1.Introduction to Computer Hardware

Identify major components of a computer such as Mother board, Daughter cards, Bus slots, SMPS, Internal storage devices, Interfacing Ports.

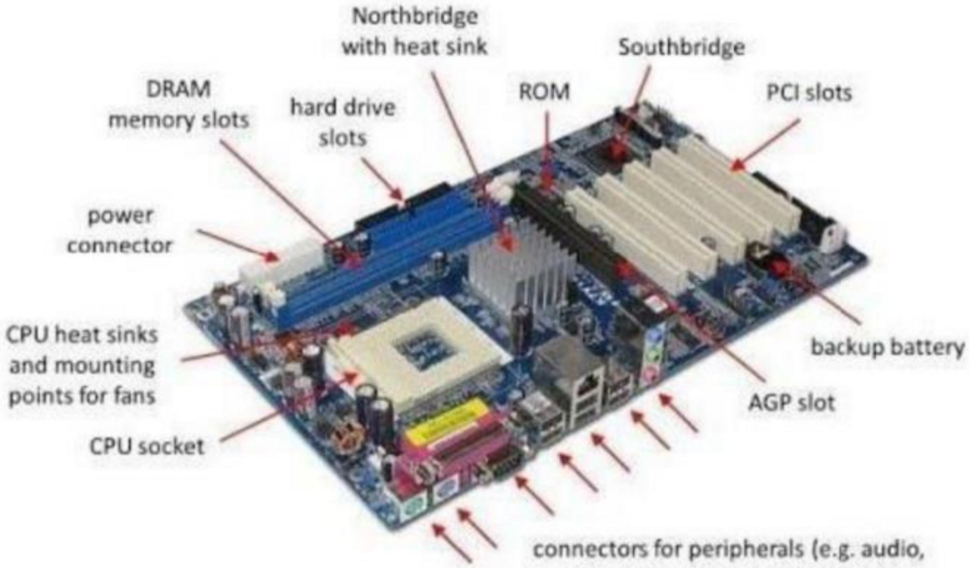
Physical identification of major components of a computer system such as motherboard, RAM modules, daughter cards, bus slots, SMPS, internal storage devices, interfacing ports. Specifications of desktop and server class computers. Installation of common operating systems for desktop and server use. (Students may be asked to formulate specifications for a computer to be used as a Desktop, Web server.)

MOTHERBOARD

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

Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.

Motherboard means specifically a PCB with expansion capabilities. As the name suggests, this board is often referred to as the "mother" of all components attached to it, which often include peripherals, interface cards, and daughterboards: sound cards, video cards, network cards, host bus adapters, TV tuner cards, IEEE 1394 cards, and a variety of other custom components.


Northbridge with heat sink
Southbridge
DRAM memory slots
hard drive slots
ROM
PCI slots
power connector
CPU heat sinks and mounting points for fans
backup battery
AGP slot
CPU socket
connectors for peripherals (e.g. audio, Ethernet, serial port, USB, etc.)

RAM MODULES

In computing, a memory module or RAM (random-access memory) stick is a printed circuit board on which memory integrated circuits are mounted. Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, workstations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer. Later, memory modules were standardized by organizations such as JEDEC and could be used in any system designed to use them.

Types of memory modules include:

- TransFlash Memory Module
- SIMM, a single in-line memory module
- DIMM, dual in-line memory module
- Rambus memory modules (subset of DIMMs, normally referred to as RIMMs)
- SO-DIMM, small outline DIMM, a smaller version of the DIMM, used in laptops

Distinguishing characteristics of computer memory modules include voltage, capacity, speed (bit rate), and form factor. For economic reasons, the large (main) memories found in personal computers, workstations, and non-handheld game consoles (such as PlayStation and Xbox) normally consist of dynamic RAM (DRAM). Other parts of the computer, such as cache memories, normally use static RAM (SRAM). Small amounts of SRAM are sometimes used in the same package as DRAM. However, since SRAM has high leakage power and low density, die-stacked DRAM has recently been used for designing multi-megabyte-sized processor caches.

DAUGHTER BOARD

The daughter board is a computer hardware component. It is also known as the piggyback board, riser card, daughter board, daughter card, or daughter card. A daughter board is a printed circuit board that is connected to the motherboard or expansion card. As compared to the motherboard, it is smaller in size.

A daughter board does not act as an expansion card. An expansion card adds extra new functions to the computer, but a daughter board that is connected to the motherboard adds or supports the main functions of the motherboard.

Daughter boards are directly connected to the motherboard. Expansion cards are connected to the motherboard using the bus and other serial interfaces, but daughter boards are directly connected to the board by soldering. As an update of the motherboard or expansion card, daughter boards are released to extend the features and services of the motherboard or expansion cards.

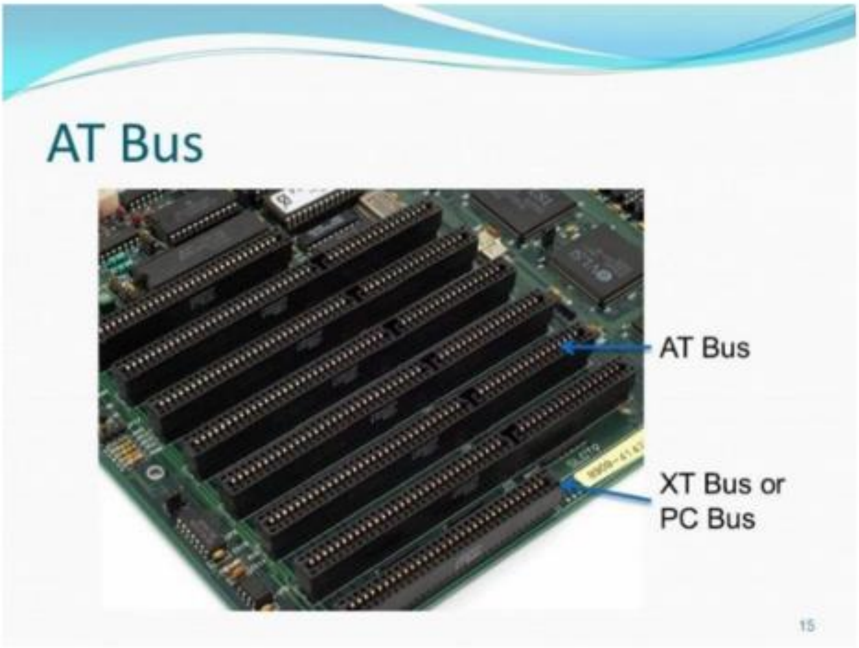
BUS SLOTS

Alternatively known as a bus slot or expansion port, an expansion slot is a connection or port inside a computer on the motherboard or riser card. It provides an installation point for a hardware expansion card to be connected, which provides additional features to a computer such as video, sound, advanced graphics, Ethernet, or memory.

The expansion card has an edge connector that fits precisely into the expansion slot as well as a row of contacts that is designed to establish an electrical connection between the motherboard and the electronics on the card, which are mostly integrated circuits. Depending on the form factor of the case and motherboard, a computer system generally can have anywhere from one to seven expansion slots. With a backplane system, up to 19 expansion cards can be installed.

Expansion cards can provide various functions including:

- Sound
- Modems
- Solid-state drive
- Network
- Power-on self-test
- Interface adapters
- Advanced multirate codec
- TV and radio tuning
- Basic input/output system (BIOS)
- Video processing
- Host adapting such as redundant array of independent disks or small computer system interface
- Expansion read-only memory (ROM)
- Security devices
- RAM memory



AT Bus

SMPS

A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as inductors or capacitors to supply power when the switching device is in its non-conduction state.

Switching power supplies have high efficiency and are widely used in a variety of electronic equipment, including computers and other sensitive equipment requiring a stable and efficient power supply.

A switched-mode power supply is also known as a switch-mode power supply or switching-mode power supply.

Switched-mode power supplies are classified according to the type of input and output voltages. The four major categories are:

- AC to DC
- DC to DC
- DC to AC
- AC to AC

A basic isolated AC to DC switched-mode power supply consists of:

- Input rectifier and filter
- Inverter consisting of switching devices such as MOSFETs
- Transformer
- Output rectifier and filter
- Feedback and control circuit

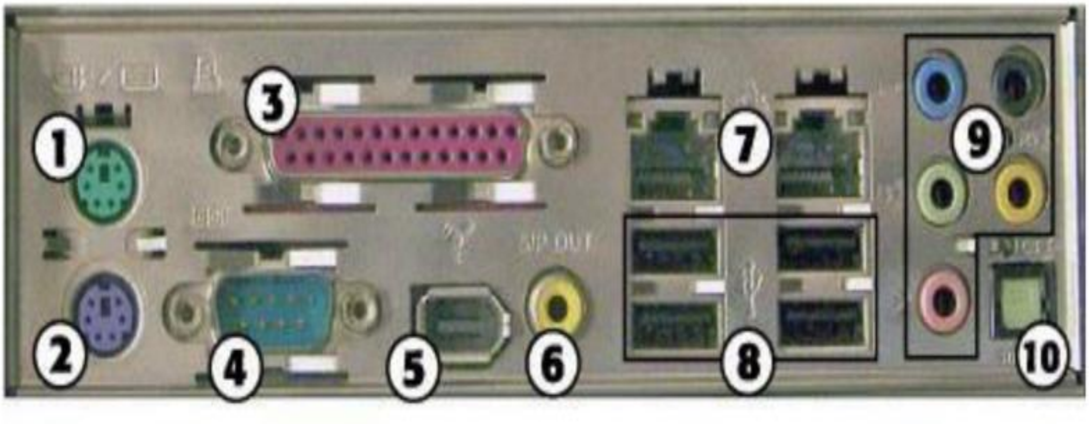
INTERNAL STORAGE DEVICES

A storage unit is a part of the computer system that is employed to store the information and instructions to be processed. A storage device is an integral part of the computer hardware that stores information/data to process the result of any computational work.

Without a storage device, a computer would not be able to run or even boot up. Or in other words, we can say that a storage device is hardware that is used for storing, porting, or extracting data files. It can also store information/data both temporarily and permanently. Computer storage is of two types:

- **Primary Storage Devices:** Also known as internal memory and main memory. This is a section of the CPU that holds program instructions, input data, and intermediate results. It is generally smaller in size. RAM (Random Access Memory) and ROM (Read Only Memory) are examples of primary storage.
- **Secondary Storage Devices:** Secondary storage is a memory that is stored externally to the computer. It is mainly used for permanent and long-term storage of programs and data. Examples include Hard Disk, CD, DVD, Pen/Flash drive, SSD, etc.

INTERFACING PORTS



1. PS/2 mouse port
2. PS/2 keyboard port
3. Parallel port
4. Serial port
5. IEEE 1394a port
6. SPDIF coaxial digital audio port
7. Ethernet ports
8. USB ports
9. 1/8-inch mini-jack audio ports
10. SPDIF optical digital audio port

A **port** is a physical docking point used to connect external devices to the computer. It acts as an interface between the computer and external devices like hard drives and printers.

Characteristics of Ports:

- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of an external device is plugged.
- Examples of external devices attached via ports: mouse, keyboard, monitor, microphone, speakers, etc.

2.Basic Linux Commands

Study of a terminal based text editor such as Vim or Emacs. (By the end of the course, students are expected to acquire following skills in using the editor: cursor operations, manipulate text, search for patterns, global search and replace)
Basic Linux commands, familiarity with following commands/operations expected

1. man
2. ls, echo, read
3. more, less, cat,
4. cd, mkdir, pwd, find
5. mv, cp, rm ,tar
6. wc, cut, paste
7. head, tail, grep, expr
8. chmod, chown
9. Redirections & Piping
10. useradd, usermod, userdel, passwd
11. df,top, ps
12. ssh, scp, ssh-keygen, ssh-copy-id

1. man :by using this command you can easily learn how to use

```
mits@mits-H610M-H-V2-DDR4:~$ man ls
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.
    -a, --all
        do not ignore entries starting with .
    -A, --almost-all
        do not list implied . and ..
    --author
        with -l, print the author of each file
    -b, --escape
        print C-style escapes for nongraphic characters
    --block-size=SIZE
        with -l, scale sizes by SIZE when printing them; e.g., '--block-size=M'; see
SIZE format below
```

```
       -B, --ignore-backups
              do not list implied entries ending with ~
       -c     with -lt: sort by, and show, ctime (time of last modification of file status
information); with -l: show ctime and  sort  by
              name; otherwise: sort by ctime, newest first
       -C     list entries by columns
```

2. ls, echo, read

ls:The ls command is used to view the contents of a directory. By default, this command will display the contents of your current working directory.If you want to see the content of other directories, type ls and then the directory's path.

```
mits@mits-H610M-H-V2-DDR4:~$ ls
document.docx  document.pdf  india  snap
```

There are variations you can use with the ls command:

- ls -R will list all the files in the sub-directories aswell

  ```
  mits@mits-H610M-H-V2-DDR4:~$ ls -R
  .:
  document.docx  document.pdf  india  snap
  ```

- ls –l – long listing

  ```
  mits@mits-H610M-H-V2-DDR4:~$ ls -l
  total 252
  -rw-rw-r-- 1 mits mits  26431 Feb  5 11:36 document.docx
  -rw-rw-r-- 1 mits mits 218271 Feb  5 10:16 document.pdf
  -rw-rw-r-- 1 mits mits    454 Feb  5 10:48 india
   drwx------ 4 mits mits   4096 Feb  5 10:08 snap
  ```

- ls -a will show the hidden files

  ```
  mits@mits-H610M-H-V2-DDR4:~$ ls -a
  .              .bash_logout  .config        .fontconfig  .lesshst              .mca.swp
  .profile  .sudo_as_admin_successful
  ..             .bashrc       document.docx  .gnupg       .local                .mca.txt.swp
  snap      .thunderbird
  .bash_history  .cache        document.pdf   india        .~lock.document.docx#
  .mozilla      .ssh
  ```

- ls -al will list the files and directories with detailed information like the perimission, size, owner, etc.

```
mits@mits-H610M-H-V2-DDR4:~$ ls -al
total 364
-rw-rw-r--  1 mits mits     84 Feb  5 11:36 .~lock.document.docx#
-rw-------  1 mits mits  12288 Apr 15  2024 .mca.swp
-rw-------  1 mits mits  12288 Apr 15  2024 .mca.txt.swp
drwx------  3 mits mits   4096 Oct 10 15:30 .mozilla
-rw-r--r--  1 mits mits    807 Jan 24  2024 .profile
drwx------  4 mits mits   4096 Feb  5 10:08 snap
drwx------  2 mits mits   4096 Mar  4  2024 .ssh
-rw-r--r--  1 mits mits      0 Jan 24  2024 .sudo_as_admin_successful
drwx------  6 mits mits   4096 Oct 10 15:30 .thunderbird
```

- ls -t lists files sorted in the order of "lastmodified"

  ```
  mits@mits-H610M-H-V2-DDR4:~$ ls -t
  document.docx  india  document.pdf  snap
  ```

- ls -r option will reverse the natural sorting order. Usually used incombination with other switches such as ls -tr. This will reverse thetime-wise listing.

  ```
  mits@mits-H610M-H-V2-DDR4:~$ ls -r
  snap  india  document.pdf  document.docx
  ```

echo: echo command is used to move some data into a file. If you want to add the text, "Hello, my name is John" into a file called name.txt, you would type echo Hello, my name is John >> name.txt 2. head.

```
mits@mits-H610M-H-V2-DDR4:~$ echo "god is love"
god is love
mits@mits-H610M-H-V2-DDR4:~$ echo -e "god\nis\nlove"
god
is
love
```

read: read the contents of a line into a variable. The read command can be used with and without arguments. read command is used to read [options] [name...] . $read $read var1 var2 var3. $echo &quot;[$var1] [$var2] [$var3].

```
mits@mits-H610M-H-V2-DDR4:~$ echo "Enter your name:"; read;
Enter your name:
Gokul
mits@mits-H610M-H-V2-DDR4:~$ echo "Enter your name:"; read name;
echo "hello" $name;
Enter your name:
gokul
```

```
hello Gokul
```

3. more, less, cat

more: Like cat command, more command displays the content of a file. Only difference is that, in case of larger files, &#39; cat&#39; command output will scroll off your screen while &#39; more&#39; command displays output one screenful at a time. Enter key

```
mits@mits-H610M-H-V2-DDR4:~$ more -p india

india is my country
i love my country
all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia.
 It is the seventh-largest country by area
since its independence in 1947, the world's most populous democracy
Bounded by the Indian Ocean on the south
he Arabian Sea on the southwest
Bay of Bengal on the southeast
shares land borders with Pakistan to the west
China, Nepal, and Bhutan to the north
```

less: The 'less' command is same as 'more' command but include some more features. It automatically adjusts with the width and height of the terminal window, while 'more' command cuts the content as the width of the terminal window get shorter

```
mits@mits-H610M-H-V2-DDR4:~$ less india
india is my country
i love my country
all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia.
 It is the seventh-largest country by area
since its independence in 1947, the world's most populous democracy
Bounded by the Indian Ocean on the south
he Arabian Sea on the southwest
Bay of Bengal on the southeast
shares land borders with Pakistan to the west
China, Nepal, and Bhutan to the north
india (END)
```

Cat:cat (short for concatenate) is one of the most frequently used commands in Linux. It is used to list the contents of a file on the standard output stdout . To run this command, type cat followed by the file's name and its extension.

```
mits@mits-H610M-H-V2-DDR4:~$ cat > india
india is my country
i love my country
all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia.
^C
mits@mits-H610M-H-V2-DDR4:~$ cat india
india is my country
i love my country
all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia
mits@mits-H610M-H-V2-DDR4:~$ cat -n  india
     1 india is my country
     2 i love my country
     3 all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia.
```

4. cd, mkdir, pwd, find

cd :To navigate through the Linux files and directories, use the cd .It requires either the full path or the name of the directory, depending on the current working directory that you're in.

```
mits@ mits-H610M-H-V2-DDR4:~$ cd s1mca
mits@mits-H610M-H-V2-DDR4:~/s1mca$ cd s2mca
mits@mits-H610M-H-V2-DDR4:~/s1mca/s2mca$ cd ..
mits@mits-H610M-H-V2-DDR4:~/s1mca$ cd ..
mits@ mits-H610M-H-V2-DDR4:~$
```

mkdir : Use mkdir command to make a new directory — if you type mkdir Music it will create a directory called Music.To generate a new directory inside another directory, use this Linux basic command

```
mits@mits-H610M-H-V2-DDR4:~$ ls
document.docx  f1  india  kerala  linuxtext  snap
mits@mits-H610M-H-V2-DDR4:~/$ mkdir s1mca
mits@mits-H610M-H-V2-DDR4:~/$ mkdir s2mca
mits@mits-H610M-H-V2-DDR4:~$ ls
document.docx  f1  india  kerala  linuxtext  snap s1mca s2mca
```

pwd (Print Working Directory): Use the pwd command to find out the path of the current working directory (folder) you're in. The command will return an absolute (full) path, which is basically a path of all the directories that starts with a forward slash (/). An example of an absolute path is /home/username.

```
mits@mits-H610M-H-V2-DDR4:~$ pwd
/home/mits
```

find: Similar to the locate command, using find also searches for files and directories. The difference is, you use the find command to locate files within a given directory. As an example, find /home/ -name notes.txt command will search for a file called notes.txt within the home directory and its subdirectories. Other variations when using the find are: To find files in the current directory use, find . -name notes.txt. To look for directories use, / -type d -name notes. txt.

```
mits@mits-H610M-H-V2-DDR4:~$:~$find ~ -name "india"
/home/mits/india
mits@mits-H610M-H-V2-DDR4:~$:~$find . -name "*.txt"
./sample.txt
./file1.txt
./file2.txt
```

5. mv, cp, rm ,tar

mv : The primary use of the mv command is to move files, it can also be used to rename files.The arguments in mv are similar to the cp command. You need to type mv, the file's name, and the destination's directory. mv file.txt /home/username/Documents .To rename files, the Linux is mv oldname.ext newname.ext.

```
mits@mits-H610M-H-V2-DDR4:~/s2mca$ ls
apple  f1  linux  new  orange
mits@mits-H610M-H-V2-DDR4:~/s2mca$ mv f1 f2
mits@mits-H610M-H-V2-DDR4:~/s2mca$ ls
apple  f2  linux  new  orange
```

cp : cp command issued to copy files from the currentdirectorytoa different directory. For instance, the command cp scenery.jpg /home/username/Pictures would create a copy of scenery.jpg (from your current directory) into the Pictures directory. cp -i will ask for user's consent in case of a potential file overwrite. cp -p will preserve source files'mode, ownership and timestamp. cp -r will copy directories recursively. cp -u copies files only if the destination fileisnotexistingor thesource file is newer than the destination file.

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ ls
file1
mits@mits-H610M-H-V2-DDR4:~/gokul$ cp file1 file2
mits@mits-H610M-H-V2-DDR4:~/gokul$ ls
file1  file2
```

rm : The rm command is used to delete directories and the contents within them. If you only want to delete the directory —as an alternative to rmdir — use rm -r. Be very careful with this command and double-check which directory you are in. This will delete everything and there is no undo. To remove a file use rm filename.

```
mits@mits-H610M-H-V2-DDR4:~$ ls
document.docx grapes   india   kerala   linuxtext  mca   mint   s2mca   snap   yellow
mits@mits-H610M-H-V2-DDR4:~$ rm mca
rm: cannot remove 'mca': Is a directory
mits@mits-H610M-H-V2-DDR4:~$ rm -r mca
mits@mits-H610M-H-V2-DDR4:~$ ls
document.docx grapes   india   kerala   linuxtext   mint   s2mca   snap   yellow
```

tar: The Linux ‘tar’stands for tape archive, is used to createArchive and extract theArchive files Linux tar command to create compressed or uncompressed Archive files.

```
mits@mits-H610M-H-V2-DDR4:~$ tar -cvf archive.tar myfolder
myfolder/
myfolder/sample.txt
```

6. wc, cut, paste

wc : wc stands for word count. Used for counting purpose. It is used to find out number of lines, word count, byte and characters count in the files specified in the file arguments. #wc state.txt 6 8 54 state.tx . #wc state.txt capital.txt wc -l state.txt wc -w state.txt capital.txt wc -c state.txt .wc -m state.txt

```
mits@mits-H610M-H-V2-DDR4:~$ cat state
Kerala
Tamil nadu
Goa
mits@mits-H610M-H-V2-DDR4:~$ wc state
3  4 22 state
mits@mits-H610M-H-V2-DDR4:~$ wc -l state
3 state
```

```
mits@mits-H610M-H-V2-DDR4:~$ wc -c state
22 state
mits@mits-H610M-H-V2-DDR4:~$ wc -w state
4
```

cut : The cut command is used for cutting out the sections from each line offiles and writing the result to standard output. It can be used to cut parts of aline by byte position, character and file.

```
mits@mits-H610M-H-V2-DDR4:~$ cat > state
andhra pradesh
arunachal pradesh
assam
bihar
Chhattisgarh
india
^C
mits@mits-H610M-H-V2-DDR4:~$ cut -b 1,2,3,4 state
andh
arun
assa
biha
Chha
indi
mits@mits-H610M-H-V2-DDR4:~$ cut -b 1-3,6-7 state
anda
aruch
ass
bih
Chhti
ind
mits@mits-H610M-H-V2-DDR4:~$ cut -b 3- state
dhra pradesh
unachal pradesh
sam
har
hattisgarh
dia
```

paste : It is used to join files horizontally (parallel merging) by outputting lines consisting of lines from each file specified, separated by tab as delimiter, to the standard output. paste [OPTION]... [FILES]...$ paste state.txt capital.txt.

```
mits@mits-H610M-H-V2-DDR4:~$ cat number
1
2
3
4
5
mits@mits-H610M-H-V2-DDR4:~$ cat state
arunachal pradesh
assam
andhra pradesh
bihar
chattisgrah
mits@mits-H610M-H-V2-DDR4:~$ cat capital
itanagar
dispur
hyderabad
patna
raipur
mits@mits-H610M-H-V2-DDR4:~$ paste number state capital
1   arunachal pradesh   itanagar
2   assam   dispur
3   andhra pradesh  hyderabad
4   bihar   patna
5   chattisgrah raipur
mits@mits-H610M-H-V2-DDR4:~$ paste -d "|" number state capital
1|arunachal pradesh|itanagar
2|assam|dispur
3|andhra pradesh|hyderabad
4|bihar|patna
5|chattisgrah|Raipur
mits@mits-H610M-H-V2-DDR4:~$ paste -d "," number state capital
1,arunachal pradesh,itanagar
2,assam,dispur
3,andhra pradesh,hyderabad
4,bihar,patna
5,chattisgrah,raipur
mits@mits-H610M-H-V2-DDR4:~$ paste -d "|," number state capital
1|arunachal pradesh,itanagar
2|assam,dispur
```

```
3|andhra pradesh,hyderabad
4|bihar,patna
5|chattisgrah,raipur
mits@mits-H610M-H-V2-DDR4:~$ paste -s number state capital
1   2   3   4   5
arunachal pradesh   assam   andhra pradesh  bihar   chattisgrah
itanagar    dispur  hyderabad   patna   raipur
mits@mits-H610M-H-V2-DDR4:~$ paste -s -d ":" number state capital
1:2:3:4:5
arunachal pradesh:assam:andhra pradesh:bihar:chattisgrah
itanagar:dispur:hyderabad:patna:raipu
```

7. head, tail, grep, expr

head: The head command is used to view the first lines of any text file. By default, it will show the first ten lines, but you can change this number to your liking. If you only want to show the first five lines, type head -n 5 filename.txt.

```
mits@mits-H610M-H-V2-DDR4:~$ head india
india is my country
i love my country
all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia.
 It is the seventh-largest country by area
since its independence in 1947, the world's most populous democracy
Bounded by the Indian Ocean on the south
he Arabian Sea on the southwest
Bay of Bengal on the southeast
shares land borders with Pakistan to the west

mits@mits-H610M-H-V2-DDR4:~$ head -5 india
india is my country
i love my country
all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia.
 It is the seventh-largest country by area
```

tail: This one has a similar function to the head command, but instead of showing the first lines, the tail command will display the last ten lines of a text file. tail -n filename.txt.

```
mits@mits-H610M-H-V2-DDR4:~$ tail india
```

```
i love my country
all indians are my brothers and sisters
india, officially the Republic of India,[j][20] is a country in South Asia.
 It is the seventh-largest country by area
since its independence in 1947, the world's most populous democracy
Bounded by the Indian Ocean on the south
he Arabian Sea on the southwest
Bay of Bengal on the southeast
shares land borders with Pakistan to the west
China, Nepal, and Bhutan to the north
mits@mits-H610M-H-V2-DDR4:~$ tail -5 india
Bounded by the Indian Ocean on the south
he Arabian Sea on the southwest
Bay of Bengal on the southeast
shares land borders with Pakistan to the west
China, Nepal, and Bhutan to the north
```

grep : Another basic Linux command that is undoubtedly helpful for everyday use is grep. It lets you search through all the text in a given file. To illustrate, grep blue notepad.txt will search for the word blue in the notepad file. Lines that contain the searched word will be displayed fully. Usually output of a previous command is piped into the grep command. For example, ls -l |grep “kernel”.

```
mits@mits-H610M-H-V2-DDR4:~$ cat exmple
unix is great os. unix was developed in Bell labs.
learn operating system.
Unix linux which one you choose.
uNix is easy to learn.unix is a multiuser os.Learn unix .unix is a powerful.
mits@mits-H610M-H-V2-DDR4:~$ grep -c "unix" exmple
2
mits@mits-H610M-H-V2-DDR4:~$ grep -h "unix" exmple
unix is great os. unix was developed in Bell labs.
uNix is easy to learn.unix is a multiuser os.Learn unix .unix is a powerful.
mits@mits-H610M-H-V2-DDR4:~$ grep -i "unix" exmple
unix is great os. unix was developed in Bell labs.
Unix linux which one you choose.
uNix is easy to learn.unix is a multiuser os.Learn unix .unix is a powerful.
mits@mits-H610M-H-V2-DDR4:~$ grep -l "unix" exmple
exmple
mits@mits-H610M-H-V2-DDR4:~$ grep -n "unix" exmple
1:unix is great os. unix was developed in Bell labs.
```

```
4:uNix is easy to learn.unix is a multiuser os.Learn unix .unix is a powerful.
```

expr : The expr command evaluates a given expression and displays its corresponding output. It is used for: . Basic operations like addition, subtraction, multiplication, division, and modulus on integers. Evaluating regular expressions,string operations like substring, length of strings etc. Performing operations on variables inside a shell script.

```
mits@mits-H610M-H-V2-DDR4:~$ a="20"
mits@mits-H610M-H-V2-DDR4:~$ b="4"
mits@mits-H610M-H-V2-DDR4:~$ expr $a + $b
24
mits@mits-H610M-H-V2-DDR4:~$ expr $a - $b
16
mits@mits-H610M-H-V2-DDR4:~$ expr $a \* $b
80
mits@mits-H610M-H-V2-DDR4:~$ expr $a / $b
5
```

8. chmod, chown

chmod : To change directory permissions of file/ Directory in Linux. #chmod who what which file/directory chmod +rwx filename to add permissions. chmod -rwx directory name to remove permissions. chmod +x filename to allow executable permissions. chmod -wx filename to take out write and executable permissions. #chmod u+x test #chmod g- rwx test #chmod o-r test 4

```
mits@mits-H610M-H-V2-DDR4:~$ ls -l
drwxrwxr-x 2 mits mits    4096 Feb 20 11:47  mca
-rw-rw-r-- 1 mits mits      18 Feb  6 14:16  mint
-rw-rw-r-- 1 mits mits     148 Mar  5 11:22  myfile1.txt
-rw-rw-r-- 1 mits mits     148 Mar  5 11:22  myfile2.txt

mits@mits-H610M-H-V2-DDR4:~$ chmod 777 myfile1.txt
mits@mits-H610M-H-V2-DDR4:~$ ls -l
drwxrwxr-x 2 mits mits    4096 Feb 20 11:47  mca
-rw-rw-r-- 1 mits mits      18 Feb  6 14:16  mint
-rwxrwxrwx 1 mits mits     148 Mar  5 11:22  myfile1.txt
-rw-rw-r-- 1 mits mits     148 Mar  5 11:22  myfile2.txt
```

chown : The chown command allows you to change the user and/or group ownership of a given file, directory. #chownTom Test

```
mits@mits-H610M-H-V2-DDR4:~$ ls -l
```

```
-rw-rw-r-- 1 mits mits     148 Mar  5 11:22  myfile1.txt
-rw-rw-r-- 1 mits mits     148 Mar  5 11:22  myfile2.txt

mits@mits-H610M-H-V2-DDR4:~$ sudo chown gokul myfile1.txt
mits@mits-H610M-H-V2-DDR4:~$ ls -l
-rwxrwxrwx 1 gokul mits     148 Mar  5 11:22  myfile1.txt
-rw-rw-r-- 1 mits  mits     148 Mar  5 11:22  myfile2.txt
```

9. Redirections & Piping: A pipe is a form of redirection to send the output of one command/program/process to another command/program/process for further processing. Pipe is used to combine two or more commands, the output of one command acts as input to another command, and this command's output may act as input to the next command and so on.

```
mits@mits-H610M-H-V2-DDR4:~$echo "Hello" > output.txt
mits@mits-H610M-H-V2-DDR4:~$echo "Linux" >> output.txt
mits@mits-H610M-H-V2-DDR4:~$ls -l | grep ".txt"
```

10. useradd, usermod, userdel, passwd

useradd : This is available only to system admins .Since Linux is a multi- user system, this means more than one person can interact with the same system at the same time. useradd is used to create a new user, while passwd is adding a password to that user's account. To add a new person named John type, useradd John and then to add his password type, passwd 123456789

```
mits@mits-H610M-H-V2-DDR4:~$ sudo useradd gokul
[sudo] password for mits:
mits@mits-H610M-H-V2-DDR4:~$ cat /etc/passwd | grep gokul
gokul:x:1003:1003::/home/gokul:/bin/sh
mits@mits-H610M-H-V2-DDR4:~$ cat /etc/passwd | grep "gokul"
gokul:x:1003:1003::/home/gokul:/bin/sh
.
```

usermod : usermod command is used to change the properties of a user in Linux through the command line command-line utility that allows you to modify a user's login information.

```
mits@mits-H610M-H-V2-DDR4:~$ sudo usermod -l gookul gokul
mits@mits-H610M-H-V2-DDR4:~$ cat /etc/passwd | grep "gookul"
gookul:x:1003:1004::/home/gokul:/bin/sh
```

userdel : Remove a user is very similar to adding a new user. To delete theusers account type, userdel UserName

```
mits@mits-H610M-H-V2-DDR4:~$ sudo userdel gokul
mits@mits-H610M-H-V2-DDR4:~$ cat /etc/passwd | tail -3
mca:x:1001:1001::/home/mca:/bin/sh
mysql:x:128:136:MySQL Server,,,:/nonexistent:/bin/false
exam:x:1002:1002:Exam,,,:/home/exam:/bin/bash
```

passwd : Changes passwords for user accounts. A normal user may only change the password for their own account, while the superuser may change the password for any account

11. df,top, ps

df : Use df command to get a report on the system’s disk space usage, shown in percentage and KBs. If you want to see the report in megabytes, type df - m.

```
mits@mits-H610M-H-V2-DDR4:~$ df
Filesystem     1K-blocks     Used Available Use% Mounted on
tmpfs             789976     2284    787692   1% /run
/dev/sda5      216888480 16665692 189132664   9% /
tmpfs            3949860        0   3949860   0% /dev/shm
tmpfs               5120        4      5116   1% /run/lock
efivarfs             256      125       127  50% /sys/firmware/efi/efivars
/dev/sda1          98304    31816     66488  33% /boot/efi
```

top: top command is used to show the Linux processes. It provides a dynamic real- time view of the running system

Syntax:

top [options]

```
mits@mits-H610M-H-V2-DDR4:~$ top
top - 14:35:28 up  1:28,  1 user,  load average: 0.52, 0.44, 0.39
Tasks: 337 total,   1 running, 336 sleeping,   0 stopped,   0 zombie
%Cpu(s):  1.0 us,  0.7 sy,  0.0 ni, 98.2 id,  0.0 wa,  0.0 hi,  0.1 si,  0.0 st
MiB Mem :   7714.6 total,    447.0 free,   3179.0 used,   4088.6 buff/cache
MiB Swap:   2048.0 total,   2048.0 free,      0.0 used.   3508.2 avail Mem
```

ps : The ps command, short for Process Status, is a command line utility that is used to display or view information related to the processes running in a Linux system. PID – This is the unique process ID TTY– This is the type of terminal that the user is logged in to . TIME – This is the time in minutes and seconds that the process has been running

.CMD – The command that launched the process

Syntax:

ps [options]

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ ps
    PID TTY          TIME CMD
   4182 pts/0    00:00:00 bash
   9697 pts/0    00:00:00 ps
```

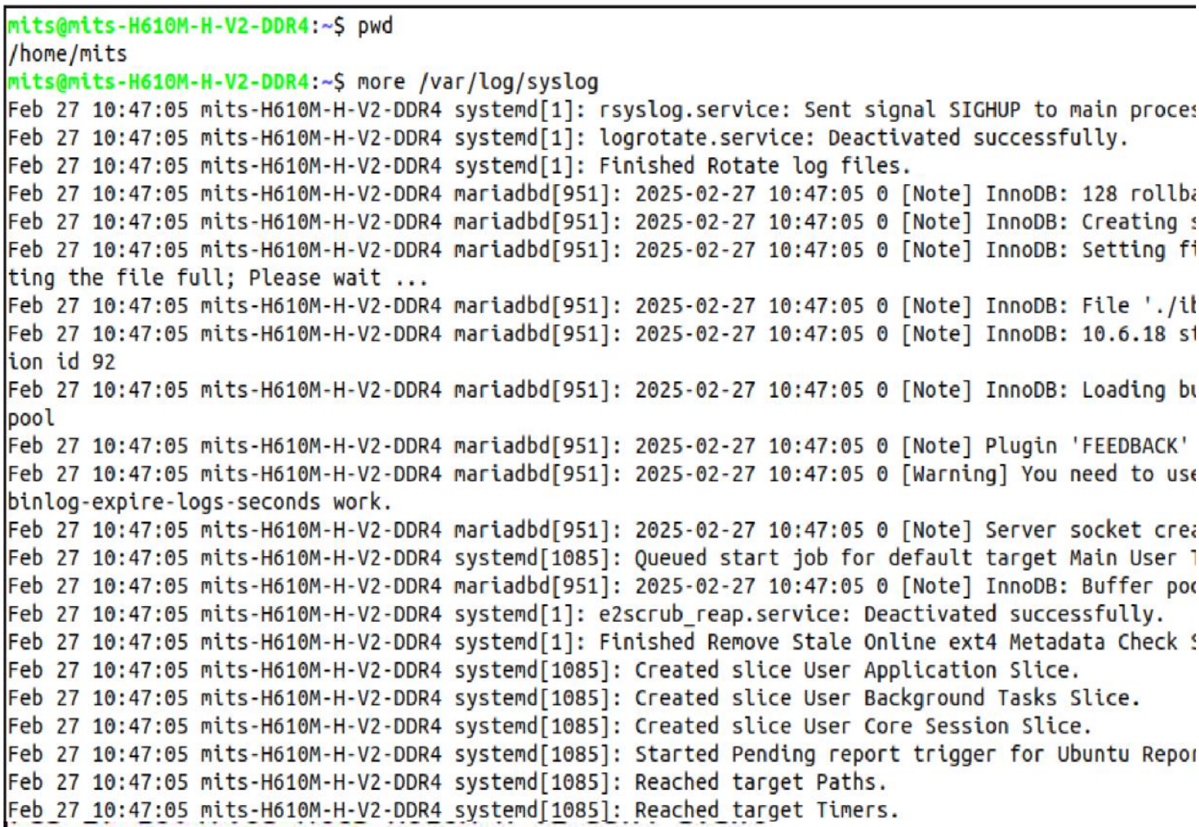
3.Execute the following scenario using basic Linux commands

a) Login to your home directory
b) List contents of your current working directory
c) List all contents of your current working directory, including hidden files
d) Make a directory called April2024 inside your current working directory. Change to the directory April2024
e) Create an empty file name file1
f) Make a copy of file1 to file2
g) Copy file1 from the current working directory and save it as the name file2 in one Directory up from the current directory
h) Clear the terminal window

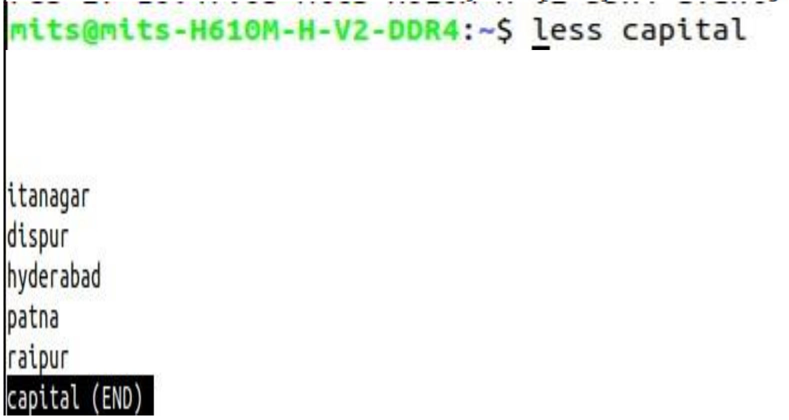
```
mits@mits-H610M-H-V2-DDR4:~$ pwd
/home/mits
mits@mits-H610M-H-V2-DDR4:~$ ls
document.docx  document.pdf  india  snap
mits@mits-H610M-H-V2-DDR4:~$ ls -a
.   .bash_logout  .config  .fontconfig  .lesshst   .mca.swp     .profile  .sudo_as_admin_
successful
..  .bashrc       document.docx  .gnupg      .local      .mca.txt.swp  snap      .thunderbird
.bash_history  .cache       document.pdf   india  .~lock.document.docx#  .mozilla   .ssh
mits@mits-H610M-H-V2-DDR4:~$ mkdir April2024
mits@mits-H610M-H-V2-DDR4:~$ cd April2024
mits@mits-H610M-H-V2-DDR4:~/April2024$ touch file1
mits@mits-H610M-H-V2-DDR4:~/April2024$ ls
file1
mits@mits-H610M-H-V2-DDR4:~/April2024$ cp file1 file2
mits@mits-H610M-H-V2-DDR4:~/April2024$ ls
file1 file2
mits@mits-H610M-H-V2-DDR4:~/April2024$ cp file1 ../file2
mits@mits-H610M-H-V2-DDR4:~/April2024$ clear
```

4.Execute the following scenario using basic Linux commands

a) Login to your home directory
b) Write the contents of syslog (located in the /var/log/ directory) onto thescreen a page at a time.
c) Read documentation on a command: less



```
mits@mits-H610M-H-V2-DDR4:~$ pwd
/home/mits
mits@mits-H610M-H-V2-DDR4:~$ more /var/log/syslog
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1]: rsyslog.service: Sent signal SIGHUP to main proces
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1]: logrotate.service: Deactivated successfully.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1]: Finished Rotate log files.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] InnoDB: 128 rollba
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] InnoDB: Creating s
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] InnoDB: Setting fi
ting the file full; Please wait ...
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] InnoDB: File './ib
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] InnoDB: 10.6.18 st
ion id 92
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] InnoDB: Loading bu
pool
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] Plugin 'FEEDBACK'
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Warning] You need to use
binlog-expire-logs-seconds work.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] Server socket crea
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1085]: Queued start job for default target Main User T
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 mariadbd[951]: 2025-02-27 10:47:05 0 [Note] InnoDB: Buffer poo
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1]: e2scrub_reap.service: Deactivated successfully.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1]: Finished Remove Stale Online ext4 Metadata Check S
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1085]: Created slice User Application Slice.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1085]: Created slice User Background Tasks Slice.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1085]: Created slice User Core Session Slice.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1085]: Started Pending report trigger for Ubuntu Repor
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1085]: Reached target Paths.
Feb 27 10:47:05 mits-H610M-H-V2-DDR4 systemd[1085]: Reached target Timers.
```



```
mits@mits-H610M-H-V2-DDR4:~$ less capital
```

```
itanagar
dispur
hyderabad
patna
raipur
capital (END)
```

5.Execute the following scenario using basic Linux Commands

a) Create an untitled document myfile.txt using anyone editor
b) Place the following text in myfile.txt and save it
Neo: What are you trying to tell me?
That I can dodge bullets?
Morpheus: No, Neo. I'm trying to tell
you that when you're ready, you won't have to.
c) Count the number of characters, words, and lines in the file
d) Find the occurrence of the word “tell” in the file e.
e) Make two copies of myfile.txt with names myfile1.txt and myfile2.txt
f) List all the filenames with the word file in the present working directory

```
mits@nits-H610M-H-V2-DDR4:~$ touch myfile.txt
mits@mits-H610M-H-V2-DDR4:~$ gedit myfile.txt
mits@mits-H610M-H-V2-DDR4:~$ cat myfile.txt
Neo: What are you trying to tell me?
That I can dodge bullets?
Morpheus: No, Neo. I'm trying to tell
you that when you're ready, you won't have to.
mits@mits-H610M-H-V2-DDR4:~$ wc myfile.txt
4 29 148 myfile.txt
mits@mits-H610M-H-V2-DDR4:~$ wc -c myfile.txt
148 myfile.txt
mits@mits-H610M-H-V2-DDR4:~$ wc -w myfile.txt
29 nyfile.txt
mits@mits-H610M-H-V2-DDR4:~$ wc -l myfile.txt
4 myfile.txt
mits@mits-H610M-H-V2-DDR4:~$ grep -c "tell" myfile.txt
2
mits@mits -H610M-H-V2-DDR4:~$ grep "tell" myfile.txt
Neo: What are you trying to tell me?
Morpheus: No, Neo. I'm trying to tell
mits@mits-H610M-H-V2-DDR4:~$ cp myfile.txt myfile1.txt
mits@nits-H610M-H-V2-DDR4:~$ cp myfile.txt myfile2.txt
mits@mits-H610M-H-V2-DDR4:-$ ls *file*
file2 myfile1.txt myfile2.txt myfile.txt
```

6.File System Hierarchy

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.

Procedure

1. /root – Root User Directory
This is the home directory of the root user. The root user's home directory is located at /root. Which is noteworthy because it is, unlike the rest of the users' home directories, not located in /home.

2. /bin – essential utilities
The directory contains the core system programs and important utilities. For example, commonly used and well known commands such as "cat" are located in "/bin". The reason for this is that if these utilities are not stored in this directory, there is no certainty that the system will have access to them if there isn't a file system mounted.

3. /etc – Configuration files
The configuration files of BIOS and other similar files can be found in /etc. You can edit these configuration files in a text editor as you see fit. Basically, every single kind of configuration file is located in /etc, including but not limited to system configuration files.

4. /sbin – System Administration Programs
The /sbin directory is similar to the /bin directory in that it contains essential programs. But it differs with the addition that it is intended to be used by the root user.

5. /usr – User Shared Read-Only Data
The /usr directory is used to contain applications and files that are used and shared by and between users.

6. /var – Variable Data
The /var directory is used like the /usr directory, only instead of being read-only, it is writable. This directory contains system logs and other various variable data.

7. /dev – Devices or Files
Linux displays connected devices as files and the /dev directory contains these files. Though, the thing is, as you can see by the title, these are not "actual" files, they just

appear as files. /dev is also where physical drives can be mounted.

8. /home – Home Folder Containment
There's a home folder for every user on your system and each one is contained together in the /home directory. These folders are created using the name of your user name. For example, your user name is jaise, so your home folder would be located in /home/jaise.

These home folders contain your user data files and configuration files that are specific to the user, which is also the one of the only types of configuration files that are stored elsewhere besides /etc as we explained above. If one wants to modify other files on a system, they must become the root user, as each user only has write permissions for their own home folder.

9. /lib – Libraries for Programs
Each program or binary uses specific libraries to function and the /lib directory is where these libraries can be located.

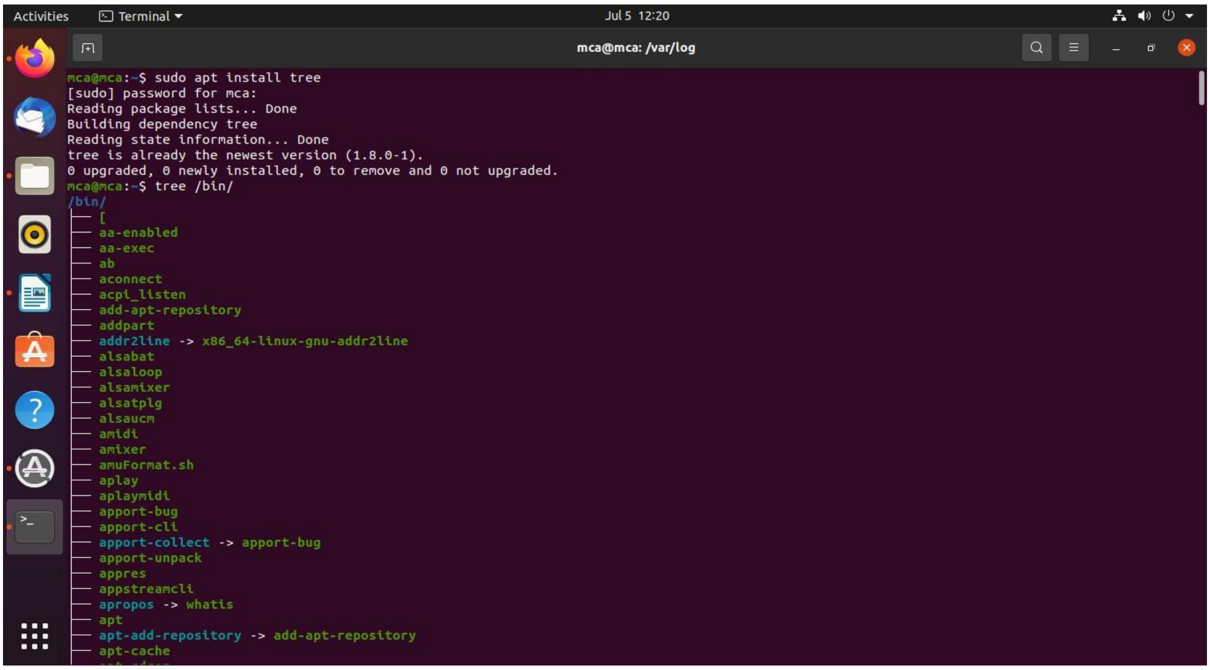
10. /mnt – Temporary Mounts
This directory is used for mounting temporary file systems. If you are using a file system for a very specific purpose and for a relatively brief period of time, you would probably mount it in /mnt. Though you can mount it anywhere on the system if you so choose.

11. /opt – Optional Packages
The /opt directory contains a set of subdirectories where optional software packages are located and managed by the package manager.

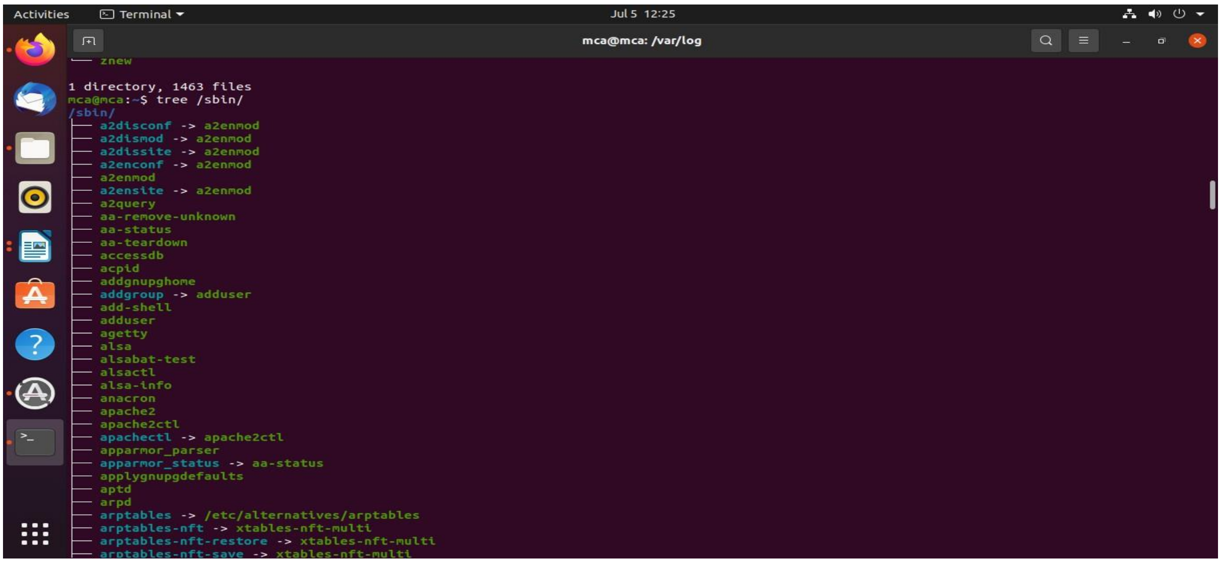
12. /proc – Kernel and Process Pseudo Files
The /proc directory is another interesting case of a directory that contains these "fake" files, very similarly to the /dev directory that we discussed earlier in this list. These files are special files that are actually, and interestingly, system and process information.

13. /root – Root User Directory
Every user has his own home directory. This is the home directory of the root user. The root user's home directory is located at /root.
Which is noteworthy because it is, unlike the rest of the users' home directories, not located in /home. Like we've said above, in an earlier section of this article, /root is different from the root directory "/", and this fact should be committed to memory if possible.

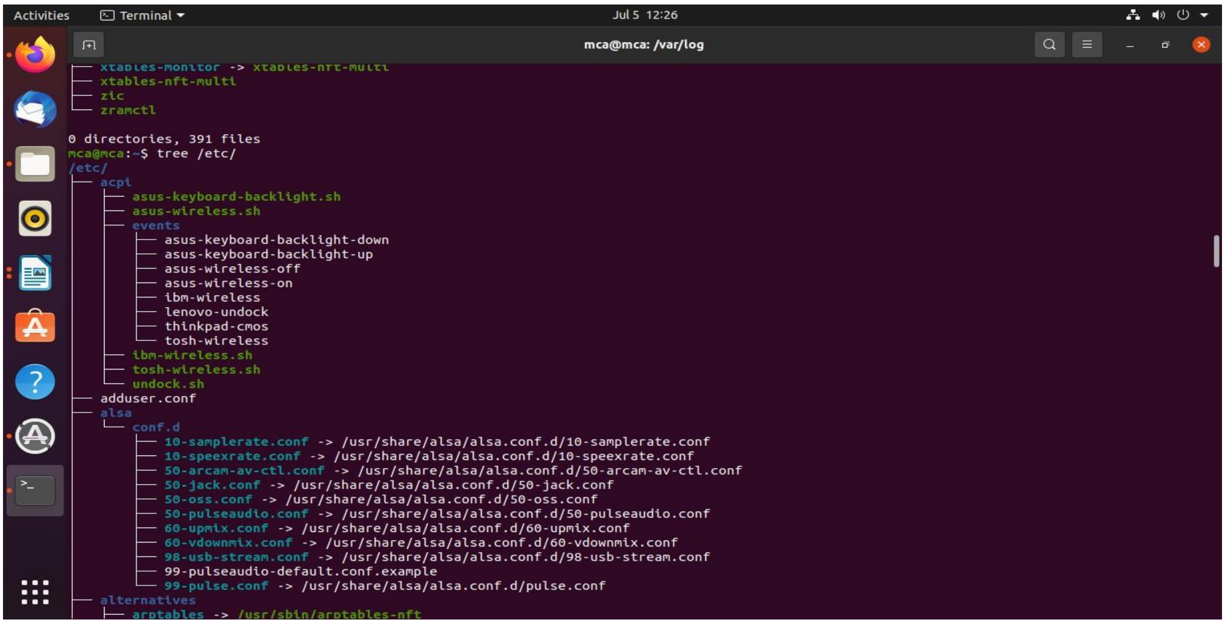
Output Screenshot



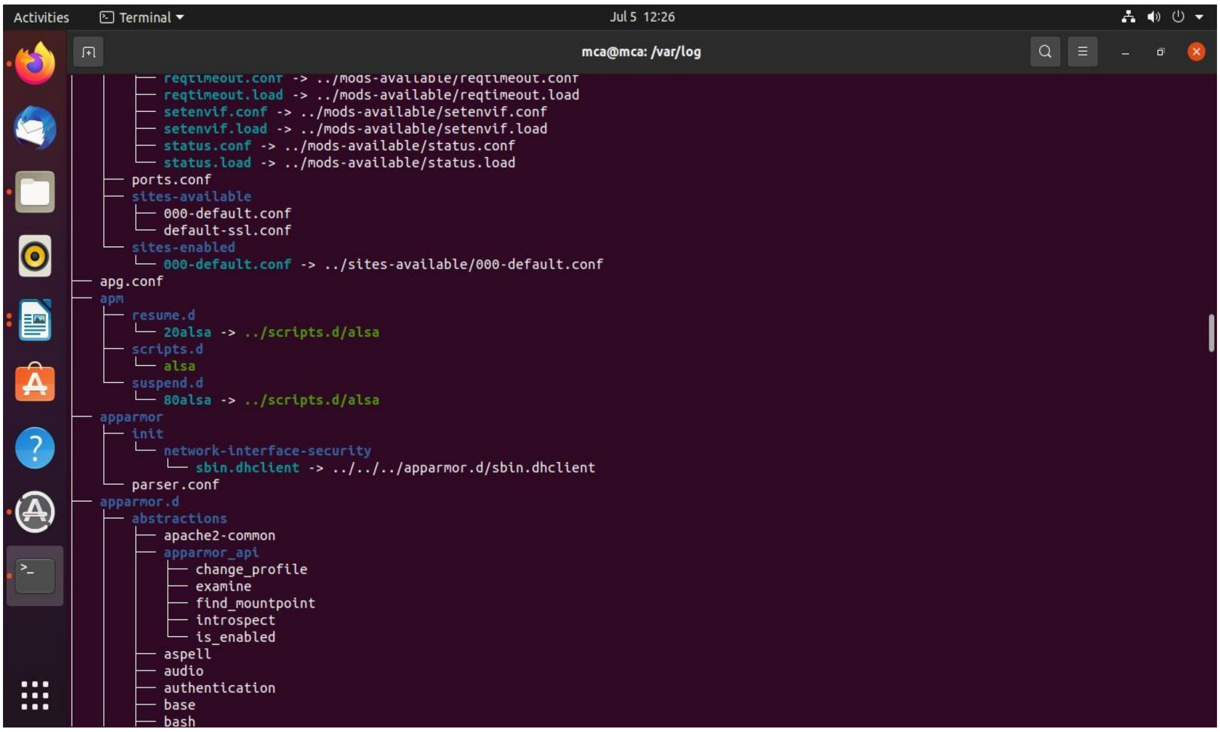
```
mca@mca:~$ sudo apt install tree
[sudo] password for mca:
Reading package lists... Done
Building dependency tree
Reading state information... Done
tree is already the newest version (1.8.0-1).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
mca@mca:~$ tree /bin/
/bin/
├── [
├── aa-enabled
├── aa-exec
├── ab
├── aconnect
├── acpi_listen
├── add-apt-repository
├── addpart
├── addr2line -> x86_64-linux-gnu-addr2line
├── alsabat
├── alsaloop
├── alsamixer
├── alsatplg
├── alsaucm
├── amidi
├── amixer
├── amuFormat.sh
├── 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
```



```
└── znew

1 directory, 1463 files
mca@mca:~$ tree /sbin/
/sbin/
├── a2disconf -> a2enmod
├── a2dismod -> a2enmod
├── a2dissite -> a2enmod
├── a2enconf -> a2enmod
├── a2enmod
├── a2ensite -> a2enmod
├── a2query
├── aa-remove-unknown
├── aa-status
├── aa-teardown
├── accessdb
├── acpid
├── addgnupghome
├── addgroup -> adduser
├── add-shell
├── adduser
├── agetty
├── alsa
├── alsabat-test
├── alsactl
├── alsa-info
├── anacron
├── apache2
├── apache2ctl
├── apachectl -> apache2ctl
├── apparmor_parser
├── apparmor_status -> aa-status
├── applygnupgdefaults
├── aptd
├── arpd
├── arptables -> /etc/alternatives/arptables
├── arptables-nft -> xtables-nft-multi
├── arptables-nft-restore -> xtables-nft-multi
├── arptables-nft-save -> xtables-nft-multi
```



```
├── xtables-monitor -> xtables-nft-multi
├── xtables-nft-multi
├── zic
└── zramctl

0 directories, 391 files
mca@mca:~$ 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
```



```
│   │   ├── reqtimeout.conf -> ../mods-available/reqtimeout.conf
│   │   ├── reqtimeout.load -> ../mods-available/reqtimeout.load
│   │   ├── setenvif.conf -> ../mods-available/setenvif.conf
│   │   ├── setenvif.load -> ../mods-available/setenvif.load
│   │   ├── status.conf -> ../mods-available/status.conf
│   │   └── status.load -> ../mods-available/status.load
│   ├── ports.conf
│   ├── sites-available
│   │   ├── 000-default.conf
│   │   └── default-ssl.conf
│   └── sites-enabled
│       └── 000-default.conf -> ../sites-available/000-default.conf
├── apg.conf
├── apm
│   ├── resume.d
│   │   └── 20alsa -> ../scripts.d/alsa
│   ├── scripts.d
│   │   └── alsa
│   └── suspend.d
│       └── 80alsa -> ../scripts.d/alsa
├── apparmor
│   ├── init
│   │   └── network-interface-security
│   │       └── sbin.dhclient -> ../../../apparmor.d/sbin.dhclient
│   └── parser.conf
├── apparmor.d
│   ├── abstractions
│   │   ├── apache2-common
│   │   ├── apparmor_api
│   │   │   ├── change_profile
│   │   │   ├── examine
│   │   │   ├── find_mountpoint
│   │   │   ├── introspect
│   │   │   └── is_enabled
│   │   ├── aspell
│   │   ├── audio
│   │   ├── authentication
│   │   ├── base
│   │   ├── bash
```

7.Shell Script

1. Write a shell script to find sum,product,quotient,difference & remainder of 2 numbers

PROGRAM

```
echo "enter a and b"
read a b
sum=`expr $a + $b`
diff=`expr $a - $b`
pro=`expr $a \* $b`
quo=`expr $a / $b`
mod=`expr $a % $b`
echo "sum="$sum
echo "diff="$diff
echo "pro="$pro
echo "quo="$quo
echo "mod="$mod
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash arithmetic.sh
enter a and b
15 6
sum=21
diff=9
pro=90
quo=2
mod=3
```

2. Write a shell script to swap 2 numbers with & without using a temporary variable.

PROGRAM

```
echo "enter a and b"
read a b
echo "before swap"
echo $a $b
a=$((a+b))
b=$((a-b))
a=$((a-b))
echo "after swap"
echo $a $b
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash swap.sh
enter a and b
8 6
before swap
8 6
after swap
6 8
```

3.Write a shell script that accepts two integers as its arguments and computes the value of the first number raised to the power of the second number.

PROGRAM

```
echo "enter a and b"
read a b
c=$((a**b))
echo $c
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash power.sh
enter a and b
6 3
216
```

4.Write a shell script to add two floating point numbers.

PROGRAM

```
echo "enter a and b"
read a b
echo "scale=3;$a+$b" | bc
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ bash floatadd.sh
enter a and b
4.5 6.7
11.2
```

5.Assign the values 5,6,10,2 to the variables a,b,c &d. Write a shell script to evaluate the expression (a*b*c)/d

PROGRAM

```
a=5
b=6
c=10
d=2
echo $(((a*b*c)/d))
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ bash expr.sh
150
```

6.Write a shell script to
a)Find the length of a word/sentence

PROGRAM

```
echo "enter a sentence"
read a
echo "length=${#a}"
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ bash strings1.sh
enter a sentence
welcome
length=7
```

b)Concatenate 2 strings

PROGRAM

```
echo "enter string1"
read b
echo "enter string2"
read c
d=${b}${c}
echo "after concatenate=$d"
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ bash strings2.sh
enter string1
gokul
enter string2
raj
after concatenate=gokulraj
```

c)Find & replace string

PROGRAM

```
read -p "Enter the original string: " original
read -p "Enter the string to find: " to_find
read -p "Enter the string to replace with: " replace_with
mod=${original//$to_find/$replace_with}
echo "The modified string is: $mod"
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ bash strings3.sh
Enter the original string: hello welcome all
Enter the string to find: all
Enter the string to replace with: everyone
The modified string is: hello welcome everyone
```

7.Write a shell script to find simple interest.

PROGRAM

```
echo "enter amount"
read p
echo "enter rate of interest"
read r
echo "enter no of years"
read n
value=$(echo "($p*$n*$r)/100" | bc)
echo $value
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ bash interest.sh
enter amount
5600
enter rate of interest
4
enter no of years
5
1120
```

8. Write a shell script to find
a.Area & circumference of a circle

PROGRAM

```
echo "enter radius"
read r
area=$(echo "3.14*$r*$r" | bc)
perim=$(echo "2*3.14*$r" | bc)
echo "area of traingle:"$area
echo "perimeter of traingle:"$perim
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul$ bash circleq.sh
enter radius
5
area of traingle:78.50
perimeter of traingle:31.40
```

b.Area & perimeter of a rectangle

PROGRAM

```
echo "enter length of rectangle"
read l
echo "enter breadth of rectangle"
read b
area=$(echo "$l*$b" | bc)
perim=$(echo "2*($l+$b)" | bc)
echo "area of rectangle:"$area
echo "perimeter of rectangle:"$perim
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash rectangleq.sh
enter length of rectangle
6
enter breadth of rectangle
5
area of rectangle:30
perimeter of rectangle:22
```

c.Area & perimeter of a square

PROGRAM

```
echo "enter side of square"
read s
area=$(echo "$s*$s" | bc)
perim=$(echo "4*$s" | bc)
echo "area of traingle:"$area
echo "perimeter of traingle:"$perim
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash sqaureq.sh
enter side of square
5
area of traingle:25
perimeter of traingle:20
```

9. Write a shell script to find the largest of 2 numbers.

PROGRAM

```
echo "enter value 1"
read x
echo "enter value 2"
read y
if [ $x -gt $y ]
then
echo $x "is greater"
elif [ $y -gt $x ]
then
echo $y "is greater"
else
echo "both equal"
fi
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash large2.sh
enter value 1
12
enter value 2
5
12 is greater
```

10. Write a shell script that computes the gross salary of a employee according to the following rules :
i) if basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
ii) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic.

PROGRAM

```
echo "enter employee name"
read n
echo "enter basic salary"
read bs
if [ $bs -lt 1500 ]
then
hra=$(echo "$bs/10" | bc)
da=$(echo "($bs*9)/10" | bc)
gs=$(echo "$bs+$hra+$da" | bc)
echo "name:"$n
echo "gross salary:"$gs
else
da=$(echo "($bs*98)/100" | bc)
gs=$(echo "$bs+500+$da" | bc)
echo "name:"$n
echo "gross salary:"$gs
fi
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash salary.sh
enter employee name
gokul
enter basic salary
1800
name:gokul
gross salary:4064
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash salary.sh
enter employee name
gokul
enter basic salary
1200
name:gokul
gross salary:2400
```

11. Write a shell script to find the largest of 3 numbers.

PROGRAM

```
echo "enter value 1"
read x
echo "enter value 2"
read y
echo "enter value 3"
read z
if [ $x -gt $y ]
then
if [ $x -gt $z ]
then
echo $x "is greater"
else
echo $z "is greater"
fi
else
if [ $y -gt $z ]
then
echo $y "is greater"
else
echo $z "is greater"
fi
fi
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash large3.sh
enter value 1
4
enter value 2
10
enter value 3
6
10 is greater
```

12.Write a shell script that receives any number of file names as arguments check if every arguments applied is a file or a directory and reports accordingly,whenever the argument is a file or directory.

PROGRAM

```
for f in "$@"
do
if [ -f $f ]
then
echo "$f is a file"
elif [ -d $f ]
then
echo "$f is a directory"
else
echo "enter valid file"
fi
done
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash checkfile.sh s2mca
s2mca is a directory
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash checkfile.sh abcd
enter valid file
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash checkfile.sh circleq.sh
circleq.sh is a file
```

13. Write a shell script to calculate the sum of digits of a number

PROGRAM

```
echo "enter number"
read n
s=0
while [ $n -gt 0 ]
do
k=$(( $n % 10 ))
n=$(( $n / 10 ))
s=$(( $s + $k ))
done
echo "sum of digit=$s"
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash dgsum.sh
enter number
562
sum of digit=13
```

14. Write a shell script to display the first 10 even numbers.

PROGRAM

```
a=2
while [ $a -le 20 ]
do
echo $a
a=`expr $a + 2`
done
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash evenno.sh
2
4
6
8
10
12
14
16
18
20
```

15. Write a shell script to display even numbers less than 10

PROGRAM

```
a=2
while [ $a -lt 10 ]
do
echo $a
a=`expr $a + 2`
done
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash evenless.sh
2
4
6
8
```

16. Write a shell script to convert the contents of a file into uppercase.

PROGRAM

```
echo "enter file name"
read b
if [ ! -f $b ]
then
echo "file doesnt exsist"
else
tr 'a-z' 'A-Z'<$b
fi
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ cat file3
hello welcome
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash toupper.sh
enter file name
file3
HELLO WELCOME
```

17. Write a shell script that delete all lines containing a specified word

PROGRAM

```
read -p "Enter file name:" fname
if [ -f $fname ]
then
read -p "Enter word to delete:" word
echo "File before removing $word:"
cat $fname
grep -v -i $word $fname > test
mv test $fname
echo "File after removing $word:"
cat $fname
else
echo "The file $fname is not existing"
fi
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash dltline.sh
Enter file name:file1
Enter word to delete:hi
File before removing hi:
hello
hi
welcome
abc
File after removing hi:
hello
welcome
abc
```

18. Write a shell script to find the factorial of given integer.

PROGRAM

```
echo "enter number"
read a
fact=1
for ((i=1;i<=a;i++))
do
fact=$((fact*i))
done
echo "factorial of $a is $fact"
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash fact.sh
enter number
5
factorial of 5 is 120
```

19. Write a shell script to find whether a given number is prime

PROGRAM

```
echo "Enter the number"
read num
for ((i=2;i<num;i++))
do
if [ $((num % i)) -eq 0 ]
then
echo "$num is not a prime number."
exit
fi
done
echo "$num is a prime."
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash primenum.sh
Enter the number
23
23 is a prime.
```

20. Write a shell script to print the pattern

```
1
2 2
3 3 3
4 4 4 4
```

PROGRAM

```
for ((i=1;i<=4;i++))
do
for ((j=1;j<=i;j++))
do
echo -n $i ""
done
echo ""
done
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash pattern.sh
1
2 2
3 3 3
4 4 4 4
```

21.Write a shell program to perform simple calculator operations like addition, subtraction,multiplication or division depending upon the user input

PROGRAM

```
echo "enter number 1"
read num1
echo "enter number 2"
read num2
s=0
while [ $s -eq 0 ]
do
echo "1.addition
2.substraction
3.multiplication
4.division
5.modulus
6.exit"
echo "choose operation"
read n
case $n in
"1")
sum=$((num1+num2))
echo "sum=$sum"
;;
"2")
diff=$((num1-num2))
echo "difference=$diff"
;;
"3")
pro=$((num1*num2))
echo "product=$pro"
;;
"4")
quo=$((num1/num2))
echo "quotient=$quo"
;;
"5")
mod=$((num1%num2))
echo "modulus=$mod"
;;
```

```
"6")
echo "exit"
s=1
break;
;;
*)
echo -n "Invalid"
;;
esac
done
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash calculator.sh
enter number 1
10
enter number 2
4
1.addition
2.substraction
3.multiplication
4.division
5.modulus
6.exit
choose operation
1
sum=14
1.addition
2.substraction
3.multiplication
4.division
5.modulus
6.exit
choose operation
2
difference=6
1.addition
2.substraction
3.multiplication
4.division
5.modulus
```

```
6.exit
choose operation
3
product=40
1.addition
2.substraction
3.multiplication
4.division
5.modulus
6.exit
choose operation
4
quotient=2
1.addition
2.substraction
3.multiplication
4.division
5.modulus
6.exit
choose operation
5
modulus=2
1.addition
2.substraction
3.multiplication
4.division
5.modulus
6.exit
choose operation
6
exit
```

22. Write a shell program to find the factorial of a given number using until loop.

PROGRAM

```
echo "enter number"
read n
i=1
fact=1
until [[ $i -gt $n ]]
do
fact=$((fact*i))
((i++))
done
echo "factorial : $fact"
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash factusinguntil.sh
enter number
6
factorial : 720
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash factusinguntil.sh
enter number
5
factorial : 120
```

23. Write a menu driven shell program
a.to find sum of digits of a number
b.find the largest of two numbers
c.to display sum of squares of the digits of a number
d.exit

PROGRAM

```
s=0
while [ $s -eq 0 ]
do
echo "1.sum of digit of number
2.largest of two number
3.sum of squares of digit of number
4.exit"
echo "choose operation"
read n
case $n in
"1")
echo "enter a number"
read n1
sum=0
while [ $n1 -gt 0 ]
do
k=$(( $n1 % 10 ))
n1=$(( $n1 / 10 ))
sum=$(( $sum + $k ))
done
echo "sum of digit=$sum"
;;
"2")
echo "enter number 1"
read n2
echo "enter number 2"
read n3
if [ $n2 -gt $n3 ]
then
echo "$n2 is greater"
elif [ $n3 -gt $n2 ]
then
echo "$n3 is greater"
```

```
else
echo "both equal"
fi
;;
"3")
echo "enter a number"
read n4
sum1=0
while [ $n4 -gt 0 ]
do
k=$(( $n4 % 10 ))
n4=$(( $n4 / 10 ))
sum1=$(( $sum1 + $k**2 ))
done
echo "sum of squares of digit=$sum1"
;;
"4")
echo "exit"
s=1
;;
*)
echo -n "Invalid"
;;
esac
done
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash menudrivenpgm.sh
1.sum of digit of number
2.largest of two number
3.sum of squares of digit of number
4.exit
choose operation
1
enter a number
234
sum of digit=9
1.sum of digit of number
2.largest of two number
3.sum of squares of digit of number
```

```
4.exit
choose operation
2
enter number 1
15
enter number 2
13
15 is greater
1.sum of digit of number
2.largest of two number
3.sum of squares of digit of number
4.exit
choose operation
3
enter a number
123
sum of squares of digit=14
1.sum of digit of number
2.largest of two number
3.sum of squares of digit of number
4.exit
choose operation
4
exit
```

24. Write a menu driven shell program
1.puffs
2.bun
3.juice
4.exit

PROGRAM

```
s=0
sum1=0
sum2=0
sum3=0
sum4=0
while [ $s -eq 0 ]
do
echo "               FOOD MENU                  "
echo "---------------------------------------"
echo "ITEMS "
echo "1. Puffs  -20 Rs"
echo "2. BUN  -7 Rs"
echo "3. JUICE  -10 Rs"
echo "choose item"
read n
case $n in
"1")
echo "Enter Quantity Of Puffs"
read q1
sum1=$(($sum1+(q1*20)))
sum4=$((sum4+sum1))
;;
"2")
echo "Enter Quantity Of Bun"
read q2
sum2=$(($sum2+(q2*7)))
sum4=$((sum4+sum2))
;;
"3")
echo "Enter Quantity Of of Juice"
read q3
sum3=$(($sum3+(q3*10)))
sum4=$((sum4+sum3))
```

```
;;
*)
echo "invalid"
;;
esac
echo "do you have more items to order Yes-0 No-1"
read s
done
echo "---------------------------------------------------"
echo "                    CAFE 24"
echo "---------------------------------------------------"
echo " BILL "
echo "---------------------------------------------------"
echo " Item      Unit Price      Quantity      Price"
echo "---------------------------------------------------"
if [ $q1 -gt 0 ]
then
echo " PUFFS      20 Rs           $q1            $sum1 Rs"
fi
if [ $q2 -gt 0 ]
then
echo " BUN        7 Rs            $q2            $sum2 Rs"
fi
if [ $q3 -gt 0 ]
then
echo " JUICE      20 Rs           $q3            $sum3 Rs"
fi
echo "_____________________________________________________"
echo " "
echo "TOTAL BILL AMOUNT: $sum4 Rs"
echo "_____________________________________________________"
echo "THANK YOU FOR SHOPPING"
echo "---------------------------------------------------"
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash menudrivenpgm2.sh
          FOOD MENU
--------------------------------------
ITEMS
1. Puffs  -20 Rs
```

```
2. BUN  -7 Rs
3. JUICE  -10 Rs
choose item
1
Enter Quantity Of Puffs
4
do you have more items to order Yes-0 No-1
0
            FOOD MENU
---------------------------------------
ITEMS
1. Puffs  -20 Rs
2. BUN  -7 Rs
3. JUICE  -10 Rs
choose item
2
Enter Quantity Of Bun
2
do you have more items to order Yes-0 No-1
0
            FOOD MENU
---------------------------------------
ITEMS
1. Puffs  -20 Rs
2. BUN  -7 Rs
3. JUICE  -10 Rs
choose item
3
Enter Quantity Of of Juice
4
do you have more items to order Yes-0 No-1
1
-----------------------------------------------------
                  CAFE 24
-----------------------------------------------------
 BILL
-----------------------------------------------------
 Item      Unit Price      Quantity      Price
-----------------------------------------------------
 PUFFS     20 Rs           4             80 Rs
 BUN        7 Rs            2             14 Rs
 JUICE      20 Rs            4             40 Rs
____________________________________________________________

TOTAL BILL AMOUNT: 134
____________________________________________________________
THANK YOU FOR SHOPPING
----------------------------------------------------
```

25. Write a shell script to prepare mark list of s2mca students.Input internal and extrenal marks obtained by student for 4 theory subjects adbms, acn, ipr, ob. Register no of students must be mcao1,mca02...etc..

PROGRAM

```
echo "enter no of students"
read n
for ((i=1;i<=n;i++))
do
echo "enter student name"
read name[$i]
echo "enter internal mark of IPR"
read ipri[$i]
echo "enter external mark of IPR"
read ipre[$i]
echo "enter internal mark of ADBMS"
read adbmsi[$i]
echo "enter external mark of ADBMS"
read adbmse[$i]
echo "enter internal mark of OB"
read obi[$i]
echo "enter external mark of OB"
read obe[$i]
echo "enter internal mark of ACN"
read acni[$i]
echo "enter external mark of ACN"
read acne[$i]
iprt[$i]=$((ipri[$i]+ipre[$i]))
adbmst[$i]=$((adbmsi[$i]+adbmse[$i]))
obt[$i]=$((obi[$i]+obe[$i]))
acnt[$i]=$((acni[$i]+acne[$i]))
done
echo ""
for ((i=1;i<=n;i++))
do
echo ""
echo "                    Mark List        "
echo "                   ***********        "
echo ""
echo "Name:${name[$i]}"
echo "RegNo:MUTMCA$i"
echo ""
echo "--------------------------------------------------------------------------------"
echo " Subject Name       Internal Mark       External Mark       Total Mark     "
echo " IPR               ${ipri[$i]}               ${ipre[$i]}               ${iprt[$i]}        "
echo                                                                                              "
ADBMS            ${adbmsi[$i]}              ${adbmse[$i]}              ${adbmst[$i]}      "
echo " OB               ${obi[$i]}               ${obe[$i]}               ${obt[$i]}         "
echo " ACN               ${acni[$i]}               ${acne[$i]}               ${acnt[$i]}        "
done
```

OUTPUT

```
mits@mits-H610M-H-V2-DDR4:~/gokul linux$ bash marklist.sh
enter no of students
2
enter student name
gokul
enter internal mark of IPR
12
enter external mark of IPR
12
enter internal mark of ADBMS
13
enter external mark of ADBMS
13
enter internal mark of OB
14
enter external mark of OB
14
enter internal mark of ACN
15
enter external mark of ACN
15
enter student name
abhijith
enter internal mark of IPR
21
enter external mark of IPR
21
enter internal mark of ADBMS
```

```
22
enter external mark of ADBMS
22
enter internal mark of OB
23
enter external mark of OB
23
enter internal mark of ACN
24
enter external mark of ACN
24

                      Mark List
                     ***********

Name:gokul
RegNo:MUTMCA1

---------------------------------------------------------------------------
 Subject Name      Internal Mark      External Mark      Total Mark
 IPR               12                 12                 24
 ADBMS             13                 13                 26
 OB                14                 14                 28
 ACN               15                 15                 30

                      Mark List
                     ***********

Name:abhijith
RegNo:MUTMCA2

---------------------------------------------------------------------------
 Subject Name      Internal Mark      External Mark      Total Mark
 IPR                21                 21                42
 ADBMS              22                 22                44
 OB                 23                 23                46
 ACN                24                 24                48
```

8.LAMP INSTALLATION PROCEDURE

Install apache

updating the local package index to reflect the latest upstream changes:

```
sudo apt update && sudo apt install ufw
```

Then, install the apache2 package:

```
sudo apt install apache2
```

Install Apache using apt:

It is recommended that you enable the most restrictive profile that will still allow the traffic You have configured. Since we haven’t configured SSL for our server yet in this guide, we will only need to allow traffic on port 80:

```
sudo ufw allow 'Apache'
```

You can verify the change by typing:

```
sudo ufw status
```

The output will provide a list

Output

```
Status: active

To      ActionFrom


        OpenSSH         ALLOW           Anywhere

        Apache          ALLOW           Anywhere


        OpenSSH (v6)    ALLOW           Anywhere (v6)


        Apache (v6)     ALLOW           Anywhere (v6)
```

Checking your Web Server

At the end of the installation process, Ubuntu 20.04 starts Apache. The web server should already be up and running.
Check with the systemd init system to make sure the service is running by typing:

```
sudo systemctl status apache2
```

Output

```
● apache2.service - The Apache HTTP Server
Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset:
enabled) Active:
active (running) since Thu 2020-04-23 22:36:30 UTC; 20h ago
Docs: https://httpd.apache.org/docs/2.4/ Main PID:
29435 (apache2)
Tasks: 55 (limit: 1137)
Memory: 8.0M
CGroup: /system.slice/apache2.service


├─29435 /usr/sbin/apache2 -k start
├─29437 /usr/sbin/apache2 -k start
└─29438 /usr/sbin/apache2 -k start
```

As confirmed by this output, the service has started successfully. However, the best way to test this is to request a page from Apache.

We can access the default Apache landing page to confirm that the software is running properly through your IP address. If you do not know your server's IP address, you can get it a few different ways from the command line.

Try typing this at your server's command prompt:

```
hostname -I
```

We will get back a few addresses separated by spaces. You can try each in your web browser to determine if they work.

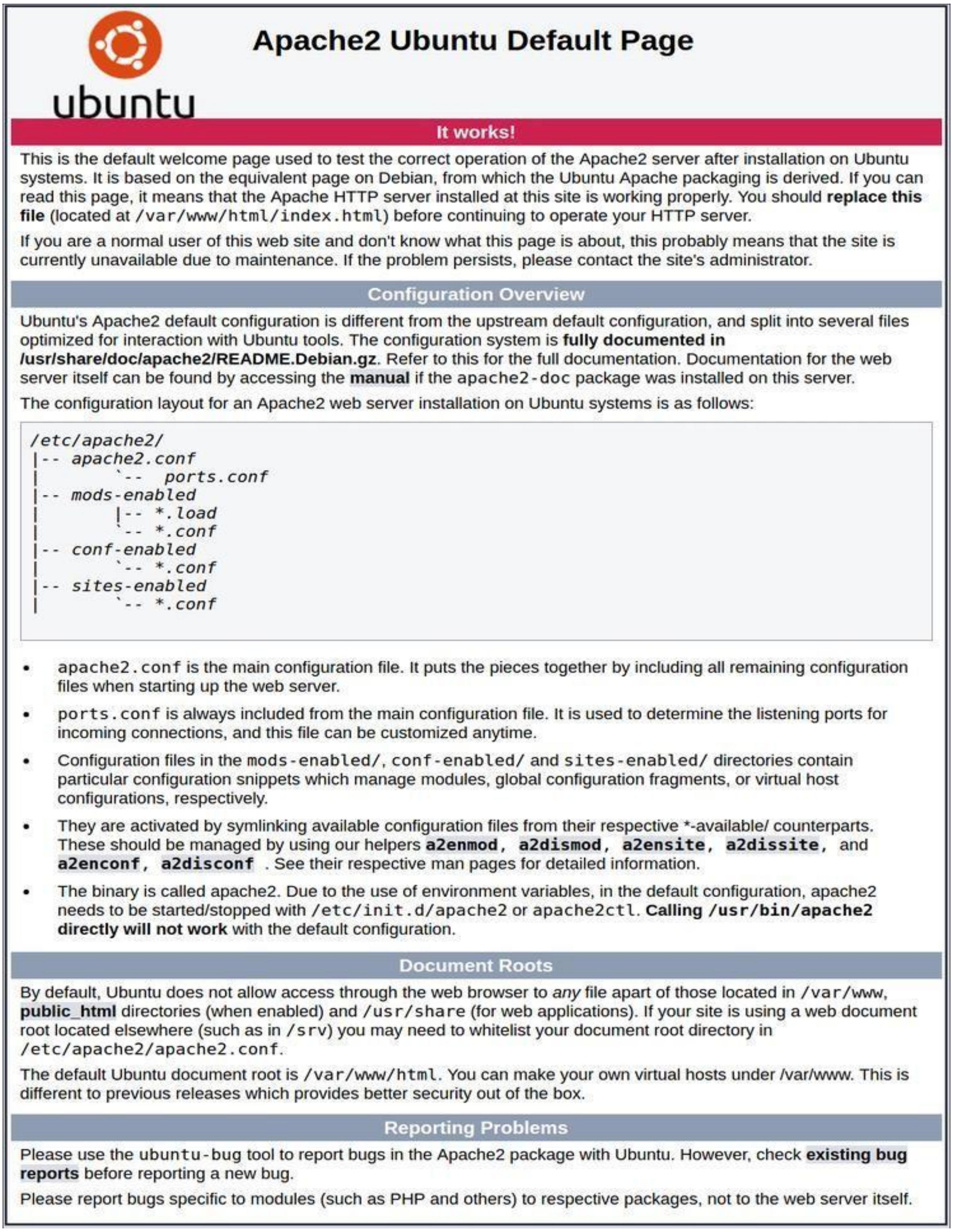
Another option is to use the Icanhazip tool, which should give you your public IP address as read from another location on the internet:

curl -4 icanhazip.com

When you have your server’s IP address, enter it into your browser’s address bar:

http://your_server_ip

You should see the default Ubuntu 20.04 Apache web page:



Apache2 Ubuntu Default Page

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Configuration Overview

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in /usr/share/doc/apache2/README.Debian.gz**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

The configuration layout for an Apache2 web server installation on Ubuntu systems is as follows:

```
/etc/apache2/
|-- apache2.conf
|       `--  ports.conf
|-- mods-enabled
|       |-- *.load
|       `-- *.conf
|-- conf-enabled
|       `-- *.conf
|-- sites-enabled
|       `-- *.conf
```

- `apache2.conf` is the main configuration file. It puts the pieces together by including all remaining configuration files when starting up the web server.
- `ports.conf` is always included from the main configuration file. It is used to determine the listening ports for incoming connections, and this file can be customized anytime.
- Configuration files in the `mods-enabled/`, `conf-enabled/` and `sites-enabled/` directories contain particular configuration snippets which manage modules, global configuration fragments, or virtual host configurations, respectively.
- They are activated by symlinking available configuration files from their respective *-available/ counterparts. These should be managed by using our helpers **`a2enmod`**, **`a2dismod`**, **`a2ensite`**, **`a2dissite`**, and **`a2enconf`**, **`a2disconf`** . See their respective man pages for detailed information.
- The binary is called apache2. Due to the use of environment variables, in the default configuration, apache2 needs to be started/stopped with `/etc/init.d/apache2` or `apache2ctl`. **Calling `/usr/bin/apache2` directly will not work** with the default configuration.

Document Roots

By default, Ubuntu does not allow access through the web browser to *any* file apart of those located in `/var/www`, **public_html** directories (when enabled) and `/usr/share` (for web applications). If your site is using a web document root located elsewhere (such as in `/srv`) you may need to whitelist your document root directory in `/etc/apache2/apache2.conf`.

The default Ubuntu document root is `/var/www/html`. You can make your own virtual hosts under /var/www. This is different to previous releases which provides better security out of the box.

Reporting Problems

Please use the `ubuntu-bug` tool to report bugs in the Apache2 package with Ubuntu. However, check **existing bug reports** before reporting a new bug.

Please report bugs specific to modules (such as PHP and others) to respective packages, not to the web server itself.

Install mariadb

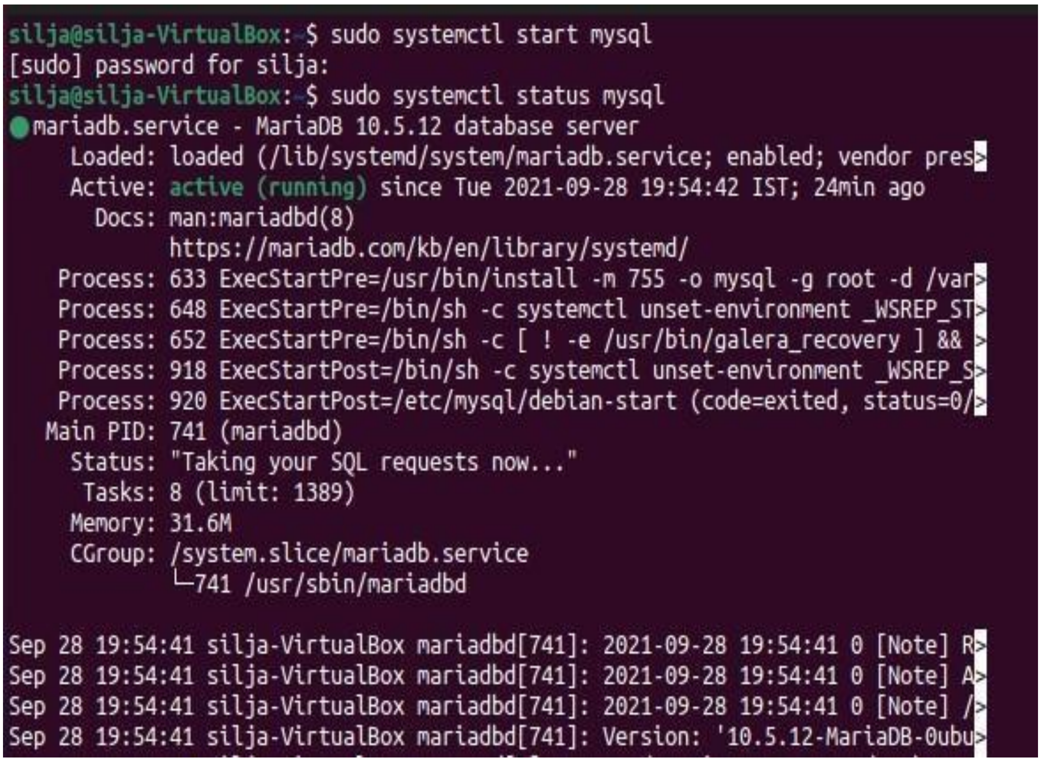
- Install mariaDB

sudo apt install mariadb-server mariadb-client

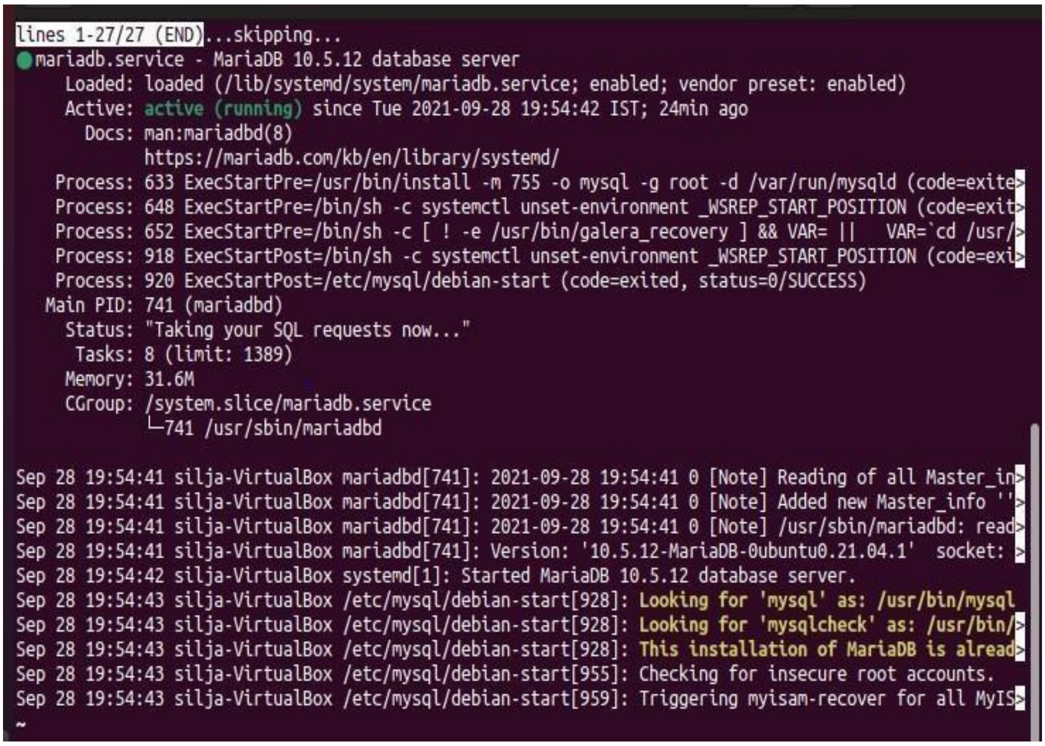
- Check mariadb Installation

sudo systemctl status mysql

(if it is not working sudo systemctl start mysql)



```
silja@silja-VirtualBox:~$ sudo systemctl start mysql
[sudo] password for silja:
silja@silja-VirtualBox:~$ sudo systemctl status mysql
● mariadb.service - MariaDB 10.5.12 database server
     Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor pres>
     Active: active (running) since Tue 2021-09-28 19:54:42 IST; 24min ago
       Docs: man:mariadbd(8)
             https://mariadb.com/kb/en/library/systemd/
    Process: 633 ExecStartPre=/usr/bin/install -m 755 -o mysql -g root -d /var>
    Process: 648 ExecStartPre=/bin/sh -c systemctl unset-environment _WSREP_ST>
    Process: 652 ExecStartPre=/bin/sh -c [ ! -e /usr/bin/galera_recovery ] && >
    Process: 918 ExecStartPost=/bin/sh -c systemctl unset-environment _WSREP_S>
    Process: 920 ExecStartPost=/etc/mysql/debian-start (code=exited, status=0/>
   Main PID: 741 (mariadbd)
     Status: "Taking your SQL requests now..."
      Tasks: 8 (limit: 1389)
     Memory: 31.6M
     CGroup: /system.slice/mariadb.service
             └─741 /usr/sbin/mariadbd

Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: 2021-09-28 19:54:41 0 [Note] R>
Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: 2021-09-28 19:54:41 0 [Note] A>
Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: 2021-09-28 19:54:41 0 [Note] />
Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: Version: '10.5.12-MariaDB-0ubu>
```



```
lines 1-27/27 (END)...skipping...
● mariadb.service - MariaDB 10.5.12 database server
     Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor preset: enabled)
     Active: active (running) since Tue 2021-09-28 19:54:42 IST; 24min ago
       Docs: man:mariadbd(8)
             https://mariadb.com/kb/en/library/systemd/
    Process: 633 ExecStartPre=/usr/bin/install -m 755 -o mysql -g root -d /var/run/mysqld (code=exite>
    Process: 648 ExecStartPre=/bin/sh -c systemctl unset-environment _WSREP_START_POSITION (code=exit>
    Process: 652 ExecStartPre=/bin/sh -c [ ! -e /usr/bin/galera_recovery ] && VAR= ||   VAR=`cd /usr/>
    Process: 918 ExecStartPost=/bin/sh -c systemctl unset-environment _WSREP_START_POSITION (code=exi>
    Process: 920 ExecStartPost=/etc/mysql/debian-start (code=exited, status=0/SUCCESS)
   Main PID: 741 (mariadbd)
     Status: "Taking your SQL requests now..."
      Tasks: 8 (limit: 1389)
     Memory: 31.6M
     CGroup: /system.slice/mariadb.service
             └─741 /usr/sbin/mariadbd

Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: 2021-09-28 19:54:41 0 [Note] Reading of all Master_in>
Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: 2021-09-28 19:54:41 0 [Note] Added new Master_info ''>
Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: 2021-09-28 19:54:41 0 [Note] /usr/sbin/mariadbd: read>
Sep 28 19:54:41 silja-VirtualBox mariadbd[741]: Version: '10.5.12-MariaDB-0ubuntu0.21.04.1'  socket: >
Sep 28 19:54:42 silja-VirtualBox systemd[1]: Started MariaDB 10.5.12 database server.
Sep 28 19:54:43 silja-VirtualBox /etc/mysql/debian-start[928]: Looking for 'mysql' as: /usr/bin/mysql
Sep 28 19:54:43 silja-VirtualBox /etc/mysql/debian-start[928]: Looking for 'mysqlcheck' as: /usr/bin/>
Sep 28 19:54:43 silja-VirtualBox /etc/mysql/debian-start[928]: This installation of MariaDB is alread>
Sep 28 19:54:43 silja-VirtualBox /etc/mysql/debian-start[955]: Checking for insecure root accounts.
Sep 28 19:54:43 silja-VirtualBox /etc/mysql/debian-start[959]: Triggering myisam-recover for all MyIS>
~
```

Install PHP

Install phpmyadmin

Install phpmyadmin

```
sudo apt install phpmyadminphp-mbstringphp-zipphp-gdphp-jsonphp-curl
```

(It ask for webserver select apache2, select dbconfiguration and set password)

Restart apache2

```
sudo systemctl restart apache2
```

Ansible installation

Ansible is a radically simple IT automation platform that makes your applications and systems easier to deploy. Avoid writing scripts or custom code to deploy and update your applications— automate in a language that approaches plain English, using SSH, with no agents to install on remote systems.

Update OS to latest version. Command: sudo apt-get update

```
root@localhost:~# sudo apt-get update

Hit:1 http://mirrors.linode.com/ubuntu cosmic InRelease

Get:2 http://mirrors.linode.com/ubuntu cosmic-updates InRelease [88.7 kB] Get:3
http://mirrors.linode.com/ubuntu cosmic-backports InRelease [74.6 kB]
Get:4 http://mirrors.linode.com/ubuntu cosmic-updates/main i386 Packages [200 kB]
Get:5 http://mirrors.linode.com/ubuntu cosmic-updates/main amd64 Packages [223
kB] Get:6 http://security.ubuntu.com/ubuntu cosmic-security InRelease [88.7 kB]
Get:7 http://security.ubuntu.com/ubuntu cosmic-security/main amd64 Packages [131
kB] Get:8 http://security.ubuntu.com/ubuntu cosmic-security/main i386 Packages
[109 kB] Fetched 915 kB in 1s (700 kB/s)
Reading package lists... Done
```

Add Ansible package to your Ubuntu system.

Command: sudo apt-add-repository --yes --update ppa:ansible/ansible

root@localhost:~# sudo apt-add-repository --yes --update ppa:ansible/ansible

Hit:1 http://mirrors.linode.com/ubuntu cosmic InRelease

Hit:2 http://mirrors.linode.com/ubuntu cosmic-updates InRelease

Get:3 http://mirrors.linode.com/ubuntu cosmic-backports InRelease [74.6 kB] Hit:4 http://security.ubuntu.com/ubuntu cosmic-security InRelease

Get:5 http://ppa.launchpad.net/ansible/ansible/ubuntu cosmic InRelease [15.9 kB]

Get:6 http://ppa.launchpad.net/ansible/ansible/ubuntu cosmic/main i386 Packages [536 B]

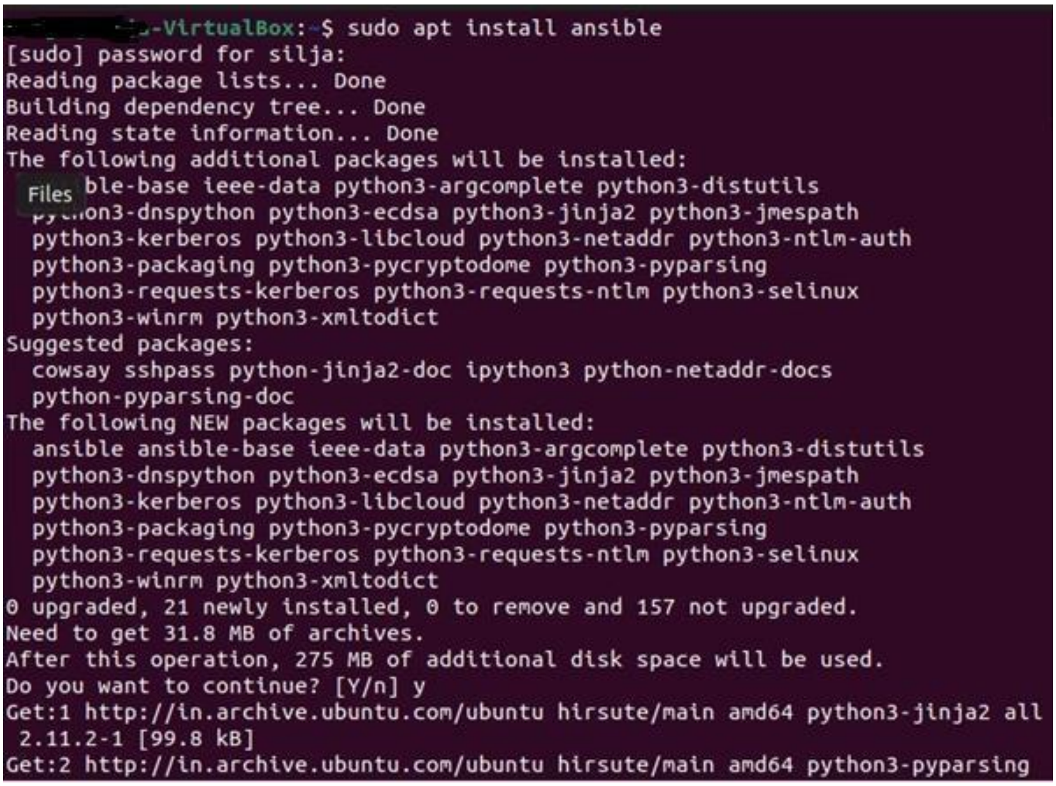
Get:7 http://ppa.launchpad.net/ansible/ansible/ubuntu cosmic/main amd64 Packages[536B]

Get:8 http://ppa.launchpad.net/ansible/ansible/ubuntu/ cosmic/main Translation-en [344 B] Fetched 91.9 kB in 1s (64.7 kB/s)

Reading package lists... Done

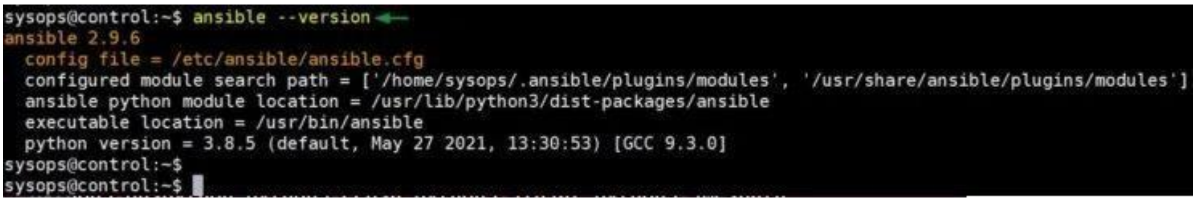
Install Ansible completely.

COMMAND sudo apt install ansible.



```
[redacted]-VirtualBox:~$ sudo apt install ansible
[sudo] password for silja:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ble-base ieee-data python3-argcomplete python3-distutils
  py..on3-dnspython python3-ecdsa python3-jinja2 python3-jmespath
  python3-kerberos python3-libcloud python3-netaddr python3-ntlm-auth
  python3-packaging python3-pycryptodome python3-pyparsing
  python3-requests-kerberos python3-requests-ntlm python3-selinux
  python3-winrm python3-xmltodict
Suggested packages:
  cowsay sshpass python-jinja2-doc ipython3 python-netaddr-docs
  python-pyparsing-doc
The following NEW packages will be installed:
  ansible ansible-base ieee-data python3-argcomplete python3-distutils
  python3-dnspython python3-ecdsa python3-jinja2 python3-jmespath
  python3-kerberos python3-libcloud python3-netaddr python3-ntlm-auth
  python3-packaging python3-pycryptodome python3-pyparsing
  python3-requests-kerberos python3-requests-ntlm python3-selinux
  python3-winrm python3-xmltodict
0 upgraded, 21 newly installed, 0 to remove and 157 not upgraded.
Need to get 31.8 MB of archives.
After this operation, 275 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu hirsute/main amd64 python3-jinja2 all
 2.11.2-1 [99.8 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu hirsute/main amd64 python3-pyparsing
```

COMMAND : ansible –version



```
sysops@control:~$ ansible --version
ansible 2.9.6
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/home/sysops/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python3/dist-packages/ansible
  executable location = /usr/bin/ansible
  python version = 3.8.5 (default, May 27 2021, 13:30:53) [GCC 9.3.0]
sysops@control:~$
sysops@control:~$
```

Install Ansible and pyVmomi

Python should already be installed on Mac but you might need to install pip by running this command.

Once pip is installed, we can use it to install Ansible with the following command.

We also need to install pyVmomi which is the Python SDK for the VMware vSphere API that allows you to manage ESX, ESXi, and vCenter.

That’s all the dependencies installed, we’re now ready to create our Ansible playbook.

Create Ansible Playbook

Ansible playbooks are YAML configuratiom files that describe what actions to run on a remote host. For this example, we’ll create a simple playbook called deploy-vms.yml that will use the vmware_guest module to deply a VM from template.

Create the file.

vim deploy-vms.yml

Add the following contents to the file. You’ll want to change the variables in the vars section to match the details of your vCenter.

```
---

- hosts: localhost

gather_facts: no

vars:

vcenter_server: "10.1.1.100"
```

```
vcenter_user: "administrator@vsphere.local"

vcenter_pass: "Pa$$w0rd"

datacenter_name: "Datacenter"

cluster_name: "Cluster"

tasks:

- name: Clone the template

vmware_guest:

hostname: "{{ vcenter_server }}"

username: "{{ vcenter_user }}"

password: "{{ vcenter_pass }}"

validate_certs: False

name: web02

template: template-ubuntu-18.04

datacenter: "{{ datacenter_name }}"

folder: /{{ datacenter_name }}/vm

cluster: "{{ cluster_name }}"

datastore: "iscsi-datastore01"
networks:
- name: VM Network
ip: 10.1.1.22
netmask: 255.255.255.0

gateway: 10.1.1.2
type: static
dns_servers: 10.1.1.2
```

customization:

hostname: "web02"

dns_servers:

- 10.1.1.2

- 1.1.1.1

state: poweredon

wait_for_ip_address: yes

delegate_to: localhost

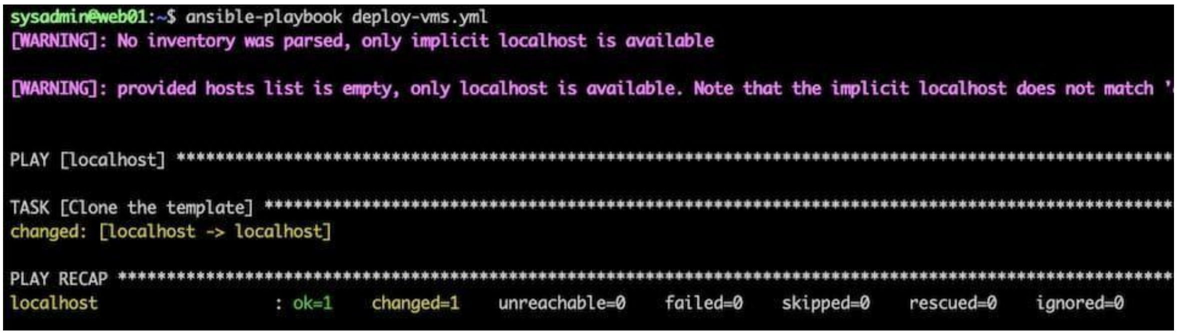
The playbook above will create a new VM called web02 and place it on a datastore called iscsi-datastore01. It will be cloned from a template called template-ubuntu-18.04.

Run the playbook

After making the required changes to the deploy-vms.yml file, save it, then run the following command to deploy the VM.

ansible-playbook deploy-vms.yml

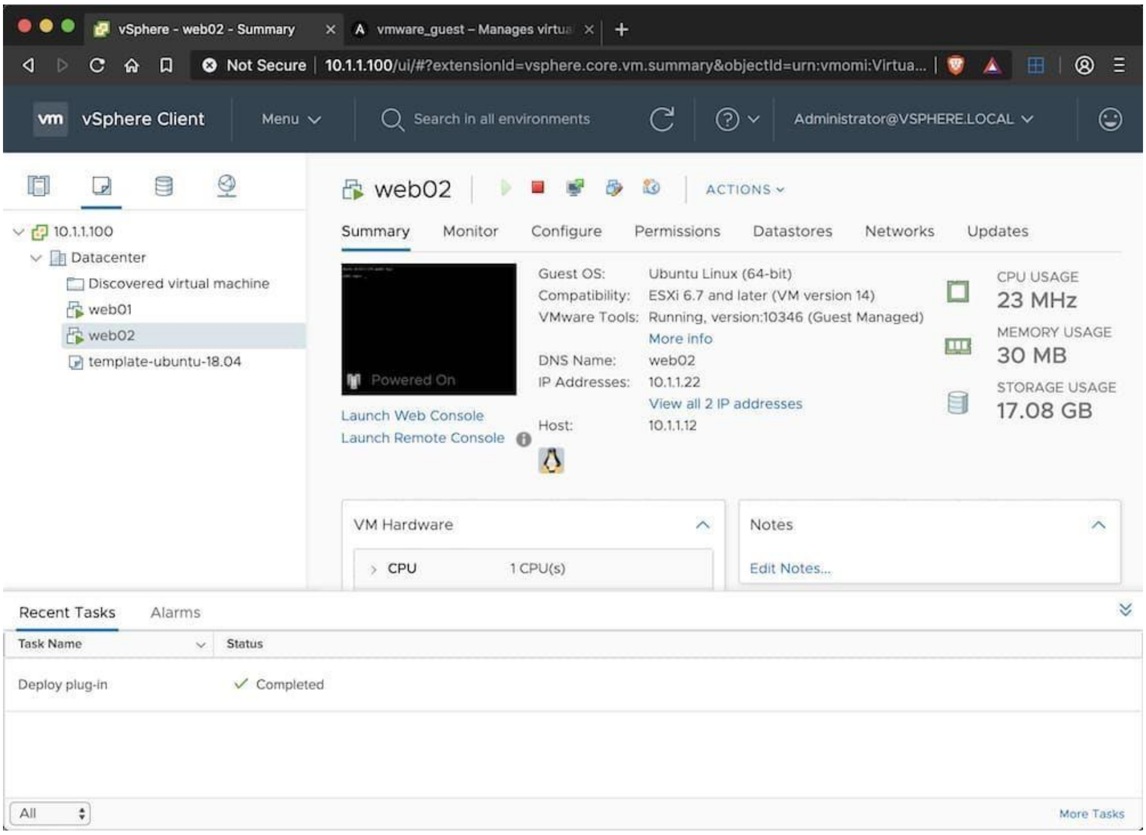
The screenshot below shows the playbook in action.



```
sysadmin@web01:~$ ansible-playbook deploy-vms.yml
[WARNING]: No inventory was parsed, only implicit localhost is available

[WARNING]: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match '


PLAY [localhost] ***************************************************************************************

TASK [Clone the template] ******************************************************************************
changed: [localhost -> localhost]

PLAY RECAP *********************************************************************************************
localhost                  : ok=1    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

The playbook might take a while to complete because we used the wait_for_ip_address: yes option, which means the Ansible command finishes once the VM has been cloned, and the network is configured with the static IP address specified.

The screenshot below shows the VM has been created in vCenter.



Guest OS: Ubuntu Linux (64-bit)
Compatibility: ESXi 6.7 and later (VM version 14)
VMware Tools: Running, version:10346 (Guest Managed)
More info
DNS Name: web02
IP Addresses: 10.1.1.22
View all 2 IP addresses
Host: 10.1.1.12

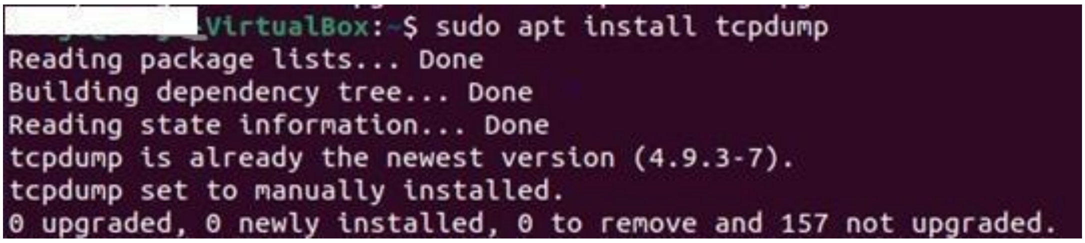
CPU USAGE 23 MHz
MEMORY USAGE 30 MB
STORAGE USAGE 17.08 GB

CPU 1 CPU(s)

Task Name	Status
Deploy plug-in	✓ Completed

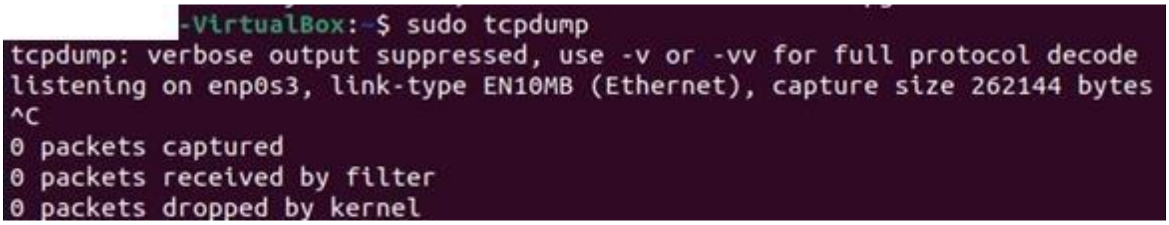
TCPDUMP

Execute tcpdump and its options on your own system,and submit the output screenshot as a document.



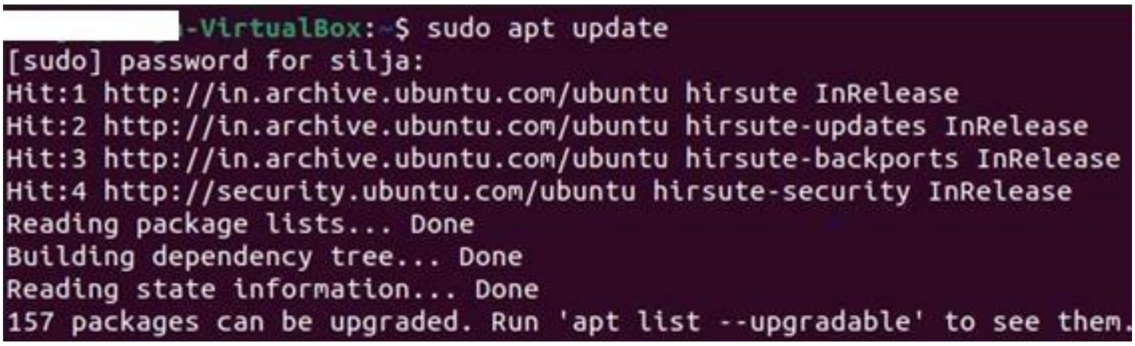
```
[redacted]VirtualBox:~$ sudo apt install tcpdump
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
tcpdump is already the newest version (4.9.3-7).
tcpdump set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 157 not upgraded.
```

Sudo tcpdump



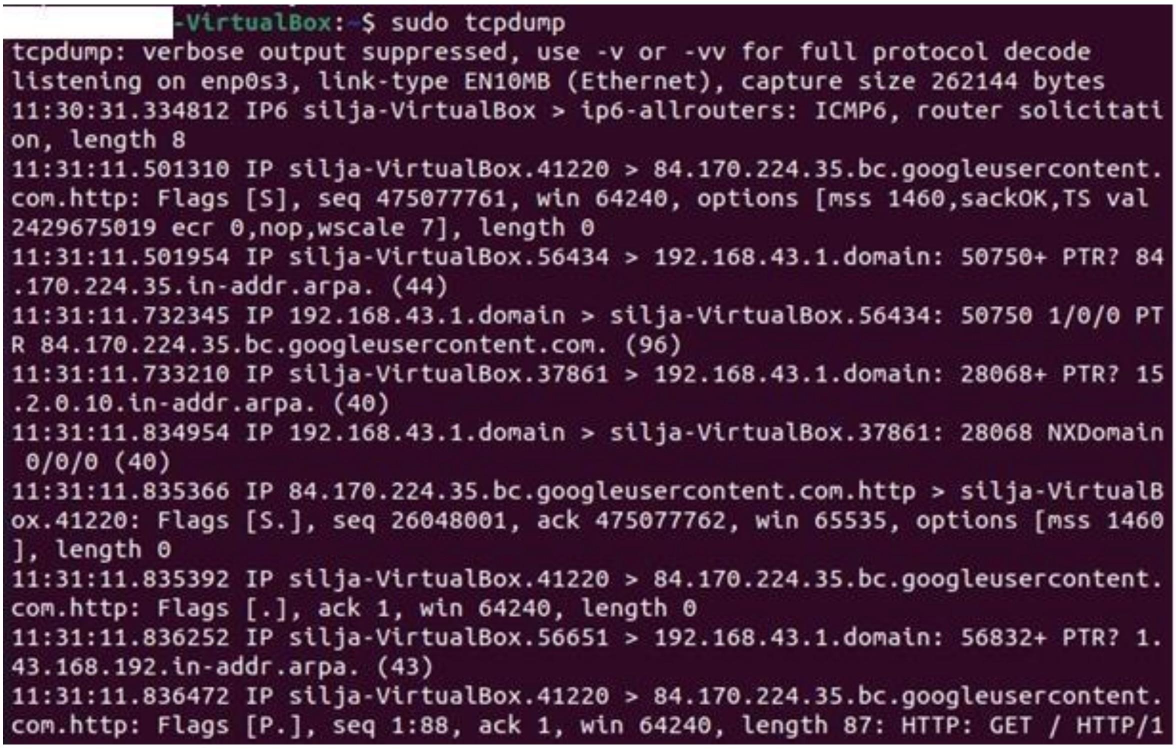
```
[redacted]-VirtualBox:~$ sudo tcpdump
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
^C
0 packets captured
0 packets received by filter
0 packets dropped by kernel
```

Sudo apt update



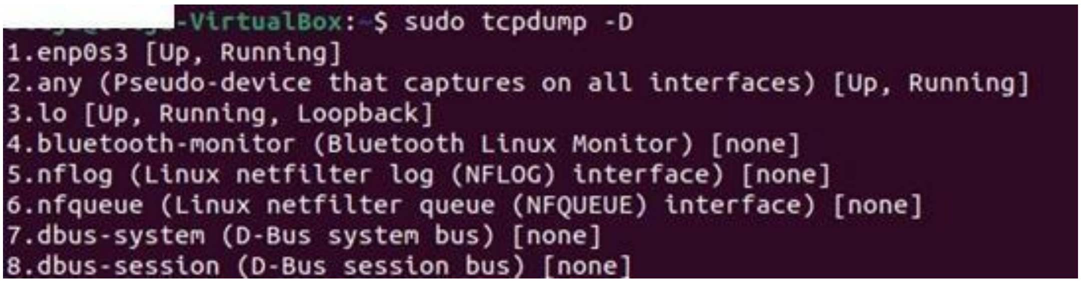
```
[redacted]-VirtualBox:~$ sudo apt update
[sudo] password for silja:
Hit:1 http://in.archive.ubuntu.com/ubuntu hirsute InRelease
Hit:2 http://in.archive.ubuntu.com/ubuntu hirsute-updates InRelease
Hit:3 http://in.archive.ubuntu.com/ubuntu hirsute-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu hirsute-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
157 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Sudo tcpdump



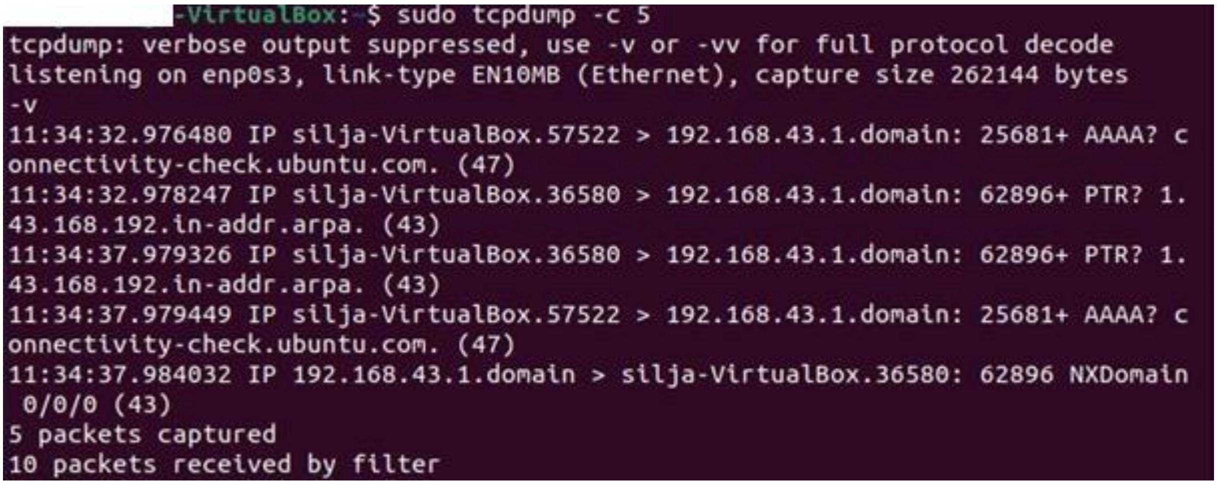
```
[redacted]-VirtualBox:~$ sudo tcpdump
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
11:30:31.334812 IP6 silja-VirtualBox > ip6-allrouters: ICMP6, router solicitati
on, length 8
11:31:11.501310 IP silja-VirtualBox.41220 > 84.170.224.35.bc.googleusercontent.
com.http: Flags [S], seq 475077761, win 64240, options [mss 1460,sackOK,TS val
2429675019 ecr 0,nop,wscale 7], length 0
11:31:11.501954 IP silja-VirtualBox.56434 > 192.168.43.1.domain: 50750+ PTR? 84
.170.224.35.in-addr.arpa. (44)
11:31:11.732345 IP 192.168.43.1.domain > silja-VirtualBox.56434: 50750 1/0/0 PT
R 84.170.224.35.bc.googleusercontent.com. (96)
11:31:11.733210 IP silja-VirtualBox.37861 > 192.168.43.1.domain: 28068+ PTR? 15
.2.0.10.in-addr.arpa. (40)
11:31:11.834954 IP 192.168.43.1.domain > silja-VirtualBox.37861: 28068 NXDomain
 0/0/0 (40)
11:31:11.835366 IP 84.170.224.35.bc.googleusercontent.com.http > silja-VirtualB
ox.41220: Flags [S.], seq 26048001, ack 475077762, win 65535, options [mss 1460
], length 0
11:31:11.835392 IP silja-VirtualBox.41220 > 84.170.224.35.bc.googleusercontent.
com.http: Flags [.], ack 1, win 64240, length 0
11:31:11.836252 IP silja-VirtualBox.56651 > 192.168.43.1.domain: 56832+ PTR? 1.
43.168.192.in-addr.arpa. (43)
11:31:11.836472 IP silja-VirtualBox.41220 > 84.170.224.35.bc.googleusercontent.
com.http: Flags [P.], seq 1:88, ack 1, win 64240, length 87: HTTP: GET / HTTP/1
```

Sudo tcpdump -D



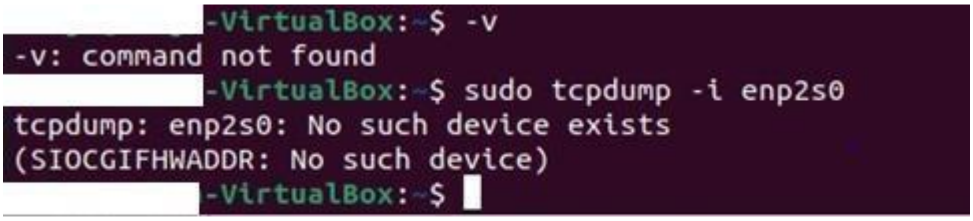
```
[redacted]-VirtualBox:~$ sudo tcpdump -D
1.enp0s3 [Up, Running]
2.any (Pseudo-device that captures on all interfaces) [Up, Running]
3.lo [Up, Running, Loopback]
4.bluetooth-monitor (Bluetooth Linux Monitor) [none]
5.nflog (Linux netfilter log (NFLOG) interface) [none]
6.nfqueue (Linux netfilter queue (NFQUEUE) interface) [none]
7.dbus-system (D-Bus system bus) [none]
8.dbus-session (D-Bus session bus) [none]
```

Sudo tcpdump –c 5



```
[redacted]-VirtualBox:~$ sudo tcpdump -c 5
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
-v
11:34:32.976480 IP silja-VirtualBox.57522 > 192.168.43.1.domain: 25681+ AAAA? c
onnectivity-check.ubuntu.com. (47)
11:34:32.978247 IP silja-VirtualBox.36580 > 192.168.43.1.domain: 62896+ PTR? 1.
43.168.192.in-addr.arpa. (43)
11:34:37.979326 IP silja-VirtualBox.36580 > 192.168.43.1.domain: 62896+ PTR? 1.
43.168.192.in-addr.arpa. (43)
11:34:37.979449 IP silja-VirtualBox.57522 > 192.168.43.1.domain: 25681+ AAAA? c
onnectivity-check.ubuntu.com. (47)
11:34:37.984032 IP 192.168.43.1.domain > silja-VirtualBox.36580: 62896 NXDomain
 0/0/0 (43)
5 packets captured
10 packets received by filter
```

Sudo tcpdump –i enp2s0

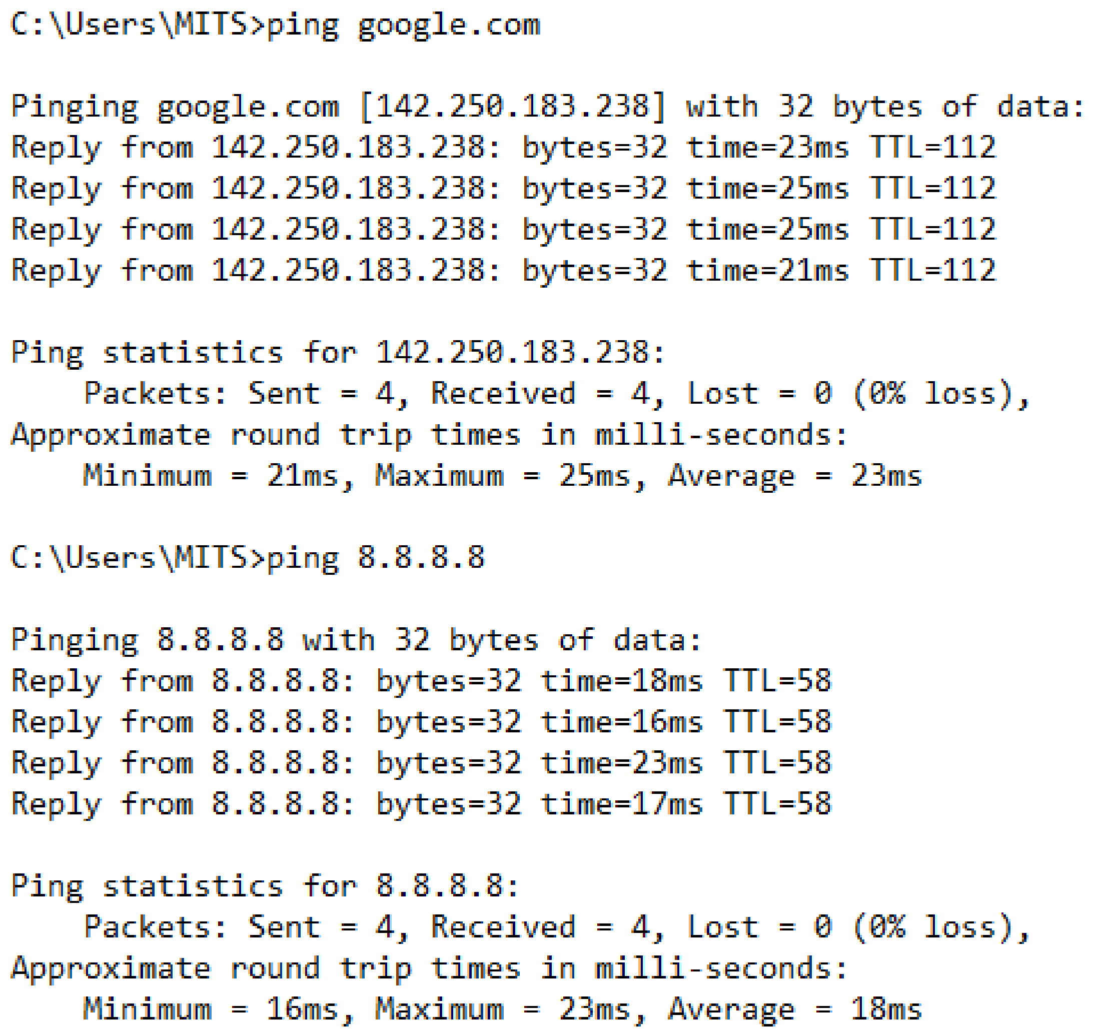


```
[redacted]-VirtualBox:~$ -v
-v: command not found
[redacted]-VirtualBox:~$ sudo tcpdump -i enp2s0
tcpdump: enp2s0: No such device exists
(SIOCGIFHWADDR: No such device)
[redacted]-VirtualBox:~$ 
```

9.Network Commands

1.Ping

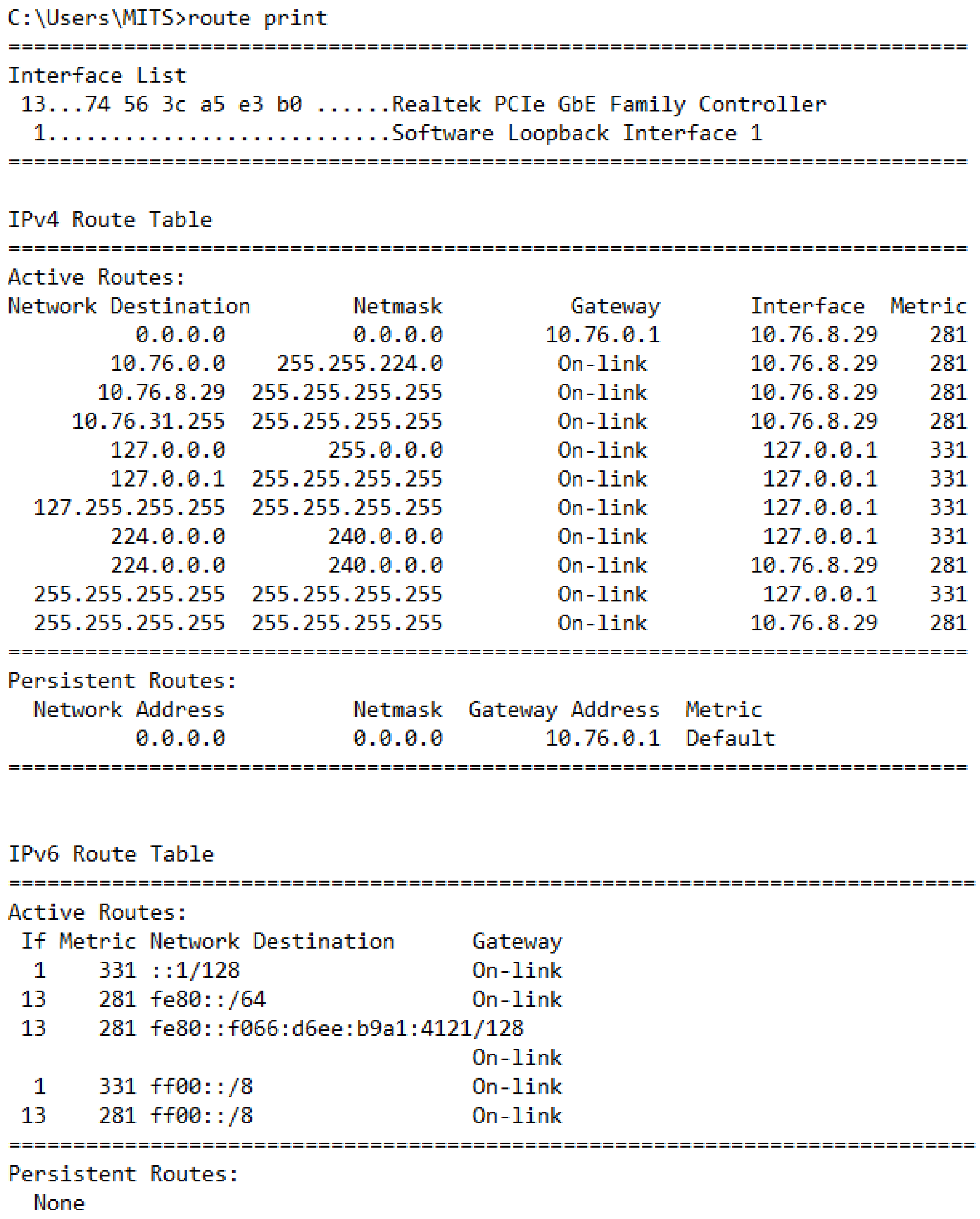
A ping is a basic Internet command that allows a user to test and verify whether a given destination IP address exists and can accept requests in computer network administration. Ping is also used for diagnosis to confirm that the computer the user tries to reach is operational. Ping can be used with any operating system (OS) that supports networking, including the majority of embedded network administration software.



```
C:\Users\MITS>ping google.com

Pinging google.com [142.250.183.238] with 32 bytes of data:
Reply from 142.250.183.238: bytes=32 time=23ms TTL=112
Reply from 142.250.183.238: bytes=32 time=25ms TTL=112
Reply from 142.250.183.238: bytes=32 time=25ms TTL=112
Reply from 142.250.183.238: bytes=32 time=21ms TTL=112

Ping statistics for 142.250.183.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 21ms, Maximum = 25ms, Average = 23ms

C:\Users\MITS>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=18ms TTL=58
Reply from 8.8.8.8: bytes=32 time=16ms TTL=58
Reply from 8.8.8.8: bytes=32 time=23ms TTL=58
Reply from 8.8.8.8: bytes=32 time=17ms TTL=58

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 23ms, Average = 18ms
```

2.Route

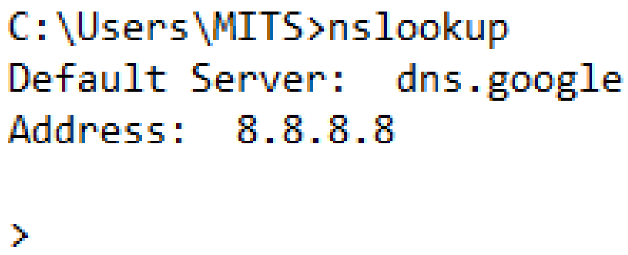
The Route command is a powerful tool used to view and manipulate the IP routing table in various operating systems, including Unix-like systems and Microsoft Windows. This command is essential for network administrators to manage network routes and ensure efficient data transmission.



```
C:\Users\MITS>route print
===========================================================================
Interface List
 13...74 56 3c a5 e3 b0 ......Realtek PCIe GbE Family Controller
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0       10.76.0.1      10.76.8.29    281
        10.76.0.0    255.255.224.0         On-link      10.76.8.29    281
       10.76.8.29  255.255.255.255         On-link      10.76.8.29    281
     10.76.31.255  255.255.255.255         On-link      10.76.8.29    281
        127.0.0.0        255.0.0.0         On-link       127.0.0.1    331
        127.0.0.1  255.255.255.255         On-link       127.0.0.1    331
  127.255.255.255  255.255.255.255         On-link       127.0.0.1    331
        224.0.0.0        240.0.0.0         On-link       127.0.0.1    331
        224.0.0.0        240.0.0.0         On-link      10.76.8.29    281
  255.255.255.255  255.255.255.255         On-link       127.0.0.1    331
  255.255.255.255  255.255.255.255         On-link      10.76.8.29    281
===========================================================================
Persistent Routes:
  Network Address          Netmask  Gateway Address  Metric
          0.0.0.0          0.0.0.0       10.76.0.1  Default
===========================================================================


IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  1    331 ::1/128                  On-link
 13    281 fe80::/64                On-link
 13    281 fe80::f066:d6ee:b9a1:4121/128
                                    On-link
  1    331 ff00::/8                 On-link
 13    281 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

3.Nslookup

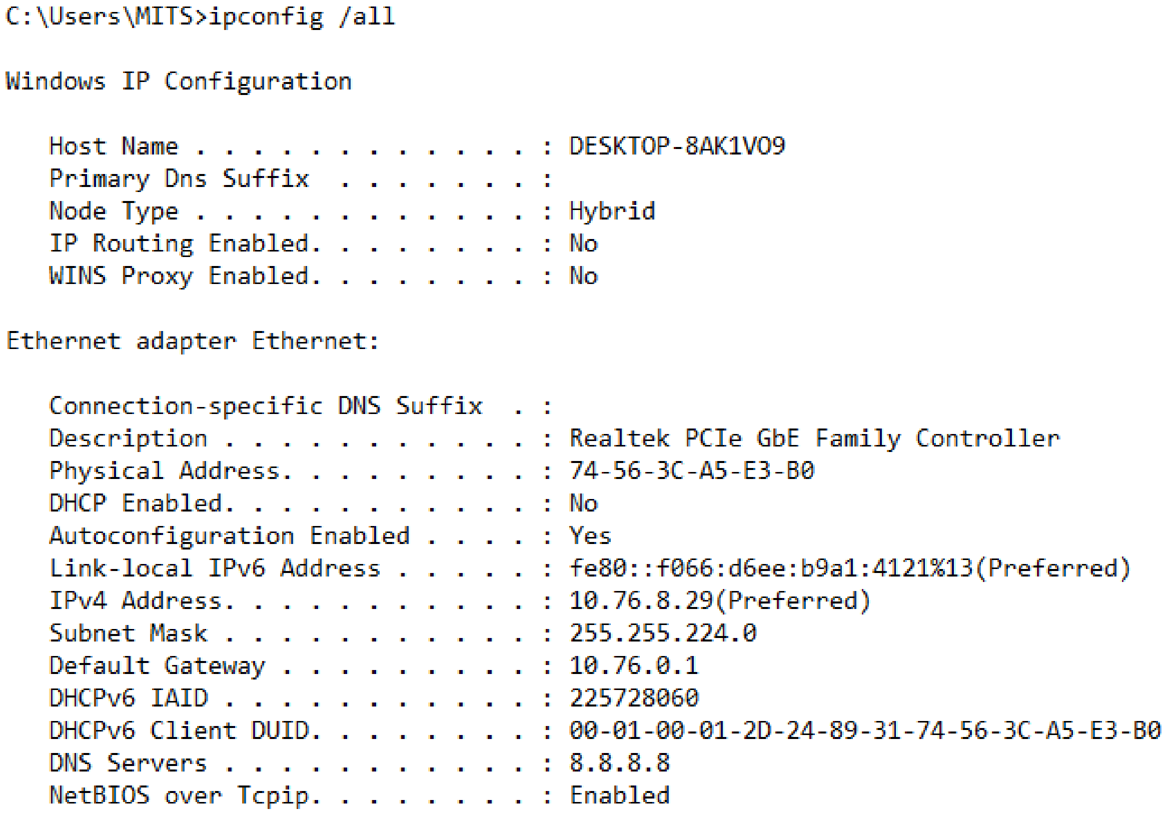
This command helps diagnose the Domain Name System (DNS) infrastructure and comes with a number of sub-commands. These are mainly for systems administrators. The primary interest for average PC users is its use to find the computer name corresponding to a numeric IP. For example, if you want to know who is &quot;216.109.112.135&quot; , enter &quot;nslookup 216.109.112.135&quot; and you will find that it is (or was anyway) a Yahoo computer. My firewall keeps a log of the IPs involved in the attempts to probe my computer and I sometimes look a few up to see who they are. (There are also Who is search sites available on the Web as mentioned in the Ipconfig section.)



```
C:\Users\MITS>nslookup
Default Server:  dns.google
Address:  8.8.8.8

>
```

4. Ipconfig

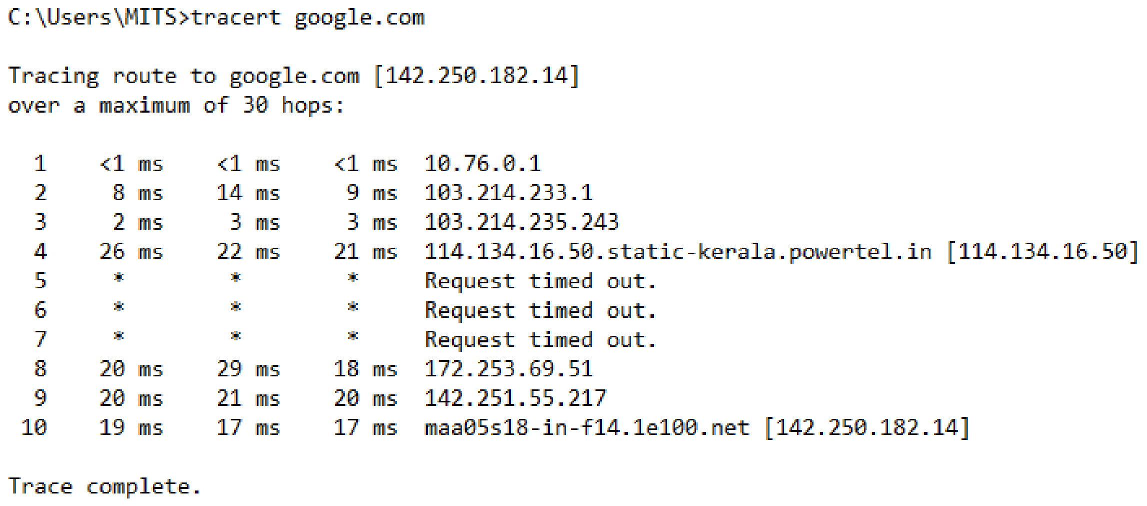
The Windows IP Configuration tool (ipconfig) is the command-line equivalent of the accessory &quot;Winipcfg&quot; that was present in Windows 9X/Me. It is used to display the TCP/IP network configuration values. To open it, enter &quot;ipconfig&quot; in the command prompt. If you are connected directly to the Internet, you will obtain your IP address.



```
C:\Users\MITS>ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : DESKTOP-8AK1VO9
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek PCIe GbE Family Controller
   Physical Address. . . . . . . . . : 74-56-3C-A5-E3-B0
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::f066:d6ee:b9a1:4121%13(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.76.8.29(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.224.0
   Default Gateway . . . . . . . . . : 10.76.0.1
   DHCPv6 IAID . . . . . . . . . . . : 225728060
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2D-24-89-31-74-56-3C-A5-E3-B0
   DNS Servers . . . . . . . . . . . : 8.8.8.8
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

5.Tracert

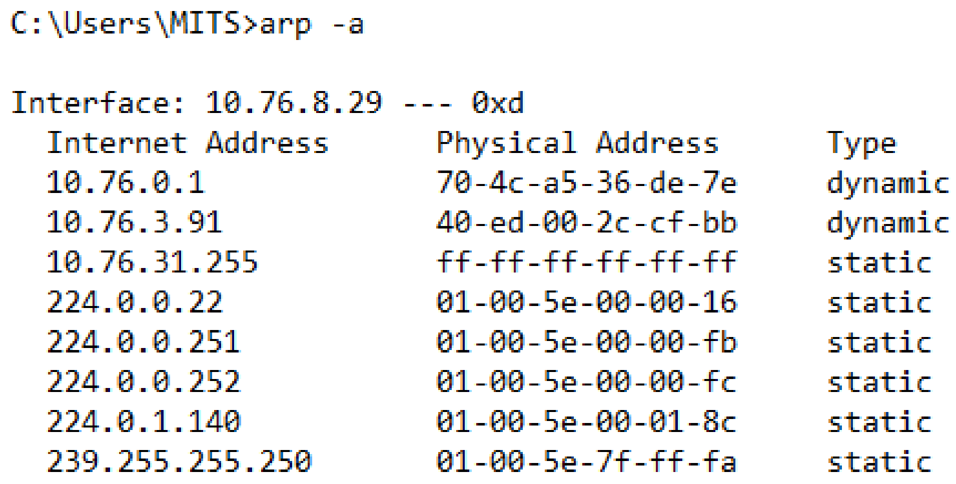
Tracert (traceroute) is another old tool borrowed from Unix. The actual path between two computers on the Internet is not a straight line but consists of numerous segments or &quot;hops&quot; from one intermediate computer to another. Tracert shows each step of the path taken. It can be interesting to see just how convolute edit is. The times for each hop and the IP addresses for each intermediate computer are displayed. Tracert shows up to 30 hops. It is convenient for finding if there is one particular segment that is causing a slow or bad connection. A typical command might be &quot;tracert dell.com&quot;.



```
C:\Users\MITS>tracert google.com

Tracing route to google.com [142.250.182.14]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  10.76.0.1
  2     8 ms    14 ms     9 ms  103.214.233.1
  3     2 ms     3 ms     3 ms  103.214.235.243
  4    26 ms    22 ms    21 ms  114.134.16.50.static-kerala.powertel.in [114.134.16.50]
  5     *        *        *     Request timed out.
  6     *        *        *     Request timed out.
  7     *        *        *     Request timed out.
  8    20 ms    29 ms    18 ms  172.253.69.51
  9    20 ms    21 ms    20 ms  142.251.55.217
 10    19 ms    17 ms    17 ms  maa05s18-in-f14.1e100.net [142.250.182.14]

Trace complete.
```

6.arp

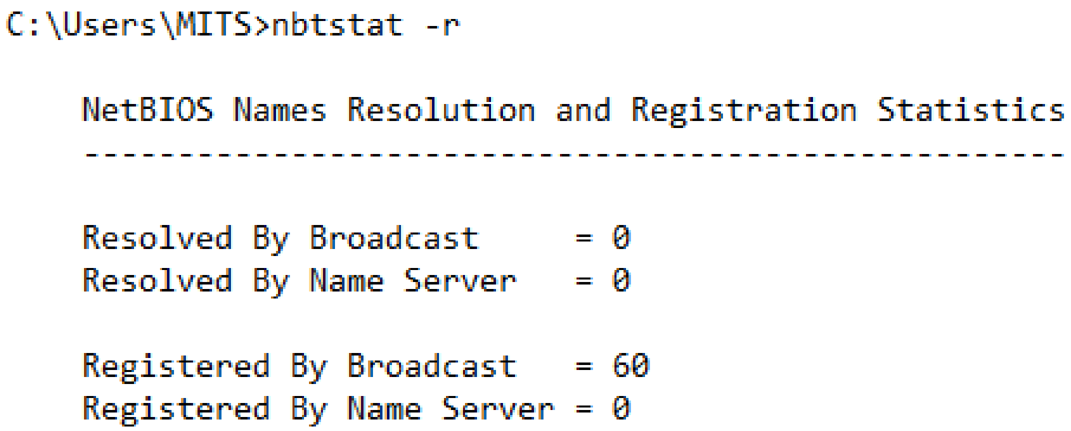
The ARP command corresponds to the Address Resolution Protocol. Although it is easy to think of network communications in terms of IP addressing, packet delivery is ultimately dependent on the Media Access Control (MAC) address of the device’s network adapter. This is where the Address Resolution Protocol comes into play. Its job is to map IP addresses to MAC addresses. Windows devices maintain an ARP cache, which contains the results of recent ARP queries. You can see the contents of this cache by using the ARP -A command. If you are having problems communicating with one specific host, you can append the remote host’s IP address to the ARP -A command.



```
C:\Users\MITS>arp -a

Interface: 10.76.8.29 --- 0xd
  Internet Address      Physical Address      Type
  10.76.0.1             70-4c-a5-36-de-7e     dynamic
  10.76.3.91            40-ed-00-2c-cf-bb     dynamic
  10.76.31.255          ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  224.0.1.140           01-00-5e-00-01-8c     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
```

7.nbtstat

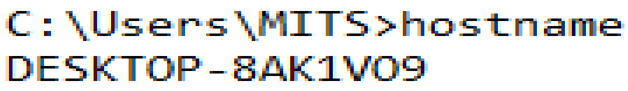
As I am sure you probably know, computers that are running a Windows operating system are assigned a computer name. Oftentimes, there is a domain name or a workgroup name that is also assigned to the computer. The computer name is sometimes referred to as the NetBIOS name. Windows uses several different methods to map NetBIOS names to IP addresses, such as broadcast, LMHost lookup, or even using the nearly extinct method of querying a WINS server. Of course, NetBIOS over TCP/IP can occasionally break down. The NbtStat command can help you to diagnose and correct such problems. The NbtStat -n command for example, shows the NetBIOS names that are in use by a device. The NbtStat -r command shows how many NetBIOS names the device has been able to resolve recently.



```
C:\Users\MITS>nbtstat -r

    NetBIOS Names Resolution and Registration Statistics
    ----------------------------------------------------

    Resolved By Broadcast     = 0
    Resolved By Name Server   = 0

    Registered By Broadcast   = 60
    Registered By Name Server = 0
```

8.hostname

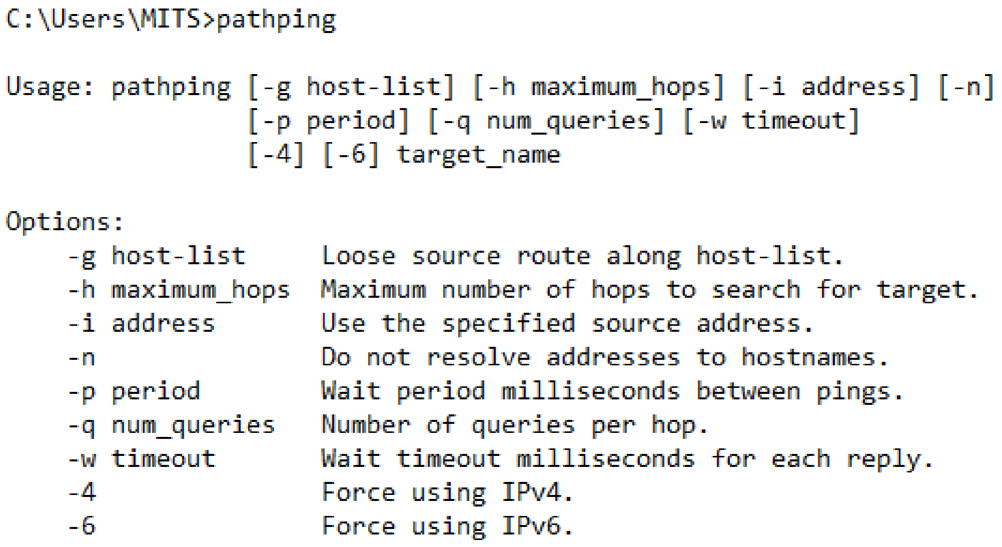
The previously discussed NbtStat command can provide you with the host name that has been assigned to a Windows device, if you know which switch to use with the command. However, if you're just looking for a fast and easy way of verifying a computer's name, then try using the Hostname command. Typing Hostname at the command prompt returns the local computer name.



```
C:\Users\MITS>hostname
DESKTOP-8AK1VO9
```

9. pathping

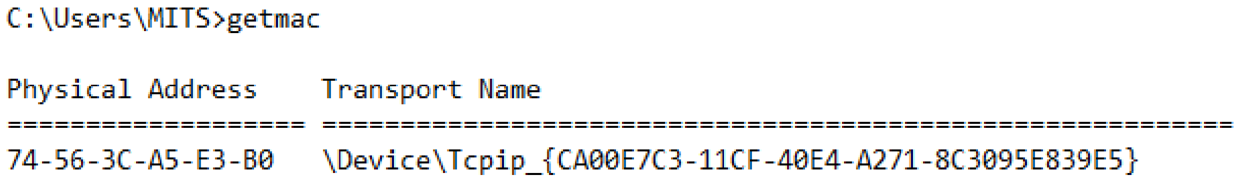
Earlier, I talked about the Ping utility and the Tracert utility, and the similarities between them. As you might have guessed, the PathPing tool is a utility that combines the best aspects of Tracert and Ping. Entering the PathPing command.



```
C:\Users\MITS>pathping

Usage: pathping [-g host-list] [-h maximum_hops] [-i address] [-n]
                [-p period] [-q num_queries] [-w timeout]
                [-4] [-6] target_name

Options:
    -g host-list     Loose source route along host-list.
    -h maximum_hops  Maximum number of hops to search for target.
    -i address       Use the specified source address.
    -n               Do not resolve addresses to hostnames.
    -p period        Wait period milliseconds between pings.
    -q num_queries   Number of queries per hop.
    -w timeout       Wait timeout milliseconds for each reply.
    -4               Force using IPv4.
    -6               Force using IPv6.
```

10.getmac

Another very simple command that shows the MAC address of your network interfaces.



```
C:\Users\MITS>getmac

Physical Address    Transport Name
=================== ==========================================================
74-56-3C-A5-E3-B0   \Device\Tcpip_{CA00E7C3-11CF-40E4-A271-8C3095E839E5}
```