

## **Experiment: 1**

### **Aim:**

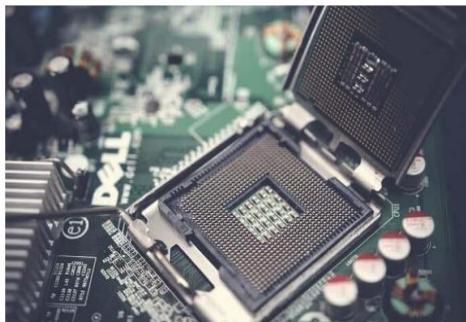
Familiarization of Hardware Components in a Computer.

### **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.

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### ➤ 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.

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**➤ 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

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local area networks to cover a larger physical area than the LAN can reach. Bridges are similar to — but more intelligent than — simple repeaters, which also extend signal range.

➤ **Solid State Drive (SSD)**



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

**Result:**

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

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## **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:**

```
sanila23@DESKTOP-M28K6VJ:~$ ls
add.sh    add2.sh   ariop.sh  logiop.sh  mul.sh      relop.sh  shellscript.sh  sub1.sh
add1.sh   add3.sh   div.sh    mod.sh    oddeven.sh  relop1.sh sub
sanila23@DESKTOP-M28K6VJ:~$
```

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

```
sanila23@DESKTOP-M28K6VJ:~$ ls -R
.:
add.sh  add2.sh  ariop.sh  logiop.sh  mul.sh      relop.sh  shellscript.sh  sub1.sh
add1.sh  add3.sh  div.sh    mod.sh     oddeven.sh  relop1.sh  sub
sanila23@DESKTOP-M28K6VJ:~$ .
```

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

```
$ls -l
```

```
sanila23@DESKTOP-M28K6VJ:~$ ls -l
total 12
-rwxr-xr-x 1 sanila23 sanila23  57 Apr  3 11:57 add.sh
-rwxr-xr-x 1 sanila23 sanila23  66 Apr  3 12:19 add1.sh
-rwxr-xr-x 1 sanila23 sanila23  57 Apr  3 12:37 add2.sh
-rwxr-xr-x 1 sanila23 sanila23 159 Apr  3 12:50 add3.sh
-rwxr-xr-x 1 sanila23 sanila23 611 Apr  4 14:51 ariop.sh
-rwxr-xr-x 1 sanila23 sanila23 148 Apr  4 13:21 div.sh
-rwxr-xr-x 1 sanila23 sanila23 474 Apr  4 16:02 logiop.sh
```

- c. ls -a :- List hidden files

```
$ls -a
```

```
sanila23@DESKTOP-M28K6VJ:~$ ls -a
.          .bash_logout  .profile    add.sh   add3.sh  logiop.sh  oddeven.sh  shellscript.sh
..         .bashrc       .sub.sh.swp add1.sh  ariop.sh mod.sh   relop.sh  sub
.bash_history .motd_shown .viminfo   add2.sh  div.sh   mul.sh   relop1.sh  sub1.sh
sanila23@DESKTOP-M28K6VJ:~$ .
```

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

```
$ls -al
```

```
sanila23@DESKTOP-M28K6VJ:~$ ls -al
total 48
drwxr-x-- 1 sanila23 sanila23 4096 Apr  4 16:36 .
drwxr-xr-x 1 root     root     4096 Apr  3 11:02 ..
-rw----- 1 sanila23 sanila23 1042 Apr  4 16:43 .bash_history
-rw-r--r-- 1 sanila23 sanila23  220 Apr  3 11:02 .bash_logout
-rw-r--r-- 1 sanila23 sanila23 3771 Apr  3 11:02 .bashrc
-rw-r--r-- 1 sanila23 sanila23     0 Apr 17 06:42 .motd_shown
-rw-r--r-- 1 sanila23 sanila23  807 Apr  3 11:02 .profile
-rw----- 1 sanila23 sanila23 12288 Apr  4 13:10 .sub.sh.swp
-rw----- 1 sanila23 sanila23  9016 Apr  4 16:36 .viminfo
-rwxr-xr-x 1 sanila23 sanila23   57 Apr  3 11:57 add.sh
```

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

```
$ls -t
```

```
sanila23@DESKTOP-M28K6VJ:~$ ls -t
shellscript.sh  relop.sh  logiop.sh  mod.sh  mul.sh  sub      add2.sh  add.sh
oddeven.sh     relop1.sh  ariop.sh  div.sh  sub1.sh  add3.sh  add1.sh
sanila23@DESKTOP-M28K6VJ:~$ .
```

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

```
$ls -r
```

```
sanila23@DESKTOP-M28K6VJ:~$ ls -r
sub1.sh shellscript.sh relop.sh mul.sh logiop.sh ariop.sh add2.sh add.sh
sub relop1.sh oddeven.sh mod.sh div.sh add3.sh add1.sh
sanila23@DESKTOP-M28K6VJ:~$
```

- read,echo

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

```
sanila23@DESKTOP-M28K6VJ:~/san$ read
Amal Jyothi
sanila23@DESKTOP-M28K6VJ:~/san$ echo $REPLY
Amal Jyothi
sanila23@DESKTOP-M28K6VJ:~/san$
```

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]”

```
sanila23@DESKTOP-M28K6VJ:~/san$ read var1 var2 var3
my name is sanila sunny
sanila23@DESKTOP-M28K6VJ:~/san$ echo "[var1][var2][var3]"
[var1][var2][var3]
sanila23@DESKTOP-M28K6VJ:~/san$ echo "[var1][var2][var3]"
[var1][var2][var3]
sanila23@DESKTOP-M28K6VJ:~/san$ echo "[var1][var2][var3]"
[my][name][is sanila sunny]
sanila23@DESKTOP-M28K6VJ:~/san$
```

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

```
$read
My \
name is \
Sanila
```

```
sanila23@DESKTOP-M28K6VJ:~/san$ read
my \
> name is\
> sanila sunny
sanila23@DESKTOP-M28K6VJ:~/san$ echo $REPLY
my name issanila sunny
sanila23@DESKTOP-M28K6VJ:~/san$
```

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

```
sanila23@DESKTOP-M28K6VJ:~/san$ read -p "Enter your name"
Enter your name Sanila Sunny
sanila23@DESKTOP-M28K6VJ:~/san$ echo "My name is $REPLY"
My name is Sanila Sunny
sanila23@DESKTOP-M28K6VJ:~/san$
```

- d. read -n :- Specify limit

\$read -n 6 -p “Enter six characters only”

```
sanila23@DESKTOP-M28K6VJ:~/san$ read -n 7 -p "Enter 6 character only "
```

```
Enter 6 character only sne@@@sanila23@DESKTOP-M28K6VJ:~/san$ read -n 7 -p "Enter 6 character only "
```

```
Enter 6 character only sanila sanila23@DESKTOP-M28K6VJ:~/san$
```

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

\$read -s -p “Enter the password: “

```
sanila23@DESKTOP-M28K6VJ:~/san$ read -n 8 -p "Enter 8 characters only "
```

```
Enter 8 characters only sanilasusani@DESKTOP-M28K6VJ:~/san$ read -s -p "Enter the password"
```

```
Enter the passwordsanila23@DESKTOP-M28K6VJ:~/san$ echo "password is $REPLY"
```

```
password is 123456789
```

```
sanila23@DESKTOP-M28K6VJ:~/san$
```

### 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](#) [Cavities That Detect X-rays, Light, and Sound](#) [Rings Around a Black Hole \(V404 Cygni\)](#) [How Astronomers Detect Black Holes by Detecting Their Effect on Light and Sound](#) [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:

```
sanila23@DESKTOP-M28K6VJ:~$ cd san
sanila23@DESKTOP-M28K6VJ:~/san$
```

- mkdir :- Make directory

\$mkdir demo

Output:

```
sanila23@DESKTOP-M28K6VJ:~$ mkdir file1
sanila23@DESKTOP-M28K6VJ:~$ ls
add.sh    add2.sh   ariop.sh   file1      mod.sh   oddeven.sh  relop1.sh      sub
add1.sh   add3.sh   div.sh    logiop.sh  mul.sh   relop.sh    shellscript.sh sub1.sh
```

- pwd :- print working directory

\$pwd

Output:

```
sanila23@DESKTOP-M28K6VJ:~$ pwd
/home/sanila23
sanila23@DESKTOP-M28K6VJ:~$
```

- 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
  - a. cp file3.txt sr.txt : -Overwrite existing file  
\$cp file3.txt sr.txt  
Output:

```
sanila23@DESKTOP-M28K6VJ:~/san$ cp new new1
sanila23@DESKTOP-M28K6VJ:~/san$ cat new1
green  GREEN
red    RED
violet VIOLET
sanila23@DESKTOP-M28K6VJ:~/san$
```

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

```
sanila23@DESKTOP-M28K6VJ:~/san$ cp new new1
sanila23@DESKTOP-M28K6VJ:~/san$ cat new1
green  GREEN
red    RED
violet VIOLET
```

- 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:

```
sanila23@DESKTOP-M28K6VJ:~$ rmdir file1
sanila23@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:

```
sanila23@DESKTOP-M28K6VJ:~$ wc san
wc: san: Is a directory
      0      0      0 san
```

- a. wc -l :- Display number of lines

\$wc -l file.txt

Output:

```
sanila23@DESKTOP-M28K6VJ:~$ wc -l san
wc: san: Is a directory
0 san
```

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

\$wc -m file.txt

Output:

```
sanila23@DESKTOP-M28K6VJ:~$ wc -m san
wc: san: Is a directory
0 san
```

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

\$wc -c file.txt

Output:

```
sanila23@DESKTOP-M28K6VJ:~$ wc -c san
wc: san: Is a directory
0 san
```

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

\$wc -w file.txt

Output:

```
sanila23@DESKTOP-M28K6VJ:~$ wc -w san
wc: san: Is a directory
0 san
```

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

---

```
$wc -L file.txt
```

Output:

```
sanila23@DESKTOP-M28K6VJ:~$ wc -L san
wc: san: Is a directory
0 san
```

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

- a. cut -b1 :- Cut by first byte position

```
$cut -b1 file1.txt
```

Output:

```
sanila23@DESKTOP-M28K6VJ:~/san$ cut -b1 file3
g
r
e
v
```

- b. cut -c3 :- Cut by third character

```
$cut -c3 file1.txt
```

Output:

```
sanila23@DESKTOP-M28K6VJ:~/san$ cut -c2 file3
r
e
i
```

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

```
$cut -d - -f1 file3.txt
```

Output:

```
sanila23@DESKTOP-M28K6VJ:~/san$ cut -d - -f1 file3
green
red
violet
```

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

```
$cut -c 1,3,5 file3.txt
```

Output:

```
sanila23@DESKTOP-M28K6VJ:~/san$ cut -c 1,3 file3
ge
rd
vo
sanila23@DESKTOP-M28K6VJ:~/san$
```

- Paste :- Merge lines of files

```
$paste sr.txt file1.txt
```

Output:

```
sanila23@DESKTOP-M28K6VJ:~/san$ paste file3 file4
green  GREEN
red   RED
violet VIOLET
```

---

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

---

\$paste file1.txt output.txt > output3.txt

Output:

```
sanila23@DESKTOP-M28K6VJ:~/san$ paste file3 file4 > new
sanila23@DESKTOP-M28K6VJ:~/san$ 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:

```
sanila23@DESKTOP-M28K6VJ:~/san$ 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:

```
sanila23@DESKTOP-M28K6VJ:~/san$ paste -s new
green  GREEN  red    RED   violet VIOLET
sanila23@DESKTOP-M28K6VJ:~/san$
```

#### 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  
\$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)

- a. 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 Sanila file

Output:

```
mca@t2:~$ sudo chown sanila file
[sudo] password for mca:
mca@t2:~$ ls
Desktop Documents Downloads file Music Pictures Public Templates Videos
mca@t2:~$ chmod +rwx file
chmod: changing permissions of 'file': Operation not permitted
mca@t2:~$ ls -l file
-rwxrwxr-x.1 sanila mca 6 Mar 20 11:57 file
mca@t2:~$
```

## 6. useradd,usermod, userdel, passwd

- sudo :- superuser do

- a. sudo useradd user :- Add new user

\$sudo useradd Sanila

Output:

```
mca@t2:~$ sudo useradd sanila
[sudo] password for mca:
mca@t2:~$ sudo useradd sanila
useradd: user 'sanila' already exists
mca@t2:~$ sudo passwd sanila
New password:
Retype new password:
passwd: password updated successfully
mca@t2:~$ sudo groupadd -g 0809 grpsan
mca@t2:~$ sudo usermod -G grpsan sanila
mca@t2:~$ █
```

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

\$sudo passwd Sanila

Output:

```
mca@t2:~$ sudo useradd sanila
[sudo] password for mca:
mca@t2:~$ sudo useradd sanila
useradd: user 'sanila' already exists
mca@t2:~$ sudo passwd sanila
New password:
Retype new password:
passwd: password updated successfully
mca@t2:~$ sudo groupadd -g 0809 grpsan
mca@t2:~$ sudo usermod -G grpsan sanila
mca@t2:~$ █
```

- 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 mcasd Sanila

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

\$id Sanila

Output:

```
mca@t2:~$ id sanila
uid=1004(sanila) gid=1005(sanila) groups=1005(sanila),809(grpsan)
```

- sudo userdel user :- Delete user

\$sudo userdel Sanila

Output:

```
mca@t2:~$ sudo userdel sanila
[sudo] password for mca:
mca@t2:~$ sudo userdel sanila
userdel: user 'sanila' does not exist
mca@t2:~$ sudo groupdel grpsan
mca@t2:~$ sudo groupdel grpsan
groupdel: group 'grpsan' does not exist
mca@t2:~$ █
```

- sudo groupdel name :- Delete group

\$sudo groupdel mcasd

**Output**

```
mca@t2:~$ sudo userdel sanila
[sudo] password for mca:
mca@t2:~$ sudo userdel sanila
userdel: user 'sanila' does not exist
mca@t2:~$ sudo groupdel grpsan
mca@t2:~$ sudo groupdel grpsan
groupdel: group 'grpsan' 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:~/sanila$ cd ..
student@t2:~$ ls
achu7  'Computer Network'  Desktop  Downloads  Music  mytest.txt  Public  sahidsiddik  snap  trial
Aswathy  demo              Documents  isdk      mycollege  Pictures  sahild  sanila    Templates  Videos
student@t2:~$ du mytest.txt
4     mytest.txt
student@t2:~$ cd sanila
student@t2:~/sanila$ cd ..
student@t2:~$ du Documents
4     Documents
student@t2:~$
```

- **ps** :- Stands for Process. Currently running programs and running instances.  
a. \$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](mailto: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/modules
```

- 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 analyze people of certain age groups who are eligible for getting a suitable job if their condition and norms get satisfied using nested if statement.
7. Write a shell script to display the capital of a 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:
```

```

#!/bin/bash
"/home/sanila23/file7"
countlines=`wc -l < $file_path`
`wc -w < $file_path`
echo "Num of lines:$countlines"
~
~
~
~

sanila23@DESKTOP-M28K6VJ:~$ readlink -f file7
/home/sanila23/file7
sanila23@DESKTOP-M28K6VJ:~$ vi file7
sanila23@DESKTOP-M28K6VJ:~$ chmod +x file7
sanila23@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(( $num1 == 0 ))
then
    echo "$num1 is neither odd nor even number"
elif(( $num1 % 2 == 0 ))
then
    echo "$num1 is an even number"
else
    echo "$num1 is a odd number"
fi

```

Press 'Esc' to end INSERT

:wq!

chmod +x filename.sh

./filename.sh

Output:

```

sanila23@DESKTOP-M28K6VJ:~$ vi oddeven.sh
sanila23@DESKTOP-M28K6VJ:~$ chmod +x oddeven.sh
sanila23@DESKTOP-M28K6VJ:~$ ./oddeven.sh
Enter the number : 5
The number is odd.
sanila23@DESKTOP-M28K6VJ:~$ ./oddeven.sh
Enter the number : 6
The number is even.

```

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:**

```

sanila23@DESKTOP-M28K6VJ:~$ vi shellscript.sh
sanila23@DESKTOP-M28K6VJ:~$ chmod +x shellscript.sh
sanila23@DESKTOP-M28K6VJ:~$ ./shellscript.sh
Enter the number : 10
The number is positive.
sanila23@DESKTOP-M28K6VJ:~$ ./shellscript.sh
Enter the number : -5
The number is negative.
sanila23@DESKTOP-M28K6VJ:~$ 

```

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**

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

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

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

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

```
sanila23@DESKTOP-M28K6VJ:~$ vi age.sh
sanila23@DESKTOP-M28K6VJ:~$ chmod +x age.sh
sanila23@DESKTOP-M28K6VJ:~$ ./age.sh
Enter your age:
23
You are eligible for job consideration.
You are in the suitable age group for many jobs.
Enter your age:
52
You are eligible for job consideration.
You are in the suitable age group for senior roles.
sanila23@DESKTOP-M28K6VJ:~$
```

**7.**

```
#!/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
```

```
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.

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

```
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.

```
#!/bin/bash

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

```
:wq! █
```

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

**10.**

```
#!/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))
```

```
sanila23@DESKTOP-M28K6VJ:~$ vi armstrongg.sh
sanila23@DESKTOP-M28K6VJ:~$ chmod +x armstrongg.sh
sanila23@DESKTOP-M28K6VJ:~$ ./armstrong.sh
```

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

**11.**

```
#!/bin/bash
read -p "Enter the number: " n
if [ $n -lt 2 ]
then
echo "$n is not a prime number" else
for (( i=2; i<$n; i++ )) do
num=$(expr $n % $i)
if [ $num -eq 0 ]
then
echo "$n is not a prime number"
exit
fi
done
fi
echo "$n is a prime number"
```

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

**12.**

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

```
Enter the number: 5
Factorial of 5 is 120
```

---

**13.**

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

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

---

**14.**

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

---

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

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

### **Result:**

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

## Experiment:5

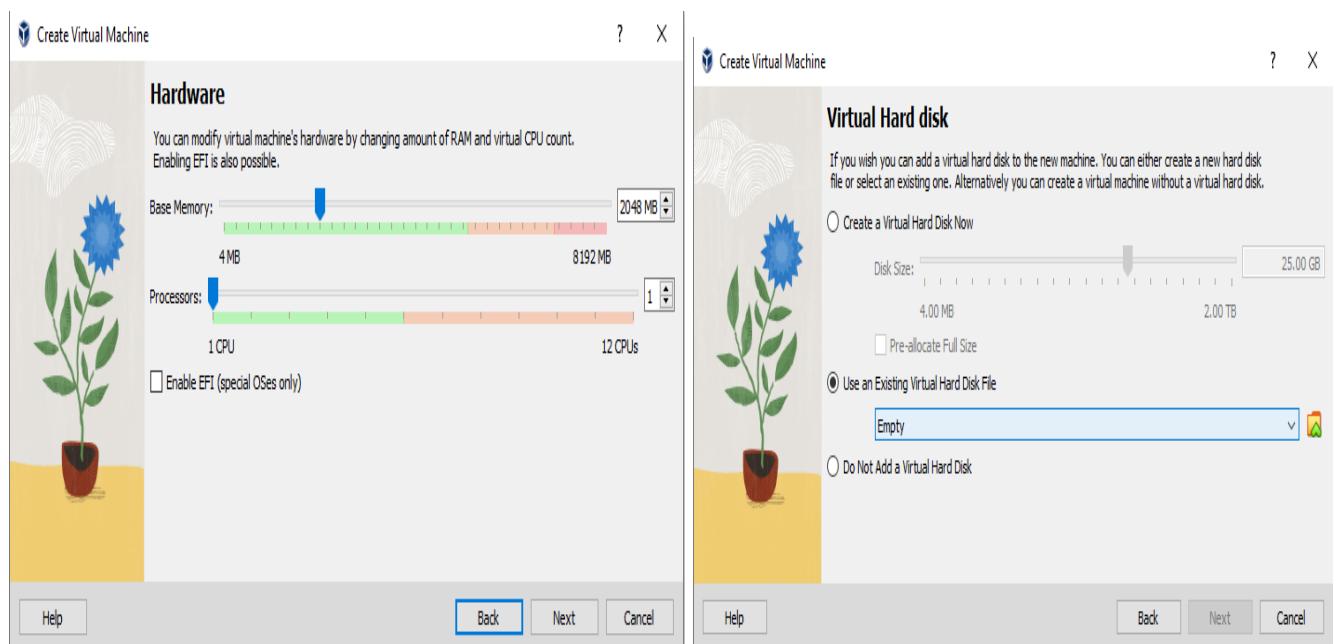
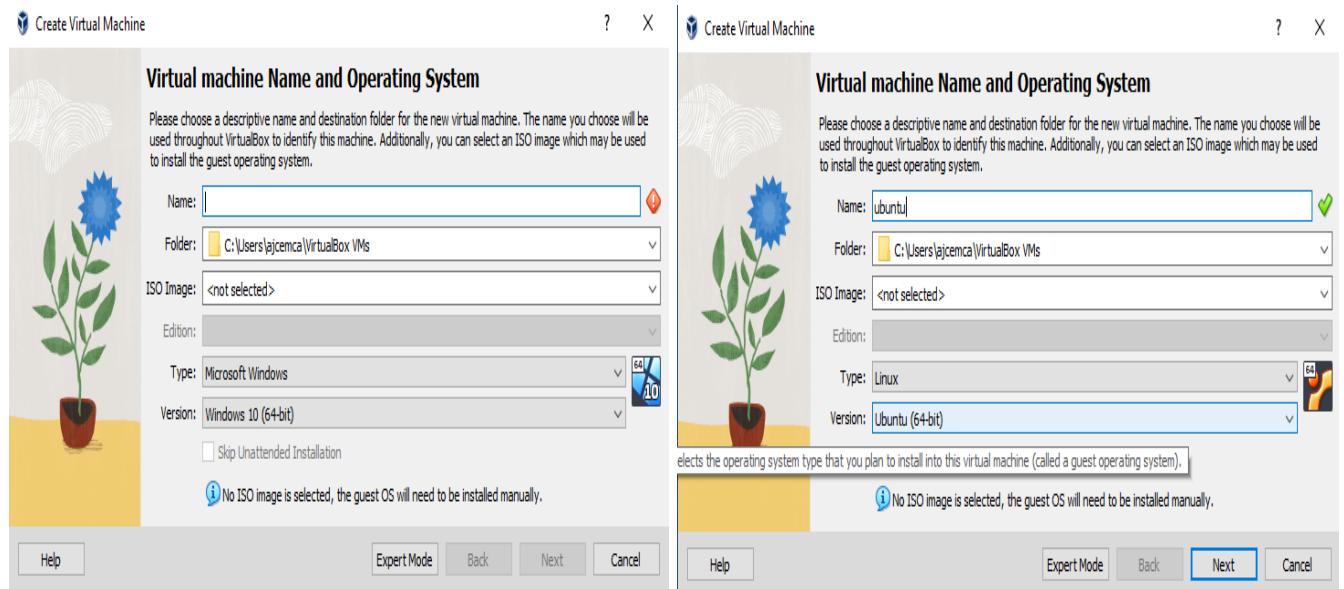
### Aim:

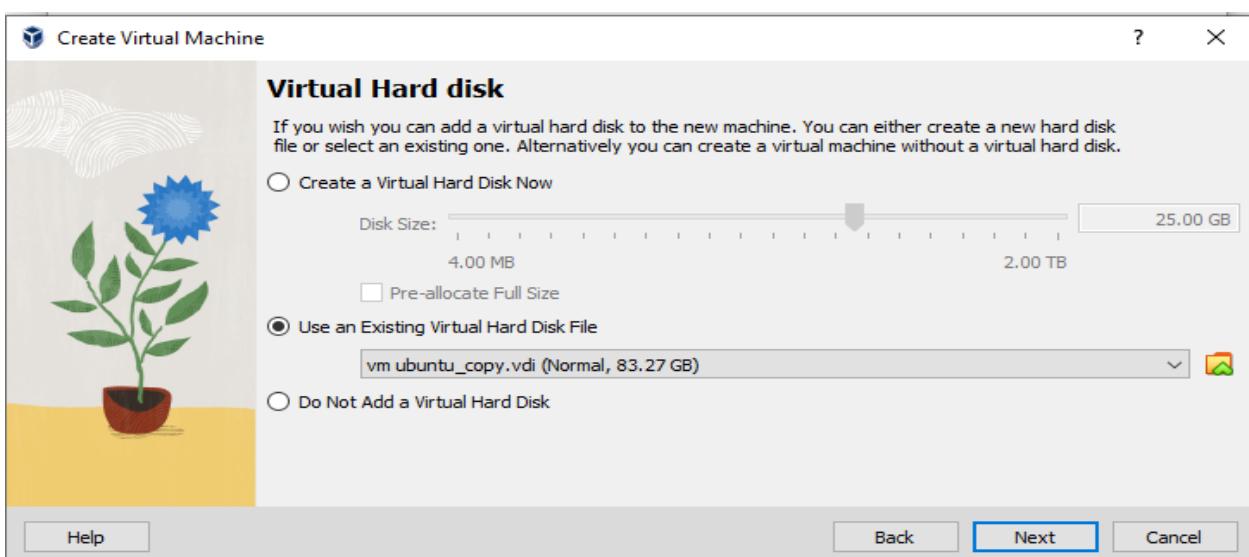
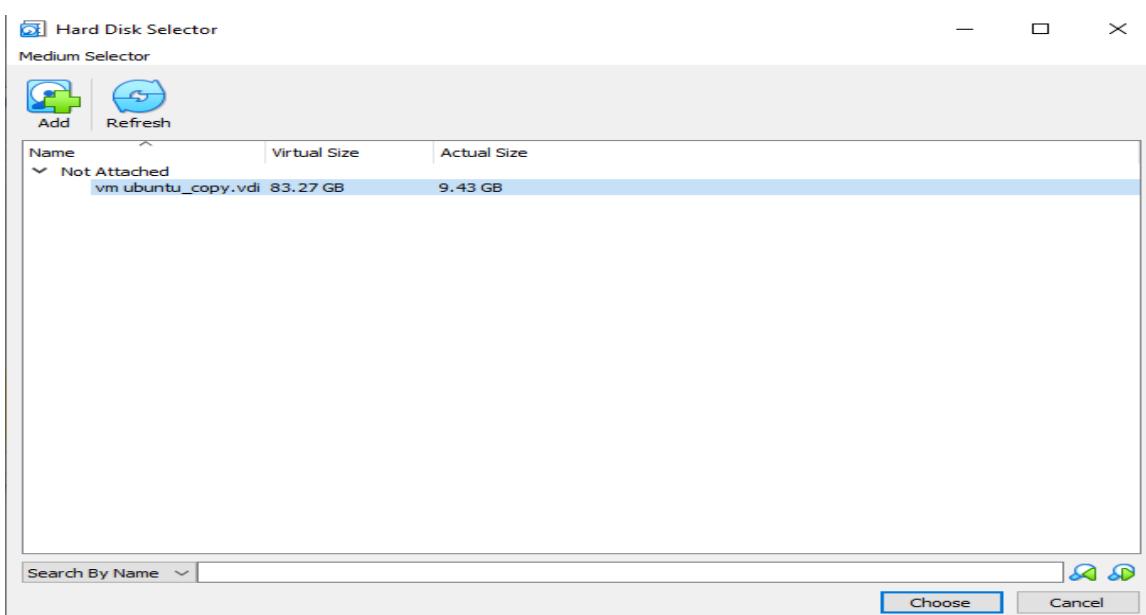
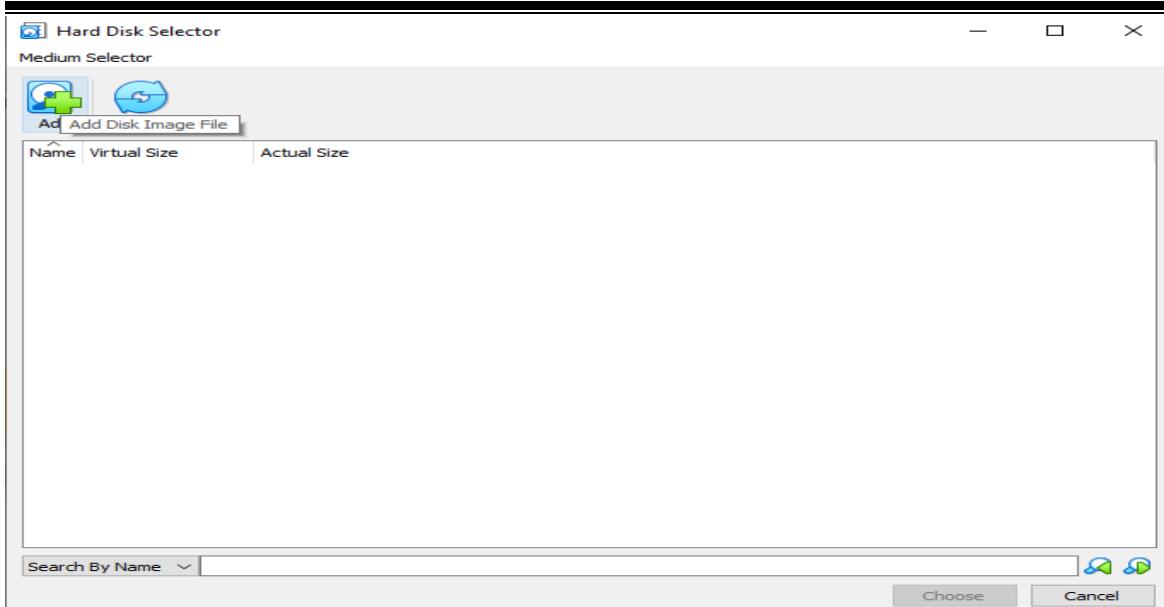
Install latest version of Ubuntu on a virtual box.

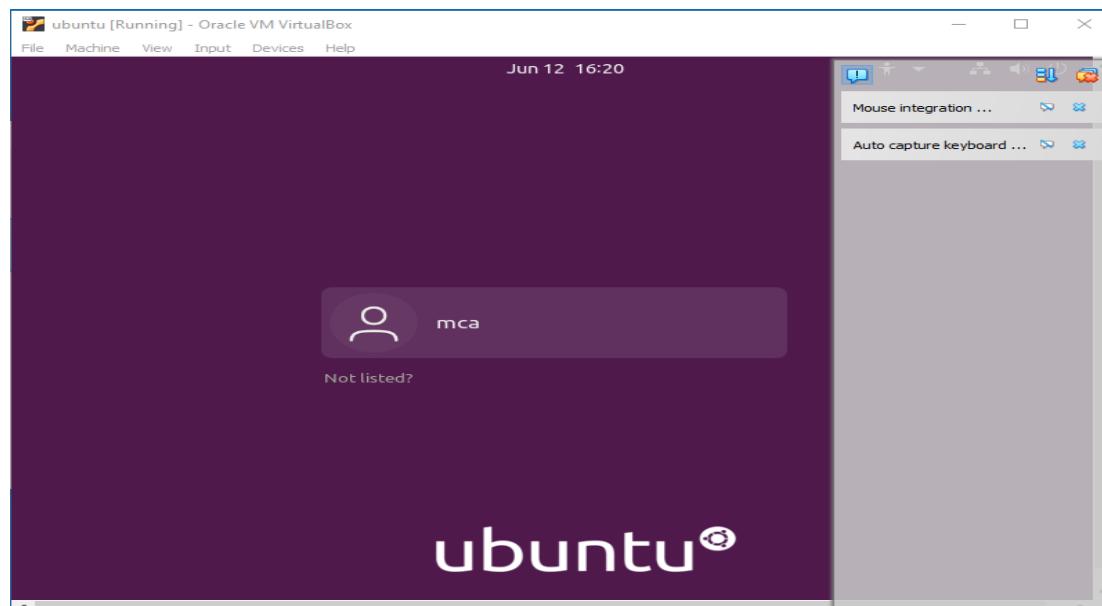
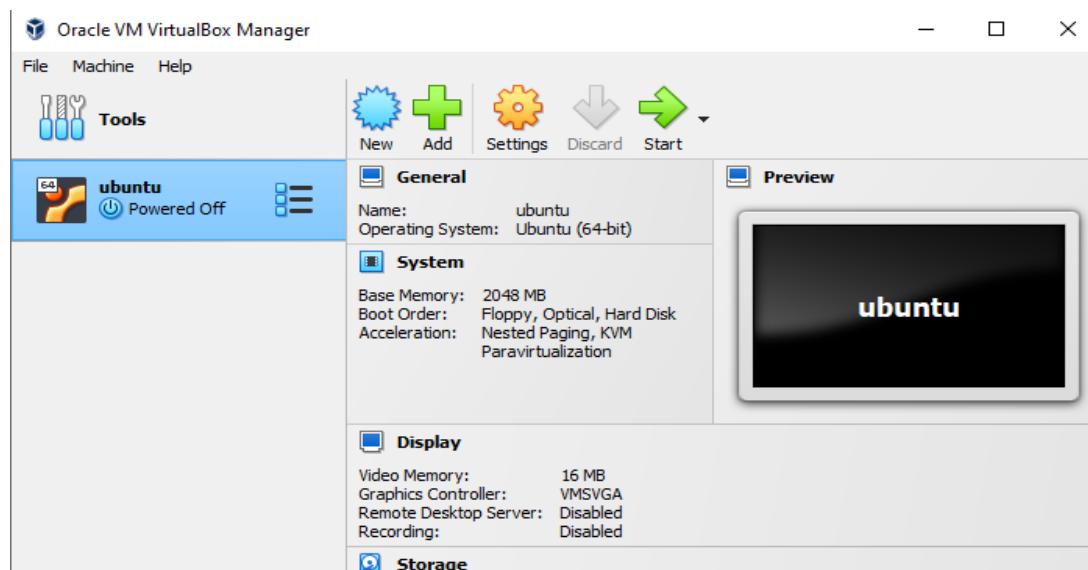
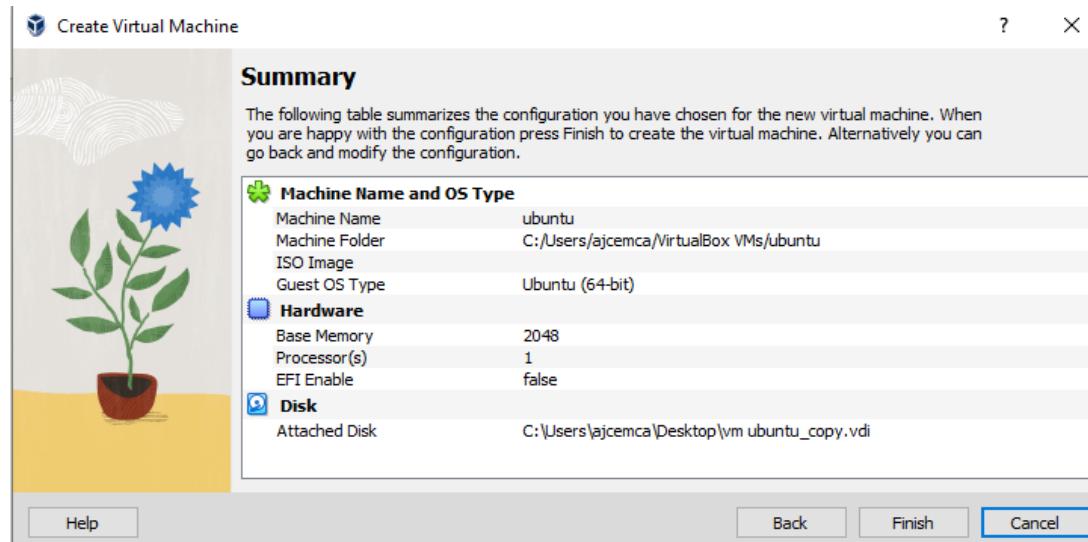
### CO1:

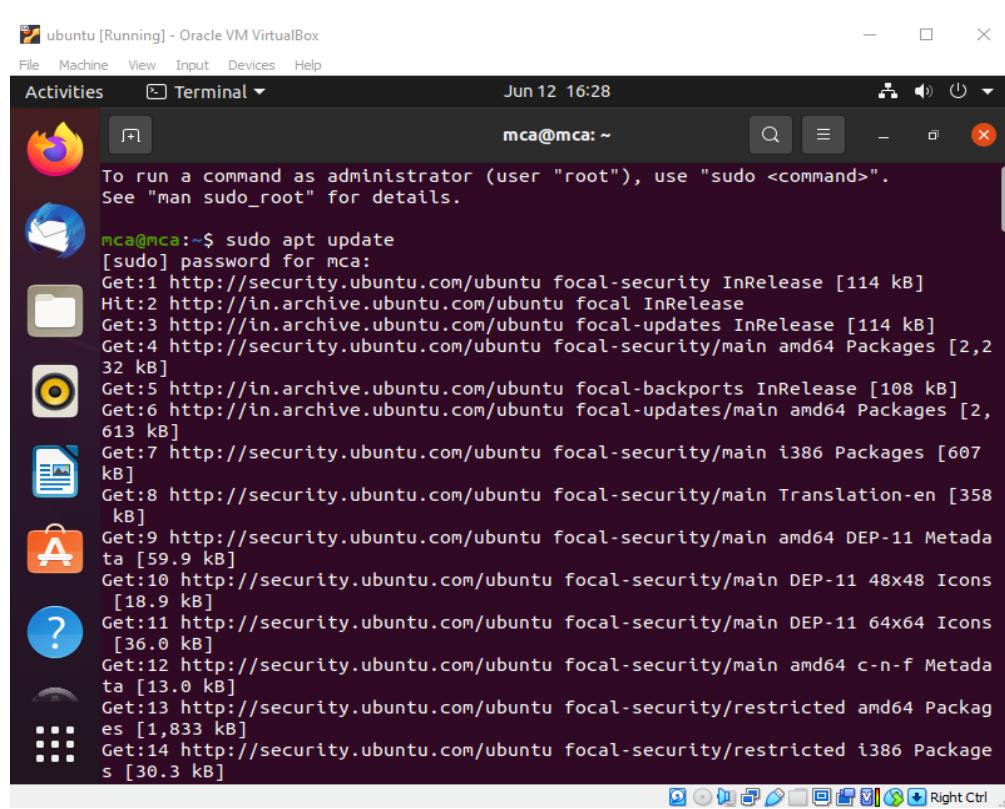
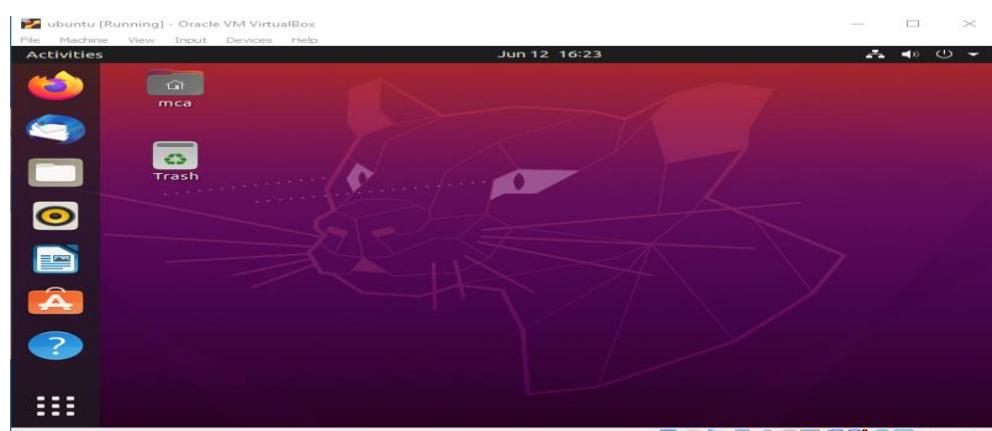
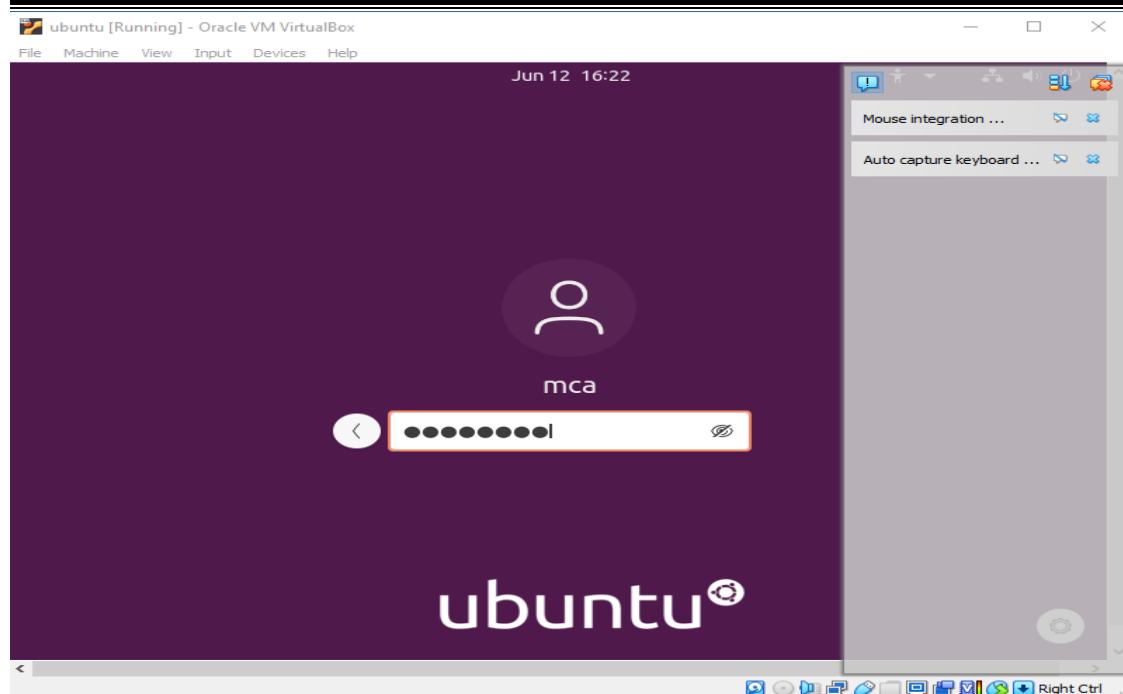
Install and configure common operating systems in virtual environment.

### Procedure:









ubuntu [Running] - Oracle VM VirtualBox

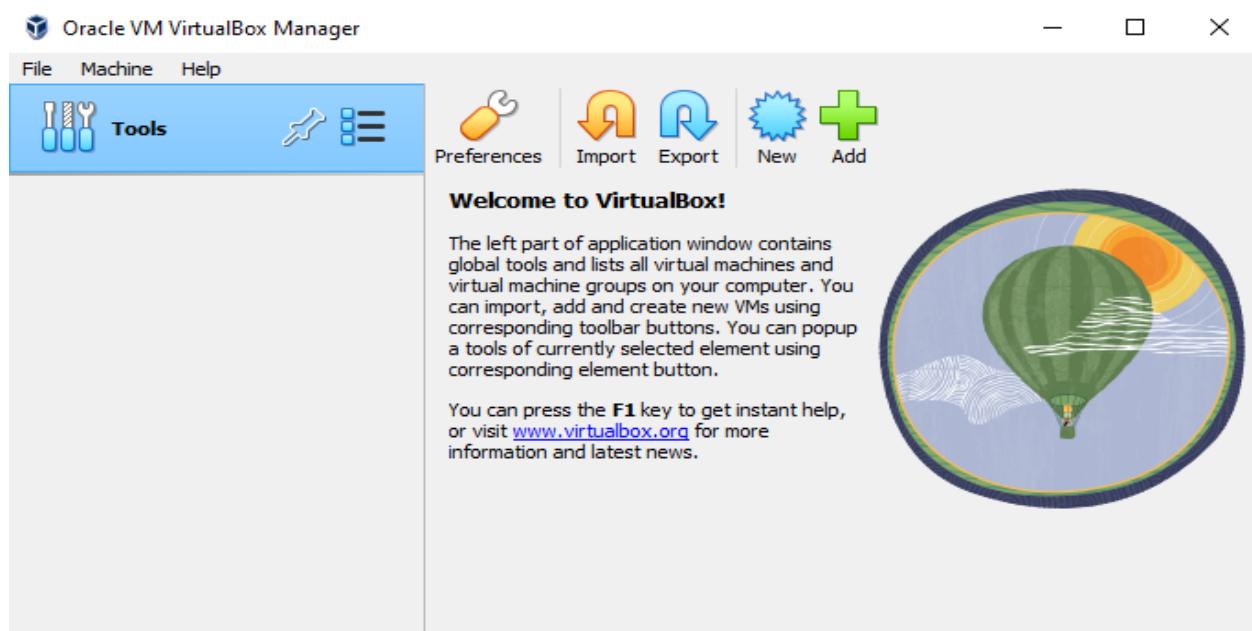
File Machine View Input Devices Help

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:

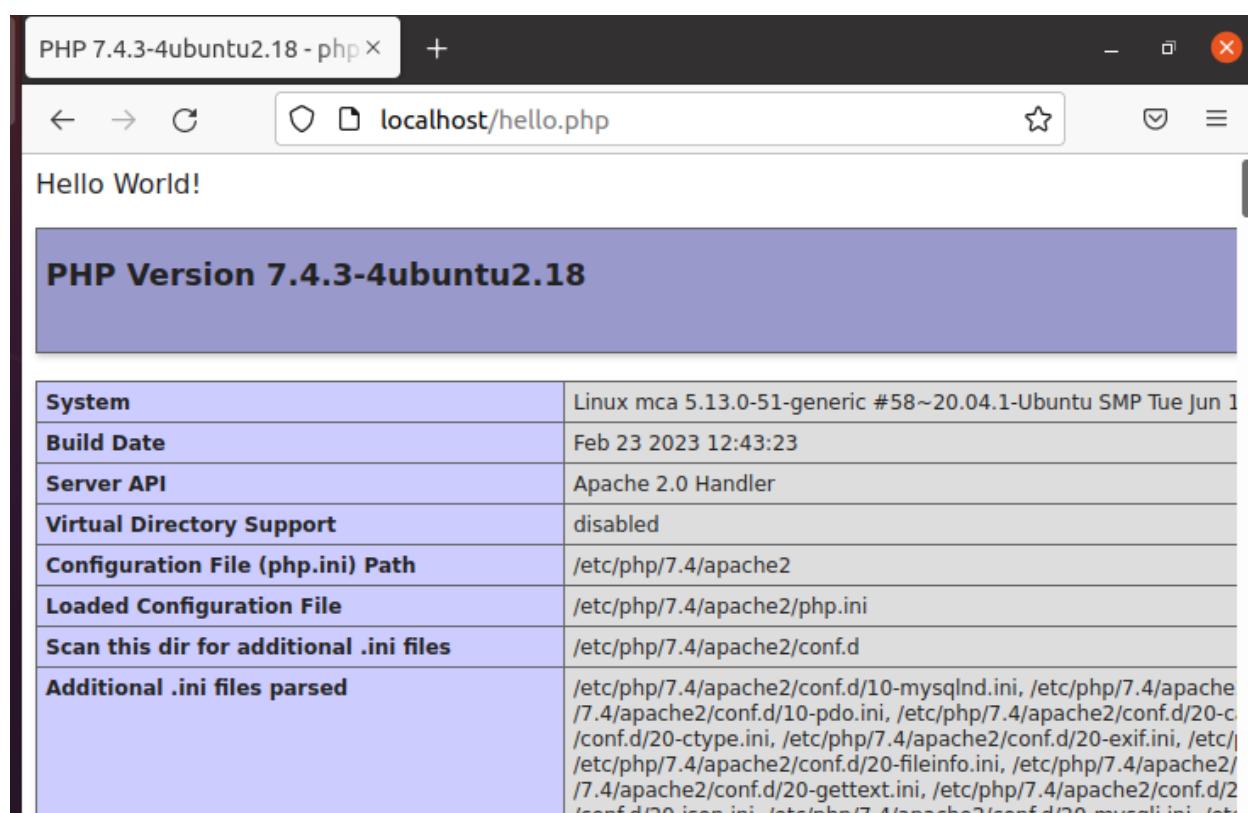
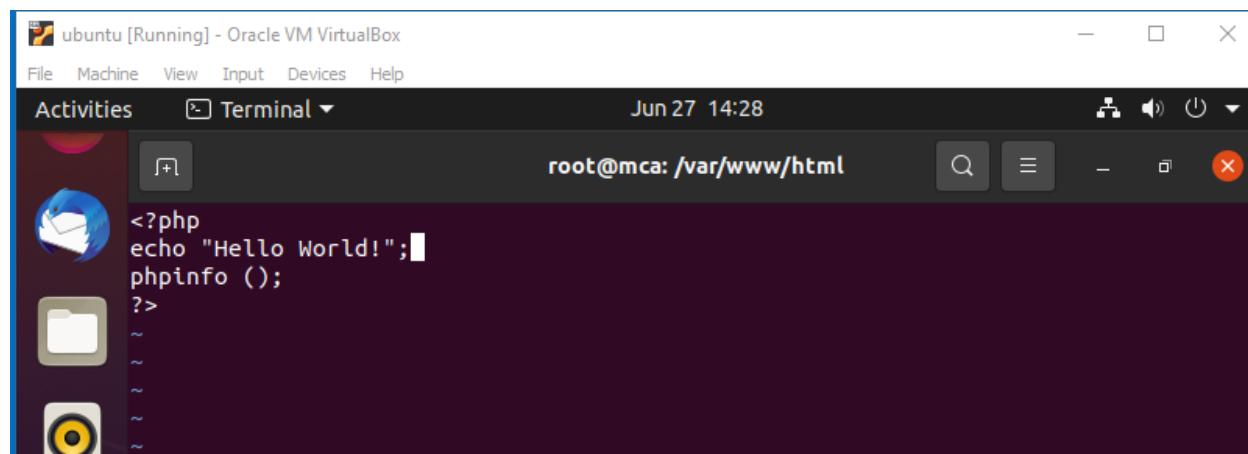
```
root@mca:/home/mca# which apache2
/usr/sbin/apache2
root@mca:/home/mca# ls
Desktop Documents Downloads Music Pictures Public Templates Videos
root@mca:/home/mca# cd /var
root@mca:/var# ls
backups crash local log metrics run spool www
cache lib lock mail opt snap tmp
root@mca:/var# cd www
root@mca:/var/www#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

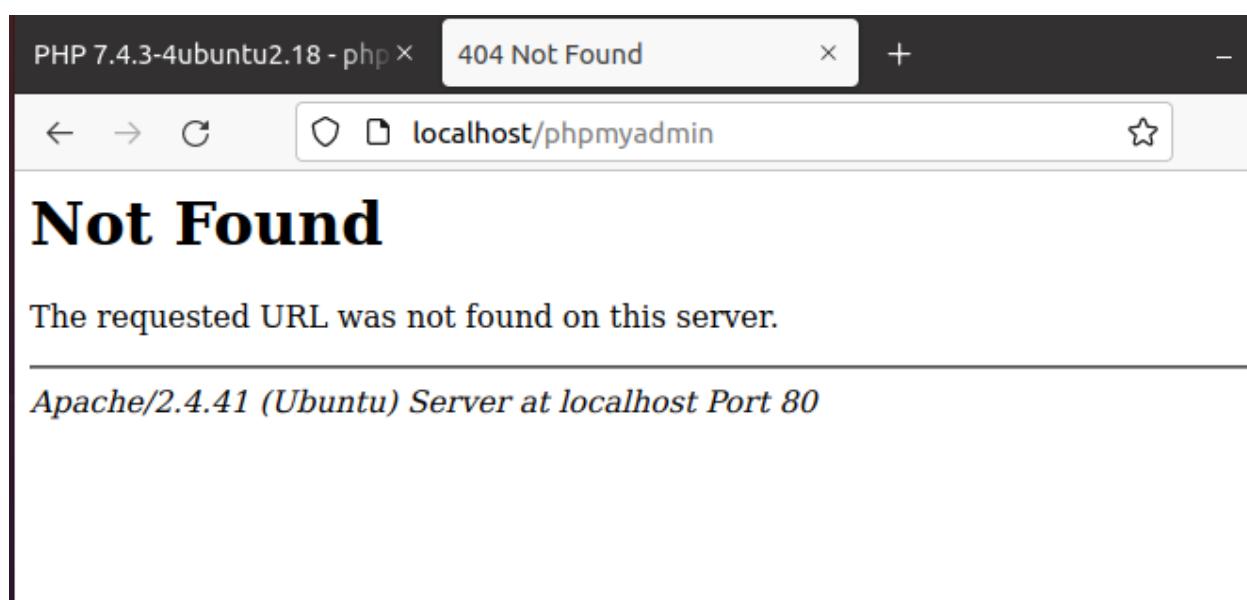
```
root@mca:/home/mca# php -v
PHP 7.4.3-4ubuntu2.18 (cli) (built: Feb 23 2023 12:43:23) ( NTS )
Copyright (c) The PHP Group
Zend Engine v3.4.0, Copyright (c) Zend Technologies
  with Zend OPcache v7.4.3-4ubuntu2.18, Copyright (c), by Zend Technologies
root@mca:/home/mca#
```

```
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.

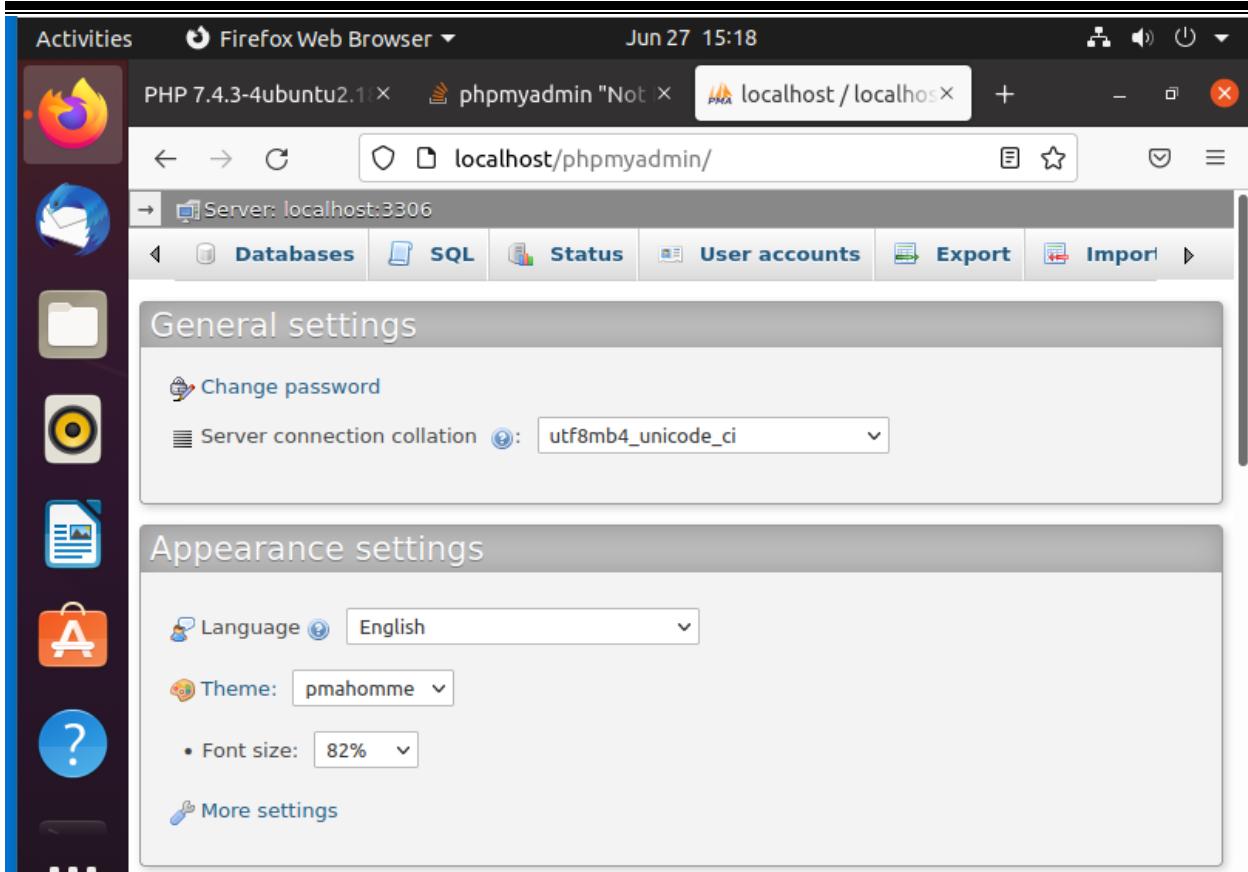
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
```

```
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 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) @ 2.40GHz
      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 )
```

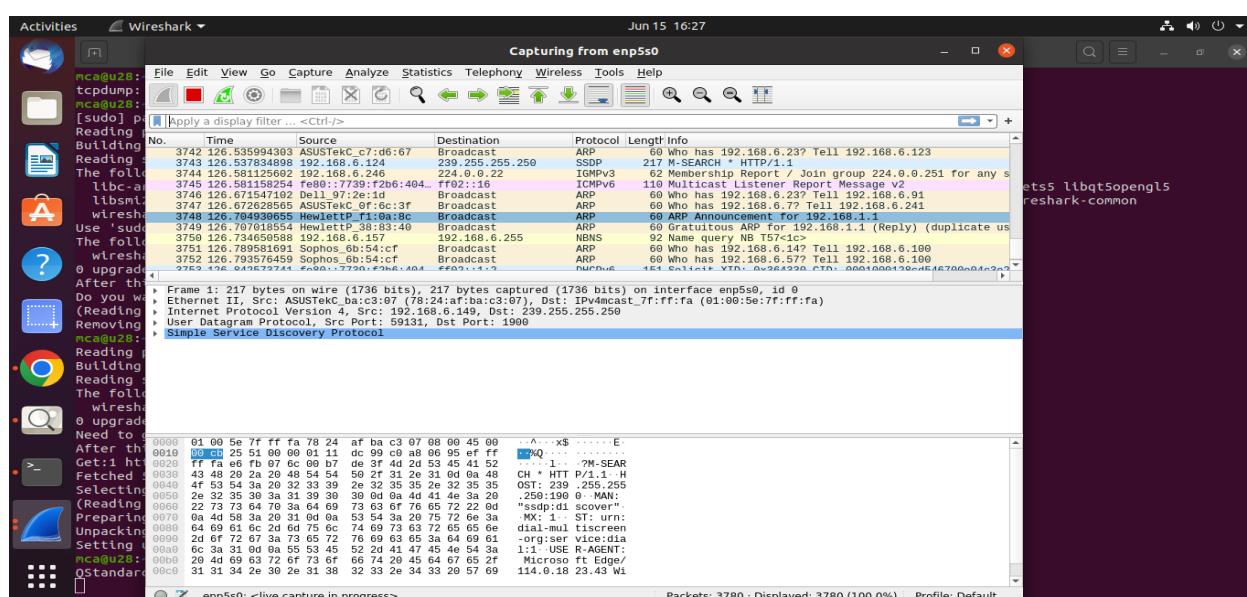
```
mca@u28:~$ sudo tcpdump -w data.txt -i enp5s0
tcpdump: listening on enp5s0, link-type EN10MB (Ethernet), capture size 262144
bytes
^Z
[8]+  Stopped                  sudo tcpdump -w data.txt -i enp5s0
```

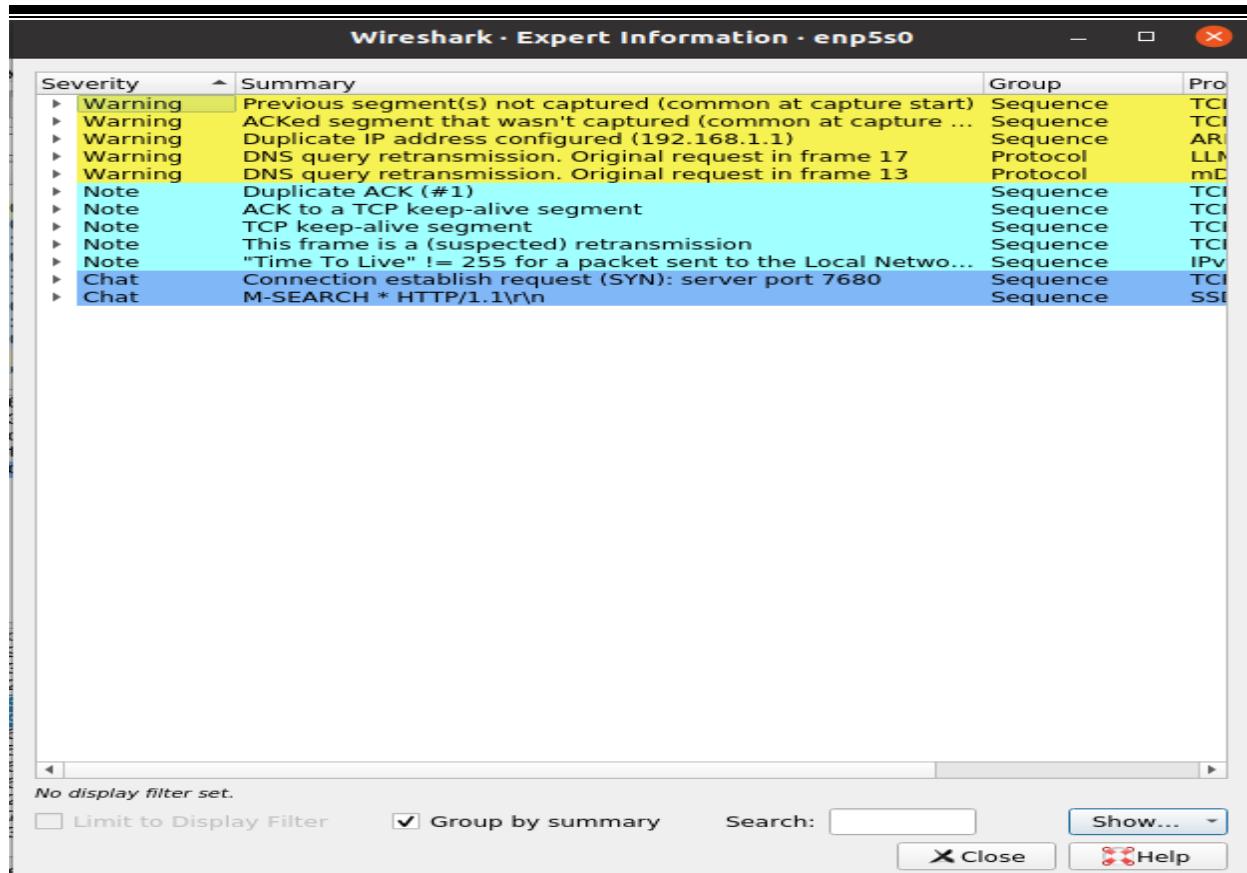
- Install wireshark

```
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:~

```
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:
  libc-ares2 liblua5.2-0 libqt5multimedia5 libqt5multimedia5-plugins libqt5multimediasettings5 libqt5multimediawidgets5 libqt5opengl5
  libsmi2dbl libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark13 libwiresharktap10 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 8 (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 CQ5 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

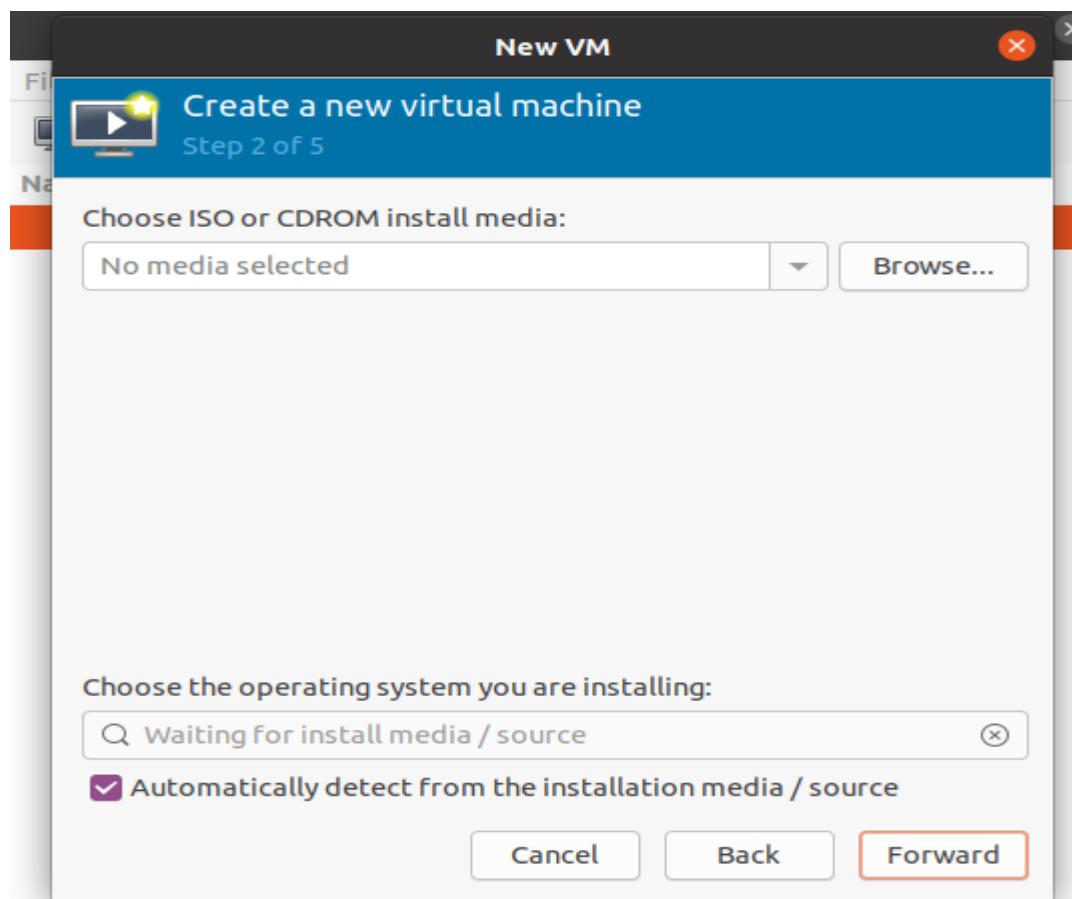
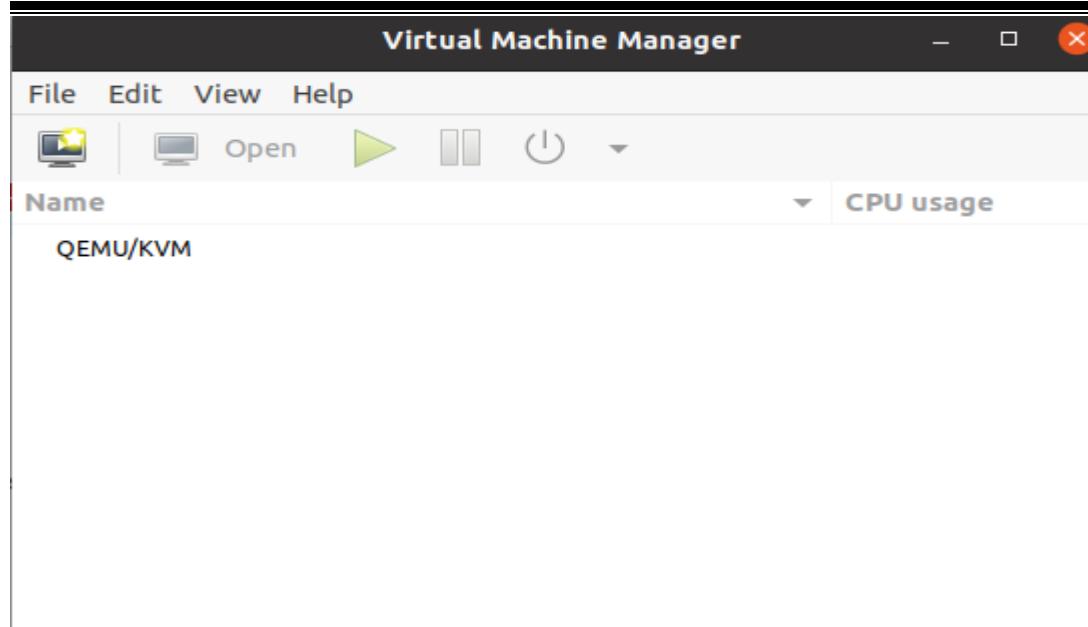
Command 'virt-manager' not found, but can be installed with:

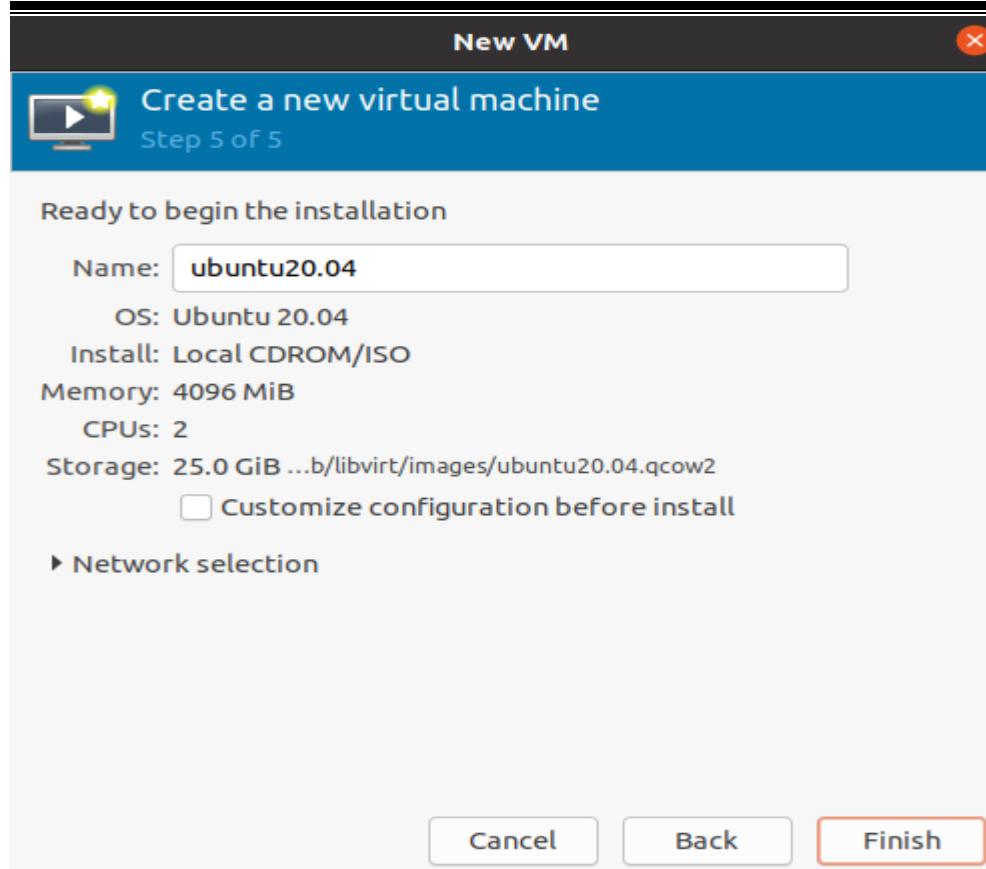
apt install virt-manager

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-v4l2-driver intel-media-v4l2-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:~$
```

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

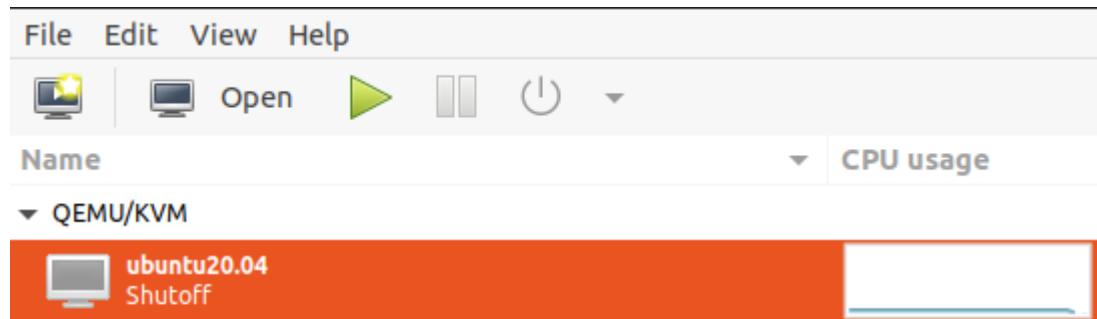
```
mca@u28:~$ sudo virsh resume ubuntu20.04
Domain ubuntu20.04 resumed
```

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

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

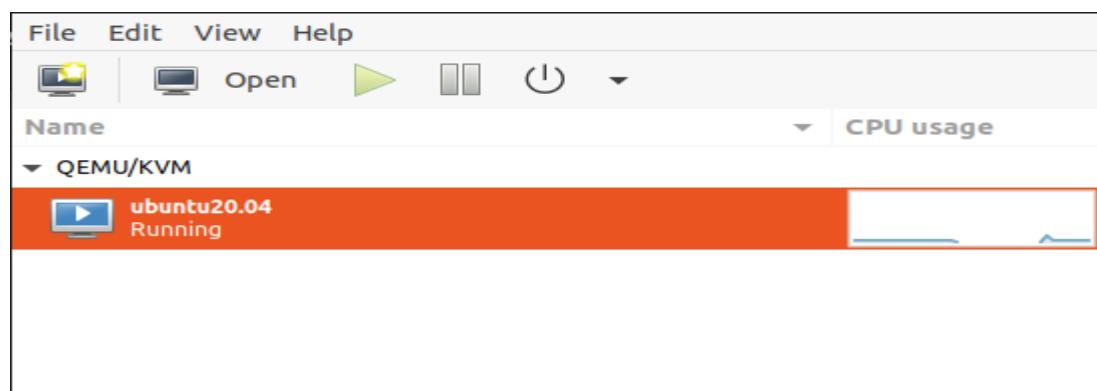
mca@u28:~$ sudo virsh shutdown ubuntu20.04
Domain ubuntu20.04 is being shutdown

mca@u28:~$
```



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

mca@u28:~$
```



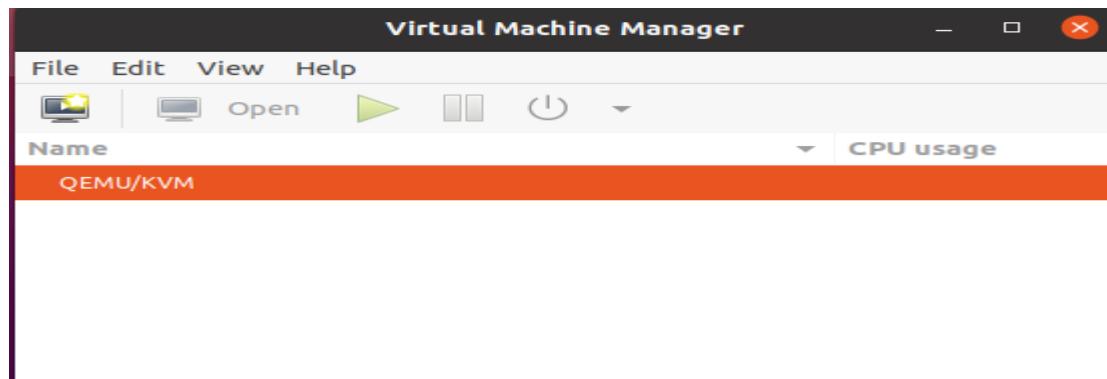
```
mca@u28:~$ sudo virsh destroy ubuntu20.04
Domain ubuntu20.04 destroyed

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:**

```
root@ip-172-31-83-57:/home/ec2-user - X ^

Microsoft Windows [Version 10.0.19045.3086]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ajcemca\Downloads> ssh -i "san1.pem" ec2-user@ec2-54-162-92-223.compute-1.amazonaws.com
The authenticity of host 'ec2-54-162-92-223.compute-1.amazonaws.com (54.162.92.223)' can't be established.
ECDSA key fingerprint is SHA256:8mabGa0gJ0y1t2pfMFLY5ztOAJAoeo+lbkY7h9pPi/w.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-54-162-92-223.compute-1.amazonaws.com,54.162.92.223' (ECDSA) to the list of known hosts.

          #_
~\ _ #####_      Amazon Linux 2023
~~ \ #####\_
~~  \###|_
~~   \#/  https://aws.amazon.com/linux/amazon-linux-2023
~~    \v' '-'>
~~     /
~~. _ /_
~~  / /_
~~ /m/'

[ec2-user@ip-172-31-83-57 ~]$ pwd
/home/ec2-user
[ec2-user@ip-172-31-83-57 ~]$ sudo su
[root@ip-172-31-83-57 ec2-user]# which docker
/usr/bin/which: no docker in (/root/.local/bin:/root/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/var/lib/snapd/snap/bin)
[root@ip-172-31-83-57 ec2-user]# yum install docker -y
Last metadata expiration check: 0:02:26 ago on Fri Jun 23 09:04:54 2023.
Dependencies resolved.

=====
Package           Architecture      Version       Repository      Size
=====
```

```
[root@ip-172-31-83-57 ec2-user]# yum install docker -y
Last metadata expiration check: 0:02:26 ago on Fri Jun 23 09:04:54 2023.
Dependencies resolved.
=====
Package           Architecture   Version      Repository    Size
=====
Installing:
  docker          x86_64        20.10.23-1.amzn2023.0.1  amazonlinux  42 M
Installing dependencies:
  containerd      x86_64        1.6.19-1.amzn2023.0.1  amazonlinux  31 M
  iptables-libc   x86_64        1.8.8-3.amzn2023.0.2  amazonlinux  401 k
  iptables-nft    x86_64        1.8.8-3.amzn2023.0.2  amazonlinux  183 k
  libcgroup       x86_64        3.0-1.amzn2023.0.1   amazonlinux  75 k
  libnetfilter_conntrack x86_64  1.0.8-2.amzn2023.0.2  amazonlinux  58 k
  libnftnl        x86_64        1.0.1-19.amzn2023.0.2  amazonlinux  30 k
  libpopt         x86_64        1.2.2-2.amzn2023.0.2  amazonlinux  84 k
  pigz            x86_64        2.5-1.amzn2023.0.3   amazonlinux  83 k
  runc            x86_64        1.1.5-1.amzn2023.0.1  amazonlinux  3.1 M

Transaction Summary
=====
Install 10 Packages

Total download size: 77 M
```

Complete!

```
[root@ip-172-31-83-57 ec2-user]# docker --version
Docker version 20.10.23, build 7155243
```

```
[root@ip-172-31-83-57 ec2-user]# docker info
Client:
  Context: default
  Debug Mode: false
  Plugins:
    buildx: Docker Buildx (Docker Inc., 0.0.0+unknown)

Server:
  ERROR: Cannot connect to the Docker daemon at unix:///var/run/docker.sock. Is the docker daemon running?
  errors pretty printing info
```

```
errors pretty printing info
[root@ip-172-31-83-57 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; preset: disabled)
  Active: inactive (dead)
  TriggeredBy: ● docker.socket
    Docs: https://docs.docker.com
```

DOCS: <https://docs.docker.com>

```
[root@ip-172-31-83-57 ec2-user]# service docker start
Redirecting to /bin/systemctl start docker.service
```

```
Complete!
[root@ip-172-31-83-57 ec2-user]# docker --version
Docker version 20.10.23, build 7155243
[root@ip-172-31-83-57 ec2-user]# docker info
Client:
  Context:    default
  Debug Mode: false
  Plugins:
    buildx: Docker Buildx (Docker Inc., 0.0.0+unknown)

Server:
ERROR: Cannot connect to the Docker daemon at unix:///var/run/docker.sock. Is the docker daemon running?
errors pretty printing info
[root@ip-172-31-83-57 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; preset: disabled)
  Active: inactive (dead)
TriggeredBy: ● docker.socket
  Docs: https://docs.docker.com
[root@ip-172-31-83-57 ec2-user]# service docker start
Redirecting to /bin/systemctl start docker.service
[root@ip-172-31-83-57 ec2-user]# service docker status
```

```
● docker.service - Docker Application Container Engine
  Loaded: loaded (/usr/lib/systemd/system/docker.service; disabled; preset: disabled)
  Active: active (running) since Fri 2023-06-23 09:10:16 UTC; 16s ago
TriggeredBy: ● docker.socket
  Docs: https://docs.docker.com
  Process: 26195 ExecStartPre=/bin/mkdir -p /run/docker (code=exited, status=0/SUCCESS)
  Process: 26196 ExecStartPre=/usr/libexec/docker/docker-setup-runtimes.sh (code=exited, status=0/SUCCESS)
  Main PID: 26197 (dockerd)
    Tasks: 7 (limit: 1114)
   Memory: 22.7M
      CPU: 279ms
     CGroup: /system.slice/docker.service
             └─26197 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock --default-ulimit nofile=32768

Jun 23 09:10:15 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:15.520016497Z" level=info msg="ccRe>
Jun 23 09:10:15 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:15.520099947Z" level=info msg="Clie>
Jun 23 09:10:15 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:15.522365826Z" level=error msg="Fai>
Jun 23 09:10:15 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:15.569806317Z" level=info msg="Load>
Jun 23 09:10:15 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:15.957427780Z" level=info msg="Defa>
Jun 23 09:10:16 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:16.081445254Z" level=info msg="Load>
Jun 23 09:10:16 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:16.108068562Z" level=info msg="Dock>
Jun 23 09:10:16 ip-172-31-83-57.ec2.internal dockerd[26197]: time="2023-06-23T09:10:16.108455077Z" level=info msg="Daem>
```

```
[root@ip-172-31-83-57 ec2-user]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
[root@ip-172-31-83-57 ec2-user]# docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
[root@ip-172-31-83-57 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-172-31-83-57 ec2-user]# docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
ubuntu latest 99284ca6cea0 2 weeks ago 77.8MB
[root@ip-172-31-83-57 ec2-user]# docker run -it ubuntu /bin/bash
root@91d4df08a93e:/# exit
exit
[root@ip-172-31-83-57 ec2-user]# docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
[root@ip-172-31-83-57 ec2-user]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
91d4df08a93e ubuntu "/bin/bash" 21 seconds ago Exited (0) 14 seconds ago lucid_rosalind
[root@ip-172-31-83-57 ec2-user]# docker run -it --name sanila ubuntu /bin/bash
root@e2494add76c6:/# exit
exit
[root@ip-172-31-83-57 ec2-user]# docker run -it --name sanila ubuntu /bin/bash
```

```
root@e2494add76c6:/# exit
exit
[root@ip-172-31-83-57 ec2-user]# docker run -it --name sanila ubuntu /bin/bash
docker: Error response from daemon: Conflict. The container name "/sanila" is already in use by container "e2494add76c6b3cce430b02003b27e732b054ea103a5a91416b1c05e7b0fd24". You have to remove (or rename) that container to be able to reuse that name.
See 'docker run --help'.
[root@ip-172-31-83-57 ec2-user]# docker run -it --name sanila ubuntu /bin/bash
docker: Error response from daemon: Conflict. The container name "/sanila" is already in use by container "e2494add76c6b3cce430b02003b27e732b054ea103a5a91416b1c05e7b0fd24". You have to remove (or rename) that container to be able to reuse that name.
See 'docker run --help'.
[root@ip-172-31-83-57 ec2-user]# ps -a
 PID TTY      TIME CMD
 2233 pts/0    00:00:00 sudo
 2235 pts/0    00:00:00 su
 2236 pts/0    00:00:00 bash
 27318 pts/0   00:00:00 ps
[root@ip-172-31-83-57 ec2-user]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
e2494add76c6 ubuntu "/bin/bash" About a minute ago Exited (0) About a minute ago sanila
91d4df08a93e ubuntu "/bin/bash" 3 minutes ago Exited (0) 3 minutes ago lucid_rosalind
[root@ip-172-31-83-57 ec2-user]# docker run -it --name sneha /bin/bash
docker: invalid reference format.
See 'docker run --help'.
```

```
[root@ip-172-31-83-57 ec2-user]# docker run -it --name sneha mongo /bin/bash
Unable to find image 'mongo:latest' locally
latest: Pulling from library/mongo
3f94e4e483ea: Pull complete
5ac5d4dae314: Pull complete
cbe6867b3f80: Pull complete
ec4c7cb44e89: Pull complete
38c7016c15b5: Pull complete
2d740b6c9811: Pull complete
329604f22078: Pull complete
71c33622dbce: Pull complete
45f7e12b56a3: Pull complete
Digest: sha256:d2e09ab3edcd6d11e57ae4ab18df673b5df46f4f3b5a788ada9b8a98de2c4a08
Status: Downloaded newer image for mongo:latest
root@c7bf6c0afee9:/# docker ps -a
bash: docker: command not found
root@c7bf6c0afee9:/# exit
exit
[root@ip-172-31-83-57 ec2-user]# docker ps -a
CONTAINER ID   IMAGE      COMMAND           CREATED        STATUS          PORTS     NAMES
c7bf6c0afee9   mongo      "docker-entrypoint.s..."  50 seconds ago   Exited (127) 10 seconds ago
e2494add76c6   ubuntu     "/bin/bash"       7 minutes ago   Exited (0) 7 minutes ago
91d4df08a93e   ubuntu     "/bin/bash"       9 minutes ago   Exited (0) 9 minutes ago
l
[root@ip-172-31-83-57 ec2-user]# docker start sanila
sanila
[root@ip-172-31-83-57 ec2-user]#
```

```
[root@ip-172-31-83-57 ec2-user]# docker start sanila
sanila
[root@ip-172-31-83-57 ec2-user]# docker attach sanila
root@e2494add76c6:/# cat > sanfile.txt
Content
Name
^Z
[1]+  Stopped                  cat > sanfile.txt
root@e2494add76c6:/# cat sanfile.txt
Content
Name
root@e2494add76c6:/# ls
bin  dev  home  lib32  libx32  mnt  proc  run      sbin  sys  usr
boot etc  lib   lib64  media   opt  root  sanfile.txt  srv   tmp  var
root@e2494add76c6:/#
```

```
root@e2494add76c6:/# yum install apache2 -y
bash: yum: command not found
root@e2494add76c6:/# apt install apache2 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package apache2
root@e2494add76c6:/# apt-get update
Get:1 http://archive.ubuntu.com/ubuntu jammy InRelease [270 kB]
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [108 kB]
Get:5 http://archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [164 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [17.5 MB]
Get:7 http://archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1792 kB]
Get:8 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [266 kB]
Get:9 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [42.2 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [545 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1191 kB]
Get:12 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [922 kB]
Get:13 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [49.4 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [25.5 kB]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [634 kB]
Get:16 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [36.3 kB]
Get:17 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [541 kB]
Get:18 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [939 kB]
Fetched 25.2 MB in 2s (11.3 MB/s)
Reading package lists... Done
```

```
root@e2494add76c6:/# which apache
root@e2494add76c6:/# which apache2
/usr/sbin/apache2
root@e2494add76c6:/# ■
```

```
root@e2494add76c6:/# exit
exit
There are stopped jobs.
root@e2494add76c6:/# ■
```

```
root@e2494add76c6:/# docker start sanila
bash: docker: command not found
root@e2494add76c6:/# exit
exit
There are stopped jobs.
root@e2494add76c6:/# exit
exit
[root@ip-172-31-83-57 ec2-user]# docker start sanila
sanila
[root@ip-172-31-83-57 ec2-user]# docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
e2494add76c6 ubuntu "/bin/bash" 20 minutes ago Up 8 seconds sanila
[root@ip-172-31-83-57 ec2-user]#
```

```
[ec2-user@ip-172-31-40-229 ~]$ sudo su
[root@ip-172-31-40-229 ec2-user]# docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
23d4051b009d ubuntu "/bin/bash" 39 hours ago Exited (0) 39 hours ago busy_chaum
e7fica558cec mongo "docker-entrypoint.s..." 40 hours ago Exited (127) 40 hours ago sneha
a6aa0b431850 ubuntu "/bin/bash" 40 hours ago Exited (137) 39 hours ago sanila
f517c671bf56 ubuntu "/bin/bash" 40 hours ago Exited (0) 40 hours ago interesting_heyrovsky
```

```
[root@ip-172-31-40-229 ec2-user]# docker start sanila
sanila
[root@ip-172-31-40-229 ec2-user]# docker attach sanila
root@a6aa0b431850:/# which apache2
root@a6aa0b431850:/# 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/main amd64 Packages [634 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [17.5 MB]
Get:7 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [36.3 kB]
Get:8 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [939 kB]
Get:9 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [541 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [266 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy/restricted amd64 Packages [164 kB]
Get:12 http://archive.ubuntu.com/ubuntu jammy/main amd64 Packages [1792 kB]
```

## Result:

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