

## LINUX FUNDAMENTAL

- There are only two core operating systems are available.
  - Windows
  - Unix

### Windows

Not free

Not open to the world

(source code)

Types -

Windows 98

Windows XP

Windows Vista

Windows 7

Windows 8

Windows 10

small changes

we called it

Desktop system

operating system

is used in office use

is used in personal

purpose

Versions

Windows 2008 R2

Windows 2012

Windows 2016

Windows 2019

Windows 2022

They have

added some

more features

one by one

server Based  
operating systems.

It is used in  
company.

- Microsoft develop another operating system

is server release

It is like a high configuration computer.

- Microsoft company os is mention different different version.

## UNIX FUNDAMENTAL

### • Unix

- Unix operating is completely free.

This is completely open to the world (Raw source code is available in free).

### • Linux - Availability

Linux - Linus Torvalds is used unix source code for develop new operating system i.e. Linux.

IBM - According to these business need (modify code) to work on unix they have developed new operating system

### • AIX

HP - HP-UX

Apple - Mac OS

Sun Microsystem - Sun Solaris

This is all company

used unix source code for develop new

OS as per these needs

sun solaris

They will never ever provide raw source code (all company)

Linux - This operating system is completely free.

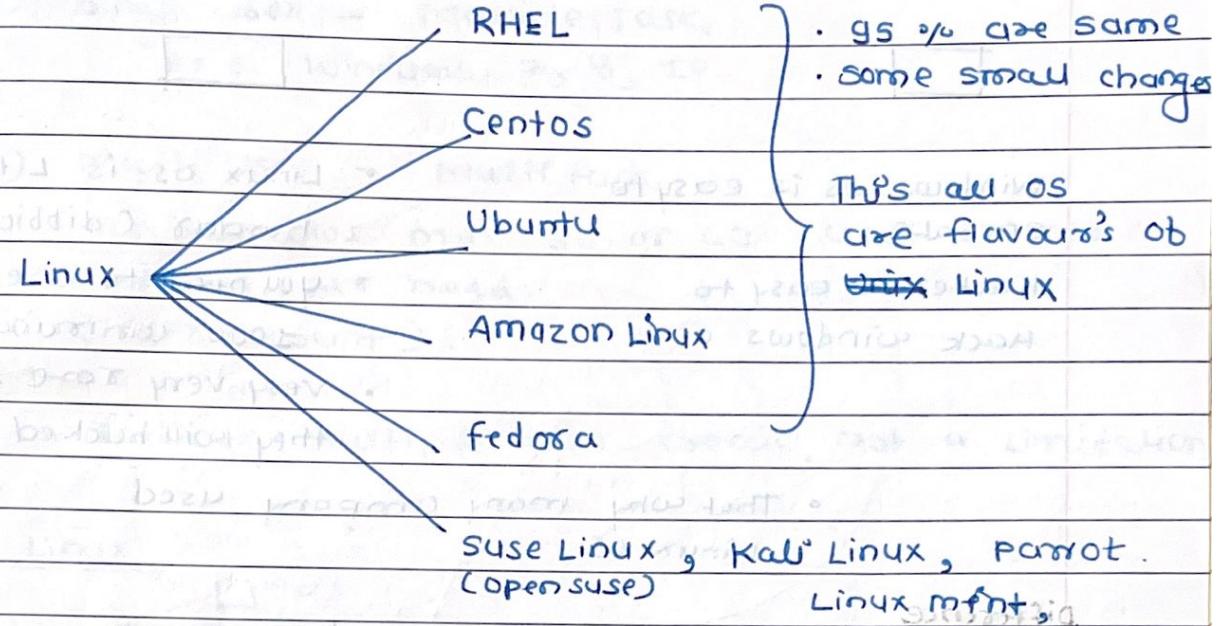
- Developed by Linus Torvalds.

↓ This operating system source code is used by different companies to developed new operating system as per these need.

• This all OS are flavours of Unix

Linux Flavours :-

(Red Hat Enterprise Linux)

Operating System

:- Interface between user and computer Hardware.

Advantages of Linux OS

1) Completely free & open to the world

2) Light Weight - It is consuming less resources (KB's)

Linux  
CLI - Command Line Interface same song available

MP3 (only audio)

MP4 (Audio+video)

(MBs)

Windows  
CLI + GUI = command line interface

+ Graphical User Interface

30 GB RAM

Hacker → They try to steal our data (important)

3) Secure

or illegal activity

Virus

Hacker :-

Windows

Linux

Windows OS is easy to operate

Linux OS is little bit harder (difficult)

Hacker is easy to

you need to use 1000 commands

hack windows OS

• very very rare scenario they will hacked.

• That why many company used Linux OS.

Difference

Virus :- Windows

Linux

Try to download

It will not shutdown

one software

It will not restart.

virus will be spread

It will not spread

virus is available

for each and every

It is attached to

Malware

corner, each & every

be particular software

Attacks

folder. i.e. is a behaviour

virus attacks are

of OS.

very very less.

• Complete virus remove

That's why many comp

We have to reinstall complete

- unies used Linux

OS.

over than windows.

• No guaranty for attacking

• we don't have permanent solution.

#### 4) Multiple Use

i) Single User - Single task

ex :-

MS-DOS (operating system)

## 2) Single User - Multiple Task

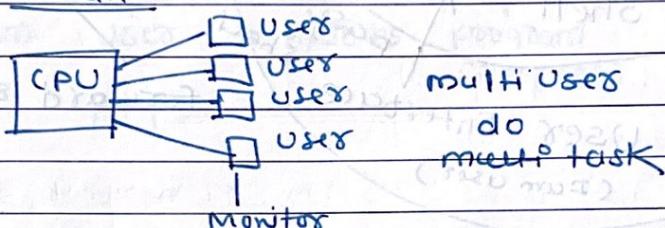
Ex :- Windows 7, 8, 10.

## 3) Multi User - Multitask

In windows max 30 or 40 user create as per our need.  
(User Account).

In Linux multiple user create, not a limitation.

### Linux



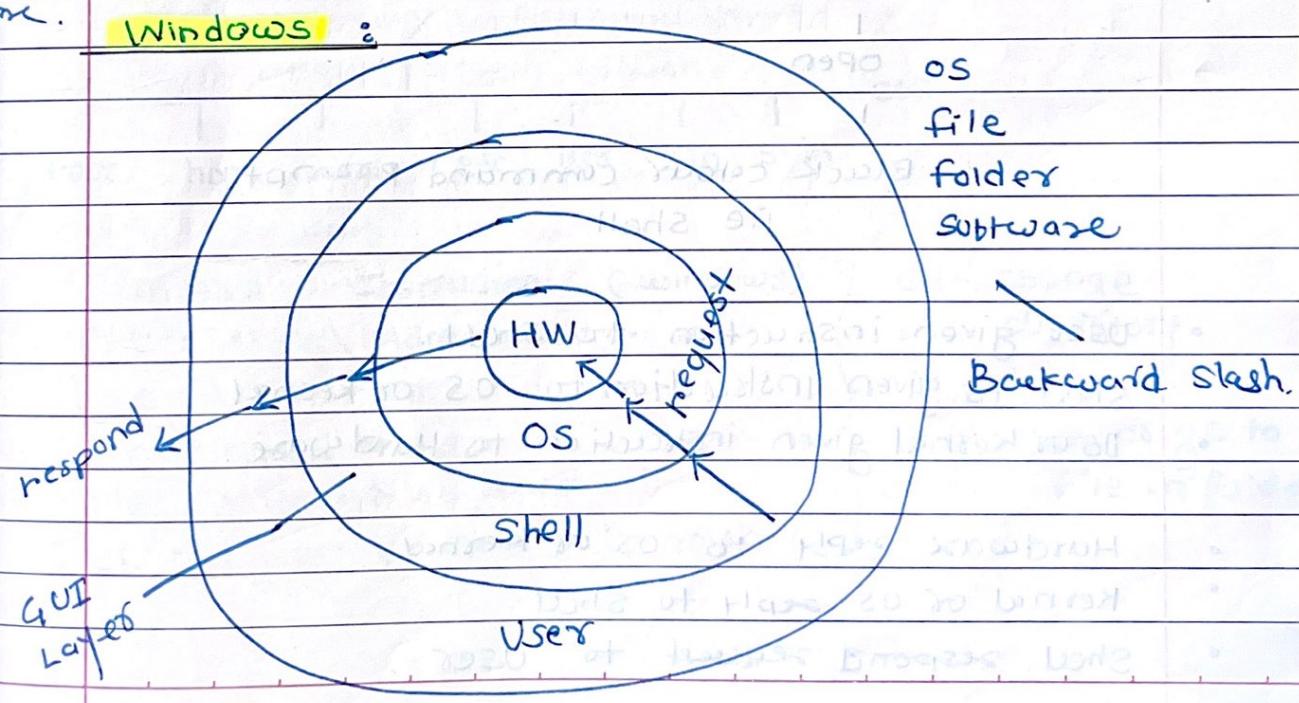
multi users  
do  
multi task

not limitation  
user creation  
on Linux.

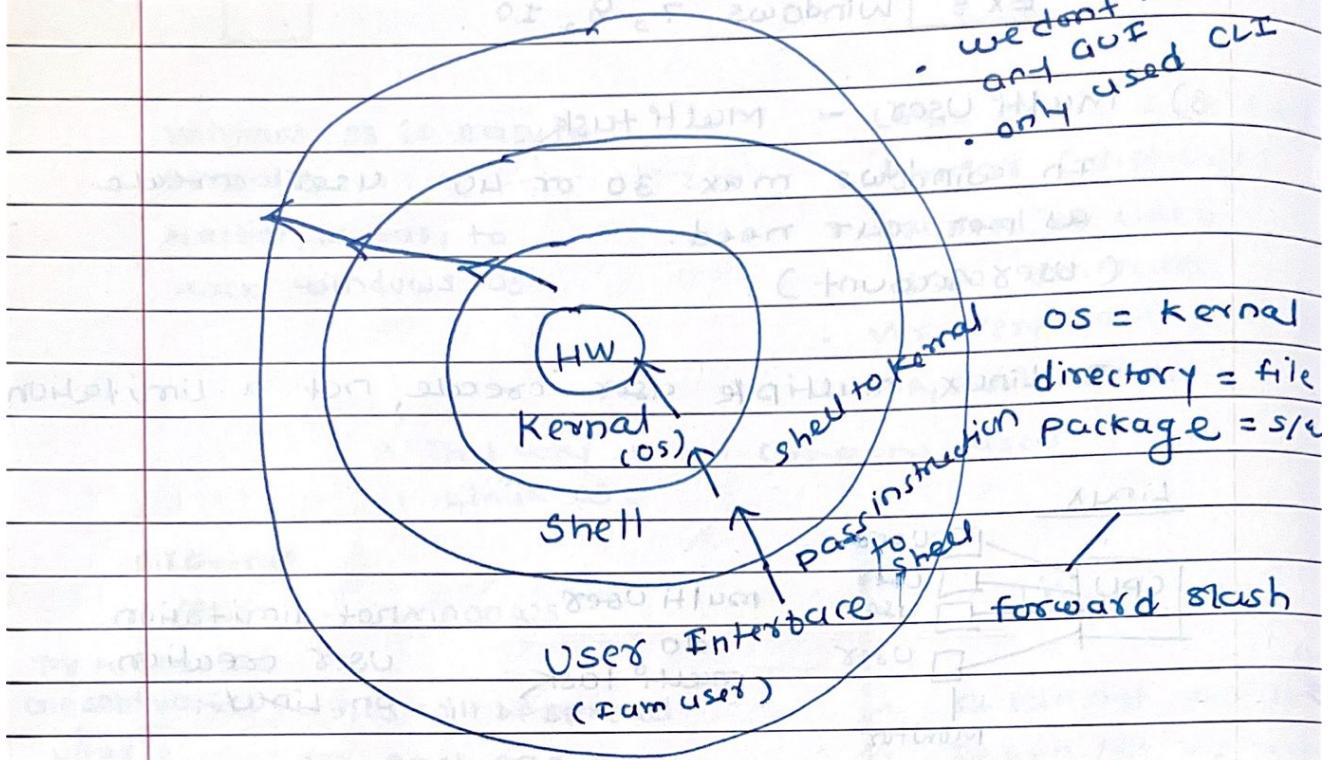
Layers of OS →

## Architecture Of Linux / windows

Windows :



## Linux 8



## CMD - Command prompt

I  
open

Black colour command prompt  
i.e. Shell

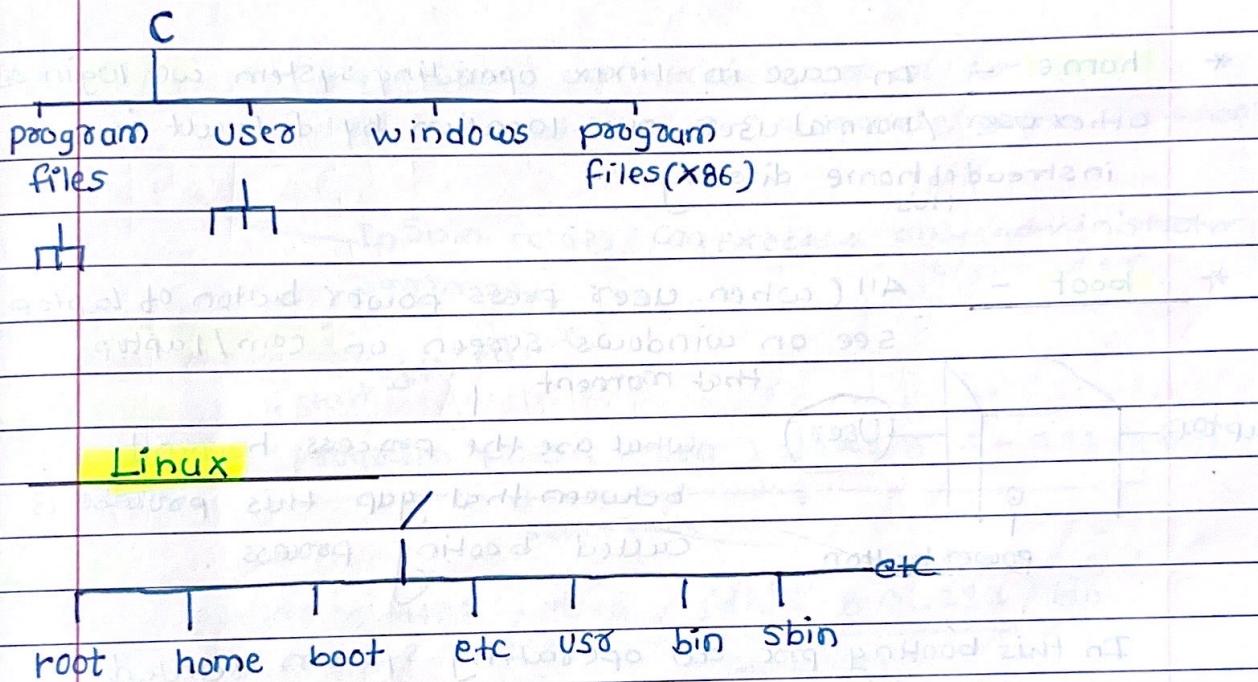
- User given instruction to shell.
- shell is given instruction to OS or Kernel
- OS or Kernel given instruction to Hardware.
- Hardware reply to OS or Kernel
- Kernel or OS reply to shell
- Shell respond request to user.

{ we can create one folder by using GUI  
 { and again we can create one folder by CLI.

## File System Hierarchy

(Structure of files & folders)

### Windows



### Linux

root home boot etc usr bin sbin

In shell, Instruction (Windows)

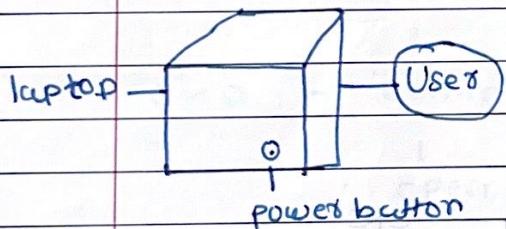
- { c :\user\Admin>cd .. } Cd - change directory
- { c :\User>cd .. } change or go to
- { c :\>cd user } on this file or folder
- { c :\User>cd Admin }
- { c :\user\Admin>cd down }

C:\Users\Admin>cd ..\.. (direct go to main folder)  
 C:\

- \* **root** - is a Administrator of Linux OS  
 Is a home/house by default location  
 If you login as a administrator by default will be  
 instead of root user.

- \* **home** - In case in linux operating system we login as other user / normal user our location by default is instead of home directory

- \* **boot** - All (when user press power button of laptop see on windows screen on com/laptop that moment)



what are the process happen between that gap this process is called booting process.

In this booting proc. all operating system related files which are they in C drive. They will come inactive state to active state if they do on self test that self test called as bootstrap. (Power on self test)

| Any electronic's device process is same.

- All operating system related files instead in this boot folders.

\* **etc** - so many configuration files (cfg).  
default configuration files in this folder.  
ex : bike configuration (gear, switch, Average etc)

\* **usr** - All the software will be instead of in usr folders.

\* **bin** - Instead of bin so many commands are available in this folder.

Administrator / Normal user - 1000... commands

\* **sbin** - Only Admin can execute some commands.  
Only Normal User can not execute some commands  
In Sbin folder can execute only administrator user command.

\* **Difference :-**

**Windows** :- starts with c drive.  
C :\ program files \ java \ jdk1.8.0\_191 \ bin

**LINUX** :- / program files / java / jdk 1.8.0\_191 / bin

Forward slash

Separator

\* **TOP level root directory**

This is not separator.

\* **C\** - under of C all folder are instead C folder

**/** - all this folders are available instead top level root directory.

Ex 8

In EC2 - User "",

<https://aws.amazon.com/amazon-linux-2/>

Normal User [ec2-user]@ip-172-31-12-234:~]\$ sudo su  
 Admin user [root]@ip-172-31-12-234:~\$ ls  
 [root]@ip-common:~\$ cd .. / ..  
 [root]@ip-common:~/..\$ ls

bin dev home lib64 media opt root sbin  
 boot etc lib local mnt proc run srv

and you begin as a user and switch to root

Administrator user - EC2 Linux \ sudo \$ SUDO USER  
 tmp var

[root@ip-172-31-12-234:~]\$

↑  
 Top level root directory

\* **sudo su** - switch user do  
 super user - root user

\* **ls** - list - show list of folders under root

\* **cd** - change directory (folder)

\* **cd .. / ..** - back to the file on top level root directory.

\* Normal user not perform all the operation

Administrator user perform all the operation.

that why normal user switch to super user.

comes and is used sudo su

Go to ec2 users on AWS ec2 instances :

- \* **Clear screen** - everything screen can clear used this command.

Basic commands : How to create file,

How to save file,

How to move file,

## 1] **Cat command** : for creating file

- \* How to create file - 4 command are available.

① **cat** = **cat > file1 <**  
---- enter the data what you have.

[root @ ip-172-31-12-234 ec2-user] # cat > file1  
Hello Dear Student !! {add data} {enter}

- Some more data can be add.

**cat >> file1 <**

-----

ctrl + d

[root @ ip-172-31-12-234 ec2-user] # cat >> file1

How are you ? ) enter } some more data can be add.

-----

- ② If i want to see contain in file or folder used command i.e ls

list

- ④ If you want to see all data contain in file or folder we used command.

**Cat file1**

```
[root @ ip - 172 - 31 - 12 - 234 ec2-user] # cat file1
Hello Dear Student !!
How are you?
```

## 2] **touch** (for creating empty files)

Syntax: touch = touch file 2 (empty file)

```
[root @ ip - 172 - 31 - 12 - 234 ec2-user] # touch file2
```

If you want to create multiple file empty

touch file 1 file 2 file 3 - any root files.

## 3] **Nano**

Syntax & nano file3 ↵ enter

open page

==== enter data if you want

Ctrl X, Y ↵ enter.

```
[root @ ip - 172 - 31 - 12 - 234 ec2-user] # nano file3
```

↳ Some data ↵ enter

This is nano file

Save modify buffer

Y = ?

N = ?

} Yes  
or  
No

4] vi/vim No meaning for this command.

Syntax ↪

File 4 ↪ enter ↪ (command line mode)  
enters ↪ i (insert mode)  
whatever data you want to add

esc : wq ↪ quite

Save

root @ ip - 172 - 31 - 12 - 234 [ec21-user] # vi file4

↳

=

-

"file4" [New file]

enter ↪

-- Insert ↪ enter something

This is a vim command

Good evening student !!

esc

wq ↪ enter

↓ successfully created file

This two command used for :-

{ Nano & vi/vim command calleds editors

- you can create file
- you can add data , you can edit data
- you can override data at any position
- you can append data
- you can delete data

Using this cat command

- you can create file
- you can add data
- you can append data
- you can override data
- you can delete data.

{ can not edit  
for this command.

o append:-

Ham ↑  
Sugar

I dont want to delete  
this word top of this word  
i just want add some  
other.

without deleting this word  
i just want add some more  
word top of the data

o Override:- Deleting this word and add new word.

primary operation cat file given above .

Practice 8 Cat command.

[root@ip-172-31-12-234 ec2-user]# cat file 3

This is nano file . don't want to delete this line }

[same] # cat >> file 3 — append this data } [ ]

Hello cat command

[same] # cat file 3

[This is nano file A zabbik <]

Hello cat command

override [same] # cat > file 3 command.

— dear students — override data

[same] # cat file 3

dear student (cat command)

[same] # ls

file1 file2 file3 file4

Not edit

or

delete.

\*

Create one directory / folder

[root@ip-172-31-12-234 ec2-user]# mkdir file

[—] # ls

dir1 file1 file2 file3 file4

ex: mkdir dir1 dir2 dir3 ....

\*

Lenny output

(ls -l)

list

[root@ip-172-31-12-234 ec2-user]# ls -l

—

—

—

{ lenny output shown here }

long

### \* Hidden folders

[root@ip-172-31-12-234 ec2-user]# touch  
  • file5

touch . files

  ↳ hidden file

enter

  ↳ folder

mkdir . dir

  ↳ hidden folder

    ↳ successfully we have created a hidden file

ls (-a) (all)                                    show hidden file  
  or  
(-l) flag    directory.

ls -la - all in one.

long all

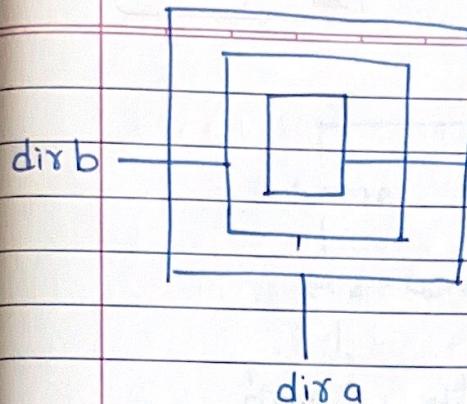
    } show everything output  
  dentry output

### \* controlD or clear

for clearing entire word output

### \* One folder instead of another folder

add



[root@ip-172-31-12-234 ec2-user] # mkdir -p  
dir a / dir b / dir c

enters

[ same ] # ls

dir1 dir a file1 file2 file3 file4

instead of this dir b  
of this dir c  
folders

\$ how to see

[ same ] # cd dir a

[ same ] # ls

dir b ←

[ same ] # cd dir b . . \ . . bo # [ Emo2]

[ same ] # ls

dir C ←

[ same ] # cd dir c

[ same ] # ls

can not see → because no folder in dir c.

[ same ] # cd .. . ( previous directory)

[ same ] # ls

dir C ←

[same] # cd ..

[same] # ls  
dir b

[same] # cd ..

[same] # .

\*

{ • Single dot - current directory

• Double dot - previous directory

cd dir name - go inside

cd ... - come back from the folder

\*

: [root@ip-172-31-12-234 ec2-user] #

cd dir a / dir b / dir c

dir c

[same] # cd ../../..

[same] - normal user

enter

\*

pwd - present working directory

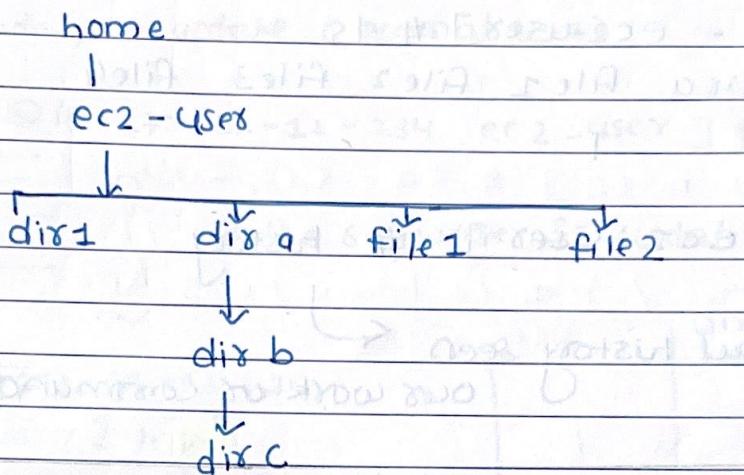
print working directory

[root@ip-172-31-12-234 ec2-user] # pwd

/home / ec2-user

(present working directory)

/ top level root directory



[root@ip-172-31-12-234 ~] # cd .. / .. / ..

[root@ip-172-31-12-234 ~] # ) enter  
[root@ip-172-31-12-234 ~] # Go to normal user

[same] # cd ..

[root@ip-172-31-12-234 ~] # pwd  
/home

[--- home] # cd

[root@ip-172-31-12-234 ~] # pwd  
/

[--- ~] # ls

our file show on this page folder & file.

[--- ~] # cd home

[--- home] # ls  
ec2-user

[ - - - home ] # cd ec2-user

[ - - - ec2-user ] # ls  
dir1 dir2 file1 file2 file3 file4.

[ - ec2-user ] # history

all history seen  
our work or command or verify.

**practical :-**

\* Update your system

Run "sudo yum update" to apply all updates.

[ec2-user@ip-172-31-12-234 ~] \$ sudo su

sudo yum update (normal user).

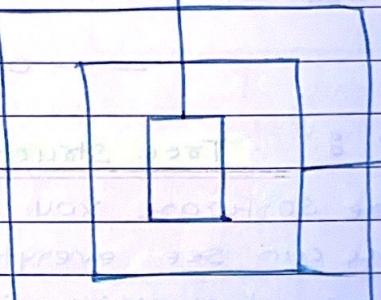
[root@ip-172-31-12-234 ec2-user] # yum update.

=====  
==== }  
==== } All the software is updating  
==== }

[root@ip-172-31-12-234

ec2-user] # ls

dira dirb file1 file10 file2  
file3 file4



dirb

[root@ip-172-31-12-234]

ec2-user] # pwd

/home/ec2-user

dira

[root@ip-172-31-12-234 ec2-user] # cd dira

[root — dira] # cd dirb

[root — dirb] # cd dirc

[root — dirc] # ls

[root — dirc] # cd ..

[root — dirb] # ls

dirc

[root — dirb] # cd ..

[root — dira] # pwd

/home/ec2-user/dira

[root — dira] # cd ..

[root — ec2-user] # cd dira/dirb/dirc

[root — dirc] # cd .. / .. / ..

[root — ec2-user] # pwd

/home/ec2-user

[root — ec2-user] # cd ..

[root — home] # pwd  
/home

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[root — home] # cd ..

[root — /] # ls

[root — home] # cd ec2-user

[root — ec2-user] # cd .. / ..

[root — /] # cd home/ec2-user

[root — ec2-user] #

### concept 8 Tree Structure

Tree software you have to install.

You can see everything in tree structure.

Instead of which folder how many folders are available.

[root @ ip-172-31-12-234 ec2-user] #

        yum install tree -y

===== enter

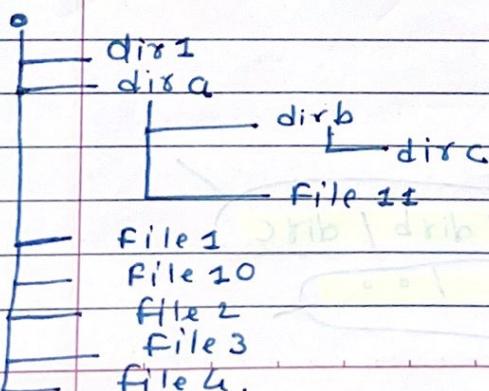
successfully install tree software.

complete

[root — ec2-user] # ls

dir1 dir2 file1 file20 file2 file3 file4

[root — ec2-user] # tree



[root — ec2-user] # mkdir -p dirv/dirw/dixx/diry

[root — ec2-user] # ls /dirz

dir1 dir2 dir3 file1

file10 file2 file3 file4

[root — ec2-user] # tree dirz

current  
directories.

dir1

dir2

  └── dirb

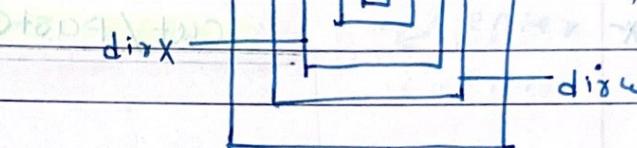
    └── dirc

      └── file11

  └── dirv

    └── dirw

      └── dixx



→ file1

→ file10

→ file2

→ file3

→ file4

9 directories , 6 files

\*

COPYcp

cp source destination

[root - ec2-user] # cp file1 dir1

\*

CUT / PASTE

move file destination

destination

Syntax: mv file2 dir1 [enter]  
done

\*

Rename

mv oldname new name

#  
~~source~~

Syntax # mv file3 myfile300 [enter]

done.

\* Delete

rm - rf forcefully

remove

recursive

for delete :

# rm - rf dir1

which file we want delete,

\* Syntax : touch dir v / dir w / dir x / dir y / dir z /  
  +  
  test file 4

for creating file under this folder

- o Add some data in path folder like :

# cat > dir a / dir b / dir c / test file 3

Hello test file 3

see this data :

- o # cat dir a / dir b / dir c / test file 3

Hello test file 3

- o # ls dir a / dir b / dir c  
test file 2 test file 3

data file see in this folder

\* Path follow to create / add / move / copy / delete  
/ append / override data on linux administration

commands :-

- \* For data viewing in linux commands will be used
  - 1) cat /etc/passwd
  - 2) Less /etc/passwd
  - 3) more /etc/passwd
- \* Display only top lines in our file, so used given command.

] # head /etc/passwd

= = = { Top lines 10 cmd  
by default show.

You can't only 3 lines:

] # head -3 /etc/passwd

TOP  
lines

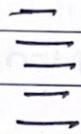
] # head -7 /etc/passwd

\* Recently added files

] # tail /etc/passwd

= = = } bottom line data

] # tail -5 /etc/passwd



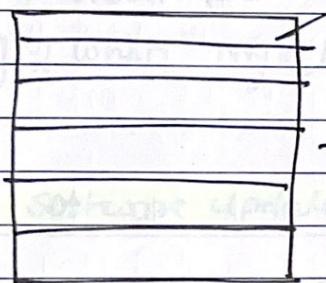
bottom lines.

] # tail -2 /etc/passwd



head) command

TOP  
lines



data

Bottom lines

(Tail) command

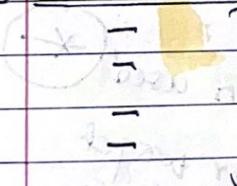
\*

( See Data on Alphabetical Order )

Output

normally see data not in alphabetical order in our output but we can see data in alphabetical order then used command given below:

] # sort my file



alphabetical order

### \* For check hostname & ip details

] # hostname

] # ifconfig

i don't want to see lengthy output. see only ip used given command.

] # hostname -i

(ip address)

### \* See os related information

] # cat /etc/os-release

### \* if forget some letters on command

] # cat /etc/os-rel\*

$\leftarrow$  letters forged then used

first letter forged  
then used \*

] # cat /etc/os-\*

] # cat /etc/os-\*elease

$\leftarrow$  forget first & last letters.

\* **Install software**

    ] # yum install (httpd) *any software.*

(yum) - yellow dot update modifier

\* **which software we have installed in a machine.**

    ] # which httpd

    ] # which etc

    ] # which mysql

{ Shows the software which

It shows which software we have installed or not in a machine.

\* **Software update**

    ] # yum update (httpd) *take any software*

No packages marked for update / all soft update  
meaning is in our syst.

\* **For removing software**

    ] # yum remove (httpd) *any software purinfall*

\* **check how many software we have installed in our system**

    ] # yum list installed

HTTPD (httpd) *installed*

\*

`] # yum list | grep httpd*`

↳ searching for particular soft  
in our system.

\*

FOR Starting Service or Check Status

`] # service httpd status`

— Active or Inactive

} status

`] # service httpd start`

} start service

`] # service httpd status`

} status check

`] # service httpd stop`

} stop service

\*

IF service has stop, start when instance is stopped and this same instance has logged again then service start manually one by one but when relogging instance then directly to see all services has running or active state then used given below command & .

`Chkconfig (httpd) on`

any software name

\* if service has off

1# chkconfig (httpd) off

any software name

### Family of OS

REDHAT — Red Hat Enterprise Linux

CentOS using rpm package

fedora — use yum

Debian (DB) — apt-get

Red Hat Enterprise Linux ?

7 version

8 version

Up to 6 version we used

service httpd start

or

Systemctl start httpd

above 7 version used command

\* rpm — Red Hat package Manager

command• echo

] # echo "Hi"

Hi

] # echo "Hello"

Hello

save data on this file

] # echo "Dear student" > newfile

verity

] ls

disa dirv ec2-user myfile newfile scifile2

] # cat newfile } check data

Dear students

] # echo "Good Evening" > newfile

] # cat new file

Dear students

Good Evening

add more

data

or

append data

] # echo "Ham" > newfile } override data

Ham

but it wrote Ham twice

because previous data was not removed

• whoami

root

ec2-user

In case i want to know user,

EC2-458

- find -type f we find file on current directory -> **file type** represent hidden file

first dot represent / . bash - logout  
 constant / . bash - profile  
 draw / . bashrc  
 • / . ssh / authorized - key  
 • / . bash history  
 • . file5  
 • / dira / dirb / dirc / test file3  
 • / dir9 / file11  
 • / dirv / dirw / test file2  
 • / ec2 - user  
 • / saifile2  
 • / my file  
 • / new file

folders      Hidden file

- # file / -type f we find all files on top level root directory

↳ top level root directory like as C folder on windows

- # file / -type d we find all directory on top level root directory

- # file / -type f -name password if i know filename and i want to see where is located.

- # find / -type f -name *os-release* where file is available.
- # find / -type d -name *dir a* /home/ec2-user/dir a *↑ find dir where ps located.*
- find -type d -name *dir a* *↑ / dir a* *represent present working directory*
- # find / -type d -name *etc* /etc /usr/etc /usr/local/etc *↑ all command run by us scroll*
- *↑*

- # touch *----- (filename)* create filename & data
- # cat > *----- (file name)* see data in a file  
right mark copy
- # cat > *first few three letter, enter then add.*

- at a time 20 files may be created

# touch file { 1..20 }

ex: # touch file { 1..20 }

check ls -l

ex: # mkdir dir { 11..15 }

check ls -l

} multiple  
director  
or  
file  
created

## control C

# cd dir\n no need to execute

this command then  
enter control + C

# cd dir\n C

### \* For creating user

`]# useradd han`

`]# passwd`

`]# cat /etc/passwd`

Syntax : `useradd (username)`.

= } default users show

### \* How to create group

`]# groupadd DevOps`

`]# cat /etc/group`

= } system group or default groups.

- If user created ex: sai then group will be created by default as a sai name.

### \* Add user in to group

`]# gpasswd -a han DevOps`

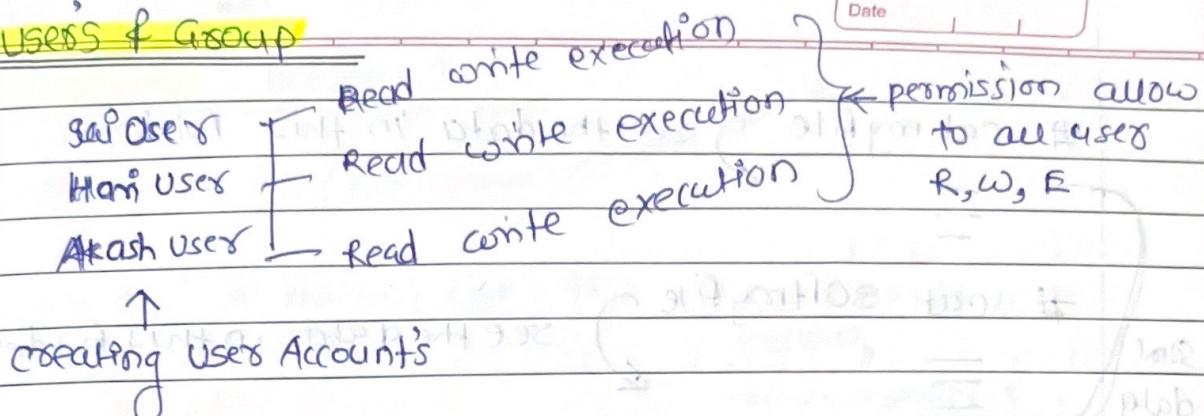
Adding user han to group DevOps.

### \* Add multiple user in to group

`]# gpasswd -M han, sai, roj, paran DevOps`

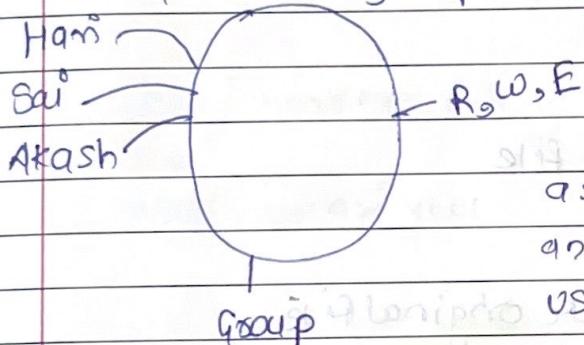
`]# cat /etc/group`

## Users & Group



Other option : create one group and add multiple users in this group to allow all permission & access

add users in group



- \* How to create softlink (it is like a short cut)
- \* How to create Hardlink (it is like a backup)

# ln -s myfile softmyfile

# ls -l

# ls -l

-  
-  
-

- - - softmyfile → myfile.

ip address colour  
softmyfile

# cat myfile → see the data in this folder

same date  
# cat softmyfile → see the data in this folder

add more data → add data

# cat >> softmyfile → add data

Adding more data

control+D

cat softmyfile → original file

shift+ctrl+R → see added data,

Q delete original file

# rm -rf myfile →

Deleted

# ls -l →

softmyfile → myfile because rm has  
been disconnected due to delete original  
file.

# cat softmyfile,

No such a file → due to delete original file.

## • Hardlink (Backup)

# In newfile (filename) → hardnew file

add data in backup file like cat > hardfile

cat > hardfile

Hello, sir

How are you?

cat newfile

← seeddata

Han

Hello how are you?

cat hardnewfile

Han

Hello how are you

) backup file is ready.

( Data compress )

topic

create

## How to zip file

dir a

packaging

dir a. tar

zip(gz)

dir a. tar.gz

→ const

dir a. tar.gz

gz removal

command # tar -cvf dir a. tar

# tar -cvf dira.tar dira

dira/

dira/ dirb

dira/ dirb/ dirc

dira/ dirb/ dirc / testfile3

dira/ file11

# ls

----- dira.tar

### \* How to apply zip :

# gzip dira.tar

# ls

----- dira.tar.gz

### \* How to remove tar file :-

# rm -rf dira

# ls  
----- removefile dira.tar

### \* How to remove qz file :

# gunzip dira.tar.gz

# ls

----- dira.tar

File and Directories

### \* How to remove tar file

# tar -xvf dir.tar

\* extract stored  
\* folder

### \* Download Software on system

If software is not installed in our machine  
then how to download given below:

Command : wget

COPY URL from google or internet as we  
required which software will be download.

? # wget (link) → # ls → Shows software  
file.

Then install software:

# yum install chef -> enter

→ installing software.

### \* for removing software

# gpasswd -d han Devops

Removing user han from group DevOps.

Remove everything files or folders from `ll -4 user`

``` rm -rf \* \* represent everything

``` ls

``` # ---

dir1 ~ directory

file1 ~ file

ls -l  
list all

starting (-d)  
starting (-)

also blue colour is directory

also white colour is a folder

how whenever you create file or folder default size

is 6 KB

- Directory for 6 KB by default.
- whenever you create folders or directory -
  - 2 hard link will be created
- whenever you create file - 1 hard link will be created.
- we dont have any temporary deletion in linux OS.

don't have recyclebin folder

If delete then first take the backup.

| directory / folder |                 | directory permission |      | hardlink |      | owner |              | but detect this root is a part of group. |              | date |  | Created time |  |
|--------------------|-----------------|----------------------|------|----------|------|-------|--------------|------------------------------------------|--------------|------|--|--------------|--|
| (d) -rwxr-xr-x     | 2               | root                 | root | 6        | Jul  | 2     | 15:46        | dis1                                     | blue colour  |      |  |              |  |
| -rw-r--r--         | 1               | root                 | root | 0        | July | 2     | 15:45        | file1                                    | white colour |      |  |              |  |
| file               | file permission | hardlink             |      | KB       | date | date  | Created time |                                          |              |      |  |              |  |

### \* permissions

r - read

r - 4

w - write

w - 2

x - execute

x - 1

dir/folder :-

owner

group

other

r w x

r - x

4 2 1

4 1

4 1

7

5

5

by default of both

= 755 (dir/folder permission. whenever create)

file :- owner

group

other

r w -

r - -

r - -

by default

4 2

4

4

= 644 (file)

6

4

4

### \* Change permission

commands :- chmod

if give read, write or execute permission to file or folder or dir.

# chmod 777 (filename) dis1  
(dir name)

chmod 777 (file1)

- if you give only read permission

# chmod 444 dir1 (foldername)

# chmod 444 file1 (filename)

#### \* How to change owner

# chown ham dir1

# chown ham file1

#### \* How to change group

chgrp Devops file1

chgrp Devops dir1

#### Output

| dir        | hardlink | user | group  | KB | date  | time  | directory |
|------------|----------|------|--------|----|-------|-------|-----------|
| dr--r--r-- | 2        | ham  | Devops | 6  | JUL 2 | 15:46 | dir       |
| Gr--r--r-- | 1        | ham  | Devops | 0  | JUL 2 | 15:45 | file      |

ls -l (command)   
 (ctrl + z)