

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY

(FISAT)TM

HORMIS NAGAR, MOOKKANNOOR

ANGAMALY-683577



'FOCUS ON EXCELLENCE'

LABORATORY RECORD

Name : KRISHNAPRIYA V M

Branch : MCA

Semester : SECOND

Batch : B

Roll No : 11

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University Exam.Reg. No:

CERTIFICATE

Certified that this is the Bonafide record of the Practical work done by

Mr/Ms in the

..... Laboratory of the Federal Institute of

Science and Technology during the academic year

Signature of Staff in Charge

Signature of H.O.D

Name :

Name:

Date :

Date of University practical examination

Signature of

Signature of

Internal Examiner

External Examiner

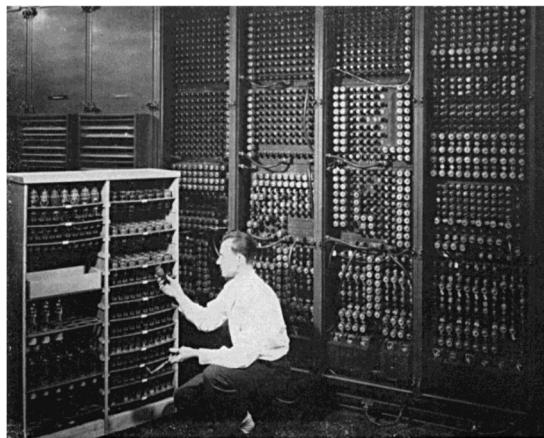
EXPERIMENT -1

1. BASIC INTRODUCTORY CONCEPT OF COMPUTER HARDWARE

1.1 What is Computer?

A computer is a programmable electronic device that accepts raw data as input and processes it with a set of instructions (a program) to produce the result as output. It renders output just after performing mathematical and logical operations and can save the output for future use. It can process numerical as well as non-numerical calculations.

1.2 History of Computers

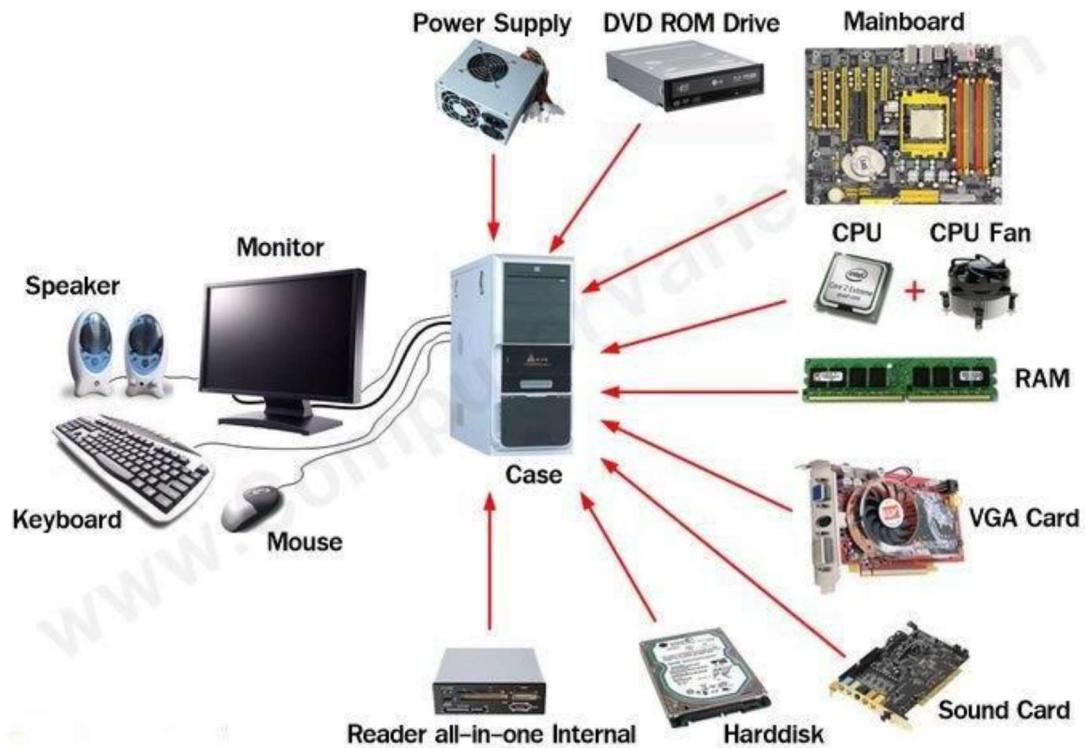


Replacing a bad tube meant checking among ENIAC's 19,000 possibilities.

Since the evolution of humans, devices have been used for calculations for thousands of years. One of the earliest and well-known devices was an abacus. Then in 1822, the father of computers, **Charles Babbage** began developing the first mechanical computer.

1.3 Computer Hardware

Computer hardware includes the physical parts of a computer, such as the case, central processing unit (CPU), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard. Hardware is typically directed by the software to execute any command or instruction. A combination of hardware and software forms a usable computing system, although other systems exist with only hardware.



1.4 The following are the basic components that will be detailed :-

1.4.1 Motherboard

1.4.2. RAM Modules

1.4.3. Daughter cards

1.4.4 Bus slots

1.4.5. SMPS

1.4.6. Internal Storage Devices

1.4.7. Interfacing Ports

1.4.1 MOTHERBOARD

A motherboard (also called mainboard, main circuit board, system board, baseboard, planar board ,logic 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.



ComputerHope.com

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 daughter cards: soundcards, video

cards, network cards, host bus adapters, TV tuner cards, IEEE 1394 cards; and a variety of other custom components.

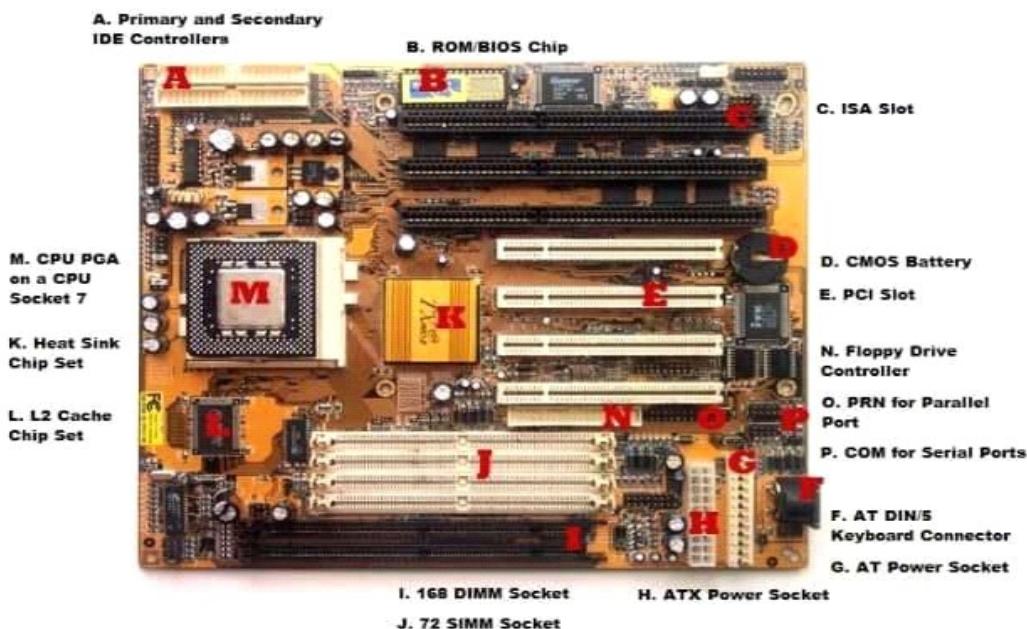
1.4.1.1 FEATURES OF MOTHERBOARD

- Motherboard varies greatly in supporting various types of components.
- Motherboard supports a single type of CPU and few types of memories.
- Video cards, hard disks, sound cards have to be compatible with the motherboard to function properly.
- Motherboards, cases, and power supplies must be compatible to work properly together.

1.4.1.2 TYPES OF MOTHERBOARD

1.4.1.2.1 AT Motherboard

These motherboards have bigger physical dimensions of hundreds of millimetres and hence they are not the right fit for the mini desktop category of computers.



1.4.1.2.2 ATX Motherboards

ATX denotes Advanced technology extended, It was developed by Intel during the 1990s and it was an improved version over an earlier version of AT motherboard. It is smaller in size when compared to AT and it provides interchangeability of the connected components.

1.4.1.2.3 BTX Motherboard

BTX denotes Balanced Technology Extended, intended to manage demands of new technologies in terms of more power requirements hence generation of more heat.

1.4.1.2.4 Pico BTX Motherboard

These boards are smaller in size and hence the word Pico. Two expansion slots are supported in spite of being sharing the top half of BTX. Half-height or riser cards are its unique features and it supports the demands of digital applications.

1.4.1.2.5 Mini ITX Motherboard

It's a miniature version of motherboard. Designed in the early 2000s and its dimension is 17 x 17 cm. Mainly used in small form factor (SFF) computer due to its lower power consumption and faster cooling ability.

1.4.1.3 MAIN COMPONENTS OF MOTHERBOARD

1.4.1.3.1 FLOPPY DISC CONTROLLER

A floppy disk controller (FDC) is an electronic chip controller used as an interface between a computer and a floppy disk drive. Modern computers have this chip embedded in the motherboard, whereas they were a separate component when they were originally introduced.

A floppy disk controller (FDC) is a specially designed chip that controls the reading and writing functionality of a floppy drive. An FDC can support up to four floppy disk drives at a time. The controller is connected to the system bus of the CPU and appears as a set of I/O ports to the computer. It is usually also linked to a serial bus of the direct memory access (DMA) controller. In an x86 computer, the floppy disk controller uses IRQ6, whereas interrupt schemes are used on other systems. Data transmission is often done by FDC while in DMA mode.



Floppy disk controller functions (FDC)

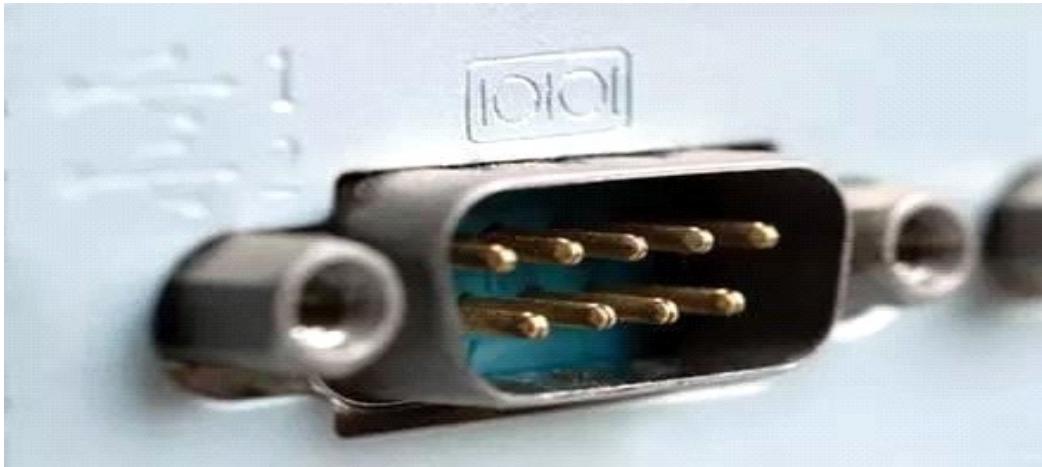
- Translate data bits into FM, MFM, M²FM, or GCR format to be able to record them
- Interpret and execute commands such as seek, read, write, format, etc.
- Error detection with check sums generation and verification, like CRC
- Synchronize data with phase-locked loop(PLL)

1.4.1.3.2 Serial Ports



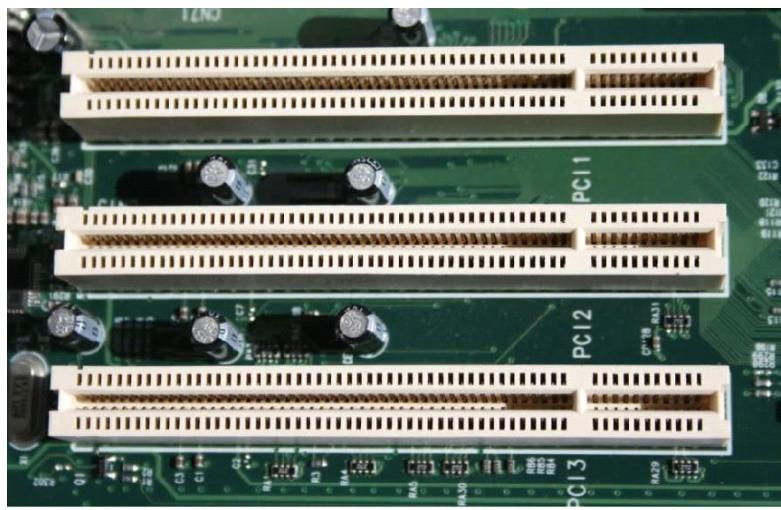
Serial Ports provide an interface to connect serial lines to prepare a serial communication. Serial ports are typically used in modem, mouse, security cameras etc. A Serial port uses DB-9 connector, a 9 pin D-Shaped Connector which connects to the transmission line. A serial port provides a serial communication using one line and thus have no dependency on other wire's speed and its length can be extended as per the need.

1.4.1.3.3 Parallel Ports



Parallel ports provide an interface to connect multiple lines to prepare a parallel communication to send large data at a time. Parallel ports are used in connecting printers, hard-drives, CD-drives etc. All lines speed should be same to avoid error and cross-talk issues. To avoid such issues, the wires are kept small in length. A parallel port uses D-25 connector, a 25 pin D- Shaped connector which connects to the transmission wires.

1.4.1.3.4 The Expansion Buses



An expansion bus is an input/output pathway from the CPU to peripheral devices and it is typically made up of a series of slots on the motherboard. Expansion boards(cards) plug into the bus. PCI is the most common expansion bus in a PC and other hardware platforms. PCI stands for Peripheral Component Interface; PCI slot allows you to insert expansion cards into your computer. Buses carry signals such as data, memory addresses, power, and control signals from component to component. Other types of buses include

ISA and EISA. Expansion buses enhance the PCs capabilities by allowing users to add missing features in their computers by slotting adapter cards into expansion slots.

1.4.1.3.5 The Computer Chip-sets



A chipset is a group of small circuits that coordinate the flow of data to and from a PC's key components. These key components include the CPU itself, the main memory, the secondary cache, and any devices situated on the buses. A chip set also controls data flow to and from hard disks and other devices connected to the IDE channels.

A computer has got two main chipsets:

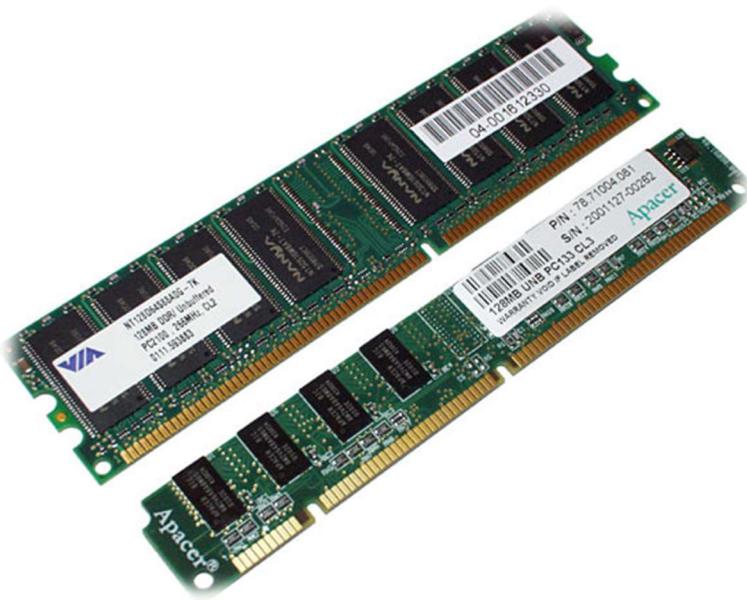
- The North Bridge (also called the memory controller) is in charge of controlling transfers between the processor and the RAM, which is why it is located physically near the processor. It is sometimes called the GMCH, for Graphic and Memory Controller Hub.
- The South Bridge (also called the input/output controller or expansion controller) handles communications between slower peripheral devices. It is also called the ICH (I/O Controller Hub). The term "bridge" is generally used to designate a component which connects two buses.

Chipset manufacturers include SIS, VIA, ALI, and OPTI.

1.4.2. RANDOM ACCESS MEMORY

1.4.2.1. Introduction

RAM, which stands for Random Access Memory, is a hardware device generally located on the motherboard of a computer and acts as an internal memory of the CPU. It allows CPU store data, program, and program results when you switch on the computer. It is the read and write memory of a computer, which means the information can be written to it as well as read from it.



RAM comes in the form of a chip that is individually mounted on the motherboard or in the form of several chips on a small board connected to the motherboard. It is the main memory of a computer. It is faster to write to and read from as compared to other memories such as a hard disk drive (HDD), solid-state drive (SSD), optical drive, etc.

A computer's performance mainly depends on the size or storage capacity of the RAM. If it does not have sufficient RAM (random access memory) to run the OS and software programs, it will result in slower performance. So, the more RAM a computer has, the faster it will work. Information stored in RAM is accessed randomly, not in a sequence as on a CD or hard drive. So, its access time is much faster.

1.4.2.2. CHARACTERISTICS OF RAM

1.4.2.2.1. SDRAM AND DDR

Memory modules are labelled with either SDRAM (Synchronous Dynamic Random-Access Memory) or DDR (Double Data Rate). DDR RAM, as the "double data rate" name suggests, offers much faster speeds than SDRAM. Each generation of DDR, such as DDR2 and DDR3, offers performance improvements over the one preceding it.

1.4.2.2.2. SPEED

The two numbers often quoted first on memory module specifications -- for example, "DDRxxx/PCxxxx" -- indicate the maximum clock speed and maximum transfer rate the device can operate at -- and the higher the better. The stated clock speed is actually double the real figure, so a stick of RAM labelled DDR3-1333 PC3200 offers a clock speed of 666 MHz and a transfer rate of 3,200 MB/s.

1.4.2.2.3 PINS

Essentially, the number of pins a memory module has indicates the number of connections it has to the motherboard -- and thus which motherboards it's compatible with. More pins mean more data can be transferred at once, for faster operation overall, though performance is based on a variety of different factors, including CPU speed and the motherboard configuration.

1.4.2.2.4 VOLTS

The voltage rating associated with a memory module -- for example, 2.5 V -- indicates how much power it draws from the motherboard in order to operate properly. RAM sticks that can work at lower voltages use up less power and give off less heat, and are therefore more suitable for smaller systems such as laptops.

1.4.2.2.5 CAS LATENCY

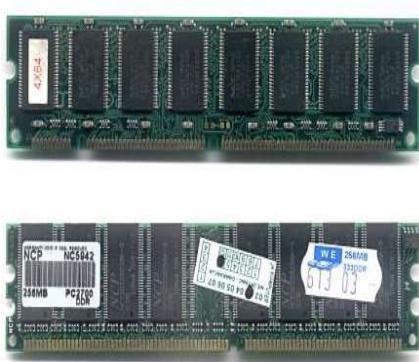
CAS (Column Address Strobe) Latency, sometimes abbreviated to just "CL," indicates the time it takes for a memory module to return data to the CPU. A lower CAS Latency indicates RAM that performs faster.

1.4.2.2.6 TIMING

Memory modules feature other timings besides CAS Latency, usually listed as a series of numbers after the other specifications. In order after CAS Latency, they are RAS (Row Address Strobe) to CAS delay, RAS Precharge, Active to Precharge delay and, optionally, command rate. These timings are only really of interest to advanced technical users, as the impact they have on performance is very small.

1.4.2.2.7 REDUNDANCY

The redundancy built into a memory module indicates its ability to recover from errors and to alert the operating system to a problem, rather than just allowing it to crash and lose your data. More expensive and critical server memory uses Error Checking and Correcting Redundancy, or ECC, in order to detect and correct errors wherever possible.

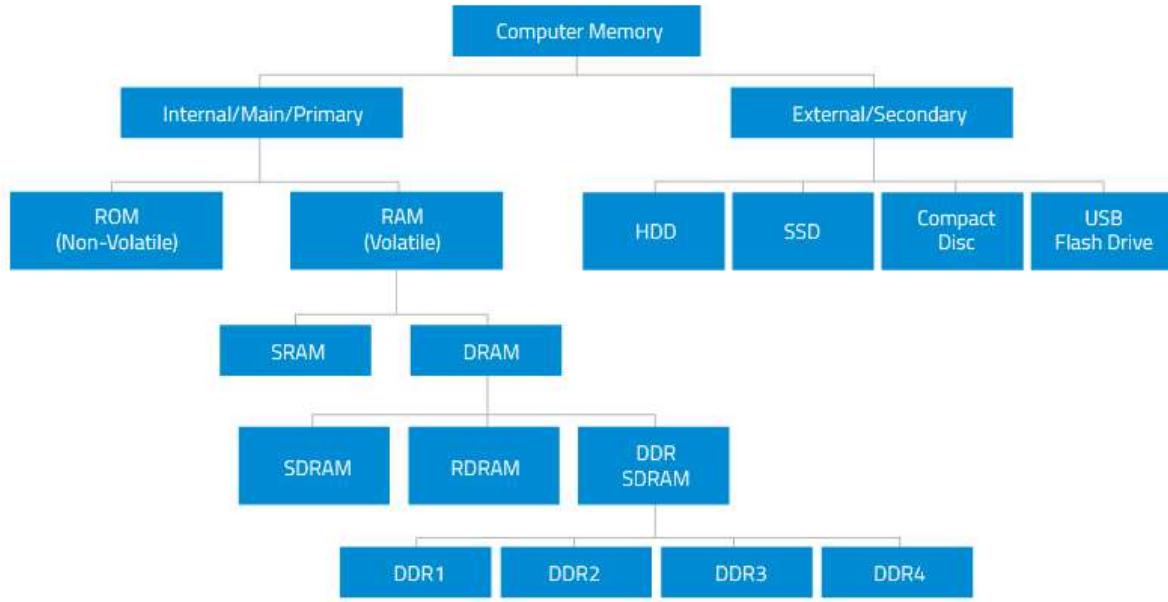


1.4.2.3. Different Types of RAM

RAM(Random Access Memory) is a part of computer's Main Memory which is directly accessible by CPU. RAM is used to Read and Write data into it which is accessed by CPU randomly. RAM is volatile in nature, it means if the power goes off, the stored information is lost. RAM is used to store the data that is currently processed by the CPU. Most of the programs and data that are modifiable are stored in RAM.

Integrated RAM chips are available in two form:

1. SRAM(Static RAM)
2. DRAM(Dynamic RAM)



1.4.2.3.1 SRAM

The SRAM memories consist of circuits capable of retaining the stored information as long as the power is applied. That means this type of memory requires constant power. SRAM memories are used to build Cache Memory.

1.4.2.3.2 DRAM

DRAM stores the binary information in the form of electric charges that applied to capacitors. The stored information on the capacitors tend to lose over a period of time and thus the capacitors must be periodically recharged to retain their usage. The main memory is generally made up of DRAM chips.

1.4.2.4. Functions

1.4.2.4.1. Reading Files

Hard drives can store vast numbers of files, but compared to other computer components, drives run very slowly. Accessing hard drive files -- especially when those files are scattered across the drive due to fragmentation -- requires the drive to move its mechanical read/write head back and forth and to wait for the spinning platters to spin into the correct position. Even though drives spin at thousands of rotations per minute, this process causes a noticeable delay when reading files. To lessen the slowdown,

computers store files in RAM after the files are first read from the drive. RAM has no moving parts, so the files can load very quickly during subsequent uses.

1.4.2.4.2 Temporary Storage

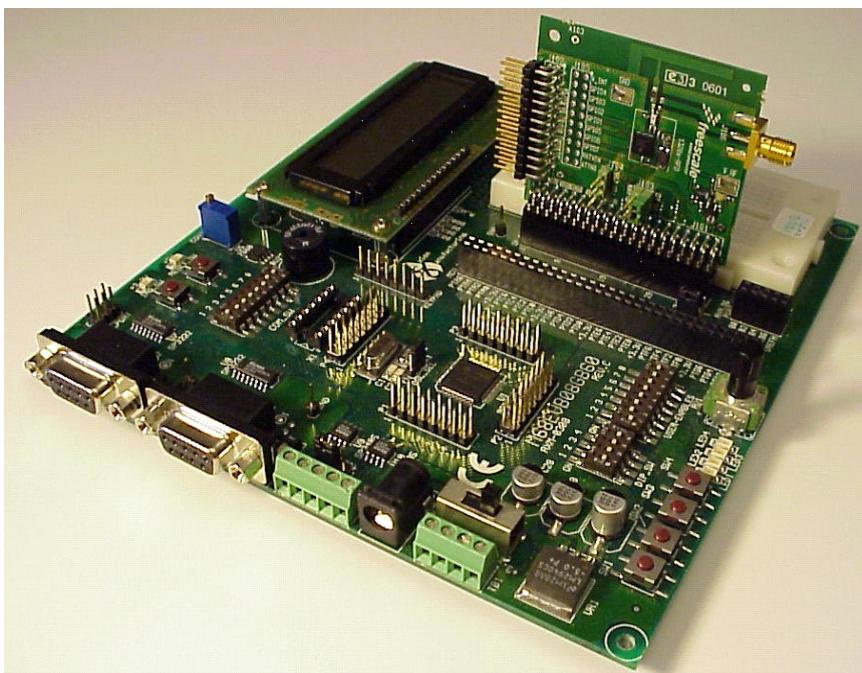
In addition to storing files read from the hard drive, RAM also stores data that programs are actively using but that doesn't need to be saved permanently. By keeping this data in RAM, programs can work with it quickly, improving speed and responsiveness.

1.4.2.4.3 RAM Size

If RAM works so much faster than the hard drive, why not load all of the computer's data into RAM? One major reason: computers have far less RAM than drive space. As of publication, hard drive sizes range from a few hundred gigabytes in laptops to 10TB in high-end enterprise systems. Most home computers have between 1 and 4TB of drive space.

1.4.3 DAUGHTER CARD

Referred to as a piggyback board and **daughter card**, a daughterboard is an expansion board that connects directly to the motherboard and gives added functionality.



Motherboard with daughter card

To disable a daughter board, the user must physically remove it from the motherboard. Daughter boards do not provide new functions to the circuit like an expansion but they extend the circuitry of the circuit in which they are plugged into.

1.4.3.1 Functionalities of daughter board:

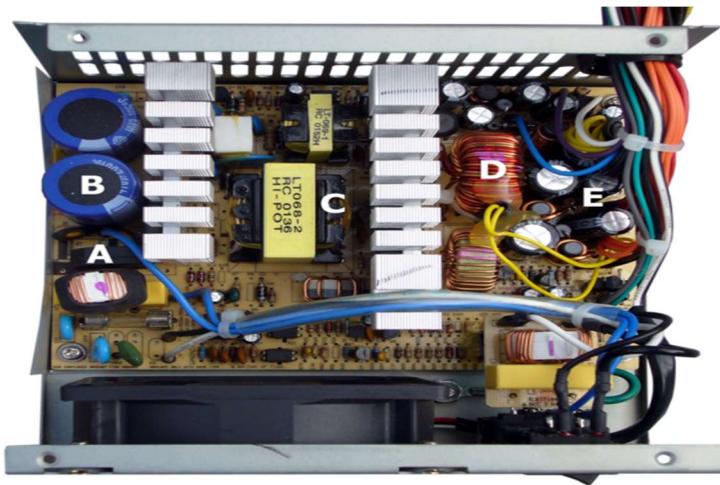
- It is known as the piggyback board, riser card, daughtercard etcetera.
- A daughter board is smaller than a motherboard and may have some slots like the motherboard.
- A daughter board is a printed circuit board which is connected to the motherboard or expansion card.
- Unlike expansion card, daughter boards are directly connected to the motherboard by soldering.
- Daughter boards do not provide new functions to the circuit like an expansion but they extend the circuitry of the circuit in which they are plugged into.
- Daughter boards are released by the vendors as an update of motherboard or expansion card.

1.4.3.2 List of daughter cards

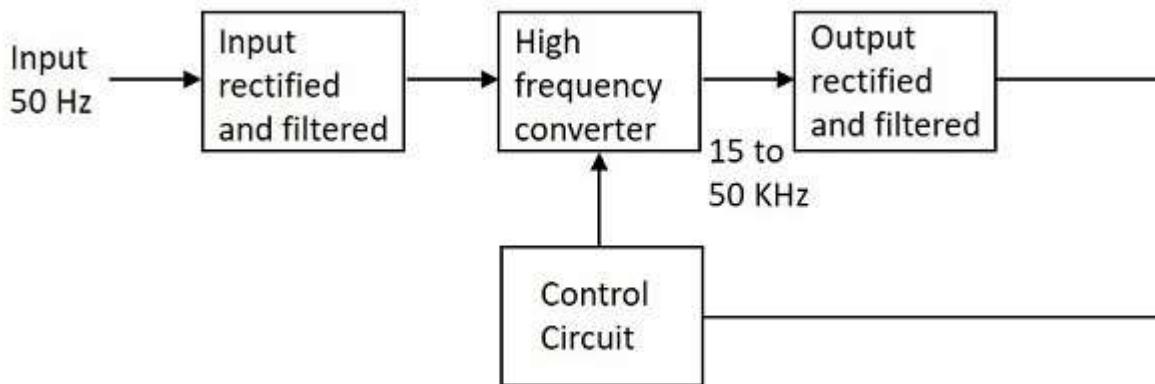
- Video Card: This is also referred to as the graphics adapter, display adapter or video adapter.
- Sound Card: To handle sound, to insert a microphone or connect a speaker this sound card is used.
- Network Interface Card: This is also referred as NIC. The computer can be connected to a network only with the use of this network interface card.
- Ethernet Card: Ethernet card is used to connect computers to computers. A cable is used to connect the Ethernet cards in each computer to make a network.

1.4.4. SWITCHED- MODE POWER SUPPLY

Switched-mode power supply Introduction A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Its function is to convert a level of voltage to the voltage or current required by the client through different forms of architecture.



WORKING



The working of SMPS is simply understood by knowing that the transistor used in LPS is used to control the voltage drop while the transistor in SMPS is used as a controlled switch. The AC input supply signal 50 Hz is given directly to the rectifier and filter circuit combination without using any transformer. A fast switching device such as a Power transistor is employed in this section, which switches ON and OFF according to the variations and this output is given to the primary of the transformer. This is a regulated output voltage which is then given to the control circuit, which is a feedback circuit

1.4.5. INTERNAL STORAGE DEVICES

A storage device is any type of computing hardware that is used for storing, porting or extracting data files and objects. Storage devices can hold and store information both temporarily and permanently. They may be internal or external to a computer.

Some storage devices are classed as 'internal' which means they are inside the computer case. At the most basic level, internal storage is needed to hold the operating system so that the computer is able to access the input and output devices. It will also be used to store the applications software that you use and more than likely, the original copies of your data files.

Internal storage allows the data and applications to be loaded very rapidly into memory, ready for use. The data can be accessed much faster than data which is stored on an external storage device. This is because internal storage devices are connected directly to the motherboard and its data bus whereas external devices are connected through a hardware interface such as USB, which means they are considerably slower to access.

The main disadvantage of internal storage is that when the hard disk fails (and it will), all the data and applications may be lost. This can be avoided to some extent by using more than one hard disk within the machine. Each hard disk has a copy of all the data, so if one fails the other can carry on. This is called a RAID array. An alternative is to use external drives for backup

1.4.5.1. Examples of Internal storage devices

- Hard Disk
- SSD
- RAM

1.4.5.1.1. HARD DISK

A **hard disk drive** (sometimes abbreviated as a **hard drive**, **HD**, or **HDD**) is a non-volatile data storage device. It is usually installed internally in a computer, attached directly to the disk controller of the computer's motherboard. It contains one or more platters, housed inside of an air-sealed casing. Data is written to the platters using a magnetic head, which moves rapidly over them as they spin.

Internal hard disks reside in a drive bay, connected to the motherboard using an ATA, SCSI, or SATA cable. They are powered by a connection to the computer's PSU (power supply unit).

Hard disk, Magnetic storage medium for a microcomputer. Hard disks are flat, circular plates made of aluminum or glass and coated with a magnetic material. Hard disks for personal computers can store up to several gigabytes (billions of bytes) of information. Data are stored on their surfaces in concentric tracks. A small electromagnet, called a magnetic head, writes a binary digit (1 or 0) by magnetizing tiny spots on the spinning disk in different directions and reads digits by detecting the magnetization direction of the spots. A computer's hard drive is a device consisting of several hard disks, read/write heads, a drive motor to spin the disks, and a small amount of circuitry, all sealed in a metal case to protect the disks from dust. In addition to referring to the disks themselves, the term hard disk is also used to refer to the whole hard drive.

Computers rely on hard disk drives (HDDs) to store data permanently. They are storage devices used to save and retrieve digital information that will be required for future reference.

Hard drives are non-volatile, meaning that they retain data even when they do not have power. The information stored remains safe and intact unless the hard drive is destroyed or interfered with. The information is stored or retrieved in a random-access manner as opposed to sequential access. This implies that blocks of data can be accessed at any time they are required without going through other data blocks.



1.4.5.1.2. SOLID STATE DRIVE

A solid-state drive (SSD) is a solid-state storage device that uses integrated circuit assemblies to store data persistently , typically using flash memory, and functioning as secondary storage in the hierarchy of computer storage. It is also sometimes called a **solid-state device** or a **solid-state disk**, even though SSDs lack the physical spinning disks and movable read–write heads used in hard disk drives (HDDs) and floppy disks.

Compared with electromechanical drives, SSDs are typically more resistant to physical shock, run silently, and have quicker access time and lower latency. SSDs store data in semiconductor cells. SSDs have a limited number of writes, and slow as they reach storage capacity.



1.4.5.1.3. RAM

RAM (Random Access Memory) is the internal memory of the CPU for storing data, program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. RAM is small, both in terms of its physical size and in the amount of data it can hold.



RAM is of two types –

- Static RAM (SRAM)
- Dynamic RAM (DRAM)

1.4.5.2. Static RAM (SRAM)

The word **static** indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on a regular basis.

1.4.5.3. Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually **refreshed** in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small

1.4.5.4 SOME OTHER STORAGE DEVICES

- Magnetic Storage Device
- Optical Storage Device
- Flash Memory Device
- Online and Cloud
- Paper Storage



1.4.6 . COMPUTER PORTS

1.4.6.1 WHAT IS MEANT BY A PORT?

A port in a computer network is a communication endpoint whereas, in an operating system, it is a logical construct, recognizes precise method otherwise a network service type. These endpoints recognize the combination of every protocol and its address through 16-bit unsigned numbers, called the port number. The protocols that use port numbers are the TCP (Transmission Control Protocol) and UDP (User Datagram Protocol). The port number in every computer networking uses an IP address of the type of protocol & the host

1.4.6.2 What is Port in Computer/Computer Port?

A computer port or a communication port is a connection point used as an interface between the computer & the peripherals like keyboard, mouse, printer, display unit, monitor, flash drive and speaker. The computer port transmits the data from any peripheral to the computer. In general, the communication ports are available in two type like Serial Ports as well as Parallel Ports.



1.4.6.3 Characteristics of Computer Ports

The characteristics of the computer port include the following.

- It is an interface between external devices as well as a computer.

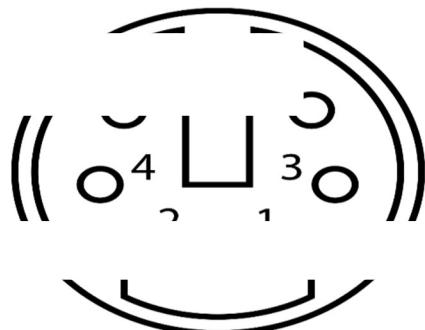
- Ports on the motherboard can be connected using an external device cable by plugging in.
- The external devices which are connected through via ports are the keyboard, mouse, microphone, monitor, speakers, etc.

1.4.6.4 Types of Computer Ports

There are different types of ports available in a computer network. Some of them are:

- PS/02
- Serial Port
- Parallel Port
- Ethernet
- VGA Port
- USB Port
- DVI Port
- HDMI Port
- Display Port

1.4.6.4.1 PS/2 PORTS: PS/2 is a type of port used by older computers for connecting input devices such as keyboards and mice. The port was introduced with IBM's Personal System/2 computer in 1987 (which was abbreviated "PS/2"). The PS/2 port has six pins and is roughly circular in shape



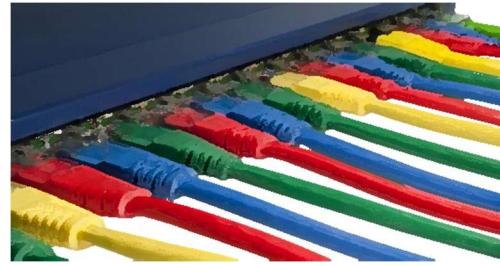
1.4.6.4.2 SERIAL PORT: A serial port is an interface that allows a PC to transmit or receive data one bit at a time. It is one of the oldest types of interfaces commonly used to connect printers and external modems to a PC. Compared to a parallel port, the data transfer rate of a serial port is slower. Normally, a serial port is a male port, while a parallel port is a female port. The serial port standard is RS-232. This standard is used for transmitting serial communication between devices,



1.4.6.4.3 PARALLEL PORT: Parallel port is a type of interface found on computers (personal and otherwise) for connecting peripherals. Parallel ports send multiple bits of data at once (parallel communication), as opposed to serial communication, in which bits are sent one at a time. Parallel port is an interface between computer and peripheral devices like printers with parallel communication



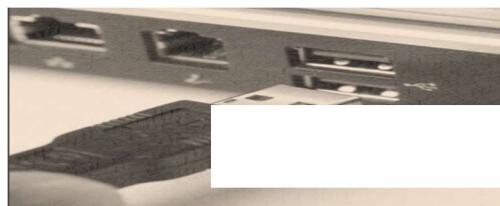
1.4.6.4.4 ETHERNET: A Ethernet port is a jack or socket on a computer that allows the use of an Ethernet connector. These ports are essential in allowing the creation of local area networks (LANs). An Ethernet port is usually found on networking devices, including computers, routers, video game consoles, modems, and televisions. Ethernet is a communication system that allows multiple local devices to share information and work together.



1.4.6.4.5 VGA PORT: Abbreviated VGA, Video Graphics Array is a standard type of connection for video devices such as monitors and projectors. Generally, VGA refers to the types of cables, ports, and connectors used to connect monitors to video cards.



1.4.6.4.6 USB PORT: A USB port is a common interface for personal computers and consumer electronics devices. USB stands for Universal Serial Bus, USB ports allow USB devices to be connected to each other with and transfer digital data over USB cables



1.4.6.4.7 HDMI PORT: Full form of HDMI is **High-Definition Multimedia Interface**. HDMI is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device..

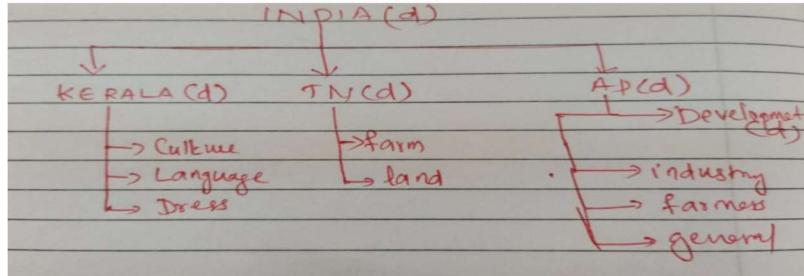


1.4.6.4.8 DISPLAY PORT: DisplayPort is a digital display interface developed by a consortium of PC and chip manufacturers and standardized by the Video Electronics Standards Association. Display Port is a digital display interface with optional multiple channel audio and other forms of data. Display Port is developed with an aim of replacing VGA and DVI ports as the main interface between a computer and monitor.



EXPERIMENT -2

2.1. Linux commands



Q1. Create the directories and files as given in the above directory structure. Directories are mentioned as (d). Files should be filled with necessary text data

```

ubuntu@ubuntu-VirtualBox:~$ mkdir INDIA
ubuntu@ubuntu-VirtualBox:~$ cd INDIA
ubuntu@ubuntu-VirtualBox:~/INDIA$ mkdir KERALA
ubuntu@ubuntu-VirtualBox:~/INDIA$ mkdir TN
ubuntu@ubuntu-VirtualBox:~/INDIA$ mkdir AP
ubuntu@ubuntu-VirtualBox:~/INDIA$ cd KERALA
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ cat>culture.txt
This is about the culture of kerala.
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ cat>dress.txt
saree
kurti
skirt
churidar
pant
shirt
t shirt
frock
mundu
jeans
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ cat>language.txt
Malayalam is the language of Kerala
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ ls
culture.txt dress.txt language.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ cd ..
ubuntu@ubuntu-VirtualBox:~/INDIA$ cd TN
ubuntu@ubuntu-VirtualBox:~/INDIA/TN$ cat>farm.txt
In Tamil Nadu, major plantation crops are tea,coffee,rubber ,arecanut,bamboo and cashew
ubuntu@ubuntu-VirtualBox:~/INDIA/TN$ cat>land.txt
Tamil Nadu is a state in southern India. It's capital and largest city is Chennai.
ubuntu@ubuntu-VirtualBox:~/INDIA/TN$ cd ..
  
```

```

ubuntu@ubuntu-VirtualBox:~/INDIA$ cd TN
ubuntu@ubuntu-VirtualBox:~/INDIA/TN$ cat>farm.txt
In Tamil Nadu, major plantation crops are tea,coffee,rubber ,arecanut,bamboo and cashew
ubuntu@ubuntu-VirtualBox:~/INDIA/TN$ cat>land.txt
Tamil Nadu is a state in southern India. It's capital and largest city is Chennai.
ubuntu@ubuntu-VirtualBox:~/INDIA/TN$ cd ..
ubuntu@ubuntu-VirtualBox:~/INDIA$ cd AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ mkdir DEVELOPMENT
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cat>industry.txt
Main industries in AP are IT industry,Textiles and Apparels, Automobiles and Auto components industry and Poultry farming
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cat>general.txt
Andhra Pradesh is a state in the south-eastern coastal region of India. It is the seventh largest state by area covering in india
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cat>farmers.txt
Andhra pradesh's total population, approximately 62% or 46 lakh families dependent on the agriculture
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ 
  
```

Q2. List your present working directory

```
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls
DEVELOPMENT farmers.txt general.txt industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q3. Move to the root directory.

```
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cd ..
ubuntu@ubuntu-VirtualBox:~/INDIA$ cd ..
ubuntu@ubuntu-VirtualBox:~$
```

Q4. Copy the file ‘Culture’ to the folder AP

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA
ubuntu@ubuntu-VirtualBox:~/INDIA$ cp -r KERALA/culture.txt AP
ubuntu@ubuntu-VirtualBox:~/INDIA$ cd AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls
culture.txt DEVELOPMENT farmers.txt general.txt industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q5. Display the content of the file ‘general’

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cat general.txt
Andhra Pradesh is a state in the south-eastern coastal region of India. It is the seventh largest state by area covering in india
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q6. Move the file ‘language’ to the directory AP/Development

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cat general.txt
Andhra Pradesh is a state in the south-eastern coastal region of India. It is the seventh largest state by area covering in india
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cd ..
ubuntu@ubuntu-VirtualBox:~/INDIA$ mv KERALA/language.txt AP/DEVELOPMENT
ubuntu@ubuntu-VirtualBox:~/INDIA$ cd AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ cd DEVELOPMENT
ubuntu@ubuntu-VirtualBox:~/INDIA/AP/DEVELOPMENT$ ls
language.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP/DEVELOPMENT$
```

Q7. List all the files in the folder AP

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls
culture.txt DEVELOPMENT farmers.txt general.txt industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q8. List first 10 lines of the file ‘Dress’

```
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ cat>dress.txt
saree
kurti
skirt
churidar
pant
shirt
t shirt
half saree
frock
mundu
jeans
set saree
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ head -n 10 dress.txt
saree
kurti
skirt
churidar
pant
shirt
t shirt
half saree
frock
mundu
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$
```

Q9. List the last 10 lines of the file ‘Dress’

```
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ tail -n 10 dress.txt
skirt
churidar
pant
shirt
t shirt
half saree
frock
mundu
jeans
set saree
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$
```

Q10. List all the files in AP in long listing format

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls -al
total 28
drwxrwxr-x 3 ubuntu ubuntu 4096 Aug 28 09:54 .
drwxrwxr-x 5 ubuntu ubuntu 4096 Aug 27 22:32 ..
-rw-rw-r-- 1 ubuntu ubuntu 37 Aug 28 09:54 culture.txt
drwxrwxr-x 2 ubuntu ubuntu 4096 Aug 28 10:01 DEVELOPMENT
-rw-rw-r-- 1 ubuntu ubuntu 102 Aug 27 23:37 farmers.txt
-rw-rw-r-- 1 ubuntu ubuntu 130 Aug 27 23:22 general.txt
-rw-rw-r-- 1 ubuntu ubuntu 122 Aug 27 23:08 industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q11. List the files in AP which begin with the character ‘f’

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls
culture.txt  DEVELOPMENT  farmers.txt  general.txt  industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls -d f*
farmers.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q12. List the files page by page

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls -la|more
total 28
drwxrwxr-x 3 ubuntu ubuntu 4096 Aug 28 09:54 .
drwxrwxr-x 5 ubuntu ubuntu 4096 Aug 27 22:32 ..
-rw-rw-r-- 1 ubuntu ubuntu 37 Aug 28 09:54 culture.txt
drwxrwxr-x 2 ubuntu ubuntu 4096 Aug 28 10:01 DEVELOPMENT
-rw-rw-r-- 1 ubuntu ubuntu 102 Aug 27 23:37 farmers.txt
-rw-rw-r-- 1 ubuntu ubuntu 130 Aug 27 23:22 general.txt
-rw-rw-r-- 1 ubuntu ubuntu 122 Aug 27 23:08 industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q13. Remove the file ‘general’

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/AP
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls
culture.txt  DEVELOPMENT  farmers.txt  general.txt  industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ rm -i general.txt
rm: remove regular file 'general.txt'? y
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$ ls
culture.txt  DEVELOPMENT  farmers.txt  industry.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/AP$
```

Q14. Change the permission of the file ‘Culture’ as only read permission to all

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/KERALA
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ ls
culture.txt dress.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ ls -l culture.txt
-rw-rw-r-- 1 ubuntu ubuntu 37 Aug 27 22:36 culture.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ chmod g-wx culture.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ ls -l culture.txt
-rw-r--r-- 1 ubuntu ubuntu 37 Aug 27 22:36 culture.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$
```

Q15. List the lines of the file which contains a string ‘Saree’

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/KERALA
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ grep 'saree' dress.txt
saree
half saree
set saree
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$
```

Q16. Use man command to get the syntax of **wc** command

WC(1)	User Commands	WC(1)
NAME		
wc - print newline, word, and byte counts for each file		
SYNOPSIS		
wc [OPTION]... [FILE]... wc [OPTION]... --files0-from=F		
DESCRIPTION		
Print newline, word, and byte counts for each FILE, and a total line if more than one FILE is specified. A word is a non-zero-length sequence of characters delimited by white space.		
With no FILE, or when FILE is -, read standard input.		
The options below may be used to select which counts are printed, always in the following order: newline, word, character, byte, maximum line length.		
-c, --bytes print the byte counts		
-m, --chars print the character counts		
-l, --lines print the newline counts		
--files0-from=F read input from the files specified by NUL-terminated names in file F; If F is - then read names from standard input		
<u>Manual page wc(1) line 1 (press h for help or q to quit)</u>		

Q17. Count the number of characters, words, lines in the directory listing

```
ubuntu@ubuntu-VirtualBox:~$ cd INDIA/KERALA
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ ls
culture.txt dress.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$ wc dress.txt
12 15 85 dress.txt
ubuntu@ubuntu-VirtualBox:~/INDIA/KERALA$
```

Q18. Put a listing of the files in your directory into a file called **filelist**.

```
ubuntu@ubuntu-VirtualBox:~$ ls -l >>filelist.txt
ubuntu@ubuntu-VirtualBox:~$ cat filelist.txt
total 36
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Desktop
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Documents
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Downloads
-rw-rw-r-- 1 ubuntu ubuntu 0 Aug 28 11:13 filelist.txt
drwxrwxr-x 5 ubuntu ubuntu 4096 Aug 27 22:32 INDIA
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Music
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Pictures
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Public
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Templates
drwxr-xr-x 2 ubuntu ubuntu 4096 Aug 27 19:00 Videos
ubuntu@ubuntu-VirtualBox:~$
```

Q19. List the status of all process running in your system

```
ubuntu@ubuntu-VirtualBox:~$ ps
  PID TTY      TIME CMD
1459 pts/0    00:00:00 bash
2081 pts/0    00:00:00 man
2091 pts/0    00:00:00 pager
2198 pts/0    00:00:00 ps
ubuntu@ubuntu-VirtualBox:~$ ps -aux
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root        1  0.0  0.9 167532  9560 ?        Ss  08:32  0:05 /sbin/init splash
root        2  0.0  0.0     0   0 ?        S   08:32  0:00 [kthreadd]
root        3  0.0  0.0     0   0 ?        I<  08:32  0:00 [rcu_gp]
root        4  0.0  0.0     0   0 ?        I<  08:32  0:00 [rcu_par_gp]
root        6  0.0  0.0     0   0 ?        I<  08:32  0:00 [kworker/0:0H-kblock]
root        9  0.0  0.0     0   0 ?        I<  08:32  0:00 [mm_percpu_wq]
root       10  0.0  0.0     0   0 ?        S   08:32  0:00 [ksoftirqd/0]
root       11  0.0  0.0     0   0 ?        I   08:32  0:03 [rcu_sched]
root       12  0.0  0.0     0   0 ?        S   08:32  0:00 [migration/0]
root       13  0.0  0.0     0   0 ?        S   08:32  0:00 [idle_inject/0]
root       14  0.0  0.0     0   0 ?        S   08:32  0:00 [cpuhp/0]
root       15  0.0  0.0     0   0 ?        S   08:32  0:00 [kdevtmpfs]
root       16  0.0  0.0     0   0 ?        I<  08:32  0:00 [netns]
root       17  0.0  0.0     0   0 ?        S   08:32  0:00 [rcu_tasks_kthre]
root       18  0.0  0.0     0   0 ?        S   08:32  0:00 [rcu_tasks_rude_]
root       19  0.0  0.0     0   0 ?        S   08:32  0:00 [rcu_tasks_trace]
root       20  0.0  0.0     0   0 ?        S   08:32  0:00 [kaudittd]
root       21  0.0  0.0     0   0 ?        S   08:32  0:00 [khungtaskd]
root       22  0.0  0.0     0   0 ?        S   08:32  0:00 [oom_reaper]
root       23  0.0  0.0     0   0 ?        I<  08:32  0:00 [writeback]
root       24  0.0  0.0     0   0 ?        S   08:32  0:00 [kcompactd0]
root       25  0.0  0.0     0   0 ?        SN  08:32  0:00 [ksmd]
root       26  0.0  0.0     0   0 ?        SN  08:32  0:00 [khugepaged]
root       72  0.0  0.0     0   0 ?        I<  08:32  0:00 [kintegrityd]
root       73  0.0  0.0     0   0 ?        I<  08:32  0:00 [kblockd]
```

root	74	0.0	0.0	0	0 ?	I<	08:32	0:00 [blkcg_punt_bio]
root	75	0.0	0.0	0	0 ?	I<	08:32	0:00 [tpm_dev_wq]
root	76	0.0	0.0	0	0 ?	I<	08:32	0:00 [ata_sff]
root	77	0.0	0.0	0	0 ?	I<	08:32	0:00 [md]
root	78	0.0	0.0	0	0 ?	I<	08:32	0:00 [edac-poller]
root	79	0.0	0.0	0	0 ?	I<	08:32	0:00 [devfreq_wq]
root	80	0.0	0.0	0	0 ?	S	08:32	0:00 [watchdogd]
root	82	0.0	0.0	0	0 ?	I<	08:32	0:00 [pm_wq]
root	86	0.0	0.0	0	0 ?	S	08:32	0:01 [kswapd0]
root	87	0.0	0.0	0	0 ?	S	08:32	0:00 [ecryptfs-kthrea]
root	89	0.0	0.0	0	0 ?	I<	08:32	0:00 [kthrotld]
root	90	0.0	0.0	0	0 ?	I<	08:32	0:00 [acpi_thermal_pm]
root	91	0.0	0.0	0	0 ?	S	08:32	0:00 [scsi_eh_0]
root	92	0.0	0.0	0	0 ?	I<	08:32	0:00 [scsi_tmf_0]
root	93	0.0	0.0	0	0 ?	S	08:32	0:00 [scsi_eh_1]
root	94	0.0	0.0	0	0 ?	I<	08:32	0:00 [scsi_tmf_1]
root	96	0.0	0.0	0	0 ?	I<	08:32	0:00 [vfio-irqfd-clea]
root	98	0.0	0.0	0	0 ?	I<	08:32	0:00 [ipv6_addrconf]
root	107	0.0	0.0	0	0 ?	I<	08:32	0:00 [kstrp]
root	110	0.0	0.0	0	0 ?	I<	08:32	0:00 [zswap-shrink]
root	111	0.0	0.0	0	0 ?	I<	08:32	0:00 [kworker/u3:0]
root	114	0.0	0.0	0	0 ?	I<	08:32	0:01 [kworker/0:1H-kblock]
root	117	0.0	0.0	0	0 ?	I<	08:32	0:00 [charger_manager]
root	152	0.0	0.0	0	0 ?	S	08:32	0:00 [scsi_eh_2]
root	154	0.0	0.0	0	0 ?	I<	08:32	0:00 [scsi_tmf_2]
root	174	0.0	0.0	0	0 ?	S	08:32	0:00 [jbd2/sda5-8]
root	175	0.0	0.0	0	0 ?	I<	08:32	0:00 [ext4-rsv-conver]
root	214	0.0	1.5	51948	15728 ?	Ss<	08:32	0:01 /lib/systemd/systemd
root	239	0.0	0.5	23820	5076 ?	Ss	08:32	0:01 /lib/systemd/systemd
root	245	0.0	0.0	0	0 ?	S<	08:32	0:00 [loop0]
root	247	0.0	0.0	0	0 ?	S<	08:32	0:00 [loop1]
root	248	0.0	0.0	0	0 ?	S<	08:32	0:00 [loop2]
root	250	0.0	0.0	0	0 ?	S<	08:32	0:00 [loop3]

root	251	0.0	0.0	0	0 ?	S<	08:32	0:00 [loop4]
root	282	0.0	0.0	0	0 ?	S	08:32	0:01 [irq/18-vmwgfx]
root	283	0.0	0.0	0	0 ?	I<	08:32	0:00 [ttm_swap]
root	298	0.0	0.0	0	0 ?	I<	08:32	0:00 [cryptd]
systemd+	472	0.0	1.0	24100	10532 ?	Ss	08:33	0:02 /lib/systemd/systemd
systemd+	474	0.0	0.5	90456	5248 ?	Ssl	08:33	0:02 /lib/systemd/systemd
root	508	0.0	0.7	250524	7496 ?	Ssl	08:33	0:00 /usr/lib/accountsser
root	509	0.0	0.0	2548	760 ?	Ss	08:33	0:00 /usr/sbin/acpid
avahi	511	0.0	0.3	8532	3156 ?	Ss	08:33	0:00 avahi-daemon: runnin
root	512	0.0	0.2	18052	3004 ?	Ss	08:33	0:00 /usr/sbin/cron -f
root	513	0.0	0.7	37212	7576 ?	Ss	08:33	0:00 /usr/sbin/cupsd -l
message+	514	0.0	0.5	8916	5244 ?	Ss	08:33	0:02 /usr/bin/dbus-daemon
root	515	0.0	1.6	420824	16120 ?	Ssl	08:33	0:05 /usr/sbin/NetworkMan
root	529	0.0	1.6	47956	16344 ?	Ss	08:33	0:00 /usr/bin/python3 /us
root	530	0.0	0.9	239020	9696 ?	Ssl	08:33	0:01 /usr/lib/polkit-1
syslog	532	0.0	0.3	224356	3700 ?	Ssl	08:33	0:00 /usr/sbin/rsyslogd -
root	533	0.0	1.6	627820	16268 ?	Ssl	08:33	0:06 /usr/lib/snapd/snapd
root	534	0.0	0.5	244232	5860 ?	Ssl	08:33	0:00 /usr/libexec/switche
root	536	0.0	0.7	16972	7228 ?	Ss	08:33	0:00 /lib/systemd/systemd
root	542	0.0	1.0	395520	10696 ?	Ssl	08:33	0:00 /usr/lib/udisks2/udi
root	545	0.0	0.2	13688	2780 ?	Ss	08:33	0:00 /sbin/wpa_supplicant
avahi	552	0.0	0.0	8352	216 ?	S	08:33	0:00 avahi-daemon: chroot
root	602	0.0	1.1	180576	11420 ?	Ssl	08:33	0:00 /usr/sbin/cups-brows
lp	605	0.0	0.6	15340	6132 ?	S	08:33	0:00 /usr/lib/cups/notifi
lp	606	0.0	0.6	15340	6188 ?	S	08:33	0:00 /usr/lib/cups/notifi
root	615	0.0	0.7	240020	7524 ?	Ssl	08:33	0:00 /usr/sbin/ModemManag
root	623	0.0	1.7	126484	17524 ?	Ssl	08:33	0:00 /usr/bin/python3 /us
root	649	0.0	0.7	248116	7696 ?	Ssl	08:33	0:00 /usr/sbin/gdm3
root	664	0.0	0.9	323036	9180 ?	Sl	08:33	0:00 gdm-session-worker [
whoopsie	681	0.0	1.3	327336	13608 ?	Ssl	08:33	0:00 /usr/bin/whoopsie -f
kernoops	687	0.0	0.2	11264	2104 ?	Ss	08:33	0:00 /usr/sbin/kerneloops
kernoops	689	0.0	0.0	11264	448 ?	Ss	08:33	0:00 /usr/sbin/kerneloops
ubuntu	708	0.0	0.8	19272	8536 ?	Ss	08:33	0:03 /lib/systemd/systemd

ubuntu	709	0.0	0.1	103400	1340	?	S	08:33	0:00	(sd-pam)
ubuntu	728	0.0	1.3	1679088	13748	?	S<sl	08:33	0:01	/usr/bin/pulseaudio
ubuntu	730	0.0	1.5	520136	15388	?	SNsl	08:33	0:00	/usr/libexec/tracker
ubuntu	742	0.0	0.6	248808	6992	?	SLL	08:33	0:00	/usr/bin/gnome-keyring
ubuntu	746	0.0	0.5	172652	5956	tty2	Ssl+	08:33	0:00	/usr/lib/gdm3/gdm-x
ubuntu	761	0.4	3.2	529392	33000	tty2	Rl+	08:33	0:46	/usr/lib/xorg/Xorg v
rtkit	763	0.0	0.2	152940	2984	?	SNsl	08:33	0:00	/usr/libexec/rtkit-d
ubuntu	765	0.0	0.5	9156	5856	?	Ss	08:33	0:02	/usr/bin/dbus-daemon
ubuntu	773	0.0	0.6	248320	6980	?	Ssl	08:33	0:00	/usr/libexec/gvfsd
ubuntu	778	0.0	0.5	382060	5800	?	Sl	08:33	0:00	/usr/libexec/gvfsd-f
ubuntu	790	0.0	0.7	326068	7720	?	Ssl	08:34	0:00	/usr/libexec/gvfs-ud
ubuntu	805	0.0	0.5	244508	5532	?	Ssl	08:34	0:00	/usr/libexec/gvfs-go
ubuntu	809	0.0	2.4	554888	24904	?	Sl	08:34	0:00	/usr/libexec/goa-dae
ubuntu	820	0.0	0.8	327236	8092	?	Sl	08:34	0:00	/usr/libexec/goa-ide
ubuntu	822	0.0	0.7	325360	7836	?	Ssl	08:34	0:01	/usr/libexec/gvfs-af
ubuntu	831	0.0	0.5	244332	5920	?	Ssl	08:34	0:00	/usr/libexec/gvfs-mt
ubuntu	839	0.0	0.6	246608	6376	?	Ssl	08:34	0:00	/usr/libexec/gvfs-gp
root	843	0.0	0.8	260752	8896	?	Ssl	08:34	0:01	/usr/lib/upower/upow
ubuntu	865	0.0	1.3	199560	13880	tty2	Sl+	08:34	0:00	/usr/libexec/gnome-s
ubuntu	932	0.0	0.0	6040	456	?	Ss	08:34	0:00	/usr/bin/ssh-agent /
ubuntu	955	0.0	0.7	383468	7256	?	Ssl	08:34	0:00	/usr/libexec/at-spi-
ubuntu	961	0.0	0.3	7380	3776	?	S	08:34	0:00	/usr/bin/dbus-daemon
ubuntu	996	0.0	0.3	98696	3920	?	Ssl	08:34	0:00	/usr/libexec/gnome-s
ubuntu	1003	0.0	1.4	495228	14220	?	Ssl	08:34	0:00	/usr/libexec/gnome-s
ubuntu	1021	1.3	27.6	3711696	277292	?	Rsl	08:34	2:09	/usr/bin/gnome-shell
ubuntu	1047	0.0	0.8	397096	8648	?	Sl	08:34	0:00	ibus-daemon --panel
ubuntu	1051	0.0	0.7	175184	7160	?	Sl	08:34	0:00	/usr/libexec/ibus-me
ubuntu	1052	0.0	3.1	286100	31164	?	Sl	08:34	0:07	/usr/libexec/ibus-ex
ubuntu	1056	0.0	2.7	208988	27908	?	Sl	08:34	0:01	/usr/libexec/ibus-x1
ubuntu	1058	0.0	0.7	248980	7504	?	Sl	08:34	0:00	/usr/libexec/ibus-po
ubuntu	1070	0.0	0.6	162912	6368	?	Sl	08:34	0:00	/usr/libexec/at-spi2
ubuntu	1074	0.0	0.4	244228	4440	?	Ssl	08:34	0:00	/usr/libexec/xdg-per
ubuntu	1079	0.0	1.3	581620	13948	?	Sl	08:34	0:00	/usr/libexec/gnome-s

ubuntu	1086	0.0	1.9	685772	19552	?	Ssl	08:34	0:00	/usr/libexec/evoluti
ubuntu	1097	0.0	1.9	716364	19876	?	Ssl	08:34	0:00	/usr/libexec/evoluti
ubuntu	1110	0.0	0.5	156220	5344	?	Sl	08:34	0:00	/usr/libexec/dconf-s
ubuntu	1117	0.0	1.8	682064	18680	?	Ssl	08:34	0:00	/usr/libexec/evoluti
ubuntu	1136	0.0	2.0	2607384	20952	?	Sl	08:34	0:00	/usr/bin/gjs /usr/sh
ubuntu	1142	0.0	0.8	326176	8952	?	Sl	08:34	0:00	/usr/libexec/gvfsd-t
ubuntu	1156	0.0	0.7	322540	7372	?	Ssl	08:34	0:00	/usr/libexec/gsd-a11
ubuntu	1157	0.0	2.8	579108	28788	?	Ssl	08:34	0:01	/usr/libexec/gsd-col
ubuntu	1160	0.0	1.4	382992	14436	?	Ssl	08:34	0:00	/usr/libexec/gsd-dat
ubuntu	1161	0.0	0.8	322776	8064	?	Ssl	08:34	0:01	/usr/libexec/gsd-hou
ubuntu	1165	0.0	2.8	356928	28444	?	Ssl	08:34	0:01	/usr/libexec/gsd-key
ubuntu	1168	0.0	3.0	912312	30688	?	Ssl	08:34	0:01	/usr/libexec/gsd-med
ubuntu	1170	0.0	3.1	624356	31860	?	Ssl	08:34	0:01	/usr/libexec/gsd-pow
ubuntu	1173	0.0	1.0	256864	10820	?	Ssl	08:34	0:00	/usr/libexec/gsd-pri
ubuntu	1174	0.0	0.5	465732	5752	?	Ssl	08:34	0:00	/usr/libexec/gsd-rfk
ubuntu	1176	0.0	0.5	244140	5904	?	Ssl	08:34	0:00	/usr/libexec/gsd-scr
ubuntu	1178	0.0	0.9	477584	9996	?	Ssl	08:34	0:00	/usr/libexec/gsd-sha
ubuntu	1181	0.0	0.7	326700	7288	?	Ssl	08:34	0:00	/usr/libexec/gsd-sma
ubuntu	1183	0.0	0.9	330404	9540	?	Ssl	08:34	0:00	/usr/libexec/gsd-sou
ubuntu	1185	0.0	0.7	396500	7872	?	Ssl	08:34	0:00	/usr/libexec/gsd-usb
ubuntu	1190	0.0	2.7	356464	27972	?	Ssl	08:34	0:01	/usr/libexec/gsd-wac
ubuntu	1194	0.0	0.8	326864	8524	?	Ssl	08:34	0:00	/usr/libexec/gsd-wwa
ubuntu	1196	0.0	2.9	357568	29692	?	Ssl	08:34	0:01	/usr/libexec/gsd-xse
ubuntu	1202	0.0	0.5	231800	5244	?	Sl	08:34	0:00	/usr/libexec/gsd-dis
ubuntu	1221	0.0	4.9	647332	49796	?	Sl	08:34	0:01	/usr/libexec/evoluti
ubuntu	1228	0.0	0.7	175176	7436	?	Sl	08:34	0:00	/usr/libexec/ibus-en
ubuntu	1235	0.0	1.4	350824	14768	?	Sl	08:34	0:00	/usr/libexec/gsd-pri
colord	1277	0.0	1.2	257600	12716	?	Ssl	08:34	0:00	/usr/libexec/colord
ubuntu	1371	0.0	0.6	170880	6204	?	Ssl	08:35	0:00	/usr/libexec/gvfsd-m
ubuntu	1381	0.0	5.2	804012	53172	?	Sl	08:35	0:01	/usr/bin/gnome-calen
ubuntu	1386	0.2	4.9	824760	50012	?	Ssl	08:35	0:26	/usr/libexec/gnome-t
ubuntu	1406	0.0	3.5	432304	35228	?	Sl	08:35	0:01	update-notifier
ubuntu	1459	0.0	0.4	19248	4904	pts/0	Ss	08:35	0:00	bash

```

root      2049  0.0  0.0      0      0 ?          I   10:22  0:01 [kworker/0:0-events]
ubuntu    2081  0.0  0.4  18496  4144 pts/0    T   10:48  0:00 man wc
ubuntu    2091  0.0  0.2  17076  2420 pts/0    T   10:48  0:00 pager
root      2110  0.0  0.0      0      0 ?          I   10:54  0:00 [kworker/u2:1-events]
root      2116  0.0  0.0      0      0 ?          I   11:06  0:00 [kworker/u2:0-ext4-r]
root      2161  0.1  0.0      0      0 ?          I   11:07  0:00 [kworker/0:2-events]
root      2196  0.0  0.0      0      0 ?          I   11:14  0:00 [kworker/u2:2-ext4-r]
ubuntu    2199  0.0  0.3  20320  3500 pts/0    R+  11:16  0:00 ps -aux
ubuntu@ubuntu-VirtualBox:~$ 

```

Q20. List the disk partitions in your harddisk.

```

ubuntu@ubuntu-VirtualBox:~$ lsblk
NAME  MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
loop0  7:0      0  219M  1 loop /snap/gnome-3-34-1804/66
loop1  7:1      0 55.5M  1 loop /snap/core18/1988
loop2  7:2      0 64.8M  1 loop /snap/gtk-common-themes/1514
loop3  7:3      0  51M  1 loop /snap/snap-store/518
loop4  7:4      0 31.1M  1 loop /snap/snapd/11036
sda    8:0      0   10G  0 disk
└─sda1  8:1      0  512M  0 part /boot/efi
└─sda2  8:2      0     1K  0 part
└─sda5  8:5      0  9.5G  0 part /
sr0    11:0     1 1024M  0 rom
ubuntu@ubuntu-VirtualBox:~$ 

```

Q21. Redirect the output of the **top** program to a file called ‘errors’.

```

ubuntu@ubuntu-VirtualBox:~$ top>>error.txt
[3]+  Stopped                  top >> error.txt
ubuntu@ubuntu-VirtualBox:~$ cat error.txt

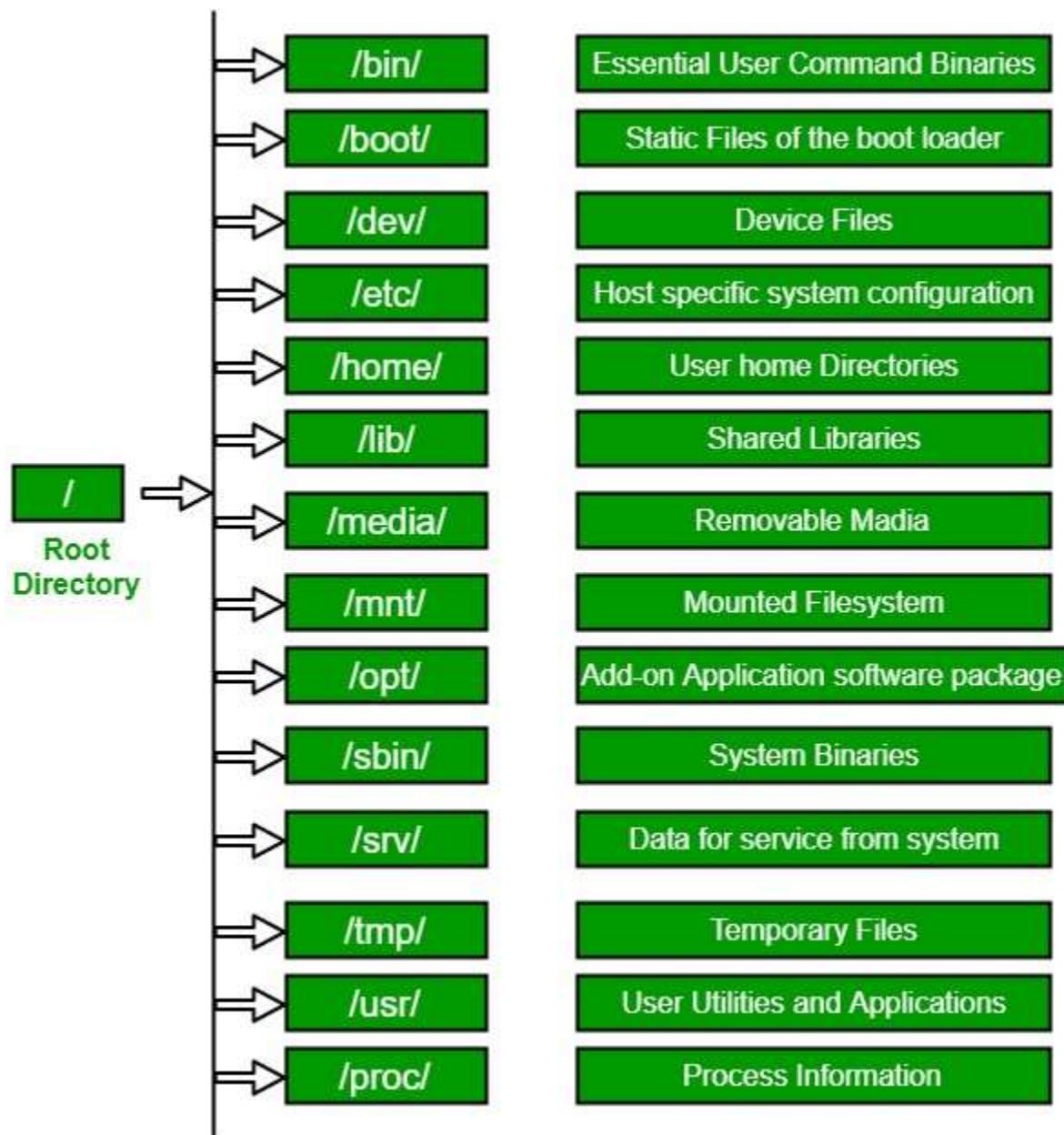
top - 11:29:22 up  2:56,  1 user,  load average: 1.06, 1.03, 0.67
Tasks: 169 total,   3 running, 164 sleeping,   2 stopped,   0 zombie
%Cpu(s): 79.4 us, 20.6 sy,  0.0 ni,  0.0 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem :  980.9 total,   147.7 free,   573.1 used,   260.0 buff/cache
MiB Swap:  448.5 total,   317.5 free,   131.0 used.   261.7 avail Mem


```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
2797	root	20	0	273704	95876	61996	R	92.4	9.5	7:58.61	unattended-upgr
730	ubuntu	39	19	520136	13344	11348	S	1.5	1.3	0:00.95	tracker-miner-f
761	ubuntu	20	0	529392	25048	13264	S	1.5	2.5	1:00.74	Xorg
1021	ubuntu	20	0	3711696	236176	49020	S	1.5	23.5	2:16.39	gnome-shell
1386	ubuntu	20	0	824760	36116	23640	S	1.5	3.6	0:31.66	gnome-terminal-
3033	ubuntu	20	0	20496	3744	3232	R	1.5	0.4	0:00.20	top
1	root	20	0	167532	8752	6552	S	0.0	0.9	0:06.14	systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kthreadd
3	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	rcu_gp
4	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	rcu_par_gp
6	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker/0:0H-k+
9	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	mm_percpu_wq
10	root	20	0	0	0	0	S	0.0	0.0	0:00.74	ksoftirqd/0
11	root	20	0	0	0	0	R	0.0	0.0	0:03.92	rcu_sched
12	root	rt	0	0	0	0	S	0.0	0.0	0:00.26	migration/0
13	root	-51	0	0	0	0	S	0.0	0.0	0:00.00	idle_inject/0
14	root	20	0	0	0	0	S	0.0	0.0	0:00.00	cpuhp/0
15	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kdevtmpfs
16	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	netns
17	root	20	0	0	0	0	S	0.0	0.0	0:00.00	rcu_tasks_kthre
18	root	20	0	0	0	0	S	0.0	0.0	0:00.00	rcu_tasks_rude_

Experiment 3

3.1. Linux File System Hierarchy Structure:



The Linux File System Hierarchy defines the directory structure and directory contents in Unix-like operating systems. It is maintained by the Linux Foundation.

- The all files and directories appear under the root directory /, even if they are stored on different physical or virtual devices.
- Most of these directories exist in all UNIX operating systems and are generally used in much the same way; however, the descriptions here are those used specifically for the FHS and are not considered authoritative for platforms other than Linux.

- Most Linux distributions follow the Filesystem Hierarchy Standard and declare it their own policy to maintain FHS compliance.
- Some distributions generally follow the standard but deviate from it in some areas. The FHS is a "trailing standard", and so documents common practices at a point in time.

3.2. The tree intallation process:

- Install tree using the following command:
\$ sudo apt install tree

```
ubuntu@ubuntu-VirtualBox:~$ sudo apk install tree
[sudo] password for ubuntu:
sudo: apk: command not found
ubuntu@ubuntu-VirtualBox:~$ sudo apt install tree
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
tree
0 upgraded, 1 newly installed, 0 to remove and 309 not upgraded.
Need to get 43.0 kB of archives.
After this operation, 115 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 tree amd64 1.8.0-1 [43.0 kB]
Fetched 43.0 kB in 0s (93.8 kB/s)
Selecting previously unselected package tree.
(Reading database ... 144996 files and directories currently installed.)
Preparing to unpack .../tree_1.8.0-1_amd64.deb ...
Unpacking tree (1.8.0-1) ...
Setting up tree (1.8.0-1) ...
Processing triggers for man-db (2.9.1-1) ...
ubuntu@ubuntu-VirtualBox:~$ █
```

```
ubuntu@ubuntu-VirtualBox:~$ tree -L 1
.
├── Desktop
├── Documents
├── Downloads
├── error.txt
├── filelist.txt
├── INDIA
├── Music
├── Pictures
├── Public
├── Templates
└── Videos

9 directories, 2 files
ubuntu@ubuntu-VirtualBox:~$ █
```

- Explore various directories and files using the command cd, ls etc in linux and provide its screenshots

```
ubuntu@ubuntu-VirtualBox:~$ ls
Desktop  Downloads  filelist.txt  Music    Public    Videos
Documents  error.txt  INDIA      Pictures  Templates
ubuntu@ubuntu-VirtualBox:~$ cd Downloads
ubuntu@ubuntu-VirtualBox:~/Downloads$ ls
ubuntu@ubuntu-VirtualBox:~/Downloads$ cd ..
ubuntu@ubuntu-VirtualBox:~$ cd Desktop
ubuntu@ubuntu-VirtualBox:~/Desktop$ ls
ubuntu@ubuntu-VirtualBox:~/Desktop$ cd Documents
bash: cd: Documents: No such file or directory
ubuntu@ubuntu-VirtualBox:~/Desktop$ cd ..
ubuntu@ubuntu-VirtualBox:~$ cd Documents
ubuntu@ubuntu-VirtualBox:~/Documents$ cd ..
ubuntu@ubuntu-VirtualBox:~$ cd Documents
ubuntu@ubuntu-VirtualBox:~/Documents$ ls
ubuntu@ubuntu-VirtualBox:~/Documents$ cd ..
ubuntu@ubuntu-VirtualBox:~$ cd INDIA
ubuntu@ubuntu-VirtualBox:~/INDIA$ ls
AP  KERALA  TN
ubuntu@ubuntu-VirtualBox:~/INDIA$ cd ..
ubuntu@ubuntu-VirtualBox:~$ cd Music
ubuntu@ubuntu-VirtualBox:~/Music$ ls
ubuntu@ubuntu-VirtualBox:~/Music$ cd ..
ubuntu@ubuntu-VirtualBox:~$ cd Templates
ubuntu@ubuntu-VirtualBox:~/Templates$ ls
ubuntu@ubuntu-VirtualBox:~/Templates$ cd ..
ubuntu@ubuntu-VirtualBox:~$ █
```

3.3. The detailed explanation of directories in Linux

1. / (Root): Primary hierarchy root and root directory of the entire file system hierarchy.

- Every single file and directory starts from the root directory
- The only root user has the right to write under this directory
- /root is the root user's home directory, which is not the same as /

2. /bin : Essential command binaries that need to be available in single-user mode; for all users, e.g., cat, ls, cp.

- Contains binary executables
- Common linux commands you need to use in single-user modes are located under this directory.
- Commands used by all the users of the system are located here e.g. ps, ls, ping, grep, cp

3. /boot : Boot loader files, e.g., kernels, initrd.

- Kernel initrd, vmlinuz, grub files are located under /boot
- Example: initrd.img-2.6.32-24-generic, vmlinuz-2.6.32-24-generic

4. /dev : Essential device files, e.g., /dev/null.

- These include terminal devices, usb, or any device attached to the system.
- And also know the connected devices.

5. /etc : Host-specific system-wide configuration files.

- Contains configuration files required by all programs.
- This also contains startup and shutdown shell scripts used to start/stop individual programs.
- Example: /etc/resolv.conf, /etc/logrotate.conf.
- The old format is et cetera

6. /home : Users' home directories, containing saved files, personal settings, etc.

- Home directories for all users to store their personal files.

7. /lib : Libraries essential for the binaries in /bin/ and /sbin/.

- Library filenames are either ld* or lib*.so.*
- Eg wifi, printer etc

8. /media : Mount points for removable media such as CD-ROMs (appeared in FHS-2.3).

- Temporary mount directory for removable devices.
- Examples, /media/cdrom for CD-ROM; /media/floppy for floppy drives; /media/cdrecorder for CD writer

9. /mnt : Temporarily mounted filesystems.

- Temporary mount directory where sysadmins can mount filesystems.

10. /opt : Optional application software packages.

- Contains add-on applications from individual vendors.
- Add-on applications should be installed under either /opt/ or /opt/ sub-directory.

11. /sbin : Essential system binaries, e.g., fsck, init, route.

- Just like /bin, /sbin also contains binary executables.
- The linux commands located under this directory are used typically by system administrator, for system maintenance purpose.
- Example: iptables, reboot, fdisk, ifconfig, swapon

12. /srv : Site-specific data served by this system, such as data and scripts for web servers, data offered by FTP servers, and repositories for version control systems.

- srv stands for service.
- Contains server specific services related data.
- Example, /srv/cvs contains CVS related data.

13. /tmp : Temporary files. Often not preserved between system reboots, and may be severely size restricted.

- Directory that contains temporary files created by system and users.
- Files under this directory

14. /usr : Secondary hierarchy for read-only user data; contains the majority of (multi-)user utilities and applications.

- Contains binaries, libraries, documentation, and source-code for second level programs.
- /usr/bin contains binary files for user programs. If you can't find a user binary under /bin, look under /usr/bin. For example: at, awk, cc, less, scp
- /usr/sbin contains binary files for system administrators. If you can't find a system binary under /sbin, look under /usr/sbin. For example: atd, cron, sshd, useradd, userdel
- /usr/lib contains libraries for /usr/bin and /usr/sbin
- /usr/local contains users programs that you install from source. For example, when you install apache from source, it goes under /usr/local/apache2
- /usr/src holds the Linux kernel sources, header-files and documentation.

15. /proc : Virtual filesystem providing process and kernel information as files. In Linux, corresponds to a procfs mount. Generally automatically generated and populated by the system, on the fly.

- Contains information about system process.
- This is a pseudo filesystem contains information about running process. For example: /proc/{pid} directory contains information about the process with that particular pid.
- This is a virtual filesystem with text information about system resources. For example: /proc/uptime

16. /var — Variable Data Files

The /var directory is the writable counterpart to the /usr directory, which must be read-only in normal operation. Log files and everything else that would normally be written to /usr during normal operation are written to the /var directory. For example, you'll find log files in /var/log.

17./srv — Service Data

The /srv directory contains “data for services provided by the system.” If you were using the Apache HTTP server to serve a website, you'd likely store your website's files in a directory inside the /srv directory.

18./run — Application State Files

The /run directory is fairly new, and gives applications a standard place to store transient files they require like sockets and process IDs. These files can't be stored in /tmp because files in /tmp may be deleted

EXPERIMENT-04

4.1. Shell Script

1. Write a Shell program to display a given message

Shell code:

```
echo "Enter a message"
read msg
echo "The given message is :$msg"
```

Output :

```
krishna@krishna-VirtualBox:~$ chmod +x sh1
krishna@krishna-VirtualBox:~$ ./sh1
Enter a message:
hey, good morning
The message given by user is: hey, good morning
```

Result:

The program execute succesfully

2. Write a shell script to evaluate arithmetic operations.

Shell code:

```
echo "enter two integer number"
read a
read b
c=`expr $a + $b`
echo "sum of two numbers=$c"
c=`expr $a - $b`
echo "Differents of two numbers=$c"
c=`expr $a / $b`
echo "division of two numbers=$c"
c=`expr $a \* $b`
echo "multiplication of two numbers=$c"
c=`expr $a % $b`
echo "remainder=$c"
```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x shellscript2
krishna@krishna-VirtualBox:~$ ./shellscript2
Enter two integer number
4
8
sum= 12
sub= -4
div= 0
multiplication= 32
remainder= 4
```

Result:

The program execute successfully

3. Write a shell Script to determine largest among three integer number

Shell code:

```
echo "enter three integer number"
read a
read b
read c
if [ $a -gt $b ] && [ $a -gt $c ]
then
echo "$a is largest number"
elif [ $b -gt $a ] && [ $b -gt $c ]
then
echo "$b is largest number"
else
echo "$c is largest number"
fi
```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x shell3
krishna@krishna-VirtualBox:~$ ./shell3
Enter three integer number
5
2
8
8 is largest number
```

Result:

The program execute successfully

4. Write a shell script to compare two string

Shell code:

```
echo "enter two string"
read a
read b
if [ -z $a ]
then
echo " First String is empty: Null String"
fi
if [ -z $b ]
```

```

then
echo " First String is empty: Null String"
fi
if [ $a = $b ]
then
echo "Strings are equal: strings Matched"
else
echo "Strings are not equal: Strings not match"
fi

```

Output:

```

krishna@krishna-VirtualBox:~$ chmod +x sh4
krishna@krishna-VirtualBox:~$ ./sh4
Enter two strings
hello
baby
Strings are not equal: Strings not match

```

Result:

The program execute successfully

5. Write a shell script to read and check the directory exists or not, if not make directory

Shell code:

```

echo "enter name of directory"
read dir
if [ -d $dir ]
then
echo "Directory $dir Exists!"
else
mkdir $dir
fi

```

Output:

```

krishna@krishna-VirtualBox:~$ chmod +x sh5
krishna@krishna-VirtualBox:~$ ./sh5
Enter name of directory
home
Directory home exists

```

Result:

The program execute successfully

6. Write a shell script to read and check the file exists or not, if not make file.

Shell code:

```

echo "enter name of file"
read filename

```

```
if [ -f $filename ]
then
echo "File $filename Exists!"
else
touch $filename
fi
```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x sh6
krishna@krishna-VirtualBox:~$ ./sh6
Enter name of file
calculator
```

Result:

The program execute successfully

7. Write a shell script to implement menu driven program to perform all arithmetic operation using case statement.

Shell code:

```
echo "enter two integer values"
read a
read b
echo " Menu"
echo "1->Addition"
echo "2->Substraction"
echo "3->Multiplication"
echo "4->Division"
echo "5->Remainder "
echo "enter choice"
read ch
case $ch in
1) echo "Sum=$(expr $a + $b)";;
2) echo "Substraction=$(expr $a - $b)";;
3) echo "Multiplication=$(expr $a \* $b)";;
4) echo "Division=$(expr $a / $b)";;
5) echo "Remainder=$(expr $a % $b)";;
6) echo "invalid Choice:Try Again!"
esac
```

Output:

```

krishna@krishna-VirtualBox:~$ chmod +x shellpgm7
krishna@krishna-VirtualBox:~$ ./shellpgm7
Enter two integer values
12
8
Menu
1 for Addition
2 for Subtraction
3 for Multiplication
4 for Division
5 for Remainder
Enter choice
1
Sum= 20
krishna@krishna-VirtualBox:~$ ./shellpgm7
Enter two integer values
10
5
Menu
1 for Addition
2 for Subtraction
3 for Multiplication
4 for Division
5 for Remainder
Enter choice
3
Multiplication= 50

```

Result:

The program execute successfully

8. Write a shell script to do:

- display list of directory contents**
- Name of current directory**
- Who is logged on**
- Long listing of directory contents according to choose of user.**

Shell code:

```

echo " Menu"
echo " 1-> listing directory content"
echo " 2-> print name of current directory"
echo " 3-> Show who is logged on "
echo " 4-> Show directory content using long listing format "
echo "enter your choice "
read ch
case $ch in
1) ls;;
2) pwd;;
3) who;;
4) ls -l;;
*) echo "Invalid Choice: Try Again!!"
esac

```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x sh8
krishna@krishna-VirtualBox:~$ ./sh8
Menu
1 for listing directory content
2 for print name of current directory
3 for show who is logged on
4 for show directory content using long listing format
Enter your choice
1
calculator first naural sh3 sh8 shellpgm7 sum
Desktop home Pictures sh4 shell2 shellscript2 Templates
details info Public sh5 shell3 shellscript3 Videos
Documents Music sh1 sh6 shell7 shellscript7
Downloads natural sh2 sh7 shellpgm2 studentdetail
krishna@krishna-VirtualBox:~$ ./sh8
Menu
1 for listing directory content
2 for print name of current directory
3 for show who is logged on
4 for show directory content using long listing format
Enter your choice
3
krishna :0 2021-09-21 19:41 (:0)
```

Result:

The program execute successfully

9. Write a shell script to getting input details like name, roll number and marks and print them using command line arguments.cat

Shell code:

```
echo "Name of the student: $1"
echo "Roll Number of the student: $2"
echo "Marks of the student: $3"
```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x studentdetail
krishna@krishna-VirtualBox:~$ ./studentdetail Krishna 11 95
Name of the student: Krishna
Roll Number of the student: 11
Marks of the student: 95
```

Result:

The program execute successfully

10. Understand the differences between Echo statement using single quote , double quote and without quotes.

Shell code:

```
a=12
echo $a
echo "$a"
```

```
echo '$a'
```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x sh10
krishna@krishna-VirtualBox:~$ ./sh10
12
12
$a
```

Result:

The program execute successfully

11. To check whether there is any entry in the month of May in the system log.

Shell code:

```
if [[ -e /var/log/syslog ]]
then
cat /var/log/syslog | grep "May"
else
echo "File not found"
fi
```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x shel11
krishna@krishna-VirtualBox:~$ ./shel11
File not found
```

Result:

The program execute successfully

12. Implement arithmetic calculator using Functions

Shell code:

```
add()
{
i=$1
j=$2
k=$((i+j))
echo "Sum is $k"
}
sub()
{
i=$1
```

```

j=$2
((k=i-j))
echo "different is $k"
}
mul()
{
i=$1
j=$2
((k=i*j))
echo "product is $k"
}
echo "Enter your option: 1: Add, 2:Subtract, 3: Multiply"
read i
case $i in
1) add 11 2;;
2) sub 10 5;;
3) mul 1 2;;
esac

```

Output:

```

krishna@krishna-VirtualBox:~$ chmod +x sh12
krishna@krishna-VirtualBox:~$ ./sh12
Enter your option: 1:Add, 2:Subtraction, 3:Multiply
1
Sum is 3
krishna@krishna-VirtualBox:~$ ./sh12
Enter your option: 1:Add, 2:Subtraction, 3:Multiply
2
Sum is -1
krishna@krishna-VirtualBox:~$ ./sh12
Enter your option: 1:Add, 2:Subtraction, 3:Multiply
3
Sum is 2

```

Result:

The program execute successfully

13. To find the sum of n natural numbers.

a. Using for loop

shell code:

```

sum=0
for ((i=0;i<10;i++))
do
((sum=sum+i))
done
echo $sum

```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x shellscript13
krishna@krishna-VirtualBox:~$ ./shellscript13
45
```

b. Using While loop

shell code:

```
i=0
sum=0
while ((i<10));do
((sum=sum+i))
((i=i+1))
done
echo $sum
```

Output:

```
krishna@krishna-VirtualBox:~$ chmod +x shell13b
krishna@krishna-VirtualBox:~$ ./shell13b
45
```

Result:

The program execute successfully

EXPERIMENT-05

5.1 Installing LAMP on Ubuntu

Step 1: Update Package Repository Cache

Before you begin:

1. Open the terminal either by using the **CTRL+ALT+T** keyboard shortcut or by searching for the word **terminal** in **Ubuntu**
2. Make sure to update the package repository cache to ensure it installs the latest versions of the software. To do so, type in the following command:

```
sudo apt-get update
```

```
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo apt-get update
Get:1 http://in.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Hit:2 https://screenrec.com/download/ubuntu stable InRelease
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [27.6 kB]
Get:5 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [61.0 kB]
Get:6 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2,464 B]
Get:1 http://in.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Get:1 http://in.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Get:1 http://in.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Hit:7 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:8 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease
Fetched 463 kB in 2min 36s (2,977 B/s)
Reading package lists... Done
hp@hp-HP-Laptop-15s-du0xxx:~$
```

Step 2: Install Apache

1. To install Apache, run the following command in the terminal:

```
sudo apt-get install apache2
```

```

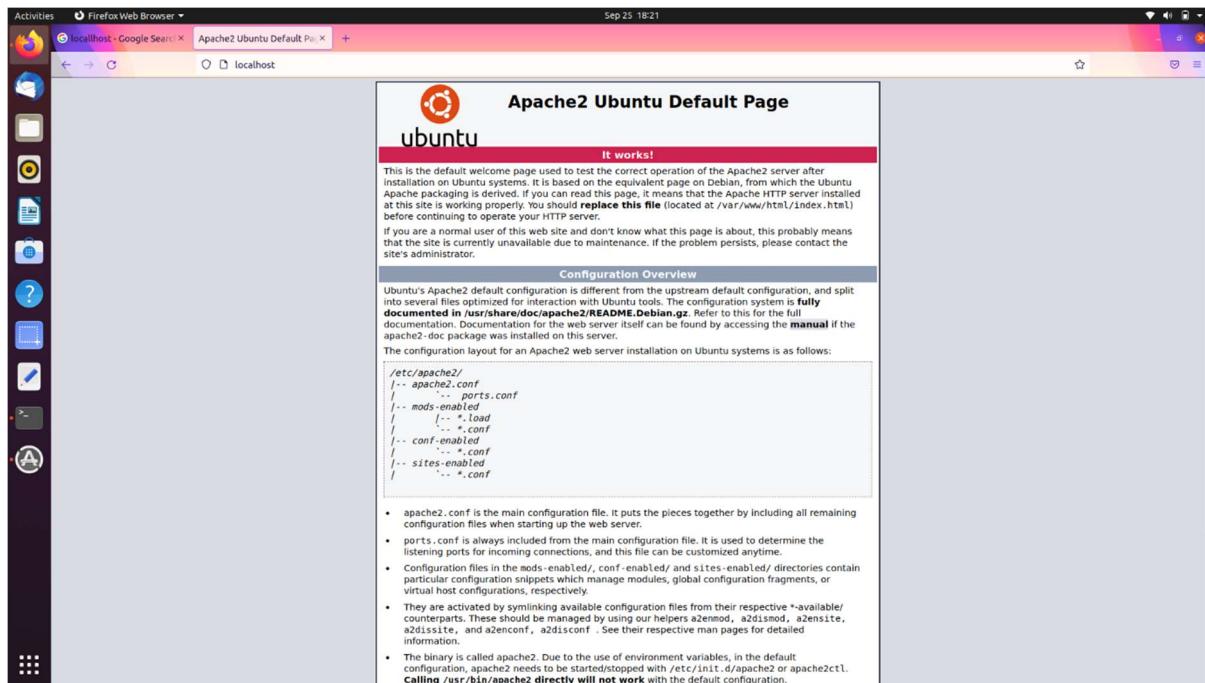
Reading package lists... Done
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo apt-get install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  enchant geoip-database libbind9-161 libboost-filesystem1.67.0
  libboost-iostreams1.67.0 libdns-export1107 libdns1107 libdns1109 libenchant1c2a
  libexiv2-14 libfprint0 libgeoip1 libgspell-1-1 libgutenprint-common
  libgutenprint9 libiptc0 libirs161 libisc-export1104 libisc1104 libisc1105
  libisccc161 libisccfg163 liblvm9 liblres161 libnfs12 liboauth0
  printer-driver-gutenprint python3-asnicrypto shim ubuntu-software
  ubuntu-system-service
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.2-0
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.2-0
0 upgraded, 9 newly installed, 0 to remove and 66 not upgraded.
Need to get 1,819 kB of archives.
After this operation, 7,938 kB of additional disk space will be used.
Do you want to continue? [Y/n] 

```

Press **y** (yes) and hit **ENTER** to permit the installation.

2. To ensure Apache is running, enter the Localhost of your server in the address bar and press **ENTER**.

The test Apache web server page should display as below.



Step 3: Install PHP

- To install PHP, run the following command:

\$ sudo apt-get install php7.4

```
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo apt-get install php7.4
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  enchant geop-database libbind9-161 libboost-filesystem1.67.0 libboost-iostreams1.67.0 libdns-export1107 libdns1107 libdns1109 libenchant1c2a libxiv2-14 libfprint0 libgeoip1 libgsspell-1-1
  libgutenprint-common libgutenprint9 libiptc0 libirs161 libisc-export1104 libisc1104 libisc1105 libisc1105 libisccfg163 liblvm9 liblwres161 libnfs12 liboauth0 printer-driver-gutenprint
  python3-asn1crypto shin ubuntu-software ubuntu-system-service
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libapache2-mod-php7.4 php-common php7.4-cli php7.4-common php7.4-json php7.4-opcache php7.4-readline
Suggested packages:
  php-pear
The following NEW packages will be installed:
  libapache2-mod-php7.4 php-common php7.4-cli php7.4-common php7.4-json php7.4-opcache php7.4-readline
0 upgraded, 8 newly installed, 0 to remove and 66 not upgraded.
Need to get 4,015 kB of archives.
After this operation, 18.0 MB of additional disk space will be used.
Do you want to continue? [Y/n] ■
```

Press **y** and **ENTER** to allow the installation.

Step 4: Restart Apache

After the php installation you must restart the Apache service.

Enter the command:

\$ sudo /etc/init.d/apache2 restart

Step 5: Test PHP Processing on Web Server

1. Create a basic **PHP script** and save it to the “web root” directory. This is necessary for Apache to find and serve the file correctly. This directory is located at **/var/www/html/**.

To create a file in that directory, type in the following command:

sudo nano /var/www/html/test.php

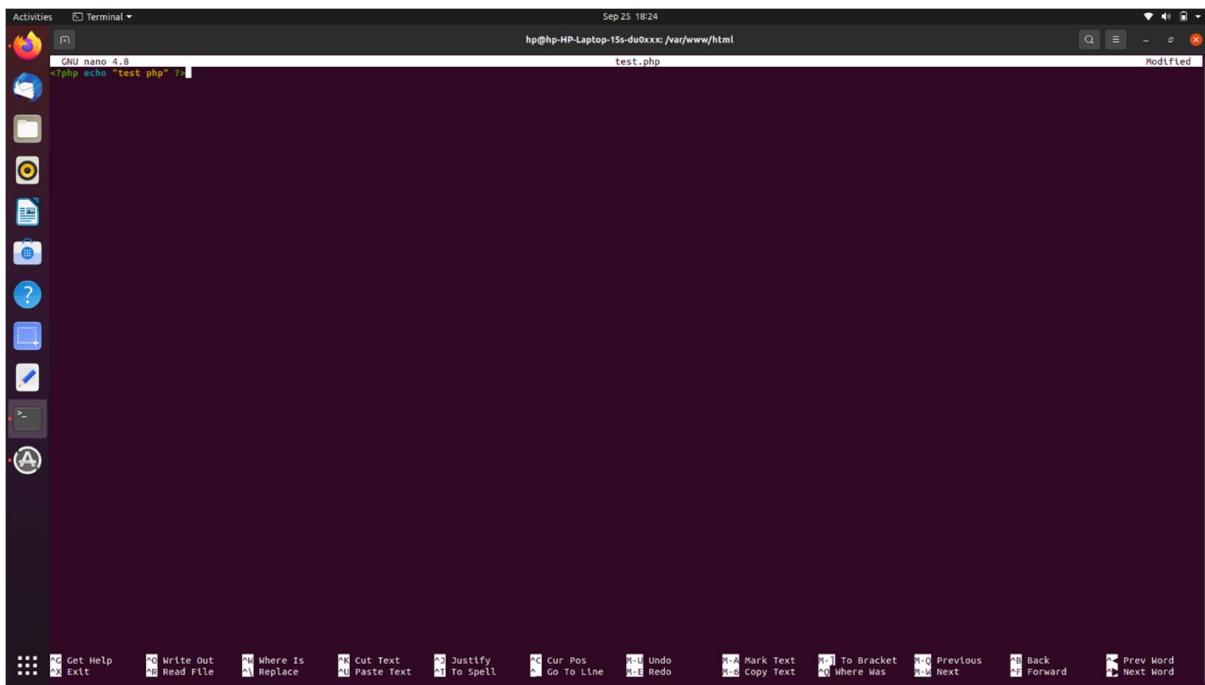
```
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo nano /var/www/html/test.php
[sudo] password for hp:
hp@hp-HP-Laptop-15s-du0xxx:~$ ■
```

This command opens the **bank file**.

2. Inside the file, type in the valid PHP code:

```
<?php
Echo " test php ";
```

?>

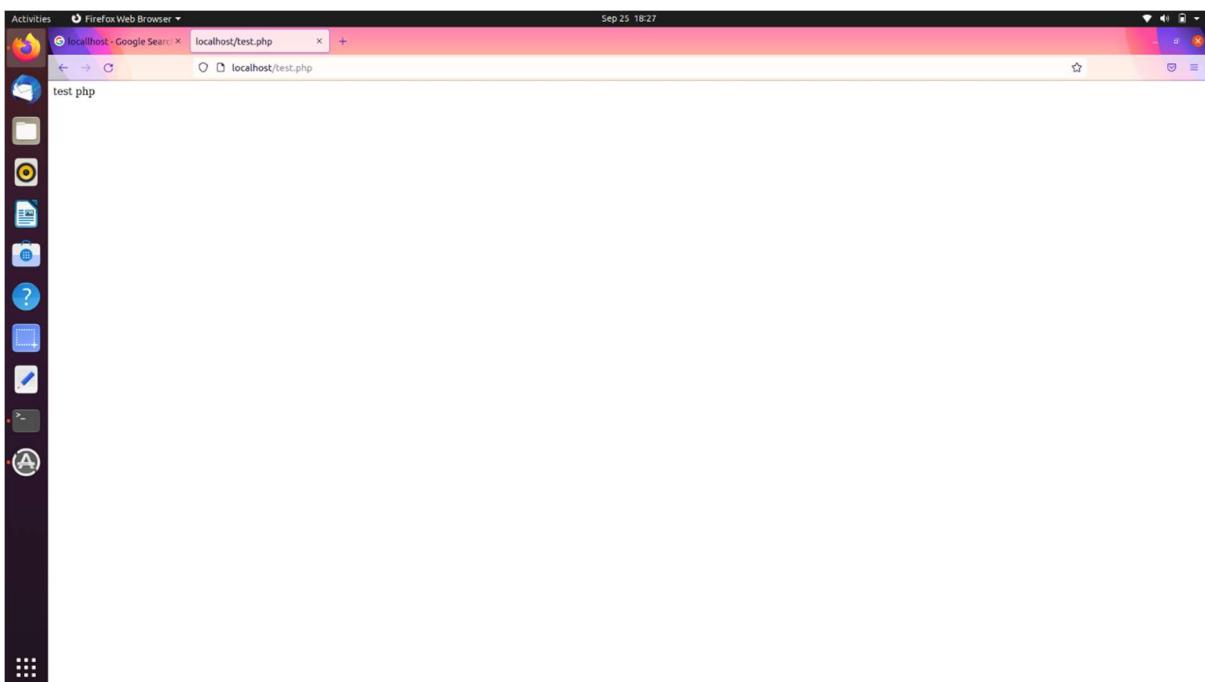


```
Activities Terminal Sep 25 18:24
hp@hp-HP-Laptop-15s-du0xxx: /var/www/html
GNU nano 4.8 test.php Modified
<?php echo "test php"; ?>
```

The screenshot shows a terminal window titled 'Terminal' with the command 'GNU nano 4.8' running. The file being edited is 'test.php'. The content of the file is a single line of PHP code: '<?php echo "test php"; ?>'. The terminal window has a dark theme with white text. At the bottom, there is a menu bar with various icons and labels for text operations like 'Get Help', 'Exit', 'Write Out', 'Where Is', 'Replace', etc.

3. Press **CTRL + X** to save and close the file. Press **y** and **ENTER** to confirm.
4. Then check the code are run correctly in php.open the browser enter the Ip address (localhost/test.php).

It show the below image



Step 6: Install Mysql server

1. To install Mysql server, run the following command:

```
$ sudo apt-get install mysql-server
```

```
other options.
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo apt-get install mysql-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  enchant geoip-database libbind9-161 libboost-filesystem1.67.0
  libboost-iostreams1.67.0 libdns-export1107 libdns1107 libdns1109
  libenchant1c2a libexiv2-14 libfprint0 libgeoip1 libgspell-1-1
  libgutenprint-common libgutenprint9 libiptc0 libirs161 libisc-export1104
  libisc1104 libisc1105 libisccc161 libisccfg163 liblvm9 liblwres161 libnfs12
  liboauth0 printer-driver-gutenprint python3-asn1crypto shim ubuntu-software
  ubuntu-system-service
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libaio1 libcgi-fast-perl libcgi-pm-perl libevent-core-2.1-7
  libevent-pthreads-2.1-7 libfcgi-perl libhtml-template-perl libmecab2
  mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-client-8.0
  mysql-client-core-8.0 mysql-server-8.0 mysql-server-core-8.0
Suggested packages:
```

2. Then it's asking us for a root password . enter the password . Again we get to repeat it

Step 7: Check the Mysql server

1. To check Mysql server, run the following command

```
$ mysql -u root -p
```

- Enter the root password and press enter

```

hp@hp-HP-Laptop-15s-du0xxx:~$ mysql -u root -p
Enter password:
ERROR 1045 (28000): Access denied for user 'root'@'localhost' (using password: YES)
hp@hp-HP-Laptop-15s-du0xxx:~$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 19
Server version: 8.0.26-0ubuntu0.20.04.2 (Ubuntu)

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

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

mysql> create database testdb;
Query OK, 1 row affected (0.01 sec)

mysql> show databases;
+-----+
| Database      |
+-----+
| information_schema |
| mysql          |
| performance_schema |
| sys            |
| testdb         |
+-----+
5 rows in set (0.00 sec)

mysql> █

```

2 . Create a database testdb and show it

- Enter the command
 Create database testdb;
 Show databases;
- So mysql is working then exit the mysql prompt just enter **exit;**

Step 8: Install PHP Myadmin

1. To install PHP Myadmin, run the following command:

```
$ sudo apt-get install phpmyadmin
```

```

hp@hp-HP-Laptop-15s-du0xxx:~$ sudo apt-get install phpmyadmin
[sudo] password for hp:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  acl apg colord-data enchant geoip-database gnome-control-center-faces gnome-online-accounts gsfonts hplib-data libbind9-161 libboost-filesystem1.67.0 libboost-iostreams1.67.0 libcolor-gtk1
  libcolorhug2 libdns-export1107 libdns1109 libenchant1c2a libexiv2-14 libfprint0 libgeotif1 libgsound0 libgspell-1-1 libgsdp-1.2-0 libgupnp-av-1.0-2 libgupnp-dlna-2.0-3
  libgutenprint-common libgutenprint9 libimagequant0 libiptc0 libirs161 libisc-export1104 libisc1104 libisccc161 libiscfg163 liblwm9 liblws161 libnfs12 liboauth0
  librsvg2-core-2.6-2 librsvg2-db-2.6-2 librsvg2-renderer-2.6-2 libsane-common libsnmp-base libwebpnu3 mobile-broadband-provider-info network-manager-gnome
  printer-driver-gutenprint printer-driver-postscript-hp python3-asn1crypto python3-macaroonbakery python3-olefile python3-pil python3-protobuf python3-pynacaroons python3-reportlab
  python3-reportlab-accel python3-fc3339 python3-tz rygel shin ubuntu-software ubuntu-system-service
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  dbconfig-common dbconfig-mysql icc-profiles-free javascript-common libjs-jquery libjs-openlayers libjs-sphinxdoc libjs-underscore libonig5 libzip5 php-bz2 php-curl php-gd php-google-recaptcha
  php-mbstring php-mysql php-phpmyadmin-notranslator php-phpmyadmin-shapefile php-phpmyadmin-sql-parser php-phseclib php-psr-cache php-psr-container php-psr-log php-symfony-cache
  php-symfony-cache-contracts php-symfony-expression-language php-symfony-service-contracts php-symfony-var-exporter php-tcpdf php-twig php-twlg-extensions php-xml php-zip php7.4-bz2 php7.4-curl
  php7.4-gd php7.4-mbstring php7.4-mysql php7.4-xnl php7.4-zip phpmyadmin
0 upgraded, 41 newly installed, 0 to remove and 61 not upgraded.
Need to get 16.0 MB of archives.
After this operation, 71.8 MB of additional disk space will be used.
Do you want to continue? [Y/n] 

```

Press **y** and **ENTER** to allow the installation

2. Then its ask what type of server, we have Apache2 is set by default that's what we want then press ok
3. Then a configuration prompt are open . here we're going to just choose yes and then it ask the input password for phpmyadmin
4. Then check it current . go to the localhost/phpmyadmin. Here we can not found it so We have to actually edit the file php is located in Apache2 folder.
5. Enter the following command to edit the file
\$ sudo nano/etc/php7.4/apache2.php.ini
6. Then we need to uncomment an **extension=mysql.so**. find it the file just remove the Semicolon.

7.Then enter **ctrl+x** to save

Step 9: Restart Apache

After the php installation you must restart the Apache service.

Enter the command:

\$ sudo /etc/init.d/apache2 restart

Step 9.1:Include phpmyadmin in apache configuration

1. Enter the command:

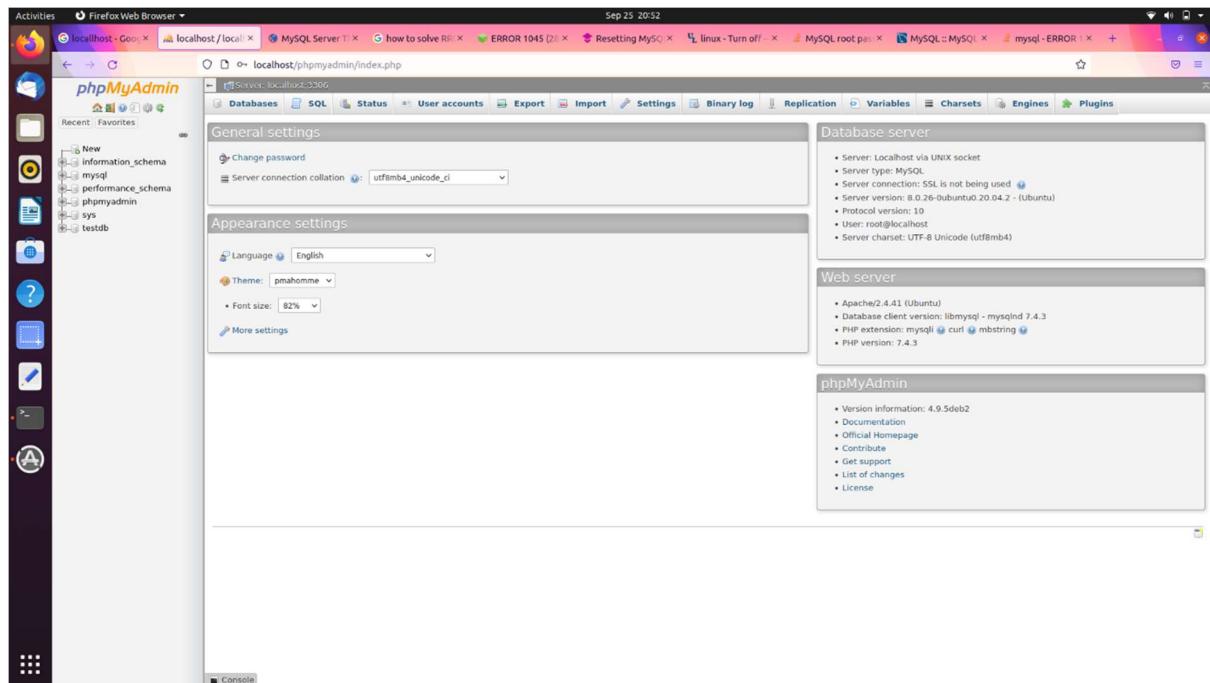
\$ sudo nano/etc/apache2/apache2.conf

2. Type the following command to the nano editor

Include /etc/phpmyadmin/apache.conf

- 3.Then enter **ctrl+x** to save

- 4.Then again restart the apache



EXPERIMENT-06

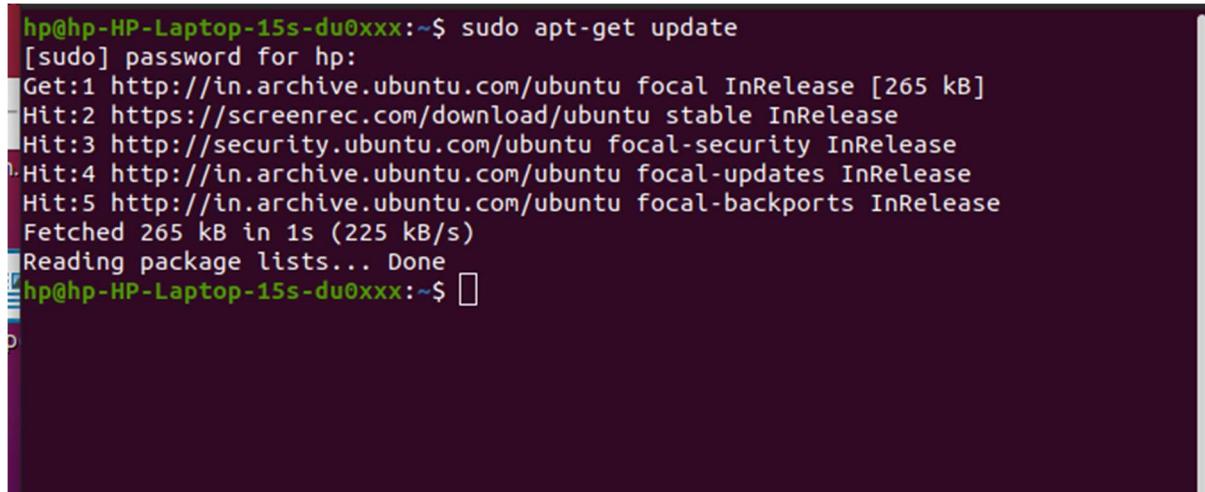
6.1.Laravel installation On Ubuntu with Apache

Step 1: Update Package Repository Cache

Before you begin:

1. Open the terminal either by using the **CTRL+ALT+T** keyboard shortcut or by searching for the word **terminal** in **Ubuntu**
2. Make sure to update the package repository cache to ensure it installs the latest versions of the software. To do so, type in the following command:

```
sudo apt-get update
```



```
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo apt-get update
[sudo] password for hp:
Get:1 http://in.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Hit:2 https://screenrec.com/download/ubuntu stable InRelease
Hit:3 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:4 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:5 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease
Fetched 265 kB in 1s (225 kB/s)
Reading package lists... Done
hp@hp-HP-Laptop-15s-du0xxx:~$
```

Step 2: Install Apache

1. To install Apache, run the following command in the terminal:

```
sudo apt-get install apache2
```

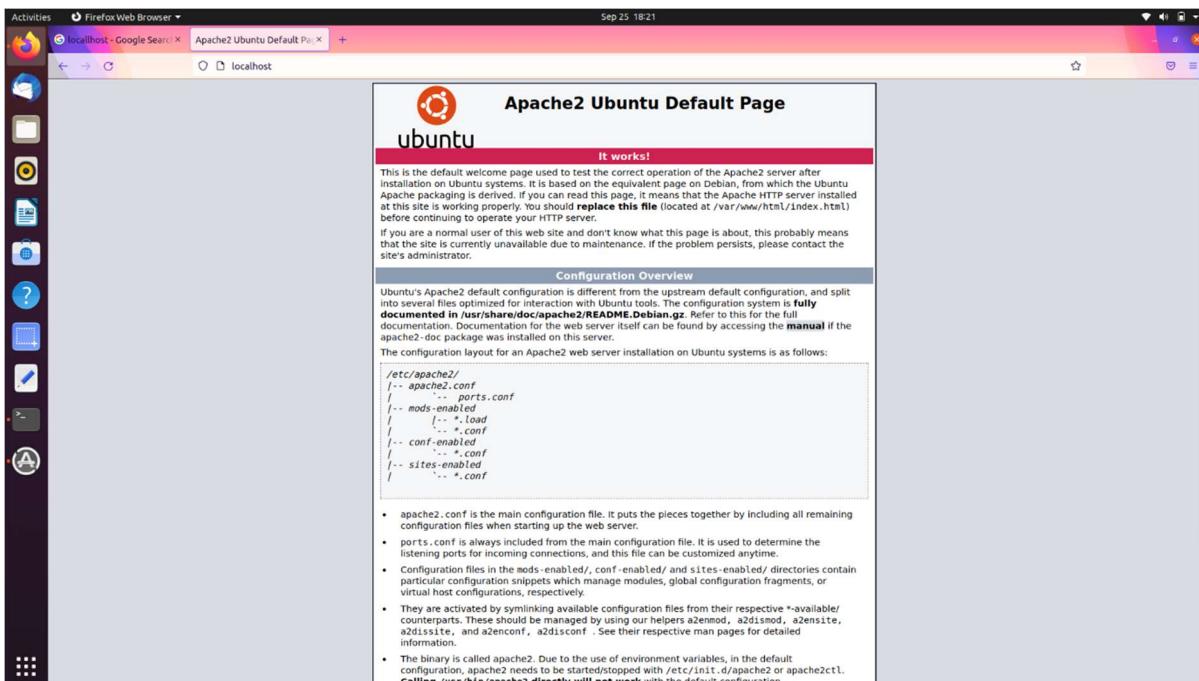
```

Reading package lists... Done
hp@hp-HP-Laptop-1S-du0xxx:~$ sudo apt-get install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  enchant geoip-database libbind9-161 libboost-filesystem1.67.0
  libboost-iostreams1.67.0 libdns-export1107 libdns1107 libdns1109 libenchant1c2a
  libexiv2-14 libfprint0 libgeoip1 libgsspell-1-1 libgutenprint-common
  libgutenprint9 libiptc0 libirs161 libisc-export1104 libisc1104 libisc1105
  libisccc161 libisccfg163 libl1v9 liblres161 libnfs12 libauth0
  printer-driver-gutenprint python3-asn1crypto shim ubuntu-software
  ubuntu-system-service
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.2-0
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.2-0
0 upgraded, 9 newly installed, 0 to remove and 66 not upgraded.
Need to get 1,819 kB of archives.
After this operation, 7,938 kB of additional disk space will be used.
Do you want to continue? [Y/n] 

```

2. To ensure Apache is running, enter the Localhost of your server in the address bar and press **ENTER**.

The test Apache web server page should display as below.



Step 3: Install PHP

2. To install PHP, run the following command:

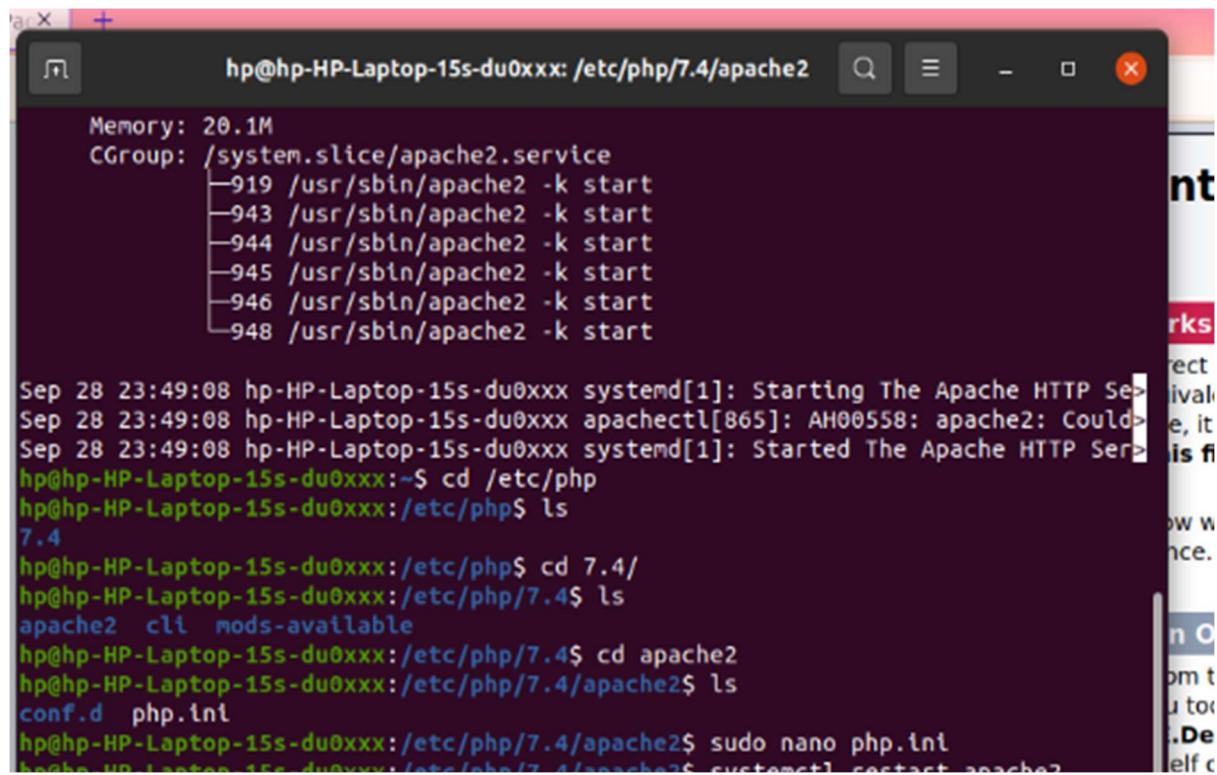
```
$ sudo apt-get install php7.4
```

```
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo apt-get install php/4
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  enchant geoip-database libbind9-161 libboost filesystem1.67.0 libboost iostreams1.67.0 libdns-export107 libdns1109 libenchant1c2a libexiv2-14 libfprint0 libgeoip1 libgspell-1-1
  libgutenprint-common libgutenprint9 libiptc0 libirs161 libisc-export104 libisc1105 libisccc161 libisccfg163 libl1vm9 liblwres161 libnfs12 liboauth0 printer-driver-gutenprint
  python3-asn1crypto shim ubuntu-software ubuntu-system-service
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libapache2-mod-php7.4 php-common php7.4-cli php7.4-common php7.4-json php7.4-opcache php7.4-readline
Suggested packages:
  php-pear
The following NEW packages will be installed:
  libapache2-mod-php7.4 php-common php7.4-cli php7.4-common php7.4-json php7.4-opcache php7.4-readline
0 upgraded, 0 newly installed, 0 to remove and 66 not upgraded.
Need to get 4,015 kB of archives.
After this operation, 18.0 MB of additional disk space will be used.
Do you want to continue? [Y/n] 
```

Press **y** and **ENTER** to allow the installation

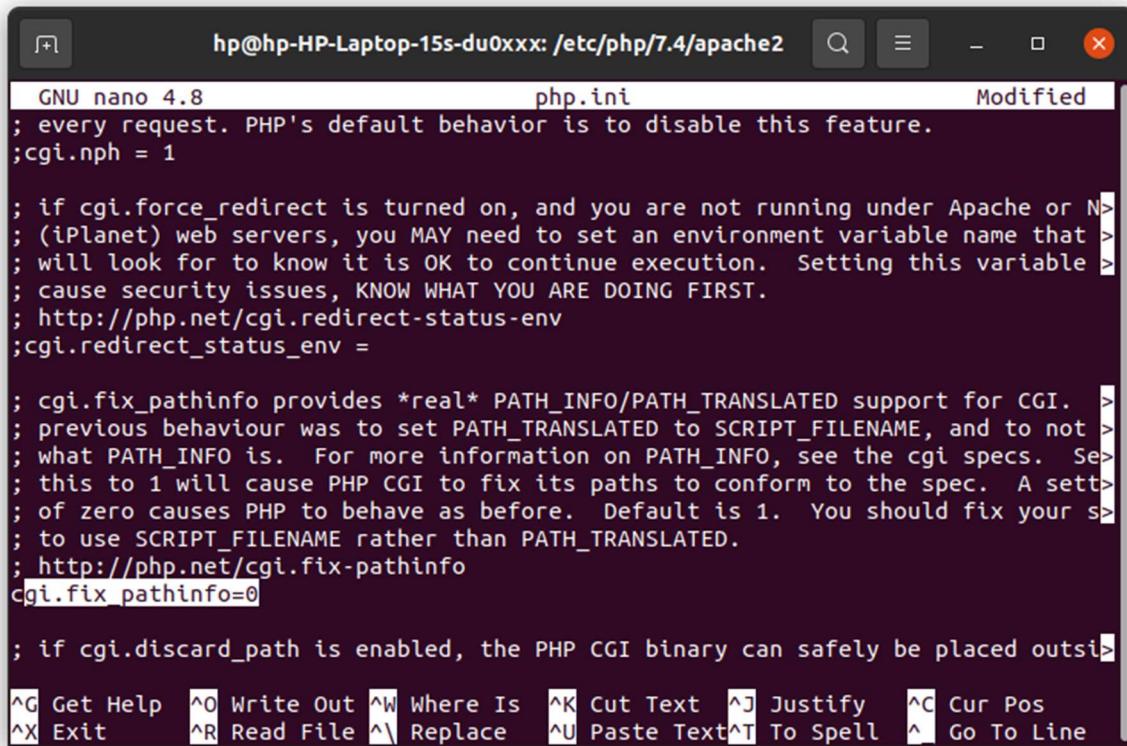
3. Then make a change in php init file . set cgi.fix_pathinfo set to be 0.Do it using the following commands.

 - Cd /etc/php/ 7.4/apache2/
 - Sudo nano php.ini
 - It open the php.ini file ,then uncomment the line and it set to be 0



```
Memory: 20.1M
CGroup: /system.slice/apache2.service
└─919 /usr/sbin/apache2 -k start
   ├─943 /usr/sbin/apache2 -k start
   ├─944 /usr/sbin/apache2 -k start
   ├─945 /usr/sbin/apache2 -k start
   ├─946 /usr/sbin/apache2 -k start
   └─948 /usr/sbin/apache2 -k start

Sep 28 23:49:08 hp-HP-Laptop-15s-du0xxx systemd[1]: Starting The Apache HTTP Server...
Sep 28 23:49:08 hp-HP-Laptop-15s-du0xxx apachectl[865]: AH00558: apache2: Could not open error log file: it...
Sep 28 23:49:08 hp-HP-Laptop-15s-du0xxx systemd[1]: Started The Apache HTTP Server...
hp@hp-HP-Laptop-15s-du0xxx:~$ cd /etc/php
hp@hp-HP-Laptop-15s-du0xxx:/etc/php$ ls
7.4
hp@hp-HP-Laptop-15s-du0xxx:/etc/php$ cd 7.4/
hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4$ ls
apache2  cli  mods-available
hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4$ cd apache2
hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4/apache2$ ls
conf.d  php.ini
hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4/apache2$ sudo nano php.ini
[Apache HP Laptop-15s-du0xxx:/etc/php/7.4/apache2]$ systemctl restart apache2
```



```
GNU nano 4.8          php.ini          Modified
; every request. PHP's default behavior is to disable this feature.
;cgi.nph = 1

; if cgi.force_redirect is turned on, and you are not running under Apache or N>
; (iPlanet) web servers, you MAY need to set an environment variable name that >
; will look for to know it is OK to continue execution. Setting this variable >
; cause security issues, KNOW WHAT YOU ARE DOING FIRST.
; http://php.net/cgi.redirect-status-env
;cgi.redirect_status_env =

; cgi.fix_pathinfo provides *real* PATH_INFO/PATH_TRANSLATED support for CGI. >
; previous behaviour was to set PATH_TRANSLATED to SCRIPT_FILENAME, and to not >
; what PATH_INFO is. For more information on PATH_INFO, see the cgi specs. Se>
; this to 1 will cause PHP CGI to fix its paths to conform to the spec. A sett>
; of zero causes PHP to behave as before. Default is 1. You should fix your s>
; to use SCRIPT_FILENAME rather than PATH_TRANSLATED.
; http://php.net/cgi.fix-pathinfo
cgi.fix_pathinfo=0

; if cgi.discard_path is enabled, the PHP CGI binary can safely be placed outsi>

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Paste Text^T To Spell  ^_ Go To Line
```

- Then restart the apache server using the following command

```
$ systemctl restart apache
```

4. Install Composer

Composer is a PHP dependency manager that facilitates the download of PHP libraries in our projects. Composer both works great with and makes it much easier to install Laravel.

1. Install composer using the following command

```
$ curl -sS https://getcomposer.org/installer | php
```

2. In this time your system not installed the curl file .then install it using the following command

```
$ sudo apt install curl
```

```

hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4/apache2$ sudo nano php.ini
hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4/apache2$ systemctl restart apache2
hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4/apache2$ curl -sS http://getcomposer.org/installer | php

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

sudo snap install curl # version 7.78.0, or
sudo apt install curl # version 7.68.0-1ubuntu2.7

See 'snap info curl' for additional versions.

hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4/apache2$ sudo apt install curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  acl apt color-data enchant geopip-database gnome-control-center-faces
  gnome-online-accounts gsfonts hplib-data libbind9-161
  libboost-fs-filesystem1.67.0 libboost-iostreams1.67.0 libcolord-gtk1
  libcolorhug2 libdns-export1107 libdns1107 libdns1109 libenchant1c2a
  libxiv2-14 libprint0 libgeoip1 libgsound0 libgspell-1-1 libgssdp-1.2-0
  libgupnp-1.2-0 libgupnp-av-1.0-2 libgupnp-dlna-2.0-3 libgutenprint-common
  libgutenprint9 libieee1284-3 libimagequant0 libiptc0 libirs161
  libisc-export1104 libisc1105 libisccc161 libiscfg163 liblvm9
  liblwres161 libnfs12 liboauth0 librygel-core-2.6-2 librygel-db-2.6-2
  librygel-renderer-2.6-2 librygel-server-2.6-2 libsane-common libsnmp-base
  libwebpmu3 mobile broadband provider info network-manager-gnome
  printer-driver-gutenprint printer-driver-postscript-hp python3-asn1crypto
  python3-macaroonbakery python3-olefile python3-pil python3-protobuf
  python3-pymacaroons python3-renderpm python3-reportlab
  python3-reportlab-accel python3-rfc3339 python3-tz rygel shim
  ubuntu-software ubuntu-system-service
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  curl
0 upgraded, 1 newly installed, 0 to remove and 91 not upgraded.
Need to get 161 kB of archives.
After this operation, 412 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 curl amd64 7.68.0-1ubuntu2.7 [161 kB]
Fetched 161 kB in 11s (14.8 kB/s)
Selecting previously unselected package curl.
(Reading database ... 192305 files and directories currently installed.)
Preparing to unpack .../curl_7.68.0-1ubuntu2.7_amd64.deb ...
Unpacking curl (7.68.0-1ubuntu2.7) ...
Setting up curl (7.68.0-1ubuntu2.7) ...
Processing triggers for man-db (2.9.1-1) ...
hp@hp-HP-Laptop-15s-du0xxx:/etc/php/7.4/apache2$ 

```

3. Move the file using the following command

```
$ sudo mv composer.phar /usr/local/bin/composer
```

The screenshot shows a terminal window with the following session:

- Initial prompt: Use it: php composer.phar
- Command: hp@hp-HP-Laptop-15s-du0xxx:~\$ sudo mv composer.phar /usr/local/bin/composer
- Output: [redacted]
- Command: hp@hp-HP-Laptop-15s-du0xxx:~\$ composer --version
- Output: Composer version 2.1.8 2021-09-15 13:55:14
- Command: hp@hp-HP-Laptop-15s-du0xxx:~\$ composer global require laravel/installer
- Output: [redacted]
- Message: Changed current directory to /home/hp/.config/composer
- Message: [RuntimeException]

Step 5 – Install Laravel 8.x on Ubuntu 20.04

Now install Laravel Framework using composer, just type composer global require Laravel/installer
It will take a while to complete download its dependencies

1. Lavaral install with following command

```
$ composer global require laravel/installer
```

```
hp@hp-HP-Laptop-15s-du0xxx:~$ composer global require laravel/installer
Changed current directory to /home/hp/.config/composer
https://repo.packagist.org could not be fully loaded (curl error 28 while downloading https://repo.packagist.org/pa
d from the local cache may be out of date
Using version ^4.2 for laravel/installer
./composer.json has been updated
Running composer update laravel/installer
Loading composer repositories with package information
Updating dependencies
Lock file operations: 13 installs, 0 updates, 0 removals
- Locking laravel/installer (v4.2.8)
- Locking psr/container (1.1.1)
- Locking symfony/console (v5.3.7)
- Locking symfony/deprecation-contracts (v2.4.0)
- Locking symfony/polyfill ctype (v1.23.0)
- Locking symfony/polyfill-intl-grapheme (v1.23.1)
- Locking symfony/polyfill-intl-normalizer (v1.23.0)
- Locking symfony/polyfill-mbstring (v1.23.1)
- Locking symfony/polyfill-php73 (v1.23.0)
- Locking symfony/polyfill-php80 (v1.23.1)
- Locking symfony/process (v5.3.7)
- Locking symfony/service-contracts (v2.4.0)
- Locking symfony/string (v5.3.7)
```

Next add bin directory to path environment through the `~/.bashrc` configuration .so edit the `~/.bashrc` configuration using nano command. The command are follow

```
$ nano ~/.bashrc
```

2.It open the file and add the following line at the end of the file.

```
export PATH="$HOME/.config/composer/vendor/bin:$PATH"
```

```
# Add an "alert" alias for long running commands. Use like so:
# sleep 10; alert
alias alert='notify-send --urgency=low -i "$( [ $? = 0 ] && echo terminal ||

# Alias definitions.
# You may want to put all your additions into a separate file like
# ~./.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~./.bash_aliases ]; then
    . ~./.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
    if [ -f /usr/share/bash-completion/bash_completion ]; then
        . /usr/share/bash-completion/bash_completion
    elif [ -f /etc/bash_completion ]; then
        . /etc/bash_completion
    fi
fi
export PATH="$HOME/.config/composer/vendor/bin:$PATH"
'

^G Get Help      ^O Write Out     ^W Where Is      ^K Cut Text      ^J Justify
^X Exit         ^R Read File     ^A Replace       ^U Paste Text    ^T To Spell
```

3.Then reload your bashrc configuration using the source command.

```
$ source ~/.bashrc
```

4.Then echo `$PATH`. It will return your “Bin” directory path for the Composer package.

```
$ echo $PATH
```

```
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo nano ~/.bashrc
[sudo] password for hp:
hp@hp-HP-Laptop-15s-du0xxx:~$ source ~/.bashrc
hp@hp-HP-Laptop-15s-du0xxx:~$ echo $PATH
/home/hp/.config/composer/vendor/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/
usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
hp@hp-HP-Laptop-15s-du0xxx:~$
```

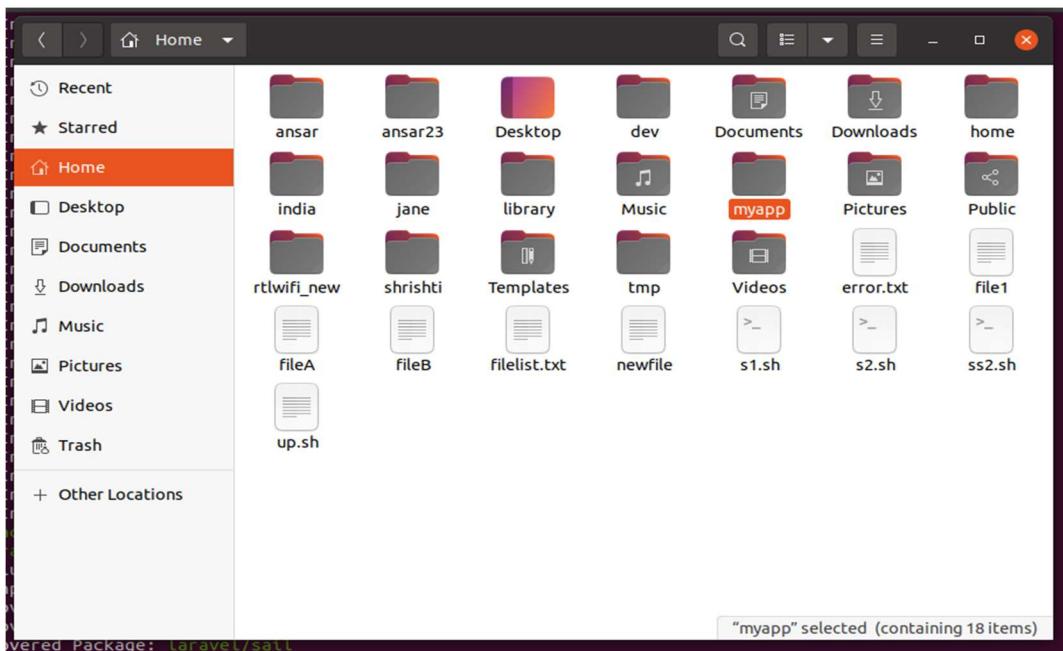
5. then create a new project in laravel with the following command

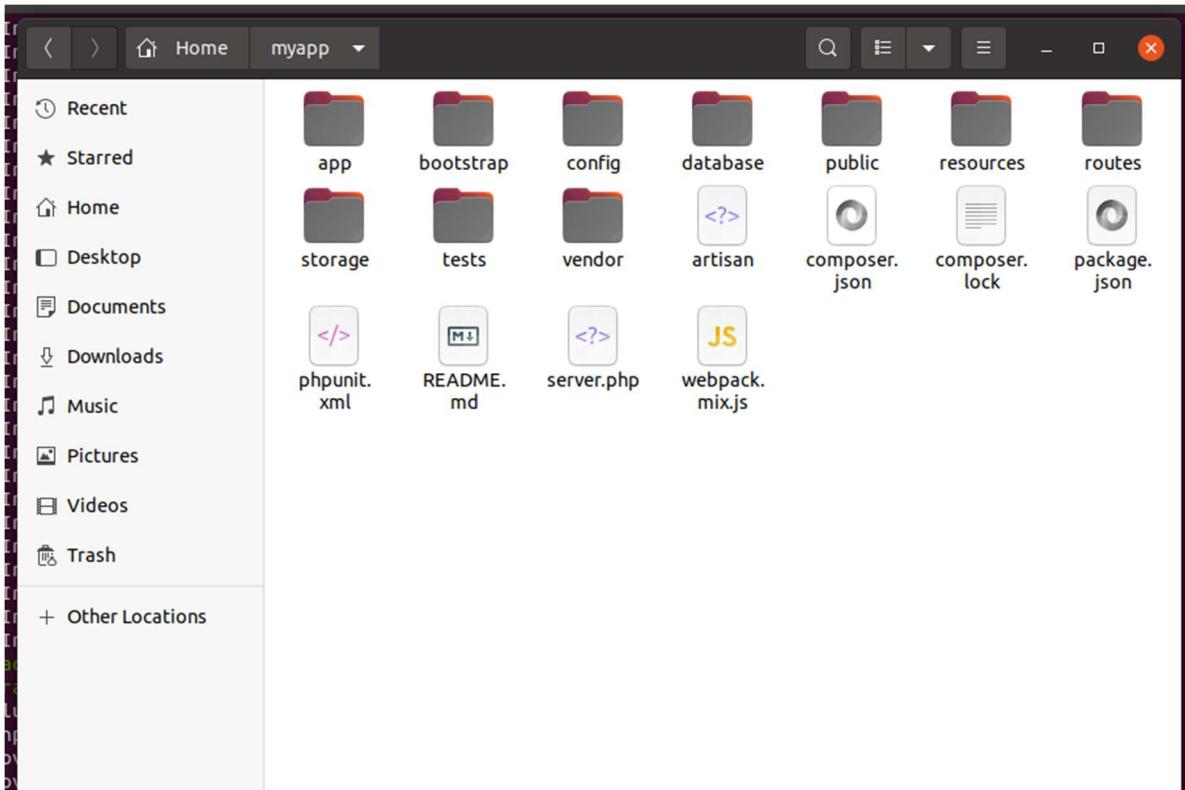
```
$ laravel new myapp1
```

```
/home/hp/.config/composer/vendor/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/
hp@hp-HP-Laptop-15s-du0xxx:~$ laravel new myapp1

Creating a "laravel/laravel" project at "./myapp1"
Installing laravel/laravel (v8.6.2)
- Downloading laravel/laravel (v8.6.2)
- Installing laravel/laravel (v8.6.2): Extracting archive
Created project in /home/hp/myapp1
> @php -r "file_exists('.env') || copy('.env.example', '.env');"
Loading composer repositories with package information
Updating dependencies
Lock file operations: 111 installs, 0 updates, 0 removals
- Locking asm89/stack-cors (v2.0.3)
- Locking brick/math (0.9.3)
- Locking dflydev/dot-access-data (v3.0.1)
- Locking doctrine/inflector (2.0.3)
- Locking doctrine/instantiator (1.4.0)
- Locking doctrine/lexer (1.2.1)
- Locking dragonmantank/cron-expression (v3.1.0)
- Locking egulias/email-validator (2.1.25)
- Locking facade/flare-client-php (1.9.1)
- Locking facade/ignition (2.13.1)
- Locking facade/ignition-contracts (1.0.2)
```

Here you can see the installation of my new project myapp1 finished. You can also see inside my home directory a new directory has been created with my project name.





Step 6– Finally Configure Apache for Laravel and test it

1. First, add your project directory to www-data group use the following command

```
$ sudo chgrp -R www-data /home/hp/myapp
```

- Then you need to change access permission 775 of the storage directory under your project. use the following command.

```
$ sudo chmod -R 775 /home/hp/myapp/storage
$ cd /etc/apache2/sites-available/
$ ls
000-default.conf default-ssl.conf
$ nano myapp1.com.conf
```

6. Then create an apache vhost configuration go to the following directory and create a vhost config file using nano file editor.

```
$ cd /etc/apache2/sites-available/
$ sudo nano myapp1.com.conf
```

And paste the following line inside the file.

```
<VirtualHost *:80>
    ServerName myapp.com

    ServerAdmin admin@myapp.com
    DocumentRoot /home/hp/myapp/public
```

```

<Directory /home/hp/myapp>
    Options Indexes MultiViews
    AllowOverride None
    Require all granted
</Directory>

    ErrorLog ${APACHE_LOG_DIR}/error.log
    CustomLog ${APACHE_LOG_DIR}/access.log combined
</VirtualHost>

```

```

chgrp: cannot access '/home/myapp': No such file or directory
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo chgrp -R www-data /home/hp/myapp
hp@hp-HP-Laptop-15s-du0xxx:~$ sudo chmod -R 775 /home/hp/myapp/storage
hp@hp-HP-Laptop-15s-du0xxx:~$ cd /etc/apache2/sites-available/
hp@hp-HP-Laptop-15s-du0xxx:/etc/apache2/sites-available$ ls
000-default.conf default-ssl.conf
hp@hp-HP-Laptop-15s-du0xxx:/etc/apache2/sites-available$ sudo nano myapp.com.conf
hp@hp-HP-Laptop-15s-du0xxx:/etc/apache2/sites-available$ sudo nano myapp.com.conf
hp@hp-HP-Laptop-15s-du0xxx:/etc/apache2/sites-available$ sudo a2enmod rewrite
Enabling module rewrite.
To activate the new configuration, you need to run:
    systemctl restart apache2
hp@hp-HP-Laptop-15s-du0xxx:/etc/apache2/sites-available$ sudo a2ensite myapp.com.conf
sudo: a2ensite myapp.com.conf: command not found
hp@hp-HP-Laptop-15s-du0xxx:/etc/apache2/sites-available$ sudo a2ensite myapp.com.conf
Enabling site myapp.com.
To activate the new configuration, you need to run:
    systemctl reload apache2

```

7. Now enable mod rewrite for apache2 just type

```
$ sudo a2enmod rewrite
```

Then enable your site, just type

```
$ sudo a2ensite myapp1.com.conf
```

Finally, Restart the apache service, type

```
$ systemctl restart apache2
```

8. As you are in a local environment you need a local dns resolver for your site. Go ahead and edit /etc/hosts file, add a dns record for your site then save the file.

```
$ sudo nano /etc/hosts
```

Inside the file add the below line

```
127.0.0.1    myapp.com
```

```

GNU nano 4.8          /etc/hosts          Modified
127.0.0.1      localhost
127.0.1.1      hp-HP-Laptop-15s-du0xxx

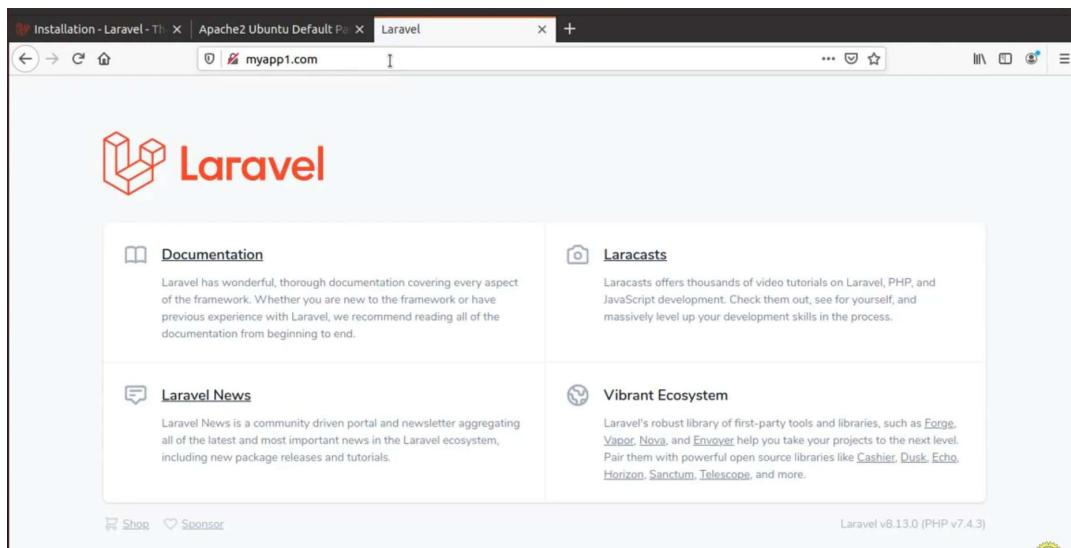
# The following lines are desirable for IPv6 capable hosts
::1      ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters

127.0.0.1  myapp.com

```

**^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify
^X Exit ^R Read File ^\ Replace ^U Paste Text ^T To Spell**

Now get back to the web browser and open a tab then type your project hostname.



And here it is it's working. Here you can see the Laravel version and PHP version.

EXPERIMENT-07

7.1. Networking commands

7.1.1. PING COMMAND

PING (Packet Internet Groper) command is used to check the network connectivity between host and server/host. This command takes as input the IP address or the URL and sends a data packet to the specified address with the message “PING” and get a response from the server/host this time is recorded which is called latency. Fast ping low latency means faster connection. Ping uses **ICMP(Internet Control Message Protocol)** to send an **ICMP echo message** to the specified host if that host is available then it sends **ICMP reply message**. Ping is generally measured in millisecond every modern operating system has this ping pre-installed.

Syntax: ping [OPTIONS] DESTINATION

```
krishna@krishna-VirtualBox:~$ ping google.com
PING google.com (142.250.193.110) 56(84) bytes of data.
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=1 ttl=116 time=24.0 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=2 ttl=116 time=24.8 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=3 ttl=116 time=17.7 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=4 ttl=116 time=17.6 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=5 ttl=116 time=17.5 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=6 ttl=116 time=17.8 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=7 ttl=116 time=17.5 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=8 ttl=116 time=17.5 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=9 ttl=116 time=18.5 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=10 ttl=116 time=21.0 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=11 ttl=116 time=23.3 ms
64 bytes from maa05s24-in-f14.1e100.net (142.250.193.110): icmp_seq=12 ttl=116 time=17.5 ms
```

7.1.2.TRACEROUTE COMMAND

Traceroute command in Linux prints the route that a packet takes to reach the host. This command is useful when you want to know about the route and about all the hops that a packet takes. Below image depicts how traceroute command is used to reach the Google (172.217.26.206) host from the local machine and it also prints detail about all the hops that it visits in between.

Syntax: traceroute [options] host_Address [pathlength]

```
krishna@krishna-VirtualBox:~$ traceroute google.com
traceroute to google.com (216.58.196.174), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2)  2.891 ms  2.852 ms  2.714 ms
 2 * * *
 3 130.230.88.202.asianet.co.in (202.88.230.130)  28.619 ms  28.577 ms  30.782
ms
 4 77.252.88.202.asianet.co.in (202.88.252.77)  24.119 ms  30.677 ms  24.078 ms
 5 * * *
 6 108.170.253.97 (108.170.253.97)  28.104 ms  21.323 ms  142.251.55.236 (142.25
1.55.236)  21.177 ms
 7 209.85.253.85 (209.85.253.85)  19.985 ms  108.170.253.122 (108.170.253.122)
19.868 ms  108.170.253.121 (108.170.253.121)  20.976 ms
 8 maa05s23-in-f14.1e100.net (142.250.183.238)  20.919 ms  74.125.242.129 (74.12
5.242.129)  20.905 ms  20.871 ms
```

7.1.3.ROUTE COMMAND

route command in Linux is used when you want to work with the IP/kernel routing table. It is mainly used to set up static routes to specific hosts or networks via an interface. It is used for showing or update the IP/kernel routing table.

Syntax: route

```
krishna@krishna-VirtualBox:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         _gateway       0.0.0.0        UG    100    0        0 enp0s3
10.0.2.0        0.0.0.0        255.255.255.0   U     100    0        0 enp0s3
link-local      0.0.0.0        255.255.0.0    U     1000   0        0 enp0s3
```

7.1.4.NSLOOKUP COMMAND

nslookup (stands for “Name Server Lookup”) is a useful command for getting information from DNS server. It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record. It is also used to troubleshoot DNS related problems.

Syntax: nslookup [option]

```
krishna@krishna-VirtualBox:~$ nslookup google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 216.58.196.174
Name:   google.com
Address: 2404:6800:4007:816::200e
```

7.1.5. IFCONFIG COMMAND

ifconfig(interface configuration) command is used to configure the kernel-resident network interfaces. It is used at the boot time to set up the interfaces as necessary. After that, it is usually used when needed during debugging or when you need system tuning. Also, this command is used to assign the IP address and netmask to an interface or to enable or disable a given interface.

Syntax: ifconfig [...OPTIONS] [INTERFACE]

```
krishna@krishna-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
        inet6 fe80::4b85:b505:6f0b:da64 prefixlen 64 scopeid 0x20<link>
          ether 08:00:27:4a:17:3a txqueuelen 1000 (Ethernet)
            RX packets 19441 bytes 28296268 (28.2 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 3062 bytes 653042 (653.0 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000 (Local Loopback)
            RX packets 564 bytes 44785 (44.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 564 bytes 44785 (44.7 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

EXPERIMENT-08

8.1 WIRESHARK installation

Wireshark is a free and open source packet analyser used for network troubleshooting and analysis.

8.1.2. Downloading steps

1. Open a web browser.
2. Navigate to <http://www.wireshark.org>.
3. Select Download Wireshark.
4. Select the Wireshark Windows Installer matching your system type. Save the program in the Downloads folder.
5. Close the web browser.

8.1.3. Installation process

1. Double-click on the file to open it.
2. If you see a User Account Control dialog box, select Yes to allow the program to make changes to this computer.
3. Select Next > to start the Setup Wizard.
4. Review the license agreement. If you agree, select I Agree to continue.
5. Select Next > to accept the default components.
6. Select the shortcuts you would like to have created. Leave the file extensions selected. Select Next > to continue.
7. Select Next > to accept the default install location.
8. Select Install to begin installation.
9. Select Next > to install WinPcap.
10. Select Next > to start the Setup Wizard.
11. Review the license agreement. If you agree, select I Agree to continue.

12. Select Install to begin installation.
13. Select Finish to complete the installation of WinPcap.
14. Select Next > to continue with the installation of Wireshark.
15. Select Finish to complete the installation of Wireshark.

1.8.4. Demonstrate the process to filtering SMTP packets.

1)) Capturing SMTP packets

1. Start a Wireshark capture.
2. Open a command prompt.
3. Type telnet gmail-smtp-in.l.google.com 25 and press Enter. If this does not work, your ISP may be blocking outbound traffic on port 25. You can try telnet smtp.gmail.com 587 instead to generate SMTP traffic and then filter on port 587 in the next activity.
4. Observe the server response.
5. Type helo and press Enter.
6. Observe the server response. Note that at this point you could enter mail, rcpt and data to send an SMTP message, but this only works on servers configured to allow clear text relay without authentication.
7. Type quit and press Enter to close the connection.
8. Observe the server response.
9. Close the command prompt.
10. Stop the Wireshark capture.

9. 2))Select destination Traffic

1. Observe the traffic captured in the top Wireshark packet list pane. To view only SMTP traffic, type smtp (lower case) in the Filter box and press Enter.
2. Select the first SMTP packet labelled 220
3. Observe the destination IP address.
4. To view all related traffic for this connection, change the filter to ip.addr == <destination>, where <destination> is the destination address of the SMTP

packet.

10. 3))Analysing TCP connection traffic

1. Observe the traffic captured in the top Wireshark packet list pane. The first three packets (TCP SYN, TCP SYN/ACK, TCP ACK) are the TCP three way handshake. Select the first packet.
2. Observe the packet details in the middle Wireshark packet details pane. Notice that it is an Ethernet II / Internet Protocol Version 4 / Transmission Control Protocol frame.
3. Expand Ethernet II to view Ethernet details.
4. Observe the Destination and Source fields. The destination should be your default gateway's MAC address and the source should be your MAC address. You can use ipconfig /all and arp -a to confirm.
5. Expand Internet Protocol Version 4 to view IP details.
6. Observe the Source address. Notice that the source address is your IP address.
7. Observe the Destination address. Notice that the destination address is the IP address of the SMTP server.
8. Expand Transmission Control Protocol to view TCP details.
9. Observe the Source port. Notice that it is a dynamic port selected for this HTTP connection.
10. Observe the Destination port. Notice that it is smtp (25). Note that all of the packets for this connection will have matching MAC addresses, IP addresses, and port numbers.

11.))Analyse SMTP Service Ready Traffic

1. Observe the traffic captured in the top Wireshark packet list pane.
2. Select the fourth packet, which is the first SMTP packet and labeled 220
3. Observe the packet details in the middle Wireshark packet details pane. Notice that it is an Ethernet II / Internet Protocol Version 4 / Transmission Control Protocol / Hypertext Transfer Protocol frame. Also notice that the Ethernet II, Internet Protocol Version 4, and Transmission Control Protocol values are consistent with the TCP connection analysed in Activity 3.
4. Expand Simple Mail Transfer Protocol and Response to view SMTP details.
5. Observe the Response code and Response parameter.

6. Observe the traffic captured in the top Wireshark packet list pane.

7. Select the fifth packet, labelled TCP ACK. This is the client TCP acknowledgement of receiving the Service Ready message.

12. 5))Analyse SMTP HELO Traffic

1. Observe the traffic captured in the top Wireshark packet list pane.

2. Select the following TCP segments and acknowledgements. If you observe the packet details in the bottom Wireshark packet bytes pane carefully, you will see that the segments spell out the helo message. The sequence ends with a Wireshark-combined SMTP client helo message, followed by a server TCP acknowledgement.

13. 6)) Analyse SMTP Completed Traffic

1. Observe the traffic captured in the top Wireshark packet list pane.

2. Select the following SMTP packet, labeled 250 ...

3. Observe the packet details in the middle Wireshark packet details pane.

4. Expand Simple Mail Transfer Protocol and Response to view SMTP details.

5. Observe the Response code and Response parameter.

14. 7))Analyse SMTP QUIT Traffic

1. Observe the traffic captured in the top Wireshark packet list pane.

2. Select the following TCP segments and acknowledgements. If you observe the packet details in the bottom Wireshark packet bytes pane carefully, you will see that the segments spell out the quit message. The sequence ends with a Wireshark-combined SMTP client quit message, followed by a server TCP acknowledgement.

15. 8))Analyse SMTP Closing Traffic

1. Observe the traffic captured in the top Wireshark packet list pane.

2. Select the following SMTP packet, labelled 221 ...

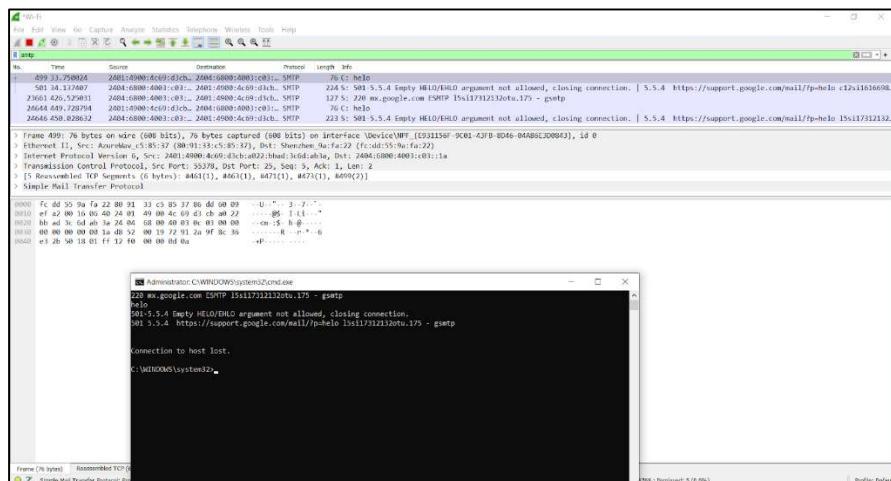
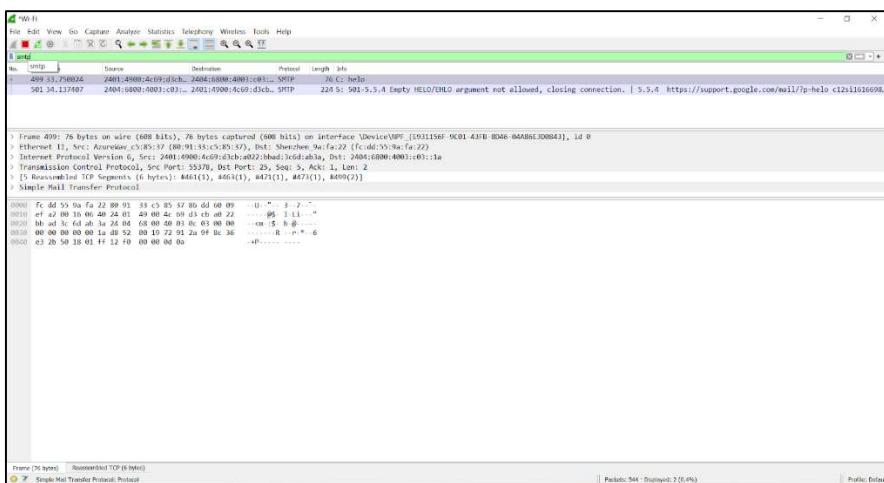
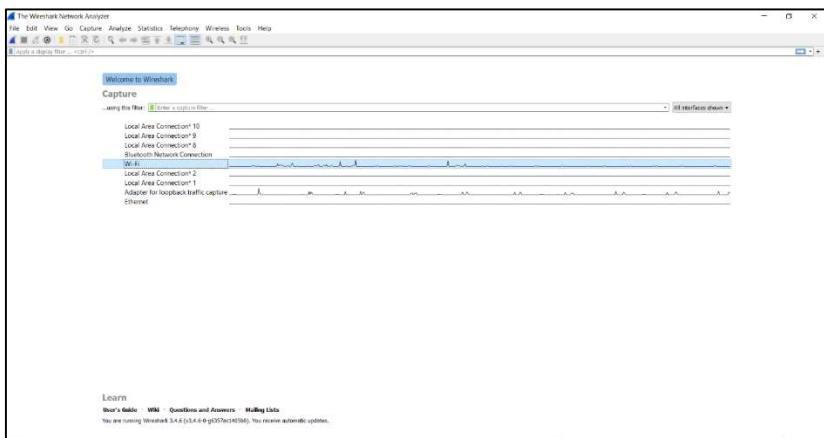
3. Observe the packet details in the middle Wireshark packet details pane.

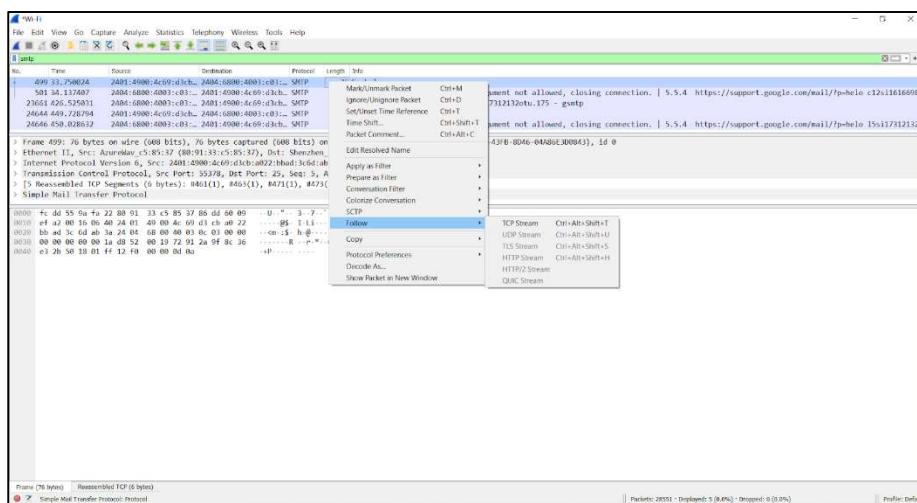
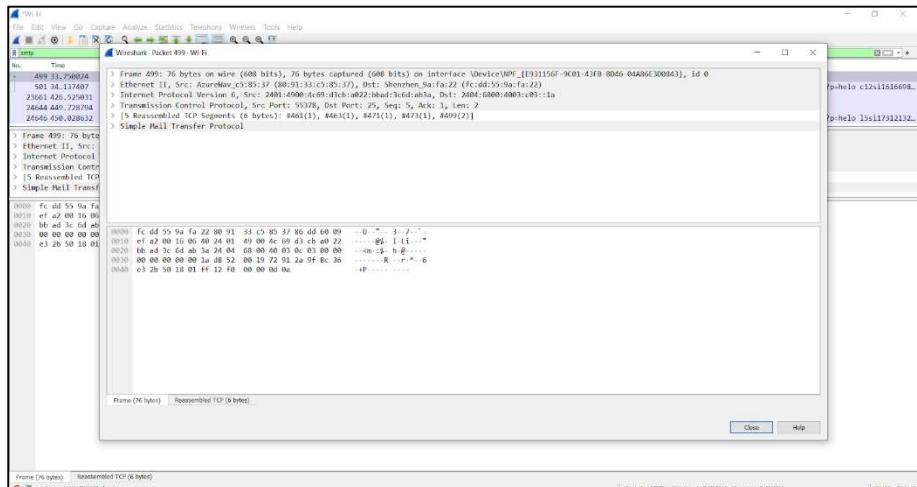
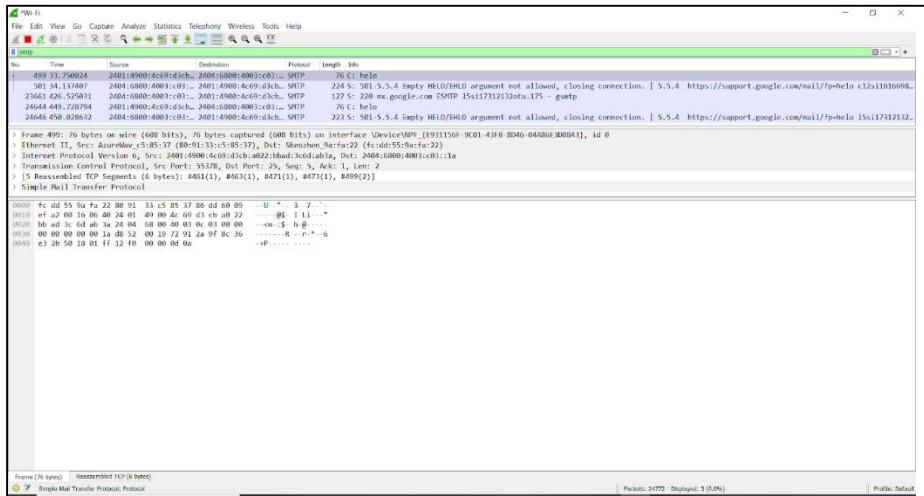
4. Expand Simple Mail Transfer Protocol and Response to view SMTP details.

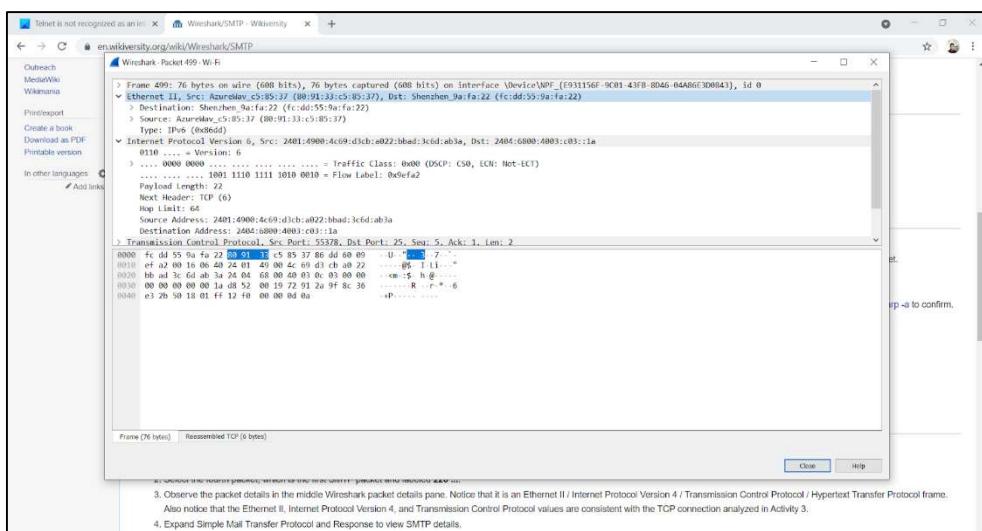
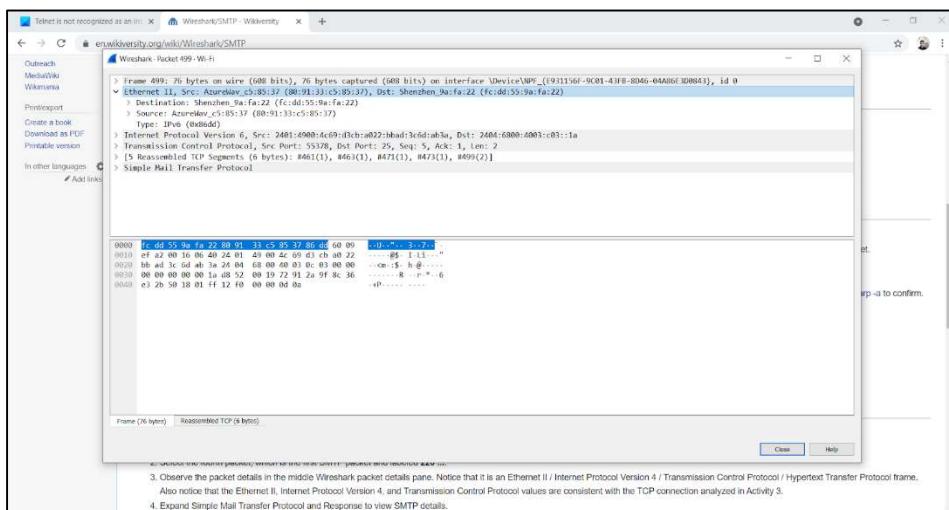
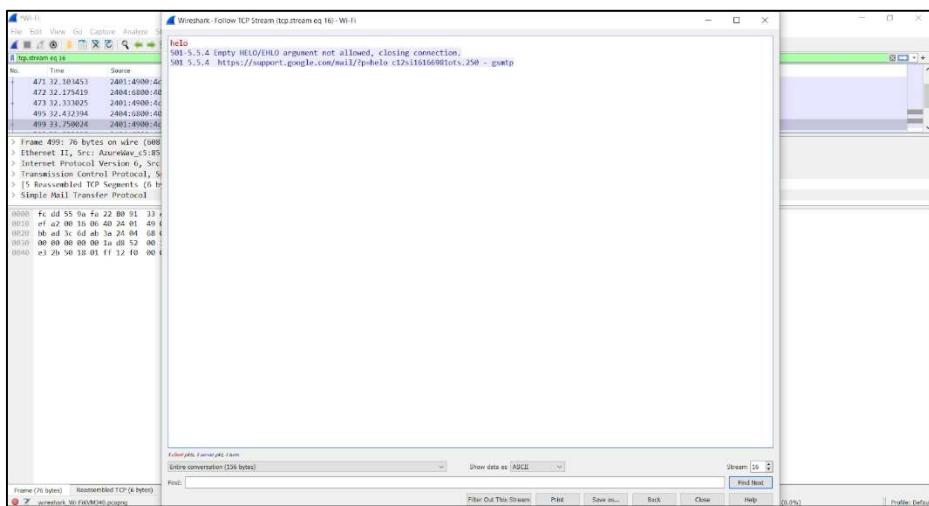
5. Observe the Response code and Response parameter.

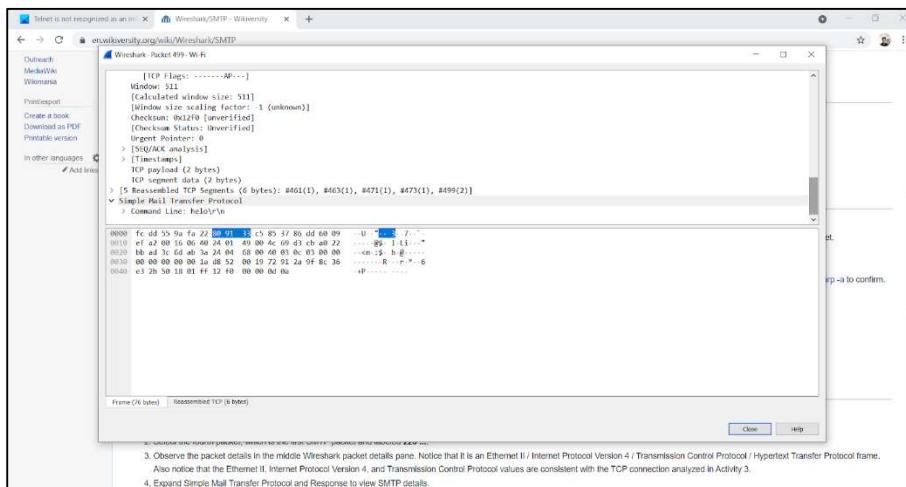
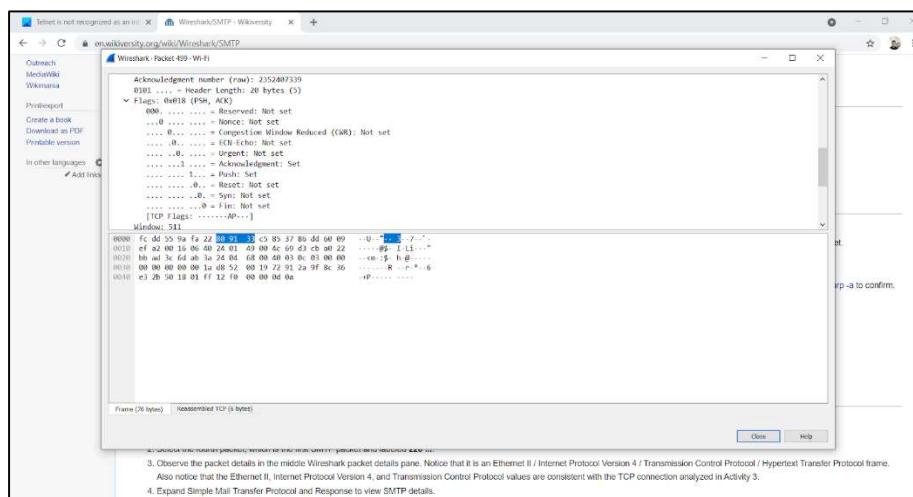
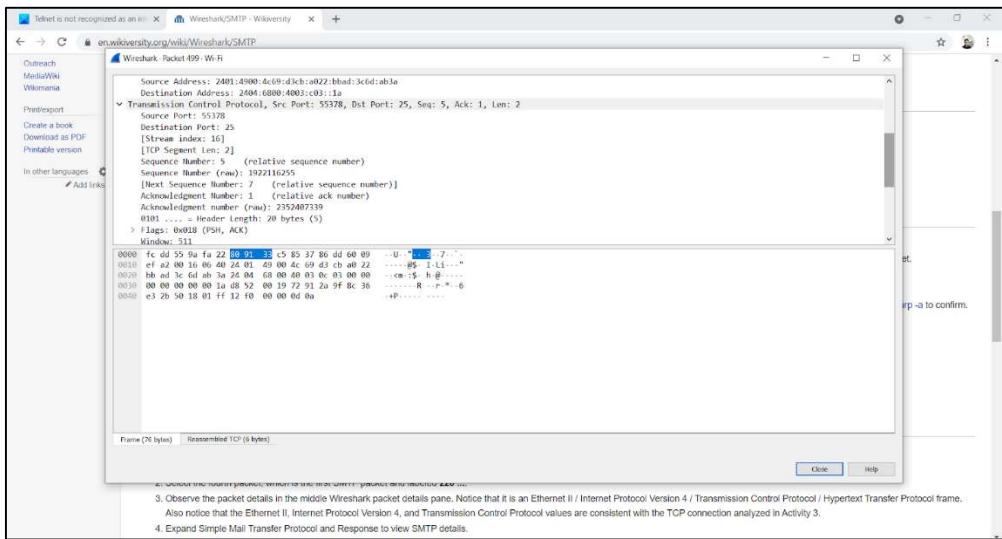
6. Close Wireshark to complete this activity. Quit without Saving to discard the captured traffic.

8.1.5. SMTP Process









EXPERIMENT-09

9.1. Introduction to Virtual Machine and installation

9.1.2. Creating a Virtual Machine

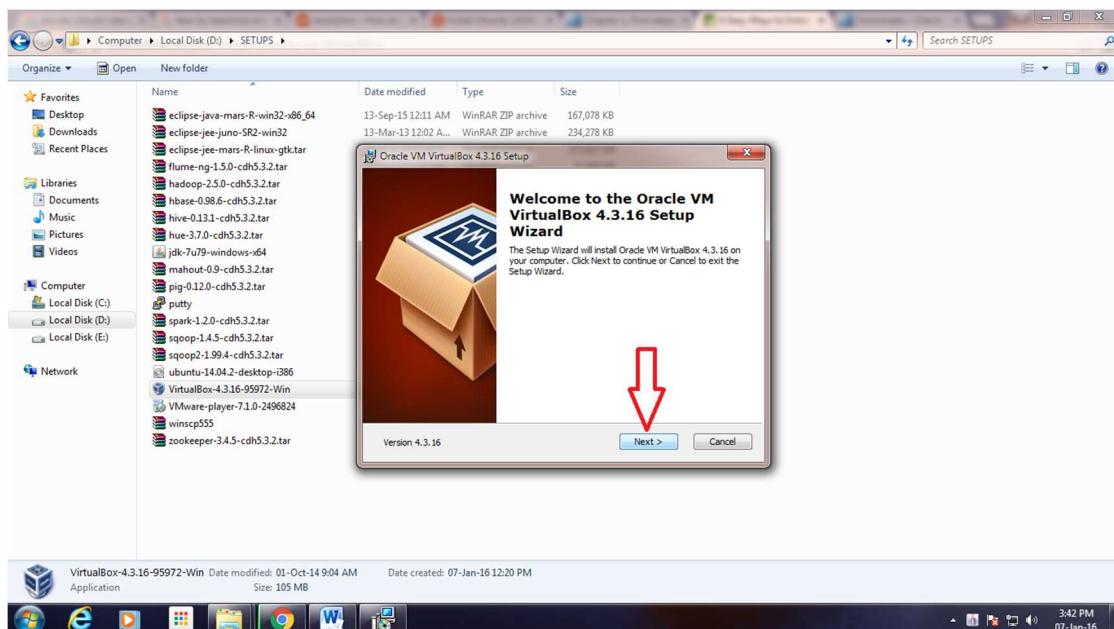
9.1.2.1 Install VirtualBox .

If you don't already have VirtualBox installed on your Windows or Mac computer, you'll need to install it before proceeding.

Following are the steps required to install VirtualBox(Oracle VM VirtualBox):

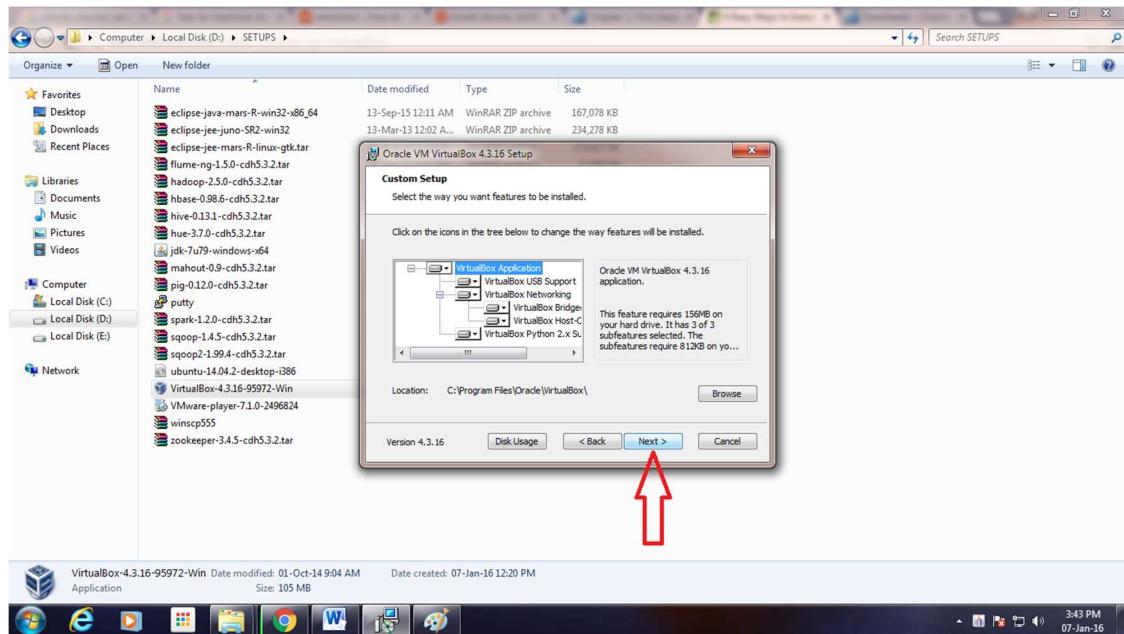
You can download the latest version of VirtualBox from the Virtual Box website: <https://www.virtualbox.org/wiki/Downloads> according to the version of your operating system Windows, Mac or Linux.

- Click Next



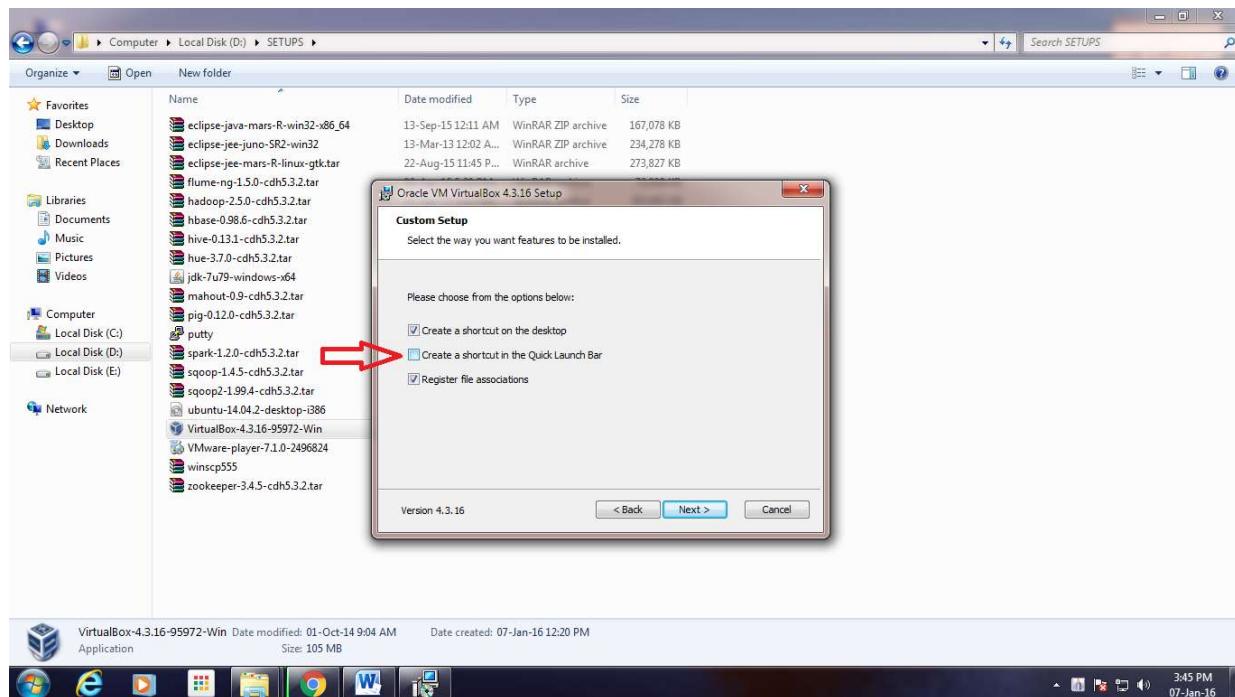
To Install VirtualBox – Setup Wizard

- Click Next



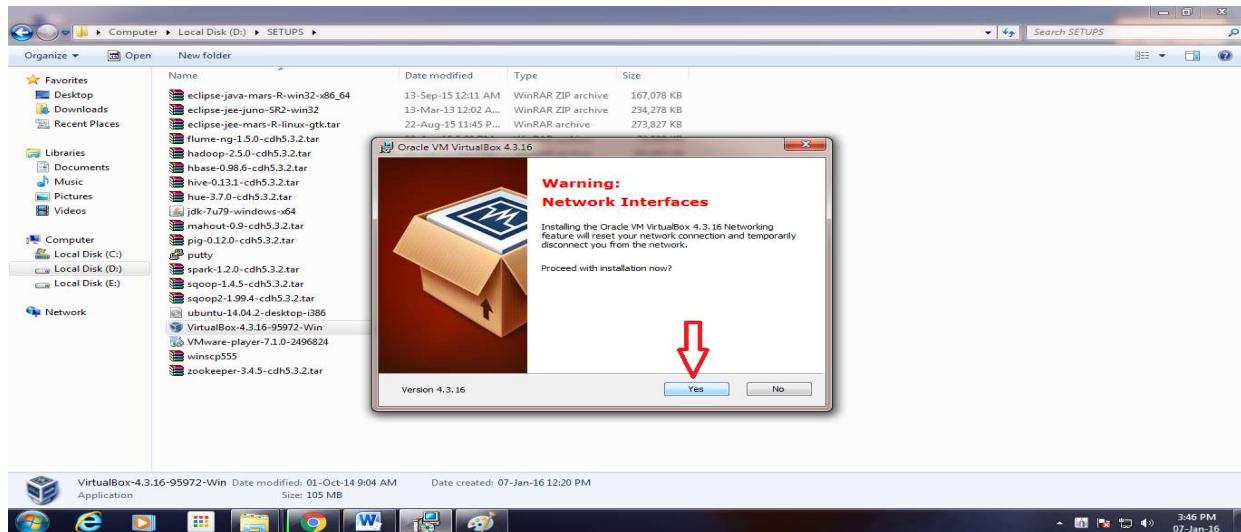
To Install VirtualBox – Custom Setup

- Uncheck “Create a shortcut in the Quick Launch Bar” and click “Next”



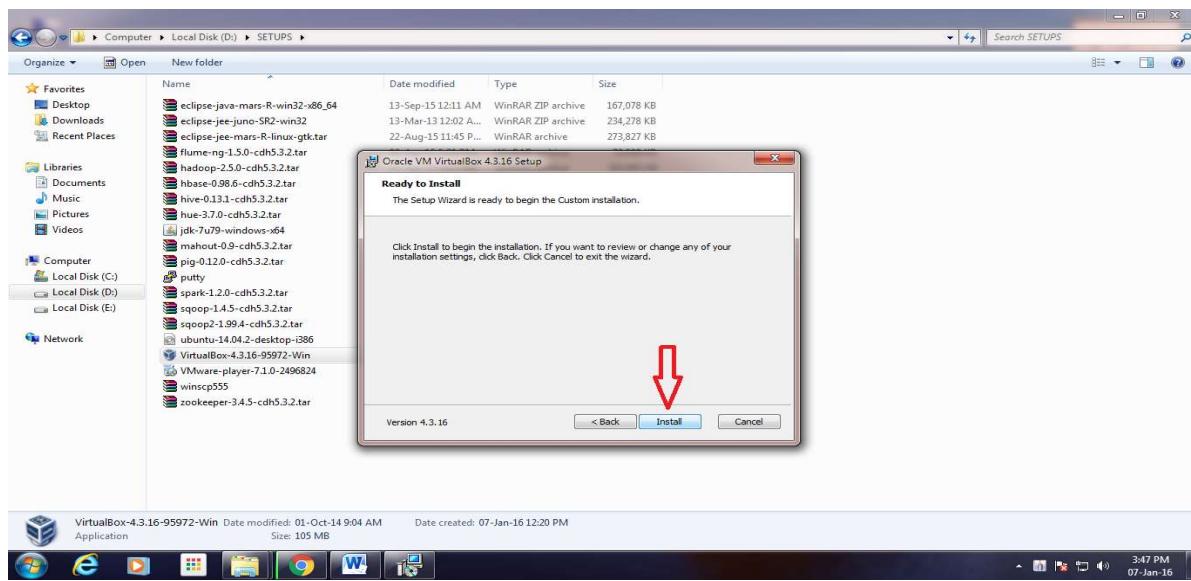
To Install VirtualBox – Features Selection

- Click “Yes”



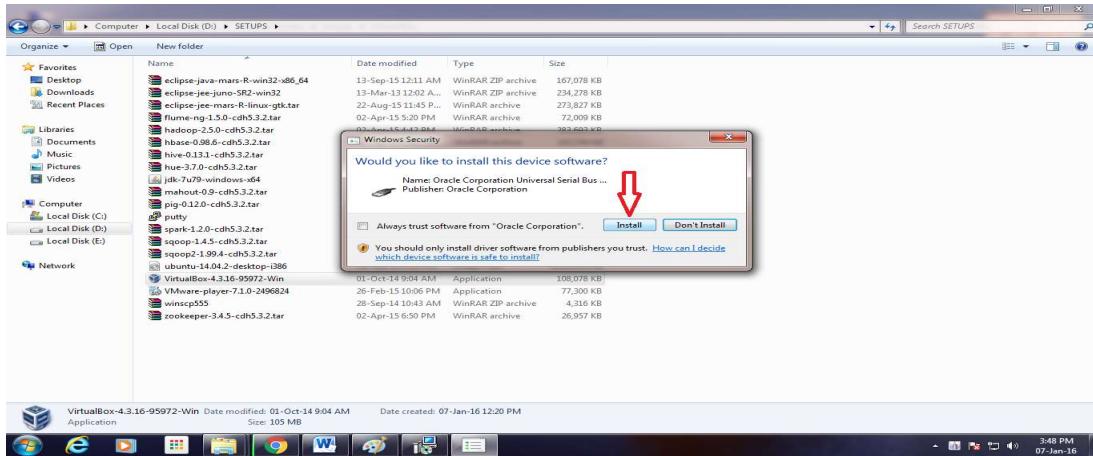
To Install VirtualBox – Network Interfaces Warning

- Click “Install”



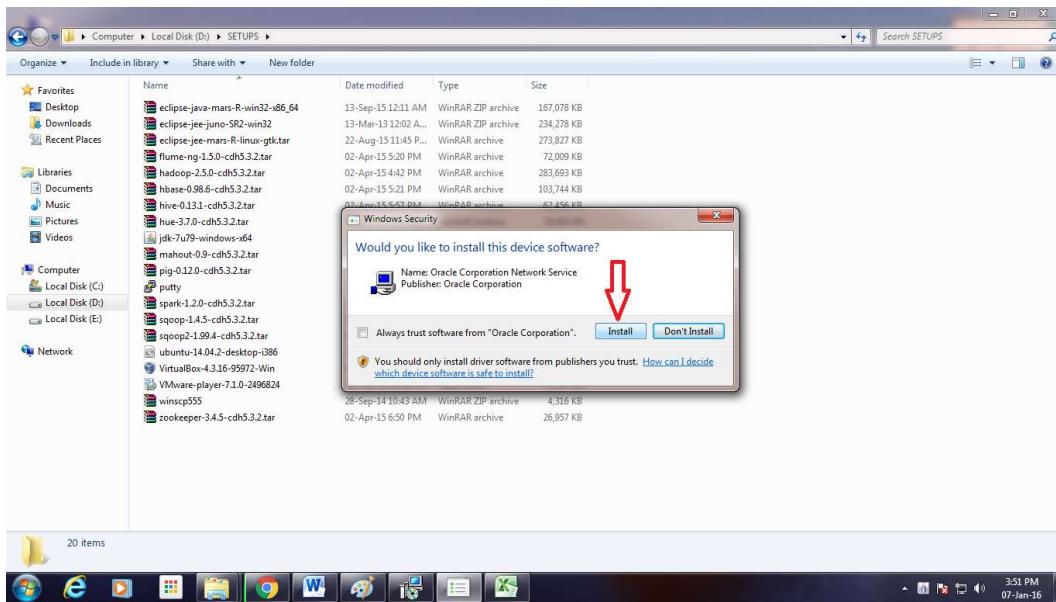
Installation of Oracle VM VirtualBox – Ready to Install

- Click “Install”



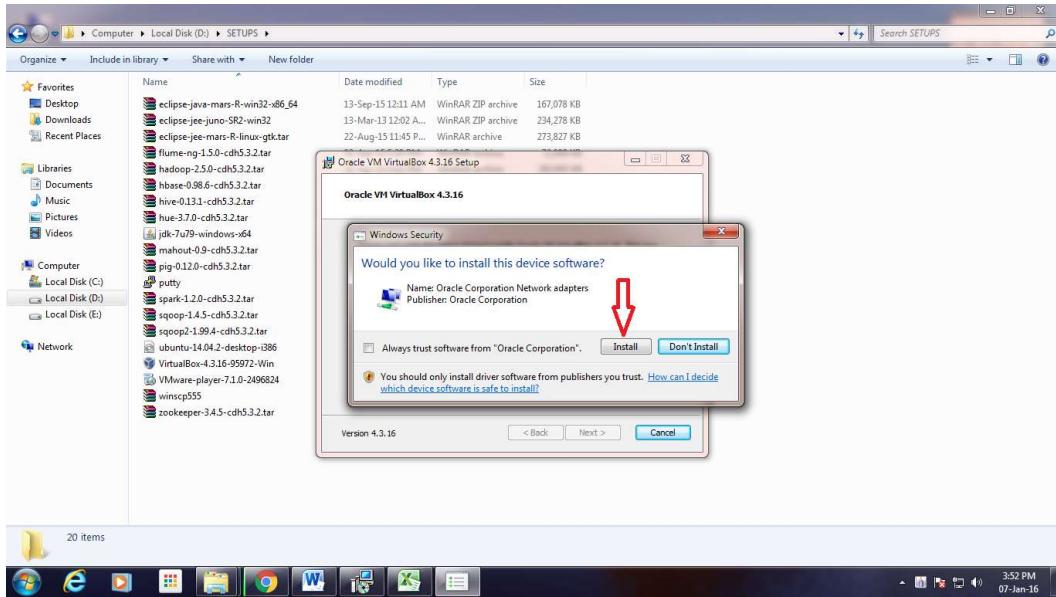
Installation of Oracle VM VirtualBox- Serial Bus Software Installation

- Click “Install”



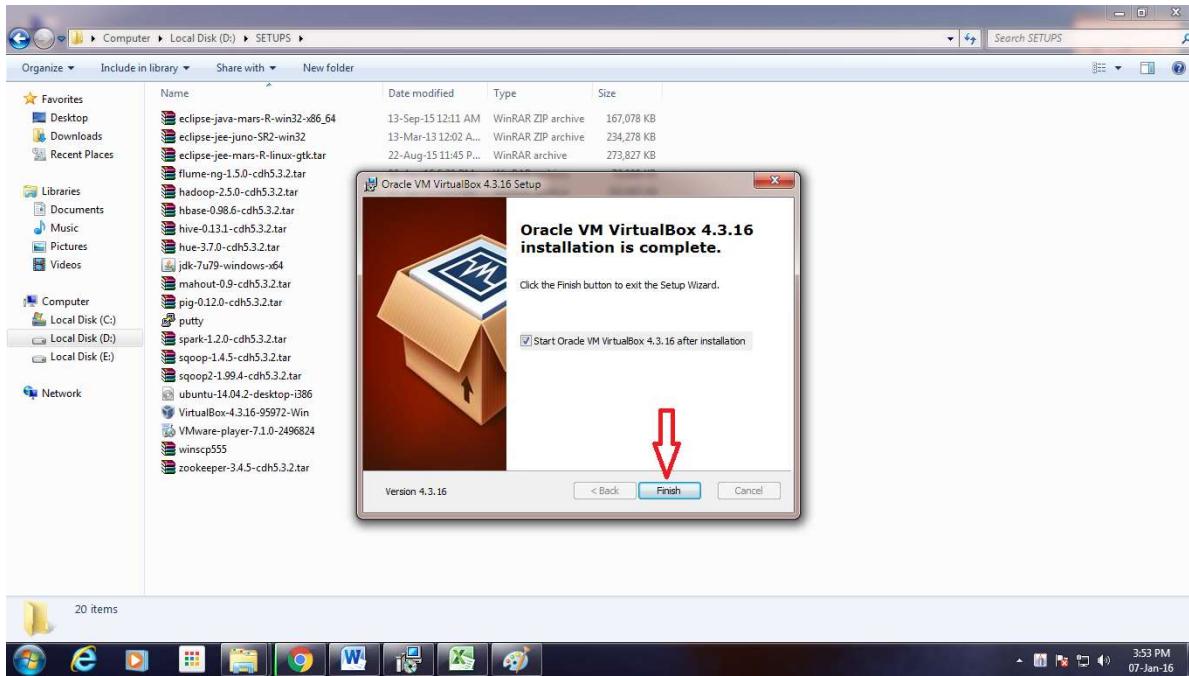
Installation of Oracle VM VirtualBox – Network Service Installation

- Click “Install”



Installation of Oracle VM VirtualBox – Network Adapters Installation

- Click “Finish”



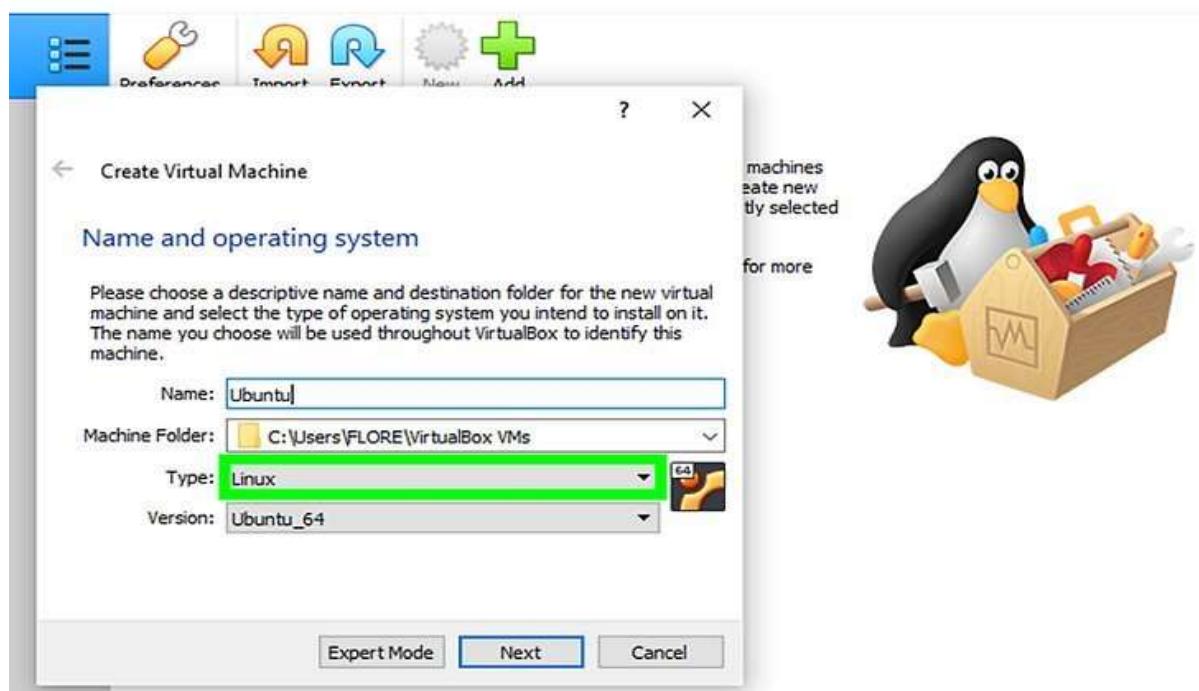
9.1.2.2. Open VirtualBox. Double-click (or click once on a Mac) the VirtualBox app icon.



Click New. It's a blue badge in the upper-left corner of the VirtualBox window. Doing so opens a pop-up menu.



Enter a name for your virtual machine. Type whatever you want to name your virtual machine (e.g., Ubuntu) into the "Name" text field that's near the top of the pop-up menu.



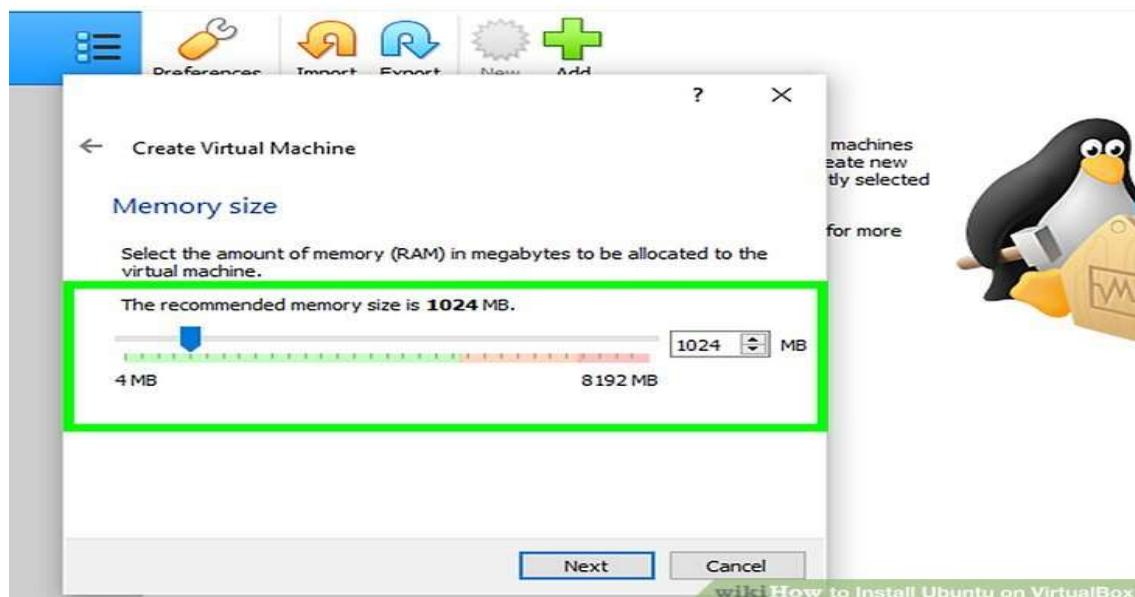
For **Operating System Type**, select the OS that you want to install.



Select the **version** of the operating system.



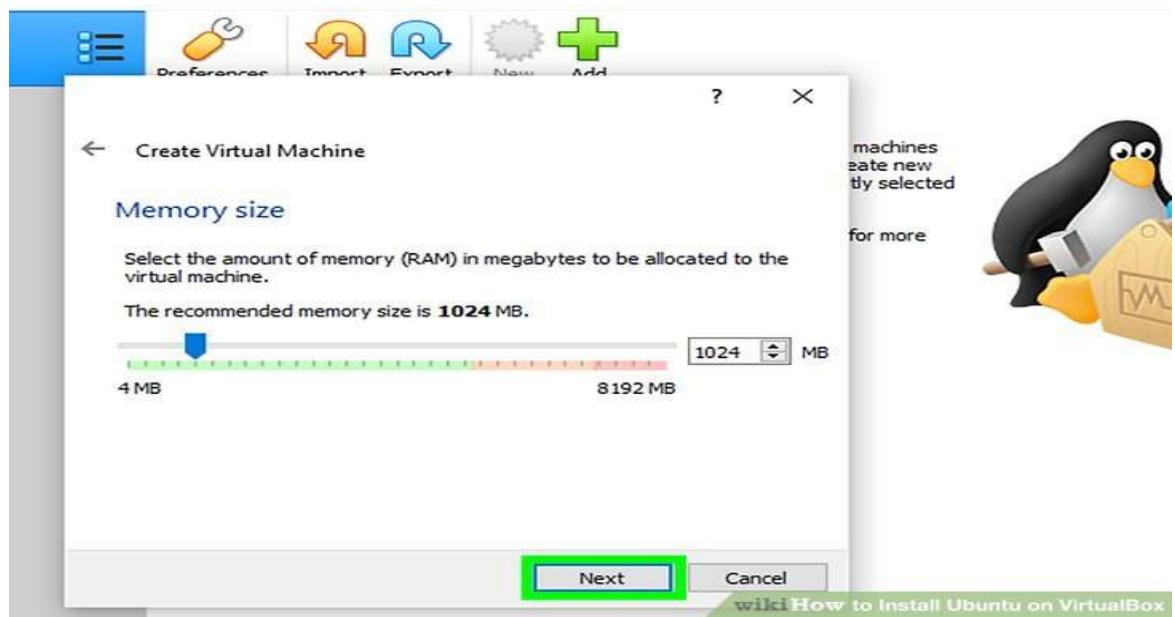
Click Next. It's at the bottom of the menu.



Select an amount of RAM to use. Click and drag the slider left or right to decrease or increase the amount of RAM that VirtualBox will have available for your virtual machine.

The ideal amount of RAM will automatically be selected when you get to this page.

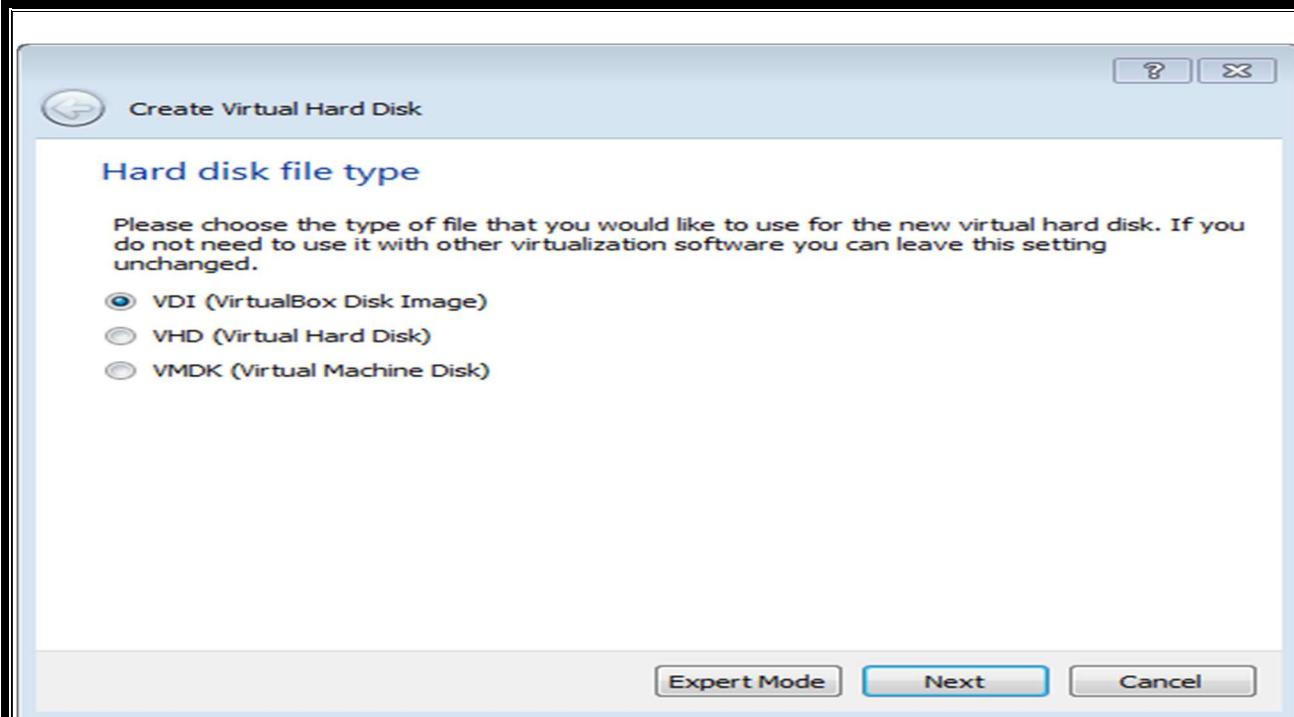
Make sure not to increase the RAM into the red section of the slider; try to keep the slider in the green.



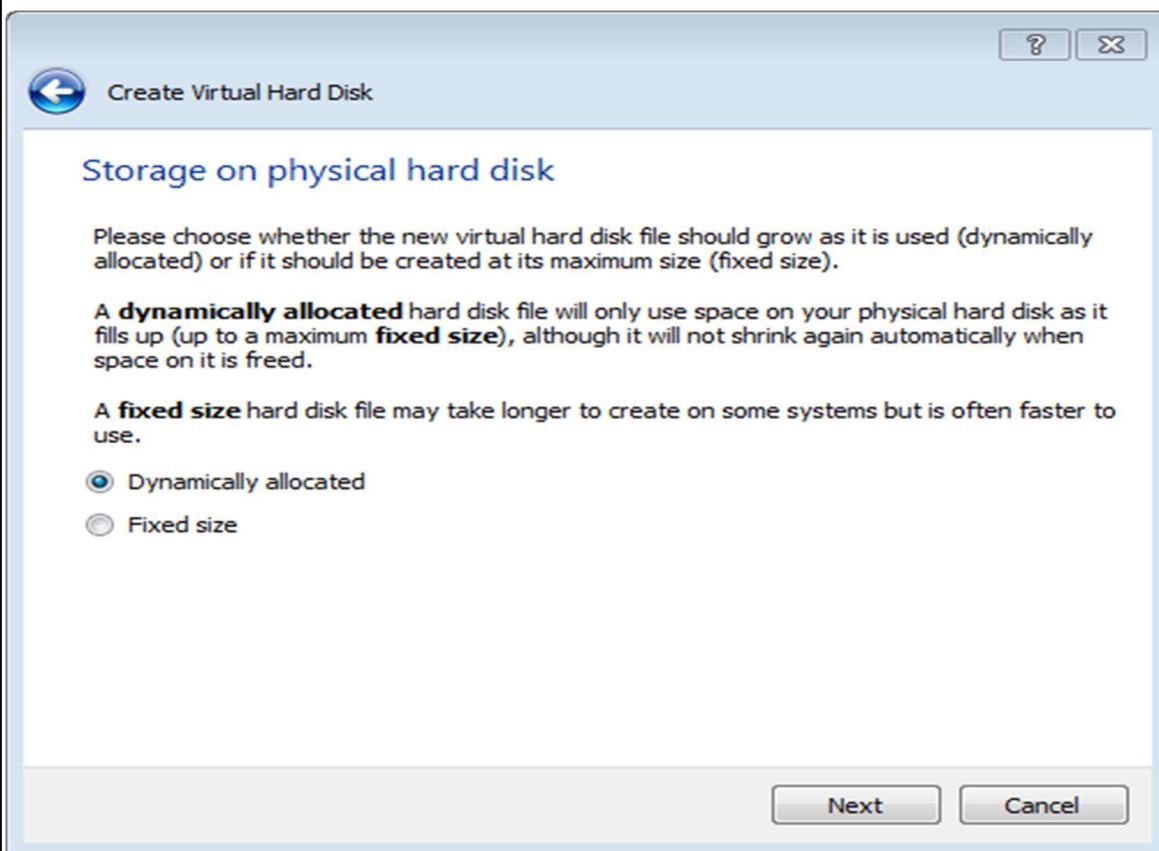
Click Next. It's at the bottom of the menu.



Create your virtual machine's virtual hard drive. The virtual hard drive is a section of your computer's hard drive space which will be used to store your virtual machine's files and programs:

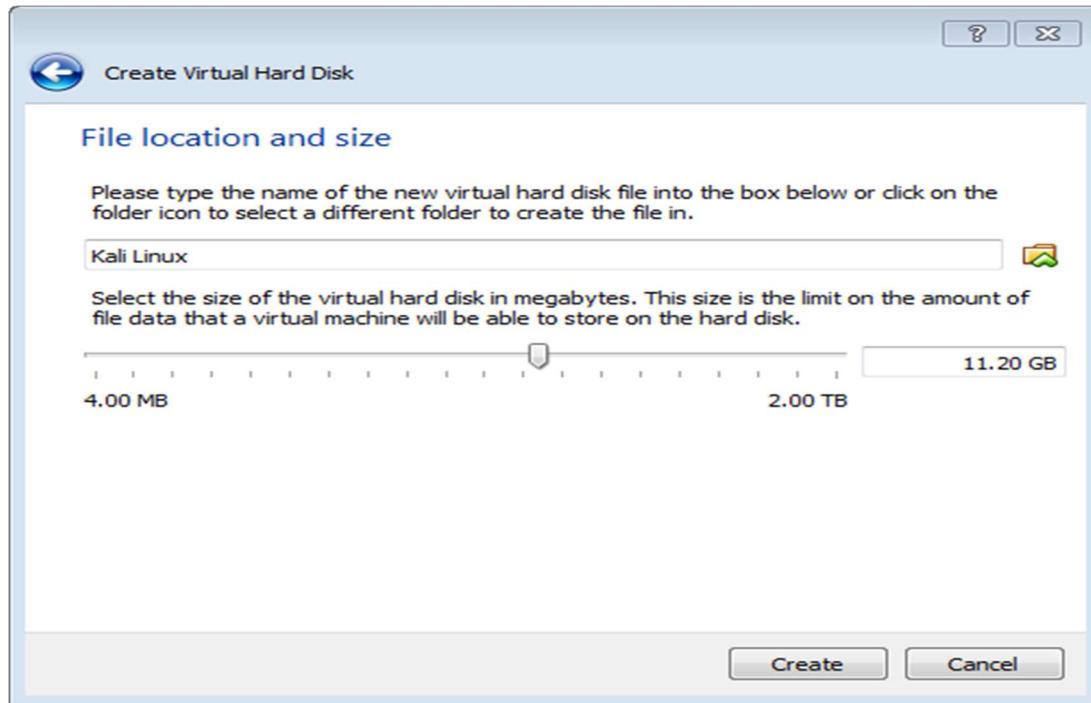


Use “VDI” to create a virtual hard disk



Choose “Dynamically allocated”

Allocate at Minimum 8 GB (recommended 10 or more).



Click **Create**, to create your new virtual machine. The virtual machine is displayed in the list on the left side of the VirtualBox Manager window, with the name that you entered initially.

VMs can run multiple operating system environments on a single physical computer, saving physical space, time and management costs.