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What is Operating System ?
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- > Operating System is a software which is used to interact with computer
- > Operating System is acting as mediator between users and computer hardware components
- > Operating System is mandatory to use any computer
- > OS provides environment to run other applications
(browser, notepad, paint, calc)
- > The OS came into market in 1950
- > Microsoft released it's first OS in 1981 (MS DOS)

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Windows OS
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- > Developed by Microsoft Company
- > It is having GUI (Graphical user interface)
- > It is single user based Operating System (only one person can use this at a time)
- > It is commercial (paid)
- > Less Security
- > It is recommended for personal use
 - Watch Movies
 - Using Internet
 - Playing Games
 - Attending Online classes
 - Store data

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Linux OS
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- > Linux is Community Based OS
- > Linux is Free & Open Source OS
- > Linux is Multi User Based OS
- > High Security
- > Recommended to use for Applications, Servers, Databases etc..

Note: In realtime, we will use Linux OS only to setup infrastructure required to run our application

-> Linux OS is not only for Administrators, even developers and testers also will use Linux OS in realtime to monitor our application and application servers and application logs.

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History Of Linux

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-> In 1991, a student 'Linus Torvalds' developed this Linux OS

-> Linux Torvalds identified some challenges in UNIX OS and he suggested some changes for Unix OS but UNIX OS Team rejected 'Linux Torvalds' suggestions

-> Linus Torvalds used Minux OS to develop Linux

Linus + Minux

-> First Two letters from his name and last 3 letters from Minux OS

LI + NUX => LINUX

-> Linus Torvalds released LINUX OS with source code into market so that anybody can modify LINUX OS that's why it is called as Open Source Operating System.

-> As Linux OS is open source, so many people and companies taken that Linux OS and modified according to their requirements and released into market with different names those are called as Linux Distributions.

RHEL -- RED HAT

Ubuntu OS

Cent OS

Fedora

Open SUSE

Kali Linux

Debian

Amazon Linux

Note : 200+ Linux Distributions are available in the market.

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Environment Setup

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1) Create account in AWS (it will ask debit/credit card) - selected cards are accepted

2) Create Linux VM using AWS EC2 service (download key pair)

3) Download MobaXterm software to connect with Linux VM

4) Connect with Linux VM using Public IP and pem file

Note: Once work is completed then stop your Linux VM in EC2 to avoid billing

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Linux Commands

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\$ whoami : It will display currently logged in username

\$ pwd : present working directory

\$ date : To display current date

\$ cal : To display calendar

-> In Linux everything will be represented as a file

-> We have 3 types of files in linux

- 1) Ordinary File / Normal File (it will start with -)
- 2) Directory File (it will start with d)
- 3) Link File (it will start with l)

-> The file which contains data is called as ordinary file

-> Directory file is equal to folder (it can contain files and folders)

-> The file which is having linking is called as Link File

=> touch : it is used to create empty file

```
$ touch f1.txt
$ touch f2.txt
$ touch f3.txt f4.txt
```

=> To display files we will use 'ls' command

```
$ ls
```

=> To create a file with data we will use 'cat' command

```
$ cat > hello.txt
//write data
press CTRL + d (to save and exit)

$ cat hello.txt (To display file data)

$ cat >> hello.txt (To append data in the file)
//write data
press CTRL + d (to save and exit)
```

-> To create directory we will use 'mkdir' command

```
$ mkdir dirname
```

-> To remove the file we will use 'rm' command

```
$ rm filename
```

-> To remove empty directory we will use 'rmdir' command

```
$ rmdir dirname
```

=> 'ls' is used to list out all files & directories available in the given directory

Note: we can pass several options for 'ls' commands

-> ls : It will display all files in alphabetical order (a to z)

-> ls -r : It will display all files in reverse of alphabetical order (z to a)

-> ls -l : It will display long listing of files

-> ls -t : It will display all files based on last modified date and time. Most recent file will be display at top and old files will display at bottom.

-> ls -rt : It will display all files based on reverse of last modified date and time. Old files will display at top and recent files will display bottom.

-> `ls -a` : It will display all files including hidden files (hidden files will start with .)

-> `ls -li` : It will display files with inode numbers.

-> `ls -lR` : It will display all files and directories along with sub directoris content

Note: -R represents recursive

Note: We can use several options for `ls` command at a time. When we are using multiple options order of the options is not important

```
$ ls -ltr
$ ls -tlr
$ ls -l -t -r
$ ls -trl
```

Note: All the above commands will give same output

-> To display content of given directory we can execute like below

```
$ ls -l <dirname>
```

-> To delete a file we will use 'rm' command

```
$ rm <filename>
```

-> To delete empty directory we will use 'rmdir' command

```
$ rmdir <dirname>
```

-> To delete non-empty directory we will use 'rm' command like below

```
$ rm -r dirname
```

-> To display file content we will use 'cat' command

```
$ cat filename
```

-> To display file content with line numbers we will use '-n' option

```
$ cat -n filename
```

-> To display multiple files content at a time execute command like below

```
$ cat file1 file2 file3
```

-> Copy one file data into another file using 'cat' command

```
$ cat f1.txt > f8.txt
```

-> Copy more than one file data into another file

```
$ cat f1.txt f2.txt > f9.txt
```

-> 'tac' command is used to reverse file content

```
$ tac filename
```

-> 'rev' command is used to reverse each line content of the file

```
$ rev filename
```

-> head command is used to display file data from top (default 10 lines)

```
$ head filename
$ head -n 5 data.log (first 5 lines data)
$ head -n 20 data.log (first 20 lines data)
```

-> tail command is used to display file data from bottom (default 10 lines)

```
$ tail filename (last 10 lines data)
$ tail -n 100 filename (last 100 lines data)

$ tail +25 filename (it will display data from 25th line to bottom)
```

Note: To see on-growing logs we can use '-f' option

```
$ tail -f data.log (Live log message we can see)
```

-> It is used to count no.of lines, no.of words and no.of characters in the file

```
$ wc f1.txt
```

-> To copy the data from one file to another file

```
$ cp one.txt two.txt ( or ) $ cat one.txt > two.txt

$ cp f1.txt f2.txt f3.txt (invalid syntax)
```

-> We can't copy morethan one file data using 'cp' command. To copy multiple files data we should go for 'cat' command

```
$ cat f1.txt f2.txt > f3.txt
```

-> To rename files we will use 'mv' command

```
$ mv f1.txt f1111.txt

$ mv dirname dirnewname
```

Note: We can use 'mv' command for renaming and moving files

-> To compare files we can use below commands

```
$ cmp f1.txt f2.txt
$ diff f1.txt f2.txt
```

-> cmp command will display only first difference in given 2 two files

-> diff command will display all the differences in the content

-> 'grep' stands for global regular expression print.

-> 'grep' command will process the text line by line and prints any lines which matches given pattern.

Ex: I want to print all lines which contains 'NullPointerException'

```
$ grep -i 'NullPointerException' *
```

Note: We can install grep using below command

```
$ sudo yum install grep
```

//search for the lines which contains given word in the given filename

```
$ grep 'word' filename
```

```
//search for the lines which are having exception keyword in server.log file
$ grep -i 'exception' server.log
```

```
//search for the given text in present directory and in sub-directories also
$ grep -R 'exception'
```

=> We can pass several options for 'grep' command

-c : This prints only the count of files that matches give pattern

-i : ignore case-sensitivity

-n : Display the matched lines and their line numbers

-l : Displays only file names that matches the pattern

-h : Displays matched lines without file names

-R : Displays matched lines with file names

```
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Working with Text Editors in Linux
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```

-> The default editor that comes with the LINUX operating system is called vi (visual editor).

-> Using vi editor, we can edit an existing file or we create a new file from scratch

-> We can also use this vi editor to just read a text file.

Modes of Operation in vi editor

```
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```

There are three modes of operations in vi:

- 1) command mode
- 2) insert mode
- 3) escape mode

```
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Command Mode:
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```

When vi starts up, it is in Command Mode. This mode is where vi interprets any characters we type as commands and thus does not display them in the window

This mode allows us to move through a file, and to delete, copy, or paste a piece of text.

To enter into Command Mode from any other mode, it requires pressing the [Esc] key. If we press [Esc] when we are already in Command Mode, then vi will beep or flash the screen.

```
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Insert mode:
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```

This mode enables you to insert text into the file.

Everything that's typed in this mode is interpreted as input and finally, it is put in the file.

The vi always starts in command mode. To enter text, you must be in insert mode.

To come in insert mode you simply type i.

To get out of insert mode, press the Esc key, which will put you back into command mode.

```
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Last Line Mode (Escape Mode):
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```

Line Mode is invoked by typing a colon [:], while vi is in Command Mode.

The cursor will jump to the last line of the screen and vi will wait for a command.

This mode enables you to perform tasks such as saving files, executing commands.

There are following way you can start using vi editor :

```
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Commands and their Description
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```

vi filename: Creates a new file if it already not exist, otherwise opens existing file.

vi -R filename : Opens an existing file in read only mode.

view filename : Opens an existing file in read only mode.

```
$ vi f1.txt
```

=> After making changes if we want to save those changes then execute :wq

=> After making changes if we don't want to save those changes then execute :q!

```
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Moving within a File(Navigation):
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```

To move around within a file without affecting text must be in command mode (press Esc twice). Here are some of the commands can be used to move around one character at a time.

```
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Commands and their Description
+++++
```

```
k : Moves the cursor up one line.
j : Moves the cursor down one line.
h : Moves the cursor to the left one character position.
l : Moves the cursor to the right one character position.
0 or | : Positions cursor at beginning of line.
$ : Positions cursor at end of line.
W : Positions cursor to the next word.
B : Positions cursor to previous word.
( : Positions cursor to beginning of current sentence.
) : Positions cursor to beginning of next sentence.
H : Move to top of screen.
nH : Moves to nth line from the top of the screen.
M : Move to middle of screen.
L : Move to bottom of screen.
nL : Moves to nth line from the bottom of the screen.
colon along with x : Colon followed by a number would position the cursor on line number represented by x.
```

```
Usecase
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```

-> We will use 'vi' editor to perform below activities

- a) To edit config files of our application
- b) To edit shell script files

```
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Working with SED command
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```

SED command in LINUX stands for stream editor and it can perform lots of functions on file like searching, find and replace, insertion or deletion.

Though most common use of SED command in LINUX is for substitution or for find and replace.

By using SED you can edit files even without opening them, which is much quicker way to find and replace something in file, than first opening that file in VI Editor and then changing it.

SED is a powerful text stream editor. Can do insertion, deletion, search and replace (substitution).

SED command in linux supports regular expression which allows it perform complex pattern matching.

Example:

```
-----
$ cat > myfile.txt
unix is great os. unix is opensource. unix is free os.
learn operating system.
unix linux which one you choose.
unix is easy to learn.unix is a multiuser os. Learn unix. unix is a powerful.
```

```
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Replacing or substituting string :
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```

Sed command is mostly used to replace the text in a file. The below simple sed command replaces the word 'unix' with 'linux' in the file

```
$ sed 's/unix/linux/' myfile.txt
```

By default, the sed command replaces the first occurrence of the pattern in each line and it won't replace the second, third occurrence in the line.

```
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Replacing the nth occurrence of a pattern in a line :
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```

Use the /1, /2 etc flags to replace the first, second occurrence of a pattern in a line. The below command replaces the second occurrence of the word 'unix' with 'linux' in a line.

```
$sed 's/unix/linux/2' geekfile.txt
```

```
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Replacing all the occurrence of the pattern in a line :
+++++
```

The substitute flag /g (global replacement) specifies the sed command to replace all the occurrences of the string in the line.

```
$ sed 's/unix/linux/g' myfile.txt
```

Deleting lines from a particular file

```
-----
SED command can also be used for deleting lines from a particular file. SED command is used for performing deletion operation without even opening the file
```

To Delete a particular line say n in this example


```
-----
$ sed '5d' myfile.txt
```

```
-> To Delete a last line : $ sed '$d' myfile.txt
```

```
-> To Delete from nth to last line : $ sed '12,$d' myfile.txt
```

Note: By default SED command changes will not store in file.

=> To make SED command changes to file permanently we will use '-i' option.

```
$ sed -i 's/unix/linux/g' myfile.txt
```

Note: With above command 'unix' keyword will be replaced with 'linux' keyword in the file permanently.

```
+++++
File permissions
+++++
```

To create a secure environment in Linux, you need to learn about user groups and permissions. For example, if you work in a company and you want the finance department to read a file but not make any modification to it, then you need to use permissions in Linux. It is a must for every programmer working with Linux nowadays.

Let's start by talking about the ownership of Linux files.

User: the owner of the file (person who created the file).

Group: the group can contain multiple users.

Therefore, all users in that group will have the same permissions. It makes things easier than assign permission for every user you want.

Other: any person has access to that file, that person has neither created the file, nor are they in any group which has access to that file.

=> Execute 'ls -l' command to file's permissions

We will work with this part `â€œ-rw-râ€œ“râ€œ““`.

The characters mean:

```
â€˜râ€™ = read.
â€˜wâ€™ = write.
â€˜xâ€™ = execute.
â€˜-â€™ = no permission.
```

```
-rw-r--r--
```

```
 -: It represents file
rw: User
r: Group
r: Other
```

As we see above, the empty first part means that it is a file. If it were a directory then it will be the letter `â€œdâ€™` instead.

The second part means that the user `â€œHomeâ€™` has read and write permissions but he does not have the execute one.

The group and others have only the read permission.

Let's change the permissions using the chmod command.

```
$ chmod o+w section.txt
```

This command will add the write permission for other users to my text file `section.txt`.

Now if you try to execute `ls -l` then you will see `-rw-r--rw-`

`o` refers to others, `g` for the group, `u` for the user, and `a` for all.

Now let's add the execute permission to the user with:

```
$ chmod u+x section.txt
```

The permissions will be `-rwxr--rw-`

If you want to remove the permission, you can use the same method but with `-` instead of `+`.

For example, let's remove the execute permission from the user by:

```
$ chmod u-x section.txt
```

And the permissions now are: `-rw-r--rw-`

Also, you can use Symbolic Mode to modify permissions like the following:

Number	Permission
0	No permission
1	Execute
2	Write
3	Execute and Write
4	Read
5	Read and Execute
6	Read and Write
7	Read, Write and Execute

For example, let's give every permission for all with:

```
$ chmod 777 section.txt
```

Then the permissions will be: `-rwxrwxrwx`.

Let's remove the execute from the group and the write from other by:

```
$ chmod 765 section.txt
```

Then the permission will be : `-rwxrw-r-x`

```
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Working with User Accounts
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```

=> Linux is multi user based operating systems

=> Within one Linux machine we can create multiple user accounts

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

-> When we launch EC2 instance with Ubuntu OS, we got by default 'ubuntu' user account

Create a user

```
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$ sudo adduser <uname>
```

=> After creating user account we can verify useraccount details using 'id' command

```
$ id <uname>
```

=> 'id' command will display user account information

=> Check the files available in home directory

```
$ ls -l
```

(We can see ubuntu folder and newly created user folder)
(That means we have 2 user accounts in our machine)

After creating a new user and setting a password to it, you can log in from the terminal

```
$ su - <uname>
```

Delete a user

```
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```

```
$ sudo userdel <uname>
```

If you try that command, you will notice that the user directory has not been deleted and you need to delete it by yourself.

You can use this automated command to do everything for you:

```
$ sudo deluser --remove-home <uname>
```

User groups

```
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```

-> A group is a collection of users.

-> The primary purpose of the groups is to define a set of privileges like read, write, or execute permission for a given resource that can be shared among the users within the group.

Create a group

```
+++++
```

You can see all of the groups you have by opening the following file:

```
$ cat /etc/group
$ sudo groupadd <groupname>
```

Add user to a group

```
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```

```
$ sudo usermod -aG <group-name> <username>
```

-> verify user groups using command -> \$ id username

Delete user from a group

```
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```

```
$ sudo gpasswd -d <username> <groupname>
```

Delete a group

```
+++++
```

```
$ sudo groupdel <groupname>
```

```
+++++
```

Working with 'find' and 'locate' commands

```
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```

locate command

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The locate Command find will search for data in local db

```
$ sudo apt install mlocate
```

```
$ locate apache
```

```
$ locate -c apache
```

```
$ locate -c *.txt
```

```
$ locate -S (to see locate database)
```

Note: when we create new files it will take some time to update those files in mlocate db

find command

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=> find command will search for the files in entire linux file system.

=> find command providing advanced searching technique

=> Using find command, we can search for the files based on name and type also.

2. Find Files Under Home Directory

```
# find /home -name f1.txt
```

7. Find Files With 777 Permissions

```
# find . -type f -perm 0777 -print
```

19. Find all Empty Files

```
# find /home -type f -empty
```

20. Find all Empty Directories

```
# find /home -type d -empty
```

Note: As find command is scanning entire file system, it will take more time to give search results.

-> 'man' command is like a help command. It is used to understand command syntax and options.

```
$ man cat
```

-> To see ip address we will use 'ifconfig' command

```
$ ifconfig
```

Note : ifconfig is not installed then execute below command

```
$ sudo apt install net-tools
```

-> 'ping' command is used to check connectivity

```
$ ping <ip>
```

-> 'curl' command is used to get response from the server

```
$ curl <url>
```

-> 'wget' command is used to download resources from internet

```
$ wget <url>
```

Installing Apache Server In Linux VM

=====

- 1) Connect to EC2 instance (UBUNTU OS)
- 2) Execute below commands to install apache server

```
$ sudo su
```

```
$ sudo apt update
```

```
$ sudo apt install apache2
```

```
$ apache2 -version
```

```
$ sudo systemctl start apache2
```

```
$ sudo systemctl status apache2
```

Note: Check accessing apache server from outside using system IP

-> If server is not accessible then create security group with http port open

-> Add security group for EC2 instance

-> After adding security group try accessing EC2 instance using IP

Ex: <http://52.66.101.3/>

-> You can modify html page content

```
$ cd /var/www/html
```

```
$ cat > index.html
```

```
<h1> Welcome to Ashok IT - Website</h1>
```

```
+++++
Deploying Static Website In EC2 Instance
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```

-> Keep index.html and assets in EC2 VM - > Location : var/www/html

Note: If permission not available to store the data then execute below command

```
$ sudo chmod 777 /var/www/html -R
```

```
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Install Java in Ubuntu
```

```
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-> java -version (Check java version)
```

```
$ sudo su
```

```
$ sudo yum install default-jdk
```


