Host Name 192.168.1.10

User gautam

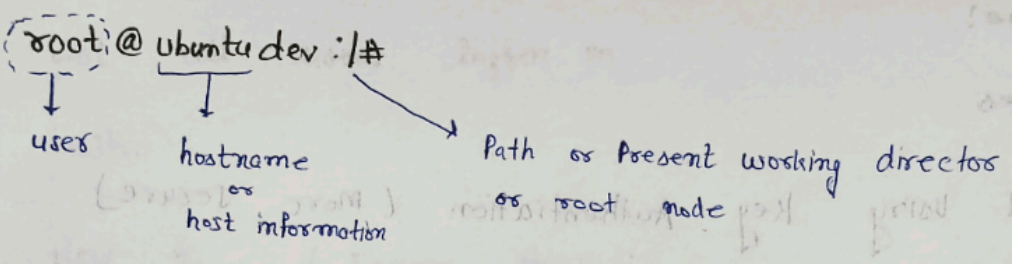
port 22

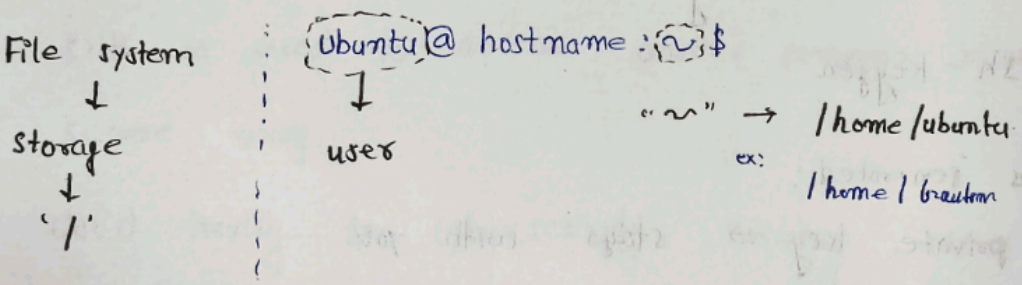
Now connect using :

ssh myserver

2. Linux file System and Navigation

- linux director / folder structure :-





Core Component of a linux Machine

User application (vim, Docker, Apache etc.)

Shell (Bash, Zsh, Fish, etc.)

System Libraries (glib, libc, OpenSSL etc.)

System Utilities (ls, grep, systemctl, etc.)

Linux Kernel (Process, Memomory, FS, Network)

Hardware (CPU, RAM, Disk, Network, Peripherals)

File structure :-

Sbin, bin, media, lib64, mnt, opt, usr, srv, var, home, boot, proc, root, dev, etc.

1. '/'

(i) / is called the root directory.

It is top-most directory in linux.

- Every thing start from /
- All files and folders come under /

Think of / like :

- root of tree
- C: drive in windows (conceptually

(ii) Why / is important

- without /, Linux cannot boot
- All system folder (/bin, /etc,, /home, /usr, etc.) live inside /
- Every path in linux start from /

ex:

/home/gautam

/etc/passwd

/bin/ls.

(iii) key fact to remeber

- / is the root directory
- All files and directories start from /
- Linux follow single directory tree
- Critical for booting and system operation
- Protected for security reasons.

1. /sbin ?

/sbin stands for system binaries. (Admin commands)

Inside /sbin : add group, poweroff, del group, reboot, shutdown etc.

- It is contains administrative commands used for system managment.
- Mainly used by the root (administrator) user
- These commands are required for:
  - System booting
  - Disk File system repair
  - Network configuration
  - System shutdow and reboot

ex:

for root user:-

(i) /usr/sbin/reboot
or
/sbin/reboot
or
reboot

All are same

reboot ? Why :-

- reboot is located in /sbin or /usr/sbin
- PATH variable automatically find the command
- because root know 'reboot' is present only one /sbin or /usr/sbin Path they enderstand internaly.
- writing full path is optional, not required.

/sbin or /usr/sbin, why?

- In modern linux system, /sbin is often a symbolic link to /usr/sbin.
- Easy to rember and explain.

for normal users!.

(i) sudo /usr/sbin/reboot
or
sudo /sbin/reboot
sudo reboot.

All are same.

Linux follow the priciple of: Least Privilege

Meaning:

- Normal user get minimum power
- Extra power when only required.

Without sudo:

- Admin must log in a root (very dangerous)

1. Not every user get sudo

only user added to sudoers file can use sudo:

or via group:

2. Sudo is NOT unlimited power.

Why sudo to normal users:

- Loging as root is dangerous.
- Sudo provide temprorary root access.
- only trusted user get ~~root~~ sudo permission.
- Command are ristricted and logged
- Prevent accidental or maliceous misuse
- Follow principle of least Poivilage.

2. /bin - Basic User Commands:

1. What is /bin/?

/bin stand for Binary files.

It contains essential user commands that are required for:

- Normal system usage
- System boots (single-user mode)
- Basic troblesshooting

- Linux must have basic commands available even when /usr is not accessible.
- Required for basic system operation
- In modern linux, /bin link to ~~/usr/bin~~ /usr/bin.

2. What type of command are inside ?

ls /bin

ls, cp, mv rm cat echo pwd mkdir rmdir chmod, chown, bash, sh

3. Important /bin command with example:

- ls - list files
- cp - copy files

  cp files.txt file.txt
- mv - move/ renam files

  mv old.txt new.txt
- rm - delele file

  rm test.txt
- Cat - view file content

  Cat notes.txt
- pwd - print absolute path of current directory.

3. /etc directory

- What is /etc ?

/etc contains configuration files for the system and installed programs.

Note!
/etc stores setting not program.

Common important files inside /etc

ls /etc

you will see many files. These are the most important.

1. /etc/passwd → user account information
2. /etc/shadow → encrypted passwords
3. /etc/group → group details
4. /etc/hostname → system name
5. /etc/ssh/ — SSH configuration files.

- These file control how system work.

(ii) Type of files in /etc

- text files only
- No executable programs
- Mostly .conf files

(iii) Permissions

- Most files are read-only for normal users.
- Only root user can modify important files.

Configuration file mean: Is a file that stores settings.

It tells linux or a program:

- what to do
- how to behave
- which option is use

4 /home Directory (very important).

(i) /home is the directory where normal user's personal files are stored.

Each user get one seperate folder inside /home.

(ii) Example (my case)

/home/gautam

inside it you have:

- Documents
- Pictures
- Project (like linux-learning proj)
- Downloads
- Desktop

(iii) Why /home is used?

- Stores user data
- keeps user seperate from system files.
- Safe place for:
  - notes
  - code
  - downloads.

5. /root Directory

1. What is /root?

/root is the home directory of the root user (administrator)

* It is not inside /home

2. Difference between /root and /home.

/home	/root
- Normal users (like /home/gautam	• Root (admin) user
• Limited permission	/root full system control

⑥ /usr Directory

1. What is usr directory ?

/usr stores installed programs, commands, and libraries that user use after the system boots.

- /usr is parent directory
- It stores software, libraries, and shared files.
- It is used after system boot
- It organizes programs, not executed directly

ex:

- /usr/bin
- /usr/lib
- /usr/share.

2. /usr/bin Directory

- /usr/bin is a subdirectory inside /usr
- It contains executable user commands.
- Commands we type in terminal run from here

⑦ /var Directory

1. What is /var ?

- /var stores variable data
- variable data = data keep changing
- used when the system is running

2. Why /var needed ?

- Some file increase in size
- Some file updated frequently
- Linux keep such files in /var

(iii) Important folder inside /var

* /var/log
  - stores system log
  - Records :
    - error
    - login activity
    - system events.

* /var/cache
  - stores temporary cached data
  - Helps system work faster

(8) Handwritten notes (

/tmp Directory

- stores tempory files
- Files are removed automatically
- used by program during execution
- Has sticky bit for security
- Not permanent storage.

(9). What is /dev ?

(i) /dev contains device files

These files represent hardware devices and some virtual devices.

(2) What does device files means ?

In linux :

Everything is treated like a file

So, hardware is accessed thrugh files.

(iii) Important points

- Files in /dev are not real files
- They are created by the kernel
- Used to communicate with hardware

(iv) Security note

- only root can manage devices
- Wrong change can damage system.

10. /proc Directory

- Virtual files system
- show process and system information
- Exits in memory
- Managed by kernel

11. /boot Directory

- Contains boot related files
- stores kernel and bootloader
- Required to start the system
- Critical system directory

12. /opt directory

- stores optional or third-party software
- keep extra application seperates
- Each software has its own folder

- Absolute Path vs Relative Path (linux)

1. What is an absolute Path ?

An absolute path is the full path from the root (/) to a file or directory.

It always starts with /

It work from any where

ex:

/home/gautam/linux-learning-journey/02-linux-director-structure/bin

2. What is Relative Path ?

A Relative path is a path based on your current directory.

- It does NOT start with /
- It depends on where you are

example:.

If your in :

/home/gautam/linux-learing-journey

Then:

cd 02-linux-director-structure/bin

This is relative path

Chmod Command

- Chmod use to change file permissions
- Permission include execute, read, write, Execute
- Permissions apply to user, group, and others.

Permission Values:

- r = 4 (read)
- w = 2 (write)
- x = 1 (execute)
- - no permission

Example:

give permission to any file:

- Chmod 644 files.txt
- chmod 755 script.sh

- How to know which file type it is and what permission are given to it?

Ans ls -l

output:

-rw-r-- r-- file.txt

drwxr-xr-x my folder

lrwxrwxrwx link → file.txt

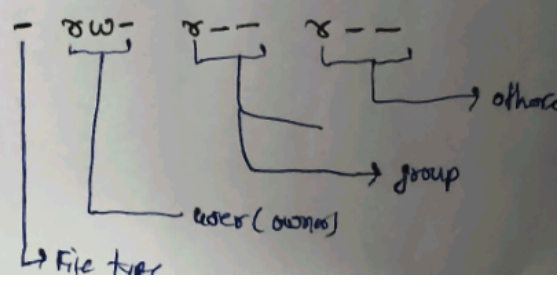
total has 10 carrecter:

First character = file type

- Regulalar file
- d Directory
- l Symbolic link
- b Block device

next 9 character = Permissions

-rw-r-- r--



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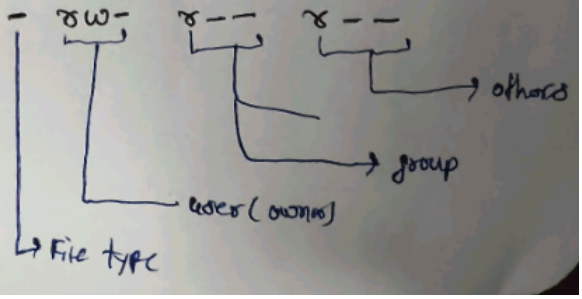
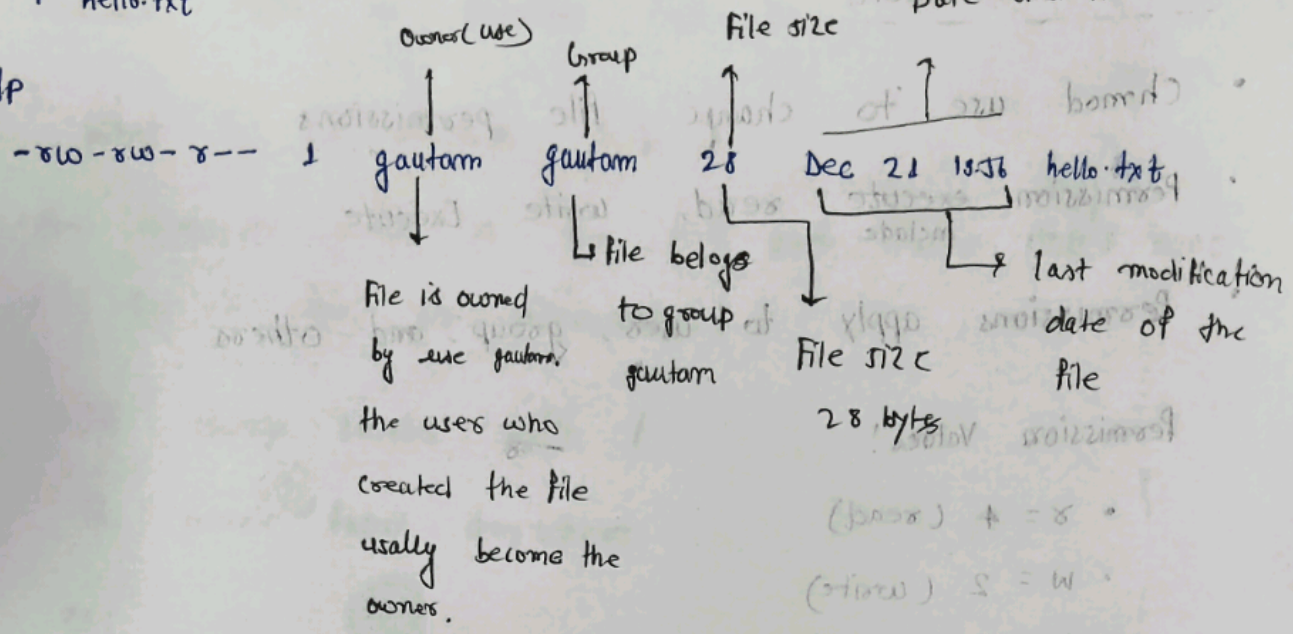


ls -l hello.txt

O/p



- Chmod +x file.txt
  - +x means:
    - Add execute permission
    - Keep all existing permission unchanged

example

Before:

-rw- r-- r--

After chmod +x:

-rwx r-x r-x

* Read write stays
* Execut is added.

File types : Regular directory , sym link device file

- Linux file type (Basic)

Linux treat everything as a file, but file have different types.

1. Regular file

- A Regular file stores data or content

Ex:

- text files
- images
- video
- programs

→ example

file.txt
notes.md
script.sh
photo.jpg

- Symbol : - (means Regular file.

2. Directory File

A directory is a file that stores other files and folder.

ex: /home
/etc
/bin

example drwxrw-r-x documents.

d mean director (symbol d)

3. Symbolic link

- Shortcut to file or directory
- Symbol : l
- Example: python → python 3

4. Device Files

- Represent hardware • Symbol : b or c • Found in /dev