

Experiment: 1

Aim:

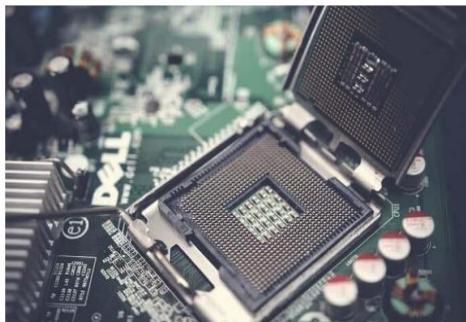
Familiarization of Hardware Components in a Computer.

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.

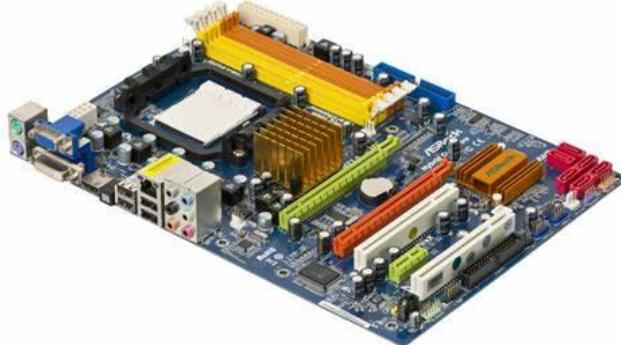
➤ Video Card



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.

➤ Motherboard

A motherboard is the main printed circuit board in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit and memory, and provides connectors for other peripherals



Parts

1. Back Panel Connectors & Ports:

Connectors and ports for connecting the computer to external devices such as display ports, audio ports, USB ports, Ethernet ports, PS/2 ports etc.

2. PCI Slots PCI:

Peripheral Component Interconnect Slot for older expansion cards such as sound cards, network cards, connector cards.

3. PCI Express x1 Slots:

Slot for modern expansion cards such as sound cards, network cards (Wi-Fi, Ethernet, Bluetooth), connector cards (USB, FireWire, eSATA) and certain lowend graphics cards.

4. PCI Express x16 Slot:

Slot for discrete graphic cards and high bandwidth devices such as top-end solid state drives.

5. Northbridge:

Also known as Memory Controller Hub (MCH). Chipset that allows the CPU to communicate with the RAM and graphics card. Beginning from Intel Sandy Bridge in 2011, this motherboard component is no longer present as it has been integrated within the CPU itself.

6. CPU Socket:

Insert CPU here.

7. ATX 12V:

Power Connector Connects to the 4-pin power cable of a power supply unit which supplies power to the CPU.

8. Front Panel USB 2.0:

Connectors Connects to USB 2.0 ports at the front or top of a computer case.

9.Front Panel Connectors:

Connects to the power switch, reset switch, power LED, hard drive LED and front audio ports of a computer case.

10. IDE Connector:

Connects to older hard drive disks and optical drives for data transfer.

11.CMOS Battery:

Supplies power to store BIOS settings and keep the real-time clock running.

12.Southbridge:

Also known as the Input/Output Controller Hub (ICH). Chipset that allows the CPU to communicate with PCI slots, PCI-Express x 1 slots (expansion cards), SATA connectors (hard drives, optical drives), USB ports (USB devices), Ethernet ports and on-board audio.

13.SATA Connectors:

Connects to modern hard disk drives, solid state drives and optical drives for data transfer.

14. Fan Headers:

Supplies power to the CPU heat sink fan and computer case fans.

15.RAM Slots:

Insert RAM here.

16. ATX Power Connector:

Connects to the 24-pin ATX power cable of a power supply unit which supplies power to the motherboard.

17.mSATA Connector:

Connects to a mSATA solid state drive. In most cases, this SSD is used as cache to speed up hard disk drives, but it's possible to re-purpose it as a regular hard drive.

18.Front Panel USB 3.0:

Connector Connects to USB 3.0 ports at the front or top of the computer case.

19.Power & Reset Button:

Onboard button to turn on, turn off and reboot the computer. This motherboard component is more common among high end boards.

➤ 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.

➤ Hard Drive



A computer hard drive (or a hard disk or HDD) is one kind of technology that stores the operating system, applications, and data files such as documents, pictures and music that your computer uses. The rest of the components in your computer work together to show you the applications and files stored on your hard drive.

➤ **Graphics Processing Unit (GPU)**



Graphics processing technology has evolved to deliver unique benefits in the world of computing. The latest graphics processing units (GPUs) unlock new possibilities in gaming, content creation, machine learning, and more.

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:

```
LS(1)                               User Commands                         LS(1)
NAME
    ls - list directory contents

SYNOPSIS
    ls [OPTION]... [FILE]...

DESCRIPTION
    List information about the FILEs (the current directory by default). Sort entries alphabetically if none of
    -cftuvSUX nor --sort is specified.

    Mandatory arguments to long options are mandatory for short options too.
```

2. ls:- list directory content

\$ls

Output:

```
student@gt2:~$ ls
1
Desktop
dir1
directory
Documents
Downloads
Music
Pictures
Public
PycharmProjects
snap
'snap Desktop Documents Downloads Music Pictures Public Templates Videos'
sreerag
sreerag1
Templates
test
Videos
```

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

```
student@t2:~$ ls -R
.:
content1  Documents  file1.txt  jetsample  output.txt  Public          RUGM    RUGMA   snap     Videos
Desktop    Downloads  jet        Music      Pictures    PycharmProjects rugma  ruksam  Templates

./Desktop:
'output pic'

'./Desktop/output pic':
'Screenshot from 2023-03-07 16-17-12.png'  'Screenshot from 2023-03-07 16-18-13.png'

./Documents:

./Downloads:
google-chrome-stable_current_amd64.deb

./Music:

./Pictures:

./Public:

./PycharmProjects:
pythonProject

./PycharmProjects/pythonProject:
main.py  venv

./PycharmProjects/pythonProject/venv:
bin  lib  pyvenv.cfg

./PycharmProjects/pythonProject/venv/bin:
activate  activate.fish  activate.ps1  deactivate.nu  f2py3  pip  pip-3.9  python  python3.9  wheel3  wheel3.9
activate.csh  activate.nu  activate_this.py  f2py        f2py3.9  pip3  pip3.9  python3  wheel      wheel-3.9

./PycharmProjects/pythonProject/venv/lib:
python3.9
```

b. ls -l :- Use long listing format

```
$ls -l
```

```
student@t2:~$ ls -l
total 68
-rw-rw-r-- 1 student student 18 Mar 7 15:21 content1
drwxr-xr-x 3 student student 4096 Mar 7 16:16 Desktop
drwxr-xr-x 2 student student 4096 Jun 17 2022 Documents
drwxr-xr-x 2 student student 4096 Mar 7 16:15 Downloads
-rw-rw-r-- 1 student student 0 Mar 7 14:36 file1.txt
-rw-rw-r-- 1 student student 18 Mar 7 15:29 jet
-rw-rw-r-- 1 student student 18 Mar 7 15:23 jetsample
drwxr-xr-x 2 student student 4096 Jun 17 2022 Music
-rw-rw-r-- 1 student student 0 Mar 7 15:34 output.txt
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
drwxrwxr-x 2 student student 4096 Mar 7 15:10 RUGM
drwxrwxr-x 2 student student 4096 Mar 6 12:56 rugma
drwxrwxr-x 2 student student 4096 Mar 6 11:54 RUGMA
drwxrwxr-x 3 student student 4096 Mar 7 15:18 ruksam
drwx----- 3 student student 4096 Jun 17 2022 snap
drwxr-xr-x 2 student student 4096 Jun 17 2022 Templates
drwxr-xr-x 2 student student 4096 Jun 17 2022 Videos
student@t2:~$
```

c. ls -a :- List hidden files

```
$ls -a
```

```
student@t2:~$ ls -a
.           .bash_logout  .config  Documents  .gnupg  jetsample  Music      .pki      PycharmProjects  RUGM    .ssh
..          .bashrc       content1  Downloads  .java    .local     output.txt  .profile  RUGM      ruksam  Templates
.bash_history .cache       Desktop   file1.txt  jet     .mozilla   Pictures   Public    rugma    snap    Videos
student@t2:~$
```

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

```
$ls -al
```

```
student@t2:~$ ls -al
total 124
drwxr-xr-x 24 student student 4096 Mar  7 15:35 .
drwxr-xr-x  6 root    root   4096 Jun 17 2022 ..
-rw-----  1 student student 1759 Mar  7 16:13 .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 19 student student 4096 Mar  7 16:19 .cache
drwxr-xr-x 15 student student 4096 Mar  7 16:19 .config
-rw-rw-r--  1 student student 18 Mar  7 15:21 content1
drwxr-xr-x  3 student student 4096 Mar  7 16:16 Desktop
drwxr-xr-x  2 student student 4096 Jun 17 2022 Documents
drwxr-xr-x  2 student student 4096 Mar  7 16:15 Downloads
-rw-rw-r--  1 student student 0 Mar  7 14:36 file1.txt
drwx----- 3 student student 4096 Mar  7 16:17 .gnupg
drwxrwxr-x  4 student student 4096 Jun 17 2022 .java
-rw-rw-r--  1 student student 18 Mar  7 15:29 jet
-rw-rw-r--  1 student student 18 Mar  7 15:23 jetsample
drwxr-xr-x  3 student student 4096 Jun 17 2022 .local
drwx----- 5 student student 4096 Mar  6 12:37 .mozilla
drwxr-xr-x  2 student student 4096 Jun 17 2022 Music
-rw-rw-r--  1 student student 0 Mar  7 15:34 output.txt
drwxr-xr-x  2 student student 4096 Jun 17 2022 Pictures
drwx----- 3 student student 4096 Mar  7 15:35 .pki
-rw-r--r--  1 student student 807 Jun 17 2022 .profile
drwxr-xr-x  2 student student 4096 Jun 17 2022 Public
drwxrwxr-x  3 student student 4096 Jun 17 2022 PycharmProjects
drwxrwxr-x  2 student student 4096 Mar  7 15:10 RUGM
drwxrwxr-x  2 student student 4096 Mar  6 12:56 rugma
drwxrwxr-x  2 student student 4096 Mar  6 11:54 RUGMA
drwxrwxr-x  3 student student 4096 Mar  7 15:18 ruksam
drwx----- 3 student student 4096 Jun 17 2022 snap
drwx----- 2 student student 4096 Jun 17 2022 .ssh
drwxr-xr-x  2 student student 4096 Jun 17 2022 Templates
drwxr-xr-x  2 student student 4096 Jun 17 2022 Videos
student@t2:~$
```

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

```
$ls -t
```

```
student@t2:~$ ls -t
Desktop      output.txt  jetsample  ruksam  file1.txt  RUGMA          snap       Music      Public     Videos
Downloads    jet         content1  RUGM    rugma     PycharmProjects  Documents  Pictures  Templates
student@t2:~$
```

f. ls -r :- Reverse order while sorting

```
$ls -r
```

```
student@t2:~$ ls -r
Videos      snap      RUGMA  RUGM          Public      output.txt  jetsample  file1.txt  Documents  content1
Templates   ruksam   rugma  PycharmProjects Pictures  Music      jet        Downloads  Desktop
student@t2:~$
```

- read, echo

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

```
student@t2:~$ read
MY NAME IS RUGMA
```

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:~$ echo $REPLY
MY NAME IS RUGMA
student@t2:~$ read var1 var2 var3
my name is RUGMA S
student@t2:~$ echo "[\$var1][\$var2][\$var3]"
[my][name][is RUGMA S]
```

- b. read input \ :- To read multiple lines

```
$read
```

```
My \
```

```
name is \
```

```
Rugma
```

```
student@t2:~$ read
my\
> name is \
> rugma
student@t2:~$ echo $REPLY
myname is rugma
```

- c. read -p :- Prompt text from user

```
$read -p "Enter your name"
```

```
$echo "my name is $REPLY"
```

```
student@t2:~$ read -p "enter your name"
enter your name rugma
student@t2:~$ echo "my name is $REPLY"
my name is rugma
```

- d. read -n :- Specify limit

```
$read -n 6 -p "Enter six characters only"
```

- e. read -s :-For security. Hides input

```
$read -s -p "Enter the password: "
```

```
student@t2:~$ read -n 6 -p "enter 6 characters only"
enter 6 characters only rugma
student@t2:~$ read -s -p "enter the password"
enter the password
student@t2:~$ echo "password is $REPLY"
password is 1234
```

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 were 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 forces 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 cloud 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

Get Involved Jingle, Pluck, and Hum: Sounds from Space Telescopes that detect x-rays, light, or other forms of electromagnetic radiation for Researchers

- 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 accumulated by killing enemies.[96][97][98][99] Character **classes**, specific jobs that enable unique abilities for characters, are another recurring theme. Introduced in the first game, character classes have been used differently in each game. Some restrict a character to a single job to integrate it into the story, while other games feature dynamic job systems that allow the player to choose from multiple classes and switch throughout the game. Though used heavily in many games, such systems have become less prevalent in favor of characters that are more versatile; characters still match an archetype, but are able to learn skills 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:

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

- mkdir :- Make directory

```
$mkdir demo
```

Output:

```
student@t2:~$ mkdir RUKKU
student@t2:~$ ls
content1 Documents file1.txt jetsample output.txt Public          RUGM    RUGMA   ruksam  Templates
Desktop   Downloads jet        Music      Pictures PycharmProjects rugma  RUKKU   snap    Videos
student@t2:~$
```

- pwd :- print working directory
\$pwd
Output:

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

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

\$ find filename.txt

Output :

```
student@s46:~$ find space.txt
find: 'space.txt': No such file or directory
student@s46:~$ cd stardust
student@s46:~/stardust$ find space.txt
space.txt
```

2. cp,mv,rm

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

Output:

```
rugma@rugma-ubuntu:~$ paste -d '-' mark1 mark2 > mark3
rugma@rugma-ubuntu:~$ cat mark3
english-67
maths-89
economics-88
IT-98
```

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

\$cp sr.txt output5.txt

Output:

```
rugma@rugma-ubuntu:~$ cp mark1 mark2
rugma@rugma-ubuntu:~$ cat mark2
english
maths
economics
IT
```

- 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:

```
@DESKTOP-M28K6VJ:~$ rmdir file1
@DESKTOP-M28K6VJ:~$
```

3. wc, cut, paste

- wc :- Word count display number of lines, number of words, number of bytes and file name

\$wc file.txt

Output:

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

Output:

```
student@t2:~$ wc -l profile
3 profile
```

- b. wc -m :-Display number of bytes

\$wc -m file.txt

Output:

```
student@t2:~$ wc -m profile
69 profile
```

- c. wc -c :- Display number of characters

\$wc -c file.txt

Output:

```
student@t2:~$ wc -c profile
69 profile
```

- d. wc -w :-Display number of words

\$wc -w file.txt

Output:

```
student@t2:~$ wc -w profile
13 profile
```

- e. wc -L :- Displays length of longest line

\$wc -L file.txt

Output:

```
student@t2:~$ wc -L profile
35 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:

```
student@t2:~$ cut -b1 file1.txt
h
h
h
i

b
```

- b. cut -b2 :- Cut by third character

\$cut -c3 file1.txt

Output:

```
student@t2:~$ cut -b2 file1.txt
i
e
o

y
```

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

\$cut -d -f1 file3.txt

Output:

```
rugma@rugma-ubuntu:~$ cut -d ' ' -f1 mark1
english
maths
economics
IT
rugma@rugma-ubuntu:~$ cut -d ' ' -f1 mark2
67
89
88
98
```

- d. cut -c :- Select only these characters

\$paste -d '-' mark1 mark2 > mark3

\$cat mark3

Output:

```
rugma@rugma-ubuntu:~$ paste -d '-' mark1 mark2 > mark3
rugma@rugma-ubuntu:~$ cat mark3
english-67
maths-89
economics-88
IT-98
```

- Paste :- Merge lines of files

\$paste sr.txt file1.txt

Output:

```
rugma@rugma-ubuntu:~$ cp mark1 mark2
rugma@rugma-ubuntu:~$ cat mark2
english
maths
economics
IT
```

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

```
@DESKTOP-M28K6VJ:$ paste file3 file4 > new
@DESKTOP-M28K6VJ:$ cat new
green  GREEN
red    RED
violet VIOLET
```

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

```
@DESKTOP-M28K6VJ:$ paste -d '|' file3 new
green|green      GREEN
red|red RED
violet|violet VIOLET
```

- c. paste -s output.txt :- Display output in a single line
\$paste -s output.txt
Output:

```
rugma@rugma-ubuntu:~$ paste -s mark1
english maths economics IT
```

4. head, tail, grep,

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

```
student@t2:~$ head numbers
100
101
102
103
104
105
106
104
103
102
```

- a. head -number filename:- Specific number of lines

\$head -5 numbers

```
student@t2:~$ head - 5 numbers
100
101
102
103
104
```

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

Output:

```
student@t2:~$ tail numbers
99
98
97
96
95
94
93
92
91
90
```

- a. tail -number filename :- Specific number of content from last

```
student@t2:~$ tail -5 numbers
```

Output:

```
student@t2:~$ tail -5 numbers
94
93
92
91
90
```

- grep :- Filtering and Searching content easily
\$grep 34 Mark

Output:

```
student@t2:~$ grep 92 file1.txt
phy 92
```

- a. grep -i :- Case insensitive search of a particular content

```
$grep -i 42 Mark
```

Output:

```
student@t2:~$ grep -i 89 file1.txt
chem 89
```

- b. grep -v :- Exclude that content during search

```
$grep -v 42 Mark
```

```
student@t2:~$ grep -v 20 file1.txt
eng 80
maths 50
phy 92
chem 89
```

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

```
$grep -A1 Maths Mark
```

Output:

```
student@t2:~$ grep -A1 eng file1.txt
eng 80
maths 50
```

- d. grep -B1 :- Specific content and one line before the content

```
$grep -B1 Maths Mark
```

Output:

```
student@t2:~$ grep -B1 phy file1.txt
maths 50
phy 92
```

- e. grep -C1 :- Specific content and one lone before and after the content.

\$grep -C1 Maths Mark

Output:

```
student@t2:~$ grep -C1 phy file1.txt
maths 50
phy 92
chem 89
```

- 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. chmod, chown

- 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:

```
mca@t2:~$ ls
Desktop Documents Downloads Music Pictures Public Templates Videos
mca@t2:~$ touch file
mca@t2:~$ ls
Desktop Documents Downloads file Music Pictures Public Templates Videos
mca@t2:~$ chmod -wx file
mca@t2:~$ cat >> file
bash: file: Permission denied
mca@t2:~$ chmod +wx file
mca@t2:~$ cat >> file
Hello
^Z
[1]+  Stopped                  cat >> file
mca@t2:~$ cat file
Hello
```

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

\$chmod +wrx file

Output:

```
mca@t2:~$ ls
Desktop Documents Downloads Music Pictures Public Templates Videos
mca@t2:~$ touch file
mca@t2:~$ ls
Desktop Documents Downloads file Music Pictures Public Templates Videos
mca@t2:~$ chmod -wx file
mca@t2:~$ cat >> file
bash: file: Permission denied
mca@t2:~$ chmod +wx file
mca@t2:~$ cat >> file
Hello
^Z
[1]+  Stopped                  cat >> file
mca@t2:~$ cat file
Hello
```

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

\$sudo chown Rugma file

Output:

```
mca@t2:~$ sudo chown RUGMA b.txt
[sudo] password for mca:
mca@t2:~$ ls
a.txt b.txt Desktop Documents Downloads Music Pictures Public rugma Templates Videos
```

6. useradd,usermod, userdel, passwd

- sudo :- superuser do

1. sudo useradd user :- Add new user

\$sudo useradd Rugma

Output:

```
mca@t2:~/rugma$ sudo useradd RUGMA
[sudo] password for mca:
mca@t2:~/rugma$ sudo useradd RUGMA
useradd: user 'RUGMA' already exists
```

- b. sudo passwd user :- Update password of the user

\$sudo passwd Rugma

Output:

```
mca@t2:~/rugma$ sudo passwd RUGMA
New password:
Retype new password:
passwd: password updated successfully
```

- 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 Rugma

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

\$id Rugma

Output:

```
mca@t2:~/rugma$ id RUGMA
uid=1006(RUGMA) gid=1007(RUGMA) groups=1007(RUGMA),2001(MCAsstud)
```

- sudo userdel user :- Delete user

\$sudo userdel Rugma

Output:

- sudo groupdel name :- Delete group

\$sudo groupdel mcastd

Output:

```
mca@t2:~$ sudo userdel RUGMA
[sudo] password for mca:
mca@t2:~$ sudo userdel RUGMA
userdel: user 'RUGMA' does not exist
mca@t2:~$
```

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:

```
student@t2:~$ ls
ash      Desktop    hell    marks   Music  'output 2'  Public    rugma  Templates  Videos
ashwathy Downloads  inzane  mick    one    Pictures  PycharmProjects snap    trail
student@t2:~$ du hell
12      hell
student@t2:~$ du mick
4      mick
```

- 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
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
 1428 ?    00:00:00 goa-identity-se
 1433 ?    00:00:00 gvfs-gphoto2-vo
 1438 ?    00:00:00 gvfs-afc-volume
 1445 tty2    00:00:00 gdm-x-session
 1447 tty2    00:00:48 Xorg
```

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

\$ps -u mca

Output:

```
mca@t2:~$ ps -u mca
  PID TTY          TIME CMD
 1426 ?    00:00:00 systemd
 1427 ?    00:00:00 (sd-pam)
 1442 ?    00:04:54 pulseaudio
 1444 ?    00:00:00 tracker-miner-f
 1447 ?    00:00:00 dbus-daemon
 1452 ?    00:00:00 gnome-keyring-d
 1459 ?    00:00:00 gvfsd
 1464 ?    00:00:00 gvfsd-fuse
 1483 ?    00:00:00 gvfs-udisks2-vo
 1489 ?    00:00:00 gvfs-mtp-volume
 1493 ?    00:00:00 gvfs-goa-volume
 1497 ?    00:00:00 goa-daemon
 1504 ?    00:00:00 goa-identity-se
 1509 ?    00:00:00 gvfs-gphoto2-vo
 1514 ?    00:00:00 gvfs-afc-volume
 1521 tty2    00:00:00 gdm-x-session
```

- 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:cPWVn00gVs1b5nCx+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.

```
mca@u28:~$ tree
Command 'tree' not found, but can be installed with:

sudo snap install tree # version 1.8.0+pkg-3fd6, or
sudo apt install tree # version 1.8.0-1

See 'snap info tree' for additional versions.
```

- If not, then install it.

```
mca@u28:~$ sudo apt update
[sudo] password for mca:
Get:1 https://dl.google.com/linux/chrome/deb stable InRelease [1,825 B]
Get:2 https://dl.google.com/linux/chrome/deb/main amd64 Packages [1,079 B]
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:4 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:5 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:6 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [2,304 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2,686 kB]
Get:9 http://security.ubuntu.com/ubuntu focal-security/main i386 Packages [620 kB]
Get:10 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [366 kB]
Get:11 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [59.9 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 [1,979 kB]
Get:14 http://security.ubuntu.com/ubuntu focal-security/restricted i386 Packages [31.8 kB]
Get:15 http://security.ubuntu.com/ubuntu focal-security/restricted Translation-en [277 kB]
Get:16 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 c-n-f Metadata [552 B]
Get:17 http://security.ubuntu.com/ubuntu focal-security/universe i386 Packages [604 kB]
Get:18 http://in.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [851 kB]
Get:19 http://in.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [448 kB]
Get:20 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [275 kB]
Get:21 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [16.9 kB]
Get:22 http://in.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [2,089 kB]
Get:23 http://security.ubuntu.com/ubuntu focal-security/universe amd64 Packages [854 kB]
Get:24 http://in.archive.ubuntu.com/ubuntu focal-updates/restricted i386 Packages [33.2 kB]
```

```
mca@u28:~$ sudo apt install tree
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  tree
0 upgraded, 1 newly installed, 0 to remove and 665 not upgraded.
Need to get 43.0 kB of archives.
After this operation, 115 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 tree amd64 1.8.0-1 [43.0 kB]
Fetched 43.0 kB in 1s (42.4 kB/s)
Selecting previously unselected package tree.
(Reading database ... 160483 files and directories currently installed.)
Preparing to unpack .../tree_1.8.0-1_amd64.deb ...
Unpacking tree (1.8.0-1) ...
Setting up tree (1.8.0-1) ...
Processing triggers for man-db (2.9.1-1) ...
```

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

```
mca@u28:~$ tree
.
├── An Introduction to Local Area Networks.pdf
├── case.sh
├── cis192QuickRef.pdf
├── cpp1
├── cpp2
├── data.txt
├── Desktop
├── Documents
│   └── 16)2023-06-15 15-09-37.png
├── Downloads
│   ├── file1.sh
│   ├── forbreak.sh
│   ├── forcolor.sh
│   ├── forcontinue.sh
│   ├── fordisplay.sh
│   ├── forloop1.sh
│   ├── forloop.sh
│   ├── google-chrome-stable_current_amd64.deb
│   ├── hellofun.sh
│   ├── m3.sh
│   ├── m4.sh
│   └── make
│       ├── a.out
│       ├── factorial.cpp
│       ├── fuctions.cpp
│       ├── functions.cpp
│       ├── functions.h
│       ├── functions.h.gch
│       ├── main.cpp
│       ├── makefile
│       └── test.cpp
└── marvel
    ├── endgame.txt
    └── Endname.txt
```

```
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
            └── bufinfo.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.

```
mca@u28:~$ tree /etc
/etc
├── acpi
│   ├── asus-keyboard-backlight.sh
│   ├── asus-wireless.sh
│   └── events
│       ├── asus-keyboard-backlight-down
│       ├── asus-keyboard-backlight-up
│       ├── asus-wireless-off
│       ├── asus-wireless-on
│       ├── ibm-wireless
│       ├── lenovo-undock
│       ├── thinkpad-cmos
│       └── tosh-wireless
├── ibm-wireless.sh
└── tosh-wireless.sh
    └── undock.sh
adduser.conf
alsa
├── conf.d
│   ├── 10-samplerate.conf -> /usr/share/alsa/alsa.conf.d/10-samplerate.conf
│   ├── 10-speexrate.conf -> /usr/share/alsa/alsa.conf.d/10-speexrate.conf
│   ├── 50-arcam-av-ctl.conf -> /usr/share/alsa/alsa.conf.d/50-arcam-av-ctl.conf
│   ├── 50-jack.conf -> /usr/share/alsa/alsa.conf.d/50-jack.conf
│   ├── 50-oss.conf -> /usr/share/alsa/alsa.conf.d/50-oss.conf
│   ├── 50-pulseaudio.conf -> /usr/share/alsa/alsa.conf.d/50-pulseaudio.conf
│   ├── 60-upmix.conf -> /usr/share/alsa/alsa.conf.d/60-upmix.conf
│   ├── 60-vdownmix.conf -> /usr/share/alsa/alsa.conf.d/60-vdownmix.conf
│   ├── 98-usb-stream.conf -> /usr/share/alsa/alsa.conf.d/98-usb-stream.conf
│   └── 99-pulseaudio-default.conf.example
        └── 99-pulse.conf -> /usr/share/alsa/alsa.conf.d/pulse.conf
├── alternatives
│   ├── arptables -> /usr/sbin/arptables-nft
│   ├── arptables-restore -> /usr/sbin/arptables-nft-restore
│   └── arptables-save -> /usr/sbin/arptables-nft-save
└── sub
    └── /proc/bin/mount
```

- Home directory for the regular users.

```
mca@u28:~$ tree /home
/home
├── ajce
│   ├── Desktop
│   ├── Documents
│   ├── Downloads
│   │   └── xampp-linux-x64-8.1.17-0-installer.run
│   ├── Music
│   ├── Pictures
│   ├── Public
│   └── PycharmProjects
│       └── pythonProject
│           ├── main.py
│           └── venv
│               ├── bin
│               │   ├── activate
│               │   ├── activate.csh
│               │   ├── activate.fish
│               │   ├── activate.nu
│               │   ├── activate.ps1
│               │   ├── activate_this.py
│               │   └── deactivate.nu
│               ├── pip
│               ├── pip3
│               ├── pip-3.8
│               └── pip3.8
│               └── python -> /usr/bin/python3.8
│               └── python3 -> python
```

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 analyse 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 state 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:
Output:

```
countlines=`wc -lines<$file_path
`wc -words<$file_path`
echo "Num of lines:$countlines"
~
```

```
@DESKTOP-M28K6VJ:~$ readlink -f file7
nila23/file7
@DESKTOP-M28K6VJ:~$ vi file7
@DESKTOP-M28K6VJ:~$ chmod +x file7
@DESKTOP-M28K6VJ:~$ ./file7
```

```
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 "Number is zero"
elif(( $num1 % 2 == 0 ))
then
    echo "$num1 is even "
else
    echo "$num1 is odd "
fi
Press 'Esc' to end INSERT
:wq!
chmod +x filename.sh
./filename.sh
```

Output:

```
-VirtualBox:~$ ./evenorodd.sh
Enter a Number: 0
the number is zero
zero
-VirtualBox:~$ ./evenorodd.sh
Enter a Number: 1
the number is odd
one
-VirtualBox:~$ ./evenorodd.sh
Enter a Number: 2
the number is even
two
```

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:

```

-VirtualBox:~/Downloads$ chmod +x new.sh
-VirtualBox:~/Downloads$ ./new.sh
.. 32
Enter a Number: 32
32 is a positive number

```

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:

```

student@t2:~$ vi StringOp.sh
student@t2:~$ ./StringOp.sh
Enter the first string: Sreerag
Enter the second string: AJCE
Both strings are not equal
Both strings are equal
First String size is non-zero
First String size is zero
First String is not Empty

```

6. #!/bin/bash

```

echo "Enter your age: "
read age
if (( age >= 18 )); then
    echo "You are eligible for job consideration."
    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
-VirtualBox:~/Downloads$ chmod +x new1.sh
-VirtualBox:~/Downloads$ ./new1.sh
Enter your age:
23
You are eligible for job consideration.
You are in the suitable age group for many jobs.

```

7. Program:

```

#!/bin/bash
capital="New Delhi"
case "$capital" in
"maharashtra") echo "MH is not the capital of India";;
"kerala") echo "Kerala is not the capital of India";;
"New Delhi") echo "New Delhi is the capital state of India";;
esac

```

Output:

```

mca@u28:~$ vi states.sh
mca@u28:~$ chmod +x states.sh
mca@u28:~$ ./states.sh
New Delhi is the capital state of India
mca@u28:~$ 

```

8. Program:

```

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

```

Output:

```

mca@u28:~$ vi whilerev.sh
mca@u28:~$ chmod +x whilerev.sh
mca@u28:~$ ./whilerev.sh
10
9
8
7
6
5
4
3
2
1
mca@u28:~$ 

```

9. Program

```
#!/bin/bash
echo Enter the number
read n
num=0
on=$n
while [ $n -gt 0 ]
do
num=$((num * 10))
k=$((n % 10))
num=$((num + k))
n=$((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
```

Output:

```
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. Program:

```
#!/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))
@mDESKTOP-M28K6VJ:~$ vi armstrongg.sh
@mDESKTOP-M28K6VJ:~$ chmod +x armstrongg.sh
@mDESKTOP-M28K6VJ:~$ ./armstrong.sh
```

```
Enter a number: 371
371 is an Armstrong number
```

11. Program

```
#!/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<$n; i++ )) do
num=$((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. Program

```
#!/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. Program

```
#!/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. Program

```
#!/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
~
```

Output:

```
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.
```

Result:

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

Experiment:5

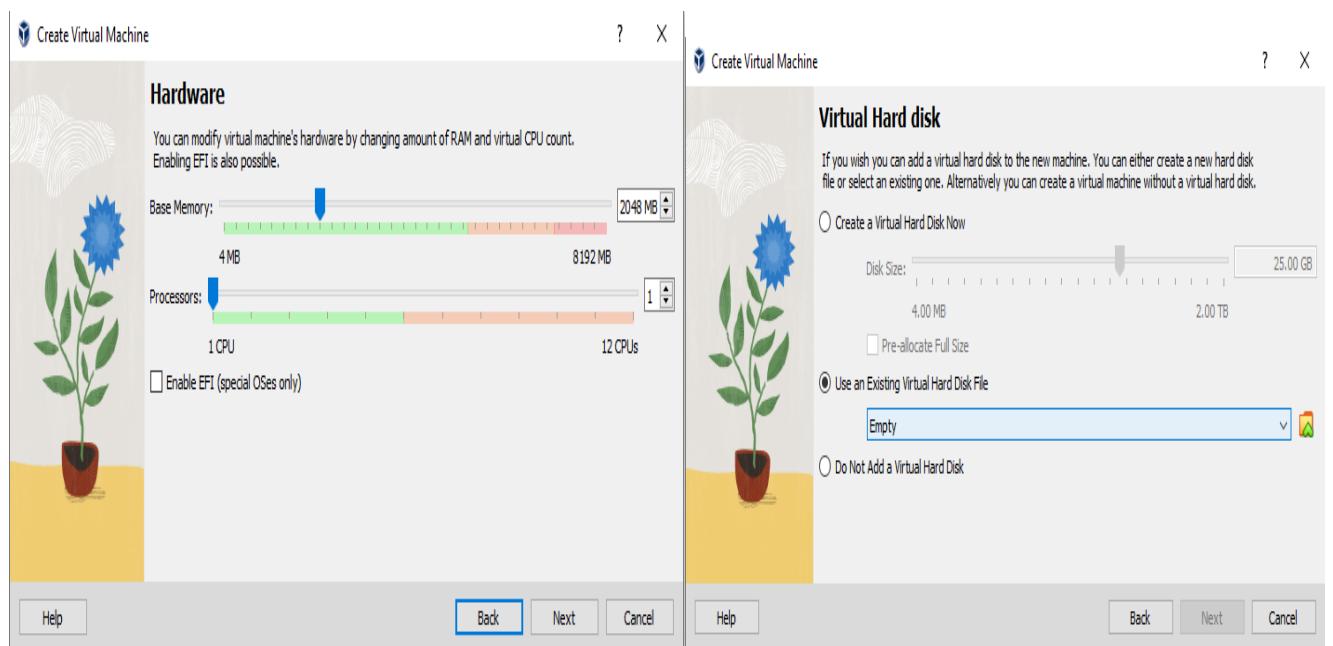
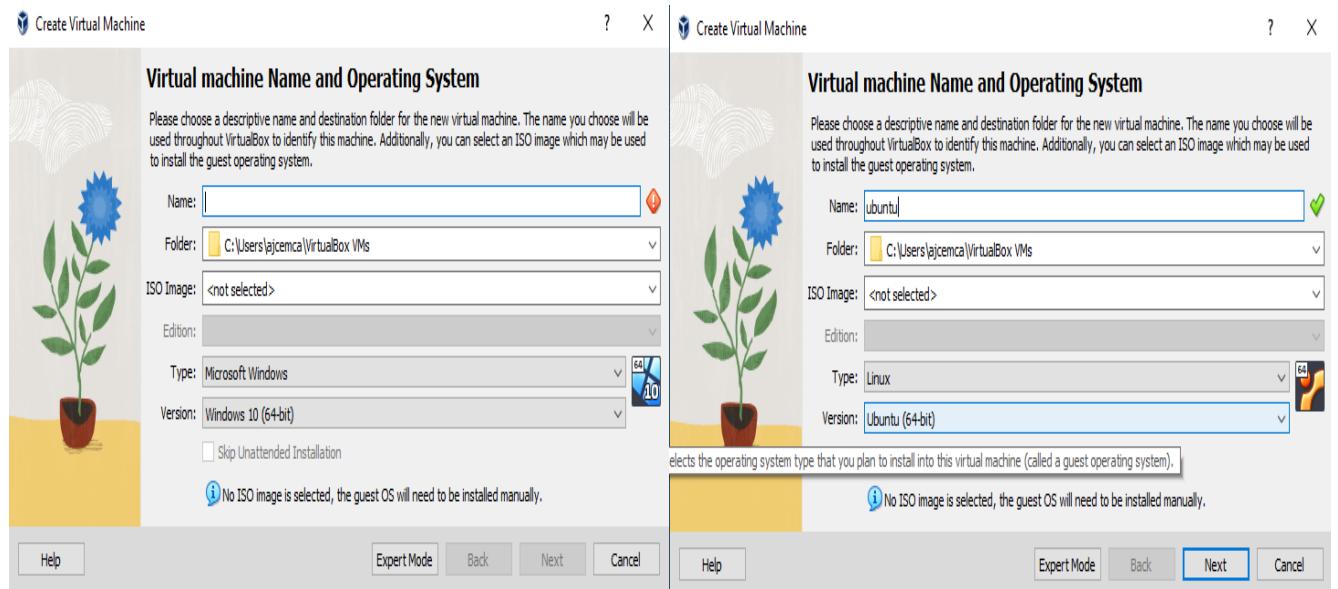
Aim:

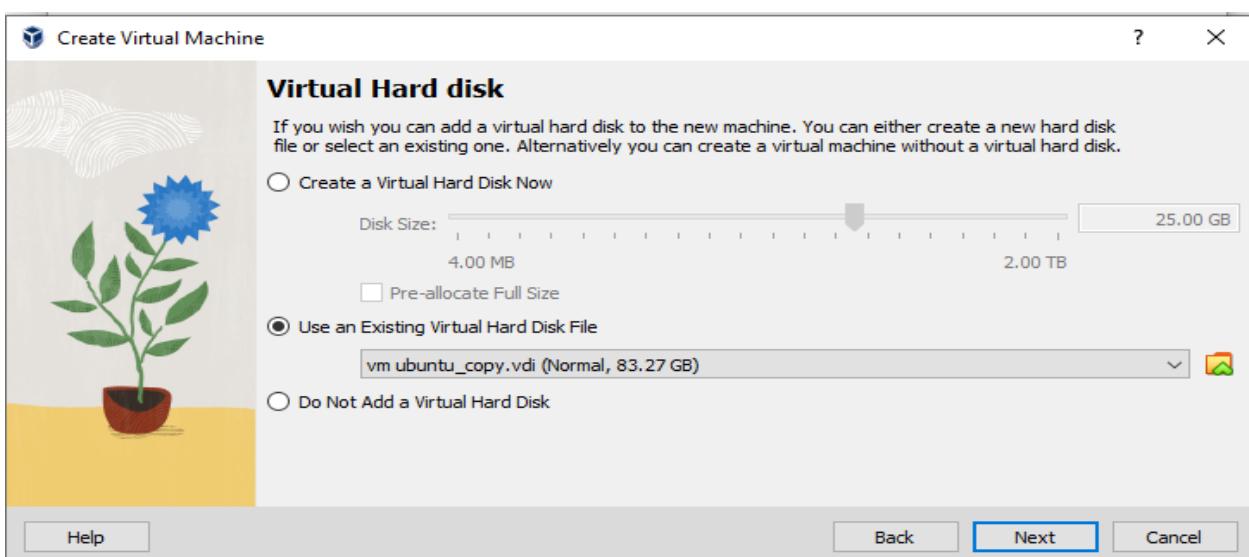
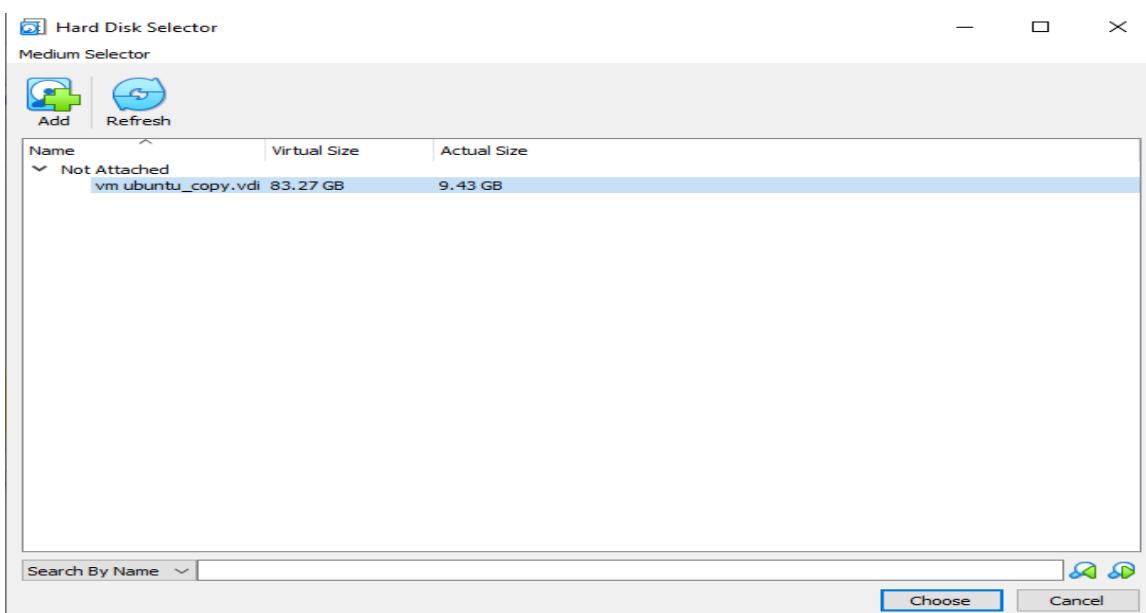
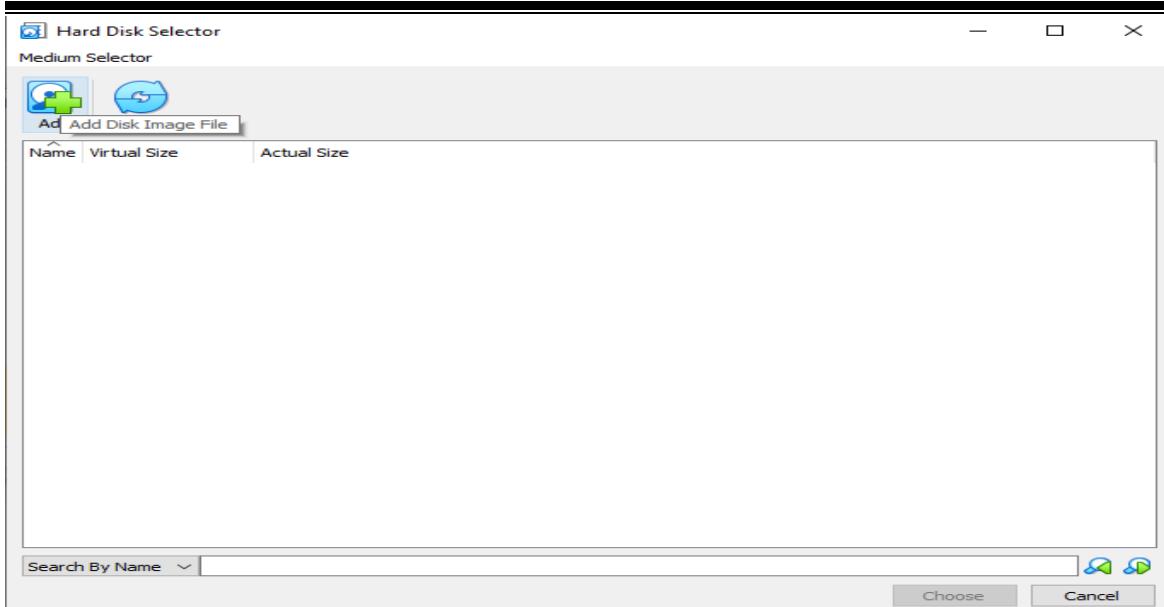
Install latest version of Ubuntu on a virtual box.

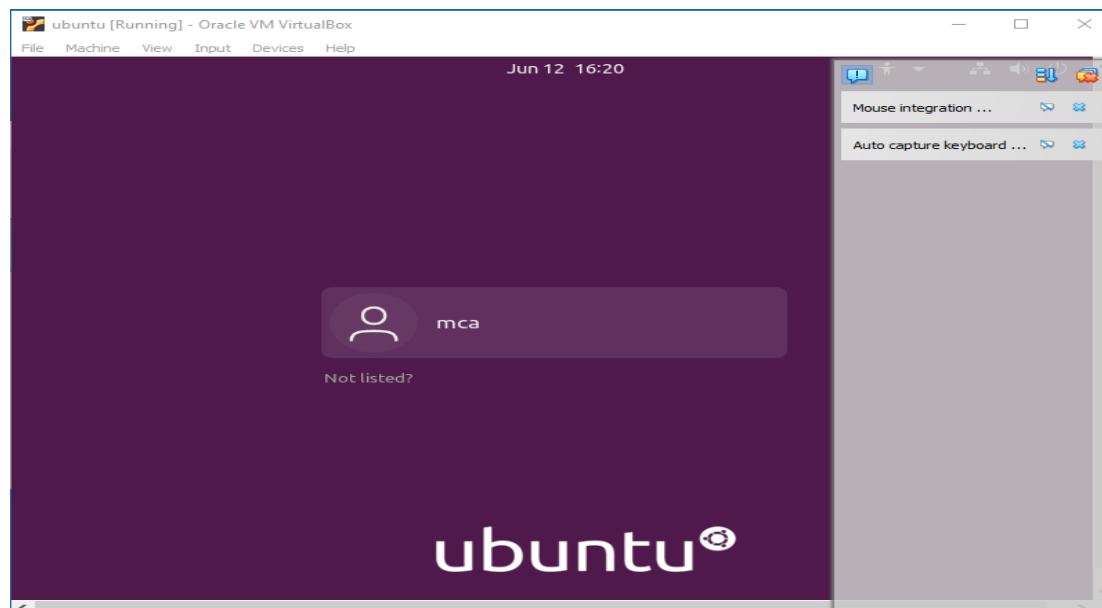
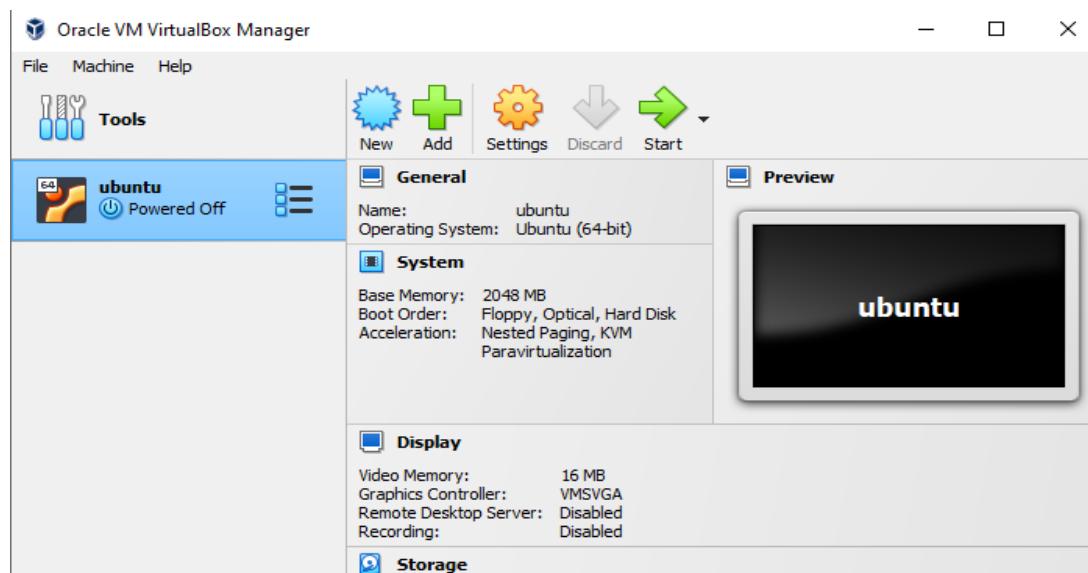
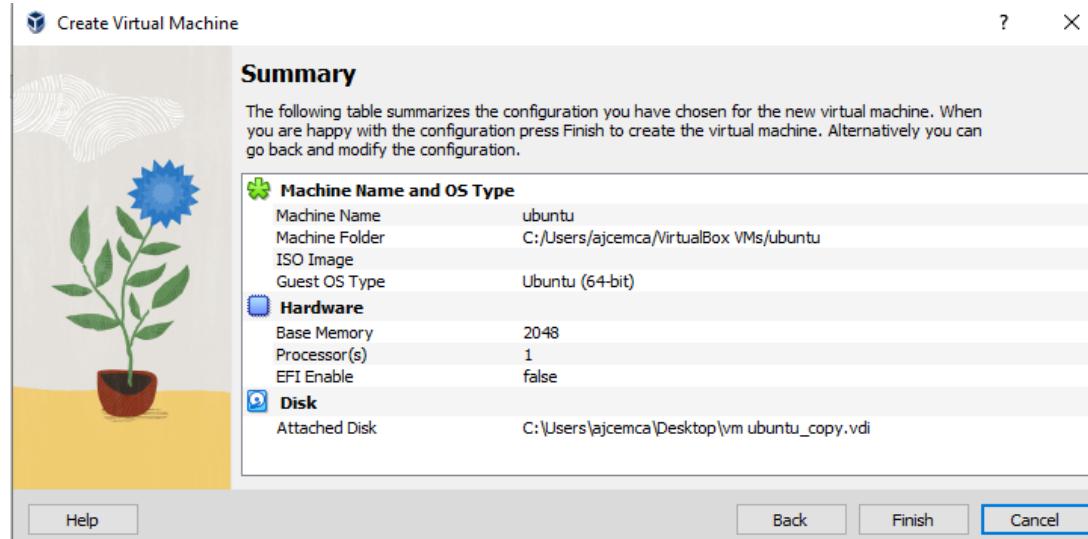
CO1:

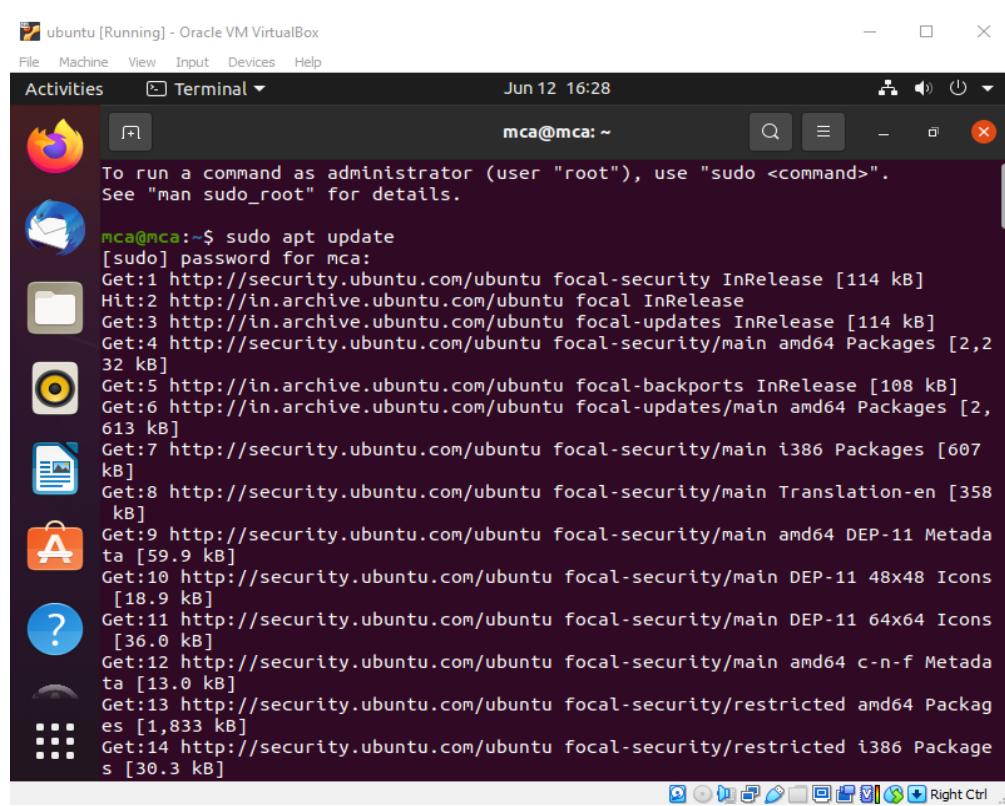
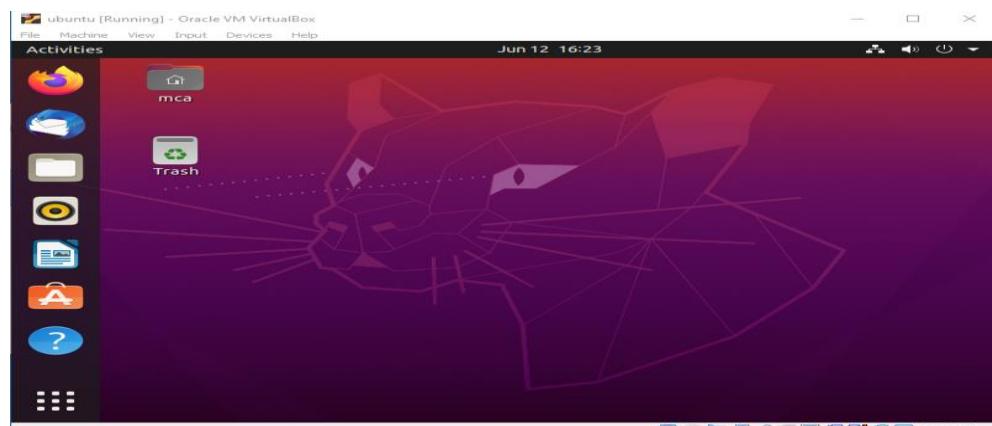
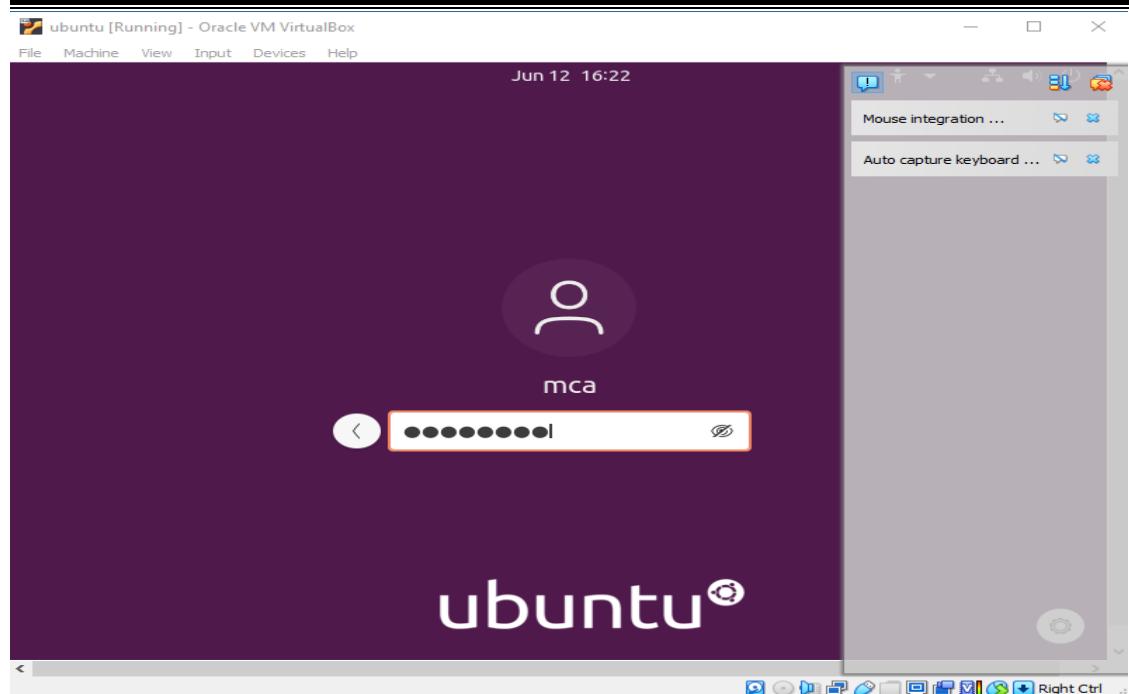
Install and configure common operating systems in virtual environment.

Procedure:









ubuntu [Running] - Oracle VM VirtualBox

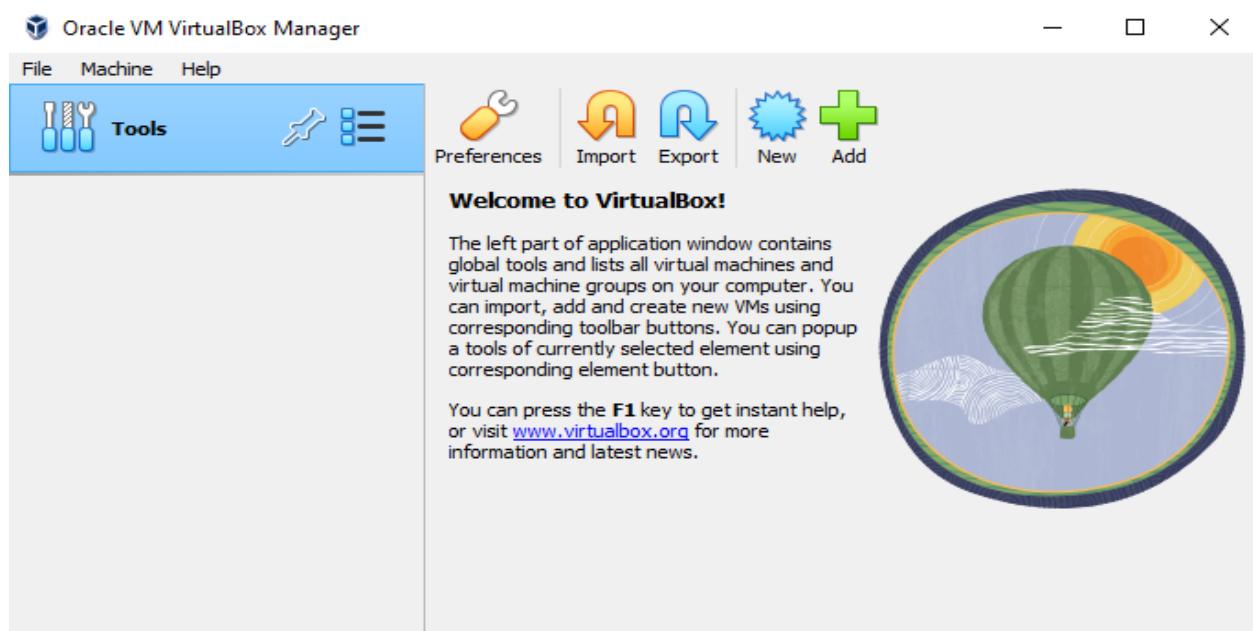
File Machine View Input Devices Help

Activities Terminal Jun 12 16:28

mca@mca: ~

```
mca@mca:~$ sudo apt install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.2-0
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.2-0
0 upgraded, 9 newly installed, 0 to remove and 406 not upgraded.
Need to get 1,821 kB of archives.
After this operation, 7,952 kB 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 libapr1 amd64 1.6.5-1ubuntu1 [91.4 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1 amd64 1.6.1-4ubuntu2.1 [84.9 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1-dbd-sqlite3 amd64 1.6.1-4ubuntu2.1 [10.6 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1-ldap amd64 1.6.1-4ubuntu2.1 [8,756 B]
Get:5 http://in.archive.ubuntu.com/ubuntu focal/main amd64 liblua5.2-0 amd64 5.2.4-1.1build3 [106 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 apache2-bin amd64 2.4.41-4ubuntu3.14 [1,182 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 apache2-data
```

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:

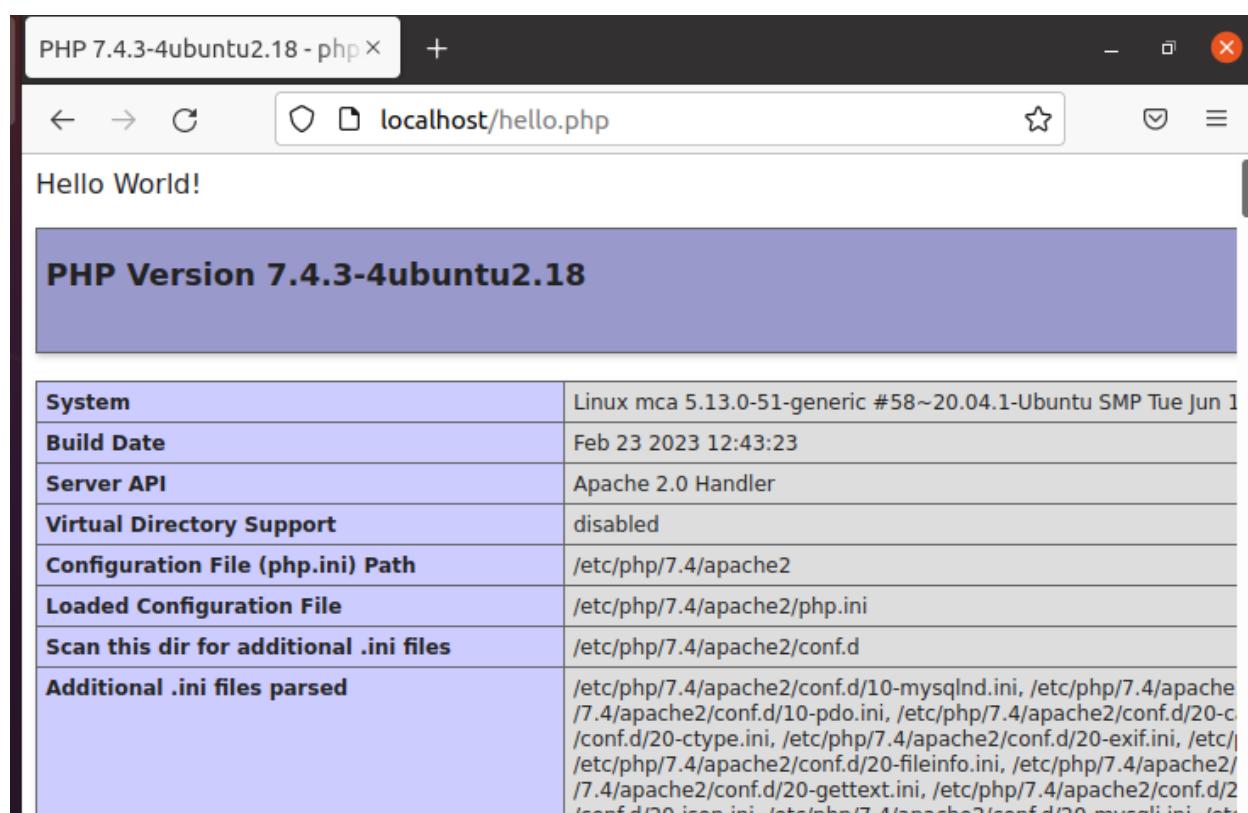
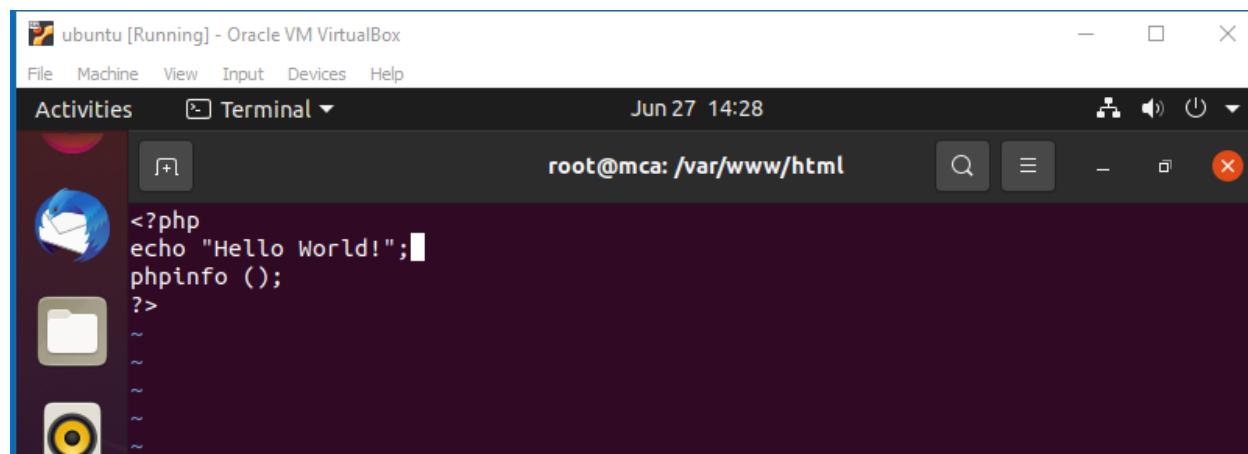
```
root@mca:/home/mca# which apache2
/usr/sbin/apache2
root@mca:/home/mca# ls
Desktop Documents Downloads Music Pictures Public Templates Videos
root@mca:/home/mca# cd /var
root@mca:/var# ls
backups crash local log metrics run spool www
cache lib lock mail opt snap tmp
root@mca:/var# cd www
root@mca:/var/www#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

```
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
```

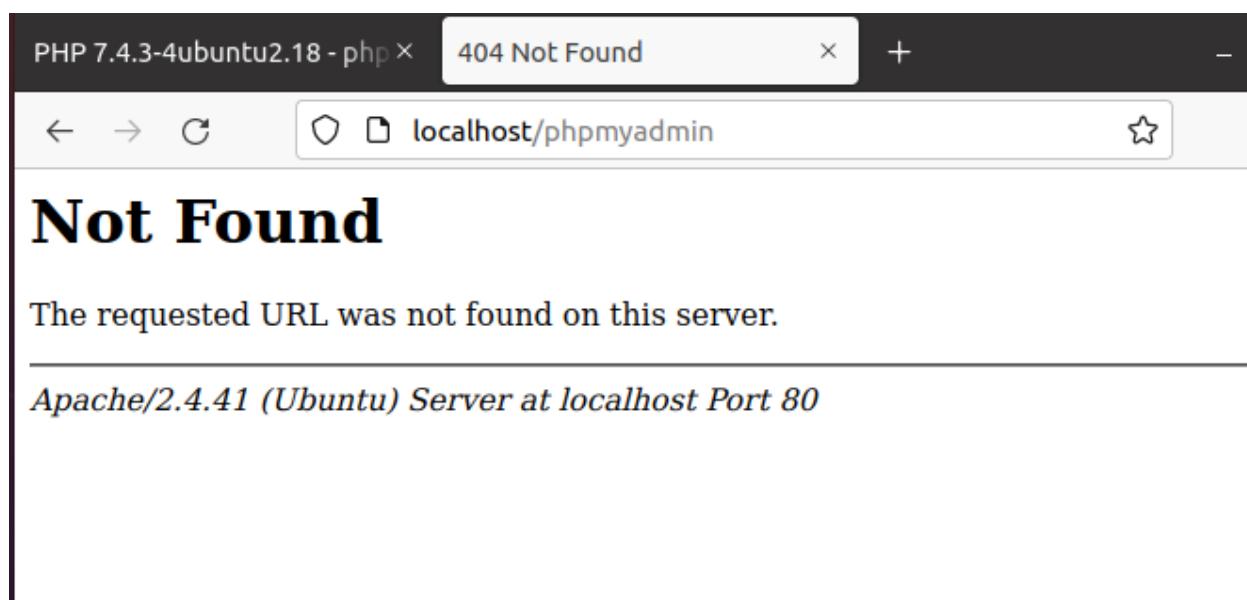
```
root@mca:/home/mca# php -v
PHP 7.4.3-4ubuntu2.18 (cli) (built: Feb 23 2023 12:43:23) ( NTS )
Copyright (c) The PHP Group
Zend Engine v3.4.0, Copyright (c) Zend Technologies
    with Zend OPcache v7.4.3-4ubuntu2.18, Copyright (c), by Zend Technologies
root@mca:/home/mca#
```

```
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-libodium 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
      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 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\""
combined
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.

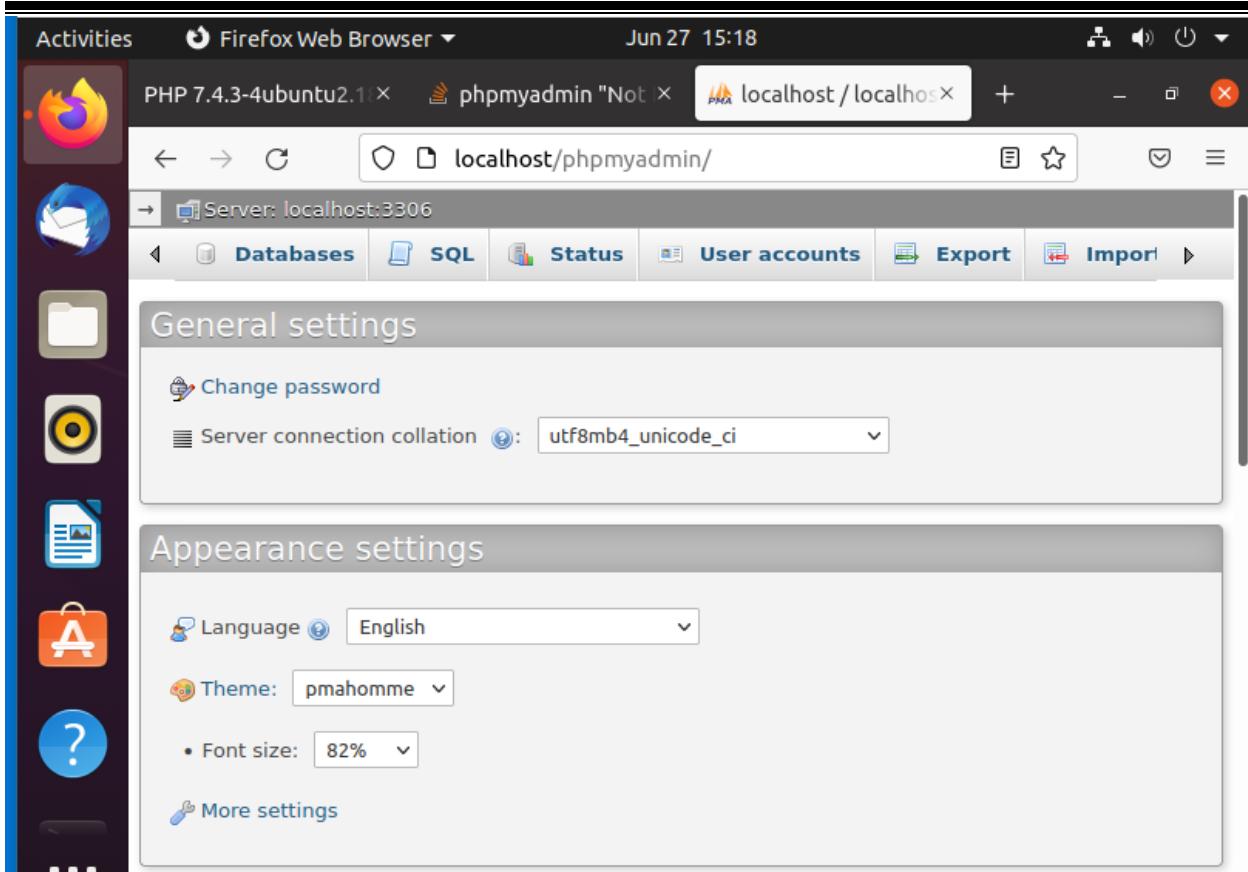
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
```

```
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     |
+-----+-----+-----+-----+
| .*KS6TCE3ivVL69y.PKm.G.SyUyd5uVg0ip8TXiALVG7oC | 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 "sanila";
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-8.0 mysql-server-core-8.0
```

```
root@mca:/home/mca# systemctl status mysql
● mysql.service - MySQL Community Server
   Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2023-06-21 16:01:24 IST; 2min 13s ago
     Main PID: 3364 (mysqld)
       Status: "Server is operational"
      Tasks: 37 (limit: 2295)
     Memory: 360.4M
        CPU: 0.000 CPU(s) since start
       CGroup: /system.slice/mysql.service
                 └─3364 /usr/sbin/mysqld

Jun 21 16:01:23 mca systemd[1]: Starting MySQL Community Server...
Jun 21 16:01:24 mca systemd[1]: Started MySQL Community Server.
lines 1-12/12 (END)
```

```
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)

Copyright (c) 2000, 2023, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
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:

```
mca@u28:~$ sudo snap install --classic code
[sudo] password for mca:
code 660393de from Visual Studio Code (vscode**) installed
mca@u28:~$ 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.
mca@u28:~$ sudo apt install make
Reading package lists... Done
Building dependency tree
Reading state information... Done
make is already the newest version (4.2.1-1.2).
0 upgraded, 0 newly installed, 0 to remove and 665 not upgraded.
mca@u28:~$ sudo apt update
Hit:1 https://dl.google.com/linux/chrome/deb stable InRelease
Get:2 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:3 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:4 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:5 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [60.0 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [96.7 kB]
Get:8 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [940 B]
Get:9 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [275 kB]
Get:10 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [410 kB]
Get:11 http://in.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:12 http://in.archive.ubuntu.com/ubuntu focal-backports/main amd64 DEP-11 Metadata [8,004 B]
Get:13 http://in.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [30.5 kB]
Fetched 1,217 kB in 3s (388 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
665 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

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:~$ 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.  
mca@u28:~$ ls /usr/bin/make  
/usr/bin/make  
mca@u28:~$ cd Documents  
mca@u28:~/Documents$ cd samplename  
mca@u28:~/Documents/samplename$ ls  
function1.cpp function2.cpp functions.h main.cpp Makefile
```

```
mca@u28:~$ 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.

mca@u28:~$ cd Home
bash: cd: Home: No such file or directory
mca@u28:~$ cd Documents
mca@u28:~/Documents$ cd samplename
mca@u28:~/Documents/samplename$ make
Makefile:2: *** missing separator. Stop.
mca@u28:~/Documents/samplename$ ls
function1.cpp function2.cpp functions.h main.cpp Makefile
mca@u28:~/Documents/samplename$ make
Makefile:2: *** missing separator. Stop.
mca@u28:~/Documents/samplename$ make
Makefile:2: *** missing separator. Stop.
mca@u28:~/Documents/samplename$ g++ main.cpp function1.cpp function2.cpp -o hello
function2.cpp: In function 'void print_hello()':
function2.cpp:5:31: error: expected ';' before '}' token
  5 |     std::cout << "hello world"
      |           ^
      |           ;
  6 | }
      | ~
mca@u28:~/Documents/samplename$ g++ main.cpp function1.cpp function2.cpp -o hello
function2.cpp: In function 'void print_hello()':
function2.cpp:5:30: error: expected ';' before '}' token
  5 |     std::cout <<"hello world"
      |           ^
      |           ;
  6 | }
      | ~
mca@u28:~/Documents/samplename$ g++ main.cpp function1.cpp function2.cpp -o hello
```

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

```
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)
```

```
mca@u29:~$ cd Documents
mca@u29:~/Documents$ cd cmakefile
mca@u29:~/Documents/cmakefile$ ls
add.cpp  add.h  CMakeLists.txt  main.cpp
```

```
mca@u29:~/Documents/cmakefile$ cmake .
-- The C compiler identification is GNU 9.4.0
-- The CXX compiler identification is GNU 9.4.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Configuring done
-- Generating done
-- Build files have been written to: /home/mca/Documents/cmakefile
mca@u29:~/Documents/cmakefile$ make
Scanning dependencies of target a.out
[ 33%] Building CXX object CMakeFiles/a.out.dir/main.cpp.o
[ 66%] Building CXX object CMakeFiles/a.out.dir/add.cpp.o
[100%] Linking CXX executable a.out
[100%] Built target a.out
mca@u29:~/Documents/cmakefile$ ./a.out
Sum of the given numbers is 40
```

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@u28:~$ ifconfig
Command 'ifconfig' not found, but can be installed with:
sudo apt install net-tools

mca@u28:~$ sudo apt update
[sudo] password for mca:
Hit:1 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [114 kB]

mca@u28:~$ 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+
```

```
mca@u28:~$ ifconfig
enp5s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
      inet 192.168.6.198  netmask 255.255.255.0  broadcast 192.168.6.255
      inet6 fe80::843e:cc3f:d678:fb4d  prefixlen 64  scopeid 0x20<link>
        ether 0c:9d:92:0f:6b:f8  txqueuelen 1000  (Ethernet)
          RX packets 17901  bytes 18306213 (18.3 MB)
          RX errors 0  dropped 22  overruns 0  frame 0
          TX packets 5503  bytes 391298 (391.2 KB)
          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
```

```
mca@u28:~$ sudo apt install ifupdown
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  rdnssd
The following NEW packages will be installed:
  ifupdown
```

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

```
mca@u28:~$ ping google.com
PING google.com (142.250.193.110) 56(84) bytes of data.
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=1 ttl=248 time=15.0 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=2 ttl=248 time=15.1 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=3 ttl=248 time=15.0 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=4 ttl=248 time=15.2 ms
```

```
mca@u28:~$ ping 142.250.193.110
PING 142.250.193.110 (142.250.193.110) 56(84) bytes of data.
64 bytes from 142.250.193.110: icmp_seq=1 ttl=248 time=15.2 ms
64 bytes from 142.250.193.110: icmp_seq=2 ttl=248 time=15.0 ms
64 bytes from 142.250.193.110: icmp_seq=3 ttl=248 time=15.0 ms
64 bytes from 142.250.193.110: icmp_seq=4 ttl=248 time=15.0 ms
^Z
[2]+ Stopped ping 142.250.193.110
```

```
mca@u28:~$ ping -c 5 google.com
PING google.com (142.250.193.110) 56(84) bytes of data.
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=1 ttl=248 time=15.1 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=2 ttl=248 time=15.1 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=3 ttl=248 time=15.1 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=4 ttl=248 time=15.1 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=5 ttl=248 time=15.1 ms

--- google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 15.050/15.105/15.141/0.035 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
```

```
mca@u28:~$ sudo apt install traceroute
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  traceroute
0 upgraded, 1 newly installed, 0 to remove and 696 not upgraded.
Need to get 45.4 kB of archives.
After this operation, 152 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 traceroute amd64
1:2.1.0-2 [45.4 kB]
Fetched 45.4 kB in 1s (41.1 kB/s)
```

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

```
mca@u28:~$ traceroute google.com
traceroute to google.com (142.250.193.110), 30 hops max, 60 byte packets
 1 _gateway (192.168.6.100)  0.111 ms  0.086 ms  0.090 ms
 2 136.232.57.109 (136.232.57.109)  1.428 ms  1.428 ms  1.594 ms
 3 172.20.97.57 (172.20.97.57)  14.729 ms  14.741 ms  14.817 ms
 4 172.27.9.126 (172.27.9.126)  20.115 ms  20.096 ms  20.073 ms
 5 172.27.9.125 (172.27.9.125)  17.110 ms  16.676 ms  17.210 ms
 6 172.17.97.221 (172.17.97.221)  14.567 ms  14.471 ms  14.526 ms
 7 172.16.5.90 (172.16.5.90)  16.563 ms  16.616 ms  16.726 ms
 8 108.170.253.106 (108.170.253.106)  15.949 ms  142.251.55.232 (142.251.55.232)
   18.424 ms 142.251.55.236 (142.251.55.236)  16.219 ms
 9 142.251.55.223 (142.251.55.223)  17.214 ms maa05s24-in-f14.1e100.net (142.25
0.193.110)  15.096 ms 142.251.55.221 (142.251.55.221)  16.617 ms
```

```
mca@u28:~$ sudo apt install whois
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  whois
0 upgraded, 1 newly installed, 0 to remove and 696 not upgraded.
Need to get 44.7 kB of archives.
After this operation, 279 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 whois amd64 5.5.6 [44
.7 kB]
Fetched 44.7 kB in 1s (42.7 kB/s)
```

```
mca@u28:~$ whois google.com
Domain Name: GOOGLE.COM
Registry Domain ID: 2138514_DOMAIN_COM-VRSN
Registrar WHOIS Server: whois.markmonitor.com
Registrar URL: http://www.markmonitor.com
Updated Date: 2019-09-09T15:39:04Z
Creation Date: 1997-09-15T04:00:00Z
Registry Expiry Date: 2028-09-14T04:00:00Z
Registrar: MarkMonitor Inc.
Registrar IANA ID: 292
Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
Registrar Abuse Contact Phone: +1.2086851750
Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
```

```
mca@u28:~$ sudo ifconfig enp5s0 down
mca@u28:~$ sudo ifconfig enp5s0 up
```

Nslookup:Used to identify domain system problem.

```
mca@u28:~$ 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: 2404:6800:4007:81f::200e

mca@u28:~$ nslookup 142.250.182.78
78.182.250.142.in-addr.arpa      name = maa05s20-in-f14.1e100.net.

Authoritative answers can be found from:

mca@u28:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos
mca@u28:~$ wget https://simms-teach.com/2012-fall/docs/cis192/cis192QuickRef.pdf
--2023-06-13 14:58:35-- https://simms-teach.com/2012-fall/docs/cis192/cis192Qui
ckRef.pdf
```

```
mca@u28:~$ ls
cis192QuickRef.pdf  Documents  Music      Public      Videos
Desktop            Downloads  Pictures    Templates
mca@u28:~$ █
```

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:

```
mca@u28:~$ sudo tcpdump
[sudo] password for mca:
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp5s0, link-type EN10MB (Ethernet), capture size 262144 bytes
15:11:51.931997 ARP, Request who-has 192.168.6.127 tell _gateway, length 46
15:11:51.934113 IP u28.49851 > dns.google.domain: 33359+ [1au] PTR? 127.6.168.19
2.in-addr.arpa. (55)
15:11:51.951097 IP dns.google.domain > u28.49851: 33359 NXDomain 0/0/1 (55)
15:11:51.951328 IP u28.49851 > dns.google.domain: 33359+ PTR? 127.6.168.192.in-a
ddr.arpa. (44)
15:11:51.951477 ARP, Request who-has 192.168.6.117 tell 192.168.6.126, length 46
15:11:51.968179 IP dns.google.domain > u28.49851: 33359 NXDomain 0/0/0 (44)
15:11:51.969280 IP u28.46629 > dns.google.domain: 58090+ [1au] PTR? 100.6.168.19
2.in-addr.arpa. (55)
```

- To display all the available network interface.

```
mca@u28:~$ sudo tcpdump -D
1.enp5s0 [Up, Running]
2.lo [Up, Running, Loopback]
3.any (Pseudo-device that captures on all interfaces) [Up, Running]
4.bluetooth-monitor (Bluetooth Linux Monitor) [none]
5.nflog (Linux netfilter log (NFLOG) interface) [none]
6.nfqueue (Linux netfilter queue (NFQUEUE) interface) [none]
mca@u28:~$
```

- To capture packets from one interface.

```
mca@u28:~$ sudo tcpdump -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
15:21:12.044866 IP 192.168.6.70.56678 > 239.255.255.250.1900: UDP, length 175
15:21:12.046407 IP u28.49353 > dns.google.domain: 14935+ [1au] PTR? 250.255.255.
239.in-addr.arpa. (57)
15:21:12.061440 IP dns.google.domain > u28.49353: 14935 NXDomain 0/1/1 (114)
15:21:12.061712 IP u28.49353 > dns.google.domain: 14935+ PTR? 250.255.255.239.in
-addr.arpa. (46)
```

- 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....i8..T@a..... .S.d.=.=.
r.}w.T.."...P.0*....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 0039 0200 0000 0000 0000 )
```

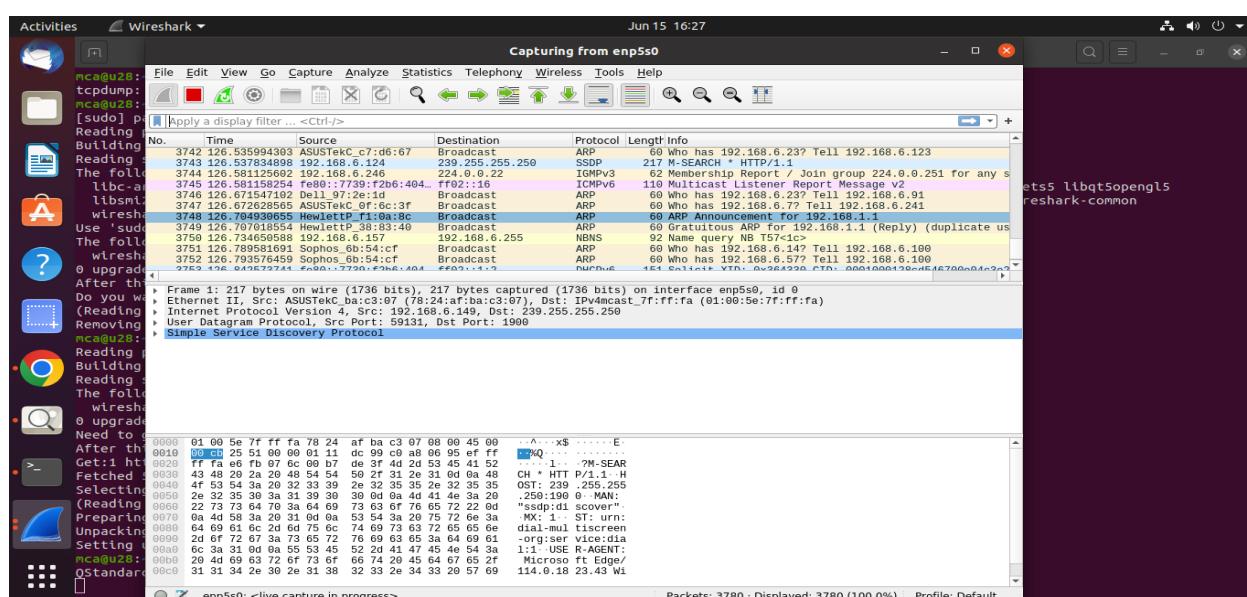
```
mca@u28:~$ sudo tcpdump -w data.txt -i enp5s0
tcpdump: listening on enp5s0, link-type EN10MB (Ethernet), capture size 262144
bytes
^Z
[8]+  Stopped                  sudo tcpdump -w data.txt -i enp5s0
```

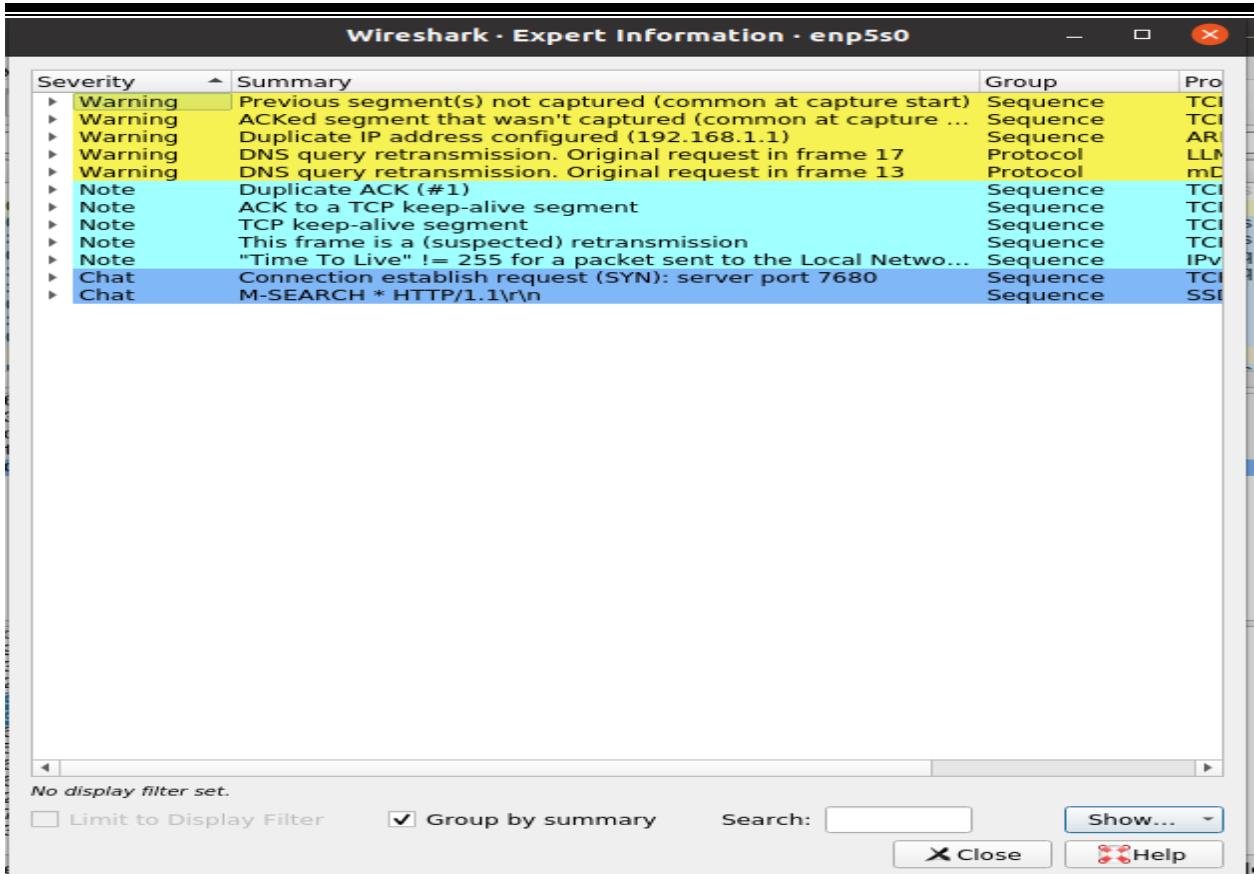
- Install wireshark

```
mca@u28:~$ sudo apt update
[sudo] password for mca:
Get:1 https://dl.google.com/linux/chrome/deb stable InRelease [1,825 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 https://dl.google.com/linux/chrome/deb stable/main amd64 Packages [1,080
B]
Get:5 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metada
ta [60.0 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2,
630 kB]
```

```
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
  libqt5multimediasettings5 libqt5multimediawidgets5 libqt5opengl5
  libsmi2ldbl libsnaappyv5 libspandsp2 libssh-gcrypt-4 libwireshark-data
  libwireshark13 libwiredtap10 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:~$
```





```
Activities Terminal ▾ Jun 15 16:28
mca@u28:~$ tcpdump -r nett.txt
tcpdump: nett.txt: Permission denied
mca@u28:~$ sudo apt-get remove wireshark
[sudo] password for mca:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libqt5ares2 libblu5.2-0 libqt5multimedias libqt5multimedia5-plugins libqt5multimediala...
  libsmi2ldbl libsnappyiv5 libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark13 libwiretap10 libwsutil11 wireshark-common
  wireshark-qt
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED:
  wireshark
  0 upgraded, 0 newly installed, 1 to remove and 693 not upgraded.
After this operation, 59.4 kB disk space will be freed.
Do you want to continue? [Y/n] Y
(Reading database ... 156827 files and directories currently installed.)
Removing wireshark (3.2.3-1) ...
mca@u28:~$ sudo apt install wireshark
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  wireshark
  0 upgraded, 1 newly installed, 0 to remove and 693 not upgraded.
Need to get 5,088 B of archives.
After this operation, 59.4 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 wireshark amd64 3.2.3-1 [5,088 B]
Fetched 5,088 B in 1s (8,794 B/s)
Selecting previously unselected package wireshark.
(Reading database ... 156823 files and directories currently installed.)
Preparing to unpack .../wireshark_3.2.3-1_amd64.deb ...
Unpacking wireshark (3.2.3-1) ...
Setting up wireshark (3.2.3-1) ...
mca@u28:~$ sudo wireshark
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
```

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@u28:~$ sudo su
[sudo] password for mca:
root@u28:/home/mca# apt update
Get:1 https://dl.google.com/linux/chrome/deb stable InRelease [1,825 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 https://dl.google.com/linux/chrome/deb stable/main amd64 Packages [1,076 B]
]
Get:6 http://security.ubuntu.com/ubuntu focal-security/main i386 Packages [608 k]
```

```
root@u28:/home/mca# egrep -c '(vmx|svm)' /proc/cpuinfo
6
root@u28:/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-myhostname
  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]
```

```
root@u28:/home/mca# sudo modprobe vhost net
root@u28:/home/mca# lsmod |grep vhost
vhost                49152  0
root@u28:/home/mca# echo "vhost_net" |sudo tee -a /etc/modules
vhost_net
root@u28:/home/mca# virt-manager

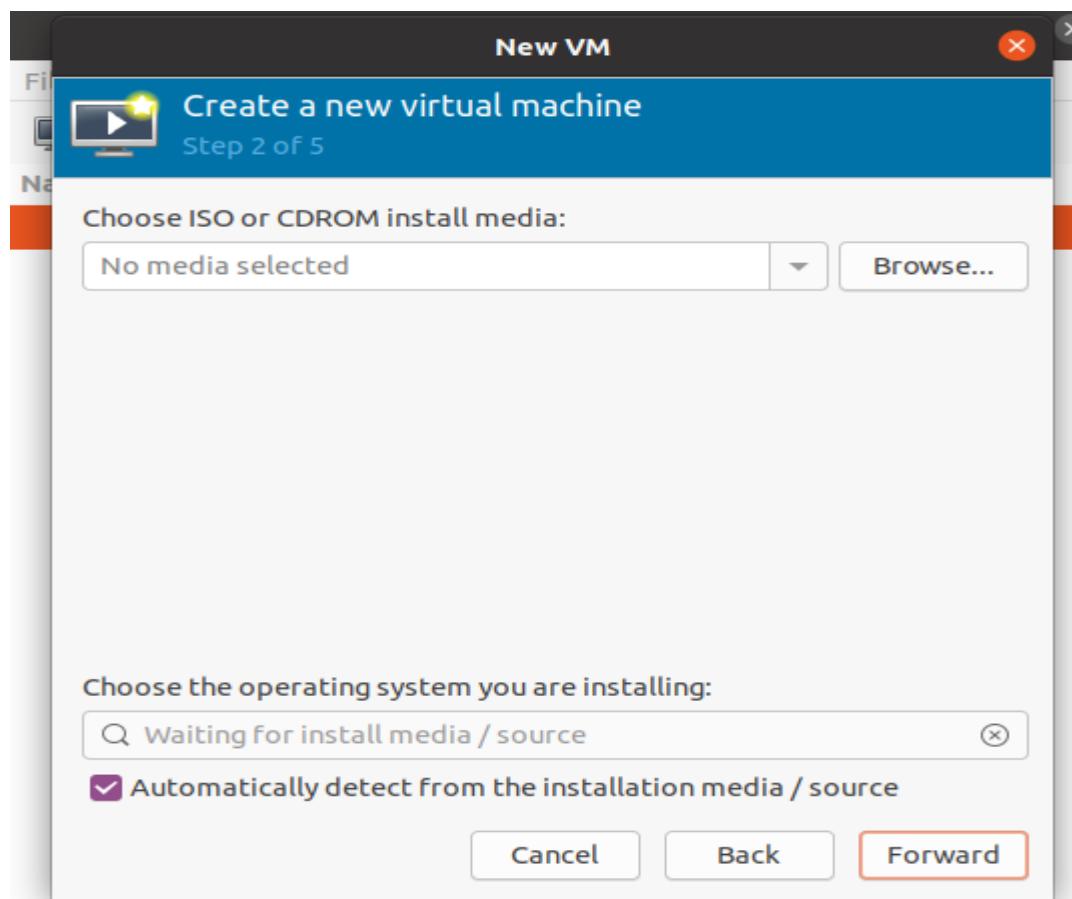
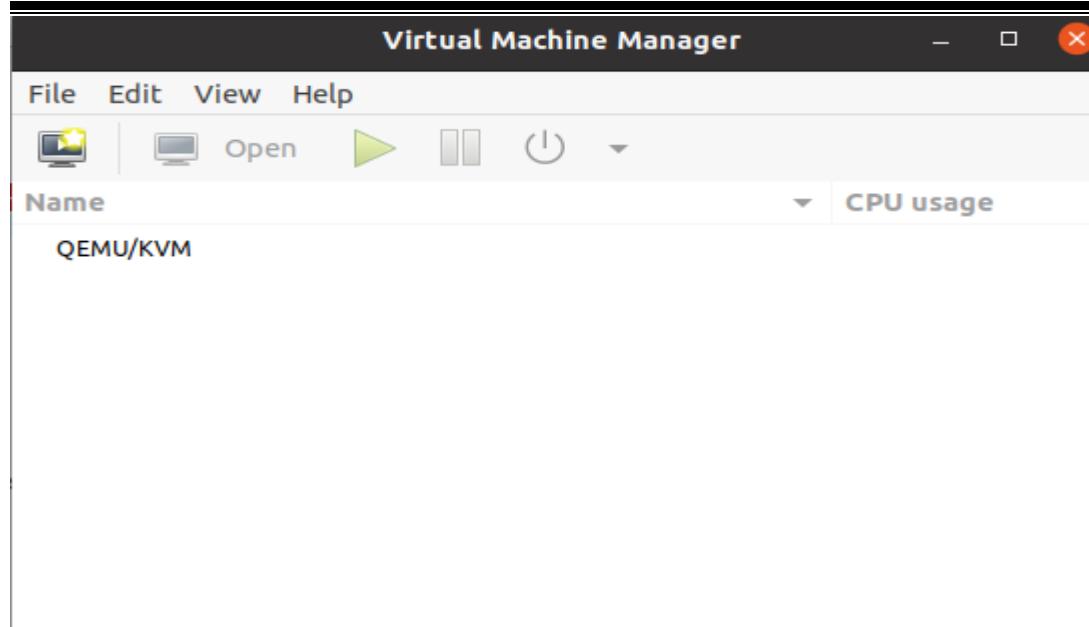
Command 'virt-manager' not found, but can be installed with:

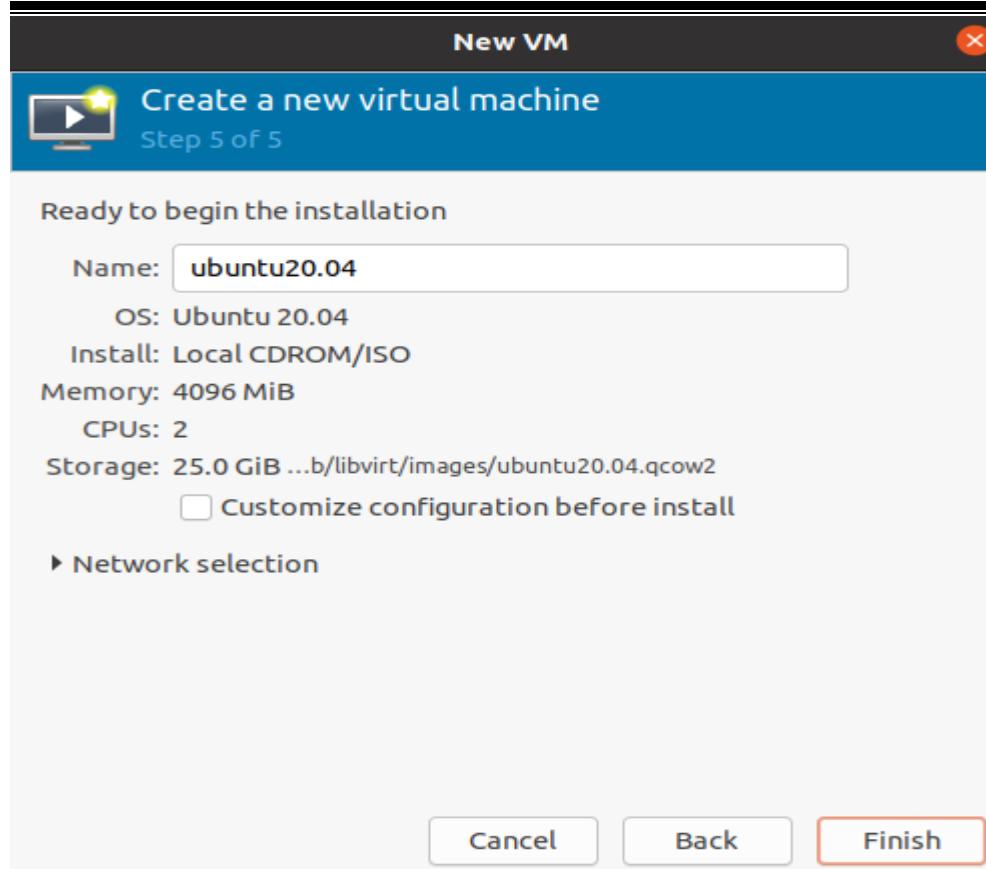
apt install virt-manager

root@u28:/home/mca# apt install virt-manager
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  gir1.2-appindicator3-0.1 gir1.2-gtk-vnc-2.0 gir1.2-libosinfo-1.0
  gir1.2-libvirt-glib-1.0 gir1.2-spiceclientglib-2.0 gir1.2-spiceclientgtk-3.0
  i965-va-driver intel-media-va-driver libdrm-amdgpu1 libgovirt-common
  libgovirt2 libgtk-vnc-2.0-0 libgvnc-1.0-0 libigdgmm11 libllvm12
```

```
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 gir1.2-appindicator3-0.1 amd64 12.10.1+20.04.20200408.1-0ubuntu1 [3,448 B]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 libgvnc-1.0-0 amd64 1.0.0-1build1 [56.4 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 libgtk-vnc-2.0-0 amd64 1.0.0-1build1 [25.9 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 gir1.2-gtk-vnc-2.0-0 amd64 1.0.0-1build1 [10.2 kB]
```

```
root@u28:/home/mca# virt-manager
root@u28:/home/mca# █
```





```
mca@u28:~$ sudo virsh
[sudo] password for mca:
Welcome to virsh, the virtualization interactive terminal.

Type: 'help' for help with commands
      'quit' to quit

virsh # 
```

```
virsh # list
 Id  Name      State
-----
 2   ubuntu20.04 running
virsh # [REDACTED]
```

```
virsh # list --all
 Id  Name      State
-----
 2   ubuntu20.04 running
virsh # [REDACTED]
```

```
virsh # nodeinfo
CPU model:          x86_64
CPU(s):             6
CPU frequency:     800 MHz
CPU socket(s):     1
Core(s) per socket: 6
Thread(s) per core: 1
NUMA cell(s):       1
Memory size:        7989888 KiB
virsh # [REDACTED]
```

```
virsh # exit
mca@u28:~$ [REDACTED]
```

```
mca@u28:~$ 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-autosta
  rt] [--with-managed-save] [--without-managed-save] [--uuid] [--name] [--table]
  [--managed-save] [--title]

DESCRIPTION
  Returns list of domains.
```

```
mca@u28:~$ sudo virsh list
 Id  Name      State
 -----
 2   ubuntu20.04  running

mca@u28:~$ sudo virsh reboot ubuntu20.04
Domain ubuntu20.04 is being rebooted

mca@u28:~$ sudo virsh dominfo ubuntu20.04
Id:                      2
Name:                    ubuntu20.04
UUID:                   1a8fb564-626c-4a1a-a2ad-5eb71cdcd4a9
OS Type:                 hvm
State:                  running
```

```
mca@u28:~$ sudo virsh dominfo ubuntu20.04
Id:                      2
Name:                    ubuntu20.04
UUID:                   1a8fb564-626c-4a1a-a2ad-5eb71cdcd4a9
OS Type:                 hvm
State:                  running
CPU(s):                  2
CPU time:                125.1s
Max memory:              4194304 KiB
Used memory:              4194304 KiB
Persistent:               yes
Autostart:                disable
Managed save:             no
Security model:           apparmor
Security DOI:              0
Security label:          libvirt-1a8fb564-626c-4a1a-a2ad-5eb71cdcd4a9 (enforcing)
```

```
mca@u28:~$ sudo virsh suspend ubuntu20.04
Domain ubuntu20.04 suspended
```

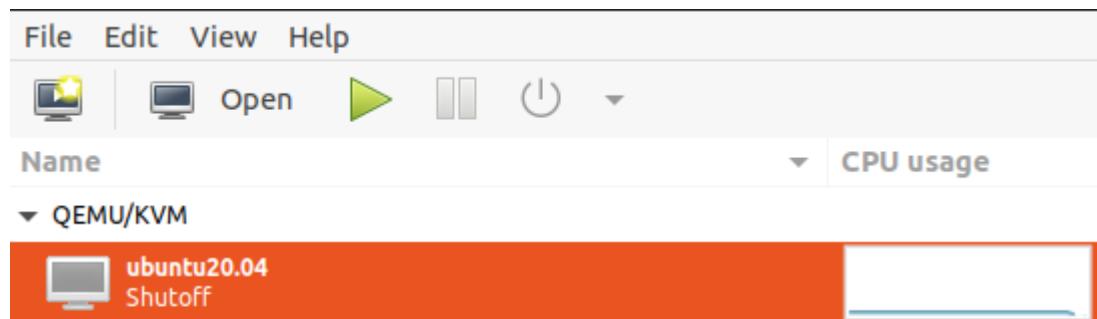
```
mca@u28:~$ sudo virsh resume ubuntu20.04
Domain ubuntu20.04 resumed
```

```
mca@u28:~$
```

```
mca@u28:~$ sudo virsh list
 Id  Name          State
 -----
 2   ubuntu20.04   running

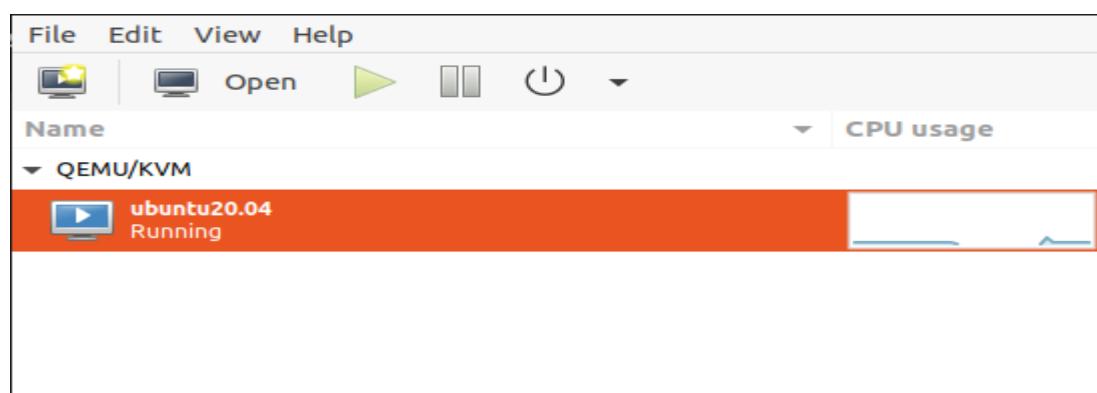
mca@u28:~$ sudo virsh shutdown ubuntu20.04
Domain ubuntu20.04 is being shutdown

mca@u28:~$
```



```
mca@u28:~$ sudo virsh start ubuntu20.04
Domain ubuntu20.04 started

mca@u28:~$
```



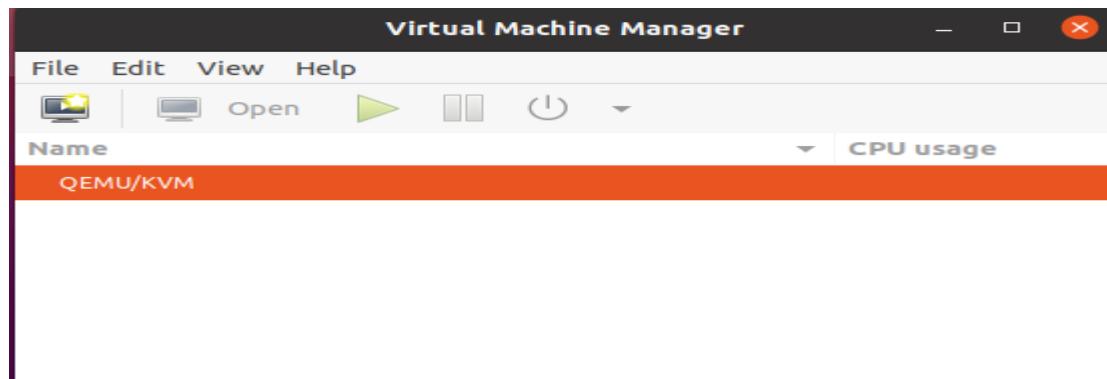
```
mca@u28:~$ sudo virsh destroy ubuntu20.04
Domain ubuntu20.04 destroyed

mca@u28:~$ sudo virsh list
 Id  Name      State
 -----
 -   ubuntu20.04  shut off

mca@u28:~$
```

```
mca@u28:~$ sudo virsh undefine --domain ubuntu20.04 --remove-all-storage
Domain ubuntu20.04 has been undefined
Volume 'vda'(/var/lib/libvirt/images/ubuntu20.04.qcow2) removed.
```

```
mca@u28:~$
```



Result:

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

Experiment:11

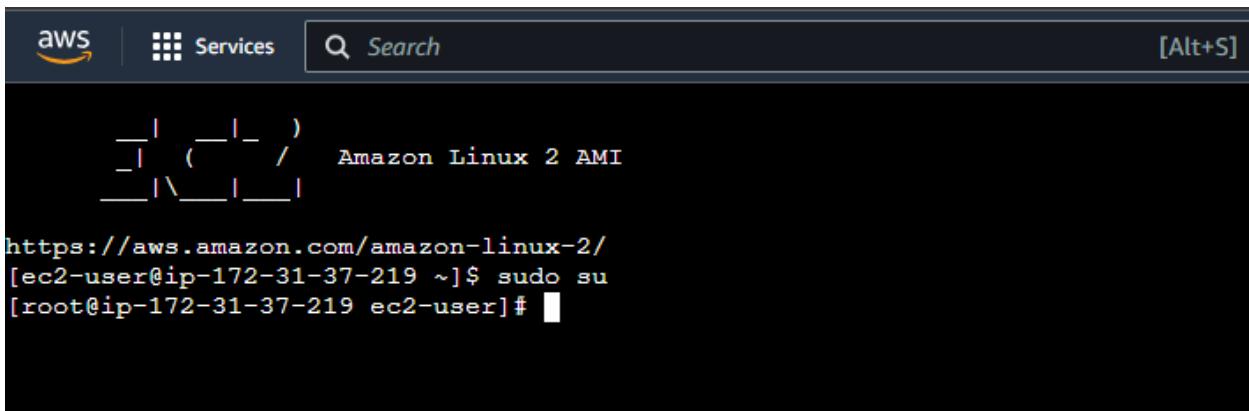
Aim:

Docker, installation and deployment.

CO3:

Install and manage servers for web applications.

Procedure:



```
aws | Services | Search [Alt+S]
      / \
     _\|_|_ ) Amazon Linux 2 AMI
    _\|_\|_|_|

https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-172-31-37-219 ~]$ sudo su
[root@ip-172-31-37-219 ec2-user]#
```

Installing docker: sudo yum install docker -y:

Installs Docker by using the yum package manager with the -y flag to automatically answer "yes" to any prompts or confirmations during the installation process.

```
https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-172-31-37-219 ~]$ sudo su
[root@ip-172-31-37-219 ec2-user]# yum install docker -y
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
Resolving Dependencies
--> Running transaction check
--> Package docker.x86_64 0:20.10.23-1.amzn2.0.1 will be installed
--> Processing Dependency: runc >= 1.0.0 for package: docker-20.10.23-1.amzn2.0.1.x
--> Processing Dependency: libatomic >= 0.40, <=1.5.15 for package: docker-20.10.23-1.amzn2.0.1.x
```

Checking Version:

```
Complete!
[root@ip-172-31-37-219 ec2-user]# which docker
/bin/docker
[root@ip-172-31-37-219 ec2-user]#
```

```
Complete!
[root@ip-172-31-37-219 ec2-user]# which docker
/bin/docker
[root@ip-172-31-37-219 ec2-user]# docker --version
Docker version 20.10.23, build 7155243
[root@ip-172-31-37-219 ec2-user]#
```

Docker info:

```
[root@ip-172-31-37-219 ec2-user]# docker info
Client:
  Context:    default
  Debug Mode: false
  Plugins:
    buildx: Docker Buildx (Docker Inc., 0.0.0+unknown)
```

Status of docker:

```
Redirecting to /bin/systemctl status docker.service
● docker.service - Docker Application Container Engine
  Loaded: loaded (/usr/lib/systemd/system/docker.service; disabled; vendor preset: disabled)
  Active: inactive (dead)
    Docs: https://docs.docker.com
[root@ip-172-31-37-219 ec2-user]#
```

service docker start: service docker start," it is used to start the Docker service on a Linux system.

service docker status: The command "service docker status" is typically used to check the status of the Docker service on a Linux system

```
[root@ip-172-31-37-219 ec2-user]# service docker start
Redirecting to /bin/systemctl start docker.service
[root@ip-172-31-37-219 ec2-user]# service docker status
Redirecting to /bin/systemctl status docker.service
● docker.service - Docker Application Container Engine
  Loaded: loaded (/usr/lib/systemd/system/docker.service; disabled; vendor preset: disabled)
  Active: active (running) since Fri 2023-06-23 09:10:17 UTC; 2s ago
    Docs: https://docs.docker.com
```

docker images: Docker images command used to give detailed descriptions images in the system

```
[root@ip-172-31-37-219 ec2-user]# docker images
REPOSITORY      TAG      IMAGE ID      CREATED      SIZE
```

docker ps -a: docker ps lists the Docker containers that are currently running on our system.

```
[root@ip-172-31-37-219 ec2-user]# docker ps -a
CONTAINER ID      IMAGE      COMMAND      CREATED      STATUS      PORTS      NAMES
```

docker pull ubuntu: The docker pull command downloads Docker images from the internet

```
[root@ip-172-31-37-219 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-172-31-37-219 ec2-user]#
```

```
[root@ip-172-31-37-219 ec2-user]# docker images
REPOSITORY      TAG      IMAGE ID      CREATED      SIZE
ubuntu          latest   99284ca6cea0   2 weeks ago   77.8MB
[root@ip-172-31-37-219 ec2-user]#
```

Run container:

```
[root@ip-172-31-37-219 ec2-user]# docker run -it ubuntu /bin/bash
root@fb4434215941:/#
```

Inside a container:

```
[root@ip-172-31-37-219 ~]# docker run -it ubuntu /bin/bash
root@fb4434215941:/# exit
exit
[root@ip-172-31-37-219 ~]# docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
[root@ip-172-31-37-219 ~]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
79f619724dfa ubuntu "/bin/bash" 33 seconds ago Exited (0) 26 seconds ago zealous_gauss
[root@ip-172-31-37-219 ~]# docker run -it --name rugma ubuntu /bin/bash
root@e158f502367f:/# exit
exit
[root@ip-172-31-37-219 ~]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
e158f502367f ubuntu "/bin/bash" 11 seconds ago Exited (0) 3 seconds ago rugma
79f619724dfa ubuntu "/bin/bash" 2 minutes ago Exited (0) 2 minutes ago zealous_gauss
[root@ip-172-31-37-219 ~]# docker run -it --name rugmas mongo/bin/bash
Unable to find image 'mongo/bin/bash:latest' locally
docker: Error response from daemon: pull access denied for mongo/bin/bash, repository does not exist or may require 'docker login': denied: requested access to the resource is denied.
See 'docker run --help'.
[root@ip-172-31-37-219 ~]# docker run -it --name rugmas mongo /bin/bash
Unable to find image 'mongo:latest' locally
latest: Pulling from library/mongo
3f94e4e483ea: Pull complete
5ac5d4dae314: Pull complete
cbe6867b3f80: Pull complete
ec4c7cb4e89: Pull complete
38c7016c15b5: Pull complete
2d74066c9811: Pull complete
329604f22078: Pull complete
71c33622dbce: Pull complete
45f7e12b56a3: Pull complete
Digest: sha256:d2e09ab3edcd6d11e57ae4ab18df673b5df46f4f3b5a788ada9b8a98de2c4a08
Status: Downloaded newer image for mongo:latest
root@372c3106a1d6:/# exit
exit
[root@ip-172-31-37-219 ~]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
372c3106a1d6 mongo "docker-entrypoint.s..." About a minute ago Exited (0) 6 seconds ago rugmas
e158f502367f ubuntu "/bin/bash" 7 minutes ago Exited (0) 7 minutes ago rugma
79f619724dfa ubuntu "/bin/bash" 10 minutes ago Exited (0) 10 minutes ago zealous_gauss
```

Unable to find image 'mongo:latest' locally

```
latest: Pulling from library/mongo
3f94e4e483ea: Pull complete
5ac5d4dae314: Pull complete
cbe6867b3f80: Pull complete
ec4c7cb4e89: Pull complete
38c7016c15b5: Pull complete
2d74066c9811: Pull complete
329604f22078: Pull complete
71c33622dbce: Pull complete
45f7e12b56a3: Pull complete
Digest: sha256:d2e09ab3edcd6d11e57ae4ab18df673b5df46f4f3b5a788ada9b8a98de2c4a08
Status: Downloaded newer image for mongo:latest
root@372c3106a1d6:/# exit
exit
[root@ip-172-31-37-219 ~]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
372c3106a1d6 mongo "docker-entrypoint.s..." About a minute ago Exited (0) 6 seconds ago rugmas
e158f502367f ubuntu "/bin/bash" 7 minutes ago Exited (0) 7 minutes ago rugma
79f619724dfa ubuntu "/bin/bash" 10 minutes ago Exited (0) 10 minutes ago zealous_gauss
```

Moving to container:

```
[root@ip-172-31-46-159 ec2-user]# docker start rugma
rugma
[root@ip-172-31-46-159 ec2-user]# docker attach rugma
root@e158f502367f:/#
```

Inside container and making a file

```
root@e158f502367f:/# cat > file.txt
hi
hello
^Z
[1]+  Stopped                  cat > file.txt
```

```
root@e158f502367f:/# cat > file.txt
hi
hello
^Z
[1]+  Stopped                  cat > file.txt
root@e158f502367f:/# ls
bin  boot  dev  etc  file.txt  home  lib  lib32  lib64  libx32  media  mnt  opt  proc  root  run  sbin  srv  sys  tmp  usr  var
root@e158f502367f:/#
```

Installing Apache

```
root@e158f502367f:/# 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://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [36.3 kB]
Get:6 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [939 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [17.5 MB]
Get:8 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [634 kB]
Get:9 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [541 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1792 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [266 kB]
Get:12 http://archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [164 kB]
Get:13 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1191 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [545 kB]
Get:15 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [922 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [42.2 kB]
Get:17 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [25.5 kB]
Get:18 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [49.4 kB]
Fetched 25.2 MB in 2s (13.0 MB/s)
Reading package lists... Done
root@e158f502367f:/#
```

```
root@e158f502367f:/# apt install apache2
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-utils bzip2 ca-certificates file libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap libbrotli1 libcurl4
  libexpat1 libgdbm-compat4 libgdbm6 libicu70 libjansson4 libldap2-2.5-0 libldap-common liblua5.3-0 libmagic-mgc libmagic1 libnghttp2-14 libper15.34
  libps15 librtmp1 libssasl2-2 libssasl2-modules libssasl2-modules-db libsqlite3-0 libssh-4 libxml2 mailcap media-types mime-support netbase openssl
  perl perl-modules-5.34 publicsuffix ssl-cert xz-utils
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser ufw bzip2-doc gdbm-110n libssasl2-modules-gssapi-mit
  libssasl2-modules-gssapi-heimdal libssasl2-modules-ldap libssasl2-modules-otp libssasl2-modules-sql perl-doc libterm-readline-gnu-perl
  libterm-readline-perl perl make libtap-harness-archive-perl
The following NEW packages will be installed:
  apache2 apache2-bin apache2-utils bzip2 ca-certificates file libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap libbrotli1
  libcurl4 libexpat1 libgdbm-compat4 libgdbm6 libicu70 libjansson4 libldap2-2.5-0 libldap-common liblua5.3-0 libmagic-mgc libmagic1 libnghttp2-14
  libper15.34 libps15 librtmp1 libssasl2-2 libssasl2-modules libssasl2-modules-db libsqlite3-0 libssh-4 libxml2 mailcap media-types mime-support
  netbase openssl perl perl-modules-5.34 publicsuffix ssl-cert xz-utils
0 upgraded, 43 newly installed, 0 to remove and 1 not upgraded.
Need to get 25.6 MB of archives.
After this operation, 111 MB of additional disk space will be used.
Do you want to continue? [Y/n] 
```

```
Get:20 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libcurl4 amd64 7.81.0-1ubuntu1.10 [290 kB]
Get:21 http://archive.ubuntu.com/ubuntu jammy/main amd64 libjansson4 amd64 2.13.1-1.1build3 [32.4 kB]
Get:22 http://archive.ubuntu.com/ubuntu jammy/main amd64 liblua5.3-0 amd64 5.3.6-1build1 [140 kB]
Get:23 http://archive.ubuntu.com/ubuntu jammy/main amd64 libicu70 amd64 70.1-2 [10.6 MB]
Get:24 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libxml2 amd64 2.9.13+dfsg-1ubuntu0.3 [763 kB]
Get:25 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 apache2-bin amd64 2.4.52-1ubuntu4.5 [1345 kB]
Get:26 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 apache2-data all 2.4.52-1ubuntu4.5 [165 kB]
Get:27 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 apache2-utils amd64 2.4.52-1ubuntu4.5 [89.1 kB]
Get:28 http://archive.ubuntu.com/ubuntu jammy/main amd64 media-types all 7.0.0 [25.5 kB]
Get:29 http://archive.ubuntu.com/ubuntu jammy/main amd64 mailcap all 3.70+mmiubuntu1 [23.8 kB]
Get:30 http://archive.ubuntu.com/ubuntu jammy/main amd64 mime-support all 3.66 [3696 B]
Get:31 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 apache2 amd64 2.4.52-1ubuntu4.5 [97.8 kB]
Get:32 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 openssl amd64 3.0.2-0ubuntu1.10 [1183 kB]
Get:33 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 ca-certificates all 20230311ubuntu0.22.04.1 [155 kB]
Get:34 http://archive.ubuntu.com/ubuntu jammy/main amd64 netbase all 6.3 [12.9 kB]
Get:35 http://archive.ubuntu.com/ubuntu jammy/main amd64 libmagic-mgc amd64 1:5.41-3 [257 kB]
Get:36 http://archive.ubuntu.com/ubuntu jammy/main amd64 libmagic1 amd64 1:5.41-3 [87.2 kB]
Get:37 http://archive.ubuntu.com/ubuntu jammy/main amd64 file amd64 1:5.41-3 [21.5 kB]
Get:38 http://archive.ubuntu.com/ubuntu jammy/main amd64 publicsuffix all 20211207.1025-1 [129 kB]
Get:39 http://archive.ubuntu.com/ubuntu jammy/main amd64 xz-utils amd64 5.2.5-2ubuntu1 [84.8 kB]
Progress: [====] 99% [=====]
Get:41 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libldap-common all 2.5.14+dfsg-0ubuntu0.22.04.2 [15.8 kB]
Get:42 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libssasl2-modules amd64 2.1.27+dfsg2-3ubuntu1.2 [68.8 kB]
Get:43 http://archive.ubuntu.com/ubuntu jammy/main amd64 ssl-cert all 1.1.2 [17.4 kB]
Fetched 25.6 MB in 2s (11.5 MB/s)
debconf: delaying package configuration, since apt-utils is not installed
  1:1565600676 (4)
```

Result:

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