g

Experiment: 1

Aim:

Familiarization of Hardware Components in a Computer.

CO1:

Install and configure common operating systems in virtual environment.

Procedure:

- **CPU**

The central processing unit (CPU) is the computer component that's responsible for interpreting and executing most of the commands from the computer's other hardware and software.All sorts of devices use a CPU, including desktop, laptop, and tablet computers, smartphones, even your flat-screen television set. Intel and AMD are the two most popular CPU manufacturers for desktops, laptops, and servers, while Apple, NVIDIA, and Qualcomm are big smartphone and tablet CPU makers.

- **Video Card**

The video card is an expansion card that allows the computer to send graphical information to a video display device such as a monitor, TV, or projector.Some other names for a video card include graphics card, graphics adapter, display adapter, video adapter, video controller, and add-in boards (AIBs).A staggering number of companies manufacture video cards, but almost every one includes a graphics processing unit (GPU) from either NVIDIA Corporation or AMD

- **Random Access Memory**

Random access memory (RAM) is fast-access memory that is cleared when the computer is power-down. RAM attaches directly to the motherboard, and is used to store programs that are currently running. RAM is a set of integrated circuits that allow the stored data to be accessed in any order (why it is called random). There are many different types of RAM. Distinctions between these different types include: writable vs. read-only, static vs. dynamic, volatile vs. non-volatile, etc.

- **Router**

The router, at least the common home network device that is usually called a router, is the piece of network hardware that allows communication between your local home network—like your personal computers and other connected devices—and the internet. The router used in home and small networks is more accurately called a residential gateway.

- **Power Supply Unit**

The power supply unit is the piece of hardware that converts the power provided from the outlet into usable power for the many parts inside the computer case.It converts the alternating current from your wall outlet into a continuous form of power called direct current that the computer components require.

It also regulates overheating by controlling voltage, which might change automatically or manually depending on the power supply.

- **Sound Card**

A sound card is a rectangular piece of hardware with numerous contacts on the bottom of the card and multiple ports on the side for connection to audio devices, such as speakers.The sound card installs in a PCI or PCIe slot on the motherboard.Since the motherboard, case, and peripheral cards are designed with compatibility in mind, the side of the sound card fits just outside the back of the case when installed, making its ports available for use.There are also USB sound cards that let you plug headphones, microphones, and maybe other audio devices into your computer through a small adapter that can plug directly into a USB port.

- **Optical Drive**

Optical Drives are used in PCs to read and write CDs and DVDs.The optical drive reads the data from the disc, which can then be transformed into a digital file that is readable by the computer.This makes it easy to backup files, play music or movies, or copy data from one disc to another.The term "CD" refers to Compact Discs, which are the most common type of optical drive on modern computers.

- **Bridges**

A network bridge joins two separate computer networks. The network bridge enables communication between the two networks and provides a way for them to work as a single network. Bridges extend local area networks to cover a larger physical area than the LAN can reach. Bridges are similar to — but more intelligent than — simple repeaters, which also extend signal range.

- **Solid State Drive (SSD)**

A solid-state drive (SSD) is a new generation of storage device used in computers. SSDs use flash-based memory, which is much faster than a traditional mechanical hard disk. Upgrading to an SSD is one of the best ways to speed up your computer. Learn how SSDs work and how to keep them optimized with a specialized performance-boosting tool.

Result:

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment:2

Aim:

Basic Linux Commands.

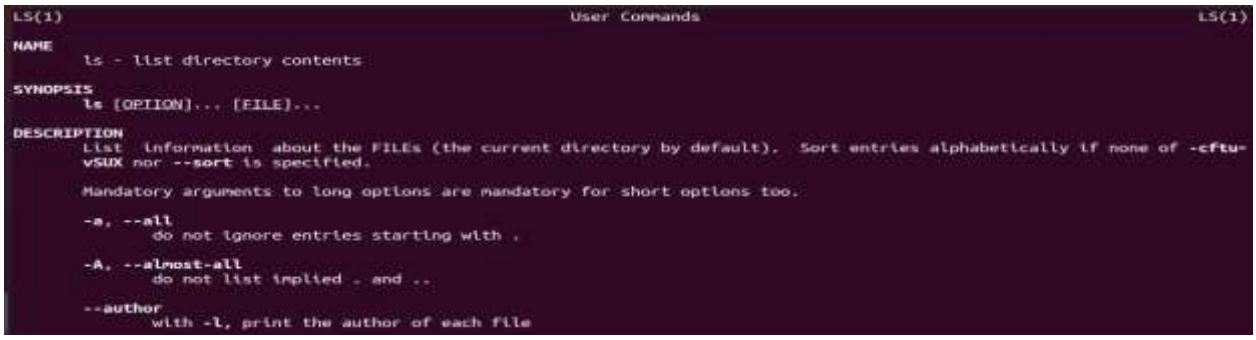
CO2:

Perform system administration tasks including network configurations, user creations and trouble shooting.

Procedure :

1. man :- An interface to system reference manuals
   $man ls

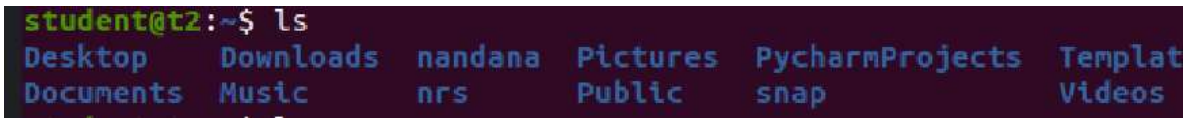
   Output:



2. ls:- list directory content

   $ls

   Output:



   a. ls -R :- list subdirectories recursively
      $ls -R

   b. ls -l :- Use long listing format
      $ls -l

```
student@t2:~$ ls -l
total 48
drwxr-xr-x 2 student student 4096 Jun 17  2022 Desktop
drwxr-xr-x 2 student student 4096 Jun 17  2022 Documents
drwxr-xr-x 2 student student 4096 Jun 17  2022 Downloads
drwxr-xr-x 2 student student 4096 Jun 17  2022 Music
drwxrwxr-x 2 student student 4096 Mar  6 12:57 nandana
drwxrwxr-x 2 student student 4096 Mar  7 15:25 nrs
drwxr-xr-x 2 student student 4096 Jun 17  2022 Pictures
drwxr-xr-x 2 student student 4096 Jun 17  2022 Public
drwxrwxr-x 3 student student 4096 Jun 17  2022 PycharmProjects
```

c. ls -a :- List hidden files
$ls -a

```
student@t2:~$ ls -a
.               .cache      .gnupg     nandana   PycharmProjects  Videos
..              .config     .java      nrs       snap
.bash_history   Desktop     .local     Pictures  .ssh
.bash_logout    Documents   .mozilla   .profile  Templates
.bashrc         Downloads   Music      Public    .thunderbird
```

d. ls -al :- list files and directories with detailed information such as permissions, size and owner
$ls -al

```
student@t2:~$ ls -al
total 104
drwxr-xr-x 22 student student 4096 Mar  7 15:05 .
drwxr-xr-x  6 root    root    4096 Jun 17  2022 ..
-rw-------  1 student student 1171 Mar  7 15:28 .bash_history
-rw-r--r--  1 student student  220 Jun 17  2022 .bash_logout
-rw-r--r--  1 student student 3771 Jun 17  2022 .bashrc
drwxrwxr-x 18 student student 4096 Mar  7 15:05 .cache
drwxr-xr-x 14 student student 4096 Mar  7 14:26 .config
drwxr-xr-x  2 student student 4096 Jun 17  2022 Desktop
```

e. ls -t :- Sort by modification time, newest first
$ls -t

```
student@t2:~$ ls -t
nrs       PycharmProjects  Desktop    Downloads  Pictures  Templates
nandana   snap             Documents  Music      Public    Videos
```

f. ls -r :- Reverse order while sorting
$ls -r

```
student@t2:~$ ls -r
Videos     snap             Public    nrs      Music      Documents
Templates  PycharmProjects  Pictures  nandana  Downloads  Desktop
```

- <u>read,echo</u>

  - read :- Read content of one line of input into a variable
    $read
  - echo $REPLY :- To print the input from the default variable

```
student@t2:~$ cd nandanars
student@t2:~/nandanars$ read
My name is Deepthi.
student@t2:~/nandanars$ echo $REPLY
My name is Deepthi.
```

echo $REPLY :- To print the input from the default variable

a. read var1 var2 var3 :- To read into specific variables

$read var1 var2 var3
$echo "[$var1][$var2][$var3]"

```
student@t2:~/nandanars$ read var1 var2 var3
My name is Deepthi.
student@t2:~/nandanars$ echo "[$var1][$var2][$var3]"
[My][name][is Deepthi.]
```

b. read input \ :- To read multiple lines
$read
My \
name is \
Deepthi

```
student@t2:~/nandanars$ read
my\
> name is\
> Deepthi
```

c. read -p :- Prompt text from user
$read -p "Enter your name"
$echo "my name is $REPLY"

```
student@t2:~/nandanars$ read -p "Enter your name"
Enter your name Deepthi
student@t2:~/nandanars$ echo "My name is $REPLY"
My name is  Deepthi
```

d. read -n :- Specify limit
$read -n 6 -p "Enter six characters only"

```
student@t2:~/nandanars$ read -n 6 -p "Enter 6 characters only"
Enter 6 characters only Deeptstudent@t2:~/nandanars$ S
```

e. read -s :-For security. Hides input
$read -s -p "Enter the password: "

```
student@t2:~/nandanars$ read -s -p "enter the password"
enter the passwordstudent@t2:~/nandanars$ echo "password is $REPLY"
password is  123456
```

3. more, less, cat

- more :-
It is similar to cat to display the content. The difference is that in case of larger files, cat command output will scroll off your screen while more command display output one screenful at a time.
$more finalfantasy.txt

```
The idea of an object in space so massive and dense that light could not escape it has been around for centuries. Most famously, black holes w
ere predicted by Einstein's theory of general relativity, which showed that when a massive star dies, it leaves behind a small, dense remnant
core. If the core's mass is more than about three times the mass of the Sun, the equations showed, the force of gravity overwhelms all other f
orces and produces a black hole.

Black Holes
A video about black holes.
Watch the video

Scientists can't directly observe black holes with telescopes that detect x-rays, light, or other forms of electromagnetic radiation. We can,
however, infer the presence of black holes and study them by detecting their effect on other matter nearby. If a black hole passes through a c
loud of interstellar matter, for example, it will draw matter inward in a process known as accretion. A similar process can occur if a normal
--More--(20%)
```

a. more +80 file.txt :- Will display content after the specified number of lines
$more +15 finalfantasy.txt

```
student@t2:~$ more +80 file2.txt
April 20, 2022  Black Holes Raze Thousands of Stars to Fuel Growth
April 13, 2022  Hubble Sheds Light on Origins of Supermassive Black Holes
April 7, 2022   Fermi Hunts for Gravitational Waves From Monster Black Holes
March 31, 2022  Feasting Black Holes Caught in Galactic Spiderweb (Spiderweb Galaxy Field)
February 22, 2022       How Magnetic Fields Help Feed a Supermassive Black Hole
January 19, 2022        Hubble Finds a Black Hole Igniting Star Formation in a Dwarf Galaxy
January 10, 2022        "Mini" Monster Black Hole Could Hold Clues to Giant's Growth (Mrk 462)
December 16, 2021       Astronomers Spy Quartet of Cavities From Giant Black Holes: RBS 797
December 9, 2021        Mini-Jet Found Near Milky Way's Supermassive Black Hole
November 10, 2021       Black Holes Can Tell Us the Expansion Rate of the Universe
September 16, 2021      Jingle, Pluck, and Hum: Sounds from Space
August 5, 2021  Huge Rings Around a Black Hole (V404 Cygni)


What We Study
```

b. more +/pattern file.txt :- Search and navigate towards a particular string and view all the instances.
$more +/classes finalfantasy.txt

```
student@t2:~$ more +/classes finalfantasy.txt

...skipping
low use of items.[95]

Like most RPGs, the Final Fantasy installments use an experience level
 system for character advancement, in which experience points are accu
mulated by killing enemies.[96][97][98][99] Character classes, specifi
c jobs that enable unique abilities for characters, are another recurr
ing theme. Introduced in the first game, character classes have been u
sed differently in each game. Some restrict a character to a single jo
b to integrate it into the story, while other games feature dynamic jo
b systems that allow the player to choose from multiple classes and sw
itch throughout the game. Though used heavily in many games, such syst
ems have become less prevalent in favor of characters that are more ve
rsatile; characters still match an archetype, but are able to learn sk
ills outside their class.[23][80][81]
```

c. more -p file.txt :- Clear the whole screen and then display the text.
$more -p file.txt

```
Last updated: March 13, 2023student@t2:~$ more file2.txt
Skip to main content
Home
NASA Science Mission Directorate
NASA SCIENCE
SHARE THE SCIENCE
Ask a Question
Ask a Question
Science Topics
News
For Researchers
Learners
Get Involved
```

d. more -d file.txt :- Helps the user to navigate according to instructions, [space to continue and ‘q’ to quit]
$more -d finalfantasy.txt

```
student@t2:~$ more -d file2.txt
Skip to main content
Home
NASA Science Mission Directorate
NASA SCIENCE
SHARE THE SCIENCE
Ask a Question
Ask a Question
Science Topics
News
For Researchers
Learners
Get Involved
Citizen Science
About Us
Español
```

4. cd, mkdir, pwd, find

- cd :- Change directory

$cd

Output:

```
/home/nandana_rs/.hushlogin file.
nandana_rs@NANDANA:~$ cd nandana
nandana_rs@NANDANA:~/nandana$
```

- mkdir :- Make directory

$mkdir demo

Output:

```
student@t2:~$ mkdir sampledire
student@t2:~$ cd sampledire
student@t2:~/sampledire$ ls
student@t2:~/sampledire$
```

- pwd :- print working directory

$pwd

Output:

```
student@t2: ~/nandanars
student@t2:~$ pwd
/home/student
```

- find - This command is used to locate a particular file from current directory.

$ find filename.txt

Output :

```
nandana_rs@NANDANA:~/nandana$ find nrsss.txt
find: ‘nrsss.txt’: No such file or directory
nandana_rs@NANDANA:~/nandana$
```

2. cp,mv,rm

- cp :- Copy the content
  1. cp file3.txt sr.txt : -Overwrite existing file
     $cp file3.txt sr.txt
     Output:

```
student@t2:~/marvels$ cp avengers marks1
student@t2:~/marvels$ cat marks1
Black widow
Spiderman
Ironman
Thor
```

  b. cp sr.txt output5.txt :- Copy into new file
     $cp sr.txt output5.txt
     Output:

```
student@t2:~/marvels$ cp avengers marks1
student@t2:~/marvels$ cat marks1
Black widow
Spiderman
Ironman
Thor
```

- mv :- move from one location to another or it can be used to rename a file. Content will be overwritten.
  $mv numbers Mark
  Output:-

```
student@t2:~$ ls
cars        Downloads  Music     Public          Templates
Desktop     Mark       Pictures  PycharmProjects  Videos
Documents   Marks.txt  profile   snap
```

  a. mv -b :- To take backup of a file while moving.
  $mv -b Mark profile
  Output:

```
student@t2:~$ mv -b file2 profile
student@t2:~$ ls
demo     detail.sh  Downloads  file5   Music     profile   Public          snap    Templates  Videos
Desktop  Documents  file1.txt  folder  Pictures  profile~  PycharmProjects  stu.sh  tilji
```

  b. mv -i :- Prompt confirmation from user before overwriting.
  $mv -i Marks.txt profile

Output:

```
student@t2:~$ mv -i profile4 profile5
mv: overwrite 'profile5'? y
```

- rmdir :- Remove empty directories
  $rmdir demo
  Output:

```
student@t2:~$ rmdir sampledire
student@t2:~$ cd sampledire
bash: cd: sampledire: No such file or directory
```

3. <u>wc, cut, paste</u>
   - wc :- Word count display number of lines, number of words, number of bytes and file name
     $wc file.txt
     Output:

```
student@t2:~/nandanars$ wc profile
 4 17 79 profile
```

   a. wc -l :- Display number of lines
   $wc -l file.txt
   Output:

```
student@t2:~/nandanars$ wc -l profile
4 profile
```

   b. wc -m :-Display number of bytes
   $wc -m file.txt
   Output:

```
student@t2:~/nandanars$ wc -m profile
79 profile
```

   c. wc -c :- Display number of characters
   $wc -c file.txt
   Output:

```
student@t2:~/nandanars$ wc -c profile
79 profile
```

   d. wc -w :-Display number of words
   $wc -w file.txt
   Output:

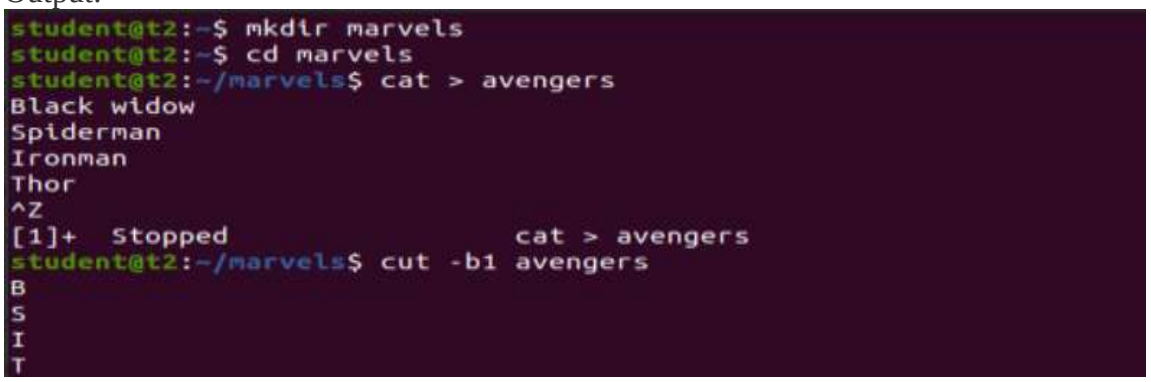
```
student@t2:~/nandanars$ wc -w profile
```

   e. wc -L :- Displays length of longest line
   $wc -L file.txt
   Output:

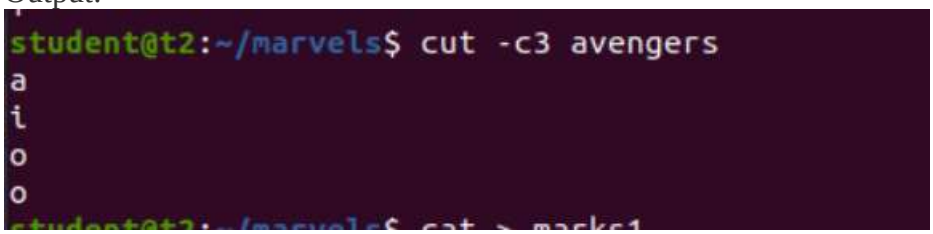
```
student@t2:~/nandanars$ wc -L profile
49 profile
```

- cut :- For cutting out the sections from each line of files and writing the result to standard output

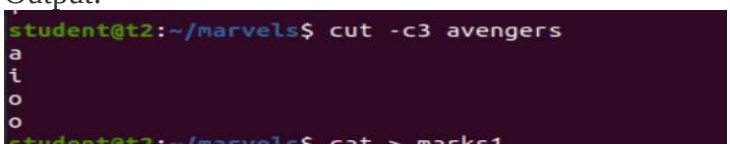
1. cut -b1 :- Cut by first byte position
   $cut -b1 file1.txt
   Output:



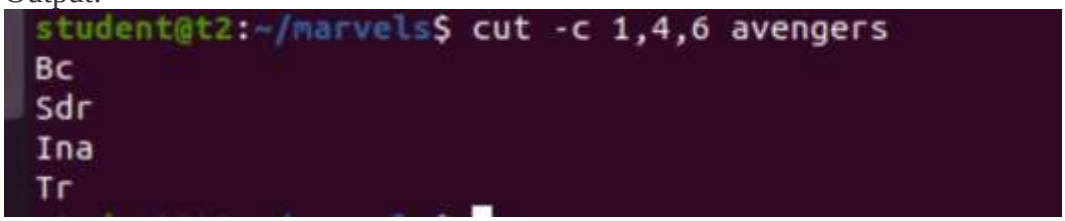
b. cut -c3 :- Cut by third character
   $cut -c3 file1.txt
   Output:



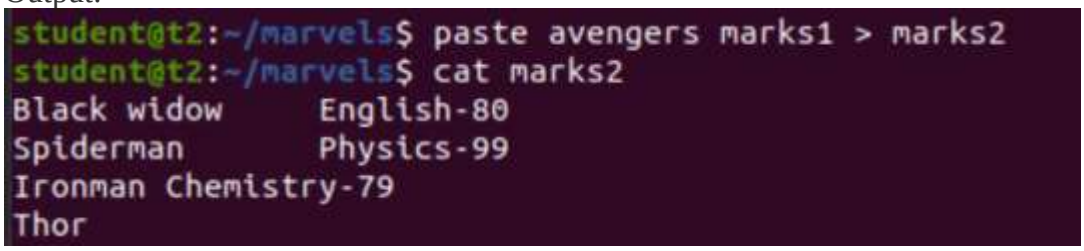
c. cut -d - -f1 file3.txt :- Cut by delimiter
   $cut -d - -f1 file3.txt
   Output:



d. cut -c :- Select only these characters
   $cut -c 1,3,5 file3.txt
   Output:



- Paste :- Merge lines of files
  $paste sr.txt file1.txt
  Output:



cat paste file1.txt output.txt> output3.txt :- Paste the merged content to new file
$paste file1.txt output.txt > output3.txt
Output:

```
student@t2:~/marvels$ paste avengers marks1 > marks2
student@t2:~/marvels$ cat marks2
Black widow      English-80
Spiderman        Physics-99
Ironman Chemistry-79
Thor
```

b. paste -d '%' file3.txt output.txt :- Separate the merged parts using a symbol(%)
$paste -d '%' file3.txt output.txt
Output:

```
student@t2:~/marvels$ paste -d '%' avengers marks2
Black widow%Black widow English-80
Spiderman%Spiderman     Physics-99
Ironman%Ironman Chemistry-79
Thor%Thor
```

4. head, tail, grep,

- head :- Used to display the first content of the file(Top 10 lines by default)
$head numbers

a. head -number filename:- Specific number of lines
$head -5 numbers

```
student@t2:~/nandanars$ head -5 demo.txt
1
2
3
4
5
```

- tail:- Used to display last contents of a file(last 10 by default)
$tail numbers
Output:

```
student@t2:~/nandanars$ tail demo.txt
6
7
8
9
10
11
12
13
14
15
```

a. tail -number filename :- Specific number of content from last
$tail -5 numbers
Output:

```
student@t2:~/nandanars$ tail -5 demo.txt
11
12
13
14
15
```

- grep :- Filtering and Searching content easily
$gerp 34 Mark
Output:

```
student@t2:~$ pwd
/home/student
student@t2:~$ mkdir nandanars
student@t2:~$ cd nandanars
student@t2:~/nandanars$ cat > marks.txt
Physics - 80
Chemistry - 90
Computer - 50
English - 40
Hindi - 100
^Z
[1]+  Stopped                 cat > marks.txt
student@t2:~/nandanars$ grep 50 marks.txt
Computer - 50
```

a. grep -i :- Case insensitive search of a particular content
$grep -i English marks
Output:

```
student@t2:~/nandanars$ grep -i English marks.txt
English - 40
```

b. grep -v :- Exclude that content during search
$grep -v 100 Marks

```
student@t2:~/nandanars$ grep -v 100 marks.txt
Physics - 80
Chemistry - 90
Computer - 50
English - 40
```

c. grep -A1 :- Specific content and one line after the content
$grep -A1 english Mark

Output:

```
student@t2:~/nandanars$ grep -A1 English marks.txt
English - 40
Hindi - 100
```

d. grep -B1 :- Specific content and one line before the content
$grep -B1 englishs Mark
Output:

```
student@t2:~/nandanars$ grep -B1 English marks.txt
Computer - 50
English - 40
```

e. grep -C1 :- Specific content and one lone before and after the content.
$gerp -C1 english Mark
Output:

```
student@t2:~/nandanars$ grep -C1 English marks.txt
Computer - 50
English - 40
Hindi - 100
student@t2:~/nandanars$
```

- expr :- Evaluate the given expression and display the output.
$expr 12 + 8
Output:

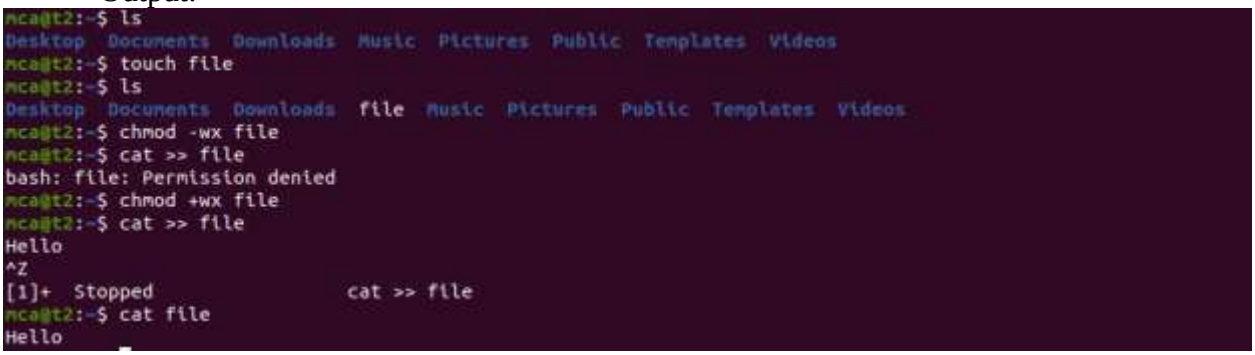
```
student@t2:~$ expr 12 + 8
20
student@t2:~$ expr 12 - 8
4
student@t2:~$ expr 12 \* 8
96
student@t2:~$ expr 96 / 12
8
```

b. expr x + y :- Add two variables obtained through read
$read x
$read y
$expr $x + $y
Output:

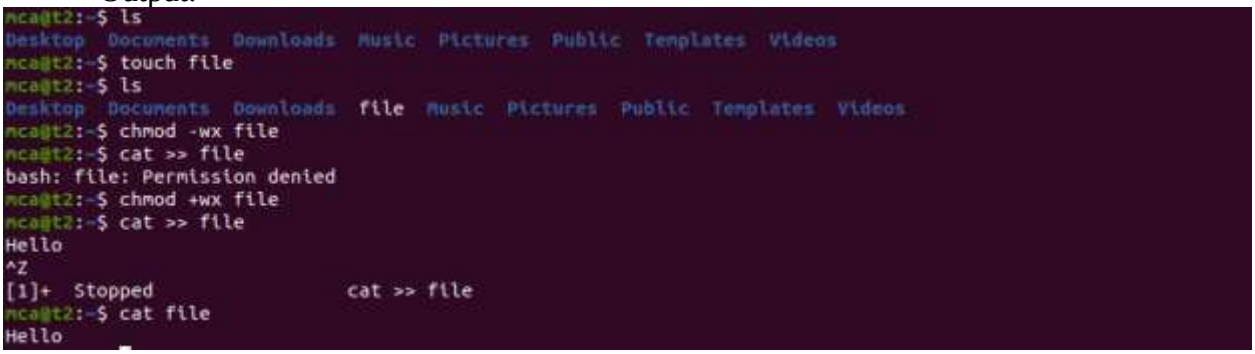
```
student@t2:~$ read x
25
student@t2:~$ read y
15
student@t2:~$ expr $x + $y
40
student@t2:~$ expr $x - $y
10
student@t2:~$ expr $x / $y
1
student@t2:~$ expr $x \* $y
375
```

5. <u>chmod, chown</u>
   - chmod :- Used to change the access permissions of files and directories. It stands for change mod namely, read(r), write(w), execute(x)
   1. chmod -wx file :- deny permission to write and execute for file

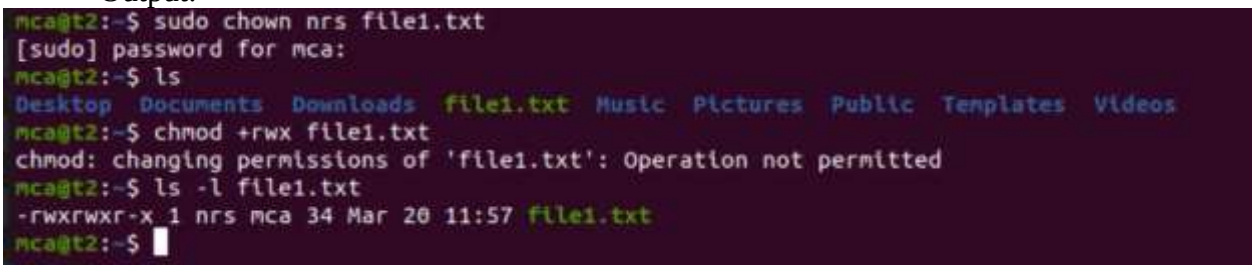
$chmod -wx file
Output:



b. chmod +wrx file :- give permission to write, read and execute for a file
$chmod +wrx file
Output:



- sudo chown :- Used to change ownership of a file or directory for a user or a group. It stands for change owner.
$sudo chown nrs file1.txt
Output:



6. useradd,usermod, userdel, passwd
   - sudo :- superuser do
   1. sudo useradd user :- Add new user
   $sudo useradd nrs
   Output:

b. sudo passwd user :- Update password of the user
$sudo passwd nrs
Output:

```
mca@t2:~$ sudo passwd nrs
New password:
Retype new password:
passwd: password updated successfully
mca@t2:~$ sudo groupadd -g 222 mcastudent
```

c. sudo groupadd -g identifier name:- To create new group
$sudo groupadd -g 269 mcastd

d. sudo usermod -G name user :- Add users to group
$sudo usermod -G mcastd nrss

e. id user :- Details on group name and numeric id of particular user.
$id nrs
Output:

```
mca@t2:~$ sudo groupadd -g 222 mcastudent
mca@t2:~$ sudo usermod -G mcastudent nrs
mca@t2:~$ id nrs
uid=1006(nrs) gid=1007(nrs) groups=1007(nrs),222(mcastudent)
```

7. df,top,ps

- df :- Get a report on disk utilization of the system
$df
Output:

```
student@t2:~$ df
Filesystem     1K-blocks     Used Available Use% Mounted on
udev             3966888        0   3966888   0% /dev
tmpfs             799004     1724    797280   1% /run
/dev/sda6      143135900 23082536 112712772  17% /
tmpfs            3995012    16248   3978764   1% /dev/shm
tmpfs               5120        4      5116   1% /run/lock
tmpfs            3995012        0   3995012   0% /sys/fs/cgroup
/dev/loop0         56960    56960         0 100% /snap/core18/2714
/dev/loop1        246656   246656         0 100% /snap/gnome-3-34-1804/24
/dev/loop2         83328    83328         0 100% /snap/gtk-common-themes/1534
/dev/loop6         55552    55552         0 100% /snap/snap-store/558
/dev/loop4         63488    63488         0 100% /snap/core20/1518
/dev/loop7           128      128         0 100% /snap/bare/5
/dev/loop9         51072    51072         0 100% /snap/snapd/18357
/dev/loop3        224256   224256         0 100% /snap/gnome-3-34-1804/77
/dev/loop5        260224   260224         0 100% /snap/gnome-3-38-2004/106
/dev/loop11       354688   354688         0 100% /snap/gnome-3-38-2004/119
/dev/loop14        56960    56960         0 100% /snap/core18/2708
/dev/loop13        47104    47104         0 100% /snap/snap-store/638
/dev/loop15       617856   617856         0 100% /snap/pycharm-community/323
/dev/loop8        617984   617984         0 100% /snap/pycharm-community/321
/dev/loop12        64896    64896         0 100% /snap/core20/1828
```

- du :- check how much space a file or directory in a given directory
$du file.txt
Output:

```
nandana_rs@NANDANA:~$ ls
1           arrayss.sh  divs.sh         large.sh    multi1.sh     namess.sh  oddeven.sh     studname.sh  test.sh
add.sh      calcu.sh    fibonacci.sh    logical.sh  multiple.sh   nandana    palindrome.sh  sub1.sh
addition.sh count.sh    file1           mod.sh      multiples.sh  nrs        relation.sh    sub2.sh
adds.sh     countss.sh  filename        mods.sh     name.sh       nrs.sh     relation2.sh   sub3.sh
amil        div.sh      firstprogram.sh mul.sh      names.sh      number.sh  studentname.sh sub4.sh
nandana_rs@NANDANA:~$ du large.sh
4       large.sh
nandana_rs@NANDANA:~$
```

- ps :- Stands for Process. Currently running programs and running instances.

1. $ps

```
mca@t2:~$ ps
    PID TTY          TIME CMD
   6498 pts/3    00:00:00 bash
   6748 pts/3    00:00:00 ps
```

b. ps -u :- Display all running processes of a particular user
$ps -u mca
Output:

```
mca@t2:~$ ps -u mca
    PID TTY          TIME CMD
   1363 ?        00:00:00 systemd
   1364 ?        00:00:00 (sd-pam)
   1370 ?        00:00:00 pulseaudio
   1372 ?        00:00:00 tracker-miner-f
   1377 ?        00:00:00 gnome-keyring-d
   1379 ?        00:00:00 dbus-daemon
   1383 ?        00:00:00 gvfsd
   1388 ?        00:00:00 gvfsd-fuse
   1407 ?        00:00:00 gvfs-udisks2-vo
   1412 ?        00:00:00 gvfs-mtp-volume
   1416 ?        00:00:00 gvfs-goa-volume
   1421 ?        00:00:00 goa-daemon
```

c. ps -C :- Specific process
$ps -C firefox
Output:

```
mca@t2:~$ ps -C firefox
    PID TTY          TIME CMD
   2762 ?        00:13:35 firefox
```

d. ps -f –p PID :- List the process by id
$ps -f -p 2762
Output:

```
mca@t2:~$ ps -f -p 2762
UID          PID    PPID  C STIME TTY          TIME CMD
mca         2762    1426  9 13:37 ?        00:13:45 /usr/lib/firefox/f
```

8. ssh,ssh-keygen

- ssh user@ip address:- Stands for Secure Shell Protocol used to securely connect to a remote server or system. ssh is secure in the sense that it transfers data in encrypted form between host and client.
  $ssh mca@192.168.6.39

  Output:

```
mca@t2:~$ ssh mca@192.168.6.27
ssh: connect to host 192.168.6.27 port 22: Connection refused
```

  a. sudo apt-get install openssh -server :- Update port
  b. sudo ufw allow 22

  $sudo ufw allow 22

  Output:

```
mca@t2:~$ sudo apt-get install openssh-server
[sudo] password for mca:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  ncurses-term openssh-client openssh-sftp-server ssh-import-id
Suggested packages:
  keychain libpam-ssh monkeysphere ssh-askpass molly-guard
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
The following packages will be upgraded:
  openssh-client
```

```
mca@t2:~$ sudo ufw allow 22
Rules updated
Rules updated (v6)
mca@t2:~$ ssh mca@192.168.6.27
The authenticity of host '192.168.6.27 (192.168.6.27)' can't be established.
ECDSA key fingerprint is SHA256:cPWVnOOgVs1b5nCx+JioIgXDM99RkyFR3e6C0/MRbB4.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.6.27' (ECDSA) to the list of known hosts.
mca@192.168.6.27's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-26-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage
```

- ssh-keygen :- Generating a key for secure shell
  $ssh-keygen
  Output:

```
mca@t2:~$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/mca/.ssh/id_rsa): write
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Passphrases do not match.  Try again.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in write
Your public key has been saved in write.pub
The key fingerprint is:
SHA256:2mmBqjowAVs2V0/xBRWUejfHU4M2MQSST2JNyLmkpH8 mca@t2
The key's randomart image is:
+---[RSA 3072]----+
|     .. +oB*B*o  |
|. + .  + X.+.+...|
|.+ o  o = *.. ..o|
|o    . o .... o.o|
| .    o S  . . o.|
|o    . + E       |
|..  . . =        |
|.  .   .         |
|.o.              |
+----[SHA256]-----+
mca@t2:~$
```

Result:

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment 3:

Aim:

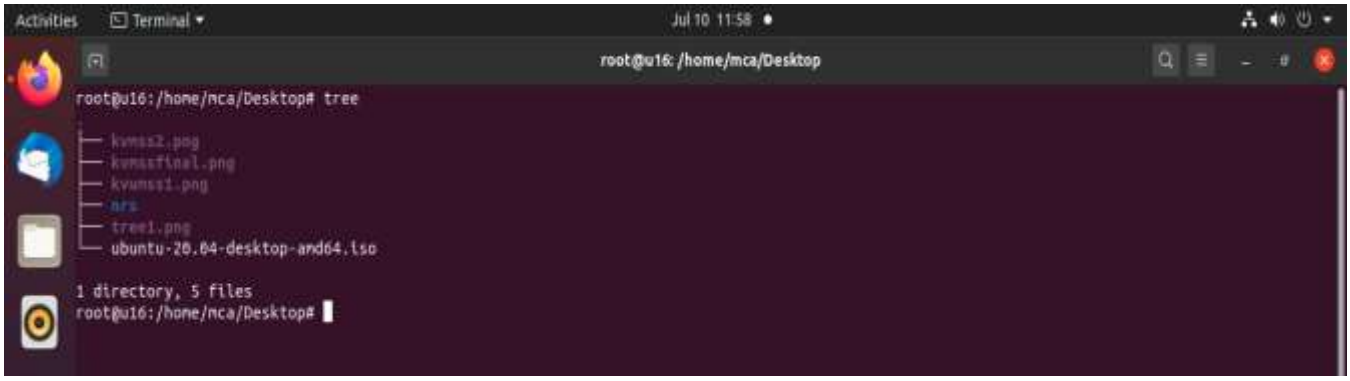
File system hierarchy in a common Linux distribution, file and device permissions, study of system configuration files in /etc, familiarizing log files for system events, user activity, network events.

CO2:

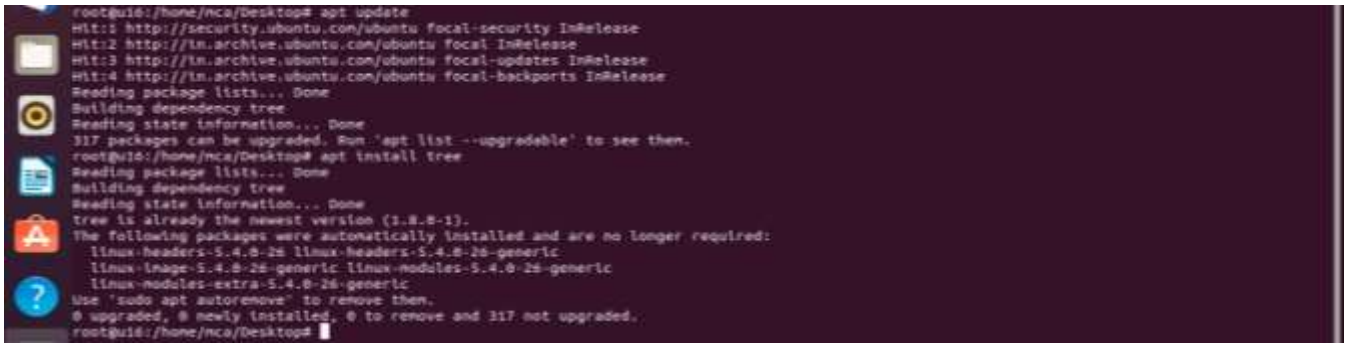
Perform system administration tasks including network configurations, user creations and trouble shooting.

Procedure:

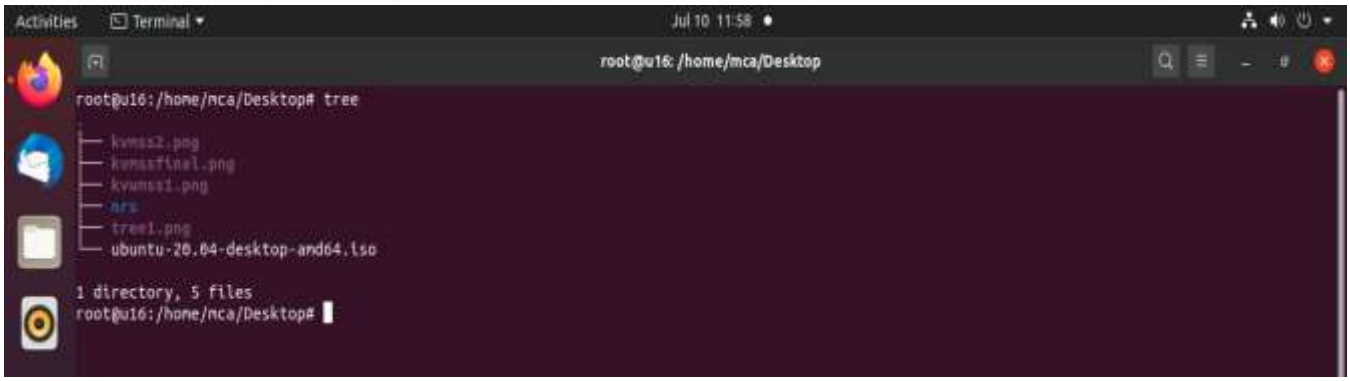
- Check whether the tree is installed or not.



- If not,then install it.



```
root@u16:/home/mca/Desktop# apt install tree
Reading package lists... Done
Building dependency tree
Reading state information... Done
tree is already the newest version (1.8.0-1).
The following packages were automatically installed and are no longer required:
  linux-headers-5.4.0-26 linux-headers-5.4.0-26-generic
  linux-image-5.4.0-26-generic linux-modules-5.4.0-26-generic
  linux-modules-extra-5.4.0-26-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 317 not upgraded.
```



- To display the directory structure of a given directory in a tree-like format.

```
mca@u28:~$ / bin
bash: /: Is a directory
mca@u28:~$ / etc
bash: /: Is a directory
mca@u28:~$
```

- Essential binary files which are accessible to all users.These files are betrayed for basic functioning and for various system operations and user interactions.

```
mca@u28:~$ tree /bin
/bin
├── [
├── aa-enabled
├── aa-exec
├── aconnect
├── acpi_listen
├── add-apt-repository
├── addpart
├── addr2line -> x86_64-linux-gnu-addr2line
├── alsabat
├── alsaloop
├── alsamixer
├── alsatplg
├── alsaucm
├── amidi
├── amixer
├── amuFormat.sh
├── apg
├── apgbfm
├── aplay
├── aplaymidi
├── apport-bug
├── apport-cli
├── apport-collect -> apport-bug
├── apport-unpack
├── appres
├── appstreamcli
├── apropos -> whatis
├── apt
├── apt-add-repository -> add-apt-repository
├── apt-cache
├── apt-cdrom
├── apt-config
├── aptdcon
├── apt-extracttemplates
├── apt-ftparchive
├── apt-get
```

- Contains all other directories and files.

```
mca@u28:~$ tree /root
/root [error opening dir]

0 directories, 0 files
```

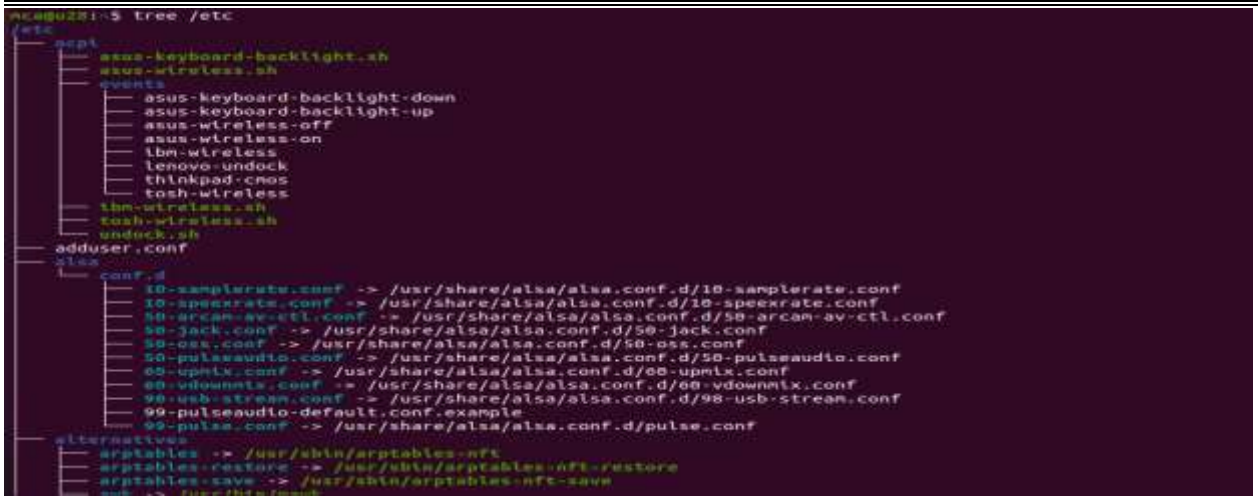
- Files required for boot process including kernel,boot loader and initial RAM disk.We want to load the OS and prepare the system for users.All the files required for booting are stored in boot directory.

```
mca@u28:~$ tree /boot
/boot
├── config-5.4.0-26-generic
├── efi [error opening dir]
├── grub
│   ├── fonts
│   │   └── unicode.pf2
│   ├── gfxblacklist.txt
│   ├── grub.cfg
│   ├── grubenv
│   ├── themes
│   ├── unicode.pf2
│   └── x86_64-efi
│       ├── acpi.mod
│       ├── adler32.mod
│       ├── affs.mod
│       ├── afs.mod
│       ├── ahci.mod
│       ├── all_video.mod
│       ├── aout.mod
│       ├── appleldr.mod
│       ├── archelp.mod
│       ├── ata.mod
│       ├── at_keyboard.mod
│       ├── backtrace.mod
│       ├── bfs.mod
│       ├── bitmap.mod
│       ├── bitmap_scale.mod
│       ├── blocklist.mod
│       ├── boot.mod
│       ├── bsd.mod
│       ├── bswap_test.mod
│       ├── btrfs.mod
│       ├── bufio.mod
```

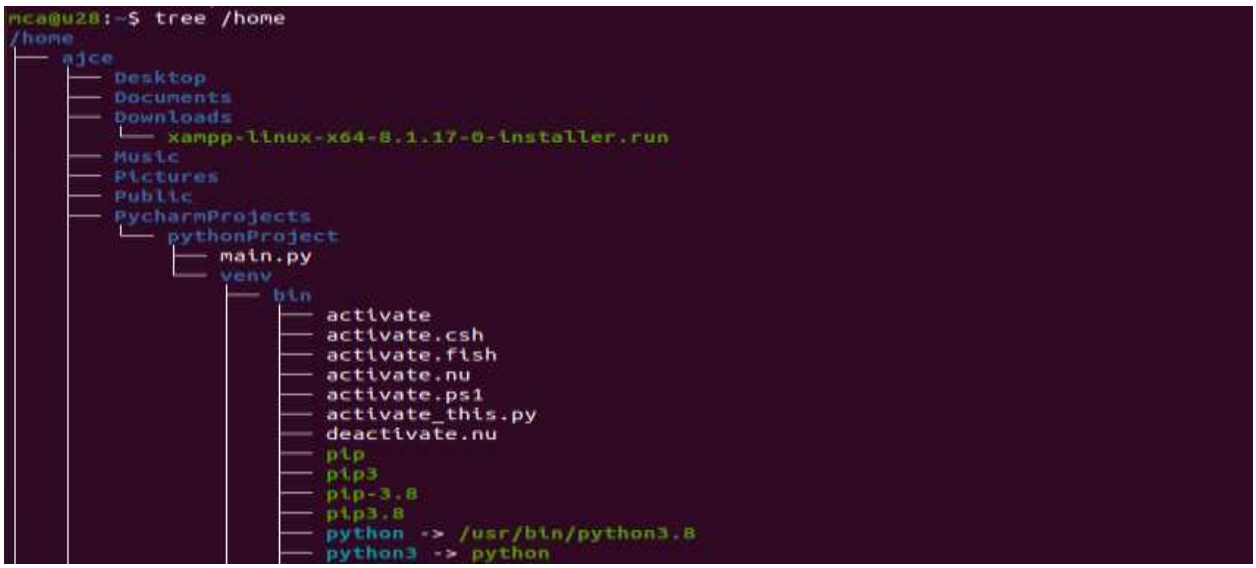
- Device files representing the physical & virtual devices such as CPU,printers,hard drives etc..

```
mca@u28:~$ tree /dev
/dev
├── autofs
├── block
│   ├── 7:0 -> ../loop0
│   ├── 7:1 -> ../loop1
│   ├── 7:10 -> ../loop10
│   ├── 7:11 -> ../loop11
│   ├── 7:12 -> ../loop12
│   ├── 7:13 -> ../loop13
│   ├── 7:14 -> ../loop14
│   ├── 7:15 -> ../loop15
│   ├── 7:16 -> ../loop16
│   ├── 7:17 -> ../loop17
│   ├── 7:18 -> ../loop18
│   ├── 7:19 -> ../loop19
│   ├── 7:2 -> ../loop2
│   ├── 7:20 -> ../loop20
│   ├── 7:21 -> ../loop21
│   ├── 7:22 -> ../loop22
│   ├── 7:3 -> ../loop3
│   ├── 7:4 -> ../loop4
│   ├── 7:5 -> ../loop5
│   ├── 7:6 -> ../loop6
│   ├── 7:7 -> ../loop7
│   ├── 7:8 -> ../loop8
│   ├── 7:9 -> ../loop9
│   ├── 8:0 -> ../sda
│   ├── 8:1 -> ../sda1
│   ├── 8:2 -> ../sda2
│   ├── 8:3 -> ../sda3
│   ├── 8:4 -> ../sda4
│   ├── 8:5 -> ../sda5
│   ├── 8:6 -> ../sda6
│   └── 8:7 -> ../sda7
├── bsg
│   └── 0:0:0:0
├── btrfs-control
```

- The system configuration files for various applications & services.Configuration files determine the behaviour,functionalities and the appearance of the software.



- Home directory for the regular users.



Result:

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment:4

Aim:

Shell Script problems.

1. Write a shell script to count lines and words in a file.
2. Shell Script to check a number is even or odd.
3. Shell script to check whether a number is positive or negative.
4. Shell script to find the greatest of three numbers.
5. Shell Script to demonstrate String Operators.
6. Shell Script to analyze people of certain age groups who are eligible for getting a suitable job if their condition and norms get satisfied using nested if statement.
7. Write a shell script to display the capital of a city in Kerala using case…esac statement.
8. Write a shell script to count the number in reverse direction.
9. Write a shell script to check whether the number is palindrome or not.
10. Write a shell script to check whether a given number is Armstrong or not.
11. Write a shell script to check whether a number is prime or not.
12. Write a shell script for factorial of a number.
13. Write a shell Script to print Fibonacci series.
14. Write a shell script to check if the current year is a leap year or not.

CO4:

Write shell scripts required for system administration.

Procedure:

1. readlink -f filename :- Get path of required file

```
$vi filename.sh
Press ‘i’ to INSERT
#!/bin/bash
file_path = “/home/Reqfilename.sh”
countlines = `wc –lines <  $file_path`
countwords = `wc –words < $file_path`
echo “Number of lines: $countlines”
echo “Number of words: $countwords”
Press ‘Esc’ to end INSERT
:wq!
chmod +x filename.sh
./filename.sh
Output:
```

```
nandana_rs@NANDANA:~$ vi count.sh
```

```
nandana_rs@NANDANA: ~
#!/bin/bash
file_path = "/home/nandana_rs/namess.sh"
countlines = `wc --lines < $file_path`
echo " countlines : $countlines"
~
```

```
To run a command as administrator (user "root"), use "sudo <comman
See "man sudo_root" for details.

nandana_rs@NANDANA:~$ vi count.sh
nandana_rs@NANDANA:~$ chmod +x count.sh
nandana_rs@NANDANA:~$ ./count.sh
```

```
number of lines : 2
number of word : 2
```

2.

vi filename.sh
Press ‘i’ to INSERT

```
#!/bin/bash
read -p "Enter a Number: " num1
if(( $num1 == 0  ))
then
        echo "$num1 is neither odd nor even number"
elif(( $num1 % 2 == 0 ))
then
        echo "$num1 is an even number"
else
        echo "$num1 is a odd number"
fi
```

Press ‘Esc’ to end INSERT
:wq!
chmod +x filename.sh
./filename.sh
Output:

```
nandana_rs@NANDANA:~$ vi oddeven.sh
```

```
nandana_rs@NANDANA:~$ chmod +x oddeven.sh
nandana_rs@NANDANA:~$ ./oddeven.sh
Enter a number : 3
 3 is odd
nandana_rs@NANDANA:~$ chmod +x oddeven.sh
nandana_rs@NANDANA:~$ ./oddeven.sh
Enter a number : 2
 2 is even
```

```
#!/bin/bash
read -p 'Enter a number : ' n

if [ `expr $n % 2` == 0 ]
then
        echo " $n is even "
else
        echo " $n is odd "
fi
~
~
```

3.

vi filename.sh
Press ‘i’ to INSERT

```
#!/bin/bash
read -p "Enter a Number: " num1
if(( $num1 > 0 ))
then
        echo "$num1 is a positive number"
elif(( $num1 < 0 ))
then
        echo "$num1 is a negative number"
else
        echo "$num1 is zero"
fi
```

Press ‘Esc’ to end INSERT
:wq!
chmod +x filename.sh
./filename.sh
Output:

```
nandana_rs@NANDANA:~$ vi number.sh
```

```
#!/bin/bash
read -p 'Enter a number : ' n

if [ $n -lt 0 ]
then
        echo "Negative"
elif [ $n -gt 0 ]
then
        echo "Positive"

else
        echo "Neithet positive nor negative "
fi
```

```
nandana_rs@NANDANA:~$ chmod +x number.sh
nandana_rs@NANDANA:~$ ./number.sh
Enter a number : 2
Positive
nandana_rs@NANDANA:~$ ./number.sh
Enter a number : -3
Negative
nandana_rs@NANDANA:~$ ./number.sh
Enter a number : 0
Neithet positive nor negative
```

4.

vi filename.sh
Press ‘i’ to INSERT

```
#!/bin/bash
read -p "Enter the first number: " num1
read -p "Enter the second number: " num2
read -p "Enter the third number: " num3
if(( $num1 > $num2 & $num1 > $num3 ))
then
        echo "$num1 is the greatest of the three"
elif(( $num2 > $num3 ))
then
        echo "$num2 is the greatest of the three"
else
        echo "$num3 is the greatest of the three"
fi
```

Press ‘Esc’ to end INSERT
:wq!
chmod +x filename.sh
./filename.sh
Output:

```
student@t2:~$ vi greatThree.sh
student@t2:~$ chmod +x greatThree.sh
student@t2:~$ ./greatThree.sh
Enter the first number: 10
Enter the second number: 35
Enter the third number: 9
35 is the greatest of the three
```

5.

vi filename.sh
Press ‘i’ to INSERT

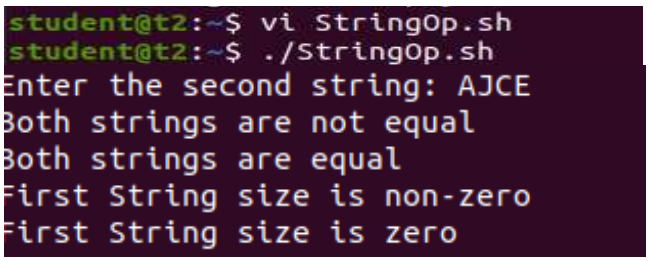
```
#!/bin/bash
read -p "Enter the first string: " str1
read -p "Enter the second string: " str2
if(( $str1=$str2 ))
then
        echo "Both strings are equal"
else
        echo "Both strings are not equal"
fi
if(( $str1!=$str2 ))
then
        echo "Both strings are not equal"
else
        echo "Both strings are equal"
fi
if(( -z$str1 ))
then
        echo "String size is zero"
else
        echo "String size is non-zero"
```

```
fi
if(( -n$str1 ))
then
        echo "String size is non-zero"
else
        echo "String size is zero"
fi
if(( $str1 ))
then
        echo "String is Empty"
else
        echo "String is not Empty"
fi
```

Press ‘Esc’ to end INSERT

```
:wq!
chmod +x filename.sh
./filename.sh
```

Output:



6.

```
#!/bin/bash

# Get user input for age
echo "Enter your age: "
read age

# Nested if statements to determine job eligibility
if (( age >= 18 )); then
   echo "You are eligible for job consideration."

   # Check for additional conditions based on age
   if (( age >= 18 && age <= 30 )); then
      echo "You are in the suitable age group for many jobs."
   elif (( age > 30 && age <= 40 )); then
      echo "You are in the suitable age group for mid-career positions."
   else
      echo "You are in the suitable age group for senior roles."
   fi

else
   echo "You are not eligible for job consideration due to age."
Fi
```

```
nandana_rs@NANDANA:~$ vi age.sh
nandana_rs@NANDANA:~$ chmod +x age.sh
nandana_rs@NANDANA:~$ ./age.sh
Enter your age:
23
You are eligible for job consideration.
You are in the suitable age group for many jobs.
Enter your age:
52
You are eligible for job consideration.
You are in the suitable age group for senior roles.
```

7.

```
mca@u16:~$ vi state.sh
```

```
#!/bin/bash
state="Kerala"
case "$state" in
        "Tamil Nadu") echo "Chennai";;
        "karanataka") echo "Bengluru";;
        "Kerala") echo "Trivandrum";;
        "Rajasthan") echo "Jaipur";;
esac
```

```
mca@u16:~$ chmod +x state.sh
mca@u16:~$ ./state.sh
Trivandrum
```

8.

```
mca@u16:~$ vi reversenum.sh
```

```
#!/bin/bash
a=10
while [ $a -gt 0 ]
do
        echo $a
        a=`expr $a - 1`
done
```

```
mca@u16:~$ chmod +x reversenum.sh
mca@u16:~$ ./reversenum.sh
10
9
8
7
6
5
4
3
2
1
```

9.

```
#!/bin/bash

echo Enter the number
read n
num=0
on=$n
while [ $n -gt 0 ]
do
num=$(expr $num \* 10)
k=$(expr $n % 10)
num=$(expr $num + $k)
n=$(expr $n / 10)
done
if [ $num -eq $on ]
then
echo The number is a palindrome number.
else
echo The number is not a palindrome number.
fi

~
~
:wq!
```

```
mca@u28:~$ vi palindrome.sh
mca@u28:~$ chmod +x palindrome.sh
mca@u28:~$ ./palindrome.sh
Enter the number
121
The number is a palindrome number.
mca@u28:~$
```

10.

```
nandana_rs@NANDANA:~$ vi armstrong.sh
nandana_rs@NANDANA:~$ chmod +x armstrong.sh
nandana_rs@NANDANA:~$ ./armstrong.sh
```

```
#!/bin/bash
read -p "Enter a number: " n
temp=$n
sum=0
while [ $temp -gt 0 ]
do
rem=$((temp % 10))
temp=$((temp / 10))
cb=$((rem * rem * rem))
```

```
enter the number : 371
371 is an armstrong number
```

11.

```
#!/bin/bash
read -p "Enter the number: " n
if [ $n -lt 2 ]
then
echo "$n is not a prime number" else
for (( i=2; i<$n; i++ )) do
```

```
num=$(expr $n % $i)
if [ $num -eq 0 ]
then
echo "$n is not a prime number"
exit
fi
done
fi
echo "$n is a prime number"
```

```
enter the number :7
7 is a prime number
```

12.

```
#!/bin/bash
read -p "Enter the number: " n
temp=$n
f=1
for (( i=$n; i>1; i-- ))
do
f=$((f * i))
done
echo "Factorial of $temp is $f"
```

```
enter the number : 5
factorial of 5 is 120
```

13.

```
#!/bin/bash
read -p "Enter the limit: " lt
n1=0
n2=1
for (( i=0; i<$lt; i++ ))
do
echo -n "$n1 "
n3=$((n1 + n2))
n1=$n2
n2=$n3
done
echo " "
```

```
Enter the limit: 10
0 1 1 2 3 5 8 13 21 34
```

14.

```
#!/bin/bash
read -p "Enter a year: " year
if((year % 4 == 0 && year % 100 != 0 ))
then
    echo "It is a leap year."
else
    echo "It is not a leap year."
fi
~
```

```
student@t2:~$ vi leapyear.sh
student@t2:~$ vi leapyear.sh
student@t2:~$ chmod +x leapyear.sh
student@t2:~$ ./leapyear.sh
Enter a year: 2014
It is not a leap year.
```

```
Enter a year: 2004
It is a leap year.
student@t2:~$
```

Result:

The program was executed and the result was successfully obtained. Thus CO4 was obtained.

Experiment:5

Aim:

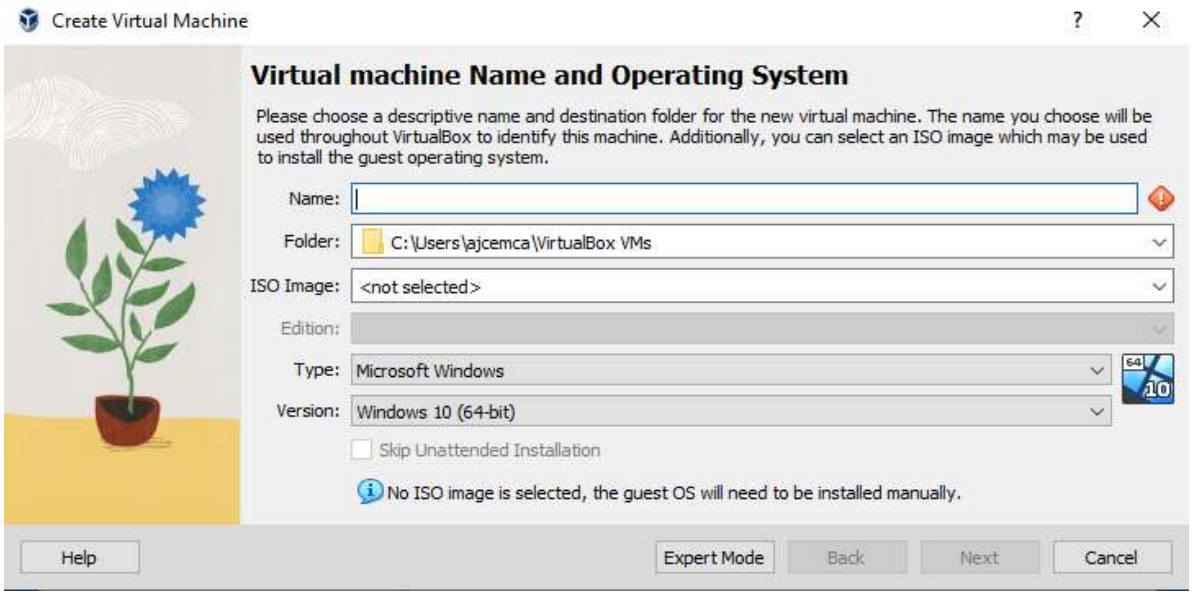
Install latest version of Ubuntu on a virtual box.

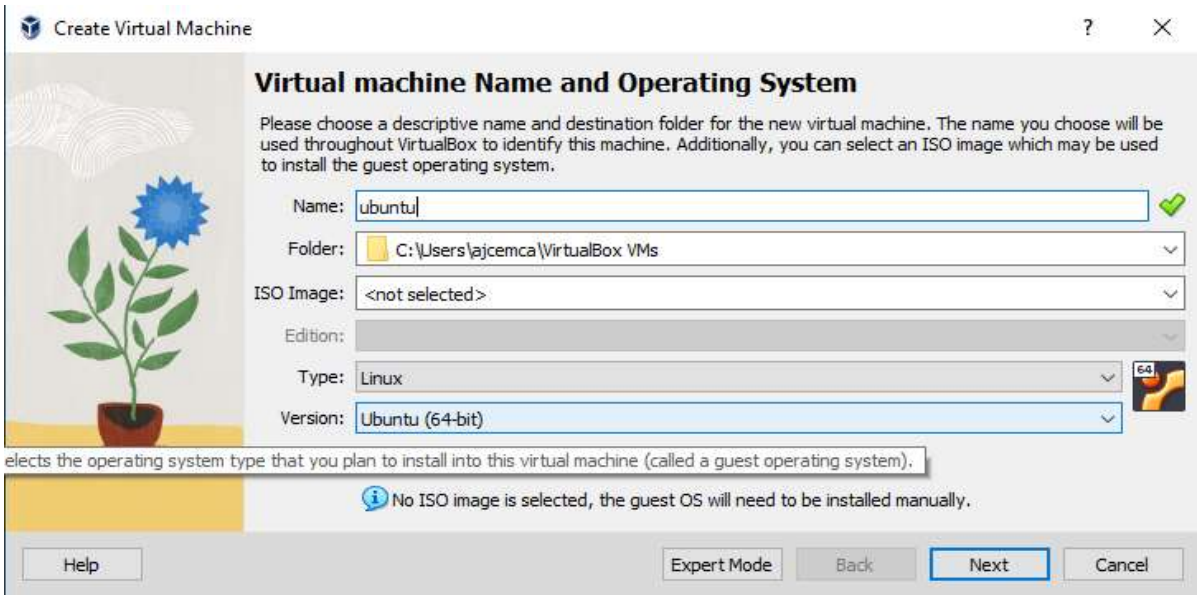
CO1:

Install and configure common operating systems in virtual environment.

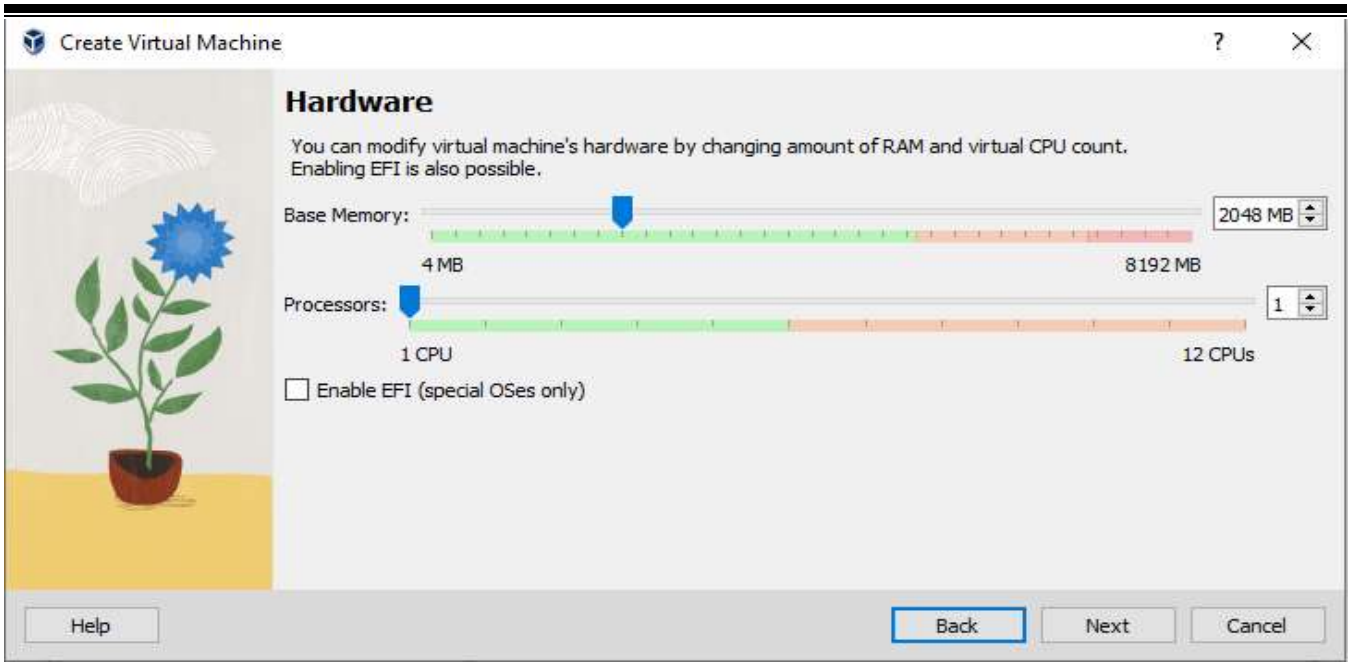
Procedure:

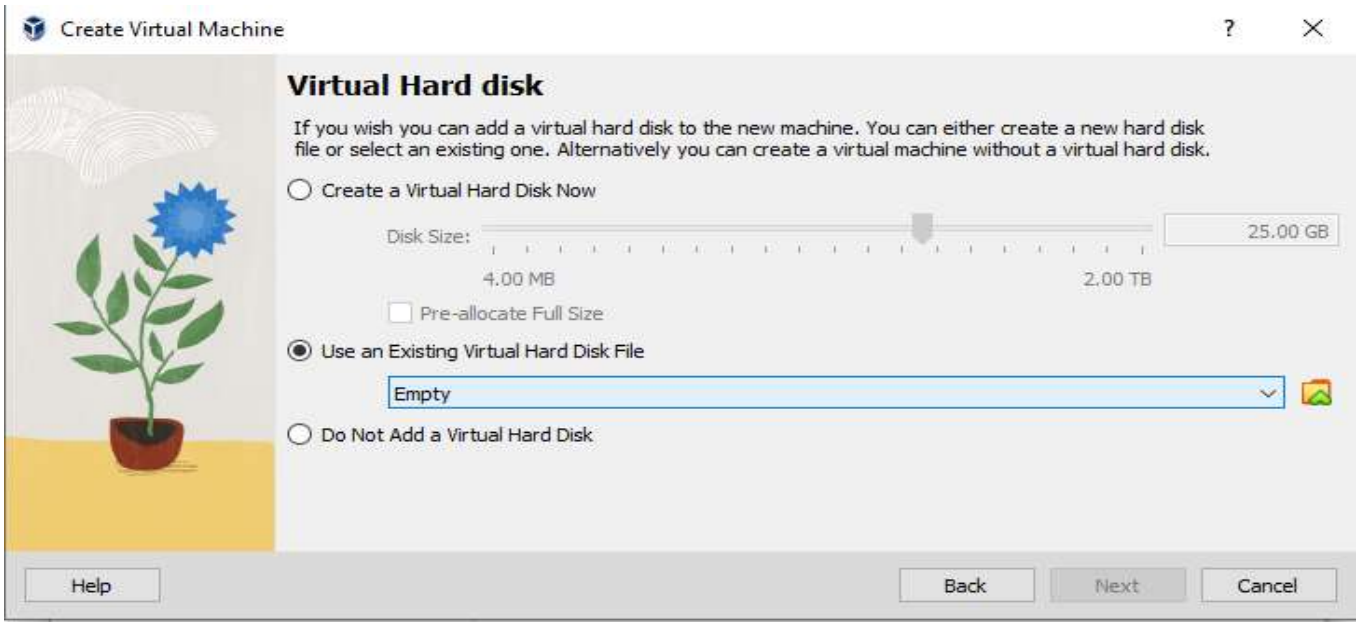
Open virtualbox then click"new" to create virtual machine.Enter "Ubuntu" as name.

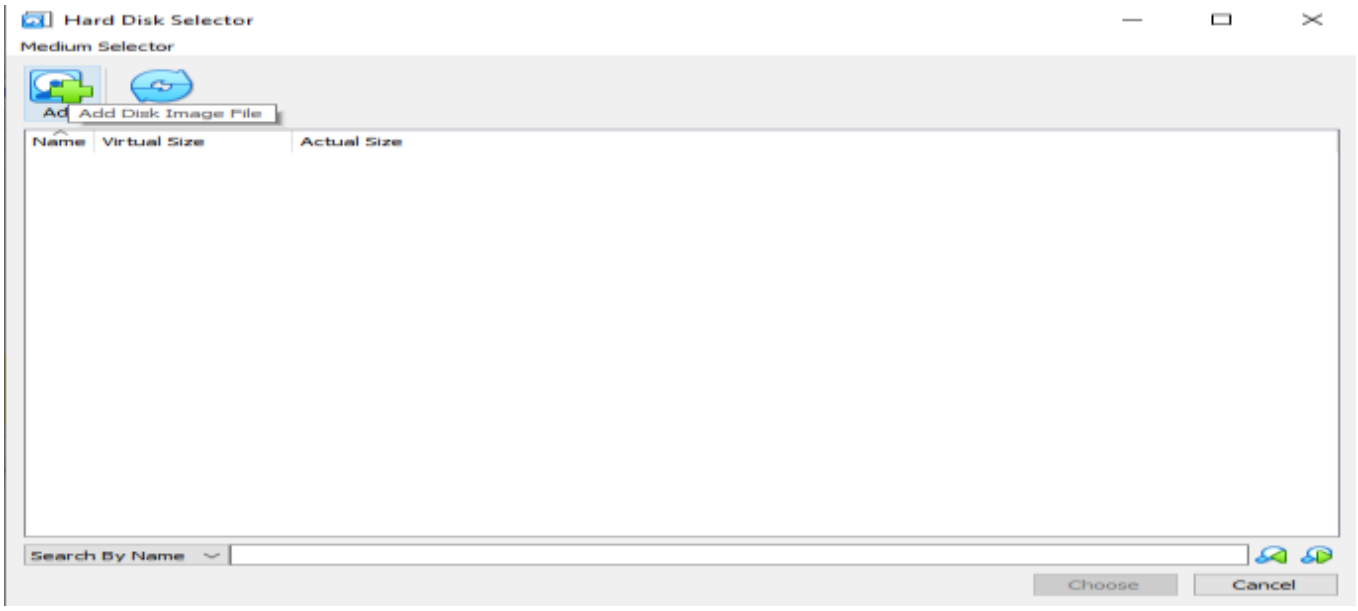


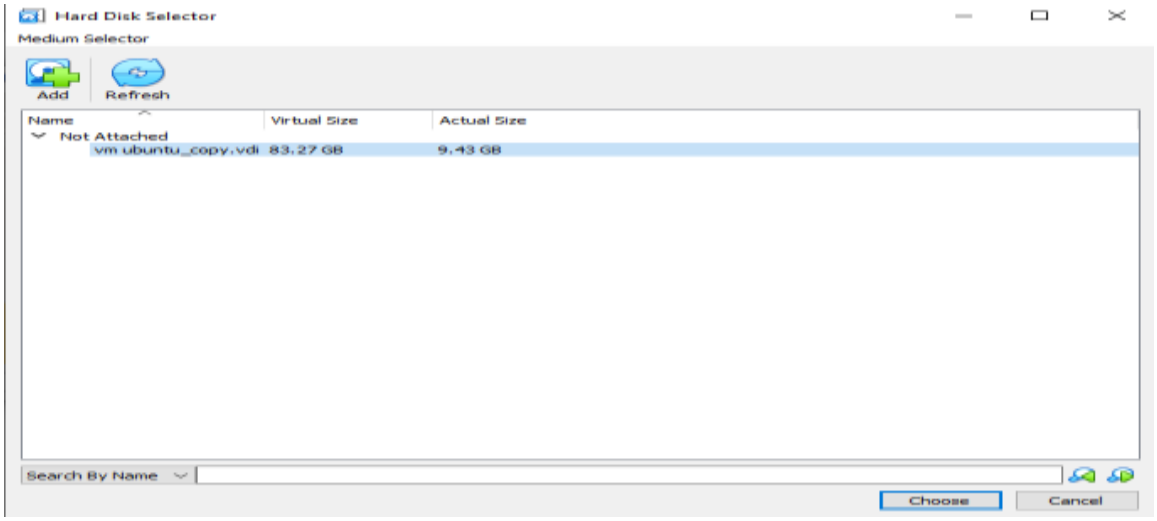


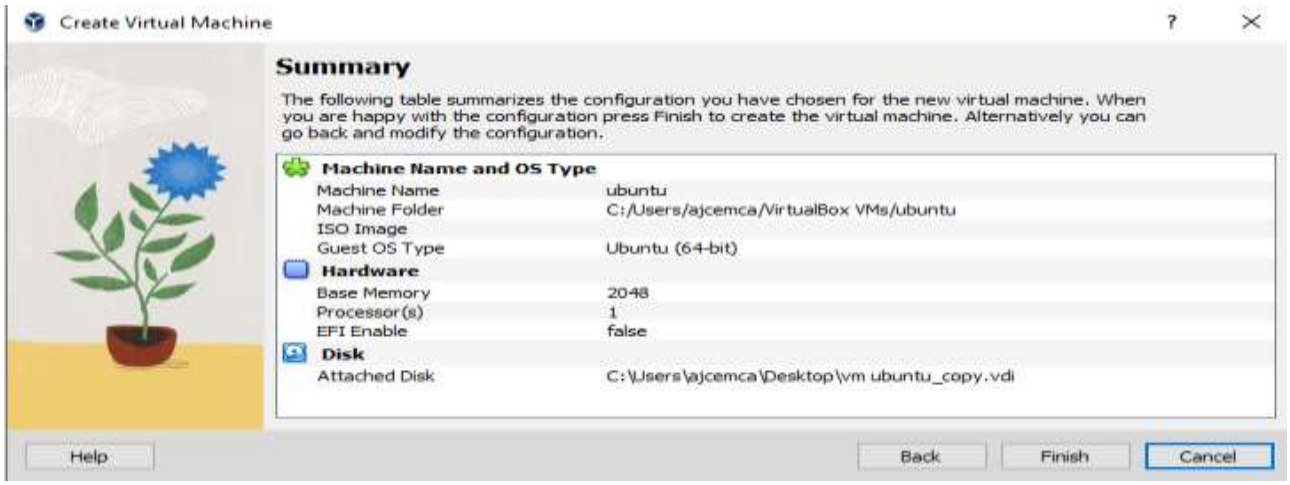
Select any amount of memory you wish , create a virtual hard disk now option.


Create Virtual Machine
Hardware
You can modify virtual machine's hardware by changing amount of RAM and virtual CPU count.
Enabling EFI is also possible.
Base Memory:
2048 MB
4 MB
8192 MB
Processors:
1
1 CPU
12 CPUs
Enable EFI (special OSes only)
Help
Back
Next
Cancel

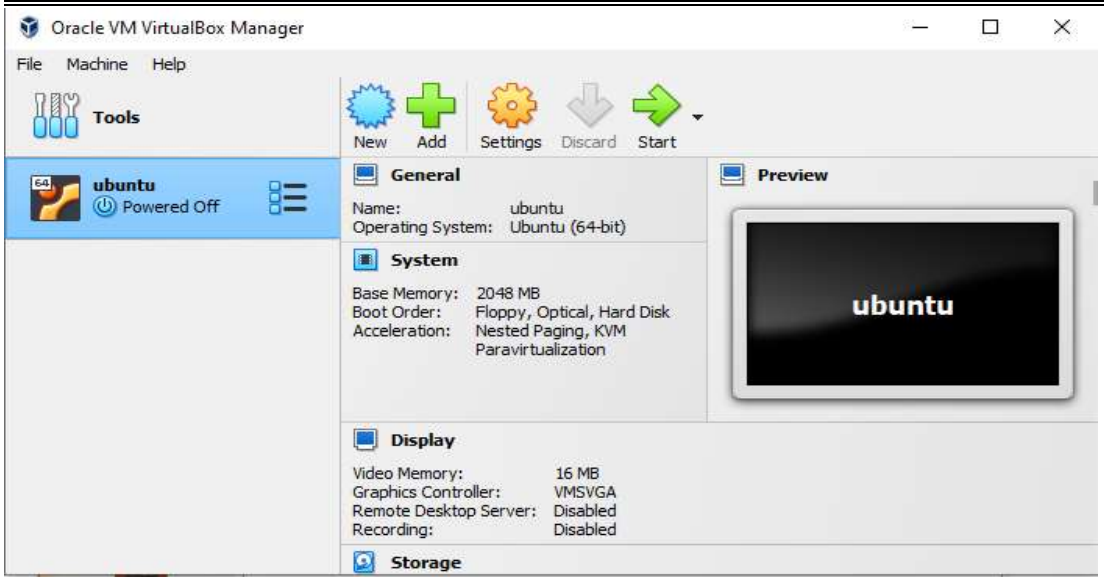

Create Virtual Machine
Virtual Hard disk
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select an existing one. Alternatively you can create a virtual machine without a virtual hard disk.
Create a Virtual Hard Disk Now
Disk Size:
25.00 GB
4.00 MB
2.00 TB
Pre-allocate Full Size
Use an Existing Virtual Hard Disk File
Empty
Do Not Add a Virtual Hard Disk
Help
Back
Next
Cancel


Hard Disk Selector
Medium Selector
Add Disk Image File
Name
Virtual Size
Actual Size
Search By Name
Choose
Cancel

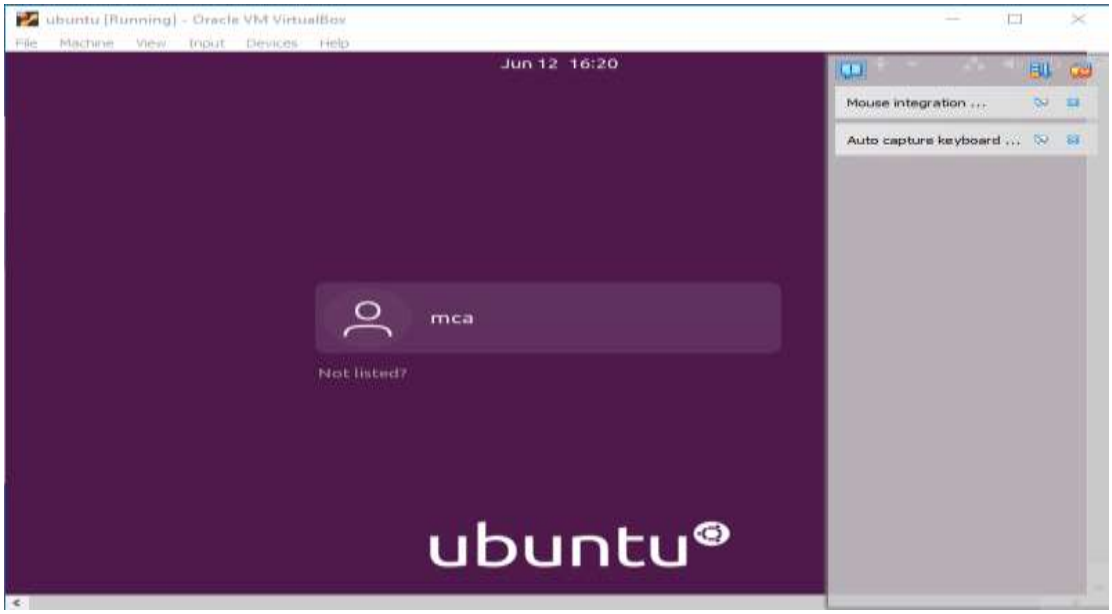


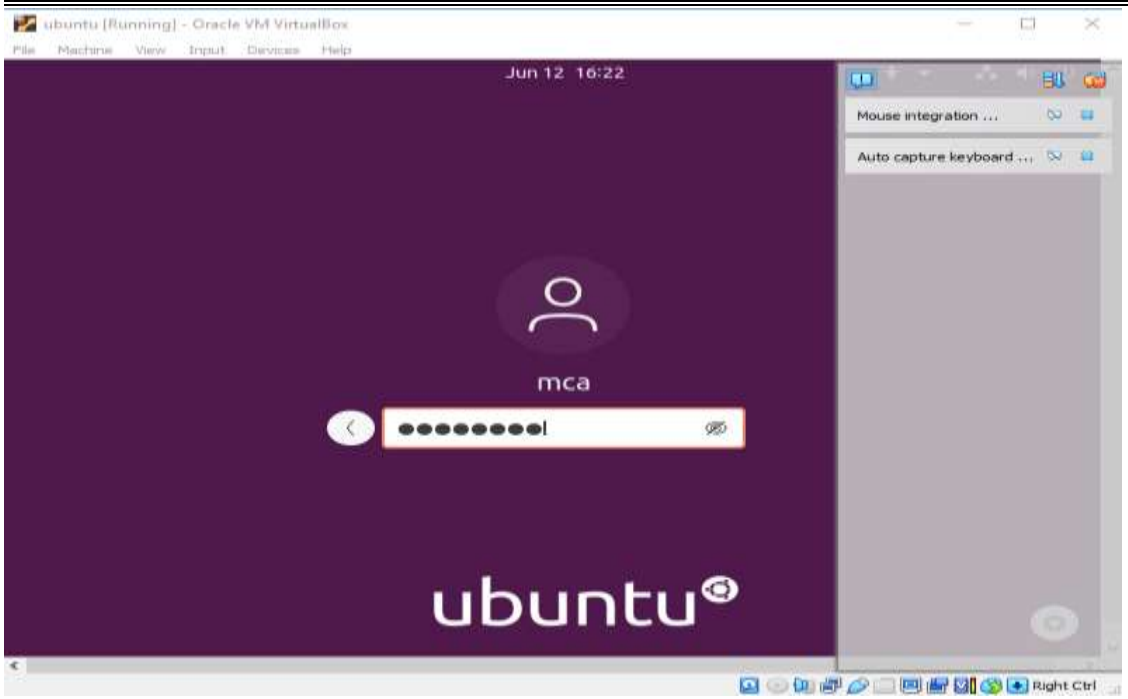


After creating virtual hard disk , you'll see ubuntu in your dashboard.Next step is to set up ubuntu disk image file(.iso).

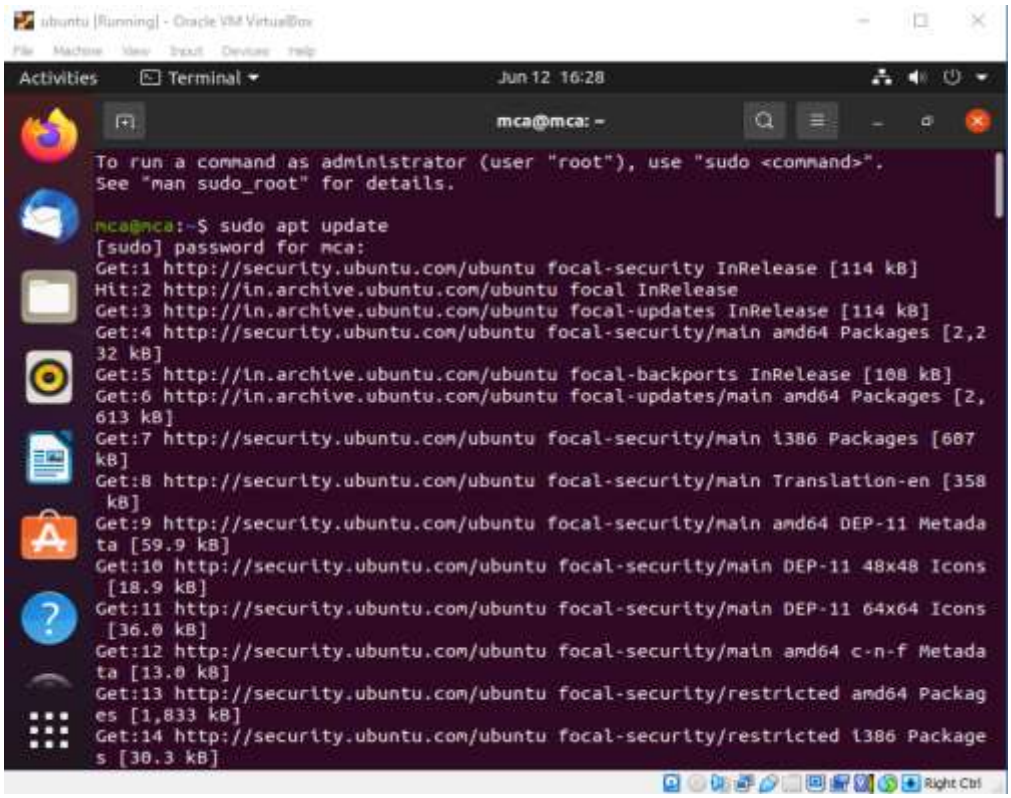


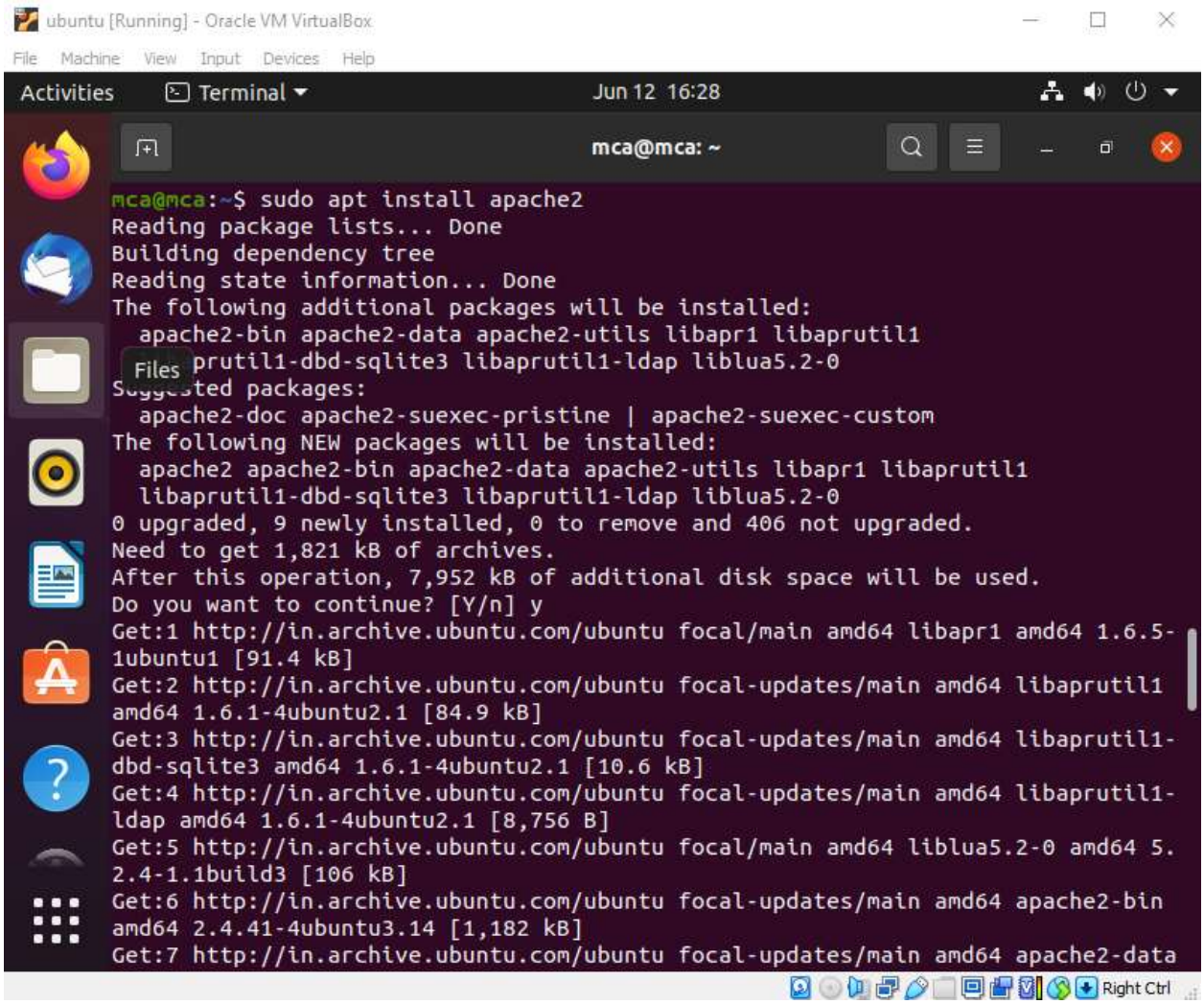
Install ubuntu




ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Jun 12 16:22
Mouse integration ...
Auto capture keyboard ...
mca
ubuntu
Right Ctrl


Activities
Jun 12 16:23
mca
Trash


ubuntu [Running] - Oracle VM VirtualBox
Activities
Terminal
Jun 12 16:28
mca@mca: ~
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
mca@mca:~$ sudo apt update
[sudo] password for mca:
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:2 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [2,232 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2,613 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/main i386 Packages [607 kB]
Get:8 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [358 kB]
Get:9 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [59.9 kB]
Get:10 http://security.ubuntu.com/ubuntu focal-security/main DEP-11 48x48 Icons [18.9 kB]
Get:11 http://security.ubuntu.com/ubuntu focal-security/main DEP-11 64x64 Icons [36.0 kB]
Get:12 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [13.0 kB]
Get:13 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages [1,833 kB]
Get:14 http://security.ubuntu.com/ubuntu focal-security/restricted i386 Packages [30.3 kB]
Right Ctrl



Result:

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment:6

Aim:

Installation and configuration of LAMP stack. Deploy an open source application such as phpmyadmin.

CO3:

Install and manage servers for web applications.

Procedure:

First,make sure your apt cache is updated with

Sudo apt install apache2

```
root@mca:/home/mca# which apache2
/usr/sbin/apache2
root@mca:/home/mca# ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos
root@mca:/home/mca# cd /var
root@mca:/var# ls
backups  crash  local  log    metrics  run   spool  www
cache    lib    lock   mail   opt      snap  tmp
root@mca:/var# cd www
root@mca:/var/www# ls
html
root@mca:/var/www# cd html
root@mca:/var/www/html# ls
index.html
```

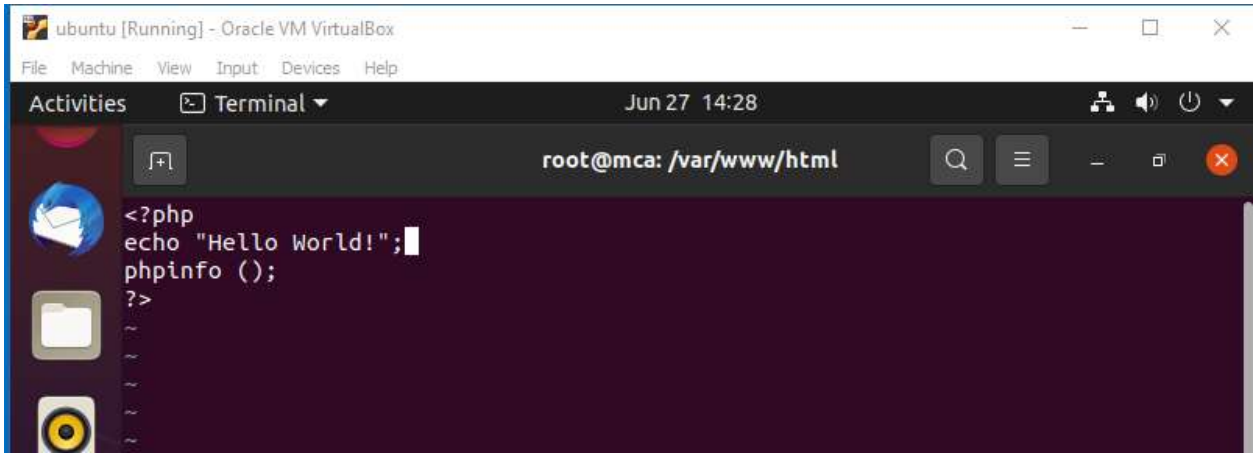
Installing php

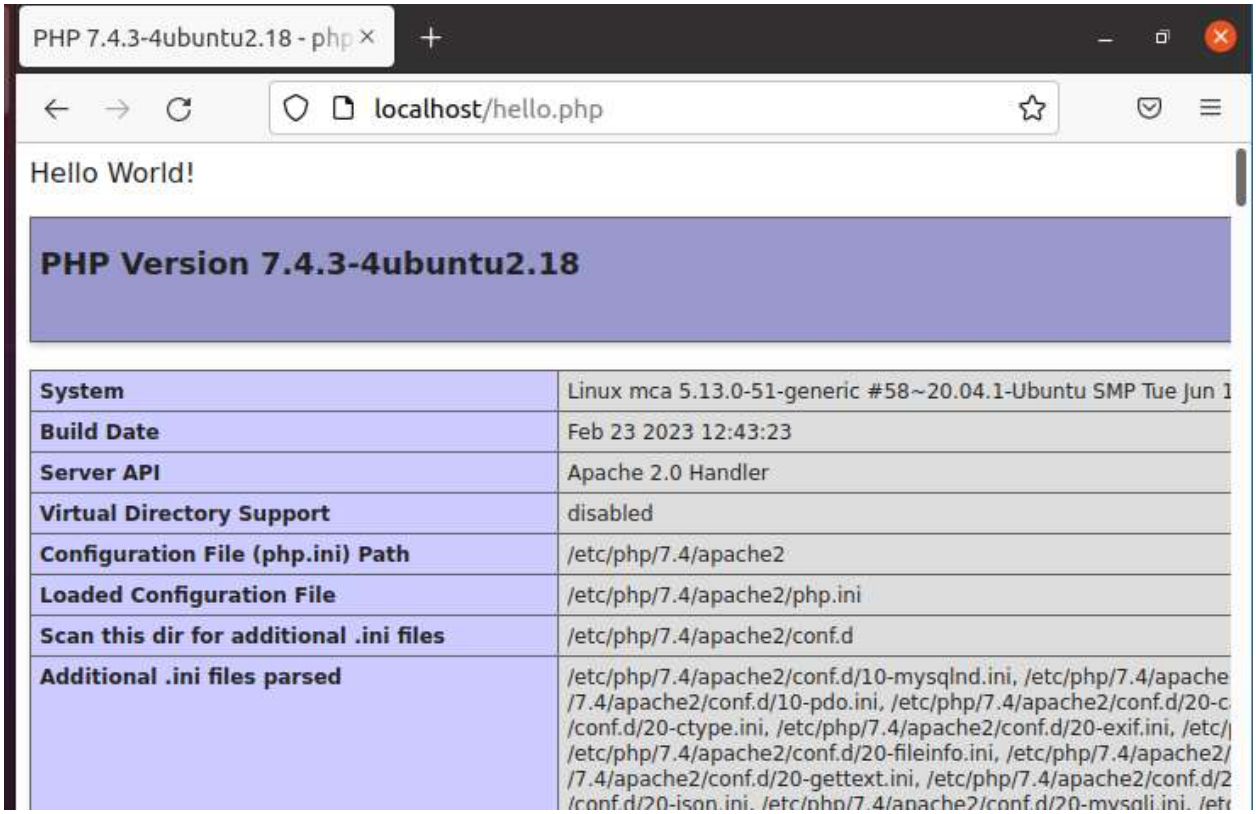
```
mca@mca:~$ sudo su
[sudo] password for mca:
root@mca:/home/mca# apt install php libapache2-mod-php php-mysql
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libapache2-mod-php7.4 php-common php7.4 php7.4-cli php7.4-common
  php7.4-json php7.4-mysql php7.4-opcache php7.4-readline
Suggested packages:
  php-pear
The following NEW packages will be installed:
  libapache2-mod-php libapache2-mod-php7.4 php php-common php-mysql php7.4
  php7.4-cli php7.4-common php7.4-json php7.4-mysql php7.4-opcache
  php7.4-readline
0 upgraded, 12 newly installed, 0 to remove and 427 not upgraded.
Need to get 4,158 kB of archives.
After this operation, 18.5 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 php-common all 2:75
[11.9 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 php7.4-commo
```

```
root@mca:/home/mca# php -v
PHP 7.4.3-4ubuntu2.18 (cli) (built: Feb 23 2023 12:43:23) ( NTS )
Copyright (c) The PHP Group
Zend Engine v3.4.0, Copyright (c) Zend Technologies
    with Zend OPcache v7.4.3-4ubuntu2.18, Copyright (c), by Zend Technologies
root@mca:/home/mca#
```

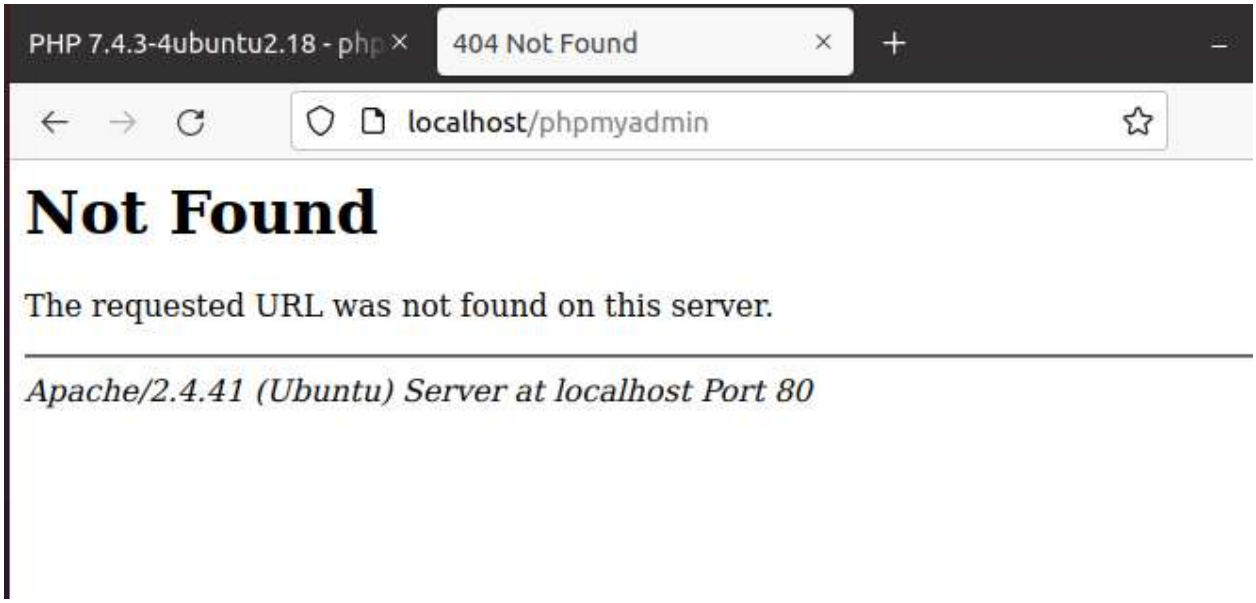
```
root@mca:/home/mca# cd /var
root@mca:/var# cd www
root@mca:/var/www# ls
html
root@mca:/var/www# cd html
```

```
root@mca:/var/www/html# vi hello.php
```





```
root@mca:/home/mca# apt install phpmyadmin -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  dbconfig-common dbconfig-mysql icc-profiles-free javascript-common
  libjs-jquery libjs-openlayers libjs-sphinxdoc libjs-underscore libonig5
  libzip5 php-bz2 php-curl php-gd php-google-recaptcha php-mbstring
  php-phpmyadmin-motranslator php-phpmyadmin-shapefile
  php-phpmyadmin-sql-parser php-phpseclib php-psr-cache php-psr-container
  php-psr-log php-symfony-cache php-symfony-cache-contracts
  php-symfony-expression-language php-symfony-service-contracts
  php-symfony-var-exporter php-tcpdf php-twig php-twig-extensions php-xml
  php-zip php7.4-bz2 php7.4-curl php7.4-gd php7.4-mbstring php7.4-xml
  php7.4-zip
Suggested packages:
  php-dbase php-libsodium php-mcrypt php-gmp
  php-symfony-service-implementation php-imagick php-twig-doc
  php-symfony-translation php-recode php-gd2 php-pragmarx-google2fa
  php-bacon-qr-code php-samyoul-u2f-php-server
Recommended packages:
  php-mcrypt
The following NEW packages will be installed:
  dbconfig-common dbconfig-mysql icc-profiles-free javascript-common
  libjs-jquery libjs-openlayers libjs-sphinxdoc libjs-underscore libonig5
```




```
root@mca:/home/mca# systemctl start apache2
root@mca:/home/mca# systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor pres>
     Active: active (running) since Tue 2023-06-27 14:05:58 IST; 29min ago
       Docs: https://httpd.apache.org/docs/2.4/
    Process: 12625 ExecReload=/usr/sbin/apachectl graceful (code=exited, statu>
   Main PID: 10556 (apache2)
      Tasks: 7 (limit: 2295)
     Memory: 13.9M
     CGroup: /system.slice/apache2.service
```

```
root@mca:/home/mca# apt update
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:2 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Fetched 336 kB in 3s (125 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
427 packages can be upgraded. Run 'apt list --upgradable' to see them.
root@mca:/home/mca# apt install phpmyadmin -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
phpmyadmin is already the newest version (4:4.9.5+dfsg1-2).
0 upgraded, 0 newly installed, 0 to remove and 427 not upgraded.
root@mca:/home/mca# systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor pres>
     Active: active (running) since Tue 2023-06-27 14:05:58 IST; 32min ago
```

```
root@mca:/home/mca# service apache2 status
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor pres>
     Active: active (running) since Tue 2023-06-27 14:05:58 IST; 33min ago
       Docs: https://httpd.apache.org/docs/2.4/
    Process: 12625 ExecReload=/usr/sbin/apachectl graceful (code=exited, statu>
   Main PID: 10556 (apache2)
      Tasks: 7 (limit: 2295)
     Memory: 14.0M
     CGroup: /system.slice/apache2.service
```

```
root@mca:/home/mca# service phpmyadmin status
Unit phpmyadmin.service could not be found.
```

```
root@mca:/home/mca# vi /etc/apache2/apache2.conf
```

```
# (the actual bytes sent including headers) instead of %b (the size of the
# requested file), because the latter makes it impossible to detect partial
# requests.
#
# Note that the use of %{X-Forwarded-For}i instead of %h is not recommended.
# Use mod_remoteip instead.
#
LogFormat "%v:%p %h %l %u %t \"%r\" %>s %O \"%{Referer}i\" \"%{User-Agent}i\""
vhost_combined
LogFormat "%h %l %u %t \"%r\" %>s %O \"%{Referer}i\" \"%{User-Agent}i\"" combin
ed
LogFormat "%h %l %u %t \"%r\" %>s %O" common
LogFormat "%{Referer}i -> %U" referer
LogFormat "%{User-agent}i" agent

# Include of directories ignores editors' and dpkg's backup files,
# see README.Debian for details.

# Include generic snippets of statements
IncludeOptional conf-enabled/*.conf
Include /etc/phpmyadmin/apache.conf
# Include the virtual host configurations:
IncludeOptional sites-enabled/*.conf

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet
```

```
root@mca:/home/mca# systemctl restart apache2
root@mca:/home/mca# vi /etc/apache2/apache2.conf
root@mca:/home/mca#
```

```
root@mca:/home/mca# mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.33-0ubuntu0.20.04.2 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
```
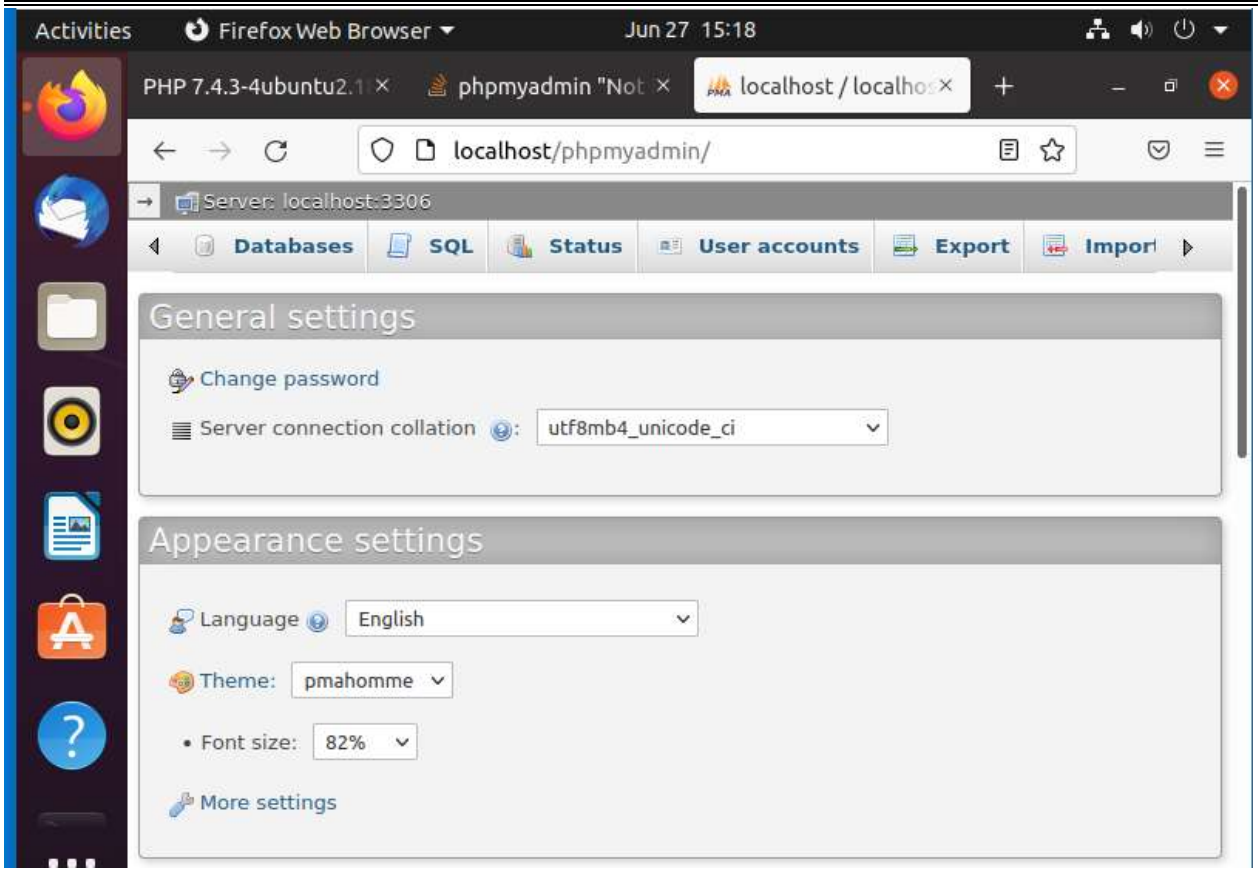

```
mysql> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| DATA               |
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.28 sec)
```

```
mysql> select user,authentication_string,plugin,host from mysql.user;
+------------------+------------------------------------------------------------------------
------------+-----------------------+-----------+
| user             | authentication_string
            | plugin                | host      |
+------------------+------------------------------------------------------------------------
------------+-----------------------+-----------+
s.*KS6TCE3ivVL69y.PKm.G.SyUyd5uVgOip8TXiALVG7oC | caching_sha2_password | local
host |
| mysql.infoschema | $A$005$THISISACOMBINATIONOFINVALIDSALTANDPASSWORDTHATMUSTN
EVERBRBEUSED | caching_sha2_password | localhost |
| mysql.session    | $A$005$THISISACOMBINATIONOFINVALIDSALTANDPASSWORDTHATMUSTN
EVERBRBEUSED | caching_sha2_password | localhost |
| mysql.sys        | $A$005$THISISACOMBINATIONOFINVALIDSALTANDPASSWORDTHATMUSTN
EVERBRBEUSED | caching_sha2_password | localhost |
| root             |
            | auth_socket           | localhost |
+------------------+------------------------------------------------------------------------
------------+-----------------------+-----------+
5 rows in set (0.01 sec)

mysql> alter user root@localhost identified with caching_sha2_password by "sani
la";
Query OK, 0 rows affected (0.29 sec)

mysql>
```




```
root@mca:/home/mca# apt install mysql-server -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libaio1 libcgi-fast-perl libcgi-pm-perl libevent-core-2.1-7
  libevent-pthreads-2.1-7 libfcgi-perl libhtml-template-perl libmecab2
  mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-client-8.0
  mysql-client-core-8.0 mysql-server-8.0 mysql-server-core-8.0
Suggested packages:
  libipc-sharedcache-perl mailx tinyca
The following NEW packages will be installed:
  libaio1 libcgi-fast-perl libcgi-pm-perl libevent-core-2.1-7
  libevent-pthreads-2.1-7 libfcgi-perl libhtml-template-perl libmecab2
  mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-client-8.0
  mysql-client-core-8.0 mysql-server mysql-server-8.0 mysql-server-core-8.0
```

```
root@mca:/home/mca# mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.33-0ubuntu0.20.04.2 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> CREATE DATABASE DATA;
Query OK, 1 row affected (0.03 sec)
```

```
mysql> SHOW  DATABASES;
+--------------------+
| Database           |
+--------------------+
| DATA               |
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.00 sec)

mysql> USE DATA;
Database changed
```

```
mysql> CREATE TABLE DATATABLE(ID INT,NAME VARCHAR(50));
Query OK, 0 rows affected (0.05 sec)

mysql>
```

Result:

The program was executed and the result was successfully obtained. Thus CO3 was obtained.

Experiment:7

Aim:

Build and install software from source code, familiarity with make and cmake utilities expected.

Write a program to find factorial of a number using make utility.
Write a program to add two numbers using cmake utility.

CO4:

Write shell scripts required for system administration.

Procedure:

```
[sudo] password for mca:
root@s16:/home/mca/Desktop# make --version

Command 'make' not found, but can be installed with:

apt install make        # version 4.2.1-1.2, or
apt install make-guile  # version 4.2.1-1.2

root@s16:/home/mca/Desktop# apt update
Get:1 http://packages.microsoft.com/repos/code stable InRelease [3,569 B]
Hit:2 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:5 http://packages.microsoft.com/repos/code stable/main arm64 Packages [72.4 kB]
Get:6 http://packages.microsoft.com/repos/code stable/main armhf Packages [72.7 kB]
Get:7 http://packages.microsoft.com/repos/code stable/main amd64 Packages [72.0 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:9 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2,679 kB]
Get:10 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [2,297 kB]
Get:11 http://in.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [849 kB]
Get:12 http://in.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [448 kB]
Get:13 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [275 kB]
Get:14 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [16.9 kB]
Get:15 http://in.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [2,089 kB]
```

```
root@s16:/home/mca/Desktop# apt install make
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  make-doc
The following NEW packages will be installed:
  make
0 upgraded, 1 newly installed, 0 to remove and 704 not upgraded.
Need to get 162 kB of archives.
After this operation, 393 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 make amd64 4.2.1-1.2 [162 kB]
Fetched 162 kB in 1s (111 kB/s)
Selecting previously unselected package make.
(Reading database ... 154722 files and directories currently installed.)
Preparing to unpack .../make_4.2.1-1.2_amd64.deb ...
Unpacking make (4.2.1-1.2) ...
Setting up make (4.2.1-1.2) ...
Processing triggers for man-db (2.9.1-1) ...
root@s16:/home/mca/Desktop# make --version
GNU Make 4.2.1
Built for x86_64-pc-linux-gnu
Copyright (C) 1988-2016 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
root@s16:/home/mca/Desktop# ls /usr/bin/make
/usr/bin/make
root@s16:/home/mca/Desktop# touch n
root@s16:/home/mca/Desktop# s
```

main.cpp

```
#include<iostream>
#include "functions.h"
int main()
{
print_hello();
std::cout << std::endl;
std::cout <<"The factorial of 5 is "<< factorial(5)<< std::endl;
return 0;
}
```

function1.cpp

```
#include "functions.h"
int factorial(int n)
{
    if(n!=1)
    {
        return(n*factorial(n-1));
    }
    else return 1;
}
```

function2.cpp

```
#include<iostream>
#include "functions.h"
void print_hello()
{
    std::cout <<"hello world";
}
```

functions.h

```
void print_hello();
int factorial(int n);
```

```
mca@u28:~/Documents/samplemake$ ls
function1.cpp  function2.cpp  functions.h  main.cpp  Makefile
```

```
mca@u28:~/Documents/samplemake$ g++ main.cpp function1.cpp function2.cpp -o hello
mca@u28:~/Documents/samplemake$ ./hello
hello world
The factorial of 5 is120
mca@u28:~/Documents/samplemake$
```

```
mca@u29:~$ cmake --version
cmake version 3.16.3

CMake suite maintained and supported by Kitware (kitware.com/cmake).
```

main.cpp

```
#include<iostream>
#include "add.h"
int main()
{
std::cout << "Sum of the given numbers is " << add(30,10)<<"\n";
return 0;
}
```

add.cpp

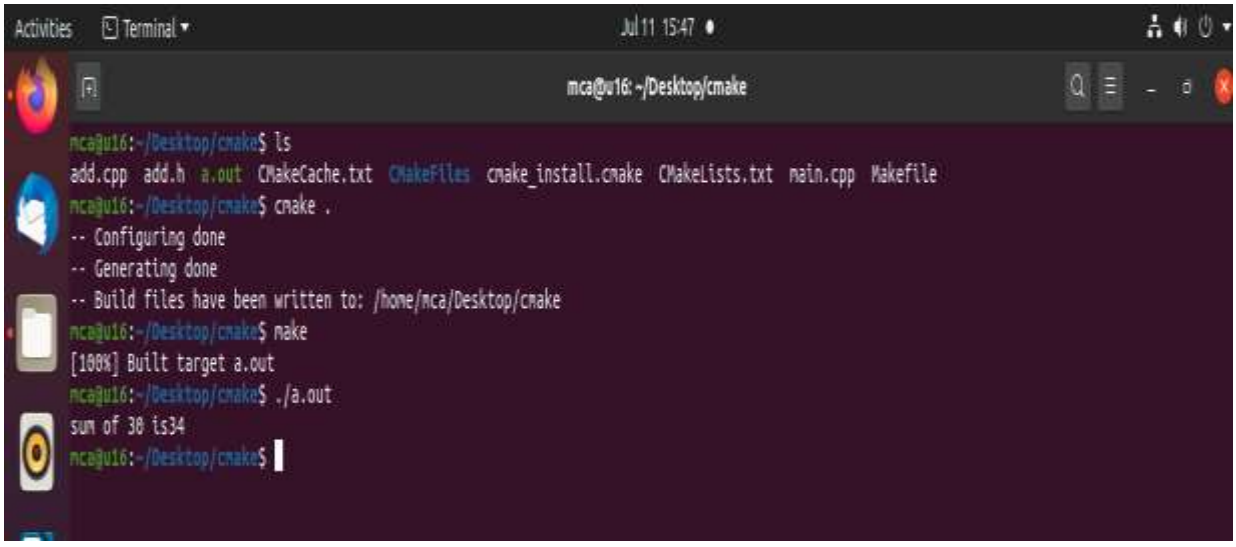
```
#include "add.h"
int add(int a, int b)
{
return a + b;
}
```

add.h

```
#pragma once
int add(int a, int b);
```

CMakeLists.txt

```
cmake_minimum_required(VERSION 3.16.3)
project("The numbers")
add_executable(a.out main.cpp add.cpp)
```



Result:

The program was executed and the result was successfully obtained. Thus CO4 was obtained.

Experiment:8

Aim:

Introduction to command line tools for networking IPv4 networking, network commands: ping route traceroute, nslookup, ip.

CO5:

Acquire skill sets required for a DevOps.

Procedure:

```
mca@u16: ~
ca@u16:~$ sudo apt update
sudo] password for mca:
et:1 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
it:2 http://in.archive.ubuntu.com/ubuntu focal InRelease
et:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
```

```
mca@u16:~$ sudo apt install net-tools
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 696 not upgraded.
Need to get 196 kB of archives.
After this operation, 864 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 net-tools amd64 1.60+git20180626.aebd88e-1ubuntu1 [196 kB]
Fetched 196 kB in 2s (118 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 153306 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20180626.aebd88e-1ubuntu1_amd64.deb ...
```

Ifconfig is used to configure the kernel-resident network interfaces.

```
mca@u16:~$ ifconfig
enp5s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.6.186  netmask 255.255.255.0  broadcast 192.168.6.255
        inet6 fe80::633d:1b4e:2bba:ec91  prefixlen 64  scopeid 0x20<link>
        ether 0c:9d:92:0f:6c:00  txqueuelen 1000  (Ethernet)
        RX packets 669186  bytes 990911239 (990.9 MB)
        RX errors 0  dropped 31  overruns 0  frame 0
        TX packets 127535  bytes 9056467 (9.0 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 1451  bytes 150381 (150.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1451  bytes 150381 (150.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

```
mca@u16:~$ sudo ifconfig enp5s0 down
mca@u16:~$ sudo ifconfig enp5s0 up
mca@u16:~$
```

Ping: Used to identify the connectivity between the host and server.Used for detecting devices on a network and for trouble shoot problems.

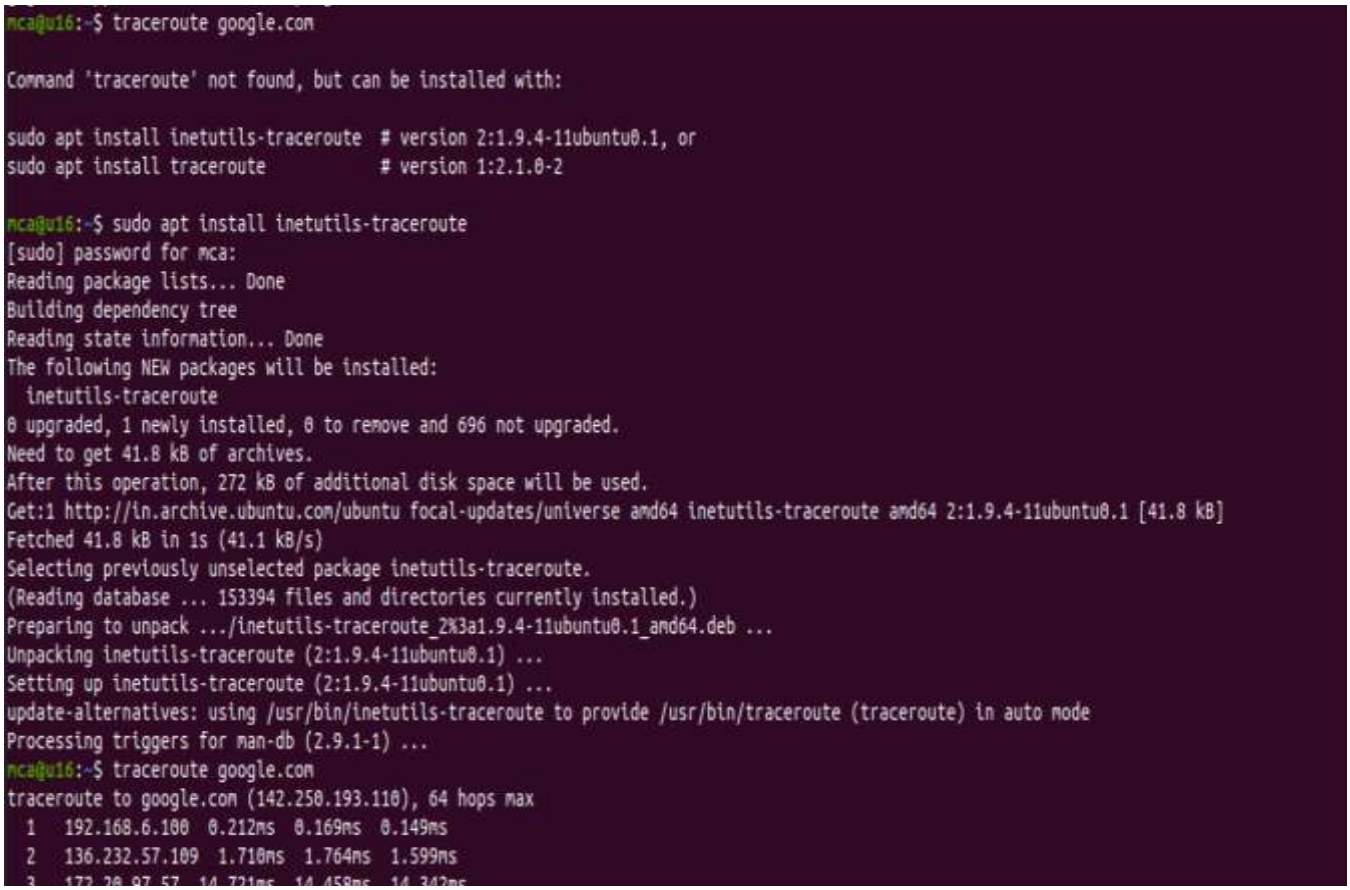
```
mca@u16:~$ ping google.com
PING google.com (142.250.182.78) 56(84) bytes of data.
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=1 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=2 ttl=248 time=16.1 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=3 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=4 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=5 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=6 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=7 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=8 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=9 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=10 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=11 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=12 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=13 ttl=248 time=15.9 ms
64 bytes from maa05s20-in-f14.1e100.net (142.250.182.78): icmp_seq=14 ttl=248 time=16.1 ms
```

```
mca@u16:~$ ping 142.250.182.78
PING 142.250.182.78 (142.250.182.78) 56(84) bytes of data.
64 bytes from 142.250.182.78: icmp_seq=1 ttl=248 time=15.9 ms
64 bytes from 142.250.182.78: icmp_seq=2 ttl=248 time=15.9 ms
64 bytes from 142.250.182.78: icmp_seq=3 ttl=248 time=15.9 ms
64 bytes from 142.250.182.78: icmp_seq=4 ttl=248 time=15.9 ms
64 bytes from 142.250.182.78: icmp_seq=5 ttl=248 time=15.9 ms
64 bytes from 142.250.182.78: icmp_seq=6 ttl=248 time=16.0 ms
64 bytes from 142.250.182.78: icmp_seq=7 ttl=248 time=15.9 ms
64 bytes from 142.250.182.78: icmp_seq=8 ttl=248 time=15.8 ms
64 bytes from 142.250.182.78: icmp_seq=9 ttl=248 time=23.9 ms
64 bytes from 142.250.182.78: icmp_seq=10 ttl=248 time=15.9 ms
```

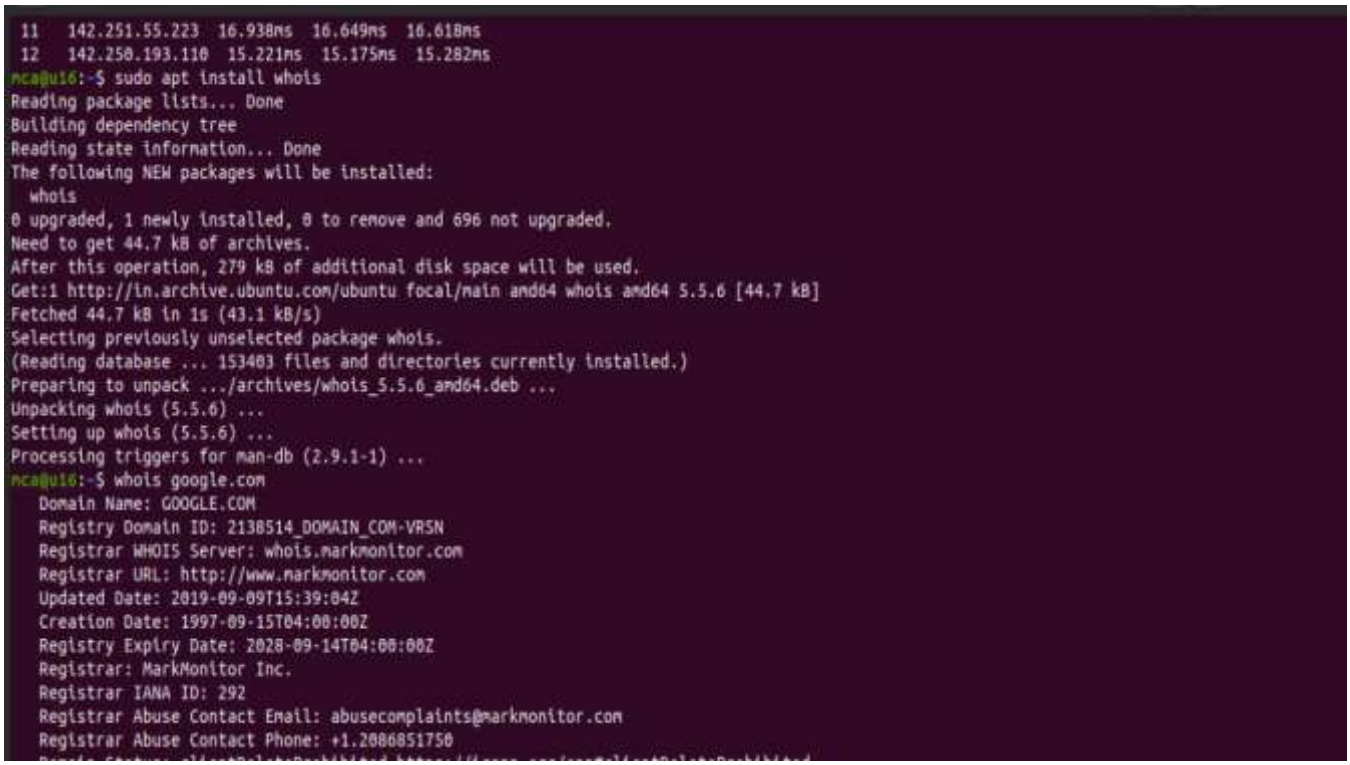
If we want to check for the connectivity of another server running on the same network then we can use ping the corresponding ip address.

```
mca@u28:~$ ping 192.168.6.199
PING 192.168.6.199 (192.168.6.199) 56(84) bytes of data.
64 bytes from 192.168.6.199: icmp_seq=1 ttl=64 time=0.347 ms
64 bytes from 192.168.6.199: icmp_seq=2 ttl=64 time=0.186 ms
64 bytes from 192.168.6.199: icmp_seq=3 ttl=64 time=0.192 ms
64 bytes from 192.168.6.199: icmp_seq=4 ttl=64 time=0.189 ms
64 bytes from 192.168.6.199: icmp_seq=5 ttl=64 time=0.190 ms
64 bytes from 192.168.6.199: icmp_seq=6 ttl=64 time=0.186 ms
64 bytes from 192.168.6.199: icmp_seq=7 ttl=64 time=0.188 ms
^Z
[3]+  Stopped                 ping 192.168.6.199
```

Traceroute:Used to identify,the route taken by the packets to reach the destination.



Whois : searches a user name directory and displays information about the user ID or nickname specified in the Name parameter



Nslookup:Used to identify domain system problem.

```
mca@u16:~$ nslookup google.com
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.182.78
Name:   google.com
Address: 2404:6800:4007:81b::200e

mca@u16:~$
```

Wget: Wget is the non-interactive network downloader which is used to download files from the server even when the user has not logged on to the system and it can work in the background without hindering the current process.

```
mca@u16:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos
mca@u16:~$ wget https://scholar.harvard.edu/files/david-morin/files/waves_quantum.pdf
--2023-06-13 14:58:51--  https://scholar.harvard.edu/files/david-morin/files/waves_quantum.pdf
Resolving scholar.harvard.edu (scholar.harvard.edu)... 23.205.88.176, 23.205.88.177
Connecting to scholar.harvard.edu (scholar.harvard.edu)|23.205.88.176|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [application/pdf]
Saving to: 'waves_quantum.pdf'

waves_quantum.pdf                   [ <=>                                                ] 483.36K  --.-KB/s    in 0.1s

2023-06-13 14:58:51 (3.52 MB/s) - 'waves_quantum.pdf' saved [494965]

mca@u16:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos  waves_quantum.pdf
mca@u16:~$
```

Result:

The program was executed and the result was successfully obtained. Thus CO5 was obtained.

Experiment:9

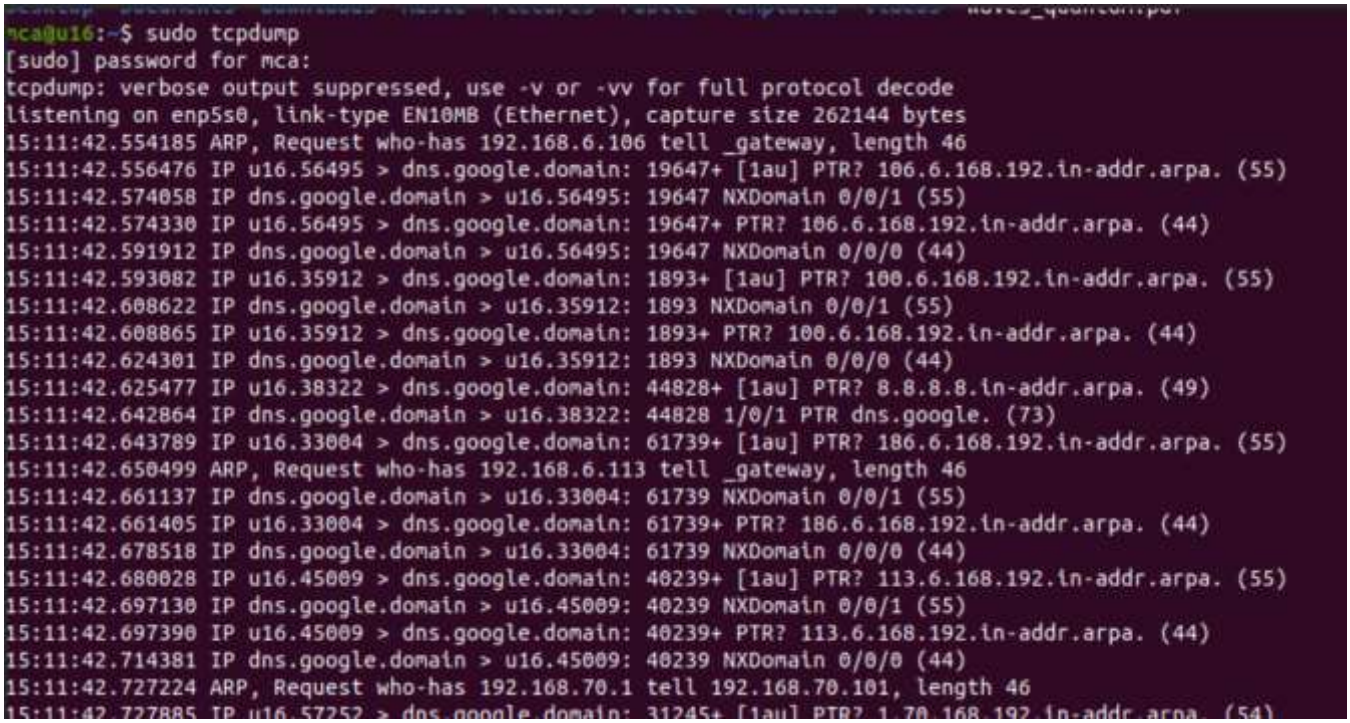
Aim:

Analyzing network packet stream using tcpdump and wireshark. Perform basic network service tests using nc.

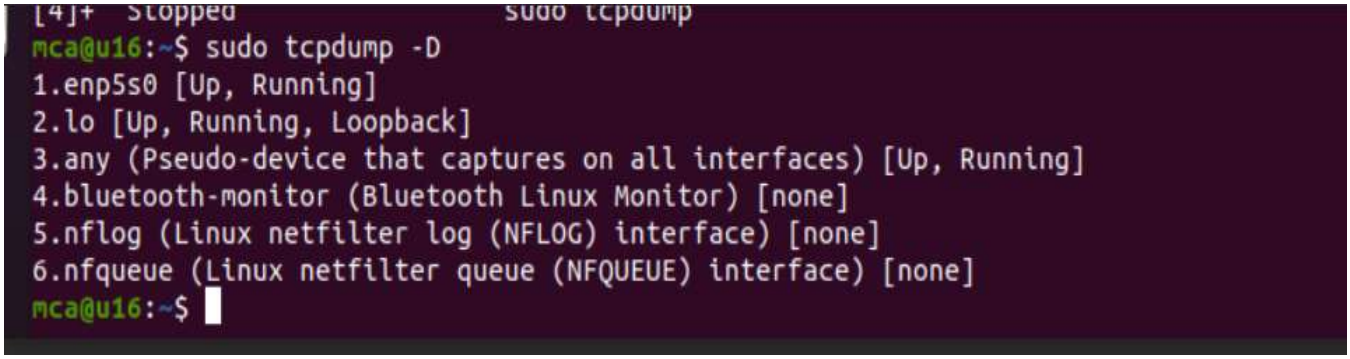
CO5:

Acquire skill sets required for a DevOps.

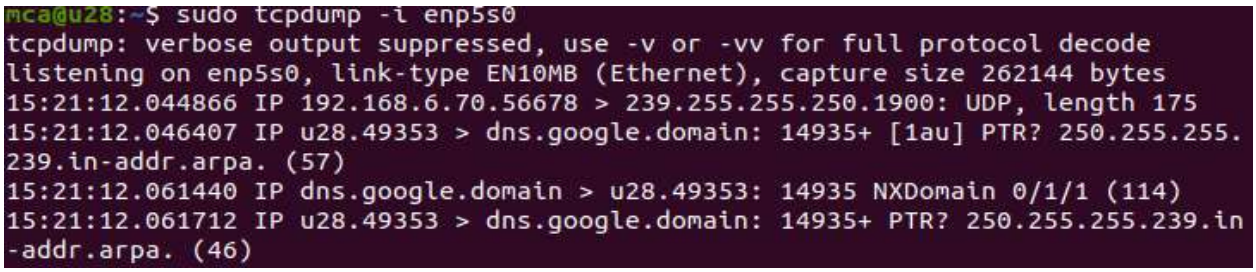
Procedure:



- To display all the available network interface.



- To capture packets from one interface.



```
mca@u28:~$ sudo tcpdump -c 5 -i enp5s0
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp5s0, link-type EN10MB (Ethernet), capture size 262144 bytes
15:22:09.222920 IP6 fe80::2f53:f28e:da4a:673e.mdns > ff02::fb.mdns: 0 PTR (QM)?
210.95.254.169.in-addr.arpa. (45)
15:22:09.222962 IP 192.168.6.189.mdns > 224.0.0.251.mdns: 0 PTR (QM)? 210.95.254
.169.in-addr.arpa. (45)
15:22:09.224940 IP u28.36810 > dns.google.domain: 41293+ [1au] PTR? b.f.0.0.0.0.
0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.2.0.f.f.ip6.arpa. (101)
15:22:09.282628 IP dns.google.domain > u28.36810: 41293 NXDomain 0/1/1 (165)
15:22:09.282965 IP u28.36810 > dns.google.domain: 41293+ PTR? b.f.0.0.0.0.0.0.0.
0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.2.0.f.f.ip6.arpa. (90)
5 packets captured
25 packets received by filter
0 packets dropped by kernel
mca@u28:~$
```

- To display packets in Askkey format.

```
mca@u28:~$ sudo tcpdump -A -i enp5s0
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp5s0, link-type EN10MB (Ethernet), capture size 262144 bytes
15:26:29.710676 IP 123.208.120.34.bc.googleusercontent.com.https > u28.60840: F
lags [P.], seq 556255873:556256329, ack 33387088, win 291, options [nop,nop,TS
val 2540850447 ecr 1658196281], length 456
E`..2n......"x.{........!'....rP...#-......
.rM.b..9.................S1....k..i.....B;b....So..g....l8..T@a........ .S.d..=.
r.}w.T.."...P.O*....rGxk..(.....tj.{.]...W.l.Lb).@.H.O..Q.%(%f.T....ct..|.....
.....gX."f...y.7...rm....W.....l   ...G/....*;.\.oE=:z..P....;.Rx.(_\.$7)Q...HGc
x....x.`bz.Wt..i..j       w.J....uN...g..&......fJ...-....#..6.p..P....[#.I,1.
...b.....y.e.:....u...?k[Y..4.j..........G>d...?>....-2.Q.ko@....?LV.....|,...6.
kKq..s..Z.K.T........T\.D..:....t.~hG....9.X.m....o...1.B
. u.e....]..'{.:^.
15:26:29.710730 IP u28.60840 > 123.208.120.34.bc.googleusercontent.com.https: F
lags [.], ack 456, win 501, options [nop,nop,TS val 1658196576 ecr 2540850447],
 length 0
```

- To display the captured packets in hexadecimal format.

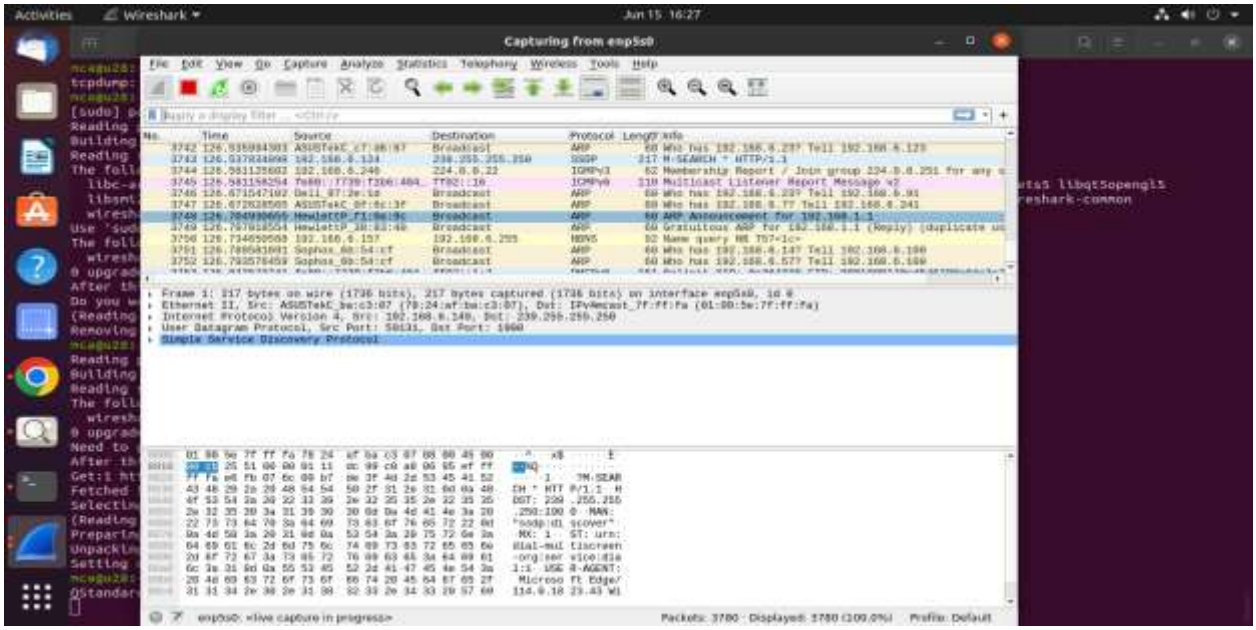
```
mca@u28:~$ sudo tcpdump -XX -i enp5s0
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp5s0, link-type EN10MB (Ethernet), capture size 262144 bytes
15:28:34.154964 ARP, Request who-has 192.168.90.1 tell 192.168.90.60, length 46
        0x0000:  ffff ffff ffff 4431 92a7 c055 0806 0001  ......D1...U....
        0x0010:  0800 0604 0001 4431 92a7 c055 c0a8 5a3c  ......D1...U..Z<
        0x0020:  0000 0000 0000 c0a8 5a01 0000 0000 0000  ........Z.......
        0x0030:  0000 0000 0000 0000 0000 0000            ............
15:28:34.156569 IP u28.55169 > dns.google.domain: 43728+ [1au] PTR? 1.90.168.19
2.in-addr.arpa. (54)
        0x0000:  001a 8c6b 54cf 0c9d 920f 6bf8 0800 4500  ...kT.....k...E.
        0x0010:  0052 f16d 4000 4011 71af c0a8 06c6 0808  .R.m@.@.q.......
        0x0020:  0808 d781 0035 003e d7cd aad0 0100 0001  .....5.>........
        0x0030:  0000 0000 0001 0131 0239 3003 3136 3803  .......1.90.168.
        0x0040:  3139 3207 696e 2d61 6464 7204 6172 7061  192.in-addr.arpa
        0x0050:  0000 0c00 0100 0029 0200 0000 0000 0000  .......)........
```

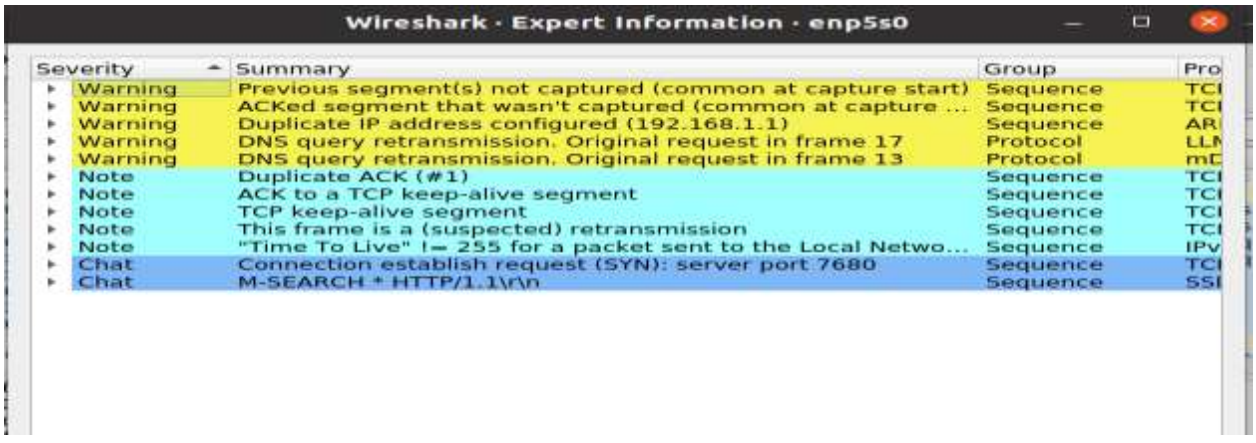
```
mca@u28:~$ sudo tcpdump -w data.txt -i enp5s0
tcpdump: listening on enp5s0, link-type EN10MB (Ethernet), capture size 262144
bytes
^Z
[8]+  Stopped                 sudo tcpdump -w data.txt -i enp5s0
```

- Install wireshark

```
mca@u28:~$ sudo apt install wireshark
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libc-ares2 liblua5.2-0 libqt5multimedia5 libqt5multimedia5-plugins
  libqt5multimediagsttools5 libqt5multimediawidgets5 libqt5opengl5
  libsmi2ldbl libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-data
  libwireshark13 libwiretap10 libwsutil11 wireshark-common wireshark-qt
Suggested packages:
  snmp-mibs-downloader geoipupdate geoip-database geoip-database-extra
  libjs-leaflet libjs-leaflet.markercluster wireshark-doc
The following NEW packages will be installed:
```

```
mca@u28:~$ sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
mca@u28:~$
```





Result:

The program was executed and the result was successfully obtained. Thus CO5 was obtained.

Experiment:10

Aim:

Installation of KVM and perform basic KVM Commands.

CO3:

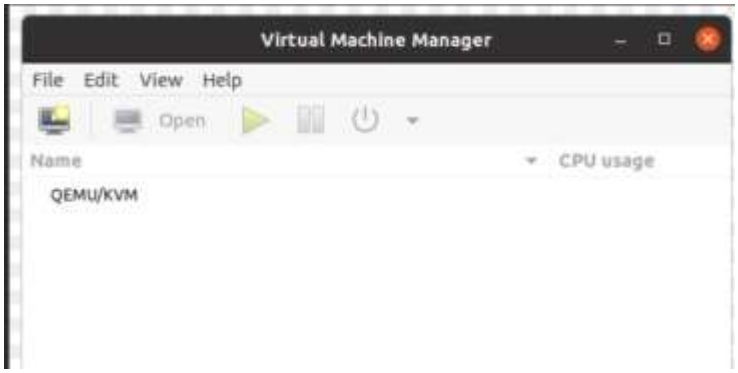
Install and manage servers for web applications.

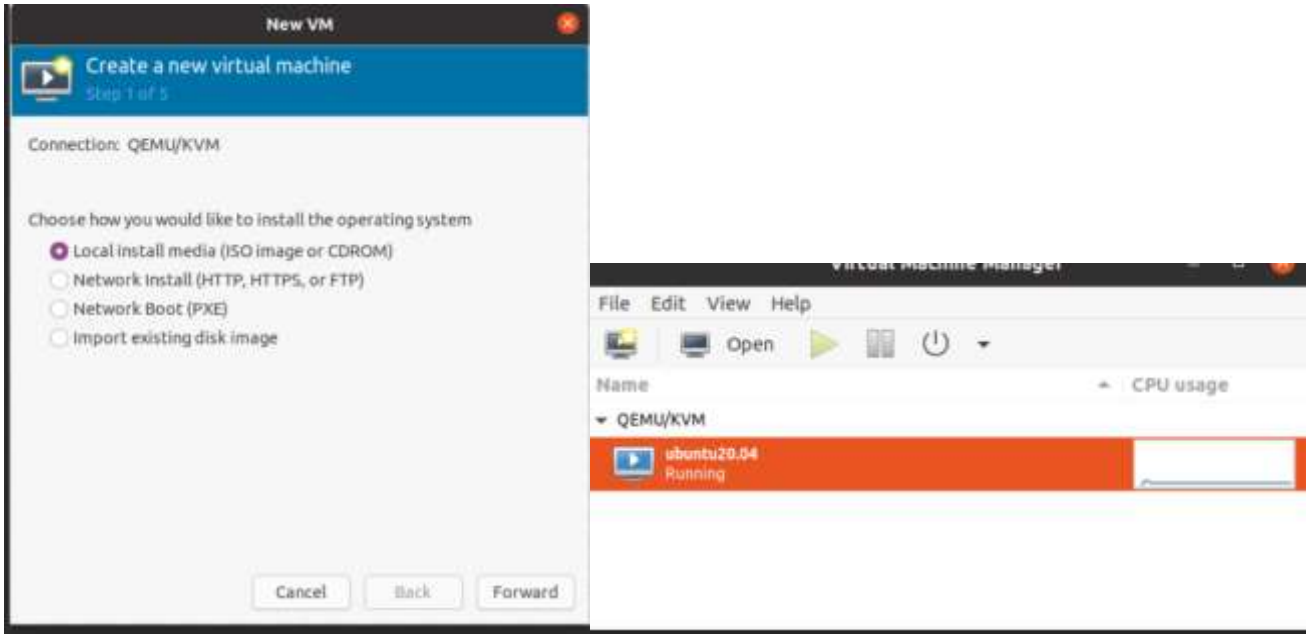
Procedure:

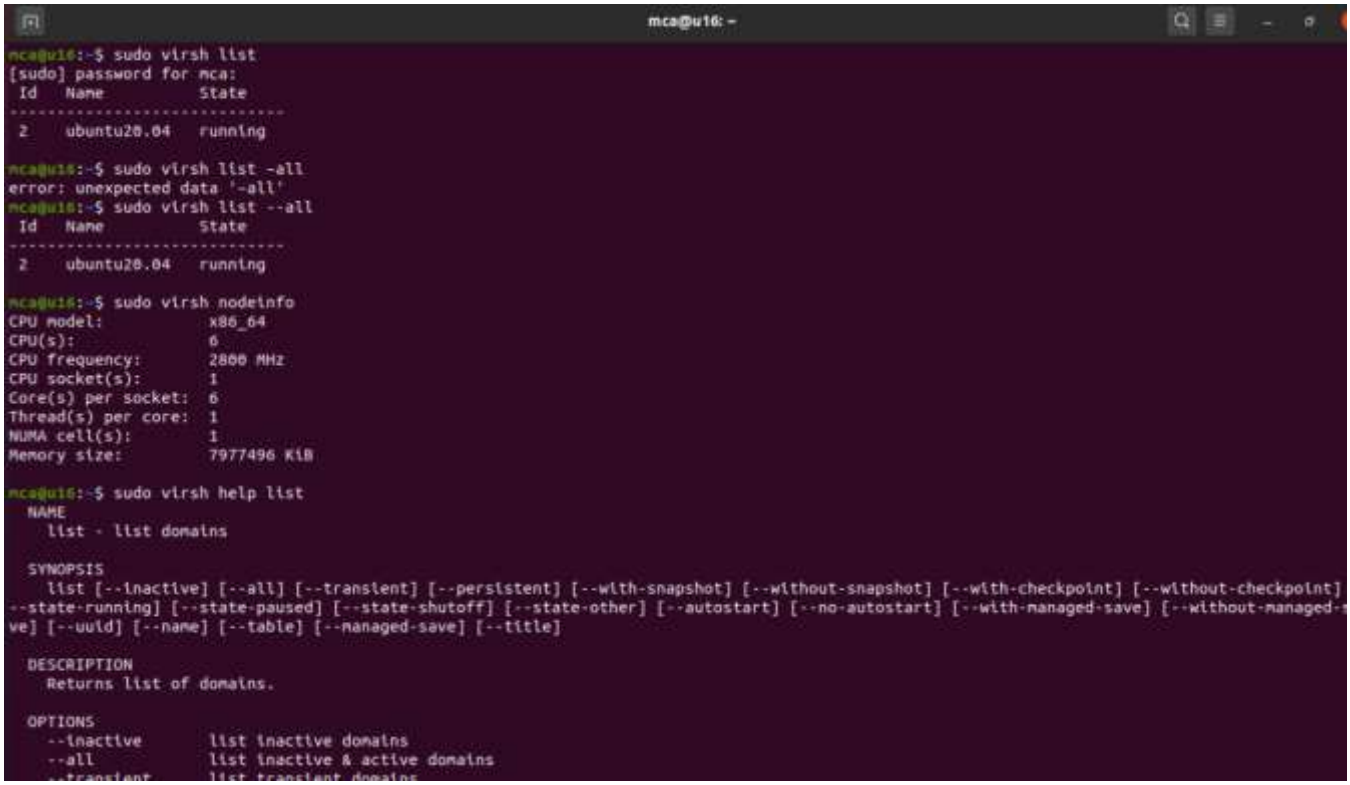
```
mca@u16:~$ sudo su
[sudo] password for mca:
root@u16:/home/mca# apt update
Hit:1 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:2 http://in.archive.ubuntu.com/ubuntu focal InRelease
Hit:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease
Reading package lists... Done
Building dependency tree
Reading state information... Done
700 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

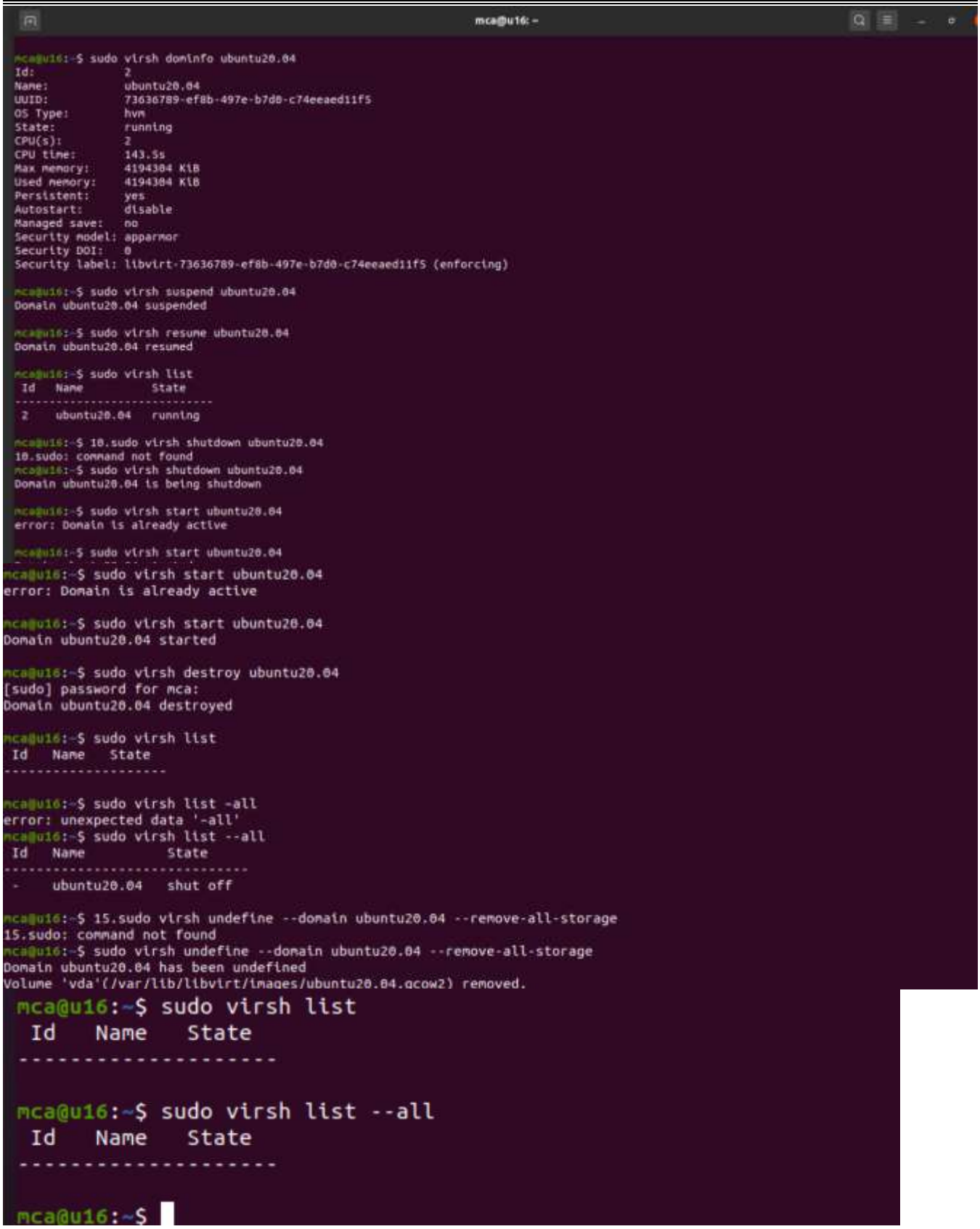
```
root@u16:/home/mca# egrep -c '(vmx|svm)'  /proc/cpuinfo
6
root@u16:/home/mca#
```

```
root@u28:/home/mca# sudo apt install qemu-kvm libvirt-daemon-system libvirt-clie
nts bridge-utils
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  cpu-checker dmeventd ibverbs-providers ipxe-qemu
  ipxe-qemu-256k-compat-efi-roms libaio1 libcacard0 libdevmapper-event1.02.1
  libfdt1 libibverbs1 libiscsi7 liblvm2cmd2.03 libnss-mymachines
  libnss-systemd libpam-systemd libpmem1 librados2 librbd1 librdmacm1
  libreadline5 libslirp0 libspice-server1 libsystemd0 libusbredirparser1
  libvirglrenderer1 libvirt-daemon libvirt-daemon-driver-qemu
  libvirt-daemon-driver-storage-rbd libvirt-daemon-system-systemd libvirt0
  libxml2-utils lvm2 msr-tools ovmf qemu-block-extra qemu-system-common
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 systemd-times
yncd amd64 245.4-4ubuntu3.22 [28.1 kB]
```




New VM
Create a new virtual machine
Step 1 of 5
Connection: QEMU/KVM
Choose how you would like to install the operating system
Local install media (ISO image or CDROM)
Network Install (HTTP, HTTPS, or FTP)
Network Boot (PXE)
Import existing disk image
Cancel
Back
Forward
File Edit View Help
Open
Name
CPU usage
QEMU/KVM
ubuntu20.04
Running


mca@u16: ~
mca@u16:~$ sudo virsh list
[sudo] password for mca:
Id Name State
2 ubuntu20.04 running
mca@u16:~$ sudo virsh list -all
error: unexpected data '-all'
mca@u16:~$ sudo virsh list --all
Id Name State
2 ubuntu20.04 running
mca@u16:~$ sudo virsh nodeinfo
CPU model: x86_64
CPU(s): 6
CPU frequency: 2800 MHz
CPU socket(s): 1
Core(s) per socket: 6
Thread(s) per core: 1
NUMA cell(s): 1
Memory size: 7977496 KiB
mca@u16:~$ sudo virsh help list
NAME
list - list domains
SYNOPSIS
list [--inactive] [--all] [--transient] [--persistent] [--with-snapshot] [--without-snapshot] [--with-checkpoint] [--without-checkpoint]
--state-running] [--state-paused] [--state-shutoff] [--state-other] [--autostart] [--no-autostart] [--with-managed-save] [--without-managed-
ve] [--uuid] [--name] [--table] [--managed-save] [--title]
DESCRIPTION
Returns list of domains.
OPTIONS
--inactive list inactive domains
--all list inactive & active domains



Result:

The program was executed and the result was successfully obtained. Thus CO3 was obtained

Experiment:11

Aim:

Docker, installation and deployment.

CO3:

Install and manage servers for web applications.

Procedure:

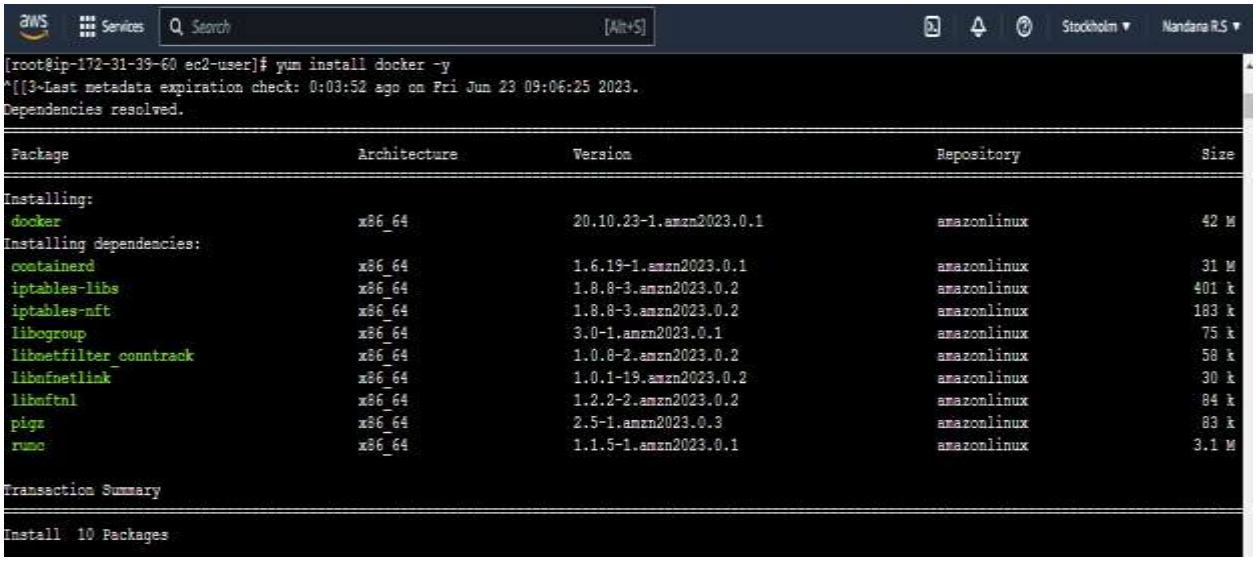
1. Sudo su
2. Yum update –y

```
       _/m/'
[ec2-user@ip-172-31-39-60 ~]$ sudo su
[root@ip-172-31-39-60 ec2-user]# yum update -y
Last metadata expiration check: 0:03:07 ago on Fri Jun 23 09:06:25 2023.
Dependencies resolved.
Nothing to do.
Complete!
```

3. Which docker

```
Complete!
[root@ip-172-31-39-60 ec2-user]# which docker
/usr/bin/which: no docker in (/root/.local/bin:/root/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/var/lib/snapd/snap/bin)
```

4. Yum install docker –y



5. Docker –version
6. Docker info

```
[root@ip-172-31-39-60 ec2-user]# docker --version
Docker version 20.10.23, build 7155243
[root@ip-172-31-39-60 ec2-user]# docker info
Client:
 Context:    default
 Debug Mode: false
 Plugins:
  buildx: Docker Buildx (Docker Inc., 0.0.0+unknown)
```

7. Service docker start
8. Docker images

```
[root@ip-172-31-39-60 ec2-user]# service docker start
Redirecting to /bin/systemctl start docker.service
[root@ip-172-31-39-60 ec2-user]# docker images
REPOSITORY   TAG       IMAGE ID   CREATED   SIZE
```

9. Docker ps –a
10. Docker ps

```
[root@ip-172-31-39-60 ec2-user]# docker ps -a
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
[root@ip-172-31-39-60 ec2-user]# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
```

11. Creating a container

Docker pull Ubuntu

Docker images

Docker ps –a

Docker run –t Ubuntu /bin/bash

Exit

Docker ps

Docker ps -a

```
[root@ip-172-31-39-60 ec2-user]# docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
6b851dcae6ca: Pull complete
Digest: sha256:6120be6a2b7ce665d0cbddc3ce6eae60fe94637c6a66985312d1f02f63cc0bcd
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest
[root@ip-172-31-39-60 ec2-user]# docker images
REPOSITORY   TAG       IMAGE ID       CREATED       SIZE
ubuntu       latest    99284ca6cea0   2 weeks ago   77.8MB
[root@ip-172-31-39-60 ec2-user]# docker ps -a
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
[root@ip-172-31-39-60 ec2-user]# docker run -it ubuntu /bin/bash
root@75bb1a884571:/# exit
exit
[root@ip-172-31-39-60 ec2-user]# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
[root@ip-172-31-39-60 ec2-user]# docker ps -a
CONTAINER ID   IMAGE     COMMAND       CREATED          STATUS                      PORTS     NAMES
75bb1a884571   ubuntu    "/bin/bash"   55 seconds ago   Exited (0) 25 seconds ago             wizardly_shannon
```

12. **Creating a container named nandana**
    Docker run –it –name nandana Ubuntu /bin/bash
    Docker ps -a

```
[root@ip-172-31-39-60 ec2-user]# docker run -it --name nandana ubuntu /bin/bash
root@51c95c5589d6:/# exit
exit
[root@ip-172-31-39-60 ec2-user]# docker ps -a
CONTAINER ID   IMAGE     COMMAND       CREATED          STATUS                      PORTS     NAMES
51c95c5589d6   ubuntu    "/bin/bash"   24 seconds ago   Exited (0) 13 seconds ago             nandana
75bb1a884571   ubuntu    "/bin/bash"   3 minutes ago    Exited (0) 3 minutes ago              wizardly_shannon
```

13. **Creating a mongodb container**
    Docker run –it –name sruthy mongo /bin/bash
    Exit
    Docker ps –a

```
[root@ip-172-31-39-60 ec2-user]# docker run -it --name sruthy mongo /bin/bash
Unable to find image 'mongo:latest' locally
latest: Pulling from library/mongo
3f94e4e483ea: Pull complete
5ac5d4dae314: Pull complete
cbe6867b3f80: Pull complete
ec4c7cb44e89: Pull complete
38c7016c15b5: Pull complete
2d740b6c9811: Pull complete
329604f22078: Pull complete
71c33622dbce: Pull complete
45f7e12b56a3: Pull complete
Digest: sha256:d2e09ab3edcd6d11e57ae4ab18df673b5df46f4f3b5a788ada9b8a98de2c4a08
Status: Downloaded newer image for mongo:latest
root@548574304b82:/# exit
exit
[root@ip-172-31-39-60 ec2-user]# docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED          STATUS                      PORTS     NAMES
548574304b82   mongo     "docker-entrypoint.s…"   22 seconds ago   Exited (0) 13 seconds ago             sruthy
51c95c5589d6   ubuntu    "/bin/bash"              7 minutes ago    Exited (0) 7 minutes ago              nandana
75bb1a884571   ubuntu    "/bin/bash"              10 minutes ago   Exited (0) 10 minutes ago             wizardly_shannon
```

14. TO enter in a container and add a file in it

Docker start nandana

Docker attach nandana

Cat > file.txt

```
[root@ip-172-31-39-60 ec2-user]# docker start nandana
nandana
[root@ip-172-31-39-60 ec2-user]# docker attach nandana
root@51c95c5589d6:/# cat > file.txt
Hello,nandana^Z
[1]+  Stopped                 cat > file.txt
root@51c95c5589d6:/# cat file.txt
root@51c95c5589d6:/# ls
bin  boot  dev  etc  file.txt  home  lib  lib32  lib64  libx32  media  mnt  opt  proc  root  run  sbin  srv  sys  tmp  usr  var
```

15. To install Apache

Apt-get update

```
root@51c95c5589d6:/# apt -get update
E: Command line option 'g' [from -get] is not understood in combination with the other options.
root@51c95c5589d6:/# apt-get update
Get:1 http://archive.ubuntu.com/ubuntu jammy InRelease [270 kB]
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [108 kB]
Get:5 http://archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [164 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [266 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [17.5 MB]
Get:8 http://archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1792 kB]
Get:9 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [36.3 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [42.2 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [922 kB]
Get:12 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1191 kB]
Get:13 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [545 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [49.4 kB]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [541 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [25.5 kB]
Get:17 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [634 kB]
Get:18 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [939 kB]
```

Apt install apache2 –y

```
root@51c95c5589d6:/# apt install apache2 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils bzip2 ca-certificates file libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap l
  libexpat1 libgdbm-compat4 libgdbm6 libicu70 libjansson4 libldap-2.5-0 libldap-common liblua5.3-0 libmagic-mgc libmagic1 libnghtt
  libpsl5 librtmp1 libsasl2-2 libsasl2-modules libsasl2-modules-db libsqlite3-0 libssh-4 libxml2 mailcap media-types mime-support
  perl perl-modules-5.34 publicsuffix ssl-cert xz-utils
```

Which apache2

```
Updating certificates in /etc/ssl/certs...
0 added, 0 removed; done.
Running hooks in /etc/ca-certificates/update.d...
done.
root@51c95c5589d6:/# which apache2
/usr/sbin/apache2
root@51c95c5589d6:/# exit
exit
There are stopped jobs.
```

16. To view running container

Docker start nandana
Docker ps

```
There are stopped jobs.
root@51c95c5589d6:/# ^C
root@51c95c5589d6:/# exit
exit
[root@ip-172-31-39-60 ec2-user]# docker start nandana
nandana
[root@ip-172-31-39-60 ec2-user]# docker ps
CONTAINER ID   IMAGE     COMMAND       CREATED          STATUS         PORTS     NAMES
51c95c5589d6   ubuntu    "/bin/bash"   19 minutes ago   Up 7 seconds             nandana
[root@ip-172-31-39-60 ec2-user]#
```

Result:

The program was executed and the result was successfully obtained. Thus CO3 was obtained.