```
=========
Linux OS
=========

=> We will install devops tools in linux machines only

                        a) Jenkins Server
                        b) Docker s/w
                        c) k8s cluster
                        d) sonarqube server
                        e) nexus server
                        f) ELK stack
                        g) Ansible

=> database server will be installed in linux machine

=> application deployment will happen in linux machine

Note: To become DevOps engineer we should have strong knowledge in Linux OS.

=============
What is OS ?
=============

=> It is a software which acts as mediator between users and computers

=> Users will communicate with computers using OS s/w.

=> Without OS we can't use any computer.

=> OS will provide platform to run our applications in computer.

        Ex: notepad, ms paint, calculator, browser...

=> We have several Operating systems in the market

        Ex: Windows, Linux, Mac, Android, IOS etc...

============
Windows OS
============

=> Developed By Microsoft company (Bill Gates)

=> Windows OS is licensed software (commercial)

=> Windows is single user based OS

=> Security Features are very less in windows
   (anti virus s/w required)

=> Windows is GUI based (Graphical User Interface)

=> Windows OS is recommended for personal computers

        Ex: watch movie, play games, ppt, online classes

=========
Linux OS
=========

=> Linux is community based OS (not specific to any company)
```

=> Linux is free and open source Operating system (OSS)

=> Linux is multi user based OS

=> Linux is Highly secured (anti virus not required)

=> Linux supports both GUI and CLI

CLI : Commandline interface

=> Linux is highly recommended for business use cases

Ex: App servers, DB servers, DevOps tools setup etc...

==========
Linux History
==========

=> Linux OS developed by "Linus Torvalds"

=> Linus Torvalds identified some issues with Unix OS. He suggested changes to Unix OS but that company not accepted.

=> Linus Torvalds identified "Minux OS" having similiar features what he is expecting.

=> Linus Torvalds downloaded "Minux OS code" and modified according to his ideas and released into market as 'Linux OS'.

(Li)nus + Mi(nux) = Linux

==========
Linux Distributions
==========

=> Linus Torvalds provided Linux OS source code for free of cost.

=> So many companies downloaded linux os code and modified according to their requirement and released into market with different names those are called as Linux Distributions.

=> We have 200+ Linux distributions in the market

Ex: Amazon Linux, Ubuntu, Cent OS, Red HAT, Kali, SUSE...

==========
How to setup Linux Machine ?
==========

Option-1 :: Download and install Linux OS in your machine

Option-2 :: Install Linux OS as Guest OS using Virtual Box

Option-3 :: Setup Linux machine in cloud (Virtual Machine)

Note: When we setup Linux Virutal Machine in AWS cloud, we can connect with that VM using SSH client softwares.

ex : Git Bash, MobaXterm, Putty ..

==========
Linux Architecture Components
==========

1) Applications / Commands

2) Shell

3) Kernel

4) Hardware components

==========
What is shell ?
==========

=> Shell acts as mediator between user and kernel.

=> Shell is responsible to process user given commands.

Note: when we execute a command, shell verify command syntax. If commad is valid then shell will convert that command into kernel understable format.

```
# check default shell of our linux vm
echo $SHELL
```

==========
What is Kernel in linux ?
==========

=> Kernel is heart of Linux OS

=> Kernel is a mediator between SHELL and Hardware components.

=> Kernel will get instructions from shell then kernel will convert that command into hardware understandable format.

```
# print kernel version
uname -r
```

==========
Linux File System
==========

=> In Linux OS everything will be represented as File only.

=> Root Directory (/) is starting point of linux machine

=> Inside root directory we have several directories like below

/home : It contains user home directories

Note: For every user one home directory will be available like below.

ec2-user : /home/ec2-user/

ashok : /home/ashok/

raju : /home/raju/

/bin : Binaries will be available (linux os programs)

/boot : static of boot loader

/dev : device files

/lib : Shared libraries

/etc : Host specific configuration files.

/opt : Optional application software packages

/tmp : Temporary files will be stored here

/usr : user utilities and applications

/mnt : Mounted file system

/media : Removable media files

==========
Linux Commands
==========

whoami : Display logged-in username

pwd : Display present working directory

date : Display current date

cal : Display current month calendar

cal 2030 : Display 2030 calendar

cd : change directory

cd .. (go one step back from pwd)

cd <dir-name> : Go inside directory

mkdir : Make directory (create folder)

```
mkdir linux
mkdir aws
mkdir devops azure gcp
```

rmdir : remove empty directory (delete)

```
rmdir aws
```

ls : display present working directory content

ls -l : long list the files in alphabetical order

ls -lr : display files in reverse of alphabetical order

ls -lt : display latest files on top

ls -ltr : display old files on top

ls -la : display hidden files

touch : to create empty files in linux

rm : to delete file

```
rm f1.txt
```

rm -rf <dir-name> (to delete non empty directories)

```
mv : For rename and move files & directories

                mv existing-name  new-name

                mv presention-location new-location


cat :  create new file with data + append data to file + print file data

                # create new file with data
                cat > f1.txt

                # append data to existing file
                cat >> f1.txt

                # print file data from top to bottom
                cat f1.txt

                # print file data with line numbers
                cat -n f1.txt


tac : To print file data from bottom to top

                tac f1.txt


cp : copy data from one file to another file

                cp  f1.txt  f2.txt


Note: If we want to copy data from multiple files then we should use cat command

                cat f1.txt f2.txt > f3.txt


head : print first 10 lines of the file

                        head f1.txt

                        #print first 5 lines of data
                        head -n 5 f1.txt

                        # print first 30 lines of data
                        head -n 30 f1.txt

tail : print last 10 lines of the file

                        tail f1.txt

                        # print last 25 lines
                        tail -n 25 f1.txt

grep : Global Regular expression print

Note: Using grep command we can search for content in the file

# print lines which contains java keyword
grep 'java' fullstack.txt

# ignore case-sensitive
grep -i 'java' fullstack.txt

# print lines which doesn't contains java keyword (invert match)
```

```
grep -v 'java' fullstack.txt

# search for java keyword in last 10 lines of file
# tail with grep combination

tail fullstack.txt | grep 'java'

wc : word count

# print no.of lines, no.of words, no.of letters in the file
wc fullstack.txt


======================
Text Editors in Linux
======================

=> vi (visual editor) it is default editor in linux machines.

=> Using 'vi' we can create new files and we can modify existing file data.

=> vi command is having 3 modes

                1) command mode (just to open the file)

                2) insert mode (to edit the file) ----> press 'i' in keyboard

                3) esc mode (to comeout from insert mode) --> press 'esc' in keyword

        # save the changes and close the file ====>  :wq + enter

        # close the file without saving changes ===> :q! + enter


Note: vi command will open the file if it is already avilable otherwise it will create new file and
it will open that file.


=============
SED Command
=============

=> SED stands for stream editor

=> SED is used to process the data (substitute, delete, print, insert)

=> Using SED command we can perform operations on the file without opening the file.

=> we will use below options with SED command

                        s - substitute

                        d - delete

                        p - print

                        i - insert

# replace first occurance of linux with unix in every line
sed 's/linux/unix/' os.txt

# replace second occurance of linux with unix in every line
sed 's/linux/unix/2' os.txt

# replace third occurance of linux with unix in every line
```

```
sed 's/linux/unix/3' os.txt

# replace all occurances of linux keyword with unix
sed 's/linux/unix/g' os.txt

# substitute linux with unix and save changes in the file
sed -i 's/linux/unix/g' os.txt


# delete first line of the file
sed -i '1d' os.txt

# delete 4th line of the file
sed -i '4d' os.txt

# delete last line of the file
sed -i '$d' os.txt

# delete from 3rd line to last line
sed -i '3, $d' os.txt

# delete from 10th line to 15th line
sed -i '10, 15d' os.txt

# Add line at end of file
sed -i '$a\i am from ashokit' os.txt

# Add line at end of file
sed -i '2i\i want to learn devops' os.txt

# print 10th line only
sed -n '10p' os.txt

# print data from 2nd line to 5th line
sed -n '2,5p' os.txt

================================
Working with Zip files in linux
================================

=> Zip is used for files archieve (compress)

## syntax to create zip file : $ zip <zip-file-name> <content>

# create zip with all .txt files
zip myfiles *.txt

# extract zip file
unzip myfiles.zip

======================
Networking commands
======================

ping : To check connectivity

                ping www.google.com

                ping www.facebook.com

                ping 102.18.4.1

wget : It is used to download files from internet

                wget <url>
```

```
curl : It is used to send http request to server

                curl https://dummyjson.com/quotes/random

ifconfig : To get IP address of our machine


====================
process management
====================

# display running processes with PID
$ ps aux

Note: Every process will have process id (PID)

# kill process
kill <PID>

# terminate process immediatley (forcefully)
kill -9 <PID>

=================
User Management
=================

=> Linux is a multi user based OS

=> Multiple users can acces single linux machine and can perform multi tasking at time.

Note: "ec2-user" is a default user in "amazon linux" vm. ec2-user having sudo priviliges.

Amazon Linux AMI ===> ec2-user (default user)

Ubuntu AMI ==> ubuntu (default user)

=> when we create user account, for user one home directory will be created.

                ec2-user => /home/ec2-user/

                john => /home/john/

                smith => /home/smith/


# display all users created
cat /etc/passwd

# create user
sudo useradd <uname>

# set pwd for user
sudo passwd <uname>

# swith user account
su <uname>

# navigate to current user home directory
cd ~

# delete user along with user home directory
sudo userdel <uname> --remove
```

/etc/passwd : This file contains user information

/etc/shadow : This file contains user passwords in encrypted format

==========
Working with user groups in linux
==========

=> When we create user in linux, for that user one user group also will be created with the given username.

```
# display all groups
cat /etc/group

# create group in linux
sudo groupadd <group-name>

# add user to group
sudo usermod -aG <group-name> <username>

# remove user from group
sudo gpasswd -d <uname> <group-name>

# display users belongs to group
sudo lid -g <group-name>

# check one user belongs to how many groups
id <uname>

# delete group
sudo groupdel <group-name>
```

==========
Assignment : create new user and connect with linux vm using newly created user account
==========

=> To connect with Linux VM using our own user account (Ex: ashokit) , we need to enable Password Based Authentication in Linux VM.

=> To enable PasswordBasedAuthentication in linux vm then we need to modify below configuration files

1) sudoers
2) sshd_config

==========
What is sudoers file in Linux
==========

=> It is very important configuration file in linux machine.

=> Using this file we can control which user can run command as a superuser.

```
# print sudoers file content
sudo cat /etc/sudoers

# Open sudoers file
sudo visudo

# Add below line under root user
<uname>   ALL=(ALL)   ALL
```

=> After making the changes, to close sudoers file we need to execute =>
(CTRL + X + Y + Enter)

```
======================================================================
How to enable password based authentication for users in linux vm ?
======================================================================

=> In linux vm, by default passwordauthentication is no

=> If we want to connect with linux vm by using username and password then we need to set
passwordauthentication value as yes.

=> WE WLL MODIFY THIS IN "sshd_config" file.


# Display sshd_configurration file data
$ sudo cat /etc/ssh/sshd_config

# Open file
$ sudo vi /etc/ssh/sshd_config

Note: Go to insert mode and enable pwdbasedauthentication as yes

# restart sshd service
# sudo systemctl restart sshd

Note : Now we can connect with linux vm using username and pwd

Step-1 : Open gitbash
Step-2 : Execute below command

        $ ssh uname@linux-vm-public-ip


=========================
File Permissions in Linux
=========================

=> Using file permissions we can secure our files and we can protect our file data.

=> We have 3 types of permissions in linux

                        r => read

                        w => write

                        x => execute

=> file/directory permissions will be represented like below

                rwxrwxrwx f1.txt

=> file permissions contains 9 characters and those are divided into 3 parts

                first 3 characters => user/owner permissions

                middle 3 characters => group permissions

                last 3 characters => other users permissions

=> Lets under file permissions with diff scenarios

Scenario-1 ::  rw-r--r--  f1.txt

                user : (rw-) : read + write
```

```
                group : (r--) : read

                others : (r--) : read


Scenario-2 :: rwxr-xr-x  f1.txt

          user : (rwx) : read + write + execute

          group : (r-x) : read + execute

          others: (r-x) : read + execute


Scenario-3 :  rwx--xr-x f1.txt

        user : ( rwx ) : read + write + execute

        group : ( --x )  : execute

        others : ( r-x ) : read + execute

=> To change file/directory permissions we will use 'chmod'     command

                +  represents adding

                - represents removing


# Giving execute permission for user
chmod u+x f1.txt

# giving write permission for group
chmod g+w f1.txt

# Remove execute permission for others
chmod o-x f1.txt

# give all permissions for group
chmod g+rwx f1.txt

# Remove all permissions for others
chmod o-rwx f1.txt

====================================
File Permissions in Numeric Format
====================================

0 => No Permission

1 => Execute

2 => Write

3 => (2+1) => Write + Execute

4 => Read

5 => (4 + 1) => Read + Execute

6 => (4 + 2) => Read + Write

7 => (6 + 1) => Read + Write + Execute
```

```
chmod 111 f1.txt

chmod 222 f1.txt

chmod 007 f1.txt

chmod 077 f1.txt


===============
chown command
===============

=> It is used to change file/directory ownership

# change owner
sudo chown <new-owner> <file/dir>

# change owner-group
sudo chown :new-group <file/directory>

# change owner & group of file/directory
sudo chown <new-owner>:<new-group> <file/directory>

==========================================
How to install Softwares in Linux VM
==========================================

Ex: git, maven, java, python etc...


Package Managers in Linux

=> package managers are used to manage software packages (softwares) in linux machine.

=> Package means a software

        Ex: git, maven, java, python, httpd etc.....


=> package managers are specific to linux distribution


                Amazon Linux VM => yum

                Ubuntu Linux VM => apt

# check git client installed or not
git --version

# install git client s/w
sudo yum install git -y

# check git installation path
whereis git


======================================
How to change host name in linux vm
======================================

# set hostname
sudo hostname <new-name>

# re-start session
```

```
exit

==========================================
How to find the location of files in linux?
==========================================

=> in linux we can use 'find' command to search file paths.

# search for the files which are having name as f1.txt
sudo find /home -name f1.txt

# search for f2.txt file in entire linux machine
sudo find / -name f2.txt

# search for empty files inside /home
sudo find /home -type f -empty

# search for empty directories inside /home
sudo find /home -type d -empty


================================================================
Assingment : host static website in linux vm (amazon linux)
================================================================

1) whoami
2) pwd
3) date
4) cal
5) cd
6) ls
7) mkdir
8) rmdir
9) rm
10) touch
11) mv
12) cp
13) cat
14) tac
15) wc
16) head
17) tail
18) grep
19) vi
20) sed
21) zip
22) unzip
23) ping
24) wget
25) curl
26) ifconfig
27) ps aux
28) kill
29) useradd
30) passwd
31) userdel
32) usermod
33) groupadd
34) gpasswd
35) lid
36) id
37) groupmod
38) chmod
39) chown
40) yum install
```

41) whereis
42) uptime
43) free
44) top
45) find