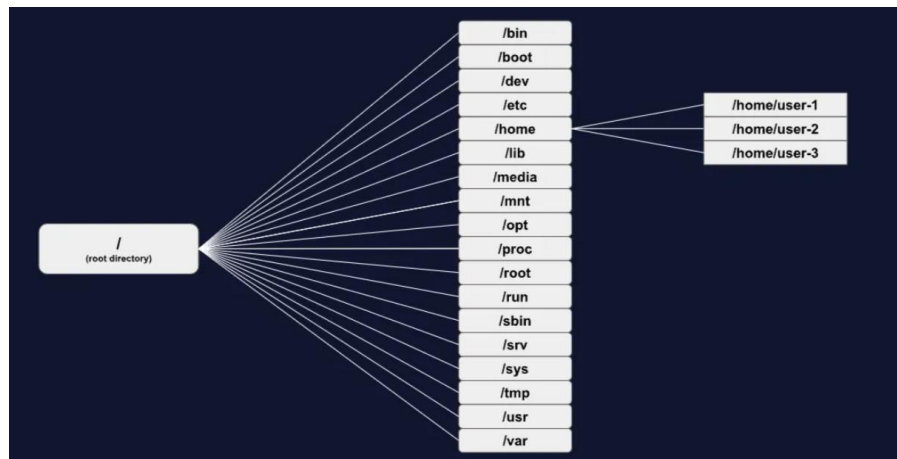
- A directory, also known as a folder, is a virtual location within a file system where files are stored.
- Users can navigate through the file system efficiently, moving in and out of directories to locate and manage files.

The significant operations which can be performed on the directories are given below:

- Create
- Delete
- Open
- Close
- Read
- Write
- Rename
- Get Attributes
- Set Attributes

Linux File Hierarchy Structure:

The Linux File Hierarchy Structure defines the directory structure and directory contents in Unix-like operating systems. It is maintained by the Linux Foundation. All files and directories appear under the root directory /, even if they are stored on different physical or virtual devices.



- /bin → Contains basic commands (like ls, cp, mv)
- /boot → Files needed for system boot
- /dev → Device files (like USB, hard disk)
- /etc → Configuration files
- /home → User data
- /root → Special home directory for the root user

Linux Navigation & Symbols Notes

Moving Between Directories

pwd → Shows current directory

1. From Parent → Root
cd /
2. From Root → Home
cd ~
cd
3. Move into another folder
cd Documents
cd /home/username/Documents

Single Dot (.) and Double Dot (..)

. → Current directory

.. → Parent directory

Example:

If you are in /home/student/docs

cd .. → moves to /home/student

cd . → stays in /home/student/docs

\$ Sign

\$ → Normal user prompt

→ Root (superuser) prompt

Example:

student@linux:~\$ ls

sudo Purpose

sudo = Super User DO

Run commands with administrator privileges

Example:

sudo apt-get update

~ (Tilde)

Represents home directory of the current user

Example:

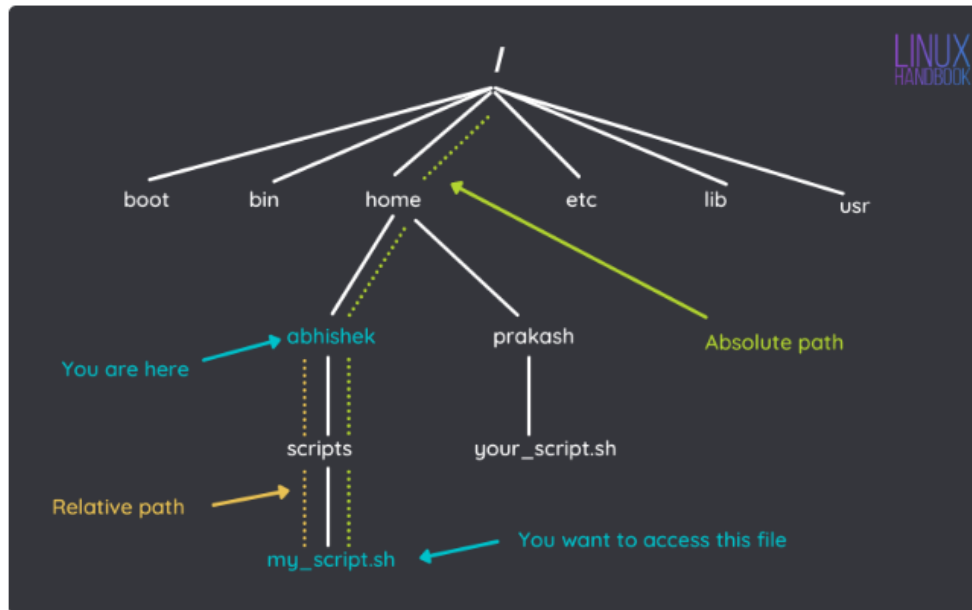
cd ~

Shell Commands (Case Sensitive):

- pwd - present working directory
- mkdir name - make a directory
- rmdir name - remove directory
- cd - change directory
- rm - remove a file
- clear - clear all
- exit - come out of the shell
- ls - list the files
 - -a Display all the files and subdirectories, including hidden files.
 - -l Display detailed information about each file and directory.
 - -r Display files in the reverse order.

Pathname:

Absolute Path	Relative Path
<ol style="list-style-type: none">1. The Absolute path always starts from the root directory (/)2. Absolute pathname identifies a file or a directory irrespective of the user's current state.3. The user's "current directory" is part of the user's state. The absolute pathname always starts from the root directory.4. For example, to locate the my_scripts.sh file in the script directory, the absolute path of the file is: /home/abhishek/scripts/my_scripts.sh	<ol style="list-style-type: none">1. The pathname identifies a file or a directory that depends on the user's state, i.e., the user's current directory2. Relative pathname specifies files concerning the user's current directory3. A relative path starts from the current directory.4. For example, if you are in the /home directory and you want to access myscripts.sh you can use. abhishek/scripts/my_scripts.sh



File Manipulation commands:

Create a file with nano editor

- nano file_name or touch file_name
- Ctrl-o -> save file
- Ctrl-x -> exit editor
- rm -r directory_name
- rm -r -i directory_name (ask for permissions)
- cat file_name (to view the created file)

The cat command will print the file contents for the read-only mode. Text editor must be used to make changes in the file.

- Rename an old directory with new one
 - mv oldfile newfile
- Delete a directory having a file
 - rm -r directory_name

Inode number:

Internal unique ID in Linux filesystem for each file.

- ls -li directory_name (-l shows the **inode number** of each file/directory.)
- ls -ld directory_name (-l shows detailed info: permissions, number of links, owner, group, size, date/time, and filename.)

Lab Tasks:

1. Remove a subdirectory name *capital* from *country* directory from the *home* directory

- a. Make a directory name *capital*. In *capital* directory create subdirectory name *country*. Now come back to the *home* directory and remove *country* subdirectory directly from *home* directory.

2. Move to a directory name *plant* directly from a subdirectory name *lion*

- a. Make a directory name *plant* in *home* directory. Create another directory name *animals* in *home* directory as well. Now create a subdirectory name *lion* in *animal* directory. Move to the directory name *plant* from the *lion* subdirectory directly

3. Rename a file name *data.txt* with new name *lab_data.txt* in a folder name *data_file*

- a. Create a directory name *data_file*. In *data_file* directory create a file name *data.txt*. After creation of *data.txt* rename it to *lab_data.txt*
- b. Find the Inode number of file named *lab_data.txt* by keeping yourself in *home* directory