==========
Where we will use Linux OS in Realtime ?
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1) Application deployment will happen on linux machines only

2) Tools will be installed on Linux machines only

Ex: Docker, K8S, Jenkins, Nexus, SonarQube, ELK etc...

3) Application log files will be stored in linux machine only

==========
What is OS ?
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=> It is a software which acts as mediator between user and computer

=> Users will communicate with computers using OS

=> Without OS we can't use any computer

=> OS provides platform to run our applications in computer

Ex: notepad, calculator, browser, tomcat, eclipse...

=> We have several operating systems in market

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

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Windows OS
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=> Developed by Microsoft company (Bill Gates)

=> It is commercial OS (licensed)

=> It is single user based OS

=> Security features are very less in Windows

Note: We need to install anti-virus software to protect files

=> Windows is GUI based OS

=> Windows is recommened for personal use only

Ex: internet browsing, games, watch movies, attend online classes....

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

=> Linux community based OS

=> Linux is free & open source os

=> Linux is CLI based OS

=> Linux is multi user based OS

=> Security Features are very high in linux

Note: Anti-virus s/w is not required

=> Linux OS developed by "Linus Torvalds"

=> Linux is highly recommended to manage servers

Ex: App Severs, DB servers, Docker, Jenkis, K8S etc..

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Linux History
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-> Linus Torvalds identified some challenges/issues in Unix OS

-> Linus Torvalds identified one OS which is matching with his ideas

i.e Minux os

-> Linus Torvalds used Minux OS code and made some changes and released into market was new OS

(Li) nus + Mi (nux) ===> Linux

==========
Linux Distributions
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-> Linus Torvalds provided Linux OS code for free of cost

-> So many companies downloaded Linux OS source code and modified according to their requirement and released into market with their brand names those are called as Linux Distributions/ Linux Flavours.

-> We have 200+ Linux Distributions in the market.

Ex: Amazon Linux, Ubuntu, CentOS, RedHat, Debian, SUSE, Kali, Fedora....

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How to setup Linux Machine ?
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Approach-1) Install Linux OS directley in computer

Approach-2) We can use Virtual Box and install Linux OS as Guest OS in Windows

Approach-3) Setup Linux VM in AWS Cloud (Recommended)

==========
Setup Linux VM in AWS Cloud
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Step-1 : Login into AWS cloud account

Step-2 : Create EC2 Instance (Linux VM) (Amazon Linux)

instance type : t2.micro (free tier eligible)

Step-3 : Connect with Ec2 instance using SSH Client

(git bash/ mobaxterm / putty)

Step-4 : Practice Linux commands

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ðŸ”¥ Today's Assignment
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ðŸ‘‰ AWS account setup : https://www.youtube.com/watch?v=xi-JDeceLeI

ðŸ‘‰ Linux Machine with Git Bash : https://www.youtube.com/watch?v=JMlQaTXvw5o

ðŸ‘‰ Linux Machine with MobaXterm : https://youtu.be/uI2iDk8iTps?si=ZuZs0lQTxoRpbRMk

ðŸ‘‰ Linux Machine with putty : https://youtu.be/GXc_bxmP0AA?si=HgSydrP89mPxv23s

==========
Linux Commands
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=> Linux is CLI based OS

=> We will perform operations in linux vm using linux commands

whoami
pwd
date
cal
cal 2025

mkdir : Make directory

```
mkdir ashokit
mkdir java python aws devops
```

rmdir : Remove empty directory

```
rmdir devops
```

ls : list the files of present working directory

ls -l : Display in alphabetical order

ls -lr : Display in reverse of alphabetical order

ls -lt : Display files based on timestamp (latest on top)

ls -ltr : Display old files on top & latest at bottom

ls -la : display hidden files (.a)

cd : change directory (navigation)

cd <dir-name> : go inside the directory

cd .. : come out from directory

touch : To create empty files

touch f1.txt

touch f2.txt f3.txt f4.txt

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

cat > f1.txt : Create new file with data

```
                        cat >> f1.txt : Append data to the exiting file data

                        cat f1.txt              : Print file data from top to bottom

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

rm : Remove files

                        rm f1.txt : Remove the file

                        rm -rf devops : remove non-empty directory

cp : copy the data from one file to another file

                        cp f1.txt f2.txt

Note: To copy the data from multiple files we need to use cat command like below

                        cat f1.txt f2.txt > f3.txt

mv : rename file/directory + move the file/directory

                        mv linux.txt  linux-os.txt

                        mv git.txt  devops/

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tac : Read file data from bottom to top (opposite of cat cmd)

                        tac f1.txt

wc : word count

                        wc f1.txt

rev : reverse the file data and print it

                        rev f1.txt

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head : To display file data from top (default 10 lines)

                                head app.log

                                head -n 20 app.log

                                head -n 25 app.log

tail : To display file data from bottom (default 10 lines)

                                tail app.log

                                tail -n 20 app.log

                                tail -n 100 app.log

grep :  grep stands for global regular expression print

Note : We will use this grep command for keyword search in file

                                grep 'exception' app.log (print lines which contains given keyword)

                                grep -i 'exception' app.log (ignore case sensitive)
```

```
                                grep -n 'java' app.log (print lines along with line num)

                                grep -v 'apache' app.log (print lines which don't have apache
keyword)

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

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

=> using 'vi' we can create new files and we can edit existing files also

                $ vi f1.txt

=> vi command is having 3 modes

        a) command mode (just to open the file)

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

        c) esc mode (to comeout from insert mode) --> press 'esc' in keyboard

    ## Save changes & close the file =>  :wq or :wq!

    ## Without saving changes close the file => :q!


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

===================================
File creation commands in linux
===================================

touch : Create empty file

cat : Create file with data

cp : copy one file data into another file

vi : create and open file for editing

====================================
Reading file data commands in linux
====================================

cat : print file data from top to bottom

tac : print file data from bottom to top

rev : print each line in reverse order

head : print top 10 lines of file

tail : print last 10 lines of file

vi : open file

=============
SED command
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=> SED stands for stream editor
```

```
=> It is used to process file data

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

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

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

# Replace all occurances
sed 's/linux/unix/g' linux-os.txt

# Substitute and save changes in original file
sed -i 's/linux/unix/g' linux-os.txt

# delete second line of data in the file
sed -i '2d' linux-os.txt

# delete fourth line of data in the file
sed -i '4d' linux-os.txt

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

# delete from nth line to last line (n is a number)
sed -i 'n,$d' linux-os.txt

# delete from 2nd line to 10th line
sed -i '2,10d' linux-os.txt

# print data from 3rd line to 6th line
$ sed -n '3,6p' linux-os.txt

# insert data before 4th line
$ sed '4i\i am from ashokit' linux-os.txt

# Add given text after last line
$ sed '$a\i love linux' linux-os.txt


============================
Working with User Accounts
============================

=> Linux is a multi user based OS

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

Note: "ec2-user" is default user in amazon linux vm

Note: ec-user having sudo priviliges

Note: For every user we can create new account to access linux vm.

# create user
sudo useradd <uname>

# set password for user account
sudo passwd <uname>

# display all users avialable in linux vm
cat /etc/passwd
```

```
# switch user
$ sudo su <uname>

# Go to logged in user home directory
$ cd ~

# Delete user account
$ sudo userdel <uname>

# Delete user account along with user home directory
$ sudo userdel <uname> --remove

# how to change username
$ sudo usermod -l <new-name> <old-name>


================================
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 sudoersfile content
$ sudo cat /etc/sudeors

Note: We should be very careful while working with sudoers file. If we do any mistakes in sudoers
file then system will be crashed.

########## Giving sudo previliges for user #######

# open suderos file
$ sudo visudo

# configure user like below in sudeors file (after root user details)
<username>  ALL=(ALL:ALL) ALL

=> After making changes to close sudoers file =>  ( CTRL + X + Y + Enter)

=========================================================
How to enable password based authentication in linux  ?
=========================================================

=> in sshd_config file , by default PassswordBasedAuthentication is no.

=> To enable password based authentication we need to set the value as yes.

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

# Open file and enter into insert mode (press 'i')
$ sudo vi /etc/ssh/sshd_config

# set PassswordBasedAuthentication as yes

# save and close the file ( esc + :wq)

# restart sshd service
# sudo systemctl restart sshd

====================
Log Server Details
====================
```

```
Public IP : 43.204.143.144
username : loguser
pwd: log@123

# use below command to connect with username and pwd
$ ssh uname@public-ip

Note: To connect with linux vm using username and password then passwordbasedauthentication must be
enabled in that linux vm.

==========================
Working with User Groups
==========================

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

# display all groups available
$ cat /etc/group

# create new group
$ sudo groupadd <group-name>

# Add user to group
$ sudo usermod -aG <group-name> <user-name>

# delete user from group
$ sudo gpasswd -d <username> <group-name>


=======================================

1) File permissions & ownership
                chomod & chown

2) Networking commands

3) Package Managers (s/w installation)

4) Linux Architecture

=================
File Permissions
=================

ec2-user => /home/ec2-user ==> f1.txt

raju => /home/raju ==> f1.txt

rani => /home/rani ==> f2.txt

ashok => /home/ashok ==> f3.txt


=> We can create several user accounts in single linux vm

=> Multiple users can connect to single linux vm at a time.

Note: One user can modify the file created by other user in linux vm.

=> To avoid this problem we will use file permissions in linux

=> In Linux, file permissions are divided into 3 types

                r => read
```

```
                w => write
                x => execute

  => A file/directory contains 3 sections of permissions

                user (owner) => u

                group => g

                others => o

  => We can see below permissions for a file & directory

                        rwxrwxrwx f1.txt

                                user having read + write + execute
                                group having read + write + execute
                                others having read + write + execute

                        rw-r--r-- f2.txt

                                user having read & write (no execute permission)
                                group having only read
                                others having only read

                        rwxr-xr-x java

                                user having read + write + execute
                                group having read + execute
                                others having read + execute

                        r-xr----x sbms

                                user having read + execute
                                group having only read
                                others having only execute


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


  # 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

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

  # give all permissions for group
  $ chmod g+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 => (4+2+1) => Read + Write + Execute

$ chmod 765 f1.txt

                - user having all permissions
                - group having read + write
                - others having read + execute

$ chmod 456 f1.txt

                - user having only read
                - group having read + execute
                - others having read + write


====================
Ownership change
====================

=> To change file/directory ownership we will use 'chown' command

# changing owner
sudo chown new-owner file/directory

# changing owner-group
sudo chown :new-group file/directory

# changing owner & group
sudo chown new-owner:new-group file/directory


==========================================
Q) What is the diff between chmod & chown ?
==========================================

chmod => To change file/directory permissions

chown => To change owner/group

====================
Networking Commands
====================

ping :  To check connectivity

                $ ping www.google.com
                $ ping www.google.com
                $ ping 192.168.1.20

wget : It is used to download the files from internet

                $ wget https://dlcdn.apache.org/tomcat/tomcat-9/v9.0.91/bin/apache-tomcat-9.0.91.zip

curl : To send http request to server (api call)

                $ curl https://type.fit/api/quotes

ifconfig: To get IP address of our machine

                $ ifconfig

======================================
```

```
whoami
pwd
date
cal
cal 2050
mkdir
rmdir
touch
ls -ltr
cat
cp
rm -rf
mv
tac
head
tail
grep
vi
sed

useradd
userdel
usermod
groupadd
groupdel
id

chmod
chown

ping
wget
curl
ifconfig

==========================
Package Managers in Linux
==========================

=> Package Managers are used to install softwares in linux machines

=> Package Managers are specific to linux distribution

                Amazon Linux + Red HAT : yum

                Ubuntu Linux + Debian : apt


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

# install java s/w
sudo yum install java

# install maven s/w
sudo yum install maven

================================
Install WebServer in Linux VM
================================

=> Webserver is a software which is used to run websites

=> Websites are divided into 2 types
```

1) static website (fixed content)

ex : wikipedia

2) dyanmic website (content will change based on user)

ex: gmail, facebook

=> For static websites execution we can use 'httpd' as webserver

=> For dynamic websites execution we can use 'tomcat' as webserver

```
# install httpd webserver
sudo yum install httpd -y

# start httpd server
sudo service httpd start
```

Note: httpd webserver runs on http protocol which is 80.

To access our webserver we need to enable 80 port number in EC2 VM security group inbound rules (firewell setting)

=> Access our webserver using EC2 VM public ip address in our browser.

```
# Navigate to webserver directory
cd /var/www/html

# create index.html file with content
sudo vi index.html
```

==========
What is systemctl in linux ?
==========

=> systemctl is a command-line utility in Linux systems which is used to manage system services

=> Starting service
=> stopping service
=> restarting service
=> reloading service
=> enabling / disabling services

```
#check service status
sudo systemctl status <service_name>

#start service
sudo systemctl start <service_name>

#stop service
sudo systemctl stop <service_name>

#re-start service
sudo systemctl restart <service_name>
```

==========
How to change hostname in linux vm ?
==========

```
# set hostname
```

```
$ sudo hostname <new-name>

# re-start session
$ exit

Note: Connect back to linux vm using ssh command.

=================
whereis command
================

To know the location of the package we have installed

whereis java

whereis maven

whereis git

==============
find command
===============

=> find command is used to search files location

# find the file whose name is oops.txt
sudo find /home -name oops.txt

# find all the empty files inside /home
sudo find /home -type f -empty

# find all the empty directories inside /home
sudo find /home -type d -empty

# find the files which are 30 days old in linux vm
sudo find /home -mtime 30 -print

===============
Assignment
===============

Deploy Spring Boot Application in Linux VM : https://www.youtube.com/watch?v=cRQPgbwOWq0


========
Summary
=========

1) Why Linux for Java developers ?

2) What is OS & why ?

3) Windows Vs Linux

4) Linux History

5) Linux Distributions

6) Linux VM Setup

7) Linux commands

8) Working with directories & files

9) Working with editors (vi & sed)
```

10) Users & groups Management

11) sudoers file & sshd_config file

12) PasswordBasedAuthentication enable

13) File Permissions & Owership

14) Package Managers

15) Services management (systemctl)