**LINUX Notes**

**Syllabus:**

* Intro to Linux
* Basic commands
* Working with text Files and Directories
* Editors
* User and group management
* Files permissions
* Archiving and compression
* Filter and search utility
* Process management
* Package management
* Partition
* scheduling task
* package management
* Networking
* Web Server:

->Http

->Nginx

->Tomcat

* Services:

->FTP

->NFS

->Mariadb

->DHCP

->SElinux

* Log Management
* Firewall
* Intro to Linux

***Que.What is Linux?***

Linux an [open source](https://www.redhat.com/en/topics/open-source/what-is-open-source) operating system (OS). An [operating system](https://www.redhat.com/en/technologies/linux-platforms/old-enterprise-linux) is the software that directly manages a system’s hardware and resources, like CPU, memory, and [storage](https://www.redhat.com/en/topics/data-storage/software-defined-storage)*.*

***Que.Can you explain what is Operating System***

OS is a Mediator between application and hardware

* it provide environment to run services
* it provide platform to run application
* It manages hardware
* It is a set of Program (It converts High level language to low level language)

->High level language: human redable language (ex. Python, java, etc)

->Low level/Machine language: in the form of 0’s and 1’s(binary)

OS

user ------------------------> computer

( interface/mediater )

History

Linux is a kernel and it was written by Linus Torvalds in 1991

kernel + SOFTWARE = OS

(linux) (GNU) (LINUX)

GNU-->The GNU project is **a mass collaborative initiative for the development of free software**. founded by the Richard Stallman

Open Source - Linux source code is freely available and it is community based development project. Multiple Teams works in collaboration to enhance the capability of Linux operating system and it is continuously evolving

***Que. Explain the Architecture of Linux***



* Linux architecture has four main components hardware,kernel,shell and user/application
* **Hardware :** it consists of motherboard ,CPU,HDD etc
* **Kernel :** kernel is the heart/core of the OS, kernel communicates with

Hardware

* **Shell :** provides interface to user to communicate with kernel
* **Application/user :** user interact with system via applications or

commands (ex. vi,ls,wget )

***Que. Define shell and explain types of shells ?***

A shell is a command-line interpreter or a user interface that interprets the commands entered by the user and communicates with the operating system to execute those commands.

Bash(Bourn Again Shell):

Bash is one of the most widely used shells and is the default shell for many Linux distributions. It is an extended version of the original Bourne Shell (sh) with additional features and improvements.

Zsh (Z Shell):

Zsh is an extended Bourne shell with many enhancements, including improved auto complete, spelling correction, and theming capabilities. It is known for its flexibility and user-friendly features.

Fish (Friendly Interactive Shell):

Fish is designed to be user-friendly and interactive. It provides syntax highlighting, auto suggestions, and a consistent scripting language. Fish aims to be easy for beginners while still being powerful for advance features

Dash: Dash is a lightweight shell that aims to be fast and efficient. It is often used as the default system shell for scripts and is the default /bin/sh on Debian-based systems.

Ksh (Korn Shell): The Korn Shell is an older shell that was developed by David Korn at Bell Labs. It includes features from both the Bourne Shell and the C Shell.

Tcsh (Tenex C Shell): Tcsh is an enhanced version of the C Shell with additional features such as command-line editing, history, and file name completion.

***Que . How to I check the available shells ?***

* #etc/shells

***Que . What is the command to change shell ?***

#chsh -s /bin/zsh

***Que . How to check current running shell ?***

# echo $SHELL

***Que. differences between windows and linux ?***

Windows:

1.user friendly

2.licensed required {closed source-Microsoft }

3.requirement of hardware is more

4.single user

5.easily attacked by virus

6.low security

7.ram consumption high

8.FAT & NTFS file system

9.used in server and client machine

Linux:

1. not user friendly (command based ,skilled person required)

2. open source----anyone can develop

3. licence not required.

4. less requirement of hardware.

5. multiple users are allowed.(6 users can allowed on terminal)

6. highly secured .

7. ram consumption low

8. file system EXT & XFS

9. nearly 80% of Servers linux based

***Que. Explain the FEATURES of Linux***

1) Open source

2)secure

3)easy installation

4)light weight

5)multiuser

6)multiple distribution

7)portable

8)difficult to use

9)low hardware requirement

***Que. What are various Distributions /Versions /Flavors of Linux ?***

as Linux is open source OS therefore its source code is accessible to general public hence anyone can modify the source code and create a new version of OS

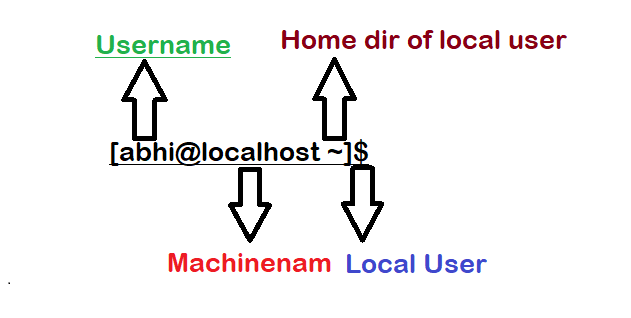
* RHEL(Red hat enterprise Linux)
* FEDORA
* DEBIAN
* UBUNTU
* KALI
* AMAZON LINUX
* CENTOS

***Que. How many types of Users are there in linux ? explain ?***

There are Three types of users in linux Local user, root and system user

* $ local user ->has limited privileges
* # root user or super user/administrator->has all the privileges
* system user -->automatically generated by system for a specific

purpose or software.



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* Basic commands
* whoami -->shows username
* who am i /who -->shows username with terminal, date and time
* su root -->super user[ grants admin level permission ]
* sudo -i -->super user
* su - username -->switch to another user
* exit -->logout from current user
* hostname -->shows machine name
* hostname newhostname -->temporary change the hostname
* bash -->to save the changes made
* vi/etc/hostname -->permanently change the host-name
* hostnamectl -->shows machine information like OS and kernel
* version etc
* cat /etc/os-release -->to check os version
* uname -->shows os name
* uname -a -->print system information like OS name, version,

date etc

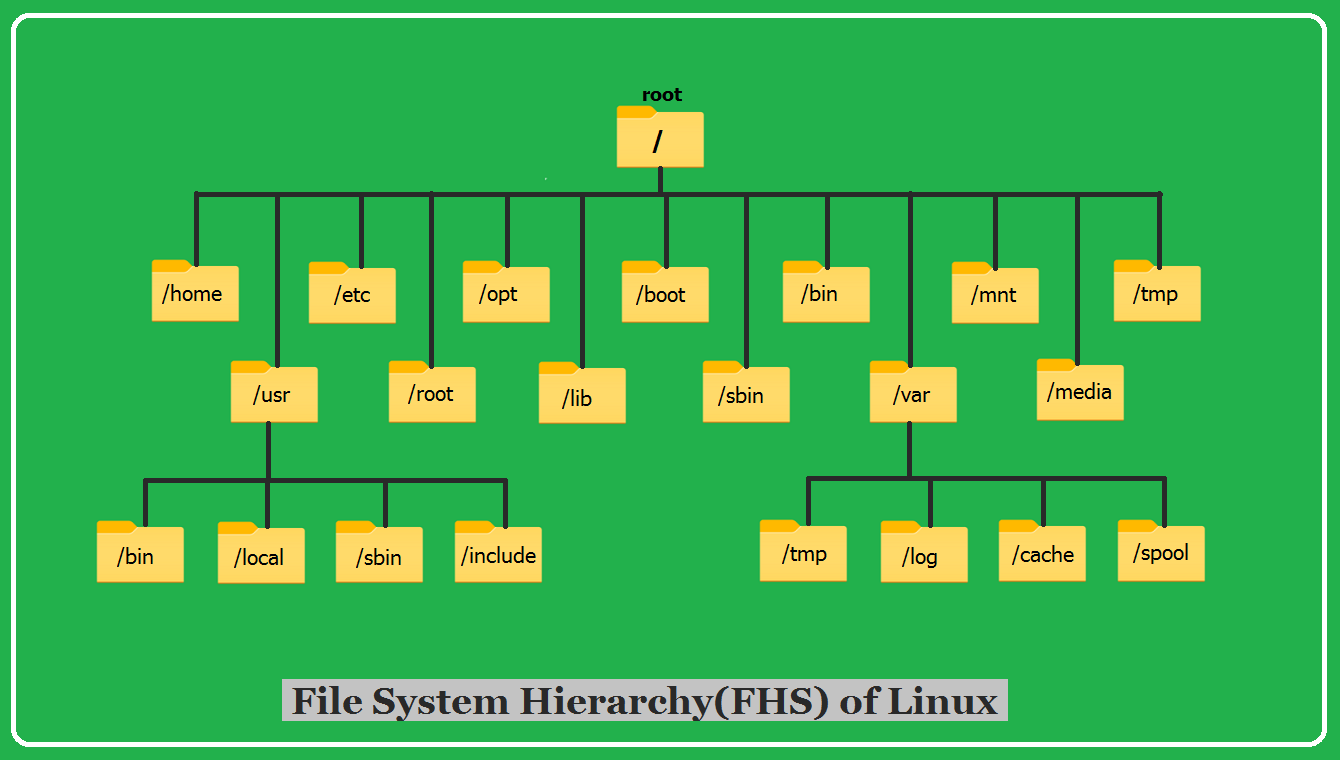
* date -->shows current month date
* date -s '2023-12-25 11:55:05' -->change the existing date
* whatis -->one or two lines description of manual page
* man <command > -->shows manual page of command
* info <command> -->same as man command
* <command> --help --> shows options
* ls --> list
* ls -l / ll --->longlist,check list along with permissions
* shutdown [init 0]-->power offf
* shutdown -h 10 -->power off after 10 min
* dmidecode -->shows hardware info[user must have root

permissions to run this command]

* lscpu -->shows CPU information
* free -h --> shows available memory [human readable]
* su root -->switch to root user[cntl +d or exit to get back to

local user]

#Linux File System Hierarchy#



***Que.Explain directory structure in linux***

Root /

* first directory in structure
* Every files and directory starts from the root directory.
* Only the root user of the system has the right to write under the root (/) directory.

\*One another directory with name root is under

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

the root user.

1)/bin  – local user's Binary files[not human readable]

2)/boot  –It stores all information about boot loader.Kernel initd, grub files are located into /boot directory.

3)/dev  – [Device Files] It includes terminal devices, USB, or any

device attached to the system. ex./dev/tty1, /dev/usb

4)/etc  – System and program configuration files

5)/home – It contains the user’s home directories,

personal files, user’s personal settings, etc.

ex. /home/abhi

6)/lib &/lib64 – [Shared Libraries] It stores libraries essential files for the binaries in /bin and /sbin.

7)/media – It is temporary mount point for removable device such as /media/cdrom, /media/floppy

8)/mnt  – It is for a temporarily mounting filesystem, where system admin can mount a file system

9)/opt  –used for optiona application software packages

10)/root -it is the home directory of the root user.

11)/run -it stores data that can give you an idea of how system resources are being utilized since startup

12)/sbin  – Root user's binary files,

It stores system related binaries executable. ex.ifconfig

13)/srv  –service

it contains server specific services related data

14)/sys - it contains information about various system components and drivers

15)/tmp  – It stores files which are created by system or user for a temporary purpose.

16)/usr  – [bin, sbin] It contains libraries, binaries, documentation, and source code

17)/var - varible

Stores files whose content is expected to change continuously ex. log files, spool files and cache files.

18)/proc  –stores information about system process information

ex. w, top, uptime

* Working with text Files and Directories

***Que. How to create directory ?***

-->mkdir <foldername>

ex. mkdir mycomputer

***Que. How to remove empty directory ?***

-->rmdir <foldername>

***Que. How to remove directory with content?***

-->rm -rvf <filename/foldername>

r ->recursive[delete folder/file within file/folder]

v ->view/verbose[shows the action taken on screen]

f ->forcefully remove

***Que. How to make multiple folder***

-->mkdir <folder1> <folder2>

***Que. How to make folder inside another folder***

-->mkdir <foldername>/{fold1,fold2}

***Que. How to make sub directories within main directory***

-->mkdir -p <foldername>/dir1/dir2/dir3

ex. mkdir -p Asia/India/Maharashtra/Nagpur

***Que. How to create 20 directories at once***

-->mkdir <mydir>{1..20} --->it will create 20 dir with the name of folder1 to folder20

***Que.how to make empty file ?***

-->touch <filename>

ex. touch abc.txt

***Que. How to create file using cat command ?***

-->cat > filename

->Hello world!

\*enter

\*press cntl + d to save the file

***Que.How to append [edit] the content in the file using cat ?***

-->cat >>filename

***Que. How to view content in the file ?***

-->cat filename

***Que.How to reverse the content of the file [bottom to top]***

-->tac filename

***Que.How do I simultaneously view the content of two diff files***

-->cat file1 file2

***Que. How to merge the content of two files into another one? Or copy***

-->cat file 1 file2 >>newfile

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* Editors

***Que. What is vi/vim and explain modes of vi?***

-->Vi/Vim is a CLI (command line interface) based text editor in Linux there are total 4 modes available in vi/vim

**1.Command Mode:**

>**this is default mode**. Press **esc** to exit from any mode and

enter into command mode.

**dd** Delete current line

**<n>dd** Delete n no. of lines from current line

**yy** Copy current line

**<n>yy** Copy n no. of lines from current line

**cc** Cut current line and enter in insert mode

**<n>cc** Cut n no. of lines and enter in insert mode

**yw** Copy current word

**<n>yw** Copy n no. of words from current word

**dw** Delete current word

**<n>**dw Delete n no. of words from current word

**cw** Cut current word and enter in insert mode

**<n>cw** Cut n no. of words from current word and enter in

insert mode

**p** Paste

**u** Undo

**Ctrl+r** Redo

**H** Move cursor to the top of screen

**M** Move cursor to the middle of screen

**L** Move cursor to the bottom of screen

**G** Move cursor at the end of file

**gg** Move cursor at the beginning

**<n>gg** Move cursor at nth line

**2.Insert Mode:**

Following are commands to enter in insert mode

**i** insert text at current cursor position

**I** insert text at start of the current line

**a** insert text just right of the current character

**A** insert text at end of the current line

**o** insert new line below the current line

**O** insert new line above the current line

**r** it replaces single character

**R** replace multiple characters

**3.Ex-mode**

**:q** quit without saving

**:q!** quit without saving forcefully

**:w** save and stay in file

**:wq** or **:x** save and quit

**:wq!** save and quit forcefully

**:set nu** set line numbers

**:<n>** Jump to nth line

**:set nonu** remove line numbers

**:/<word>** Highlight word

**:nohl** Remove highlight

**:%s/<old>/<new>/g** Find and replace old word with new word

**:!<command>** Execute any command on terminal without leaving

editor

**4.Visual Mode:** this mode is used for selection.

**v** Select character by character

**V** Select line by line

**ctrl+v** Select block

y,d,c For copy, delete, and cut selected area

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***Que. How I can execute command inside vi editor***

***-->:! ls***

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; [semicolon] execute two or more commands at once

| [pipe] it matches 1st command output to second command

and executes it

***Que. What are the Re-directors used in linux?***

> write content in the file [override]

>> add new lines along with older ones [append]

2> save error in file

2>> save error in same file [append]

&> save output + error

&>> append

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* User and group management

Users:

1. *Local user $* [normal user]

* Need to access files and folders stored on the computer.
* Has a limited access to computer resources

1. *Root user #* [super user/administrator]

* **The root account has  all the *privileges*.** This means it can read and write any files on the system, perform operations as any user, change system configuration, install and remove software, and upgrade the operating system

1. *System user*

* created by system itself when we install any service to perform necessary activities where no human intervention needed
* It has no-login shell

***Que.How to add new user?***

-->useradd username

-->adduser username

***Que. How to set password to user?***

-->passwd username

>this command will help you to set password for user

**Note**: if you want to set password for current or root user use #passwd

***Que. How to delete user?***

-->userdel username [it will only delete user]

-->userdel -r username [it will remove user with home dir And log file]

***Que. What happens when we add new user to system?***

1. **Home/username**  >home directory of user created

2. copy files from **/etc/skel/** to **/home/username/**

.bashrc ------> helps to login into the system

.bash\_logout ------> helps to logout from the system

.bash\_profile ------> creates Home directory of user

**Note**: to view above files use ls -a (shows hidden files)

#ls -a /home/username

3. **/etc/passwd** ------->it stores profile related info of user

#tail -1 /etc/passwd

1. **/etc/shadow**  ------> it consist of user password

*5. /etc/group ------->group info such as group name,gid & list of members*

*6. /etc/gshadow ------->it consists of group password*

**Note**: when you add a new user in system,the primary group will be created with the same name as user

7. **/var/spool/mail/username**  ---->all the user’s mails will be stored here

***Que. What are the Fields of /etc/passwd ?***



[username:X:8183:8183:comment:/home/username:/bin/bash]

1.username

2.encrypted password

3.uid

4.gid

5.comment

6.path of home directory

7.login shell

***Que. How to add user with customization:***

***Syntax****-*

*# useradd <options> <parameters> <username>*

-->useradd -u 2023 user1

>to assign customized **uid** while user creation

-->useradd -m -d /Dev/user3 user3

>assign diff home directory

-->useradd -s /sbin/nologin user4

>assign no login shell to user[user wont be able to login ]

-->useradd -c “development ” user5

>add comment

-->useradd -M Barry

>home directory of user will not be created

***Que.How to modify existing user with customization:***

***Syntax-***

*# usermod <option> <parameters> <username>*

-->usermod -u 2023 user1

>to assign customized **uid** while user creation

-->usermod -m -d /Dev/user3 user1

>assign diff home directory

-->usermod -s /sbin/nologin user1

>assign no login shell to user[user wont be able to login ]

-->usermod -c “development team” user1

>add comment

-->usermod -M user1

>home directory of user will not be created

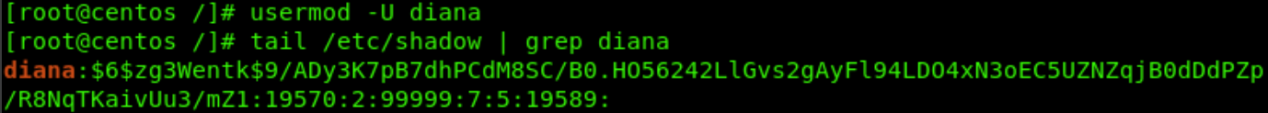
-->usermod -L user1

>lock user password

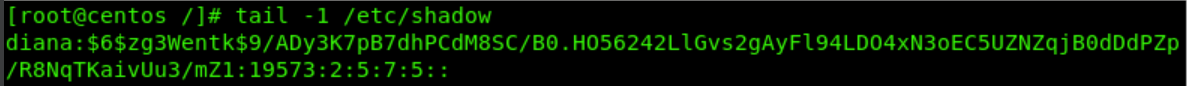


#usermod -U user1

>unlock user password



***Que. Explain Fields of /etc/shadow file?***



1 username

2 encrypted password

3 last password change

4 minimum days between password change

5 maximum days between password change

6 warning for password change

7 inactive days

8 expiry date

9 future use

***Que. Explain password policy ?***

-->A password policy defines the password strength rules that are used to determine whether a new password is valid

->chage -l

-l list or view

-m min days > chage -m 3 username

-M max days > chage -M 15 username

-I inactive days > chage -I 7 username

-E expiry date > chage -E '2023-9-1' username

-d force to change password

-W warning

**Change password policy:**

*Syntax-*

*# chage <option> <parameters> <username>*

#chage -l username --to list pass policy

#chage -m 2 username --min days between pass change

#chage -M 20 username --max days between pass change

#chage -I 5 username --set inactive days for user

#chage -W 7 username --set warning days to change pass

#chage -E ‘2023-8-15’ username --set expiry date for user

Groups:

> Group is the collection of users,

> Groups make it simple to handle users who have similar security and access right

***Que.what are the Fields of /etc/group ?***

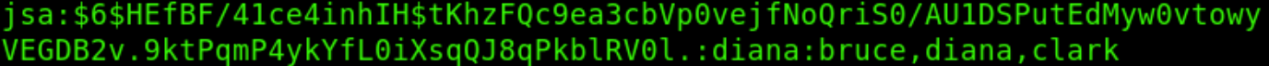




* Group name
* Redirected group password
* Group id
* List of members in the group

***Que. Exxplain the Fields of /etc/gshadow***





* Group name
* Encrypted group password
* Group admin
* List of members in the group

***Que.How to create group?***

-->groupadd groupname

***Que.How to delete group?***

-->groupdel groupname

-->groupdel -f groupname ---for forcefully delete group

***Que.How to Add user to group?***

**1>#**usermod -aG groupname username

>**to add already existing user to group**

2>#useradd -G groupname username

>to create new user and add it to the group

3>using gpasswd:

*Syntax-*

*# gpasswd <option> <username> <groupname>*

***#****gpasswd -a username groupname*

>**to add already existing user to group**

**#add multiple users to group**

#gpasswd -M mangesh,shubham dev

***Que.How to delete user from group?***

#gpasswd -d username groupname

***Que. How do you Assign Admin to group?***

#gpasswd -A username groupname

***Que.How do you Remove Admin from Group?***

#gpasswd -A ‘ ’ groupname

***Que.H0w to give root permissions to local user?***

-->root or super user has full permission to read(r), write (w) and execute(x)  any file.

-->one way is to use sudo before each command

-->onother way is too add user to wheel group

#usermod -G wheel username

**Note** :The wheel group is a special user group used on some linux systems,to control access to the su or sudo command

***Que. What is the user id of a root user ?***

-->By default **root user id is '0'**

* Files permissions
* File permissions determine who can access files
* And specify who can read, write, modify files/directories on a system

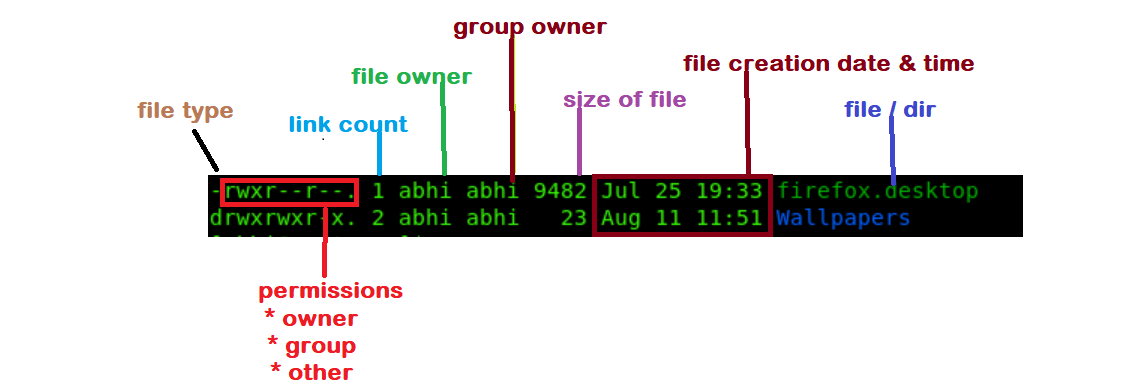
Note : Use ls -l command to check File/Dir permissions

>ll

>ll -d dirname ---to check particular Dir permission

>ll filename ---to check particular file permission

>ls -ltr



1. File type
2. Owner Permissions.
3. Group Permissions.
4. Other User Permission.
5. Link Count.
6. Owner of file/directory.
7. Group Owner of File or Directory.
8. File Size.
9. Creation Date and Time.
10. File/Directory Name

File types in Linux:

- Normal file >text files, binary files etc..

D Directory >

L Link file >

S Socket File >Sockets are Linux file descriptors that serve as the communication end-points for processes running on that device

b Block Device File >Character and block device files allow users and programs to communicate with hardware peripheral devices

c Character Device File > same as above

p Normal Pipe File >named pipes allow communication between two local

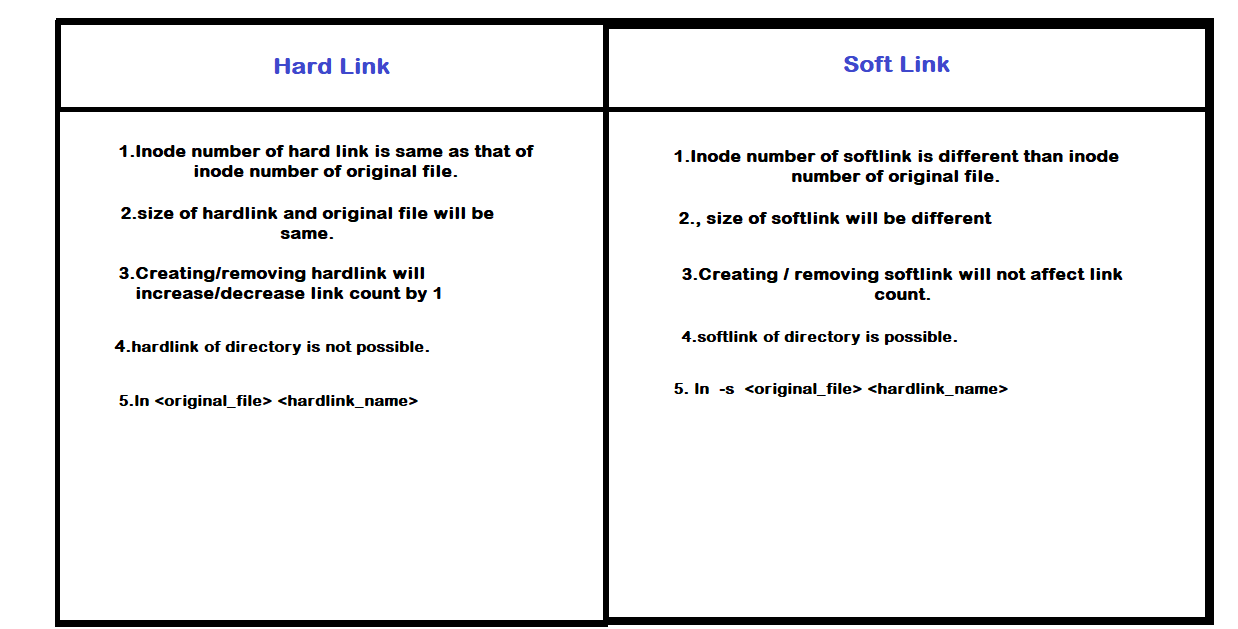
processes.

**Link Count:** It shows count of links of file/directory that has been created.

>default link count for Dir =2

>default link count for File =1

***Que. Diff between Hard link and soft link***



Inode number: inode number is generated to keep track of all the files on a Linux system

User and group ownership:

owner --->current user, who created the file

Group --->primary group of file owner

other --->other users

read r 4 --->open or view/list

write w 2 --->edit

execute x 1 --->run

***Que.How to change owner and group owner?***

**Lets take an example, “demo” dir owner and group is *root***



Now I want to make user *abhi* the owner of the dir “demo”for that use the following command

*#chown abhi demo --->change owne*r



Same with the group

*#chgrp grp-name demofile.txt --->change group owner*

*#chown user:Grp demofile.txt --->changd owner,grp at once*

Giving permissions to user/group/others individually:

chmod u+w demofile.txt --->add user permission to write

chmod u-w demofile.txt --->remove

chmod g+rwx demofile.txt --->add rwx perm. to grp owner

chmod g-r,o=rw demofile.txt --->

chmod go=r dir1 --->assign grp and owner read permission

Giving permissions to u-g-o at once :

chmod ugo+rw demofile.txt

or

chmod a+rwx demo.txt --->a-all at once

octal vs binary

Octal Binary Permission

1 001 --x

2 010 -w-

3 011 -wx

4 100 r--

5 101 r-x

6 110 rw-

7 111 rwx

***Que. What is Default Permission for root and local user?***

User Directory File

Root 755 644

localUser 775 664

Giving permissions to user/group/others using octal number:

#chmod 421 /abhi/

#ll -d /abhi/

dr---w---x 2 root root 11 aug 23 07:10 /abhi/

#chmod 642 demofile.txt

-rw-r--w- 1 root root 11 aug 23 07:11 demofile.txt

***Que. What is Umask ? what is default umask for root and local user?***

-->umask is used to set default permissions for newly created files and directories

Calculate umask:

full permission - default permission =umask

>For root user default umask is 022

*777 - 755 =022 root -->dir*

*666 - 644 =022 root -->file*

>For local user default umask is 002

*777 - 775 =002 local user -->dir*

*666 - 664 =002 local user -->file*

#umask [to check current umask]

#umask 000 [to set umask value temp]

#vi /etc/bashrc or /etc/profile [permanently set umask for all users]

#source /etc/bashrc [to apply changes]

Calculate umask:

0 : read, write and execute

1 : read and write

2 : read and execute

3 : read only

4 : write and execute

5 : write only

6 : execute only

7 : no permissions

Ex. Suppose you want to set umask 013 which means u-g-o will have following permissions

User --->read, write and execute

Group --->read and write

Others --->read only

(max perm) 777 - 013 (umask) =764 [ rwxrw-r-- ]

***Que. What is special permission and its types?***

-->special permisssions allows user to acess command/file with owner permission

suid ->

Ex. We all know local user doesn’t have permission to run “dmidecode” command. If the root user gave suid permission for this command then local user will able to run this command

It means no which user run this command command it will execute with root permissions

*#Chmod u+s /sbin/dmidecode*

s ----to allow acess

S ---to deny acess

sgid ->

if we give SGID permission to particular directory and if file created in that directory by root user or local user that files will get directory group ownership automatically.

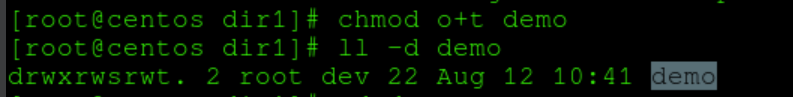




sticky bit ->prevent file from deletion

If Sticky bit is enabled on a folder, the folder contents are deleted by only owner who created them and the root user, no one else can delete other users data in this folder







**Que.What is ACL? And how to set acl?**

--> Access Control List

ACL use to set permission over file and directory to specific user or specific group.

#getfacl --to check permission

#setfacl --to apply acl permission

#setfacl -m u:sam:rw file.txt



-x to remove



Set acl to group dev:



To remove group acl :



* Archiving and Compression

Archiving -->it is the process of combining multiple files and directories

tar ---> tape archive

#tar <options> <compress-filename>.tar <files to be compressed>

options

-c create an archive

-f file name[compulsary]

-v view/verbose

-t list the content from archieve

-x execute the content from archive --extract

-p preserve permission when extracting file/dir

-C copy content from an archieve to another directory

*#du -sh /mydir ---check size of file/dir*

1> archiving using tar

***#tar -cvf /backup.tar /etc***

#du -sh /backup.tar

2>listing archiving file

#tar -tvf /backup.tar

3>extract archive files

***#tar -xvf /backup.tar*** ---extract at current location

#tar -xvf /backup.tar -C /demo/ ---extract at other dir

#du -sh /demo/etc

Compression -->it is the process of reducing the size of a file or directory

1. gzip >----fasssssssssssst <gunzip

2. bzip2 >----slow <bunzip2

3. xz >---very slow <unzip

#################################

#gzip -z <filename>.tar.gz

#bzip2 -j <filename>.tar.bzip2

#xz -J <filename>.tar.xz

---------------------------------------------------

compression using tar command:

#du -sh /etc

#tar -czvf /backup1.tar.gz /etc ---comp. with gzip

--------------------------------------------------

extraction using tar command:

#mkdir /backgz

#tar -xzvf /backup1.tar.gz -C /backgz -----extract to other folder

-----------------------------------------------------

compression using gzip command:

#du -sh /etc

#tar -cvf /etc.tar /etc

#ls

#du -sh /etc.tar

#gzip /etc.tar ----compress etc.tar archive file using gzip

#du -sh /etc.tar.gz

-----------------------------------------------------------------------------

extract using gzip:

#gunzip /etc.tar.gz

* Package management

packages=software -> are the collection of programs.

dependency ->package requires shared library or another package

***Que. How to install any package in linux?***

->Low-level tool :[rpm]

manages package files installation, update and uninstallation

Red Hat ->rpm

Debian ->dpkg

->high-level tool:[yum]

install the package with their dependencies.

red hat->yum

Debian ->apt-get

mac-os ->brew

steps: open firefox

search for tree binary package

copy binary package url

on terminal type wget and paste the url using cntrl+shift+v

now install the package using rpm

#wget --> used to download package

#curl -->also download package [curl -o] and shows output

#rpm: It only install the package and not the dependency.

#rpm <option> <package-name>

-i install package file

-v verbose/view

-h show hash bar

-U Upgrade package

-q query package

-e erase package

#rpm –ivh tree-1.6.0-10.e17.x86\_64.rpm

#yum: It download package with along with its dependencies

#yum <option/action> <package-name> [<-y/-d/-n>]

>install

>update

>list

>info

>remove

>history

>repolist

>clean ----clean cache

-------------------------------------------------------

CREATE OWN REPOSITORY:

repository --> is a storage location which is used for installing and updating software packages

#yumdownloader httpd tree

#mkdir /my\_packages

#createrepo -v /my\_packages -->create metadata using createrepo command

#cd /etc/yum.repos.d

#vim myrepo.repo -->create repository with .repo extention

[server]

name=myrepo

baseurl=file:///my\_packages --->path of metadata dir

enabled=1

gpgcheck=0

#yum clean all

#yum repolist all

#yum list tree

#yum install tree -y

------------------------------------

#yum grouplist

#yum groupinstall groupname

#yum groupremove grpname

#yum autoremove

error:cant find base url for repo/7/x86\_64

-->/etc/sysconfig/network-scriprt/ifcfg-enpo3

onboot=yes

* Partition

--> Storage is a process through which digital data is saved within a data storage device

-->Disk partition is the method of dividing hard drive into multiple logical storage

1Byte = 8 bits

1024 byte=1 kb

bytes,kilobytes,megaabytes,terrabytes,exabyte, then zettabyte and yottabyte.

ATA

defines how data is transferred between a computer's motherboard and storage devices, such as

\*hard disk drives

\*solid-state drives

[SATA] Serial Advanced Technology Attachment [data is transferred one by one]

[PATA]Parallel Advanced Technology Attachment [multiple data bits at the same time ]

Virtual

***Que. Types of partition:***

MBR--master boot record [max->4=3p,1e]

GPT--guid partition table [max ->128]

------------------------------------------------------------------------------------------

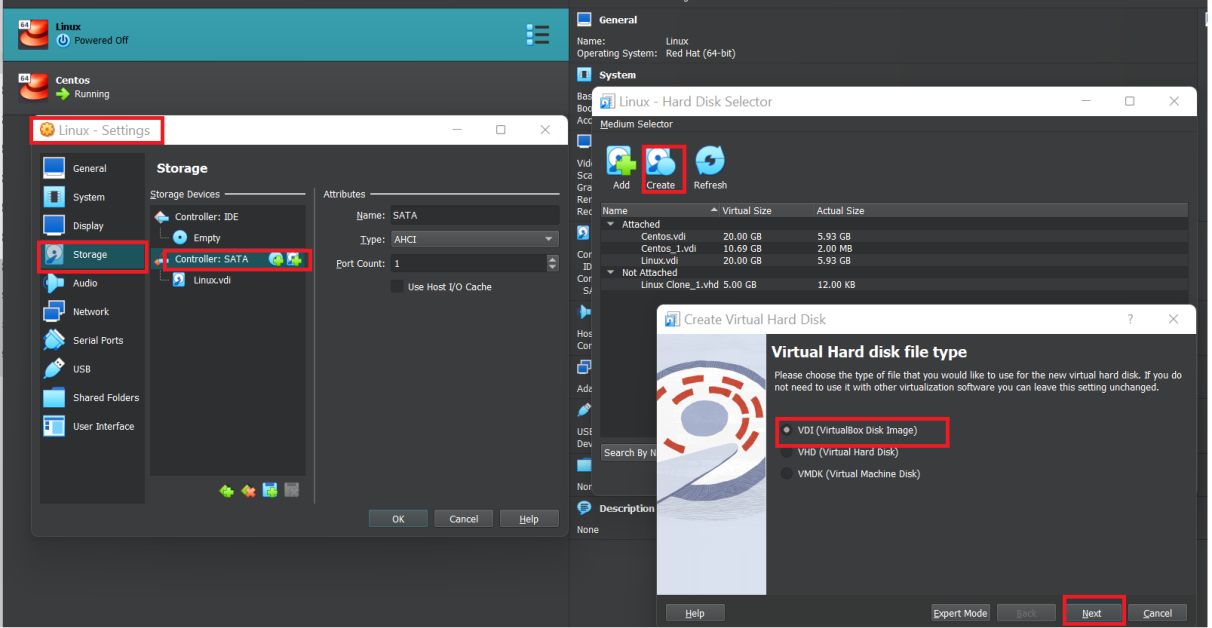
du -sh /dir name -->check size of dir

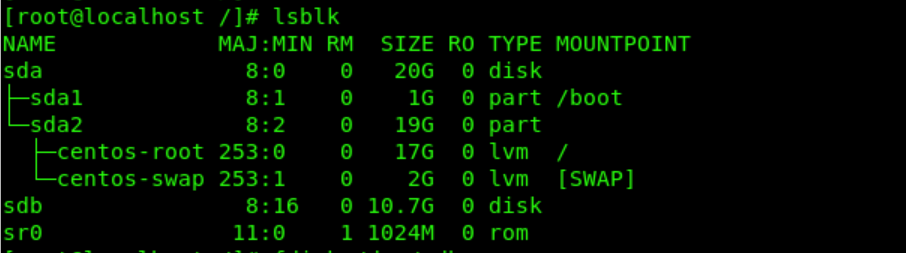
df -hT -->check file type with mount point

fdisk -l -->disk detiail

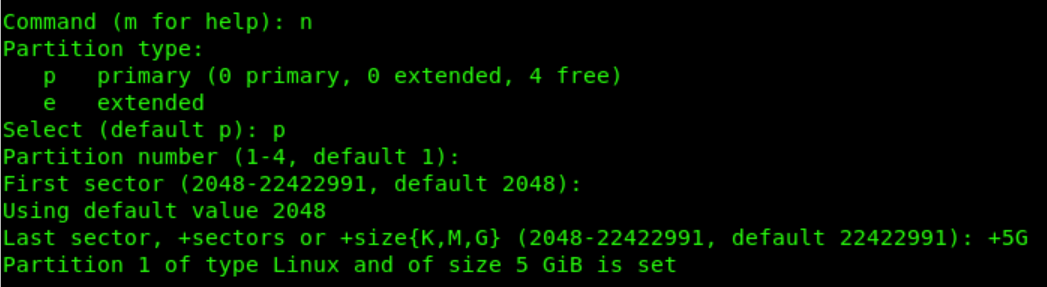
lsblk -->listing blocks,shows system partition

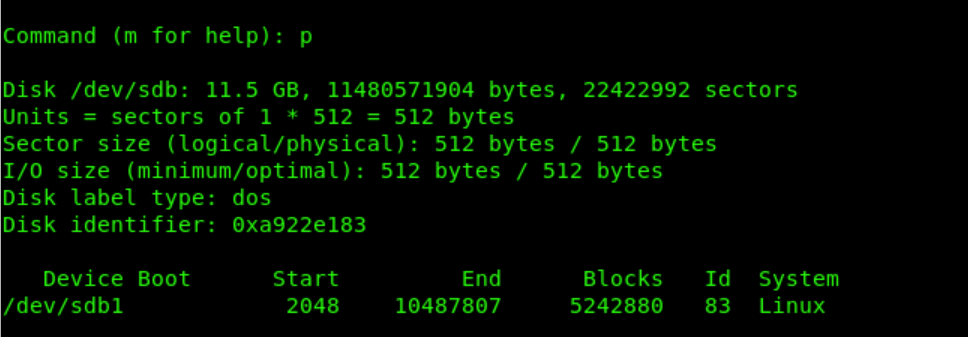
Add new disk

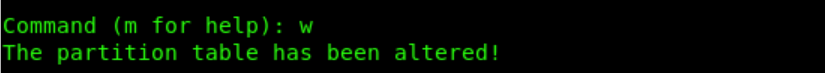




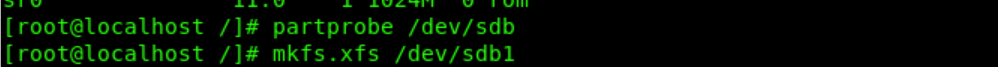




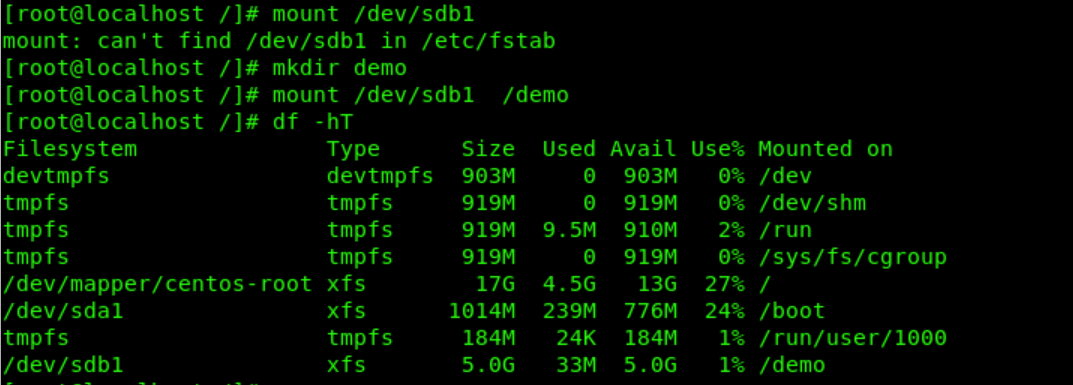




* Use partprobe command to save changes in kernel [it does not required reboot]
* Now give the attached a file system to a partion using mkfs command



* Mount the partion to some location here I am creatiing one dir with the name demo and mounting partition to this dir

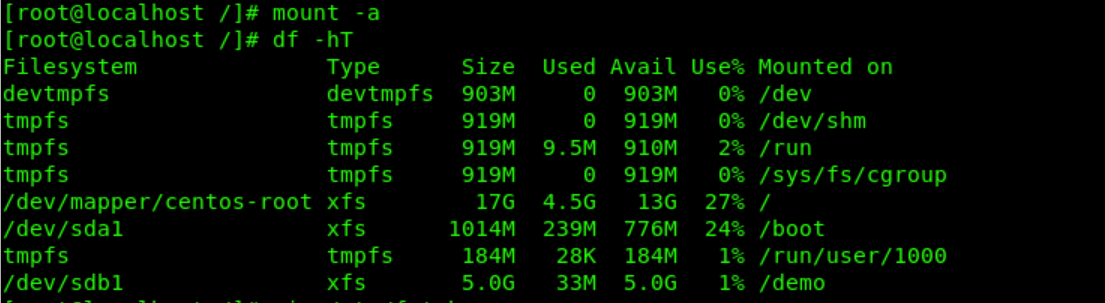


***Que. How to mount drive permanently?***





---

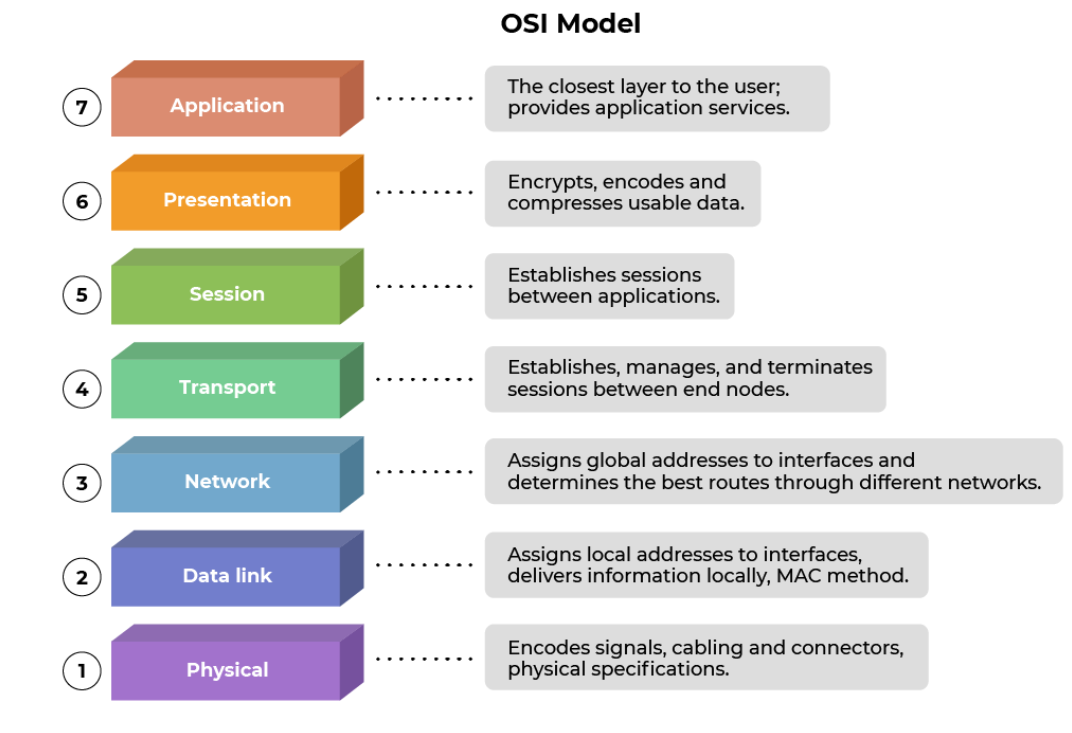


* Networking

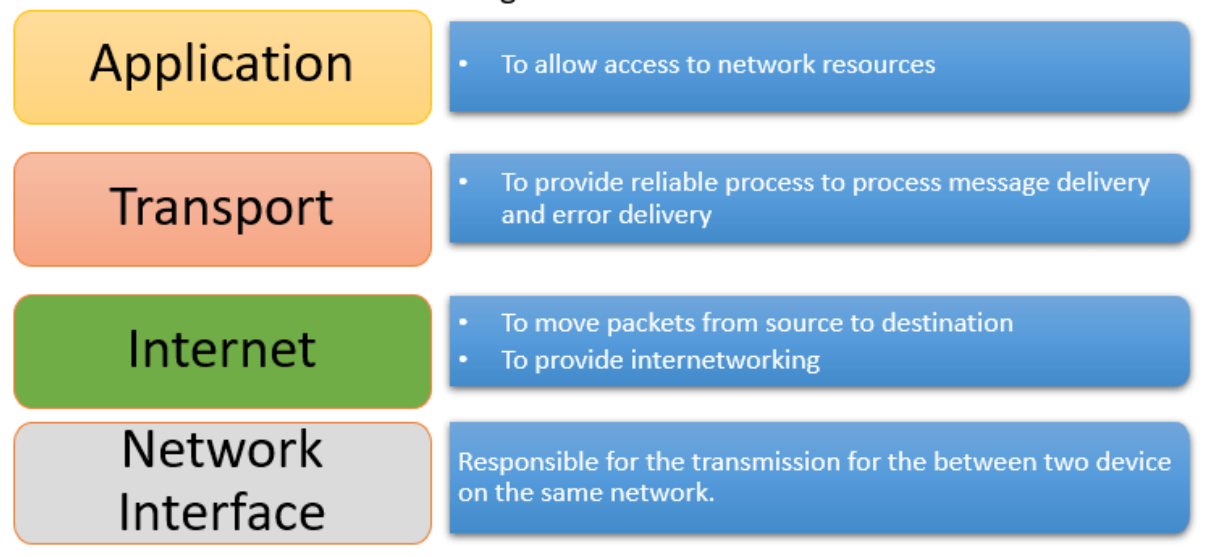
1. OSI -open system interconnection

***Que. Explain 7 layers of osi model ?***

The OSI Model is a framework for how networking systems communicate and transmit data between sender and receiver.



[2]TCP/IP



#Networking Devices:

Hub, bridge, switch, and router are all networking devices used to connect and manage network traffic

1. Hub

- A hub is a basic networking device that operates at the physical layer (Layer 1) of the OSI model.

- It is essentially a multi-port repeater, which means it takes incoming data on one port and broadcasts it to all other ports.

2. Bridge

- A bridge is a device that operates at the data link layer (Layer 2) of the OSI model.

- It is used to filter and forward network traffic based on MAC (Media Access Control) addresses.

3. Switch

- operates at the data link layer (Layer 2).

- It is similar to a bridge but is typically more intelligent and has a larger number of ports.

- Switches use MAC address tables to make forwarding decisions, allowing them to selectively forward traffic only to the appropriate port rather than

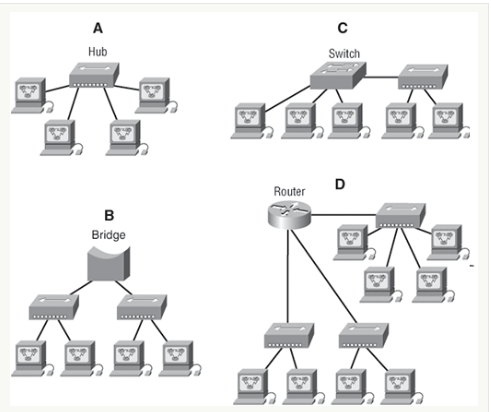
broadcasting it to all ports.

4. Router

- A router operates at the network layer (Layer 3) of the OSI model.

- It is a more complex networking device that is used to connect different networks (e.g., local area networks or LANs) and make decisions about where to

forward data based on IP (Internet Protocol) addresses.



In networking, a topology refers to the physical or logical layout of devices and the connections between them within a network.

1. Bus Topology

- In a bus topology, all devices are connected to a single central cable (the bus).

2. Star Topology

- In a star topology, each device is connected directly to a central hub or switch

- Star topologies are common in Ethernet LANs and are easy to manage.

3. Ring Topology

- In a ring topology, devices are connected in a circular fashion, with each device connecting to exactly two other devices.

- Data travels around the ring in one direction until it reaches its destination.

4. Mesh Topology

- In a mesh topology, every device is connected to every other device in the network.

- Mesh topologies provide redundancy and fault tolerance because multiple paths exist for data to travel.

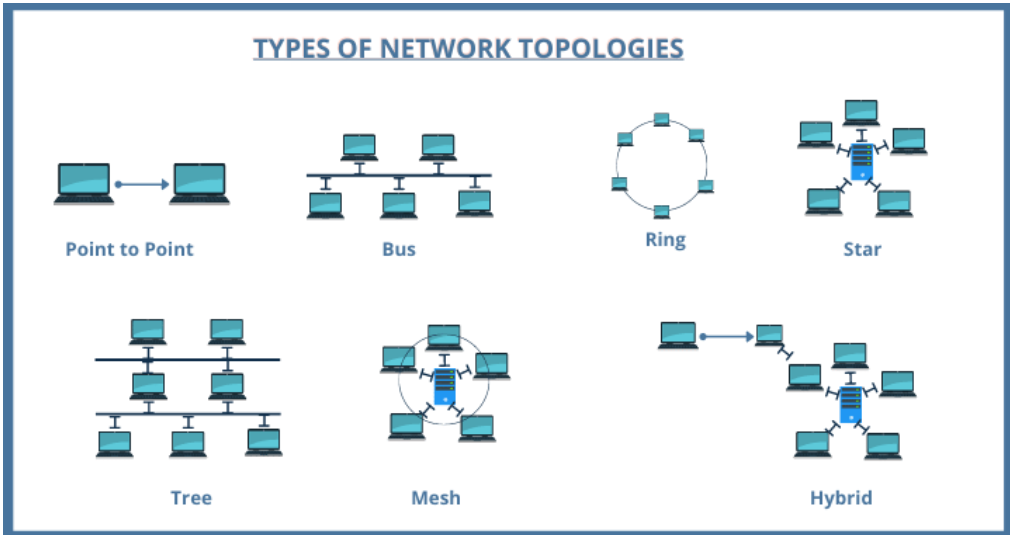
5. Point-to-Point Topology

- Point-to-point topology involves connecting each device to a single, dedicated link or channel.

- This type of topology is commonly used for direct communication between two devices, such as in a WAN (Wide Area Network) link.

6. Hybrid Topology

- Hybrid topologies combine two or more different topologies.



Types of computer networks:

1. LAN (Local Area Network)

- A LAN is a network that covers a small geographical area, such as a single building, office, or campus.

- Common LAN technologies include Ethernet and Wi-Fi (Wireless LAN), and they are used to connect computers, servers, printers, and other devices within

a localized environment.

2. MAN (Metropolitan Area Network)

- A MAN is a network that covers a larger geographical area than a LAN but is still confined to a specific city.

- MANs are used to connect multiple LANs within a city

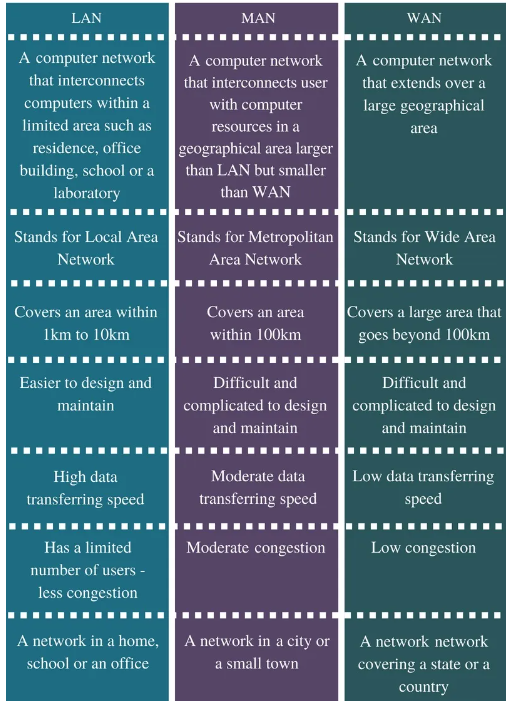
3. WAN (Wide Area Network)

- A WAN covers a much larger geographical area like cities, countries

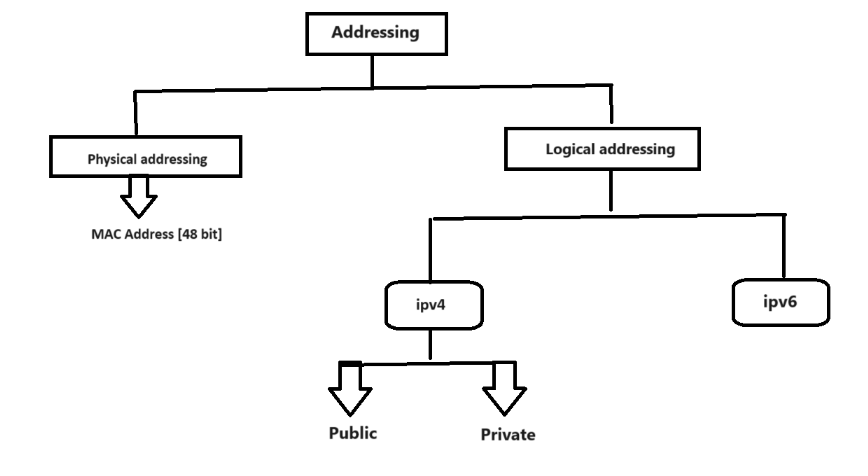
- The internet is a prime example of a global WAN, but private WANs are also used by organizations to connect their branch offices, data centers, and

remote locations.

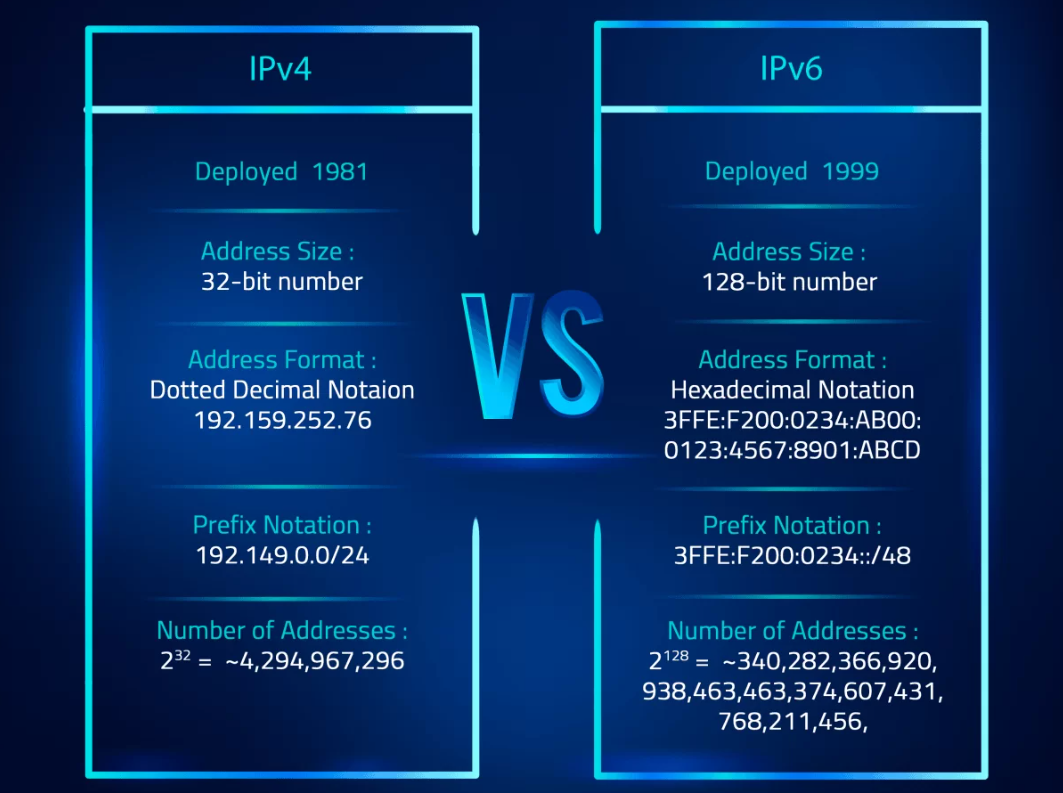
eg. VPNs (Virtual Private Networks)



ADDRESSING



***Que. Difference between ipv4 and ipv6***



***Que. Difference between public and private ip***

**Public IP Address**

1 Public IP Address is used to communicate outside the network.

2.Except private IP Addresses, rest IP addresses are public.

3.dynamic

**Private IP Address**

1. Private IP Address is used to communicate within the network.

|  |
| --- |
| 2. Private IP Address range:  10.0.0.0 – 10.255.255.255,  172.16.0.0 – 172.31.255.255,  192.168.0.0 – 192.168.255.255 |
| 1. static |

**Classful**

***Que. Explain Ipv4-Classes:***

Class A 1.0.0.0.0 - 126.0.0.0

Class B 128.0..0.0 - 191.255.0.0

Class C 192.0.0.0 - 223.255.255.0

Class D 224-239 -----research

Class E 240-255 ------research

Note: IP range 127.0.0.0 is reserved for loopback address[trouble shooting] which means an address that sends outgoing signals back to the same computer for testing

Network id ->It is a STARTING addressing of an IP [the first address is the network identification]

Broadcast id ->It is a LAST address of an IP [to transmit data to all of the hosts on the local subnet.]

Note:Both n/w id and bro. id are reserved by network [-2]

Subnet mask ->A subnet mask is for only internal usage within a network. Routers use subnet masks to route data packets to the right place

Ex. 192.168.1.0

Network id-192.168.1.0 ----host bit zero ----identify /represents network

Broadcast id-192.168.1.255 ----host bit 255 ----resvered to send msg to all

Subnet mask -255.255.255.0 ----network bits 255

**Classless**

#Sub-netting :helps you to breaks a big network into smaller parts, making it easier to manage, control, and use the available resources efficiently.

steps:

1)convert ip into binary

2) i) no of n/w = 2^n number of on bits

ii) no of usable host=2^total number of off bits [total zeros]

3)find subnet with magical number

ex. 1 1 0 0 0 0 0 0 here add two on bits and substract from max bits

256-192=64

1. subnet
2. Subnet range

* **Web Server**:

A web server stores and delivers web content to users over the internet. It handles requests from web browsers, retrieves web pages, and sends them to the users' devices. The most common protocol for communication is HTTP. Examples of web servers include Apache, Nginx, and Microsoft IIS.

**To run httpd server on linux :**

#yum install httpd

#systemctl start httpd

#systemctl enable httpd

#systemctl status httpd ---> active

#echo " welcome to cloudblitz" > ***/var/www/html/index.htm***l

open browser:

type- localhost

it will show content in the index.html file

"welcome to cloudblitz"

-----------------------------------------------------------------

**NGINX server**:

yum update

yum install epel-release -y ----download extra packages

yum install nginx

systemctl start nginx

systemctl enable nginx

systemctl status nginx

echo " welcome to nginx" >***/usr/share/nginx/html*** ----default dir for web pages

/etc/nginx/conf.d/default.conf. -------default server configuration

yum

note: if error delete httpd

add ports:

firewall-cmd --zone=public --add-service=http --permanent

firewall-cmd --zone=public --add-https

-------------------------------------------------------------

rm --rf /etc/nginx/sites-enabled/default

curl ipinfo.io/ip ----list the public ip

--------------------------------------------------------------

-------------------------------------------------------------------------

**Appache Tomcat server:**

8080 port

download java [1.8]

# yum install java-1.8\*

installation of tomcat

- download tomcat file

tomcat official site --> tomcat 8 --> copy zip file link --> on terminal download using

# wget https://dlcdn.apache.org/tomcat/tomcat-8/v8.5.93/bin/apache-tomcat-8.5.93.zip

unnzip the file

# unzip apache-tomcat-8.5.93.zip

# cd apache-tomcat-8.5.93

for tomcat start

# cd ***bin***

make sh file executable (permission)

# chmod +x \*.sh

tomcat start stop command

# ./catalina.sh stop

# ***./catalina.sh start***

#./startup.sh

setup student application

# cd apache-tomcat-8.5.93/bin

# ./catalina.sh stop

# cp student.war apache-tomcat-8.5.93/webapps/

# ./catalina.sh start

google hit

#localhost:8080/student

or

IP:8080/student

10 .0.0.11 --ip

n/w- 10.0.0.0

brod. id- 10.0.0.255

subnetmask- 255.0.0.0

------------------------------------------------------------------------------------------

* Services

***NFS:***

Network File System is a network protocol that allows computers to share and access files over a network.[share same storage ]

**port no:2049**

**Server**: 192.168.0.100

#yum install nfs-utils -y

#mkdir share

#chmod 777 share

**#vi /etc/exports**

->/share 192.168.0.200(rw,sync)

:wq

#systemctl start nfs-server

#systemctl start rpcbind

#systemctl stop firewalld.service

#exportfs -v

#exportfs -r

------------------------------------------------------------

**client**: 192.168.0.200

#yum install nfs-utils -y

#mkdir newshare

#chmod 777 newshare

#systemctl start nfs-server

#systemctl start rpcbind

#systemctl stop firewalld.service

#showmount -e 192.168.0.100 [server ip]

->/share\*

#mount 192.168.0.100:/share /newshare

#cd newshare

--------------------------------------

server:

#cd /share

#[share] mkdir linuxlab

------------------------------------------

client:

#[newshare] ls

->linuxlab

***SSH-Secure Shell:***

-> used to get access of another remote server

-> port no- 22

[ /etc/ssh/ssshd\_config]

-------------------------------------------------------

Lets suppose we have 2 servers

server -> 192.168.0.10

Client -> 192.168.0.12

Now i want to access server 2 from server 1

Two ways to access remote server:

1. password based

2. key based

a) public key [server]

b) private key [client]

**Server:**

1.Password based

[server /]# useradd user1

[server /]# passwd user1

**Client:**

ssh -i user1@192.168.10.0 -->ip of server

passwd: enter password

------------------------------------------------------------

2. key based

a) public key [server] id \_rsa.pub [who giving access]

b) private key [client] id\_rsa [who is taking access]

**Server:**

log in -> su - user1

->Generate key pair

#ssh-keygen

#cd .ssh

#ls

{ path - /home/user1/.ssh/id\_rsa

->cat id\_rsa --view key

->[chmod 600 --to authorised key] } if required

scp id\_rsa root@192.168.10.12:/mnt -->copy private key to client machine

Client:

ssh -i id\_rsa user1@192.168.10.0

***FTP:***

centralized database of an organization,used for transferring files between computers

Port no-

1. Data--> 20
2. Network --> 21

user-

1.anonymous ->no pass required /var/ftp ->only download

2.ftp user -> pass required /home -> upload and download

ftp server:192.168.0.100

client : 192.168.0.200

ftp server:

#yum repolist

#yum install vsftpd \* -y

#systemctl start vsftpd

#systemctl enable vsftpd

#firewall-cmd --add-service=ftp --permanent

#firewall-cmd --reload

#cd /var/ftp ->ls

#pub ->cd pub

#mkdir downloads

#touch files.txt

#cd /

#cmod 777 /var/ftp/pub

#getsebool -a | grep ftp --->check home dir on/off[copy 1st line]

#setsebool -P ftpd\_anon\_write on

#systemctl restart vsftpd

Client:

#yum repolist

#yum install ftp -y

#ping 192.168.0.100

#ftp 192.168.0.100

->name:anonymous

->no pass required [just press enter]

basic commands:

help ---to check commands

#ls ->cd pub ->cd downloads>ls

#get files.txt ---download file from server to local

#mget file1 file2 file3 ->press y to confirm [download multiple files]

#prompt --to skip confirmation

note:by default it will save files to current dir if you want change location use below command

#lcd /demo--to change local directory

ftp user

name:abhi

passwd :1234

#mget file1 file2 fil2

***DHCP:***

To provide client machine automatic ip address

->only single dhcp server work on network

-automatic assign dynamic ip address

-ip,subnet mask,gateway address,domain name,dns

Port: 67 and 68

DORA-process

Discover [broadcast discover package to network]

Offer [offer ip address]

Request [request]

Acknowledgement [yes need ip address]

Server-172.25.0.10

#yum install dhcp -y

#vi /etc/dhcp/dhcpd.conf

#cat /usr/share/doc/dhcp-4.2.5/dhcpd.conf.example

#cp /usr/share/doc/dhcp-4.2.5/dhcpd.conf.example /etc/dhcp/dhcpd.conf

#sed -i s/^/#/ /etc/dhcp/dhcpd.conf ---------comment all lines

#vi /etc/dhcp/dhcpd.conf

->:set nu

7->option name domain "hostname"

8->domain-name-server 172.25.0.10;

18->authoriative

27->#comment subnet mask

32->subnet 172.25.0.0 netmask 255.255.255.0

range 172.25.0.11 172.25.0.20

:wq

#systemctl start dhcpd

#systemctl enable dhcpd

#systemctl restart dhcpd

#firewall-cmd --add-service=dhcp --permanent

#firewall-cmd --reload

----------------------------------------------------------------------------

Client:

#ifconfig

#nmtui ----assign automatic ip instead of manual

#yum install dhcp -y

#ifdown enp0s3

#ifup enp0s3

#ifconfig

#systemctl restart NetworkManager

----------------------------------------

static ip:

{

host ---------.com

hardware ethernet --client machine mac id-;

fixed -addres ---ip

}

***DNS***

->It translates human-readable domain names into IP addresses, allowing users to access websites using names instead of numeric IP addresses.

User->Recursive DNS Servers->Root DNS Servers->TLD DNS Servers->Authoritative

DNS Servers ->Result

root dns->13 a-m

tld-top level domain

DNS Records:

A (IPv4)Record:

-> Maps a domain name to an IPv4 address.

Example: example.com. IN A 192.168.1.1

AAAA (IPv6 Address) Record:

-> Maps a domain name to an IPv6 address.

Example: example.com. IN AAAA 2001:0db8:85a3:0000:0000:8a2e:0370:7334

CNAME (Canonical Name) Record:

-> Used for creating aliases or subdomains.

Example: www.example.com. IN CNAME example.com

PTR (Pointer) Record:

->Used for reverse DNS lookups, mapping an IP address to a domain name.

Example: 1.1.168.192.in-addr.arpa. IN PTR example.com

/etc/named.conf

/etc/named.rfc1912.zones

f1.zone

r1.zone

/var/named

#nslookup example.com

->resolve ip address

#dig example.com

***-----------------------------------------------------------------***

***Mariadb:***

what is data?

->data means information. it could be names, numbers, dates, or any other

kind of information

what is database?

->a database is like a place where we store and organization's information

Types:

1. SQL -structured query language/ Relational

->SQL requires predefined schema[structured]

->SQL databases are well-suited for applications with structured data

and complex relationships, such as financial systems, e-commerce

platforms, and systems that requires data consistency.

->Examples: MySQL, PostgreSQL, Oracle Database, Microsoft SQL

Server

2.NoSQL- non-relational

->NoSQL requires dynamic schema[unstructured]

->NoSQL databases are suitable for applications with rapidly changing

or unstructured data, such as social media platforms, content

management systems, real-time analytics

->Examples: MongoDB, DynamoDB, Cassandra, Redis.

Installation steps:

yum install mariadb-server -y

vim /etc/my.cnf ---configuration file[skip-networking=1 --cant acess remotely]

systemctl start mariadb

systemctl enable mariadb

systemctl status mariadb

firewall-cmd --add-service=mysql --permanent

firewall-cmd --reload

---------------------------------------------------

mysql\_secure\_installation

..set root password for mariadb

->just press enter

->set root passwd ->y

->-y

->-y

------------------------------------------------------

mysql -u root -p -----login into server

enter password:

Basic database commands:

>show databases;

>create database database\_name;

>use database\_name;

>create table student\_info (Name varchar(20), RollNo int, City Varchar(20));

>show tables

>describe student\_info

>insert info student\_info values ('user1',22,'Nagpur');

>select \* from student\_info; ---view data from table

>select name from student\_info where city='nagpur'

------------------------------------------------------------

Backup:

note:

> backup

< retrive

mysql -u root -p student\_data > students.bkp -take backup

#mysql -u root -h localhost -p 1996 student\_data < aniket.bkp

* BOOTING PROCEDURE

1. BIOS – Basic input/output System

first program to execute[POST-power on self test- all working properly] check bootable device os load

kernel

2. MBR – Master Boot Record [512 bytes]

boot loader [which partition]

partition table

3. GRUB2 – Grand Unified Boot loader

path --> / boot/grub2/grub.cfg

load kernel into memory[RAM]

4. Kernel – Kernel

mount partitions

5. Systemd – First process of system start all the necessary processes

/etc/systemD/system/default.target

init/systemD

#ps -ef|grep systemd

* Firewall

A firewall is a network security device or software that monitors and controls incoming and outgoing network traffic based on predetermined security rules.

#systemctl stop firewalld

#systemctl start firewalld

#firewall-cmd --add-service=httpd --permanent

firewall-cmd --help | grep forward

->firewall-cmd --list-all

->firewall-cmd --add-forward-port=port=80:proto=tcp:toport=8888 --permanent

->systemctl restart firewalld

->->firewall-cmd --list-all

* Log Management:

[root@ip-172-31-24-16 ~]# tail -5 /var/log/messages

Jan 30 04:43:47 ip-172-31-24-16 amazon-ssm-agent: </body>

Jan 30 04:43:47 ip-172-31-24-16 amazon-ssm-agent: </html>

Jan 30 04:45:08 ip-172-31-24-16 dhclient[3012]: XMT: Solicit on eth0, interval

131720ms.

**Date and time:** Every log message starts with a timestamp. For filtering purposes,

**Host:** The host the message originated from. This is relevant because rsyslogd can be

configured to handle remote logging as well.

**Service or process name:** The name of the service or process that generated the message.

**Message content:** The content of the message, which contains the exact message that has

been logged.

Questions Linux:

1. What is the Linux operating system, and how does it differ from other operating systems?
2. Describe the role of the Linux kernel in the operating system.
3. Name a few popular Linux distributions and their specific use cases.
4. Describe the directory structure of Linux.
5. What is the root directory in Linux, and why is it significant?
6. How do you list files and directories in a directory using the command line?
7. Explain the purpose of the ls, cd, pwd, and mkdir commands.
8. File Permissions and Security:
9. Explain the concept of file permissions in Linux.
10. How do you change file permissions using numeric notation and symbolic notation?
11. What is the umask command used for?
12. How can you change the ownership of a file or directory using the command line?
13. What is the purpose of the sudo command, and how is it used to manage permissions?
14. Process Management:
15. How do you list currently running processes on a Linux system?
16. Explain the significance of the process ID (PID) in Linux.
17. How do you terminate a running process using the command line?
18. What is the purpose of the ps and top commands?

Networking and Services:

1. How can you find the IP address of a Linux system?
2. What is the purpose of the ping command, and how does it work?
3. System Monitoring and Performance:
4. How can you check CPU and memory usage on a Linux system?
5. Explain the purpose of the top command.
6. What is the load average?
7. System Logs:
8. Where are system log files typically stored in Linux?
9. Explain the purpose of the dmesg command.
10. How can you view the contents of log files using the command line?
11. SSH and Security:
12. What is SSH, and how does it provide secure communication?
13. How do you generate SSH key pairs, and why are they useful?
14. Explain the process of securing SSH access using key-based authentication.
15. Describe the purpose of the /etc/fstab file.
16. How do you list available disks and partitions on a Linux system?
17. Explain the steps to mount and unmount a filesystem using the command line.
18. What is the purpose of the du and df commands?
19. What is virtualization?
20. What is a web server, and what are some popular web servers in Linux?

User Management:

1. How do you create a new user in Linux using the command line?
2. Explain the purpose of the `/etc/passwd` file and its fields.
3. What is the difference between the user's login name (username) and the user's full name (gecos field)?
4. How can you set a password for a user account using the command line?
5. Describe the purpose of the `/etc/shadow` file in Linux.
6. How do you lock and unlock a user account?
7. What is the `useradd` command, and what are its common options?
8. How can you modify the properties of an existing user account using the `usermod` command?
9. Explain the concept of the default shell for a user account and how you can change it.
10. What is the `passwd` command used for, and how can a user change their password?
11. Group Management
12. What is the purpose of user groups in Linux?
13. How do you create a new group using the `groupadd` command?
14. How can you add a user to an existing group using the `usermod` command?
15. Explain the difference between a primary group and a supplementary group.
16. How can you list the groups a user belongs to using the `groups` command?
17. Describe the significance of the `/etc/group` and `/etc/gshadow` files in group management.
18. What is the purpose of the `newgrp` command, and how is it used?
19. How can you change the primary group of a user using the `usermod` command?
20. Explain the concept of group ownership of files and directories in Linux.
21. How do you grant read, write, and execute permissions to a group for a specific file?
22. Basic Permissions:
23. What are the three basic permissions in Linux file systems?
24. Explain the meanings of read, write, and execute permissions for files and directories.
25. How can you view the permissions of a file using the ls command?
26. Describe the output of the ls -l command and how it displays permissions.
27. Default Permissions and umask:
28. What is the default permission mode for newly created files and directories?
29. Diff. Apache and nginx
30. Diff tcp and udp protocol
31. Question set:
32. Que.What is ACL? And how to set acl?
33. Que. What is special permission and its types?
34. Que. What is Umask ? what is default umask for root and local user?
35. Que. What is Default Permission for root and local user?
36. Que.How to change owner and group owner?
37. Que. Diff between Hard link and soft link
38. Que. What is the user id of a root user ?
39. Que. How do you Assign Admin to group?
40. Que. Exxplain the Fields of /etc/gshadow
41. Que.what are the Fields of /etc/group ?
42. Que. Explain password policy ?
43. Que. What are the Fields of /etc/passwd ?
44. Que. What happens when we add new user to system?
45. Que. What are the Re-directors used in linux?
46. Que. What is vi/vim and explain modes of vi?
47. Que. How many types of Users are there in linux ? explain ?
48. Que. What are various Distributions /Versions /Flavors of Linux ?
49. Que. Explain the FEATURES of Linux
50. Que. differences between windows and linux ?
51. Que . How to I check the available shells ?
52. Que . What is the command to change shell ?
53. Que . How to check current running shell ?
54. Que. Define shell and explain types of shells ?
55. Que. Explain the Architecture of Linux
56. Que.Can you explain what is Operating System
57. Que. how to extract archive files?
58. Que. what are the file compression methods in linux?
59. Que. Which is the low level tool to download any package in linux?
60. Que.Which is the High level tool to download any package in linux?
61. Que. What is diff between yum and rpm?
62. Que. diff between wget and curl command
63. Que.how many max partition can be done in mbr?
64. Que.What are the types of mounting?
65. Que. How to mount drive permanently?
66. Que.What is lsblk command does?
67. Que.what is the command to check mounting point and file system
68. Que. how to check size of perticular directory or file ?
69. Que. explain 7 layers of osi model
70. Que. Difference between OSI and TCP/IP
71. Que. Difference between public and private ip
72. Que. Difference between ipv4 and ipv6
73. Que. Explain Ipv4-Classes?
74. Que. What is the range of private ip addresses
75. Que. Wht is network id, broadcast id and subnet mask