

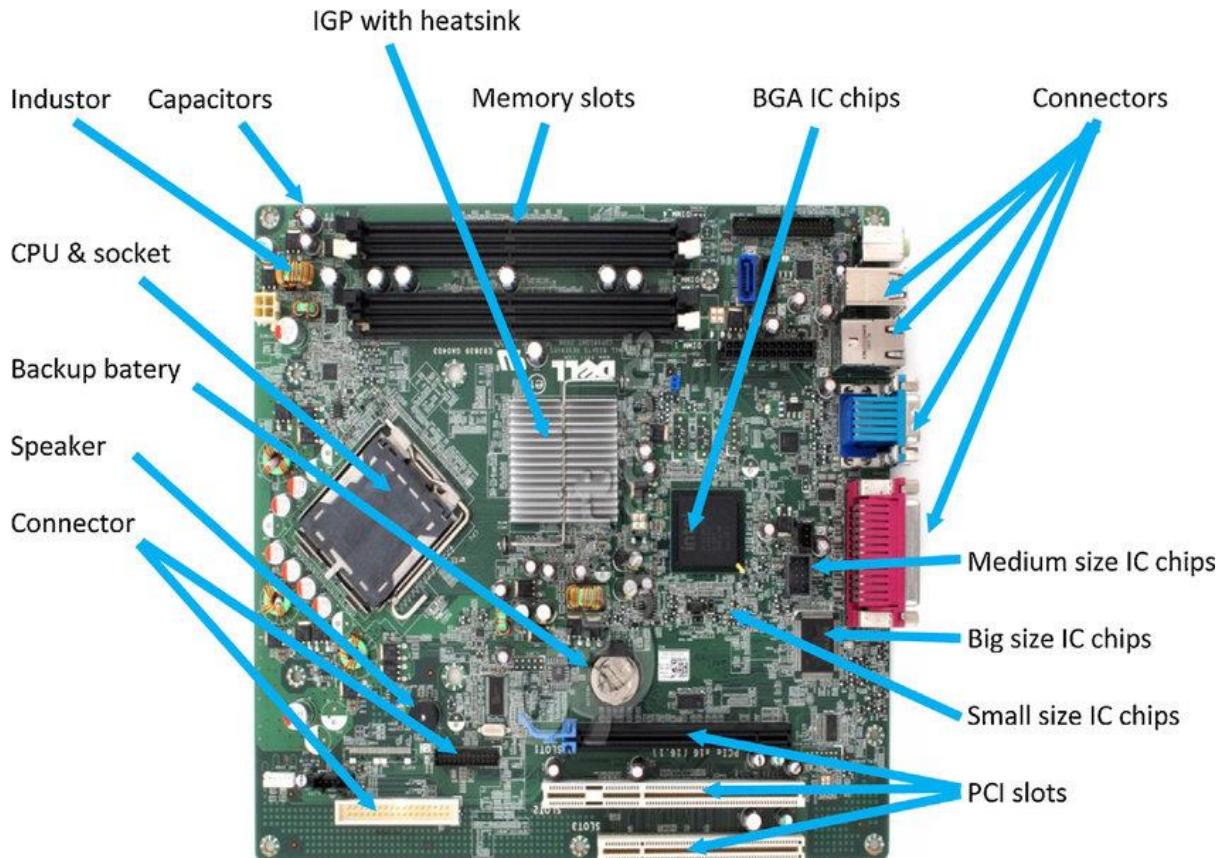
NETWORKING & SYSTEM ADMINISTRATION LAB
20MCA136
RECORD

JOBIN JOSEPH
ROLL NO : 01
S2-REG-MCA-B

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Assignment 1

1. MOTHERBOARD COMPONENTS



1. CPU (Central Processing Unit) chip



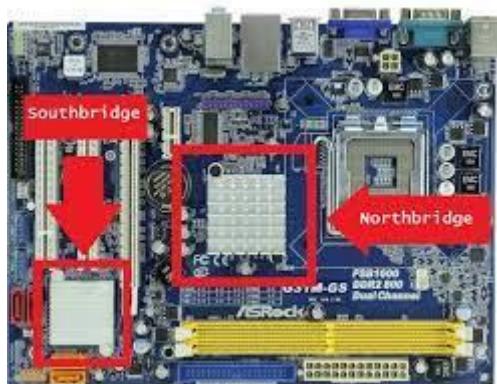
CPU is the electronic circuitry in a computer that executes instructions that make up a program. It is also known as a central processor or the main processor. The CPU executes the basic logic, arithmetic, controlling as well as input/output (I/O) operations specified by the instructions in the desktop programs.

2. RAM (Random Access Memory) slots



RAM is a kind of computer memory that can be read and written. It is mainly used to save data and machine code. A RAM device permits data to be read or written in nearly the same amount of time no matter where the data's physical location is in the memory. Compared to the direct-access storage devices like hard drives, CD/DVD and magnetic tapes, RAM media is much faster for data reading and writing.

3. Southbridge/northbridge



They are the two chips in the core logic chipset on the motherboard. Typically, the southbridge implements the slower capabilities of the motherboard in a northbridge/southbridge chipset computer architecture.

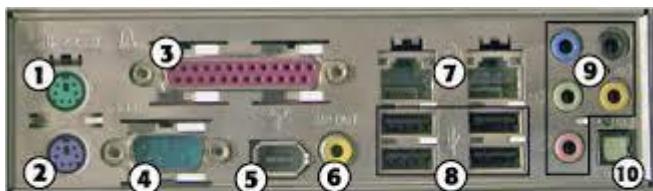
The northbridge, also known as host bridge or Memory Controller Hub, is connected directly to the CPU via the front-side bus (FSB). It is responsible for tasks requiring the highest performance. Together with the southbridge, they manage communications between the CPU and other **motherboard components**.

4. BIOS (Basic Input/Output System)



BIOS, also called system BIOS, PC BIOS or ROM BIOS, is firmware that is used to perform hardware initialization during the booting process; and to provide runtime services for operating system and programs. The BIOS firmware is the first software to run when powered on; it is re-installed on a PC's system board.

5. I/O port



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

Input/output ports are the connections between the CPU and peripheral devices on a motherboard. There are two complementary methods to perform input and output processes: memory-mapped I/O (MMIO) and port-mapped I/O (PMIO). Alternatively, you can use dedicated I/O processors, called channels on mainframe computers, which execute their own instructions.

6. USB (Universal Serial Bus)



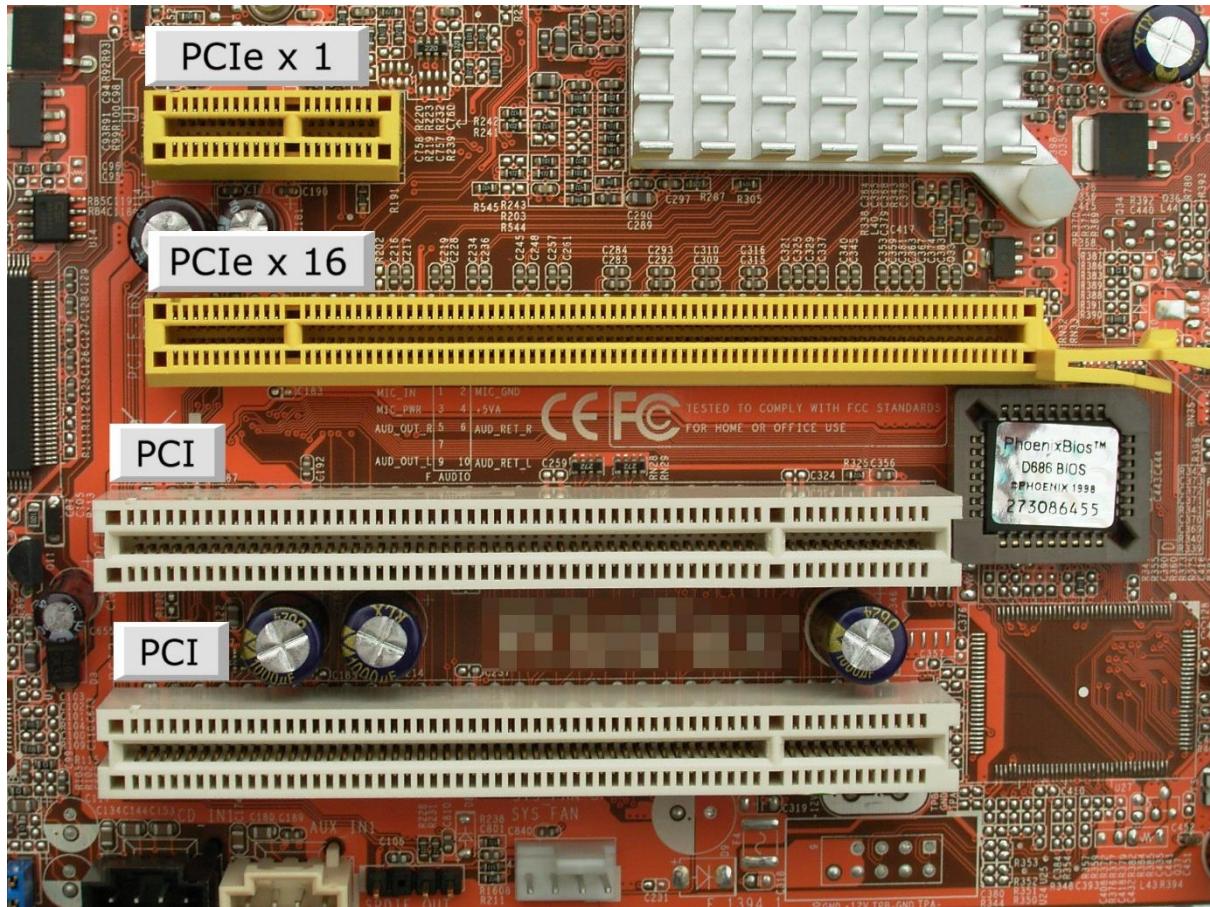
USB is an industry standard that creates specifications for connectors, cables and protocols for connection; power supply (interfacing) and communication among computers, computer peripherals as well as other desktops. There are a great many USB hardware including several different connectors, of which USB-C is the latest kind.

7. CPU slot



A CPU slot, also called a CPU socket or Processor socket, contains one or more mechanical components that provide mechanical and electrical connections between the PCB and a microprocessor (CPU). Therefore, you can install a CPU on a motherboard without soldering.

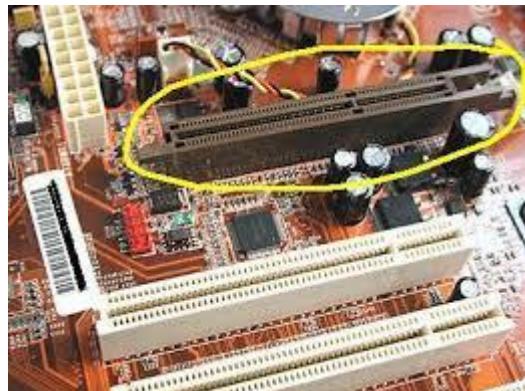
8. PCI (Peripheral Component Interconnect) slot



Peripheral Component Interconnect is a local computer bus for connecting hardware to a computer. It supports all the functions of a processor bus. PCI is usually been called Conventional PCI to distinguish it from its successor PCI Express (PCIe, PCI-e or PCI-E).

PCI Express is a high-speed serial computer expansion bus standard designed to replace the older PCI, PCI-X and AGP bus standard. It is a general-use motherboard interface for the graphics card, SSDs, hard drives, Wi-Fi as well as Ethernet hardware connections.

9. AGP (Accelerated Graphics Port) slot



AGP was designed as a high-speed point-to-point channel for connecting a video card (graphics card) to a computer system. Primarily, it was used to assist in the acceleration of 3D computer graphics. AGP is originally designed to be a descendant of the PCI series of connections for video cards. Yet, it was replaced by the PCIe slots.

10. ISA (Industry Standard Architecture) slot

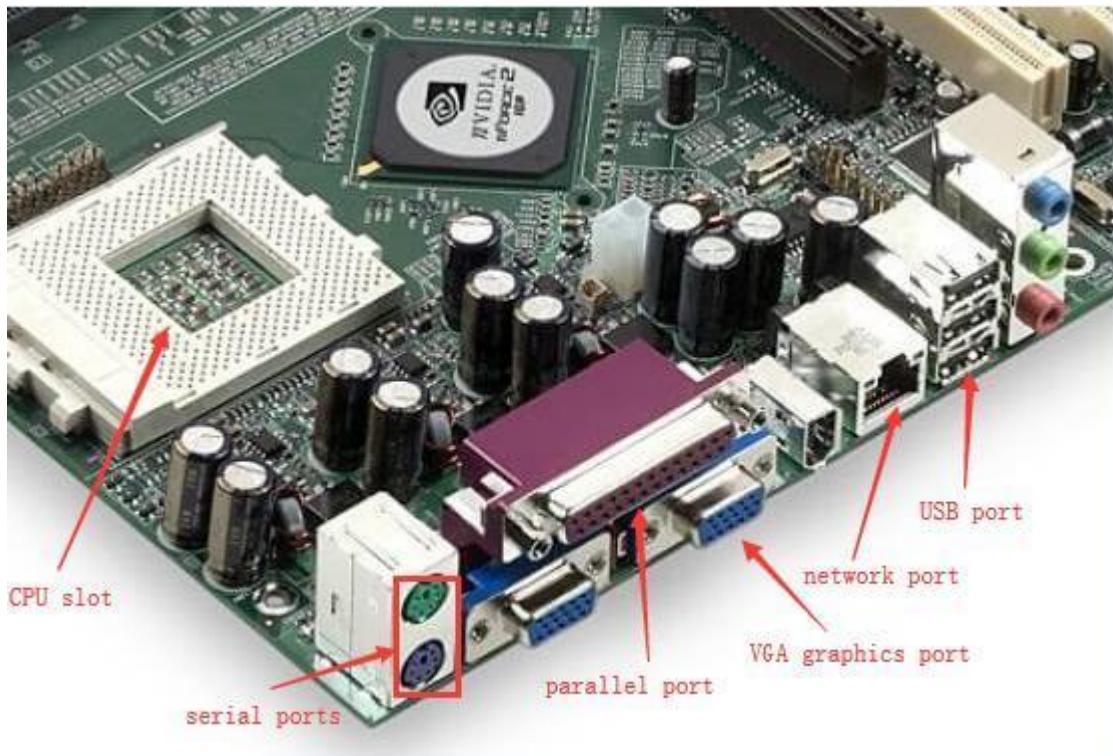


ISA is the 16-bit internal bus of IMB PC/AT and similar computers that are based on Intel 80286 and its immediate successors during the 1980s. It was backward compatible with the 8-bit bus of the 8088-based IBM PC largely.

There once was an attempt to extend ISA into a 32-bit bus, called Extended Industry Standard Architecture (EISA). The attempt wasn't very successful and the EISA was largely replaced by the later VESA Local Bus and the PCI bus.

11. Parallel port

A parallel port is a kind of interface for attaching peripherals on desktops. The name of this kind of port is derived from the way the data is sent. That is, the parallel ports send multiple bits of data at the same time. Serial interfaces, on the contrary, send bits one data at once. To achieve parallel data transfer, there are multiple data lines in the parallel port cables. The parallel port cable is larger than the cable of a contemporary serial port, which only has one data line within.



12. FDC (Floppy-Disk Controller)



FDC is a special-purpose chip and associated disk controller circuitry. It controls and directs reading from and writing to a computer's **floppy disk drive** (FDD).

13. **IDE** (Integrated Drive Electronics) controller



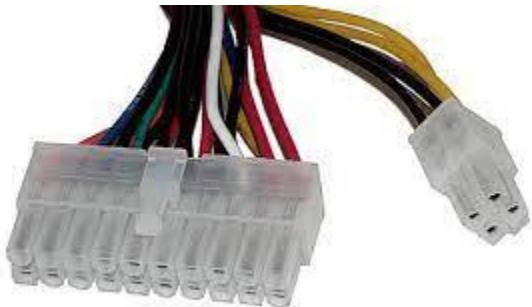
The devices used for connecting IDE, Ethernet, **FireWire**, USB and other systems can be called host adapter. So, the IDE controller refers to the host adapter. A host adapter, also called a host controller or a host bus adapter (HBA), connects a computer (acting as the host system) to other network and storage devices.

14. CMOS (Complementary Metal-oxide-semiconductor) battery



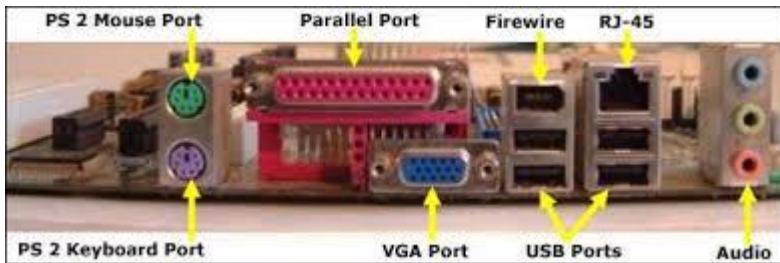
CMOS battery, also called memory battery, clock battery or real-time clock (RTC), is generally a CR2032 lithium coin cell. The lifespan of the CMOS battery is estimated to be three years when the power supply unit (PSU) is unplugged or switch off.

15. Power supply connector



A power supply provides the necessary electrical power to let the computer to work. It takes standard 110-Volt AC (Alternative Current) power to DC (Direct Current) power of 12 Volt, 5 Volt, 3.3 Volt, etc.

16. Mouse and keyboard ports



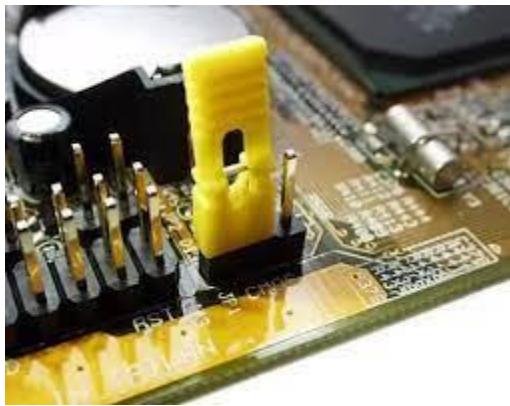
All computers have a keyboard port connected directly to the motherboard. There are two types of connectors. The oldest one is a special DIN (Deutsches Institut für Normung) connector while the newest one is the mini DIN PS/2-style connector. Many PCs use the PS/2-style connectors for both keyboard and mouse; and the connectors are marked clearly for different usage.

17. DIP (Dual In-line Package) switch



A DIP switch is a manual electric switch packaged with others in a standard dual in-line package. The term may refer to an individual switch or the whole unit. The DIP switch is designed to be used on a printed circuit board (motherboard) together with other electronic **motherboard components**. It is usually used to customize the behavior of an electronic device for specific situations.

18. Jumper



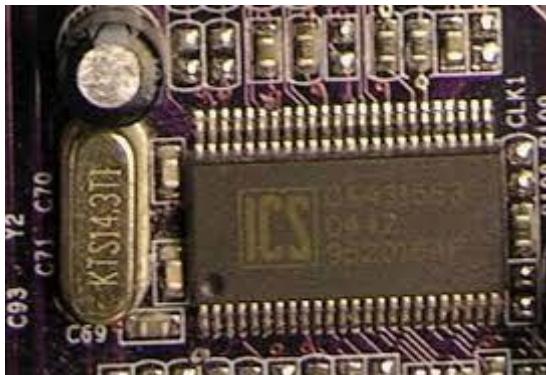
A jumper is a short length of conductor that is used to close, open or bypass part of an electronic circuit. Typically, jumpers are used to set up or configure printed circuit boards like the motherboard.

19. Heat sink/heatsink (cooling system)



A heat sink is a passive heat exchanger that transfers the heat generated by **parts of motherboard** into a fluid medium like liquid or air. The fluid medium will dissipate away from the device. Thus, the temperature of the device is kept within a tolerable range. On the motherboard, the heatsink is usually used to cool CPU, GPU (graphics processing unit), chipsets and RAM modules.

20. Clock generator



A clock generator is an electronic oscillator (circuit) that produces a clock signal for usage in synchronizing a circuit's operation. The clock signal ranges between high and low frequencies, thus creating a metronome for the coordination of actions.

2. RAM(Random Access Memory)

A RAM is a chip made up of several electronic elements that store the temporary working data of your system which can be read and written. RAM requires electric supply for functioning, hence when the system is turned off, all data from RAM vanishes. It is mounted on the motherboard.

The RAM chips are not individually mounted on the motherboard because of less capacity, hence in earlier times, several chips used to be soldered together and converted into “modules”(integrated circuit boards) and these modules were mounted over motherboard using “pins”(also known as connectors).

Types of modules:

There are Three types of modules in a RAM:

- Single In-line Memory Module(SIMM)
- Rambus in-line memory module (RIMM)
- Dual In-line Memory Module(DIMM)

SIMM(SINGLE IN-LINE MEMORY MODULE)

SIMM stands for single in line memory module.A SIMM consist of memory chips soldered onto a modular printed circuit board (PCB),which inserts into a socket on the motherboard.72 pin SIMMs transfer 32 bits of data at a time, therefore in modern microcomputers with a 64-bit data bus two SIMMs have to be paired up in order to function.



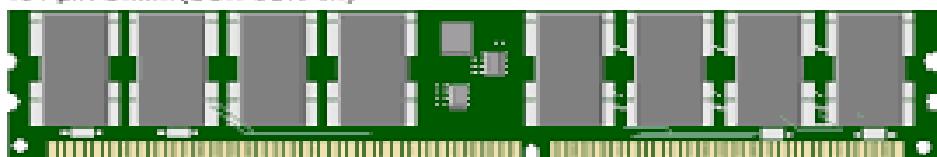
RIMM(RAMBUS IN-LINE MEMORY MODULE)

Rambus in-line memory module (RIMM), like the name suggests, was designed for Rambus memory which was backed by Intel and was supposedly going to become the ‘next big thing’ rivalling DDR SDRAM in the early 2000s. That technology never took off, in part due to its proprietary nature, licensing issues, lack of standardisation, thermal issues (early modules were prone to overheating) and by the time they were out, most vendors were already switching to DDR2 SDRAM which made Rambus irrelevant.

184-pin RDRAM (Rambus). Chips are covered with metal heat sink.

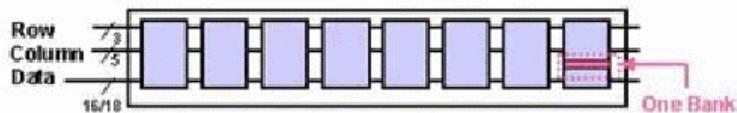


184-pin DIMM (DDR SDRAM)



Rambus In-line Memory Module (RIMM)

RIMM Modules



- 1-32 devices per RIMM module
 - 1 device responds to each access
 - Devices can be in different power states
 - Different capacities for different market segments
 - Single-device minimum upgrade granularity
 - Module bandwidth same as device bandwidth
- Devices are independent
 - 8 device RIMM, 16 banks each => RIMM has 128 banks

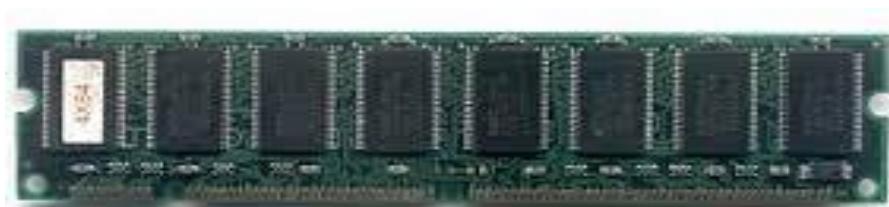


DIMM(DUAL IN-LINE MEMORY MODULE):

Dual In-line memory modules or DIMMs ,closely resemble SIMMs.

DIMMs install vertically into expansion socket.

The difference between the two is that on aSIMM,pins on opposite sides of the board are “tied together” to form one electrical contact;on a DIMM,opposing pins remain electrically isolated to form two separate contacts.



Classification of DIMM

DIMM can be classified on the basis of buffer size and type of RAM:

➤ **DIMM classification based on buffer size:**

- **Unbuffered DIMM (UDIMM):** The system directly reads/writes from/to memory chip without validation hence increasing the electrical load on the motherboard but are very faster.
- **Registered DIMM (RDIMM):** uses register that buffers signals, hence increasing clock cycle but are more reliable.

➤ **DIMM classification based on the type of RAM:**

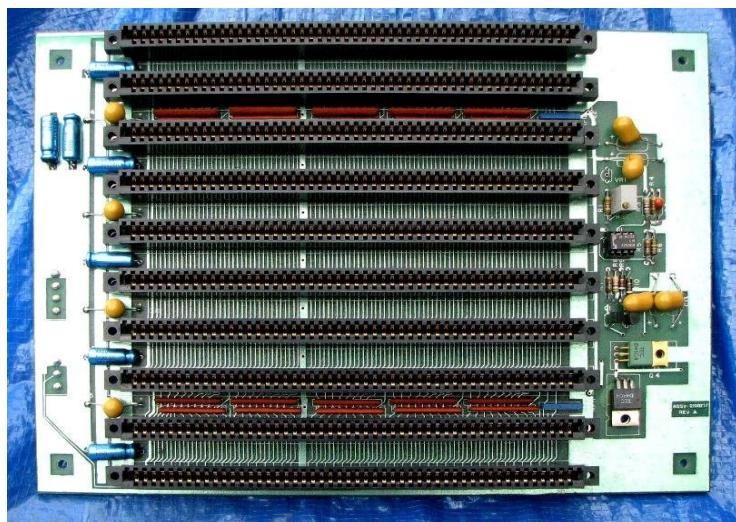
- **SDRAM (synchronous dynamic RAM) DIMM:** It was the first dynamic RAM to sync with the system clock. The refresh rate was much lower due to re-accessing data after the rising half cycle.
- **SDR(single data rate) DIMM:** single data rate means the packet of data is only accessed once per clock cycle. Serial data can be read via the serial data pins on the DIMM which enables the motherboard to autoconfigure to the exact type of DIMM installed.
- **DDR(double data rate) DIMM:** Data packet is accessed twice each clock cycle. DDR DIMMs also use two notches on each side to enable compatibility with both low- and high-profile latched sockets.
- **DDR2 DIMM:** The key difference between DDR and DDR2 is that in DDR2 the bus is clocked at twice the speed of the memory cells, so data can be transferred four times faster per memory cell cycle. DDR3 and DDR4 are the improvised versions of DDR with less latency and better accuracy. SODIMM (small outline DIMM) is much more compressed with noticeable size-reduction to use it in portable devices.

3. DAUGHTER CARDS

A daughter card or **daughterboard** is a type of **circuit board** that gets added to an existing one. Its name is appropriate for its use, since it is connected to a “**motherboard**” or “main board.” The motherboard is the primary circuit board for a device. It is usually in the device as it is shipped from the factory. A daughter card may be added later.

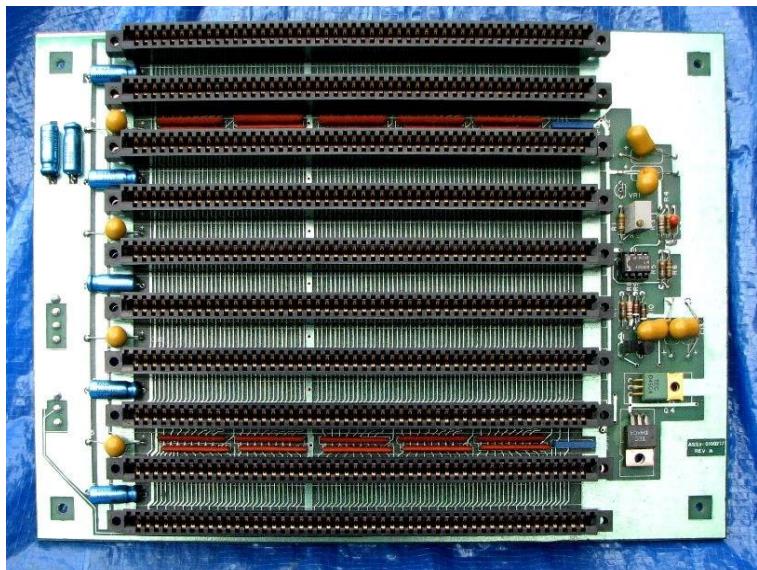
Some daughter card designs are made so that engineers can add functionality to a device without requiring a lot more room inside its housing. These kinds of items are often called riser boards or risers. Some might also call them “mezzanine boards.”

The earliest microcomputers were composed of several circuit boards, each of which performed a different function. All of these circuit boards were plugged into a single board which consisted of nothing more than some power regulation circuitry and a bunch of connectors which were interconnected. This board, which everything else plugged into, was commonly called a “bus board” or “backplane.”



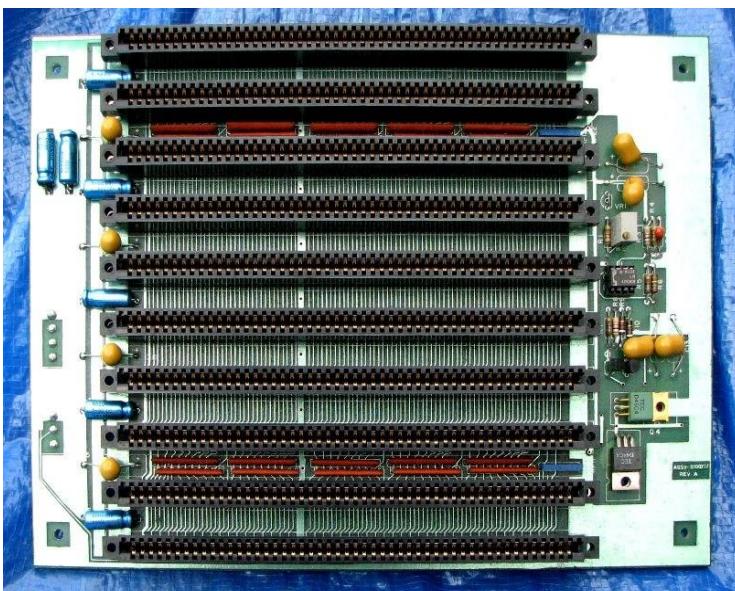
An S100 backplane board.

The cards which were plugged into the backplane were identified by their function. As such, they were processor boards, memory boards, terminal boards, serial boards, parallel controller boards, tape controller boards, drive controller boards, and so forth. Due to the number of boards being used in one of these microcomputers, they were rather bulky.



The Micral N Micro-ordinateur

In 1976, Steve Wozniak demonstrated to the Homebrew Computer Club his newly designed computer which had a single circuit board that had nearly all the functions needed for an entire computer. His computer design became known as the Apple 1. This single board, which was the first "motherboard" held the power regulation circuitry, a microprocessor, RAM, ROM, display circuitry, and a keyboard interface. This single board also had a single expansion slot (at the bottom right in the picture below), which could accept a smaller "expansion board" which could contain other circuitry.



The Apple 1 Motherboard

As other microcomputers were introduced, they retained the idea of using a single main circuit board which held the most important circuitry of a computer system, including the CPU, RAM, and ROM. Some moved the power regulation circuitry off the main circuit board and included multiple expansion slots. The computer which really spawned the modern

computer age was the IBM PC which also moved the video circuitry off to an expansion card. This last innovation allowed for a number of different video adapters to be made, each with different capabilities.



The IBM PC Motherboard.

There were many different expansion cards made for the IBM PC. Some of them provided a video display and controlled a monitor. Some provided the ability to attach floppy disk drives. Others allowed a hard disk to be attached to the computer. There were serial port expansion cards which were used to attach plotters and modems, among other devices. Expansion cards were available with parallel ports to attach printers. The Mockingboard, AdLib, and SoundBlaster expansion boards added advanced sound capabilities to the computer. There were even several different types of network adapters available on expansion boards.

Over time, almost all of these expansion cards have been incorporated into the motherboard. It is completely possible, today, to get a computer that does not need any expansion boards at all. However, expansion boards can still be used to add the ability to use functions not supported by the motherboard directly (such as USB 3.0, RAID controllers, and so forth) or to supplement/replace the functions of the motherboard with much more capable circuitry (professional grade sound cards, high end 3D video cards).

A daughterboard is an extension of the motherboard of a computer. However, unlike an expansion card, it is not simply another device added to a motherboard to increase its functionality. Instead, it provides the circuitry for an integral function of the motherboard. Without the daughterboard, a motherboard that depends on it will not function. Some of the earliest daughterboards held the processor (or an alternate processor), the RAM chips which were controlled by the motherboards memory controller circuitry, or a more robust expansion bus. Sometimes these daughterboards connect into slots and other times they connect into sockets on the board.



A motherboard with a Processor daughterboard

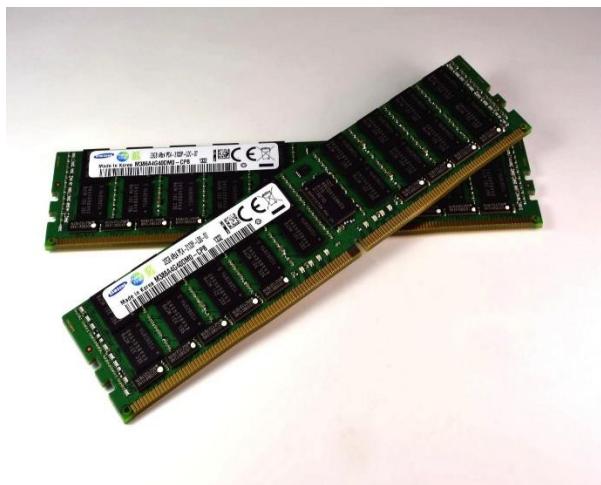


A motherboard with a Memory daughterboard.

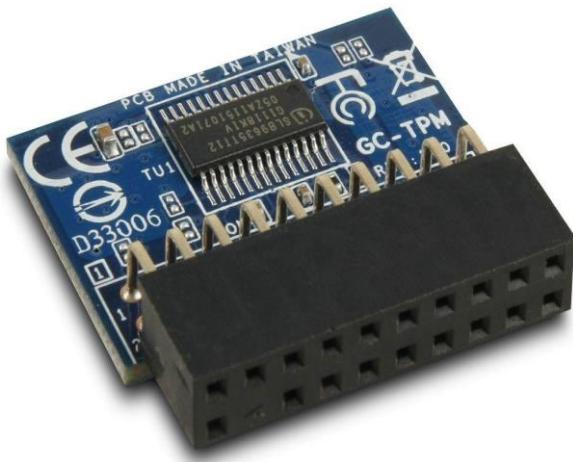


A motherboard with an Expansion Riser daughterboard

More modern examples of daughterboards include the common memory modules used in our computers and Trusted Platform Modules.



Memory Modules



Trusted Platform Module

While a daughterboard is an integral extension to a motherboard and an expansion board adds additional functions to a computer, a sisterboard adds additional capabilities to an expansion board. An example of this is the first version of the 3Dfx Voodoo. This was a device which enabled computers to have hardware accelerated 3D graphics rendering in an era long before modern gaming came to rely on this capability. However, since the VooDoo could not provide 2D graphics capabilities (which the graphical desktop depended on), it had to be used as an extension of an existing 2D graphics expansion board. This card was connected to the 2D graphics card with a video cable and passed through that 2D capability to the monitor. Another example was found in sisterboards which plugged directly into some older audio cards to add Gameport or MIDI (Musical Instrument Digital Interface Capabilities. This type of sisterboard was “piggybacked.” on the original expansion board.

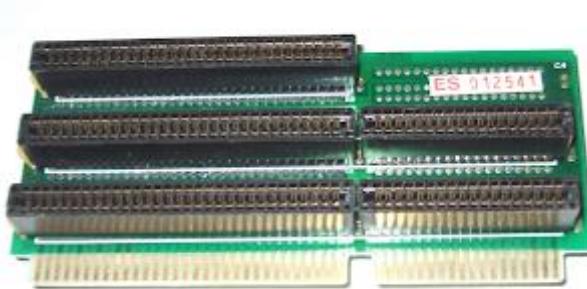
4. BUS SLOTS

Bus slots are located on the motherboard, and openings on the back of the computer allow the ports on the cards that go in the slots to be accessed. There are several types of expansion slots, including AGP, PCIe (also known as PCI express), PCI, and ISA.

The smaller card simply needs an empty spot in the case to be mounted to. It does not need to be placed into an expansion slot on the motherboard. Types of Expansion Slots:

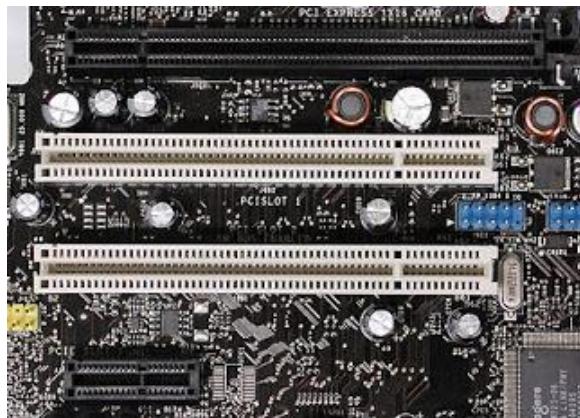
- ISA
- AGP
- PCI
- PCIe, which is short for PCI express

ISA Slots



ISA slots are an older type of expansion slot, twice as big as PCI slots and slower than PCI slots as well. ISA slots are usually black, while PCI slots are usually white. ISA slots are not used much anymore, but most computers still have at least one of them. ISA networking cards, ISA sound cards, ISA video cards, and other types of ISA expansion cards can be used in the ISA slots.

PCI Slots



The photo above is a picture of a PCI expansion slot, the most common expansion slot. PCI slots can handle 64 bits of data at a time, twice as fast as ISA slots, which can only handle 32 bits of data at a time. PCI is an abbreviation for "Peripheral Component Interconnect." A 64-bit PCI slot has 64 connections to the motherboard, and each connection is capable of handling 1 bit of data at a time. A 32-bit ISA slot has 32 connections to the motherboard, each handling one bit of data at a time. (Note: Older technology ISA slots are 8-bit and 16-bit. The newer EISA, (or Extended ISA), slots are capable of 32-bit data transfer. Older PCI technology is 32-bit. The newer PCI technology is 64-bit.)

As technology changes new expansion cards become available. These include video cards, which allow a monitor to be connected to the computer, sound cards, which allow speakers and a microphone to be connected to the computer, and networking cards, which allow computers to be linked together.

AGP Slots

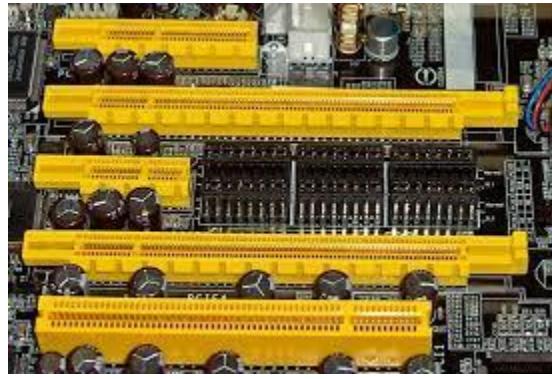


The AGP expansion slot connects AGP video cards to the motherboard. The video card shown above is an AGP GeForce FX 5500. Video cards are also known as graphics cards. They process video and image data that will be displayed on your screen. The monitor plugs into the video card. AGP is an abbreviation for Accelerated Graphics Port. Most AGP video cards are capable of a higher data transfer rate than PCI video cards. Video cards, like the one shown above, simply plug into an AGP slot and connect a monitor or other video display device to a computer, usually through the VGA port. The video card shown above has three different ports, for three different types of monitors. The "DVI Out" connector connects to a "digital video display". DVI is an abbreviation for Digital Video Interface. Video cards with a TV output connection are capable of displaying a computer's video on a television instead of a computer monitor, which is great for playing movies on your computer. Unfortunately, most televisions only support a very low resolution and refresh rate when hooked up to

computers. Video cards with a TV input connection are able of displaying a television's video on a computer. This allows you to record television programs onto your computers hard drive. The VGA connection is the standard connection to most monitors.

PCI EXPRESS

PCI Express is a new technology that is slowly replacing AGP. PCI Express x16 slots can transfer data at 4GBs per second, which is about twice as fast as an AGP 8x slot! PCIe stands for PCI Express, or PCIexpress. PCI Express slots come in five different sizes and speeds: PCIe x1, PCIe x2, PCIe x4, PCIe x8, and PCIe x16. PCIe x16 slots are used for graphics cards.



5. SMPS(Switched-Mode Power Supply).

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

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

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

Advantages of switched-mode power supplies:

- Higher efficiency of 68% to 90%
- Regulated and reliable outputs regardless of variations in input supply voltage
- Small size and lighter
- Flexible technology
- High power density

Disadvantages:

- Generates electromagnetic interference
- Complex circuit design
- Expensive compared to linear supplies



6. INTERNAL STORAGE DEVICES

Internal storage Devices. These devices are installed in all digital computers. They are the storage devices are of two types. These are RAM (Random Access Memory) and Hard disk. RAM allows data to be accessed quickly and in a random order. A RAM of a computer is one of the determining factors to the performance of any computer. A computer with a small RAM, say 64mb will be slower than a computer that has a larger RAM. A hard disc is also another type of internal computer storage device which is used to store and retrieve data that is stored in them.

- Hard Disk Drive (HDD)
- Solid State Drive (SSD)
- Random Access Memory (RAM)
- Static RAM (SRAM)
- Dynamic RAM (DRAM)

HARD DISK DRIVE(HDD)

A hard disk drive (HDD) is a non-volatile storage medium. Non-volatile data remains on a given device unless rewritten or deleted. In hard drives, an electromagnet creates positive or negative charges on the disk surface. The charges create binary code read as the rotating disk and actuator arm work in conjunction. Data is read along concentric circles, known as tracks, and sectors, known as wedges. HDDs come with a variety of benefits, including high storage capacities and overall low cost, that's why they are mostly used for backup and archiving purposes. Alternative forms of storage often cost more for similar storage capacities. These days, a two-terabyte hard drive might cost \$50.00 or less.

Hard drives include mechanical parts, though, so they wear down over time and are susceptible to sudden data loss from impact damage. Many hard drives feature fast read/write speeds, but other faster storage types are available today. Mechanical HDDs have a rotating head, that is why you will see specs like 7.5K RPM or 10K RPM (Revolutions Per Minute) on HDD devices. Typical Storage Capacity: 500 GB to 4+ TB



SOLID STATE DRIVE (SSD)

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. As of 2019, cells can contain between 1 and 4 bits of data. SSD storage devices vary in their properties according to the number of bits stored in each cell, with single-bit cells ("SLC") being generally the most reliable, durable, fast, and expensive type, compared with 2- and 3-bit cells ("MLC" and "TLC"), and finally quad-bit cells ("QLC") being used for consumer devices that do not require such extreme properties and are the cheapest of the four. In addition, 3D XPoint memory (sold by Intel under the Optane brand), stores data by changing the electrical resistance of cells instead of storing electrical charges in cells, and SSDs made from RAM can be used for high speed, when data persistence after power loss is not required, or may use battery power to retain data when its usual power source is unavailable. Hybrid drives or solid-state hybrid drives (SSHDs), such as Apple's Fusion Drive, combine features of SSDs and HDDs in the same unit using both flash memory and a HDD in order to improve the performance of frequently-accessed data.



Random Access Memory (RAM)

RAM (random-access memory) is a hardware device that allows information to be stored and retrieved on a computer. RAM is usually associated with DRAM, which is a type of memory module. Because data is accessed randomly instead of sequentially like it is on a CD or hard drive, access times are much faster. However, unlike ROM, RAM is a

volatile memory and requires power to keep the data accessible. If the computer is turned off, all data contained in RAM is lost.



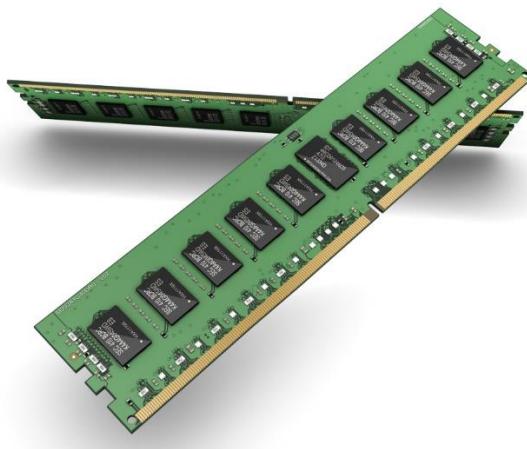
Static RAM (SRAM)

Short for static random access memory, SRAM is computer memory that requires a constant power flow to hold information. Power consumption varies widely based on how frequently the memory is accessed. Although quicker than DRAM, SRAM is more expensive and holds less data per unit volume. Therefore, it is more commonly used in cache and video card memory only.



Dynamic RAM (DRAM)

Short for dynamic random access memory, DRAM is one of the most commonly found RAM modules in PC compatible personal computers and workstations. It stores its information in a cell containing a capacitor and transistor. Because of this design, these cells must be refreshed with new electricity every few milliseconds for the memory to keep holding its data. DRAM was first invented and patented by Robert Dennard in 1968. It was released by Intel in October 1970.



7. INTERFACING PORTS

Computer ports provide the input and output interfaces the device needs to connect to the computer. A computer port is also called as a Communication Port as it is responsible for communication between the computer and its peripheral device.

Generally, the female end of the connector is referred to as a port and it usually sits on the motherboard.

In Computers, communication ports can be divided into two types based on the type or protocol used for communication. They are Serial Ports and Parallel Ports. A serial port is an interface through which peripherals can be connected using a serial protocol which involves the transmission of data one bit at a time over a single communication line. The most common type of serial port is a D-Subminiature or a D-sub connector that carry RS-232 signals.

A parallel port, on the other hand, is an interface through which the communication between a computer and its peripheral device is in a parallel manner i.e. data is transferred in or out in parallel using more than one communication line or wire. Printer port is an example of parallel port.

- Serial ports – round-shared connection points for serial cables.
- USB ports – rectangular-shaped connection points for USB cables.
- Ethernet ports – square-shaped connection points for Ethernet cables.
- Video ports.
- Parallel ports.

Serial Port

Even though the communication in PS/2 and USB is serial, technically, the term Serial Port is used to refer the interface that is compliant to RS-232 standard. There are two types of serial ports that are commonly found on a computer: DB-25 and DE-9.



Parallel Port

Parallel port is an interface between computer and peripheral devices like printers with parallel communication. The Centronics port is a 36 pin port that was developed as an interface for printers and scanners and hence a parallel port is also called as a Centronics port. Before the wide use of USB ports, parallel ports are very common in printers. The Centronics port was later replaced by DB-25 port with parallel interface.



Audio Ports

Audio ports are used to connect speakers or other audio output devices with the computer. The audio signals can be either analogue or digital and depending on that the port and its corresponding connector differ.

Examples :-

- Surround Sound Connectors
- S/PDIF / TOSLINK

Video Ports

- **VGA Port**

VGA port is found in many computers, projectors, video cards and High Definition TVs. It is a D-sub connector consisting of 15 pins in 3 rows. The connector is called as DE-15.

VGA port is the main interface between computers and older CRT monitors. Even the modern LCD and LED monitors support VGA ports but the picture quality is reduced. VGA carries analogue video signals up to a resolution of 648X480. With the increase in use of digital video, VGA ports are gradually being replaced by HDMI and Display Ports. Some laptops are equipped with on-board VGA ports in order to connect to external monitors or projectors. The pinout of a VGA port is shown below.



- **Digital Video Interface (DVI)**

VI is a high speed digital interface between a display controller like a computer and a display device like a monitor. It was developed with an aim of transmitting lossless digital video signals and replace the analogue VGA technology.

There are three types of DVI connectors based on the signals it can carry: DVI-I, DVI-D and DVI-A. DVI-I is a DVI port with integrated analogue and digital signals. DVI-D supports only digital signals and DVI-A supports only analogue signals. The digital signals can be either single link or dual link where a single link supports a digital signal up to 1920X1080 resolution and a dual link supports a digital signal up to 2560X1600 resolution. The following image compares the structures of DVI-I, DVI-D and DVI-A types along with the pinouts.

- **USB PORT**

Universal Serial Bus (USB) replaced serial ports, parallel ports, PS/2 connectors, game ports and power chargers for portable devices. USB port can be used to transfer

data, act as an interface for peripherals and even act as power supply for devices connected to it. There are three kinds of USB ports: Type A, Type B or mini USB and Micro USB.

USB Type A

USB Type-A port is a 4 pin connector. There are different versions of Type – A USB ports: USB 1.1, USB 2.0 and USB 3.0. USB 3.0 is the common standard and supports a data rate of 400MBps. USB 3.1 is also released and supports a data rate up to 10Gbps. Usually , but not all the times, the USB 2.0 is Black colour coded and USB 3.0 is Blue. The following image shows USB 2.0 and USB 3.0 ports.



USB Type C

USB Type – C is the latest specification of the USB and is a reversible connector. USB Type – C is supposed to replace Types A and B and is considered future proof. The port of USB Type – C consists of 24 pins. The pinout diagram of USB Type – C is shown below. The latest USB Specifications (USB4) is an USB-C only specification i.e., only USB type C devices can be used with USB4 specifications.



Experiment 1

Q. Basic Linux Commands: Explain linux commands `pwd`, `history`, `man`, `ls`, `cd`, `mkdir`, `rmdir`, `touch`, `rm`, `cat` with examples.

1.`pwd`

Linux `pwd` (print working directory) command displays your location currently you are working on. It will give the whole path starting from the root ending to the directory. Open your terminal and type `pwd`, press enter key. You can see your directory path. Here, my path is `/home/Desktop` and my current location is Desktop.

2.`cd`

Linux `cd` command is used to change the current working directory (i.e., in which the current user is working). The "cd" stands for 'change directory.' It is one of the most frequently used commands in the Linux terminal.

3.`ls`

The `ls` is the list command in Linux. It will show the full list or content of your directory. Just type `ls` and press the enter key. The whole content will be shown.

4.`mkdir`

The `mkdir` stands for 'make directory'. With the help of `mkdir` command, you can create a new directory wherever you want in your system. Just type "`mkdir <dir name>`", in place of `<dir name>` type the name of new directory, you want to create and then press enter.

Syntax:

```
mkdir <dirname>
```

5.`rmdir`

This command is used to delete a directory. But will not be able to delete a directory including a sub-directory. It means, a directory has to be empty to be deleted.

Syntax:

`rmdir <dirname>`

6.touch

touch command is a way to create empty files (there are some other methods also). You can update the modification and access time of each file with the help of touch command.

Syntax:

`touch <filename>`

7.rm

rm stands for remove here. rm command is used to remove objects such as files, directories, symbolic links and so on from the file system like UNIX.

8.cat

The cat command (short for “**concatenate**”) is one of the most frequently used command in Linux/Unix, Apple Mac OS X operating systems. **cat** command allows us to create single or multiple files, view contain of file, concatenate files and redirect output in terminal or files. It is a standard Unix program used to concatenate and display files. The cat command display file contents to a screen. Cat command concatenate FILE(s), or standard input, to standard output. With no FILE, or when FILE is -, it reads standard input. Also, you can use cat command for quickly creating a file. The cat command can read and write data from standard input and output devices. It has three main functions related to manipulating text files: creating them, displaying them, and combining them.

The cat command is used for:

Display text file on screen

Create a new text file

Read text file

Modifying file

File concatenation

The basic syntax of cat command is as follows:

```
$ cat filename
```

OR

```
$ cat > filename
```

OR

```
$ cat [options] filename
```

9.man

The "man" is a short term for manual page. In unix like operating systems such as linux, man is an interface to view the system's reference manual.

Syntax of man:

```
man [option(s)] keyword(s)
```

10.history

history command is used to view the previously executed command. This feature was not available in the Bourne shell. Bash and Korn support this feature in which every command executed is treated as the event and is associated with an event number using which they can be recalled and changed if required. These commands are saved in a history file. In Bash shell history command shows the whole list of the command.

Syntax:

```
$ history
```

Ubuntu [Running] - Oracle VM VirtualBox

Activities Terminal Tue 05:16

File Edit View Search Terminal Help

```
jobin@jobin-VirtualBox:~$ history -c
jobin@jobin-VirtualBox:~$ clear

jobin@jobin-VirtualBox:~$ pwd
/home/jobin
jobin@jobin-VirtualBox:~$ ls
Desktop Downloads Music Public Videos
Documents examples.desktop Pictures Templates
jobin@jobin-VirtualBox:~$ cd Desktop
jobin@jobin-VirtualBox:~/Desktop$ ls
jobin@jobin-VirtualBox:~/Desktop$ mkdir mydirectory
jobin@jobin-VirtualBox:~/Desktop$ ls
mydirectory
jobin@jobin-VirtualBox:~/Desktop$ cd mydirectory
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ ls
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ touch file1
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ ls
file1
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ cat > file2
hai
how
are
you
^Z
[1]+  Stopped                  cat > file2
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ cat file2
hai
how
are
you
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ ls
file1 file2
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ rm file1
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ ls
file2
jobin@jobin-VirtualBox:~/Desktop/mydirectory$ man cat
```

Ubuntu [Running] - Oracle VM VirtualBox

Activities Terminal Tue 05:12

File Edit View Search Terminal Help

CAT(1) User Commands CAT(1)

```
NAME      cat - concatenate files and print on the standard output
SYNOPSIS  cat [OPTION]... [FILE]...
DESCRIPTION
    Concatenate FILE(s) to standard output.

    With no FILE, or when FILE is -, read standard input.

    -A, --show-all
              equivalent to -vET
    -b, --number-nonblank
              number nonempty output lines, overrides -n
    -e      equivalent to -vE
    -E, --show-ends
              display $ at end of each line
    -n, --number
              number all output lines
    -s, --squeeze-blank
              suppress repeated empty output lines
    -t      equivalent to -vT
    -T, --show-tabs
              display TAB characters as ^I
    -u      (ignored)
    -v, --show-nonprinting
              use ^ and M- notation, except for LFD and TAB
    --help  display this help and exit
    --version
              output version information and exit

EXAMPLES
    cat f - g
              Output f's contents, then standard input, then g's contents.

    cat    Copy standard input to standard output.

AUTHOR
    Written by Torbjörn Granlund and Richard M. Stallman.
```

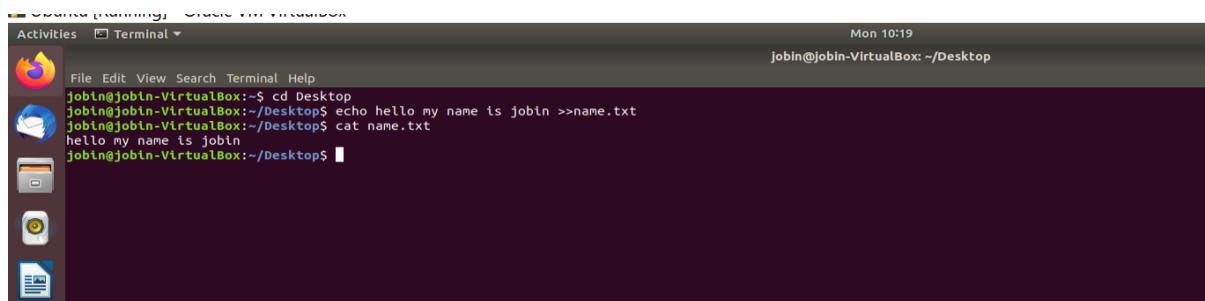
Experiment 2

Question .

Basic Linux Commands: Explain linux commands echo, head, tail, read, more, less, cut, paste, uname, cp, mv, locate, find, grep, df, du, useradd, userdel, sudo, passwd with examples.

1. echo

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

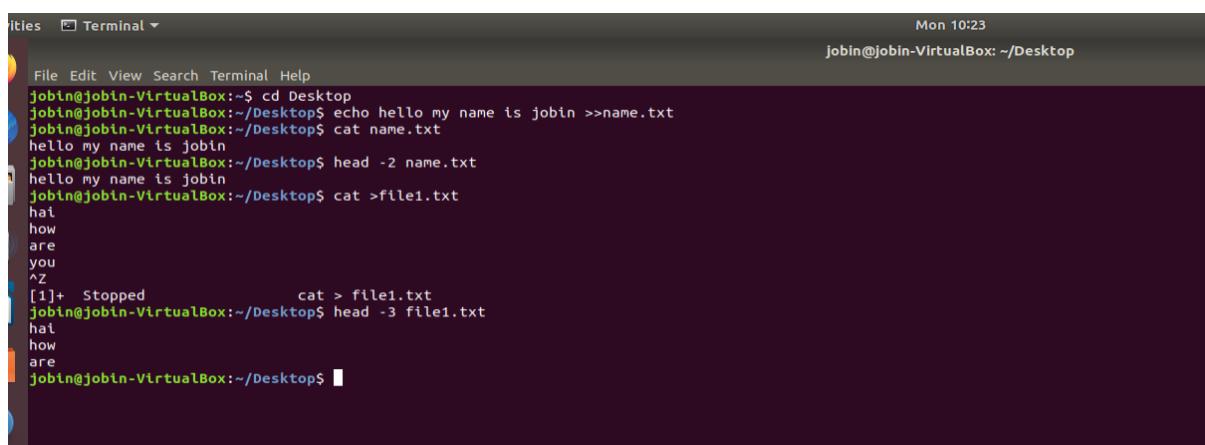


A screenshot of a Linux desktop environment. On the left is a dock with icons for a browser, file manager, terminal, and other applications. A terminal window titled 'Terminal' is open in the center. The terminal shows the following session:

```
jobin@jobin-VirtualBox:~$ cd Desktop
jobin@jobin-VirtualBox:~/Desktop$ echo hello my name is jobin >>name.txt
jobin@jobin-VirtualBox:~/Desktop$ cat name.txt
hello my name is jobin
jobin@jobin-VirtualBox:~/Desktop$
```

2. head

- The head command is used to view the first lines of any text file.
- By default, it will show the first ten lines, but you can change this number to your liking.
- If you only want to show the first three lines, type head -n 3 filename.txt



A screenshot of a Linux desktop environment. On the left is a dock with icons for a browser, file manager, terminal, and other applications. A terminal window titled 'Terminal' is open in the center. The terminal shows the following session:

```
jobin@jobin-VirtualBox:~$ cd Desktop
jobin@jobin-VirtualBox:~/Desktop$ echo hello my name is jobin >>name.txt
jobin@jobin-VirtualBox:~/Desktop$ cat name.txt
hello my name is jobin
jobin@jobin-VirtualBox:~/Desktop$ head -2 name.txt
hello my name is jobin
jobin@jobin-VirtualBox:~/Desktop$ cat >file1.txt
hat
how
are
you
^Z
[1]+  Stopped                  cat > file1.txt
jobin@jobin-VirtualBox:~/Desktop$ head -3 file1.txt
hat
how
are
jobin@jobin-VirtualBox:~/Desktop$
```

3. tail

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

- tail -n filename.txt

```

jobin@jobin-VirtualBox:~/Desktop$ cat >file1.txt
hai
how
are
you
^Z
[1]+  Stopped                  cat > file1.txt
jobin@jobin-VirtualBox:~/Desktop$ head -3 file1.txt
hai
how
are
jobin@jobin-VirtualBox:~/Desktop$ tail -3 file1.txt
how
are
you
jobin@jobin-VirtualBox:~/Desktop$ tail -2 file1.txt
are
you
jobin@jobin-VirtualBox:~/Desktop$ 

```

4. read

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

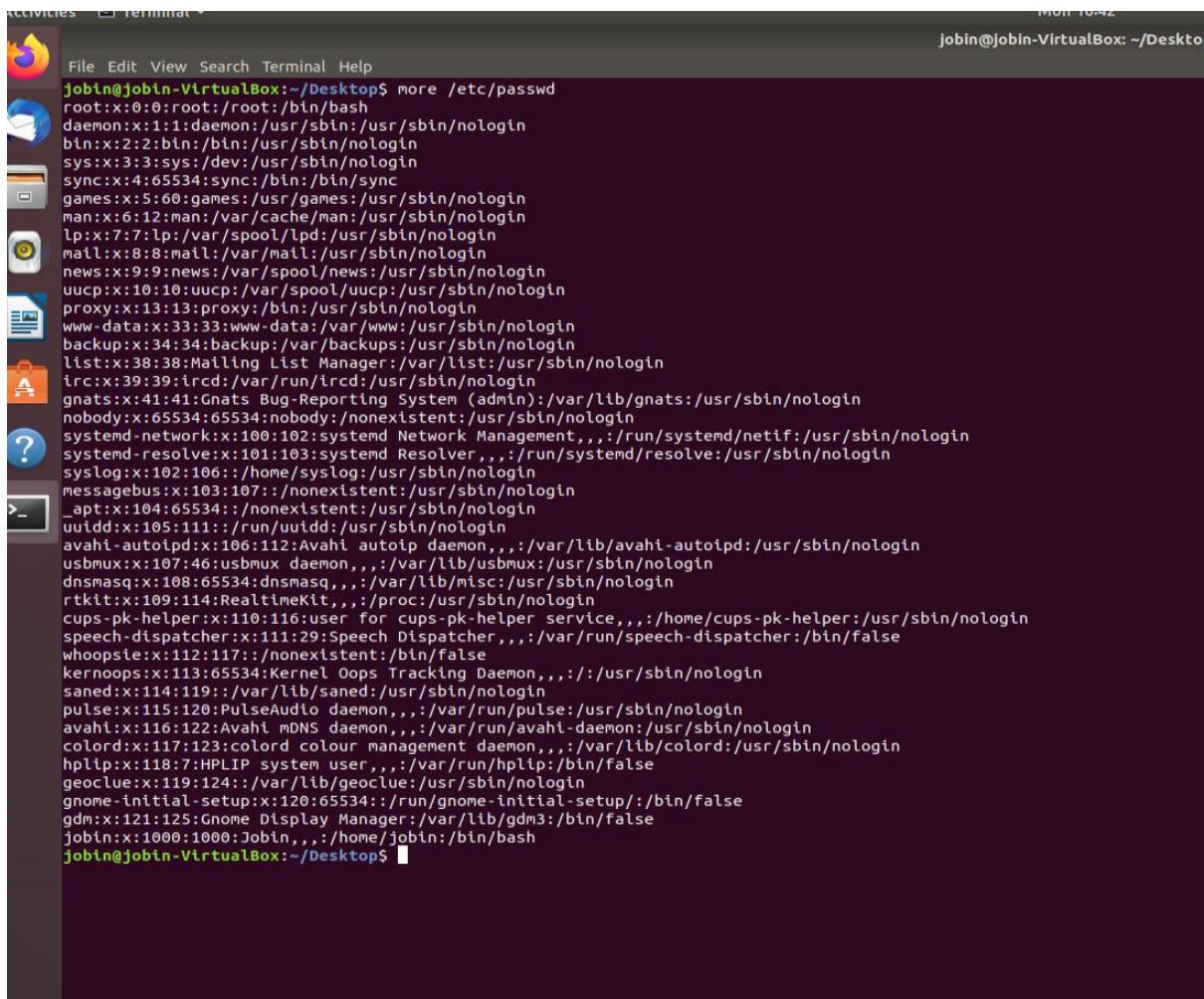
```

Activities Terminal ▾
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ read var1 var2 var3
hai how are you
jobin@jobin-VirtualBox:~/Desktop$ echo "[\$var1] [\$var2] [\$var3]"
[hai] [how] [are you]
jobin@jobin-VirtualBox:~/Desktop$ 

```

5. more

- Like cat command, more command displays the content of a file. Only difference is that, in case of larger files, 'cat' command output will scroll off your screen while 'more' command displays output one screenful at a time.
- Enter key: To scroll down page line by line.
- Space bar: To go to next page.
- b key: To go to the backward page.
- / key: Lets you search the string.
- Syntax: more <file name>
- more /etc/passwd



```

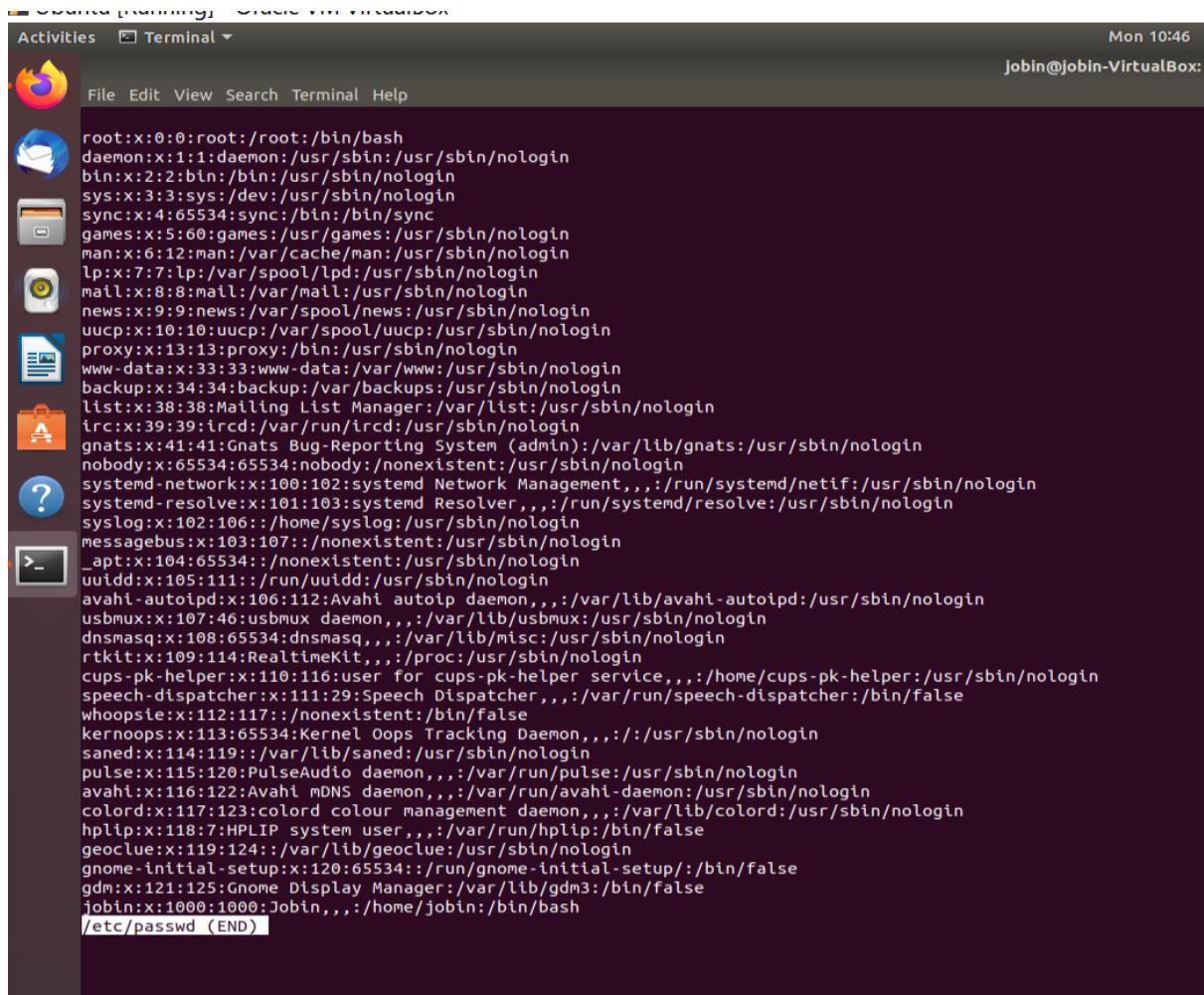
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ more /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
systemd-network:x:100:102:systemd Network Management,,,:/run/systemd/netif:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd/resolve:/usr/sbin/nologin
syslog:x:102:106::/home/syslog:/usr/sbin/nologin
messagebus:x:103:107::/nonexistent:/usr/sbin/nologin
_apt:x:104:65534::/nonexistent:/usr/sbin/nologin
_uuid:x:105:111:/run/uuid:/usr/sbin/nologin
avahi-autopd:x:106:112:Avahi autopd daemon,,,:/var/lib/avahi-autopd:/usr/sbin/nologin
usbmux:x:107:46:usbmux daemon,,,:/var/lib/usbmux:/usr/sbin/nologin
dnsmasq:x:108:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
rtkit:x:109:114:RealtimeKit,,,:/proc:/usr/sbin/nologin
cups-pk-helper:x:110:116:user for cups-pk-helper service,,,:/home/cups-pk-helper:/usr/sbin/nologin
speech-dispatcher:x:111:29:Speech Dispatcher,,,:/var/run/speech-dispatcher:/bin/false
whoopsie:x:112:117::/nonexistent:/bin/false
kernoops:x:113:65534:Kernel Oops Tracking Daemon,,,:/usr/sbin/nologin
saned:x:114:119::/var/lib/saned:/usr/sbin/nologin
pulse:x:115:120:PulseAudio daemon,,,:/var/run/pulse:/usr/sbin/nologin
avahi:x:116:122:Avahi mDNS daemon,,,:/var/run/avahi-daemon:/usr/sbin/nologin
colord:x:117:123:colord colour management daemon,,,:/var/lib/colord:/usr/sbin/nologin
hplip:x:118:7:HPLIP system user,,,:/var/run/hplip:/bin/false
geoclue:x:119:124::/var/lib/geoclue:/usr/sbin/nologin
gnome-initial-setup:x:120:65534::/run/gnome-initial-setup/:/bin/false
gdm:x:121:125:Gnome Display Manager:/var/lib/gdm3:/bin/false
jobin:x:1000:1000:Jobin,,,:/home/jobin:/bin/bash
jobin@jobin-VirtualBox:~/Desktop$ █

```

6. less

- The 'less' command is same as 'more' command but include some more features.

- It automatically adjust with the width and height of the terminal window, while 'more' command cuts the content as the width of the terminal window get shorter.
- less <file name>
- \$less /etc/passwd

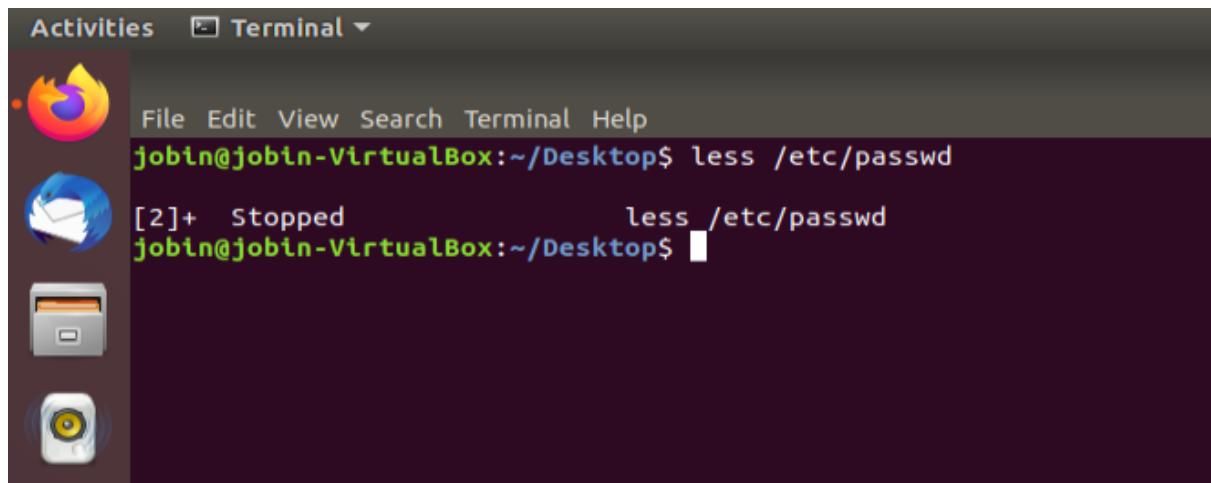


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window title is "Activities Terminal". The window shows the output of the command "less /etc/passwd". The output lists various system users and their details. The terminal window has a dark background with light-colored text. The desktop interface includes a dock with icons for the Dash, Home, and other applications.

```

root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
systemd-network:x:100:102:systemd Network Management,,,:/run/systemd/netif:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd/resolve:/usr/sbin/nologin
syslog:x:102:106:/home/syslog:/usr/sbin/nologin
messagebus:x:103:107::/nonexistent:/usr/sbin/nologin
_apt:x:104:65534:/nonexistent:/usr/sbin/nologin
uuidd:x:105:111:/run/uuidd:/usr/sbin/nologin
avahi-autoipd:x:106:112:Avahi autoip daemon,,,:/var/lib/avahi-autoipd:/usr/sbin/nologin
usbmux:x:107:46:usbmux daemon,,,:/var/lib/usbmux:/usr/sbin/nologin
dnsmasq:x:108:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
rtkit:x:109:114:RealtimeKit,,,:/proc:/usr/sbin/nologin
cups-pk-helper:x:110:116:user for cups-pk-helper service,,,:/home/cups-pk-helper:/usr/sbin/nologin
speech-dispatcher:x:111:29:Speech Dispatcher,,,:/var/run/speech-dispatcher:/bin/false
whoopsie:x:112:117::/nonexistent:/bin/false
kernoops:x:113:65534:Kernel Oops Tracking Daemon,,,:/usr/sbin/nologin
saned:x:114:119:/var/lib/saned:/usr/sbin/nologin
pulse:x:115:120:PulseAudio daemon,,,:/var/run/pulse:/usr/sbin/nologin
avahi:x:116:122:Avahi mDNS daemon,,,:/var/run/avahi-daemon:/usr/sbin/nologin
colord:x:117:123:colord colour management daemon,,,:/var/lib/colord:/usr/sbin/nologin
hplip:x:118:7:HPLIP system user,,,:/var/run/hplip:/bin/false
geoclue:x:119:124::/var/lib/geoclue:/usr/sbin/nologin
gnome-initial-setup:x:120:65534:/run/gnome-initial-setup:/bin/false
gdm:x:121:125:Gnome Display Manager:/var/lib/gdm3:/bin/false
jobin:x:1000:1000:Jobin,,,:/home/jobin:/bin/bash
/etc/passwd (END)

```



A screenshot of a Linux desktop environment showing a terminal window. The terminal window title is "Activities Terminal". The window shows the command "less /etc/passwd" being run. The output shows the first few lines of the passwd file. A message "[2]+ Stopped less /etc/passwd" indicates that the process was interrupted. The terminal window has a dark background with light-colored text. The desktop interface includes a dock with icons for the Dash, Home, and other applications.

```

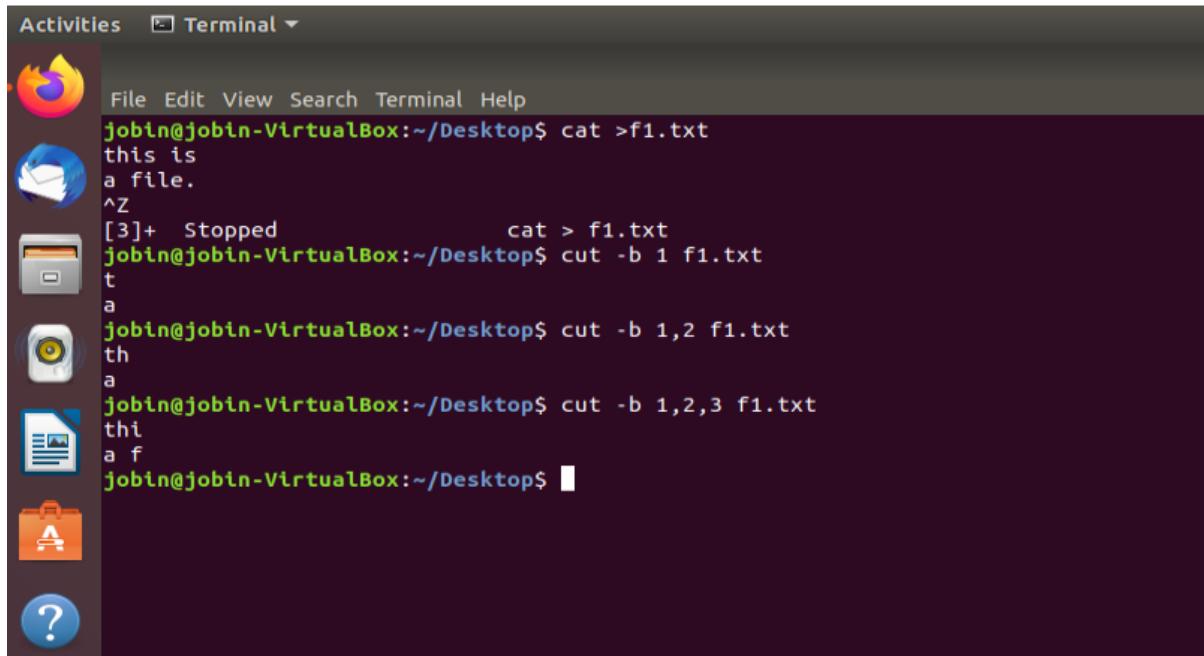
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ less /etc/passwd
[2]+  Stopped                  less /etc/passwd
jobin@jobin-VirtualBox:~/Desktop$ 

```

7. cut

- The cut command is used for cutting out the sections from each line of files and writing the result to standard output. It can be used to cut parts of a line by byte position, character and field

- `cut OPTION... [FILE]...`
- `$cut -b 1,2,3 state.txt`



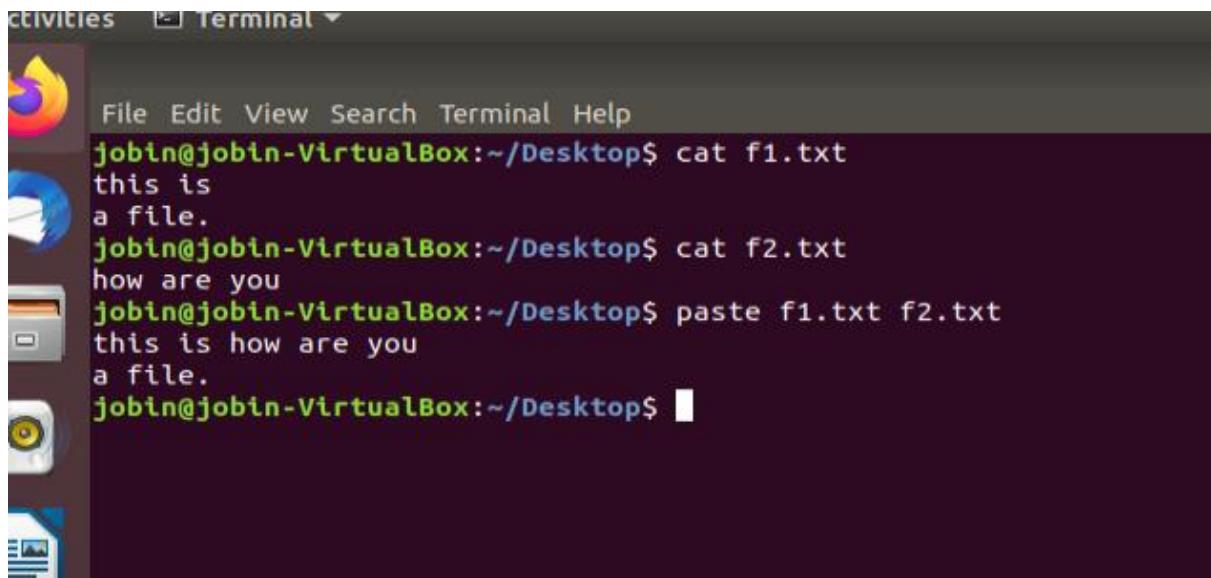
A screenshot of a Linux desktop environment. On the left is a vertical dock with icons for a browser, file manager, terminal, and other applications. The main window is a terminal titled "Terminal". The terminal shows the following session:

```
Activities Terminal ▾
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ cat > f1.txt
this is
a file.
^Z
[3]+  Stopped                  cat > f1.txt
jobin@jobin-VirtualBox:~/Desktop$ cut -b 1 f1.txt
t
a
jobin@jobin-VirtualBox:~/Desktop$ cut -b 1,2 f1.txt
th
a
jobin@jobin-VirtualBox:~/Desktop$ cut -b 1,2,3 f1.txt
thi
a f
jobin@jobin-VirtualBox:~/Desktop$
```

8. paste

- It is used to join files horizontally (parallel merging) by outputting lines consisting of lines from each file specified, separated by tab as delimiter, to the standard output.

- `paste [OPTION]... [FILES]...`
- `$ paste state.txt capital.txt`

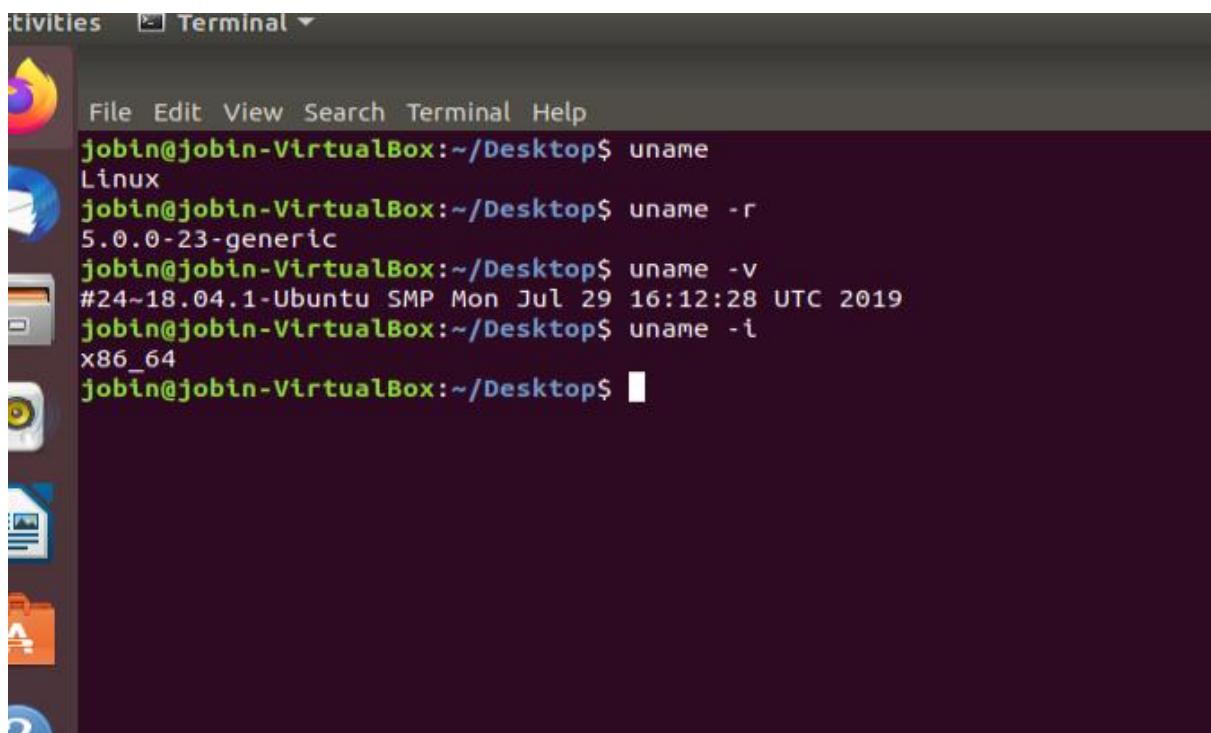


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window has a dark background and contains the following text:

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ cat f1.txt
this is
a file.
jobin@jobin-VirtualBox:~/Desktop$ cat f2.txt
how are you
jobin@jobin-VirtualBox:~/Desktop$ paste f1.txt f2.txt
this is how are you
a file.
jobin@jobin-VirtualBox:~/Desktop$
```

9. uname

- The uname command, short for Unix Name, will print detailed information about your Linux system like the machine name, operating system, kernel, and so on.
- \$uname
- \$uname -r

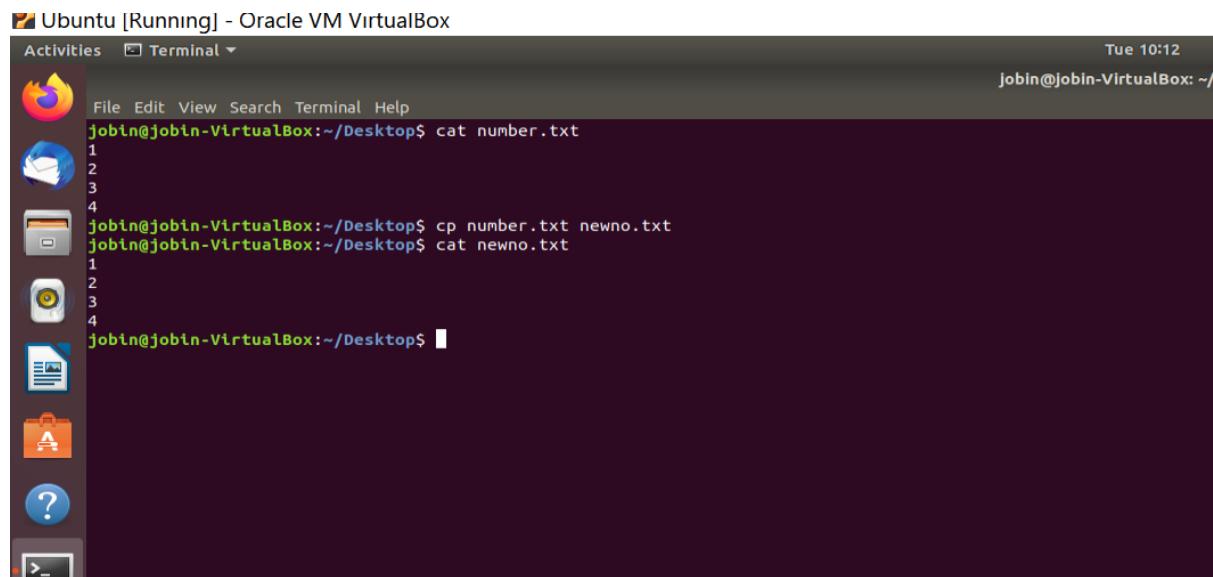


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window has a dark background and contains the following text:

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ uname
Linux
jobin@jobin-VirtualBox:~/Desktop$ uname -r
5.0.0-23-generic
jobin@jobin-VirtualBox:~/Desktop$ uname -v
#24~18.04.1-Ubuntu SMP Mon Jul 29 16:12:28 UTC 2019
jobin@jobin-VirtualBox:~/Desktop$ uname -i
x86_64
jobin@jobin-VirtualBox:~/Desktop$
```

10. cp

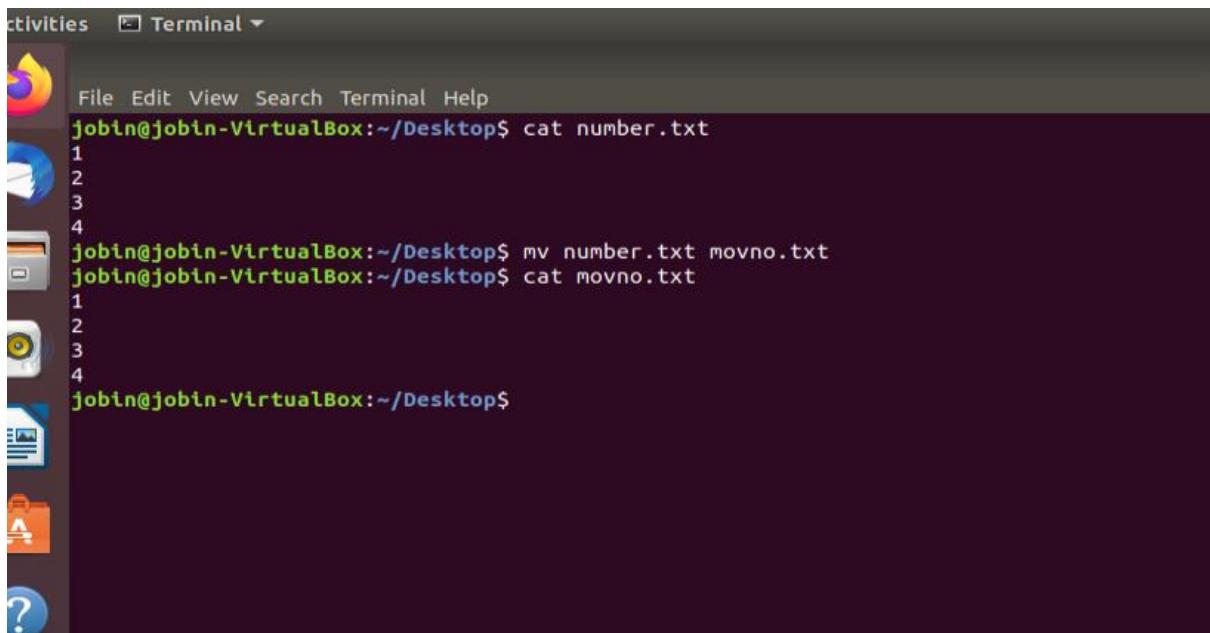
- cp command is used to copy files from the current directory to a different directory. For instance, the command cp scenery.jpg /home/username/Pictures would create a copy of scenery.jpg (from your current directory) into the Pictures directory.
- cp -i will ask for user's consent in case of a potential file overwrite.
- cp -p will preserve source files' mode, ownership and timestamp.
- cp -r will copy directories recursively.
- cp -u copies files only if the destination file is not existing or the source file is newer than the destination file.



The screenshot shows a terminal window titled "Ubuntu [Running] - Oracle VM VirtualBox". The window has a dark theme. The terminal session starts with "File Edit View Search Terminal Help" menu bar, followed by the command "jobin@jobin-VirtualBox:~/Desktop\$ cat number.txt", which outputs the numbers 1, 2, 3, 4. Then, the command "cp number.txt newno.txt" is run, followed by "cat newno.txt", which also outputs the numbers 1, 2, 3, 4. The terminal prompt "jobin@jobin-VirtualBox:~/Desktop\$" is visible at the bottom. The desktop environment includes icons for the Dash, Home, Applications, and Help.

11. mv

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

A screenshot of an Ubuntu desktop environment. On the left, there's a dock with icons for Dash, Home, Applications, and Help. A terminal window titled "Terminal" is open in the Activities overview. The terminal shows the following command-line session:

```
Activities Terminal
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ cat number.txt
1
2
3
4
jobin@jobin-VirtualBox:~/Desktop$ mv number.txt movno.txt
jobin@jobin-VirtualBox:~/Desktop$ cat movno.txt
1
2
3
4
jobin@jobin-VirtualBox:~/Desktop$
```

12. locate

- To locate a file, just like the search command in Windows.
- What's more, using the `-i` argument along with this command will make it case-insensitive, so you can search for a file even if you don't remember its exact name.
- To search for a file that contains two or more words, use an asterisk (*).
- For example, `locate -i school*note` command will search for any file that contains the word “school” and “note”, whether it is uppercase or lowercase.

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ locate -i file
/swapfile
/bin/lessfile
/bin/systemd-tmpfiles
/bin/tempfile
/boot/grub/x86_64-pc/configfile.mod
/boot/grub/x86_64-pc/file.mod
/boot/grub/x86_64-pc/search_fs_file.mod
/etc/profile
/etc/profile.d
/etc/tmpfiles.d
/etc/apparmor.d/abstractions/private-files
/etc/apparmor.d/abstractions/private-files-strict
/etc/apparmor.d/abstractions/apparmor_apl/change_profile
/etc/apparmor.d/abstractions/ubuntu-browsers.d/user-files
/etc/cups/files.conf
/etc/dconf/profile
/etc/dconf/db
/etc/profile.d/01-locale-fix.sh
/etc/profile.d/apps-bin-path.sh
/etc/profile.d/bash_completion.sh
/etc/profile.d/cedilla-portuguese.sh
/etc/profile.d/input-method-config.sh
/etc/profile.d/xdg-2-p1.sh
/etc/profile.d/xdg_dirs_desktop_session.sh
/etc/skel/.profile
/home/jobin/.mozilla/firefox/profiles.ini
/home/jobin/.mozilla/firefox/0j8j3tze.default-release/datareporting/archived/2021-06/1623147674040.6da9b952-e1c4-47d7-b4cc-2f59f5f88
/home/jobin/.mozilla/firefox/0j8j3tze.default-release/storage/default/moz-extension-accc7849-2d23-4761-8e7e-530b50a33992^userContent
/home/jobin/.mozilla/firefox/0j8j3tze.default-release/storage/permissions/1455114595AmcateLvtSYy.files
/home/jobin/.mozilla/firefox/0j8j3tze.default-release/storage/permanent/chrome/ldb/1657114595AmcateLvtSYy.files
/home/jobin/.mozilla/firefox/0j8j3tze.default-release/storage/permanent/chrome/ldb/2918063365plupsah.files
/home/jobin/.mozilla/firefox/0j8j3tze.default-release/storage/permanent/chrome/ldb/3561288849sdhle.files
/home/jobin/.mozilla/firefox/0j8j3tze.default-release/storage/permanent/chrome/ldb/3870112724rsegmnottet-es.files
/home/jobin/.thunderbird/profiles.ini
/lib/apparmor/profile-load
/lib/firmware/av7110/Makefile
/lib/firmware/cavium/toolchain/Makefile
/lib/firmware/ata/Makefile
/lib/firmware/dsp50k/Makefile
/lib/firmware/lsc1/Makefile
/lib/firmware/keyspar_pda/Makefile
/lib/firmware/usbdux/Makefile_dux
/lib/modules/5.0.0-23+generic/kernel/arch/x86/oprofile
/lib/modules/5.0.0-23+generic/kernel/arch/x86/oprofile/oprofile.ko
/lib/modules/5.0.0-23+generic/kernel/drivers/target/target_core_file.ko
/lib/modules/5.0.0-23+generic/kernel/fs/cachefiles/cachefiles.ko
/lib/modules/5.0.0-23+generic/kernel/fs/filelayout
/lib/modules/5.0.0-23+generic/kernel/fs/nfs/flexfilelayout
/lib/modules/5.0.0-23+generic/kernel/fs/nfs/filelayout_nfs_layout_nfsv41_files.ko
/lib/modules/5.0.0-23+generic/kernel/fs/nfs/flexfilelayout/nfs_layout_flexfiles.ko
/lib/systemd/systemd-tmpfiles-clean.service
```

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ locate -i file1
/snap/core/11167/usr/share/doc/liblockfile1
/snap/core/11167/usr/share/doc/liblockfile1/changelog.Debian.gz
/snap/core/11167/usr/share/doc/liblockfile1/copyright.gz
/snap/core/7270/usr/share/doc/liblockfile1
/snap/core/7270/usr/share/doc/liblockfile1/changelog.Debian.gz
/snap/core/7270/usr/share/doc/liblockfile1/copyright.gz
/snap/gnome-3-28-1804/145/usr/share/doc/libsndfile1
/snap/gnome-3-28-1804/145/usr/share/doc/libsndfile1/changelog.Debian.gz
/snap/gnome-3-28-1804/145/usr/share/doc/libsndfile1/copyright
/snap/gnome-3-28-1804/67/usr/share/doc/libsndfile1
/snap/gnome-3-28-1804/67/usr/share/doc/libsndfile1/changelog.Debian.gz
/snap/gnome-3-28-1804/67/usr/share/doc/libsndfile1/copyright
/usr/share/doc/libsndfile1
/usr/share/doc/libxkbfile1
/usr/share/doc/libsndfile1/changelog.Debian.gz
/usr/share/doc/libsndfile1/copyright
/usr/share/doc/libxkbfile1/changelog.Debian.gz
/usr/share/doc/libxkbfile1/copyright
/var/lib/dpkg/info/libsndfile1:amd64.list
/var/lib/dpkg/info/libsndfile1:amd64.md5sums
/var/lib/dpkg/info/libsndfile1:amd64.shlibs
/var/lib/dpkg/info/libsndfile1:amd64.symbols
/var/lib/dpkg/info/libsndfile1:amd64.triggers
/var/lib/dpkg/info/libxkbfile1:amd64.list
/var/lib/dpkg/info/libxkbfile1:amd64.md5sums
/var/lib/dpkg/info/libxkbfile1:amd64.shlibs
/var/lib/dpkg/info/libxkbfile1:amd64.triggers
jobin@jobin-VirtualBox:~/Desktop$
```

13. find

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

```

File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ ls
f1.txt f2.txt file1.txt mydirectory name.txt
jobin@jobin-VirtualBox:~/Desktop$ find -name file1.txt
./file1.txt
jobin@jobin-VirtualBox:~/Desktop$ / - type d find -name file1.txt
bash: /: Is a directory
jobin@jobin-VirtualBox:~/Desktop$
```

14. grep

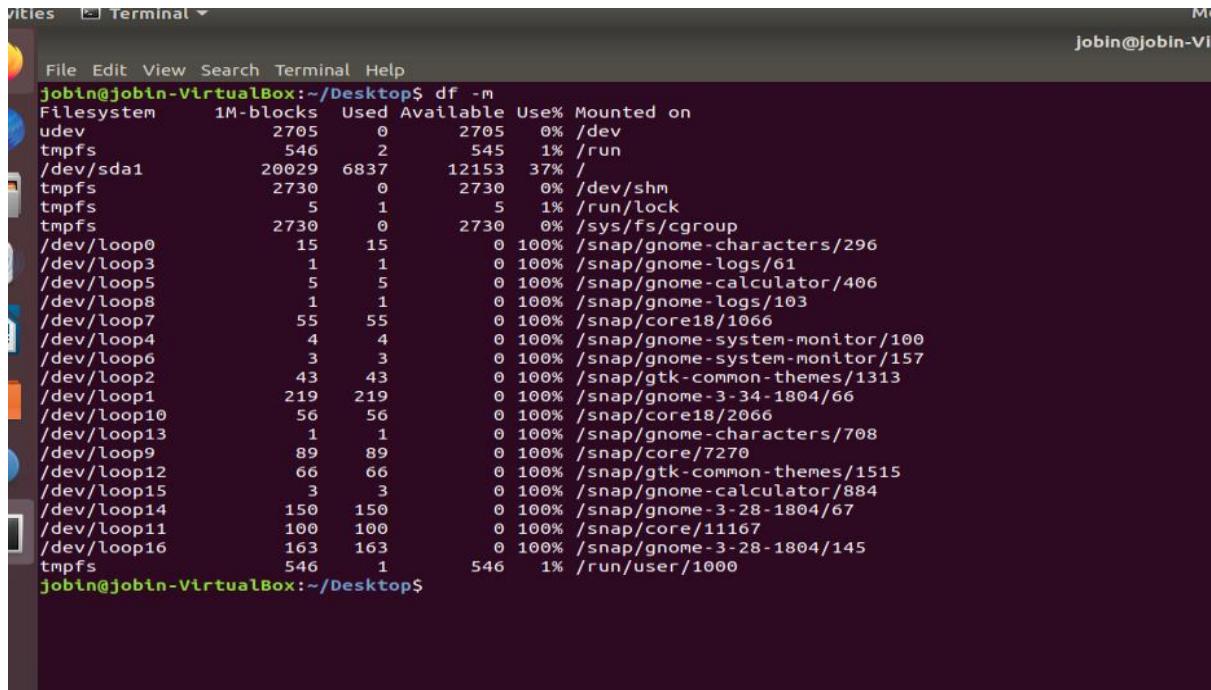
- Another basic Linux command that is undoubtedly helpful for everyday use is grep. It lets you search through all the text in a given file.
- To illustrate, grep blue notepad.txt will search for the word blue in the notepad file. Lines that contain the searched word will be displayed fully. Usually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

```

File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ cat f1.txt
this is
a file.
jobin@jobin-VirtualBox:~/Desktop$ grep this f1.txt
this is
jobin@jobin-VirtualBox:~/Desktop$ █
```

15. df

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



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ df -m
Filesystem      1M-blocks  Used Available Use% Mounted on
udev              2705      0    2705   0% /dev
tmpfs             546       2     545   1% /run
/dev/sda1        20029  6837   12153  37% /
tmpfs             2730      0    2730   0% /dev/shm
tmpfs               5       1      5   1% /run/lock
tmpfs             2730      0    2730   0% /sys/fs/cgroup
/dev/loop0          15      15      0 100% /snap/gnome-characters/296
/dev/loop3            1       1      0 100% /snap/gnome-logs/61
/dev/loop5            5       5      0 100% /snap/gnome-calculator/406
/dev/loop8            1       1      0 100% /snap/gnome-logs/103
/dev/loop7            55      55      0 100% /snap/core18/1066
/dev/loop4            4       4      0 100% /snap/gnome-system-monitor/100
/dev/loop6            3       3      0 100% /snap/gnome-system-monitor/157
/dev/loop2            43      43      0 100% /snap/gtk-common-themes/1313
/dev/loop1            219     219      0 100% /snap/gnome-3-34-1804/66
/dev/loop10           56      56      0 100% /snap/core18/2066
/dev/loop13           1       1      0 100% /snap/gnome-characters/708
/dev/loop9            89      89      0 100% /snap/core/7270
/dev/loop12           66      66      0 100% /snap/gtk-common-themes/1515
/dev/loop15           3       3      0 100% /snap/gnome-calculator/884
/dev/loop14           150     150      0 100% /snap/gnome-3-28-1804/67
/dev/loop11           100     100      0 100% /snap/core/11167
/dev/loop16           163     163      0 100% /snap/gnome-3-28-1804/145
tmpfs              546       1     546   1% /run/user/1000
jobin@jobin-VirtualBox:~/Desktop$
```

16. du

- If you want to check how much space a file or a directory takes, the du (Disk Usage) command is the answer. However, the disk usage summary will show disk block numbers instead of the usual size format.
- If you want to see it in bytes, kilobytes, and megabytes, add the -h argument to the command line.
- \$du -h

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ clear -h
clear: invalid option -- 'h'
Usage: clear [options]

Options:
  -T TERM      use this instead of $TERM
  -V           print curses-version
  -X           do not try to clear scrollback
jobin@jobin-VirtualBox:~/Desktop$
```

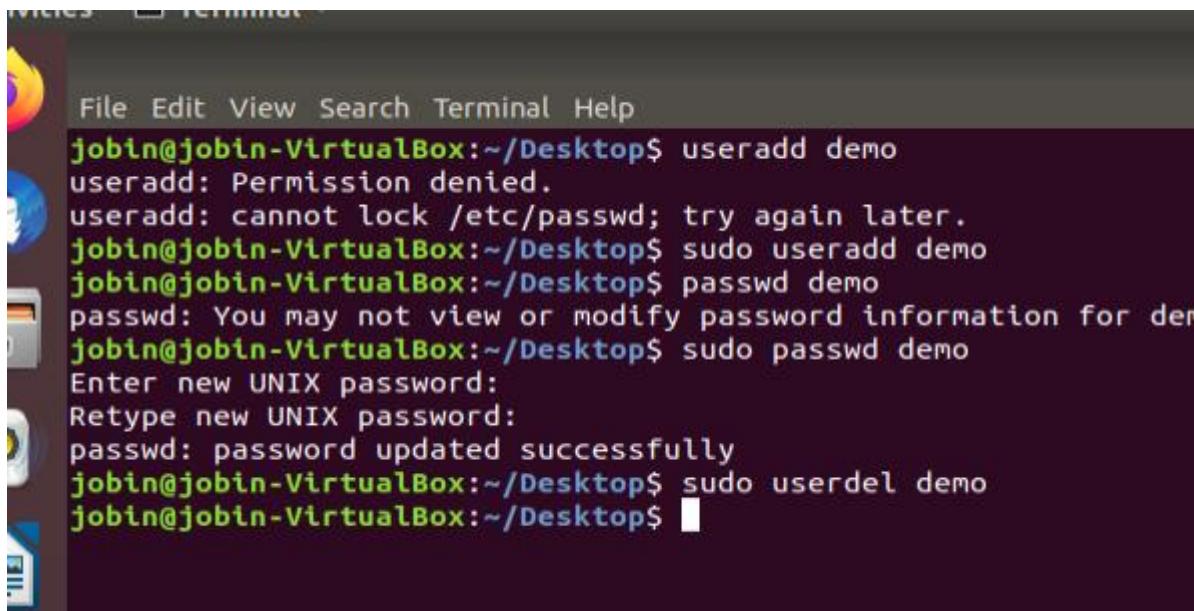
17. useradd

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

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ useradd demo
useradd: Permission denied.
useradd: cannot lock /etc/passwd; try again later.
jobin@jobin-VirtualBox:~/Desktop$ sudo useradd demo
jobin@jobin-VirtualBox:~/Desktop$ passwd demo
passwd: You may not view or modify password information for demo.
jobin@jobin-VirtualBox:~/Desktop$ sudo passwd demo
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
jobin@jobin-VirtualBox:~/Desktop$
```

18. userdel

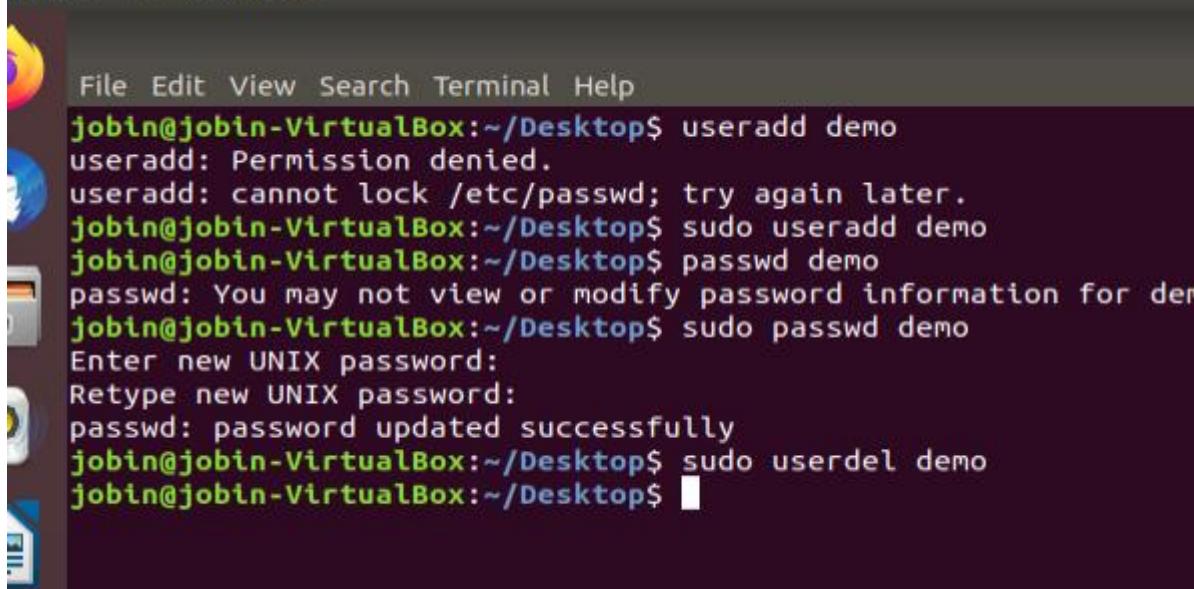
- Remove a user is very similar to adding a new user. To delete the users account type, userdel UserName



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ useradd demo
useradd: Permission denied.
useradd: cannot lock /etc/passwd; try again later.
jobin@jobin-VirtualBox:~/Desktop$ sudo useradd demo
jobin@jobin-VirtualBox:~/Desktop$ passwd demo
passwd: You may not view or modify password information for dem
jobin@jobin-VirtualBox:~/Desktop$ sudo passwd demo
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
jobin@jobin-VirtualBox:~/Desktop$ sudo userdel demo
jobin@jobin-VirtualBox:~/Desktop$
```

19. Sudo

- Short for “SuperUser Do”, this command enables you to perform tasks that require administrative or root permissions. You must have sufficient permissions to use this command.
- sudo useradd maria

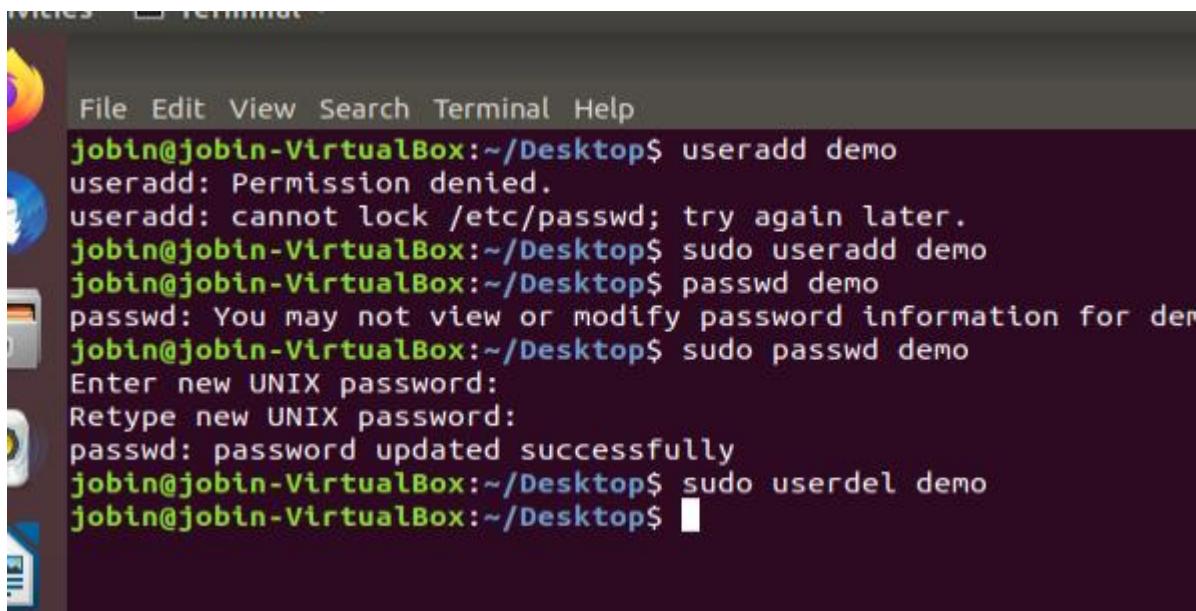


```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ useradd demo
useradd: Permission denied.
useradd: cannot lock /etc/passwd; try again later.
jobin@jobin-VirtualBox:~/Desktop$ sudo useradd demo
jobin@jobin-VirtualBox:~/Desktop$ passwd demo
passwd: You may not view or modify password information for dem
jobin@jobin-VirtualBox:~/Desktop$ sudo passwd demo
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
jobin@jobin-VirtualBox:~/Desktop$ sudo userdel demo
jobin@jobin-VirtualBox:~/Desktop$
```

20. passwd

- Changes passwords for user accounts.

- A normal user may only change the password for their own account, while the superuser may change the password for any account.
- passwd[option] [username]
- passwd
- passwd user1

A screenshot of a Linux desktop environment, specifically Ubuntu, showing a terminal window. The terminal window has a dark background and light-colored text. It displays a series of commands and their outputs:

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop$ useradd demo
useradd: Permission denied.
useradd: cannot lock /etc/passwd; try again later.
jobin@jobin-VirtualBox:~/Desktop$ sudo useradd demo
jobin@jobin-VirtualBox:~/Desktop$ passwd demo
passwd: You may not view or modify password information for dem
jobin@jobin-VirtualBox:~/Desktop$ sudo passwd demo
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
jobin@jobin-VirtualBox:~/Desktop$ sudo userdel demo
jobin@jobin-VirtualBox:~/Desktop$
```

The terminal window is titled "Terminal". The desktop environment includes icons for the Dash, Home, and other applications.

Experiment 3

Question

Basic Linux Commands: Explain linux commands usermod, groupadd, groups, groupmod, groupdel, chmod, chown, id, ps, top with examples

1.groupadd :

- Groupadd command creates a new group account using the values specified on the command line and the default values from the system.
- #gropuadd student

```
jobin@jobin-VirtualBox:~$ groupadd usr
groupadd: Permission denied.
groupadd: cannot lock /etc/group; try again later.
jobin@jobin-VirtualBox:~$ clear

jobin@jobin-VirtualBox:~$ sudo groupadd usrl
[sudo] password for jobin:
jobin@jobin-VirtualBox:~$ 
jobin@jobin-VirtualBox:~$ groups
jobin adm cdrom sudo dip plugdev lpadmin sambashare
jobin@jobin-VirtualBox:~$ cat /etc/group
```

```
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,jobin
tty:x:5:
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:20:
fax:x:21:
voice:x:22:
cdrom:x:24:jobin
floppy:x:25:
tape:x:26:
sudo:x:27:jobin
audio:x:29:pulse
dip:x:30:jobin
www-data:x:33:

```

2.groupdel:

groupdel command is used to delete a existing group. It will delete all entry that refers to the group, modifies the system account files, and it is handled by superuser or root user.

```
jobin@jobin-VirtualBox:~$ groupdel usr1
groupdel: Permission denied.
groupdel: cannot lock /etc/group; try again later.
jobin@jobin-VirtualBox:~$ sudo groupdel usr1
jobin@jobin-VirtualBox:~$ cat /etc/groups
cat: /etc/groups: No such file or directory
jobin@jobin-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,jobin
tty:x:5:
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:20:
fax:x:21:
voice:x:22:
```

3.usermod:

usermod command is used to change the properties of a user in Linux through the commandline

- command-line utility that allows you to modify a user's login information
- #usermod --help

```
#usermod -u 2000 Tom
```

```
jobin@jobin-VirtualBox:~$ sudo useradd sampleuser
jobin@jobin-VirtualBox:~$ usermod -c "hello" sampleuser
usermod: Permission denied.
usermod: cannot lock /etc/passwd; try again later.
jobin@jobin-VirtualBox:~$ sudo usermod -c "hello" sampleuser
jobin@jobin-VirtualBox:~$ cat /etc/passwd
```

```
gdm:x:121:125:Gnome Display Manager:/var/lib/gdm3:/bin/false
jobin:x:1000:1000:Jobin,,,:/home/jobin:/bin/bash
sampleuser:x:1001:1001:hello:/home/sampleuser:/bin/sh
```

4.groups:

- print the groups a user is in
- #groups alice

```
jobin@jobin-VirtualBox:~$ groups
jobin adm cdrom sudo dip plugdev lpadmin sambashare
jobin@jobin-VirtualBox:~$ sudo groups
[sudo] password for jobin:
root
jobin@jobin-VirtualBox:~$
```

5.groupmod:

- The groupmod command modifies the definition of the specified group by modifying the appropriate entry in the group database.
- # groupmod -n group1 group2

```
jobin@jobin-VirtualBox:~$ sudo groupadd usrgrp
jobin@jobin-VirtualBox:~$ groupmod -n newusergrp usrgrp
groupmod: Permission denied.
groupmod: cannot lock /etc/group; try again later.
jobin@jobin-VirtualBox:~$ sudo groupmod -n newusergrp usrgrp
jobin@jobin-VirtualBox:~$ cat /etc/group
```

```
uuidd:x:111:
avahi-autoipd:x:112:
bluetooth:x:113:
rtkit:x:114:
ssh:x:115:
lpadmin:x:116:jobin
whoopsie:x:117:
scanner:x:118:saned
saned:x:119:
pulse:x:120:
pulse-access:x:121:
avahi:x:122:
colord:x:123:
geoclue:x:124:
gdm:x:125:
jobin:x:1000:
sambashare:x:126:jobin
sampleuser:x:1001:
** newusergrp:x:1002:
```

6.chmod:

- To change directory permissions of file/ Directory in Linux.
- #chmod whowhatwhich file/directory
- **chmod +rwx filename** // To add permissions.
- **chmod -rwx directoryname** // To remove permissions.
- **chmod +x filename** // To allow executable permissions.
- **chmod -wx filename** // to take out write and executable permissions.

```
#chmod u+x test
```

```
#chmod g-rwx test
```

```
#chmod o-r test
```

```
jobin@jobin-VirtualBox:~/Desktop$ touch sample22.txt
jobin@jobin-VirtualBox:~/Desktop$ chmod +rwx sample22.txt
jobin@jobin-VirtualBox:~/Desktop$ chmod -w sample22.txt
```

7.ps:

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

```
jobin@jobin-VirtualBox:~$ ps
  PID TTY      TIME CMD
1695 pts/0    00:00:00 bash
1862 pts/0    00:00:00 ps
jobin@jobin-VirtualBox:~$ id
uid=1000(jobin) gid=1000(jobin) groups=1000(jobin),4(adm),24(cdrom),27(sudo),30(dip),46(plugdev),116(lpadmin),126(sambashare)
jobin@jobin-VirtualBox:~$
```

8.chown:

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

#chown Tom Test

```
jobin@jobin-VirtualBox:~/Desktop$ chown jobin sample22.txt
jobin@jobin-VirtualBox:~/Desktop$ ls -l sample22.txt
-rwxr-xr-x 1 jobin jobin 0 Aug 13 11:08 sample22.txt
jobin@jobin-VirtualBox:~/Desktop$
```

9.id:

id command in Linux is **used to find out user and group names** and numeric ID's (UID or group ID) of the current user or any other user in the server. List out all the groups a user belongs to. Display security context of the current user

```
jobin@jobin-VirtualBox:~$ ps
  PID TTY      TIME CMD
 1695 pts/0    00:00:00 bash
 1862 pts/0    00:00:00 ps
jobin@jobin-VirtualBox:~$ id
uid=1000(jobin) gid=1000(jobin) groups=1000(jobin),4(adm),24(cdrom),27(sudo),30(dip),46(plugdev),116(lpadmin),126(sambashare)
jobin@jobin-VirtualBox:~$
```

10.top:

top command is used to show the Linux processes. It provides a dynamic real-time view of the running system. Usually, this command shows the summary information of the system and the list of processes or threads which are currently managed by the Linux Kernel.

```

top - 11:01:49 up 1:09, 1 user, load average: 0.00, 0.00, 0.00
Tasks: 168 total, 1 running, 135 sleeping, 0 stopped, 0 zombie
%Cpu(s): 3.3 us, 0.7 sy, 0.0 ni, 96.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
KB Mem : 5589768 total, 4110744 free, 846112 used, 632912 buff/cache
KB Swap: 969960 total, 969960 free, 0 used. 4481324 avail Mem

      PID USER      PR  NI    VIRT    RES    SHR %CPU %MEM     TIME+ COMMAND
1145 jobin    20   0 3019616 314656 117940 S  2.0  5.6  0:29.26 gnome-shell
1004 jobin    20   0 454020 115020 62396 S  1.0  2.1  0:09.55 Xorg
1688 jobin    20   0 859840 37076 27116 S  0.3  0.7  0:02.80 gnome-terminal-
  1 root     20   0 159856  9132 6688 S  0.0  0.2  0:01.22 systemd
  2 root     20   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-kb
  8 root     0 -20  0      0  0 I  0.0  0.0  0:00.00 mm_percpu_wq
  9 root     20   0  0      0  0 S  0.0  0.0  0:00.05 ksoftirqd/0
 10 root    20   0  0      0  0 I  0.0  0.0  0:00.25 rCU_sched
 11 root    rt  0  0      0  0 S  0.0  0.0  0:00.00 migration/0
 12 root    -51  0  0      0  0 S  0.0  0.0  0:00.00 idle_inject/0
 13 root    20   0  0      0  0 I  0.0  0.0  0:00.89 kworker/0:1-eve
 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 kauditd
 19 root    20   0  0      0  0 S  0.0  0.0  0:00.00 khungtaskd
 20 root    20   0  0      0  0 S  0.0  0.0  0:00.00 oom_reaper
 21 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 writeback
 22 root    20   0  0      0  0 S  0.0  0.0  0:00.00 kcompactd0
 23 root    25   5  0      0  0 S  0.0  0.0  0:00.00 ksmd
 24 root    39  19  0      0  0 S  0.0  0.0  0:00.00 khugepaged
 25 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 crypto
 26 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 kintegrityd
 27 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 kblockd
 28 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 tpm_dev_wq
 29 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 ata_sff
 30 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 md
 31 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 edac-poller
 32 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 devfreq_wq
 33 root    rt  0  0      0  0 S  0.0  0.0  0:00.00 watchdogd
 37 root    20   0  0      0  0 S  0.0  0.0  0:00.00 kswapd0
 38 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 kworker/u3:0
 39 root    20   0  0      0  0 S  0.0  0.0  0:00.00 encryptfs-kthrea
128 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 kthrotld
129 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 acpi_thermal_pm
130 root    20   0  0      0  0 S  0.0  0.0  0:00.01 scsi_eh_0
131 root    0 -20  0      0  0 I  0.0  0.0  0:00.00 scsi_tmf_0
132 root    20   0  0      0  0 S  0.0  0.0  0:00.00 scsi_eh_1
133 root    0 -20  0      0  0 T  0.0  0.0  0:00.00 scsi_tmf_1

```

Experiment 4

Question

Basic Linux Commands: Explain linux commands wc, tar(create, extract using gzip, xz, bzip2), expr, redirections and piping, ssh, ssh-keygen, scp, ssh-copy-id with examples

1.wc:

wc stands for word count.

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

```
jobin@jobin-VirtualBox:~/Desktop$ cat > myfile.txt
hello hai
how
are you
hai hai
^Z
[2]+  Stopped                  cat > myfile.txt
jobin@jobin-VirtualBox:~/Desktop$ cat > myfile2.txt
hai hello
^Z
[3]+  Stopped                  cat > myfile2.txt
jobin@jobin-VirtualBox:~/Desktop$ cat myfile2.txt
hai hello
jobin@jobin-VirtualBox:~/Desktop$ wc myfile.txt
 4 7 30 myfile.txt
jobin@jobin-VirtualBox:~/Desktop$ wc myfile2.txt
 1 2 10 myfile2.txt
jobin@jobin-VirtualBox:~/Desktop$ wc -w myfile.txt myfile2.txt
 7 myfile.txt
 2 myfile2.txt
 9 total
jobin@jobin-VirtualBox:~/Desktop$ wc -c myfile.txt
30 myfile.txt
jobin@jobin-VirtualBox:~/Desktop$ wc -m myfile.txt
30 myfile.txt
jobin@jobin-VirtualBox:~/Desktop$
```

2. tar

The Linux ‘tar’ stands for tape archive, is used to create Archive and extract the Archive files

Linux tar command to create compressed or uncompressed Archive files

Options:

- c : Creates Archive
- x : Extract the archive
- f : creates archive with given filename
- t : displays or lists files in archived file
- u : archives and adds to an existing archive file
- v : Displays Verbose Information
- A : Concatenates the archive files
- z : zip, tells tar command that creates tar file using gzip
- j : filter archive tar file using tbzip
- W : Verify a archive file
- r : update or add file or directory in already existed .tar file

```
#tar cf archive.tar state.txt capital.txt //create archive file
```

```
#ls archive.tar
```

```
#tar tf /archive.tar // list contents of tar archive file
```

- Extract an archive created with tar

```
#mkdir backup
```

```
#cd backup
```

```
#tar xf /home/meera/Documents/Meera_Linux/archive.tar
```

- Compression Types

gzip(z),bzip2(j), xz(J)

```
#tar czf /abc.tar.gz /etc
```

```
#mkdir backup2
```

```
#tar cjf /abcd.tar.bz2 /etc
```

```
#cd backup2
```

```
#tar cJf /abcde.tar.xz /etc
```

```
#tar xjf /abcd.tar.bz2
```

Extract an archive

```
#mkdir backup3
```

```
#mkdir backup1
```

```
#cd backup3
```

```
#cd backup1
```

```
#tar xJf /abcde.tar.xz
```

```
#tar xzf /abc.tar.gz
```

```
jobin@jobin-VirtualBox:~/Desktop$ tar czf archive1.tar.gz file.txt
tar: file.txt: Cannot stat: No such file or directory
tar: Exiting with failure status due to previous errors
jobin@jobin-VirtualBox:~/Desktop$ tar czf archive1.tar.gz file1.txt
jobin@jobin-VirtualBox:~/Desktop$ ls
archive1.tar.gz f1.txt f2.txt f3.txt f3.txt.bz ff1.txt ff2.txt file1.txt movno.txt mydirectory myfile2.txt myfile.txt
name.txt newno.txt sample22.txt
jobin@jobin-VirtualBox:~/Desktop$ tar xzf archive1.tar.gz
jobin@jobin-VirtualBox:~/Desktop$ ls
archive1.tar.gz f1.txt f2.txt f3.txt f3.txt.bz ff1.txt ff2.txt file1.txt movno.txt mydirectory myfile2.txt myfile.txt
name.txt newno.txt sample22.txt
jobin@jobin-VirtualBox:~/Desktop$ tar cjf arc2.tar.bz2 file1.txt
jobin@jobin-VirtualBox:~/Desktop$ ls
arc2.tar.bz2 archive1.tar.gz f1.txt f2.txt f3.txt f3.txt.bz ff1.txt ff2.txt file1.txt movno.txt mydirectory myfile2.txt
myfile.txt name.txt newno.txt sample22.txt
jobin@jobin-VirtualBox:~/Desktop$ tar xf arc2.tar.bz2
jobin@jobin-VirtualBox:~/Desktop$ tar cJf arc3.tar.x2 file1.txt
jobin@jobin-VirtualBox:~/Desktop$ ls
arc2.tar.bz2 arc3.tar.x2 archive1.tar.gz f1.txt f2.txt f3.txt f3.txt.bz ff1.txt ff2.txt file1.txt movno.txt mydirectory
myfile2.txt myfile.txt name.txt newno.txt sample22.txt
jobin@jobin-VirtualBox:~/Desktop$ tar xJf arc3.tar.x2
jobin@jobin-VirtualBox:~/Desktop$ ls
arc2.tar.bz2 arc3.tar.x2 archive1.tar.gz f1.txt f2.txt f3.txt f3.txt.bz ff1.txt ff2.txt file1.txt movno.txt mydirectory
myfile2.txt myfile.txt name.txt newno.txt sample22.txt
jobin@jobin-VirtualBox:~/Desktop$
```

3.expr

The expr command evaluates a given expression and displays its corresponding output. It is used for:

Basic operations like addition, subtraction, multiplication, division, and modulus on integers.

Evaluating regular expressions, string operations like substring, length of strings etc.

Performing operations on variables inside a shell script

```
#expr 25 - 5
```

```
jobin@jobin-VirtualBox:~/Desktop$ expr 10+5
10+5
jobin@jobin-VirtualBox:~/Desktop$ expr 10 + 5
15
jobin@jobin-VirtualBox:~/Desktop$
```

4. Redirections & Piping

A pipe is a form of redirection to send the output of one command/program/process to another command/program/process for further processing.

Pipe is used to combine two or more commands, the output of one command acts as input to another command, and this command's output may act as input to the next command and so on.

```
#ls -l | wc -l
```

```
#cat /etc/passwd.txt | head -7 | tail -5
```

```
jobin@jobin-VirtualBox:~/Desktop$ ls -l|wc -l
18
jobin@jobin-VirtualBox:~/Desktop$ █
```

5. ssh

ssh stands for “Secure Shell”.

It is a protocol used to securely connect to a remote server/system.

ssh is secure in the sense that it transfers the data in encrypted form between the host and the client.

It transfers inputs from the client to the host and relays back the output. ssh runs at TCP/IP port 22.

```
#ssh user_name@host(IP/Domain_name)
```

```
#ssh -X root@server1.example.com
```

```
jobin@jobin-VirtualBox:~/Desktop$ ssh
usage: ssh [-46AaCfGgKkMNnqsTtVvXxYy] [-b bind_address] [-c cipher_spec]
           [-D [bind_address:]port] [-E log_file] [-e escape_char]
           [-F configfile] [-I pkcs11] [-i identity_file]
           [-J [user@]host[:port]] [-L address] [-l login_name] [-m mac_spec]
           [-O ctl_cmd] [-o option] [-p port] [-Q query_option] [-R address]
           [-S ctl_path] [-W host:port] [-w local_tun[:remote_tun]]
           [user@]hostname [command]
jobin@jobin-VirtualBox:~/Desktop$ ssh localhost
ssh: connect to host localhost port 22: Connection refused
jobin@jobin-VirtualBox:~/Desktop$
```

6.ssh-keygen

ssh-keygen command to generate a public/private authentication

10

key pair. Authentication keys allow a user to connect to a remote system without supplying a password. Keys must be generated for each user separately.

If you generate key pairs as the root user, only the root can use the keys.

```
$ssh-keygen -t rsa
```

```
jobin@jobin-VirtualBox:~/Desktop$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/jobin/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/jobin/.ssh/id_rsa.
Your public key has been saved in /home/jobin/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:qp6kA7j12d5b4k4ruKPwkJ4aqD02H77u89twozhZqdw jobin@jobin-VirtualBox
The key's randomart image is:
+---[RSA 2048]----+
| . . S
| +.. o .
| *+.o*=.oo .
| **+OBEB+.+
| =*O@XBo+*.
+---[SHA256]----+
jobin@jobin-VirtualBox:~/Desktop$
```

Experiment 5

Question

Managing Files, Creating Users and Groups Using Command-line tools.

1. a. Create six files with name of the form songX.mp3
- b. Create six files with name of the form snapX.jpg
- c. Create six files with name of the form filmX.mp4 (In each set, replace X with the numbers 1 through 6).

```
jobin@jobin-VirtualBox:~$ touch song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3
jobin@jobin-VirtualBox:~$ touch snap1.jpg snap2.jpg snap3.jpg snap4.jpg snap5.jpg snap6.jpg
jobin@jobin-VirtualBox:~$ touch film1.mp4 film2.mp4 film3.mp4 film4.mp4 film5.mp4 film6.mp4
jobin@jobin-VirtualBox:~$ ls
Desktop    Downloads    film1.mp4    film3.mp4    film5.mp4    Pictures    snap1.jpg    snap3.jpg    snap5.jpg    song1.mp3    song3.mp3    song5.mp3
Documents  examples.desktop  film2.mp4    film4.mp4    Music       Public      snap2.jpg    snap4.jpg    snap6.jpg    song2.mp3    song4.mp3    song6.mp4
jobin@jobin-VirtualBox:~$
```

2. From your home directory, move the song files into your music subdirectory, the snapshot files into your pictures subdirectory, and the movie files into videos subdirectory.

```
jobin@jobin-VirtualBox:~$ mv *.jpg ./Pictures/
jobin@jobin-VirtualBox:~$ mv *.mp4 ./Videos/
jobin@jobin-VirtualBox:~$ cd Pictures
jobin@jobin-VirtualBox:~/Pictures$ ls
snap1.jpg    snap2.jpg    snap3.jpg    snap4.jpg    snap5.jpg    snap6.jpg
jobin@jobin-VirtualBox:~/Pictures$ cd..
cd..: command not found
jobin@jobin-VirtualBox:~/Pictures$ cd ..
jobin@jobin-VirtualBox:~$ cd Videos
jobin@jobin-VirtualBox:~/Videos$ ls
film1.mp4    film2.mp4    film3.mp4    film4.mp4    film5.mp4
jobin@jobin-VirtualBox:~/Videos$ cd ..
jobin@jobin-VirtualBox:~$
```

3. In your home directory, create three subdirectories for organizing your files. Call these directories friends, family, and work. Create all three with one command.

```
jobin@jobin-VirtualBox:~/Videos$ cd ..  
jobin@jobin-VirtualBox:~$ mkdir -p {friends,family,work}  
jobin@jobin-VirtualBox:~$ ls  
Desktop Documents Downloads examples.desktop family friends Music Pictures Public  
song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3 Templates Videos work  
jobin@jobin-VirtualBox:~$  
jobin@jobin-VirtualBox:~$ █
```

4. Copy song files to the friends folder and snap files to family folder.

```
jobin@jobin-VirtualBox:~$ cp /home/jobin/Music/ song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3 /home/jobin/friends  
cp: -r not specified; omitting directory '/home/jobin/Music/'
```

```
jobin@jobin-VirtualBox:~$ cp /home/jobin/Pictures/ snap1.jpg snap2.jpg snap3.jpg snap4.jpg snap5.jpg snap6.jpg /home/jobin/family/  
cp: -r not specified; omitting directory '/home/jobin/Pictures/'
```

5. Attempt to delete both family and friends projects with a single rmdir command.

```
jobin@jobin-VirtualBox:~$ rmdir {friends,family}  
rmdir: failed to remove 'friends': Directory not empty  
rmdir: failed to remove 'family': Directory not empty  
jobin@jobin-VirtualBox:~$ █
```

6. Use another command that will succeed in deleting both the family and friends folder.

```
jobin@jobin-VirtualBox:~$ rm -r friends family  
jobin@jobin-VirtualBox:~$
```

7. Redirect a long listing of all home directory files, including hidden, into a file named allfiles.txt. Confirm that the file contains the listing.

```
jobin@jobin-VirtualBox:~$ ls -a > allfiles.txt  
jobin@jobin-VirtualBox:~$ █
```

```
jobin@jobin-VirtualBox:~$ cat allfiles.txt
.
..
allfiles.txt
.bash_history
.bash_logout
.bashrc
.cache
.config
Desktop
Documents
Downloads
examples.desktop
.gnupg
.ICEauthority
.local
.mozilla
Music
Pictures
.profile
Public
song1.mp3
song2.mp3
song3.mp3
song4.mp3
song5.mp3
song6.mp3
.ssh
.sudo_as_admin_successful
Templates
.thunderbird
Videos
work
jobin@jobin-VirtualBox:~$
```

8. In the command window, display today's date with day of the week, month, date and year.

```
jobin@jobin-VirtualBox:~$ date
Tue Aug 17 10:36:52 EDT 2021
jobin@jobin-VirtualBox:~$
```

9. Add the user Juliet.

```
jobin@jobin-VirtualBox:~$ sudo useradd Juliet
[sudo] password for jobin:
jobin@jobin-VirtualBox:~$
```

10. Confirm that Juliet has been added by examining the /etc/passwd file

```
jobin@jobin-VirtualBox:~$ cat /etc/passwd | grep Juliet
Juliet:x:1002:1003::/home/Juliet:/bin/sh
jobin@jobin-VirtualBox:~$
```

11. Use the passwd command to initialize Juliet's password.

```
jobin@jobin-VirtualBox:~$ sudo passwd Juliet
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
jobin@jobin-VirtualBox:~$
```

12. Create a supplementary group called Shakespeare with a group id of 30000.

```
jobin@jobin-VirtualBox:~$ sudo groupadd -g 30000 Shakesphere
jobin@jobin-VirtualBox:~$
```

13. Create a supplementary group called artists.

```
jobin@jobin-VirtualBox:~$ sudo groupadd artists
jobin@jobin-VirtualBox:~$
```

14. Confirm that Shakespeare and artists have been added by examining the /etc/group file.

```
jobin@jobin-VirtualBox:~$ less /etc/group
root:x:1000:
sambashare:x:126:jobin
sampleuser:x:1001:
newusergrp:x:1002:
Juliet:x:1003:
Shakesphere:x:30000:
artists:x:30001:
(END)
```

15. Add the Juliet user to the Shakespeare group as a supplementary group.

```
jobin@jobin-VirtualBox:~$ sudo usermod -G Shakesphere Juliet
jobin@jobin-VirtualBox:~$
```

16. Confirm that Juliet has been added using the id command.

```
jobin@jobin-VirtualBox:~$ id Juliet
uid=1002(Juliet) gid=1003(Juliet) groups=1003(Juliet),30000(Shakesphere)
jobin@jobin-VirtualBox:~$
```

17. Add Romeo and Hamlet to the Shakespeare group.

```
jobin@jobin-VirtualBox:~$ sudo useradd Romeo
jobin@jobin-VirtualBox:~$ sudo usermod -G Shakesphere Romeo
jobin@jobin-VirtualBox:~$ useradd Hamlet
useradd: Permission denied.
useradd: cannot lock /etc/passwd; try again later.
jobin@jobin-VirtualBox:~$ sudo useradd Hamlet
jobin@jobin-VirtualBox:~$ sudo usermod -G Shakesphere Hamlet
jobin@jobin-VirtualBox:~$
```

18. Add Reba, Dolly and Elvis to the artists group.

```
jobin@jobin-VirtualBox:~$ sudo useradd Reba
jobin@jobin-VirtualBox:~$ sudo Useradd Dolly
sudo: Useradd: command not found
jobin@jobin-VirtualBox:~$ sudo useradd Dolly
jobin@jobin-VirtualBox:~$ sudo useradd Elvis
jobin@jobin-VirtualBox:~$ sudo usermod -G artists Reba
jobin@jobin-VirtualBox:~$ sudo usermod -G artists Dolly
jobin@jobin-VirtualBox:~$ sudo usermod -G artists Elvis
jobin@jobin-VirtualBox:~$
```

19. Verify the supplemental group memberships by examining the /etc/group file.

```
jobin@jobin-VirtualBox:~$ less /etc/group
[3]+  Stopped                  less /etc/group
jobin@jobin-VirtualBox:~$
```

```
Shakesphere:x:30000:Juliet,Romeo,Hamlet
artists:x:30001:Reba,Dolly,Elvis
Romeo:x:30002:
Hamlet:x:1004:
Reba:x:1005:
Dolly:x:1006:
Elvis:x:1007:
(END)
```

20. Attempt to remove user Dolly.

```
jobin@jobin-VirtualBox:~$ sudo userdel Dolly
jobin@jobin-VirtualBox:~$ id Dolly
id: 'Dolly': no such user
jobin@jobin-VirtualBox:~$
```

Experiment 6

Question

Q1. Try out these network commands in Window as well as in Linux and perform at least 4 options with each command: ping, route, traceroute, nslookup, Ip Config, NetStat .

WINDOWS COMMAND

Ping:

```
Microsoft Windows [Version 10.0.19042.1165]
(c) Microsoft Corporation. All rights reserved.

C:\Users\jobin>ping google.com

Pinging google.com [2404:6800:4007:819::200e] with 32 bytes of data:
Reply from 2404:6800:4007:819::200e: time=49ms
Reply from 2404:6800:4007:819::200e: time=53ms
Reply from 2404:6800:4007:819::200e: time=47ms
Reply from 2404:6800:4007:819::200e: time=41ms

Ping statistics for 2404:6800:4007:819::200e:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 41ms, Maximum = 53ms, Average = 47ms

C:\Users\jobin>
```

```
C:\Users\jobin>ping -a google.com

Pinging google.com [2404:6800:4007:816::200e] with 32 bytes of data:
Reply from 2404:6800:4007:816::200e: time=34ms
Reply from 2404:6800:4007:816::200e: time=56ms
Reply from 2404:6800:4007:816::200e: time=58ms
Reply from 2404:6800:4007:816::200e: time=33ms

Ping statistics for 2404:6800:4007:816::200e:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 33ms, Maximum = 58ms, Average = 45ms

C:\Users\jobin>
```

```
C:\Users\jobin>ping -t google.com

Pinging google.com [2404:6800:4007:816::200e] with 32 bytes of data:
Reply from 2404:6800:4007:816::200e: time=54ms
Reply from 2404:6800:4007:816::200e: time=59ms
Reply from 2404:6800:4007:816::200e: time=54ms
Reply from 2404:6800:4007:816::200e: time=55ms
Reply from 2404:6800:4007:816::200e: time=52ms
Reply from 2404:6800:4007:816::200e: time=51ms
Reply from 2404:6800:4007:816::200e: time=61ms
Reply from 2404:6800:4007:816::200e: time=60ms
Reply from 2404:6800:4007:816::200e: time=54ms
Reply from 2404:6800:4007:816::200e: time=60ms

Ping statistics for 2404:6800:4007:816::200e:
    Packets: Sent = 10, Received = 10, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 51ms, Maximum = 61ms, Average = 56ms
Control-C
^C
C:\Users\jobin>
```

```
C:\Users\jobin>ping -j google.com

Pinging google.com [142.250.77.110] with 32 bytes of data:
General failure.
General failure.
General failure.
General failure.

Ping statistics for 142.250.77.110:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\Users\jobin>
```

```
C:\Users\jobin>ping -4 google.com

Pinging google.com [142.250.77.110] with 32 bytes of data:
Reply from 142.250.77.110: bytes=32 time=205ms TTL=112
Reply from 142.250.77.110: bytes=32 time=47ms TTL=112
Reply from 142.250.77.110: bytes=32 time=110ms TTL=112
Reply from 142.250.77.110: bytes=32 time=58ms TTL=112

Ping statistics for 142.250.77.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 47ms, Maximum = 205ms, Average = 105ms

C:\Users\jobin>
```

Route:

```
C:\Users\jobin>route print
=====
Interface List
14...f8 b4 6a b8 18 f5 ....Realtek PCIe GbE Family Controller
11...0a 00 27 00 00 0b ....VirtualBox Host-Only Ethernet Adapter
16...b2 68 e6 73 b9 7f ....Microsoft Wi-Fi Direct Virtual Adapter
17...f2 68 e6 73 b9 7f ....Microsoft Wi-Fi Direct Virtual Adapter #2
9...b0 68 e6 73 b9 7f ....Realtek RTL8822BE 802.11ac PCIe Adapter
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask        Gateway        Interface Metric
          0.0.0.0          0.0.0.0    192.168.7.222  192.168.7.169   55
         127.0.0.0        255.0.0.0       On-link        127.0.0.1    331
         127.0.0.1        255.255.255.255  On-link        127.0.0.1    331
 127.255.255.255        255.255.255.255  On-link        127.0.0.1    331
         192.168.7.0      255.255.255.0       On-link      192.168.7.169   311
 192.168.7.169        255.255.255.255  On-link      192.168.7.169   311
 192.168.7.255        255.255.255.255  On-link      192.168.7.169   311
         192.168.56.0      255.255.255.0       On-link      192.168.56.1   281
 192.168.56.1        255.255.255.255  On-link      192.168.56.1   281
 192.168.56.255       255.255.255.255  On-link      192.168.56.1   281
         224.0.0.0          240.0.0.0       On-link        127.0.0.1    331
         224.0.0.0          240.0.0.0       On-link      192.168.56.1   281
         224.0.0.0          240.0.0.0       On-link      192.168.7.169   311
 255.255.255.255       255.255.255.255  On-link        127.0.0.1    331
 255.255.255.255       255.255.255.255  On-link      192.168.56.1   281
 255.255.255.255       255.255.255.255  On-link      192.168.7.169   311
=====
Persistent Routes:
 None

IPv6 Route Table
=====
Active Routes:
If Metric Network Destination      Gateway
 9     71 ::/0                  fe80::7c8a:b3ff:fea0:abc0
 1     331 ::1/128              On-link
 9     71 2409:4073:9a:8361::/64  On-link
 9     311 2409:4073:9a:8361:514e:4158:8eaf:f6f7/128
                                On-link
 9     311 2409:4073:9a:8361:d45c:847c:e902:bb0b/128
                                On-link
11     281 fe80::/64             On-link
 9     311 fe80::/64             On-link
```

```
C:\Users\jobin>route print -4
=====
Interface List
14...f8 b4 6a b8 18 f5 .....Realtek PCIe GbE Family Controller
11...0a 00 27 00 00 0b .....VirtualBox Host-Only Ethernet Adapter
16...b2 68 e6 73 b9 7f .....Microsoft Wi-Fi Direct Virtual Adapter
17...f2 68 e6 73 b9 7f .....Microsoft Wi-Fi Direct Virtual Adapter #2
9...b0 68 e6 73 b9 7f .....Realtek RTL8822BE 802.11ac PCIe Adapter
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask          Gateway        Interface Metric
          0.0.0.0        0.0.0.0    192.168.7.222  192.168.7.169    55
         127.0.0.0    255.0.0.0        On-link       127.0.0.1    331
         127.0.0.1  255.255.255.255        On-link       127.0.0.1    331
 127.255.255.255  255.255.255.255        On-link       127.0.0.1    331
         192.168.7.0  255.255.255.0        On-link  192.168.7.169    311
 192.168.7.169  255.255.255.255        On-link  192.168.7.169    311
 192.168.7.255  255.255.255.255        On-link  192.168.7.169    311
         192.168.56.0  255.255.255.0        On-link  192.168.56.1    281
 192.168.56.1   255.255.255.255        On-link  192.168.56.1    281
 192.168.56.255  255.255.255.255        On-link  192.168.56.1    281
         224.0.0.0    240.0.0.0        On-link       127.0.0.1    331
         224.0.0.0    240.0.0.0        On-link  192.168.56.1    281
         224.0.0.0    240.0.0.0        On-link  192.168.7.169    311
 255.255.255.255  255.255.255.255        On-link       127.0.0.1    331
 255.255.255.255  255.255.255.255        On-link  192.168.56.1    281
 255.255.255.255  255.255.255.255        On-link  192.168.7.169    311
=====
Persistent Routes:
  None
C:\Users\jobin>
```

```
C:\Users\jobin>route print -6
=====
Interface List
 14...f8 b4 6a b8 18 f5 ....Realtek PCIe GbE Family Controller
 11...0a 00 27 00 00 0b ....VirtualBox Host-Only Ethernet Adapter
 16...b2 68 e6 73 b9 7f ....Microsoft Wi-Fi Direct Virtual Adapter
 17...f2 68 e6 73 b9 7f ....Microsoft Wi-Fi Direct Virtual Adapter #2
 9...b0 68 e6 73 b9 7f ....Realtek RTL8822BE 802.11ac PCIe Adapter
 1.....Software Loopback Interface 1
=====

IPv6 Route Table
=====
Active Routes:
 If Metric Network Destination      Gateway
  9     71 ::/0                      fe80::7c8a:b3ff:fea0:abc0
   1    331 ::1/128                 On-link
  9     71 2409:4073:9a:8361::/64  On-link
  9    311 2409:4073:9a:8361:514e:4158:8eaf:f6f7/128
                                         On-link
  9    311 2409:4073:9a:8361:d45c:847c:e902:bb0b/128
                                         On-link
 11    281 fe80::/64                On-link
  9    311 fe80::/64                On-link
 11    281 fe80::4dd4:de4c:4e36:8abd/128
                                         On-link
  9    311 fe80::514e:4158:8eaf:f6f7/128
                                         On-link
   1    331 ff00::/8                 On-link
 11    281 ff00::/8                 On-link
  9    311 ff00::/8                 On-link
=====

Persistent Routes:
  None
```

```
C:\Users\jobin>route print *157
=====
Interface List
 14...f8 b4 6a b8 18 f5 ....Realtek PCIe GbE Family Controller
 11...0a 00 27 00 00 0b ....VirtualBox Host-Only Ethernet Adapter
 16...b2 68 e6 73 b9 7f ....Microsoft Wi-Fi Direct Virtual Adapter
 17...f2 68 e6 73 b9 7f ....Microsoft Wi-Fi Direct Virtual Adapter #2
  9..b0 68 e6 73 b9 7f ....Realtek RTL8822BE 802.11ac PCIe Adapter
   1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
  None
Persistent Routes:
  None

IPv6 Route Table
=====
Active Routes:
  None
Persistent Routes:
  None

C:\Users\jobin>
```

Traceroute:

```
C:\Users\jobin>tracert 198.168.1.1

Tracing route to 198.168.1.1 over a maximum of 30 hops

  1    32 ms      1 ms      1 ms  192.168.7.222
  2    *          *          *      Request timed out.
  3    59 ms      29 ms     53 ms  10.72.48.3
  4    51 ms      29 ms     38 ms  192.168.47.42
  5    58 ms      27 ms     38 ms  172.26.75.36
  6    69 ms      28 ms     38 ms  172.26.75.67
  7    78 ms      43 ms     36 ms  192.168.47.22
  8    *          *          *      Request timed out.
```

```
C:\Users\jobin>2  
C:\Users\jobin>tracert www.google.com  
  
Tracing route to www.google.com [2404:6800:4007:809::2004]  
over a maximum of 30 hops:  
  
 1    2 ms      2 ms      2 ms  2409:4073:9a:8361::4e  
 2    *          *          *      Request timed out.  
 3    24 ms     28 ms     38 ms  2405:200:314:161::2  
 4    53 ms     29 ms     36 ms  2405:200:801:1100::46c  
 5    52 ms     30 ms     36 ms  2405:200:801:1100::455  
 6    *          *          *      Request timed out.  
 7    95 ms     37 ms     48 ms  2001:4860:1:1::170  
 8    52 ms     38 ms     48 ms  2404:6800:8103::1  
 9    55 ms     37 ms     48 ms  2001:4860:0:1::5654  
10   60 ms     38 ms     48 ms  2001:4860:0:135f::2  
11   49 ms     47 ms     48 ms  2001:4860:0:1340::1  
12   67 ms     49 ms     48 ms  2001:4860:0:1::ac7  
13   59 ms     58 ms     49 ms  maa03s28-in-x04.1e100.net [2404:6800:4007:809::2004]  
  
Trace complete.  
C:\Users\jobin>
```

```
C:\Users\jobin>tracert -d www.google.com  
  
Tracing route to www.google.com [2404:6800:4007:809::2004]  
over a maximum of 30 hops:  
  
 1    7 ms      2 ms      2 ms  2409:4073:9a:8361::4e  
 2    *          *          *      Request timed out.  
 3    176 ms     27 ms     40 ms  2405:200:314:161::2  
 4    47 ms     39 ms     41 ms  2405:200:801:1100::46c  
 5    *          47 ms     *      2405:200:801:1100::455  
 6    *          *          *      Request timed out.  
 7    62 ms     39 ms     57 ms  2001:4860:1:1::170  
 8    62 ms     38 ms     57 ms  2404:6800:8103::1  
 9    64 ms     40 ms     56 ms  2001:4860:0:1::5654  
10   69 ms     49 ms     49 ms  2001:4860:0:135f::2  
11   73 ms     59 ms     58 ms  2001:4860:0:1340::1  
12   60 ms     *          92 ms  2001:4860:0:1::ac7  
13   62 ms     38 ms     59 ms  2404:6800:4007:809::2004  
  
Trace complete.
```

Nslookup:

```
C:\Users\jobin>nslookup  
Default Server: UnKnown  
Address: 192.168.7.222
```

```
C:\Users\jobin>nslookup google.com  
Server: UnKnown  
Address: 192.168.7.222  
  
Non-authoritative answer:  
Name: google.com  
Addresses: 2404:6800:4007:819::200e  
          142.250.77.110  
  
C:\Users\jobin>
```

```
C:\Users\jobin>nslookup -q=MX google.com  
Server: UnKnown  
Address: 192.168.7.222  
  
Non-authoritative answer:  
google.com      MX preference = 10, mail exchanger = aspmx.l.google.com  
google.com      MX preference = 30, mail exchanger = alt2.aspmx.l.google.com  
google.com      MX preference = 20, mail exchanger = alt1.aspmx.l.google.com  
google.com      MX preference = 40, mail exchanger = alt3.aspmx.l.google.com  
google.com      MX preference = 50, mail exchanger = alt4.aspmx.l.google.com  
  
C:\Users\jobin>
```

```
C:\Users\jobin>nslookup -type=ns google.com  
Server: UnKnown  
Address: 192.168.7.222  
  
Non-authoritative answer:  
google.com      nameserver = ns2.google.com  
google.com      nameserver = ns1.google.com  
google.com      nameserver = ns3.google.com  
google.com      nameserver = ns4.google.com  
  
C:\Users\jobin>
```

Ip Config:

```
C:\Users\jobin>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . .

Ethernet adapter VirtualBox Host-Only Network:

    Connection-specific DNS Suffix . . .
    Link-local IPv6 Address . . . . . : fe80::4dd4:de4c:4e36:8abd%11
    IPv4 Address. . . . . : 192.168.56.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . .

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . .

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . . .
    IPv6 Address. . . . . : 2409:4073:9a:8361:514e:4158:8eaf:f6f7
    Temporary IPv6 Address. . . . . : 2409:4073:9a:8361:d45c:847c:e902:bb0b
    Link-local IPv6 Address . . . . . : fe80::514e:4158:8eaf:f6f7%9
    IPv4 Address. . . . . : 192.168.7.169
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::7c8a:b3ff:fea0:abc0%9
                                192.168.7.222

C:\Users\jobin>
```

```
C:\Users\jobin>ipconfig /release

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Ethernet adapter VirtualBox Host-Only Network:

    Connection-specific DNS Suffix . :
    Link-local IPv6 Address . . . . . : fe80::4dd4:de4c:4e36:8abd%11
    IPv4 Address. . . . . : 192.168.56.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . :
    IPv6 Address. . . . . : 2409:4073:9a:8361:514e:4158:8eaf:f6f7
    Temporary IPv6 Address. . . . . : 2409:4073:9a:8361:d45c:847c:e902:bb0b
    Link-local IPv6 Address . . . . . : fe80::514e:4158:8eaf:f6f7%9
    Default Gateway . . . . . : fe80::7c8a:b3ff:fea0:abc0%9

C:\Users\jobin>
```

```
C:\Users\jobin>ipconfig /displaydns

Windows IP Configuration

client.wns.windows.com
-----
Record Name . . . . . : client.wns.windows.com
Record Type . . . . . : 5
Time To Live . . . . . : 194
Data Length . . . . . : 8
Section . . . . . . . : Answer
CNAME Record . . . . . : wns.notify.trafficmanager.net

Record Name . . . . . : wns.notify.trafficmanager.net
Record Type . . . . . : 1
Time To Live . . . . . : 194
Data Length . . . . . : 4
Section . . . . . . . : Answer
A (Host) Record . . . . . : 20.198.162.76

C:\Users\jobin>
```

```
C:\Users\jobin>ipconfig /showclassid  
Error: unrecognized or incomplete command line.  
  
USAGE:  
    ipconfig [/allcompartments] [/? | /all |  
              /renew [adapter] | /release [adapter] |  
              /renew6 [adapter] | /release6 [adapter] |  
              /flushdns | /displaydns | /registerdns |  
              /showclassid adapter |  
              /setclassid adapter [classid] |  
              /showclassid6 adapter |  
              /setclassid6 adapter [classid] ]  
  
where  
    adapter      Connection name  
                  (wildcard characters * and ? allowed, see examples)  
  
Options:  
    /?            Display this help message.  
    /all          Display full configuration information.  
    /release     Release the IPv4 address for the specified adapter.  
    /release6   Release the IPv6 address for the specified adapter.  
    /renew       Renew the IPv4 address for the specified adapter.  
    /renew6     Renew the IPv6 address for the specified adapter.  
    /flushdns   Purges the DNS Resolver cache.  
    /registerdns Refreshes all DHCP leases and re-registers DNS names.  
    /displaydns Display the contents of the DNS Resolver Cache.  
    /showclassid Displays all the dhcp class IDs allowed for adapter.  
    /setclassid  Modifies the dhcp class id.  
    /showclassid6 Displays all the IPv6 DHCP class IDs allowed for adapter.  
    /setclassid6 Modifies the IPv6 DHCP class id.
```

The default is to display only the IP address, subnet mask and default gateway for each adapter bound to TCP/IP.

For Release and Renew, if no adapter name is specified, then the IP address

NetStat:

```
C:\Users\jobin>netstat
```

```
Active Connections
```

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:59097	LAPTOP-BJ9LR7NA:59113	ESTABLISHED
TCP	127.0.0.1:59113	LAPTOP-BJ9LR7NA:59097	ESTABLISHED
TCP	127.0.0.1:60092	LAPTOP-BJ9LR7NA:65001	ESTABLISHED
TCP	127.0.0.1:65001	LAPTOP-BJ9LR7NA:60092	ESTABLISHED
TCP	192.168.7.169:61854	20.198.162.76:https	ESTABLISHED
TCP	192.168.7.169:61855	20.44.229.112:https	TIME_WAIT
TCP	192.168.7.169:61856	52.178.17.2:https	ESTABLISHED

```
C:\Users\jobin>netstat -n
```

```
Active Connections
```

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:59097	127.0.0.1:59113	ESTABLISHED
TCP	127.0.0.1:59113	127.0.0.1:59097	ESTABLISHED
TCP	127.0.0.1:60092	127.0.0.1:65001	ESTABLISHED
TCP	127.0.0.1:65001	127.0.0.1:60092	ESTABLISHED
TCP	192.168.7.169:61772	204.79.197.219:443	ESTABLISHED
TCP	192.168.7.169:61854	20.198.162.76:443	ESTABLISHED
TCP	192.168.7.169:61856	52.178.17.2:443	TIME_WAIT
TCP	192.168.7.169:61857	20.44.229.112:443	TIME_WAIT
TCP	192.168.7.169:61860	20.44.229.112:443	ESTABLISHED

```
C:\Users\jobin>
```

```
C:\Users\jobin>netstat -n 5
```

```
Active Connections
```

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:59097	127.0.0.1:59113	ESTABLISHED
TCP	127.0.0.1:59113	127.0.0.1:59097	ESTABLISHED
TCP	127.0.0.1:60092	127.0.0.1:65001	ESTABLISHED
TCP	127.0.0.1:65001	127.0.0.1:60092	ESTABLISHED
TCP	192.168.7.169:61772	204.79.197.219:443	ESTABLISHED
TCP	192.168.7.169:61854	20.198.162.76:443	ESTABLISHED
TCP	192.168.7.169:61856	52.178.17.2:443	TIME_WAIT
TCP	192.168.7.169:61857	20.44.229.112:443	TIME_WAIT
TCP	192.168.7.169:61860	20.44.229.112:443	ESTABLISHED

```
C:\Users\jobin>netstat -a
```

Active Connections

Proto	Local Address	Foreign Address	State
TCP	0.0.0.0:135	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:445	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:808	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:5040	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:7680	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:49664	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:49665	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:49666	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:49667	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:49668	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	0.0.0.0:49670	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	127.0.0.1:27017	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	127.0.0.1:59097	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	127.0.0.1:59097	LAPTOP-BJ9LR7NA:59113	ESTABLISHED
TCP	127.0.0.1:59113	LAPTOP-BJ9LR7NA:59097	ESTABLISHED
TCP	127.0.0.1:60092	LAPTOP-BJ9LR7NA:65001	ESTABLISHED
TCP	127.0.0.1:65001	LAPTOP-BJ9LR7NA:0	LISTENING
TCP	127.0.0.1:65001	LAPTOP-BJ9LR7NA:60092	ESTABLISHED
TCP	192.168.7.169:139	LAPTOP-BJ9LR7NA:0	LISTENING

UBUNTU COMMANDS

Ping

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ ping www.google.com
PING www.google.com (172.217.31.196) 56(84) bytes of data.
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=1 ttl=112 time=102 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=2 ttl=112 time=122 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=3 ttl=112 time=107 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=4 ttl=112 time=164 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=5 ttl=112 time=83.4 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=6 ttl=112 time=111 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=7 ttl=112 time=126 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=8 ttl=112 time=148 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=9 ttl=112 time=85.3 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=10 ttl=112 time=87.9 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=11 ttl=112 time=109 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=12 ttl=112 time=132 ms
^C
--- www.google.com ping statistics ---
12 packets transmitted, 12 received, 0% packet loss, time 11017ms
rtt min/avg/max/mdev = 83.486/115.133/164.404/23.964 ms
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ ping -a www.google.com
PING www.google.com (172.217.31.196) 56(84) bytes of data.
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=1 ttl=112 time=242 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=2 ttl=112 time=161 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=3 ttl=112 time=82.0 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=4 ttl=112 time=104 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=5 ttl=112 time=126 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=6 ttl=112 time=148 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=7 ttl=112 time=171 ms
^C
--- www.google.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6005ms
rtt min/avg/max/mdev = 82.077/148.004/242.845/48.469 ms
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ ping -v www.google.com
ping: socket: Permission denied, attempting raw socket...
ping: socket: Permission denied, attempting raw socket...
PING www.google.com (172.217.31.196) 56(84) bytes of data.
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=1 ttl=112 time=60.4 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=2 ttl=112 time=79.9 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=3 ttl=112 time=72.6 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=4 ttl=112 time=61.3 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=5 ttl=112 time=62.3 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=6 ttl=112 time=60.5 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=7 ttl=112 time=60.4 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=8 ttl=112 time=70.1 ms
^C
--- www.google.com ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7012ms
rtt min/avg/max/mdev = 60.413/65.980/79.948/6.906 ms
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ ping -V www.google.com
ping utility, iputils-s20161105
jobin@jobin-VirtualBox:~$
```

Route

```
jobin@jobin-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
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref  Use Iface
0.0.0.0         10.0.2.2       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
169.254.0.0     0.0.0.0        255.255.0.0    U     1000   0      0 enp0s3
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ route -Cn
Kernel IP routing cache
Source          Destination     Gateway         Flags Metric Ref  Use Iface
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ ip route
default via 10.0.2.2 dev enp0s3 proto dhcp metric 100
10.0.2.0/24 dev enp0s3 proto kernel scope link src 10.0.2.15 metric 100
169.254.0.0/16 dev enp0s3 scope link metric 1000
jobin@jobin-VirtualBox:~$
```

Traceroute

```
jobin@jobin-VirtualBox:~$ traceroute google.com
traceroute to google.com (142.250.182.14), 30 hops max, 60 byte packets
 1  _gateway (10.0.2.2)  0.557 ms  0.529 ms  0.562 ms
 2  * * *
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * *^C
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ traceroute -4 google.com
traceroute to google.com (142.250.182.14), 30 hops max, 60 byte packets
 1  _gateway (10.0.2.2)  0.327 ms  0.319 ms  0.307 ms
 2  * * *
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * *^Z
[1]+  Stopped                  traceroute -4 google.com
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ traceroute -6 google.com
traceroute to google.com (2404:6800:4007:819::200e), 30 hops max, 80 byte packets
connect: Network is unreachable
jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ traceroute -d google.com
traceroute to google.com (142.250.182.14), 30 hops max, 60 byte packets
setsockopt SO_DEBUG: Permission denied
jobin@jobin-VirtualBox:~$
```

Nslookup

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ nslookup google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.182.14
Name:   google.com
Address: 2404:6800:4007:819::200e

jobin@jobin-VirtualBox:~$ █
```

```
jobin@jobin-VirtualBox:~$ nslookup -q=Mx google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
google.com      mail exchanger = 10 aspmx.l.google.com.
google.com      mail exchanger = 30 alt2.aspmx.l.google.com.
google.com      mail exchanger = 40 alt3.aspmx.l.google.com.
google.com      mail exchanger = 50 alt4.aspmx.l.google.com.
google.com      mail exchanger = 20 alt1.aspmx.l.google.com.

Authoritative answers can be found from:

jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ nslookup -type=soa google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
google.com
    origin = ns1.google.com
    mail addr = dns-admin.google.com
    serial = 396314134
    refresh = 900
    retry = 900
    expire = 1800
    minimum = 60

Authoritative answers can be found from:

jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ nslookup -type=a google.com
Server:          127.0.0.53
Address:         127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.182.14

jobin@jobin-VirtualBox:~$
```

Ifconfig

```
jobin@jobin-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::4edf:4230:c166:8222 prefixlen 64 scopeid 0x20<link>
              ether 08:00:27:4e:7f:ba txqueuelen 1000 (Ethernet)
              RX packets 4527 bytes 5483319 (5.4 MB)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 2424 bytes 210161 (210.1 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 686 bytes 61768 (61.7 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 686 bytes 61768 (61.7 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

jobin@jobin-VirtualBox:~$
```

```
jobin@jobin-VirtualBox:~$ ifconfig -v
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::4edf:4230:c166:8222 prefixlen 64 scopeid 0x20<link>
              ether 08:00:27:4e:7f:ba txqueuelen 1000 (Ethernet)
              RX packets 4527 bytes 5483319 (5.4 MB)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 2424 bytes 210161 (210.1 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 686 bytes 61768 (61.7 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 686 bytes 61768 (61.7 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

jobin@jobin-VirtualBox:~$
```

```

jobin@jobin-VirtualBox:~$ ifconfig -s
Iface      MTU     RX-OK RX-ERR RX-DRP RX-OVR     TX-OK TX-ERR TX-DRP TX-OVR Flg
enp0s3    1500     4527     0     0 0       2424     0     0     0 BMRU
lo        65536     686     0     0 0       686     0     0     0 LRU
jobin@jobin-VirtualBox:~$ 

jobin@jobin-VirtualBox:~$ ifconfig -a
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::4edf:4230:c166:8222 prefixlen 64 scopeid 0x20<link>
        ether 08:00:27:4e:7f:ba txqueuelen 1000 (Ethernet)
          RX packets 4527 bytes 5483319 (5.4 MB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 2424 bytes 210161 (210.1 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 686 bytes 61768 (61.7 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 686 bytes 61768 (61.7 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

jobin@jobin-VirtualBox:~$ 

```

Netstat

```

jobin@jobin-VirtualBox:~$ netstat
Active Internet connections (w/o servers)
Proto  Local Address          Foreign Address        State
tcp    0      jobin-VirtualBox:60850 maa05s18-in-f14.1:33469 ESTABLISHED
tcp    0      jobin-VirtualBox:40614 maa05s18-in-f14.1:33476 ESTABLISHED
tcp    0      jobin-VirtualBox:45090 maa05s18-in-f14.1:33480 ESTABLISHED
tcp    0      jobin-VirtualBox:53343 maa05s18-in-f14.1:33484 ESTABLISHED
tcp    0      jobin-VirtualBox:45545 maa05s18-in-f14.1:33475 ESTABLISHED
tcp    0      jobin-VirtualBox:49876 maa05s18-in-f14.1:33474 ESTABLISHED
tcp    0      jobin-VirtualBox:45829 maa05s18-in-f14.1:33477 ESTABLISHED
tcp    0      jobin-VirtualBox:46352 maa05s18-in-f14.1:33470 ESTABLISHED
tcp    0      jobin-VirtualBox:46472 maa05s18-in-f14.1:33478 ESTABLISHED
tcp    0      jobin-VirtualBox:54674 maa05s18-in-f14.1:33471 ESTABLISHED
tcp    0      jobin-VirtualBox:42576 maa05s18-in-f14.1:33481 ESTABLISHED
tcp    0      jobin-VirtualBox:38634 maa05s18-in-f14.1:33479 ESTABLISHED
tcp    0      jobin-VirtualBox:55294 maa05s18-in-f14.1:33473 ESTABLISHED
tcp    0      jobin-VirtualBox:60055 maa05s18-in-f14.1:33482 ESTABLISHED
tcp    0      jobin-VirtualBox:43766 maa05s18-in-f14.1:33472 ESTABLISHED
tcp    0      jobin-VirtualBox:44061 maa05s18-in-f14.1:33483 ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State         I-Node Path
unix  2      [ ]           DGRAM    13741  /var/run/systemd/journal/socket

```

```
jobin@jobin-VirtualBox:~$ netstat -n
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
udp      0      0 10.0.2.15:60850          142.250.182.14:33469 ESTABLISHED
udp      0      0 10.0.2.15:40614          142.250.182.14:33476 ESTABLISHED
udp      0      0 10.0.2.15:45090          142.250.182.14:33480 ESTABLISHED
udp      0      0 10.0.2.15:53343          142.250.182.14:33484 ESTABLISHED
udp      0      0 10.0.2.15:45545          142.250.182.14:33475 ESTABLISHED
udp      0      0 10.0.2.15:49876          142.250.182.14:33474 ESTABLISHED
udp      0      0 10.0.2.15:45829          142.250.182.14:33477 ESTABLISHED
udp      0      0 10.0.2.15:46352          142.250.182.14:33470 ESTABLISHED
udp      0      0 10.0.2.15:46472          142.250.182.14:33478 ESTABLISHED
udp      0      0 10.0.2.15:54674          142.250.182.14:33471 ESTABLISHED
udp      0      0 10.0.2.15:42576          142.250.182.14:33481 ESTABLISHED
udp      0      0 10.0.2.15:38634          142.250.182.14:33479 ESTABLISHED
udp      0      0 10.0.2.15:55294          142.250.182.14:33473 ESTABLISHED
udp      0      0 10.0.2.15:60055          142.250.182.14:33482 ESTABLISHED
udp      0      0 10.0.2.15:43766          142.250.182.14:33472 ESTABLISHED
udp      0      0 10.0.2.15:44061          142.250.182.14:33483 ESTABLISHED
Active UNIX domain sockets (w/o servers)
```

```
jobin@jobin-VirtualBox:~$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:domain        0.0.0.0:*
tcp      0      0 localhost:ipp          0.0.0.0:*
tcp      0      0 localhost:mysql        0.0.0.0:*
tcp6     0      0 [::]:http            [::]:*
tcp6     0      0 ip6-localhost:ipp      [::]:*
udp      0      0 jobin-VirtualBox:60850 maa05s18-in-f14.1:33469 ESTABLISHED
udp      0      0 jobin-VirtualBox:40614 maa05s18-in-f14.1:33476 ESTABLISHED
udp      0      0 jobin-VirtualBox:45090 maa05s18-in-f14.1:33480 ESTABLISHED
udp      0      0 localhost:domain        0.0.0.0:*
udp      0      0 0.0.0.0:bootpc        0.0.0.0:*
udp      0      0 jobin-VirtualBox:53343 maa05s18-in-f14.1:33484 ESTABLISHED
udp      0      0 jobin-VirtualBox:45545 maa05s18-in-f14.1:33475 ESTABLISHED
udp      0      0 0.0.0.0:ipp          0.0.0.0:*
udp      0      0 jobin-VirtualBox:49876 maa05s18-in-f14.1:33474 ESTABLISHED
udp      0      0 jobin-VirtualBox:45829 maa05s18-in-f14.1:33477 ESTABLISHED
udp      0      0 0.0.0.0:37687        0.0.0.0:*
udp      0      0 0.0.0.0:mdns          0.0.0.0:*
udp      0      0 jobin-VirtualBox:46352 maa05s18-in-f14.1:33470 ESTABLISHED
udp      0      0 jobin-VirtualBox:46472 maa05s18-in-f14.1:33478 ESTABLISHED
udp      0      0 jobin-VirtualBox:54674 maa05s18-in-f14.1:33471 ESTABLISHED
udp      0      0 jobin-VirtualBox:42576 maa05s18-in-f14.1:33481 ESTABLISHED
udp      0      0 jobin-VirtualBox:38634 maa05s18-in-f14.1:33479 ESTABLISHED
udp      0      0 jobin-VirtualBox:55294 maa05s18-in-f14.1:33473 ESTABLISHED
udp      0      0 jobin-VirtualBox:60055 maa05s18-in-f14.1:33482 ESTABLISHED
udp      0      0 jobin-VirtualBox:43766 maa05s18-in-f14.1:33472 ESTABLISHED
udp      0      0 jobin-VirtualBox:44061 maa05s18-in-f14.1:33483 ESTABLISHED
udp6     0      0 [::]:40285           [::]:*
udp6     0      0 [::]:mdns          [::]:*
```

```

jobin@jobin-VirtualBox:~$ netstat -n 5
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
udp      0      0 10.0.2.15:60850          142.250.182.14:33469 ESTABLISHED
udp      0      0 10.0.2.15:40614          142.250.182.14:33476 ESTABLISHED
udp      0      0 10.0.2.15:45090          142.250.182.14:33480 ESTABLISHED
udp      0      0 10.0.2.15:53343          142.250.182.14:33484 ESTABLISHED
udp      0      0 10.0.2.15:45545          142.250.182.14:33475 ESTABLISHED
udp      0      0 10.0.2.15:49876          142.250.182.14:33474 ESTABLISHED
udp      0      0 10.0.2.15:45829          142.250.182.14:33477 ESTABLISHED
udp      0      0 10.0.2.15:46352          142.250.182.14:33470 ESTABLISHED
udp      0      0 10.0.2.15:46472          142.250.182.14:33478 ESTABLISHED
udp      0      0 10.0.2.15:54674          142.250.182.14:33471 ESTABLISHED
udp      0      0 10.0.2.15:42576          142.250.182.14:33481 ESTABLISHED
udp      0      0 10.0.2.15:38634          142.250.182.14:33479 ESTABLISHED
udp      0      0 10.0.2.15:55294          142.250.182.14:33473 ESTABLISHED
udp      0      0 10.0.2.15:60055          142.250.182.14:33482 ESTABLISHED
udp      0      0 10.0.2.15:43766          142.250.182.14:33472 ESTABLISHED
udp      0      0 10.0.2.15:44061          142.250.182.14:33483 ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags     Type      State         I-Node  Path
unix    2      [ ]     DGRAM          12741   /run/systemd/journal/syslog
unix    2      [ ]     DGRAM          22578   /run/user/1000/systemd/notify
unix    3      [ ]     DGRAM          12612   /run/systemd/notify
unix   17      [ ]     DGRAM          12626   /run/systemd/journal/dev-log
unix    8      [ ]     DGRAM          12630   /run/systemd/journal/socket
unix    3      [ ]     DGRAM          12613
unix    3      [ ]     STREAM  CONNECTED  26428
unix    3      [ ]     STREAM  CONNECTED  24827   /run/systemd/journal/stdout
unix    2      [ ]     DGRAM          29861
unix    3      [ ]     STREAM  CONNECTED  26354
unix    3      [ ]     STREAM  CONNECTED  26086
unix    3      [ ]     STREAM  CONNECTED  25591   /run/systemd/journal/stdout
unix    3      [ ]     STREAM  CONNECTED  25737   /run/systemd/journal/stdout
unix    3      [ ]     STREAM  CONNECTED  25031   /run/user/1000/bus

```

Q2. Identify and perform 5 more network commands and it's working.

i. ARP

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

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

Interface: 192.168.7.169 --- 0x9
  Internet Address        Physical Address      Type
  192.168.7.222          7e-8a-b3-a0-ab-c0    dynamic
  192.168.7.255          ff-ff-ff-ff-ff-ff    static
  224.0.0.22              01-00-5e-00-00-16    static
  224.0.0.251             01-00-5e-00-00-fb    static
  224.0.0.252             01-00-5e-00-00-fc    static
  239.255.255.250         01-00-5e-7f-ff-fa    static
  255.255.255.255         ff-ff-ff-ff-ff-ff    static

Interface: 192.168.56.1 --- 0xb
  Internet Address        Physical Address      Type
  192.168.56.255          ff-ff-ff-ff-ff-ff    static
  224.0.0.22              01-00-5e-00-00-16    static
  224.0.0.251             01-00-5e-00-00-fb    static
  224.0.0.252             01-00-5e-00-00-fc    static
  239.255.255.250         01-00-5e-7f-ff-fa    static

C:\Users\jobin>
```

ii. NbtStat

As I am sure you probably know, computers that are running a Windows operating system are assigned a computer name. Oftentimes, there is a domain name or a workgroup name that is also assigned to the computer. The computer name is sometimes referred to as the NetBIOS name. Windows uses several

different methods to map NetBIOS names to IP addresses, such as broadcast, LMHost lookup, or even using the nearly extinct method of querying a WINS server. Of course, NetBIOS over TCP/IP can occasionally break down. The NbtStat command can help you to diagnose and correct such problems. The NbtStat -n command for example, shows the NetBIOS names that are in use by a device. The NbtStat -r command shows how many NetBIOS names the device has been able to resolve recently.

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

NetBIOS Names Resolution and Registration Statistics
-----
Resolved By Broadcast      = 0
Resolved By Name Server    = 0

Registered By Broadcast   = 381
Registered By Name Server = 0
```

iii. Hostname

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

```
C:\Users\jobin>hostname
LAPTOP-BJ9LR7NA

C:\Users\jobin>
```

iv. PathPing

Earlier, I talked about the Ping utility and the Tracert utility, and the similarities between them. As you might have guessed, the PathPing tool is a utility that combines the best aspects of Tracert and Ping. Entering the PathPing command followed by a host name initiates what looks like a somewhat standard Tracert process. Once this process completes however, the tool takes 300 seconds (five minutes) to gather statistics, and then reports latency and packet loss statistics that are more detailed than those provided by Ping or Tracert.

```
C:\Users\jobin>pathping www.google.com

Tracing route to www3.l.google.com [2404:6800:4007:809::200e]
over a maximum of 30 hops:
  0  LAPTOP-BJ9LR7NA [2409:4073:9a:8361:d45c:847c:e902:bb0b]
  1  2409:4073:9a:8361::4e
  2  *          *          *
Computing statistics for 25 seconds...
```

v. getmac

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

```
C:\Users\jobin>getmac

Physical Address      Transport Name
=====
B0-68-E6-73-B9-7F    \Device\Tcpip_{66811F6C-F708-4EAE-BB08-40E7DF5FD97A}
F8-B4-6A-B8-18-F5    Media disconnected
0A-00-27-00-00-0B    \Device\Tcpip_{71C91B62-5FDD-4808-AF2B-599379F933E2}
```

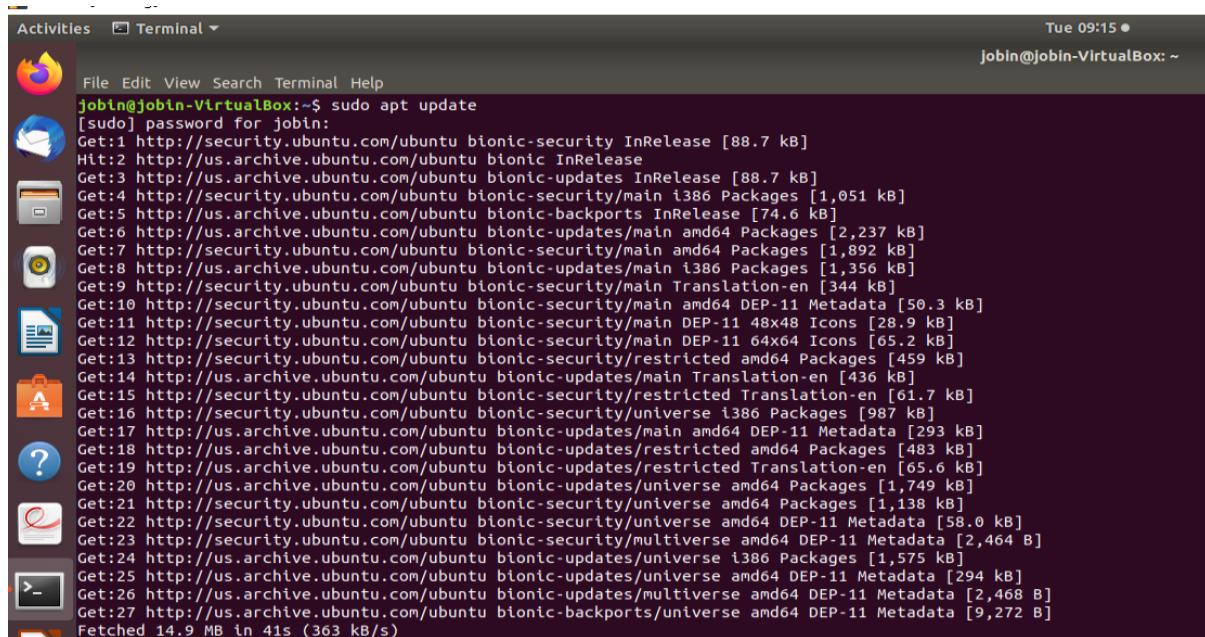
Experiment 7

Question

1. Take the screenshots of LAMP installation and outputs, Submit as a document

Install Apache

- Update your system
 - sudo apt update

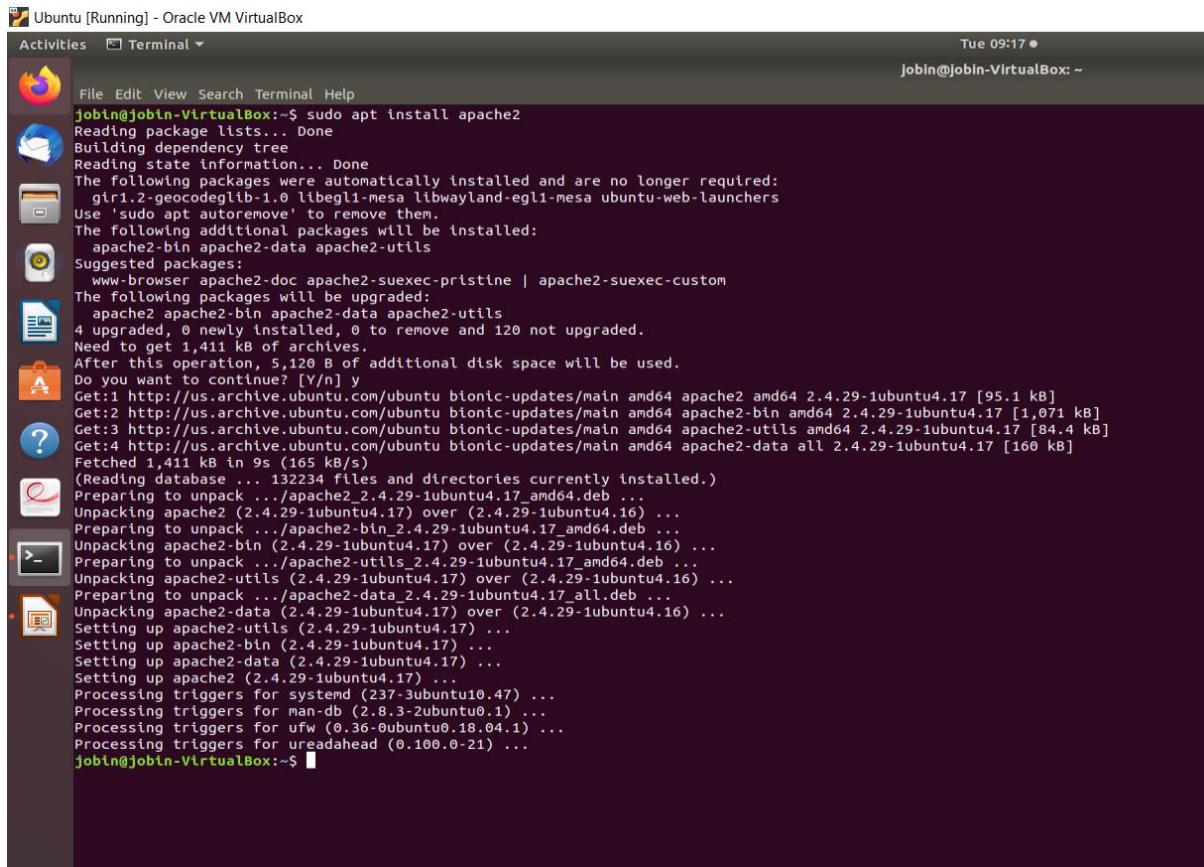


A screenshot of a Ubuntu desktop environment. In the top right corner, the date and time are shown as "Tue 09:15". Below it, the user name "jobin@Jobin-VirtualBox" and the command prompt are displayed. The main window is a terminal window titled "Terminal". The terminal shows the command "sudo apt update" being run, followed by a list of package download details. The terminal window has a dark background with light-colored text. The desktop interface includes a dock with various icons like Dash, Home, and Applications, and a panel at the top with the title bar "Activities Terminal".

```
File Edit View Search Terminal Help
jobin@Jobin-VirtualBox:~$ sudo apt update
[sudo] password for jobin:
Get:1 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Hit:2 http://us.archive.ubuntu.com/ubuntu bionic InRelease
Get:3 http://us.archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:4 http://security.ubuntu.com/ubuntu bionic-security/main i386 Packages [1,051 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [2,237 kB]
Get:7 http://security.ubuntu.com/ubuntu bionic-security/main amd64 Packages [1,892 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu bionic-updates/main i386 Packages [1,356 kB]
Get:9 http://security.ubuntu.com/ubuntu bionic-security/main Translation-en [344 kB]
Get:10 http://security.ubuntu.com/ubuntu bionic-security/main amd64 DEP-11 Metadata [50.3 kB]
Get:11 http://security.ubuntu.com/ubuntu bionic-security/main DEP-11 48x48 Icons [28.9 kB]
Get:12 http://security.ubuntu.com/ubuntu bionic-security/main DEP-11 64x64 Icons [65.2 kB]
Get:13 http://security.ubuntu.com/ubuntu bionic-security/restricted amd64 Packages [459 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [436 kB]
Get:15 http://security.ubuntu.com/ubuntu bionic-security/restricted Translation-en [61.7 kB]
Get:16 http://security.ubuntu.com/ubuntu bionic-security/universe i386 Packages [987 kB]
Get:17 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 DEP-11 Metadata [293 kB]
Get:18 http://us.archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [483 kB]
Get:19 http://us.archive.ubuntu.com/ubuntu bionic-updates/restricted Translation-en [65.6 kB]
Get:20 http://us.archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1,749 kB]
Get:21 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [1,138 kB]
Get:22 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 DEP-11 Metadata [58.0 kB]
Get:23 http://security.ubuntu.com/ubuntu bionic-security/multiverse amd64 DEP-11 Metadata [2,464 B]
Get:24 http://us.archive.ubuntu.com/ubuntu bionic-updates/universe i386 Packages [1,575 kB]
Get:25 http://us.archive.ubuntu.com/ubuntu bionic-updates/universe amd64 DEP-11 Metadata [294 kB]
Get:26 http://us.archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 DEP-11 Metadata [2,468 B]
Get:27 http://us.archive.ubuntu.com/ubuntu bionic-backports/universe amd64 DEP-11 Metadata [9,272 B]
Fetched 14.9 MB in 41s (363 kB/s)
```

- **Install Apache using apt:**

- `sudo apt install apache2`



```
Ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal ▾
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ sudo apt install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gir1.2-geocodexlib-1.0 libegl1-mesa libwayland-egl1-mesa ubuntu-web-launchers
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils
Suggested packages:
  www-browser apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following packages will be upgraded:
  apache2 apache2-bin apache2-data apache2-utils
4 upgraded, 0 newly installed, 0 to remove and 120 not upgraded.
Need to get 1,411 kB of archives.
After this operation, 5,120 B of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 apache2 amd64 2.4.29-1ubuntu4.17 [95.1 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 apache2-bin amd64 2.4.29-1ubuntu4.17 [1,071 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 apache2-utils amd64 2.4.29-1ubuntu4.17 [84.4 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 apache2-data all 2.4.29-1ubuntu4.17 [160 kB]
Fetched 1,411 kB in 9s (165 kB/s)
(Reading database ... 132234 files and directories currently installed.)
Preparing to unpack .../apache2_2.4.29-1ubuntu4.17_amd64.deb ...
Unpacking apache2 (2.4.29-1ubuntu4.17) over (2.4.29-1ubuntu4.16) ...
Preparing to unpack .../apache2-bin_2.4.29-1ubuntu4.17_amd64.deb ...
Unpacking apache2-bin (2.4.29-1ubuntu4.17) over (2.4.29-1ubuntu4.16) ...
Preparing to unpack .../apache2-utils_2.4.29-1ubuntu4.17_amd64.deb ...
Unpacking apache2-utils (2.4.29-1ubuntu4.17) over (2.4.29-1ubuntu4.16) ...
Preparing to unpack .../apache2-data_2.4.29-1ubuntu4.17_all.deb ...
Unpacking apache2-data (2.4.29-1ubuntu4.17) over (2.4.29-1ubuntu4.16) ...
Setting up apache2-utils (2.4.29-1ubuntu4.17) ...
Setting up apache2-bin (2.4.29-1ubuntu4.17) ...
Setting up apache2-data (2.4.29-1ubuntu4.17) ...
Setting up apache2 (2.4.29-1ubuntu4.17) ...
Processing triggers for systemd (237-3ubuntu10.47) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for ufw (0.36-0ubuntu0.18.04.1) ...
Processing triggers for ureadahead (0.100.0-21) ...
jobin@jobin-VirtualBox:~$
```

Confirm that Apache is now running with the following command

- `sudo systemctl status apache2`

```

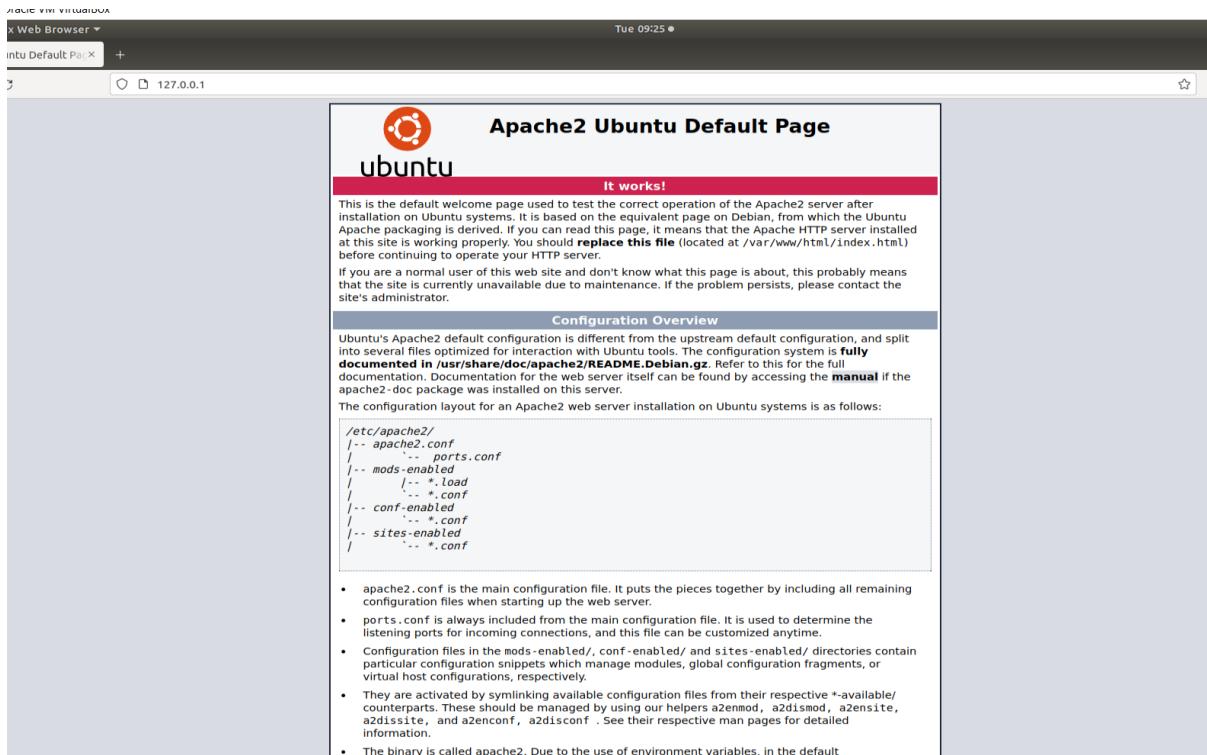
Ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal Tue 09:21 ●
jobin@jobin-VirtualBox: ~
File Edit View Search Terminal Help
apache2.service - The Apache HTTP Server
  Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
  Drop-In: /lib/systemd/system/apache2.service.d
            └─apache2-systemd.conf
    Active: active (running) since Tue 2021-09-28 09:17:29 EDT; 3min 48s ago
      Main PID: 2753 (apache2)
        Tasks: 6 (limit: 4915)
       CGroup: /system.slice/apache2.service
               ├─2753 /usr/sbin/apache2 -k start
               ├─2756 /usr/sbin/apache2 -k start
               ├─2757 /usr/sbin/apache2 -k start
               ├─2758 /usr/sbin/apache2 -k start
               ├─2759 /usr/sbin/apache2 -k start
               └─2760 /usr/sbin/apache2 -k start

Sep 28 09:17:29 jobin-VirtualBox systemd[1]: Starting The Apache HTTP Server...
Sep 28 09:17:29 jobin-VirtualBox apache2[2749]: AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 127.0.0.1 for port 80
Sep 28 09:17:29 jobin-VirtualBox systemd[1]: Started The Apache HTTP Server.

[1]+  Stopped                  sudo systemctl status apache2
jobin@jobin-VirtualBox:~$
```

- Once installed, test by accessing your server's IP in your browser:

<http://127.0.0.1>

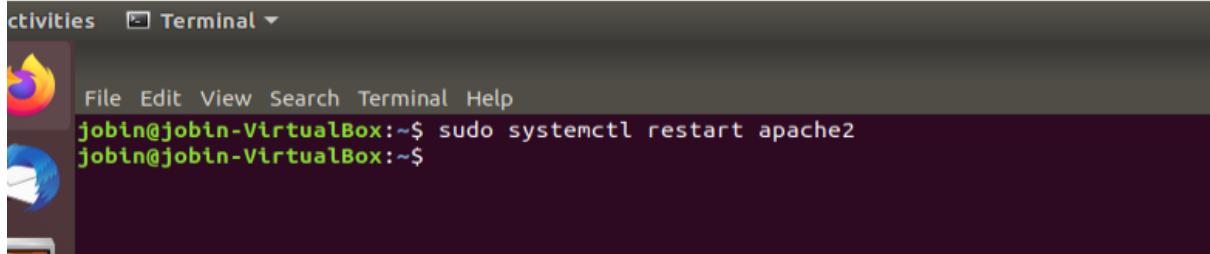


Install PHP and commonly used modules

- sudo apt install php libapache2-mod-php php-opcache php-cli php-gd php-curl php-mysql

- **Restart apache2**

- sudo systemctl restart apache2



```
Activities Terminal
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ sudo systemctl restart apache2
jobin@jobin-VirtualBox:~$
```

- **Now you can check php installation**

- sudo echo "<?php phpinfo(); ?>" | sudo tee -a /var/www/html/phpinfo.php /dev/null

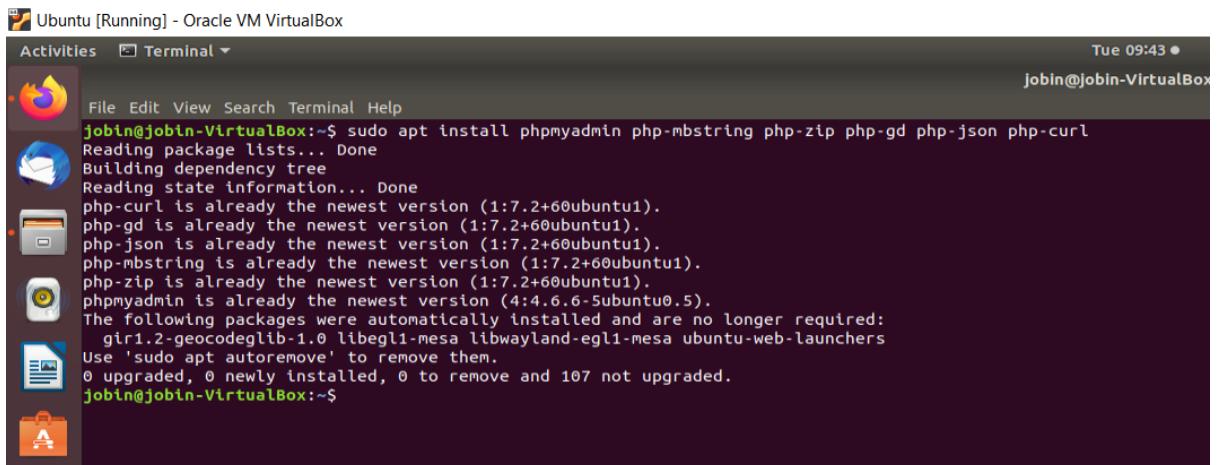
- **Open a browser**

<http://127.0.0.1/phpinfo.php>



Install phpMyAdmin

- sudo apt install phpmyadmin php-mbstring php-zip php-gd php-json php-curl
 - (It ask for webserver select apache2, select db configuration and set password)



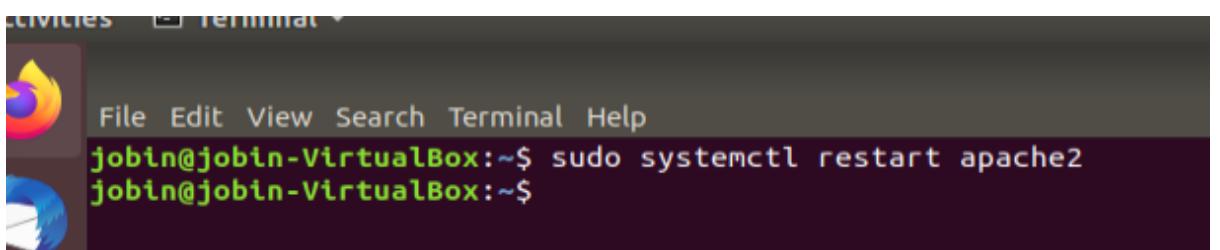
Ubuntu [Running] - Oracle VM VirtualBox

Activities Terminal Tue 09:43 • jobin@jobin-VirtualBox

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ sudo apt install phpmyadmin php-mbstring php-zip php-gd php-json php-curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
php-curl is already the newest version (1:7.2+60ubuntu1).
php-gd is already the newest version (1:7.2+60ubuntu1).
php-json is already the newest version (1:7.2+60ubuntu1).
php-mbstring is already the newest version (1:7.2+60ubuntu1).
php-zip is already the newest version (1:7.2+60ubuntu1).
phpmyadmin is already the newest version (4:4.6.6-5ubuntu0.5).
The following packages were automatically installed and are no longer required:
  gir1.2-geocodeglib-1.0 libegl1-mesa libwayland-egl1-mesa ubuntu-web-launchers
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 107 not upgraded.
jobin@jobin-VirtualBox:~$
```

- **Restart apache2**

```
sudo systemctl restart apache2
```



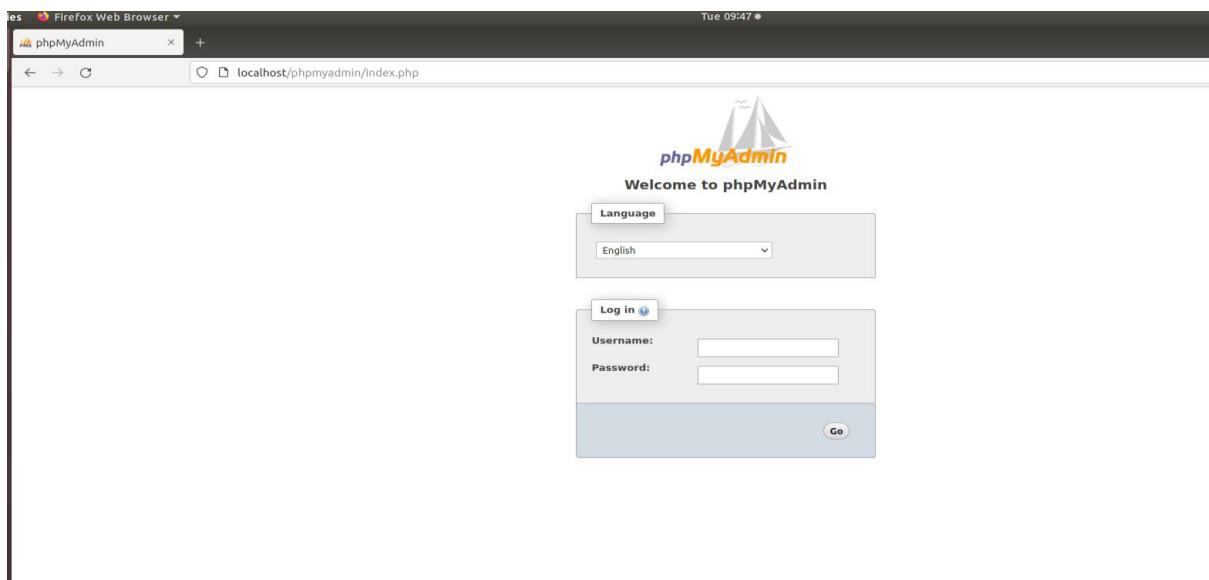
File Edit View Search Terminal Help

```
jobin@jobin-VirtualBox:~$ sudo systemctl restart apache2
jobin@jobin-VirtualBox:~$
```

- **Check phpmyadmin**

Open a browser

- <http://localhost/phpmyadmin>



Experiment 8

Question

1. Explain the steps for the installation of ansible with your own screenshots.

Sudo apt install ansible.

```
Jobin@Jobin-VirtualBox:~$ sudo apt install ansible
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gir1.2-geocodeglib-1.0 libegl1-mesa libwayland-egl1-mesa ubuntu-web-launchers
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  ieee-data libpython-stdlib python python-asn1crypto python-certifi python-cffi-backend python-chardet python-crypto python-cryptography python-jinja2 python-jmespath python-kerberos python-libcloud python-lockfile python-markupsafe python-minimal python-netaddr python-openssl python-requests python-selinux python-simplejson python-six python-urllib3 python-xmldict python-yaml python2.7 python2.7-minimal
Suggested packages:
  cowsay sshpass python-doc python-tk python-crypto-doc python-cryptography-doc python-cryptography-vectors python-enum34-doc python-jinja2-doc python-openssl-doc python-openssl-dbg python-gssapi python-setuptools python-socks python-ntlm python2.7-doc blnfmt-support
Recommended packages:
  python-wiimr
The following NEW packages will be installed:
  ansible ieee-data libpython-stdlib python python-asn1crypto python-certifi python-cffi-backend python-chardet python-crypto python-cryptography python-ipaddress python-jinja2 python-jmespath python-kerberos python-libcloud python-lockfile python-markupsafe python-minimal python-netaddr python-pyasn1 python-requests python-selinux python-simplejson python-six python-urllib3 python-xmldict python-yaml python2.7 python2.7-minimal
0 upgraded, 35 newly installed, 0 to remove and 107 not upgraded.
Need to get 9,874 kB of archives.
After this operation, 67.9 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python2.7-minimal amd64 2.7.17-1~18.04ubuntu1.6 [1,291 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-minimal amd64 2.7.15-rc1-1 [28.1 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python2.7 amd64 2.7.17-1~18.04ubuntu1.6 [248 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libpython-stdlib amd64 2.7.15-rc1-1 [7,620 B]
Get:5 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python amd64 2.7.15-rc1-1 [140 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-asn1crypto all 0.24.0-1 [72.7 kB]
Get:7 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-cffi-backend amd64 1.11.5-1 [63.4 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-enum34 all 1.1.6-2 [34.8 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-idna all 2.6-1 [32.4 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-ipaddress all 1.0.17-1 [18.2 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-six all 1.11.0-2 [11.3 kB]
Get:12 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python-cryptography amd64 2.1.4-1ubuntu1.4 [276 kB]
Get:13 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-markupsafe amd64 1.0-1build1 [13.0 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python-jinja2 all 2.10-1ubuntu0.18.04.1 [94.8 kB]
Get:15 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-pyasn1 all 0.4.2-3 [46.7 kB]
Get:16 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python-paramiko all 2.0.0-1ubuntu1.2 [110 kB]
Get:17 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-pkg-resources all 39.0.1-2 [128 kB]
Get:18 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 python-yaml amd64 3.12-1build2 [115 kB]
```

```
Selecting previously unselected package python-simplejson.
Preparing to unpack .../26-python-simplejson_3.13.2-1_amd64.deb ...
Unpacking python-simplejson (3.13.2-1) ...
Selecting previously unselected package python-libcloud.
Preparing to unpack .../27-python-libcloud_2.2.1-1_all.deb ...
Unpacking python-libcloud (2.2.1-1) ...
Selecting previously unselected package python-openssl.
Preparing to unpack .../28-python-openssl_17.5.0-1ubuntu1_all.deb ...
Unpacking python-openssl (17.5.0-1ubuntu1) ...
Selecting previously unselected package python-selinux.
Preparing to unpack .../29-python-selinux_2.7-2build2_amd64.deb ...
Unpacking python-selinux (2.7-2build2) ...
Selecting previously unselected package python-xmldict.
Preparing to unpack .../30-python-xmldict_0.11.0-1_all.deb ...
Unpacking python-xmldict (0.11.0-1) ...
Setting up ieee-data (20180204.1) ...
Setting up python2.7 (2.7.17-1~18.04ubuntu1.6) ...
Setting up libpython-stdlib:amd64 (2.7.15~rc1-1) ...
Setting up python (2.7.15~rc1-1) ...
Setting up python-idna (2.6-1) ...
Setting up python-simplejson (3.13.2-1) ...
Setting up python-yaml (3.12-1build2) ...
Setting up python-asnincrypto (0.24.0-1) ...
Setting up python-crypto (2.6.1-8ubuntu2) ...
Setting up python-pyasn1 (0.4.2-3) ...
Setting up python-netaddr (0.7.19-1) ...
Setting up python-xmldict (0.11.0-1) ...
Setting up python-jmespath (0.9.3-1ubuntu1) ...
Setting up python-certifi (2018.1.18-2) ...
Setting up python-kerberos (1.1.14-1) ...
Setting up python-pkg-resources (39.0.1-2) ...
Setting up python-markupsafe (1.0-1build1) ...
Setting up python-httplib2 (0.9.2+dfsg-1ubuntu0.3) ...
Setting up python-cffi-backend (1.11.5-1) ...
Setting up python-six (1.11.0-2) ...
Setting up python-selinux (2.7-2build2) ...
Setting up python-enum34 (1.1.6-2) ...
Setting up python-lockfile (1:0.12.2-2) ...
Setting up python-ipaddress (1.0.17-1) ...
Setting up python-urllib3 (1.22-1ubuntu0.18.04.2) ...
Setting up python-chardet (3.0.4-1) ...
Setting up python-jinja2 (2.10-1ubuntu0.18.04.1) ...
Setting up python-cryptography (2.1.4-1ubuntu1.4) ...
Setting up python-requests (2.18.4-2ubuntu0.1) ...
Setting up python-openssl (17.5.0-1ubuntu1) ...
Setting up python-paramiko (2.0.0-1ubuntu1.2) ...
Setting up ansible (2.5.1+dfsg-1ubuntu0.1) ...
Setting up python-libcloud (2.2.1-1) ...
Processing triggers for gnome-menus (3.13.3-11ubuntu1.1) ...
Processing triggers for mime-support (3.60ubuntu1) ...
Processing triggers for desktop-file-utils (0.23-1ubuntu3.18.04.2) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
jobin@jobin-VirtualBox:~$
```

Ansible --version

```
jobin@jobin-VirtualBox:~$ ansible --version
ansible 2.5.1
  config file = /etc/ansible/ansible.cfg
  configured module search path = [u'/home/jobin/.ansible/plugins/modules', u'/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python2.7/dist-packages/ansible
  executable location = /usr/bin/ansible
  python version = 2.7.17 (default, Feb 27 2021, 15:10:58) [GCC 7.5.0]
jobin@jobin-VirtualBox:~$
```

Experiment 9

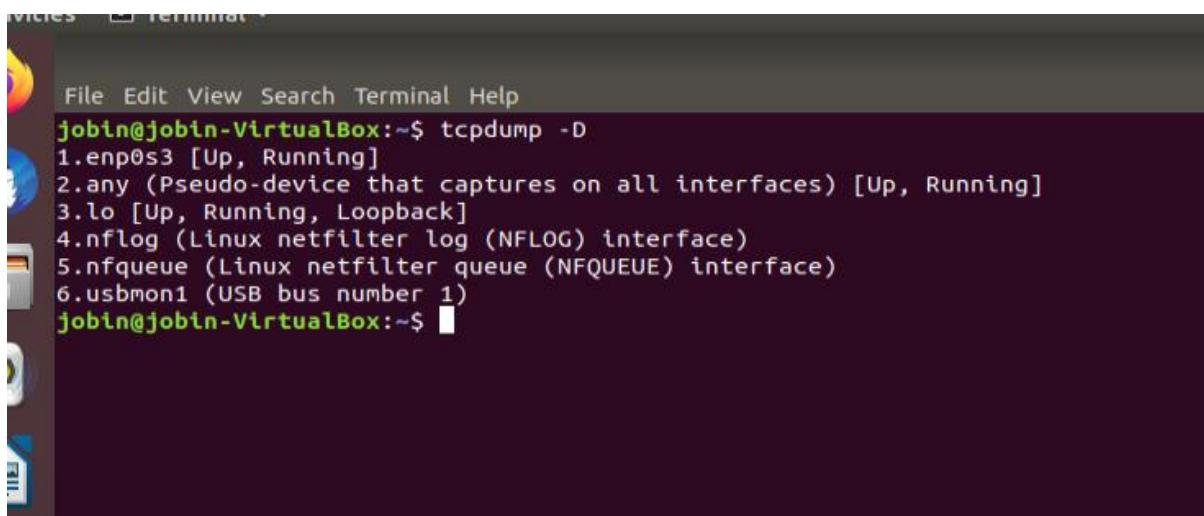
Questions

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

tcpdump is a most powerful and widely used command-line packets sniffer or package analyzer tool which is used to capture or filter TCP/IP packets that are received or transferred over a network on a specific interface.

1.**tcpdump -D** :

Print all available interfaces for capture



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ tcpdump -D
1.enp0s3 [Up, Running]
2.any (Pseudo-device that captures on all interfaces) [Up, Running]
3.lo [Up, Running, Loopback]
4.nflog (Linux netfilter log (NFLOG) interface)
5.nfqueue (Linux netfilter queue (NFQUEUE) interface)
6.usbmon1 (USB bus number 1)
jobin@jobin-VirtualBox:~$ █
```

A screenshot of a terminal window titled "Terminal". The window shows a command-line interface with a dark background and light-colored text. The user has run the command "tcpdump -D", which lists various network interfaces. The output includes "enp0s3" (Up, Running), "any" (Up, Running), "lo" (Up, Running, Loopback), "nflog" (Linux netfilter log (NFLOG) interface), "nfqueue" (Linux netfilter queue (NFQUEUE) interface), and "usbmon1" (USB bus number 1). The prompt "jobin@jobin-VirtualBox:~\$" is visible at the end of the output.

2.tcpdump -XX -i eth0 :

The following command with option -XX capture the data of each packet, including its link level header in HEX and ASCII format.

```
jobin@jobin-VirtualBox:~$ sudo tcpdump -xx -i enp0s3
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
09:31:27.691750 IP jobin-VirtualBox.41815 > 192.168.7.222.domain: 36536+ [1au] A? connectivity-check.ubuntu.com. (58)
    0x0000: 5254 0012 3502 0800 274e 7fba 0800 4500
    0x0010: 0056 ea10 4000 4011 7bf1 0a00 020f c0a8
    0x0020: 07de a357 0035 0042 d4e8 8eb8 0100 0001
    0x0030: 0000 0000 0001 1263 6f6e 6e65 6374 6976
    0x0040: 6974 792d 6368 6563 6b06 7562 756e 7475
    0x0050: 0363 6f6d 0000 0100 0100 0029 0200 0000
    0x0060: 0000 0000
09:31:27.691914 IP jobin-VirtualBox.51515 > 192.168.7.222.domain: 38793+ [1au] AAAA? connectivity-check.ubuntu.com. (58)
    0x0000: 5254 0012 3502 0800 274e 7fba 0800 4500
    0x0010: 0056 ea11 4000 4011 7bf0 0a00 020f c0a8
    0x0020: 07de c93b 0035 0042 d4e8 9789 0100 0001
    0x0030: 0000 0000 0001 1263 6f6e de65 6374 6976
    0x0040: 6974 792d 6368 6563 6b06 7562 756e 7475
    0x0050: 0363 6f6d 0000 1c00 0100 0029 0200 0000
    0x0060: 0000 0000
09:31:27.697551 IP 192.168.7.222.domain > jobin-VirtualBox.51515: 38793 0/0/0 (47)
    0x0000: 0800 274e 7fba 5254 0012 3502 0800 4500
    0x0010: 0056 ea12 4000 4011 7bef 0a00 020f c0a8
    0x0020: 07de c93b 0035 0042 d4e8 40c8 0100 0001
    0x0030: 0000 0000 0001 1263 6f6e 6e65 6374 6976
    0x0040: 6974 792d 6368 6563 6b06 7562 756e 7475
    0x0050: 0363 6f6d 0000 1c00 0100 0029 0200 0000
    0x0060: 0000 0000
09:31:27.697657 IP jobin-VirtualBox.51515 > 192.168.7.222.domain: 16584+ [1au] AAAA? connectivity-check.ubuntu.com. (58)
    0x0000: 5254 0012 3502 0800 274e 7fba 0800 4500
    0x0010: 0056 ea12 4000 4011 7bef c0a8 07de 0a00
    0x0020: 020f 0035 c93b 0037 85c2 9789 8180 0001
    0x0030: 0000 0000 0001 1263 6f6e 6e65 6374 6976
    0x0040: 6974 792d 6368 6563 6b06 7562 756e 7475
    0x0050: 0363 6f6d 0000 1c00 0100 0029 0200 0000
    0x0060: 0000 0000
09:31:27.699086 IP 192.168.7.222.domain > jobin-VirtualBox.51515: 16584 0/0/0 (47)
    0x0000: 0800 274e 7fba 5254 0012 3502 0800 4500
    0x0010: 004b 0790 0000 4011 9e7d c0a8 07de 0a00
    0x0020: 020f 0035 c93b 0037 dc83 40c8 8180 0001
    0x0030: 0000 0000 0001 1263 6f6e 6e65 6374 6976
    0x0040: 6974 792d 6368 6563 6b06 7562 756e 7475
    0x0050: 0363 6f6d 0000 1c00 0100 0029 0200 0000
    0x0060: 0000 0000
09:31:27.699228 IP jobin-VirtualBox.51515 > 192.168.7.222.domain: 49352+ [1au] AAAA? connectivity-check.ubuntu.com. (58)
    0x0000: 5254 0012 3502 0800 274e 7fba 0800 4500
    0x0010: 0056 ea13 4000 4011 7bee 0a00 020f c0a8
    0x0020: 07de c93b 0035 0042 d4e8 c0c8 0100 0001
    0x0030: 0000 0000 0001 1263 6f6e 6e65 6374 6976
    0x0040: 6974 792d 6368 6563 6b06 7562 756e 7475
    0x0050: 0363 6f6d 0000 1c00 0100 0029 0200 0000
    0x0060: 0000 0000
09:31:27.701143 IP 192.168.7.222.domain > jobin-VirtualBox.51515: 49352 0/0/0 (47)
    0x0000: 0800 274e 7fba 5254 0012 3502 0800 4500
    0x0010: 004b 0791 0000 4011 9e7c c0a8 07de 0a00
    0x0020: 020f 0035 c93b 0037 5c83 c0c8 8180 0001
    0x0030: 0000 0000 0001 1263 6f6e 6e65 6374 6976
```

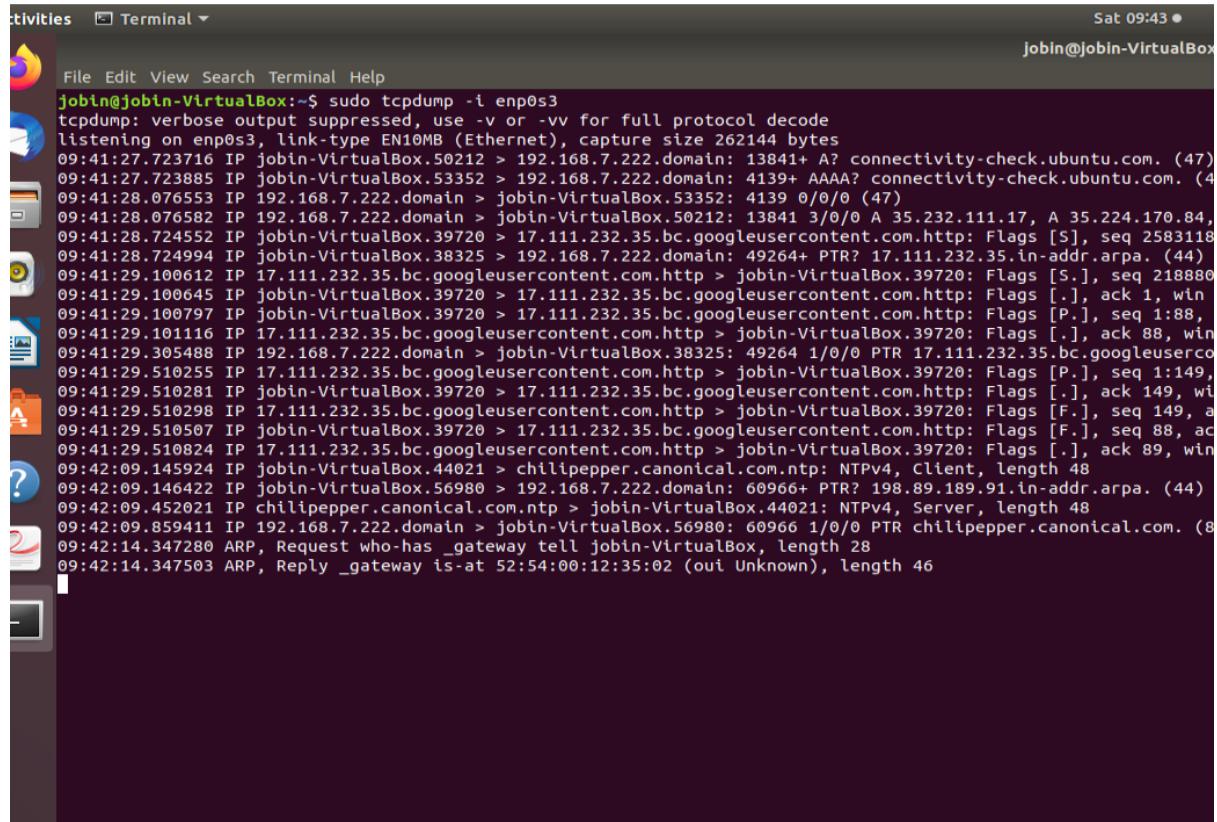
3.tcpdump -n -i enp0s3 :

To capture packets for a specific interface, run the following command with option -n

```
jobin@jobin-VirtualBox:~$ sudo tcpdump -n -i enp0s3
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
09:36:27.772710 IP 10.0.2.15.35591 > 192.168.7.222.53: 36803+ AAAA? connectivity-check.ubuntu.com. (47)
09:36:27.786471 IP 192.168.7.222.53 > 10.0.2.15.35591: 36803 0/0/0 (47)
09:36:29.355333 IP 10.0.2.15.35718 > 10.0.2.15.39718: Flags [S], seq 1761886664, win 64240, options [mss 1460,sackOK,TS val 1487606235 ecr 0,nop,wscale 7], length 0
09:36:29.354800 IP 10.0.2.15.39718 > 10.0.2.15.35718: Flags [S.], seq 1761886665, win 65535, options [mss 1460], length 0
09:36:29.354825 IP 10.0.2.15.39718 > 35.232.111.17.80: Flags [S.], ack 1, win 64240, length 0
09:36:29.355082 IP 10.0.2.15.39718 > 35.232.111.17.80: Flags [P.], ack 1, win 64240, length 87: HTTP: GET / HTTP/1.1
09:36:29.355311 IP 35.232.111.17.80 > 10.0.2.15.39718: Flags [.], ack 88, win 65535, length 0
09:36:29.3838121 IP 35.232.111.17.80 > 10.0.2.15.39718: Flags [.], seq 1:149, ack 88, win 65535, length 148: HTTP: HTTP/1.1 204 No Content
09:36:29.3838142 IP 10.0.2.15.39718 > 35.232.111.17.80: Flags [.], ack 149, win 64092, length 0
09:36:29.3838157 IP 35.232.111.17.80 > 10.0.2.15.39718: Flags [.], seq 149, ack 88, win 65535, length 0
09:36:29.3838894 IP 10.0.2.15.39718 > 35.232.111.17.80: Flags [.], seq 88, ack 150, win 64091, length 0
09:36:29.389114 IP 35.232.111.17.80 > 10.0.2.15.39718: Flags [.], ack 89, win 65535, length 0
09:36:30.686251 IP 10.0.2.15.53859 > 192.168.7.222.53: 62653+ A? daisy.ubuntu.com. (34)
09:36:30.686422 IP 10.0.2.15.59691 > 192.168.7.222.53: 57809+ AAAA? daisy.ubuntu.com. (34)
09:36:30.693599 IP 192.168.7.222.53 > 10.0.2.15.59691: 57809 0/0/0 (34)
09:36:30.890070 IP 192.168.7.222.53 > 10.0.2.15.53859: 62653 2/0/0 A 162.213.33.108, A 162.213.33.132 (66)
```

4.tcpdump -i ens0p :

The command screen will scroll up until you interrupt and when we execute the tcpdump command it will captures from all the interfaces, however with -i switch only capture from the desired interface.



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ sudo tcpdump -i ens0p
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on ens0p, link-type EN10MB (Ethernet), capture size 262144 bytes
09:41:27.723716 IP jobin-VirtualBox.50212 > 192.168.7.222.domain: 13841+ A? connectivity-check.ubuntu.com. (47)
09:41:27.723885 IP jobin-VirtualBox.53352 > 192.168.7.222.domain: 4139+ AAAA? connectivity-check.ubuntu.com. (44)
09:41:28.076553 IP 192.168.7.222.domain > jobin-VirtualBox.53352: 4139 0/0/0 (47)
09:41:28.076582 IP 192.168.7.222.domain > jobin-VirtualBox.50212: 13841 3/0/0 A 35.232.111.17, A 35.224.170.84,
09:41:28.724552 IP jobin-VirtualBox.39720 > 17.111.232.35.bc.googleusercontent.com.http: Flags [S], seq 2583118
09:41:28.724994 IP jobin-VirtualBox.38325 > 192.168.7.222.domain: 49264+ PTR? 17.111.232.35.in-addr.arpa. (44)
09:41:29.100612 IP 17.111.232.35.bc.googleusercontent.com.http > jobin-VirtualBox.39720: Flags [S.], seq 218880
09:41:29.100645 IP jobin-VirtualBox.39720 > 17.111.232.35.bc.googleusercontent.com.http: Flags [.], ack 1, win 1
09:41:29.100797 IP jobin-VirtualBox.39720 > 17.111.232.35.bc.googleusercontent.com.http: Flags [P.], seq 1:88, ack 1
09:41:29.101116 IP 17.111.232.35.bc.googleusercontent.com.http > jobin-VirtualBox.39720: Flags [.], ack 88, win 1
09:41:29.305488 IP 192.168.7.222.domain > jobin-VirtualBox.38325: 49264 1/0/0 PTR 17.111.232.35.bc.googleusercontent.com.http > jobin-VirtualBox.39720: Flags [P.], seq 1:149, ack 1
09:41:29.510255 IP 17.111.232.35.bc.googleusercontent.com.http > jobin-VirtualBox.39720: Flags [.], ack 149, win 1
09:41:29.510281 IP jobin-VirtualBox.39720 > 17.111.232.35.bc.googleusercontent.com.http: Flags [.], ack 149, win 1
09:41:29.510298 IP 17.111.232.35.bc.googleusercontent.com.http > jobin-VirtualBox.39720: Flags [F.], seq 149, ack 149
09:41:29.510507 IP jobin-VirtualBox.39720 > 17.111.232.35.bc.googleusercontent.com.http: Flags [F.], seq 88, ack 88
09:41:29.510824 IP 17.111.232.35.bc.googleusercontent.com.http > jobin-VirtualBox.39720: Flags [.], ack 89, win 1
09:42:09.145924 IP jobin-VirtualBox.44021 > chilipepper.canonical.com.ntp: NTPV4, Client, length 48
09:42:09.146422 IP jobin-VirtualBox.56980 > 192.168.7.222.domain: 60966+ PTR? 198.89.189.91.in-addr.arpa. (44)
09:42:09.452021 IP chilipepper.canonical.com.ntp > jobin-VirtualBox.44021: NTPV4, Server, length 48
09:42:09.859411 IP 192.168.7.222.domain > jobin-VirtualBox.56980: 60966 1/0/0 PTR chilipepper.canonical.com. (8)
09:42:14.347280 ARP, Request who-has _gateway tell jobin-VirtualBox, length 28
09:42:14.347503 ARP, Reply _gateway is-at 52:54:00:12:35:02 (out Unknown), length 46
```

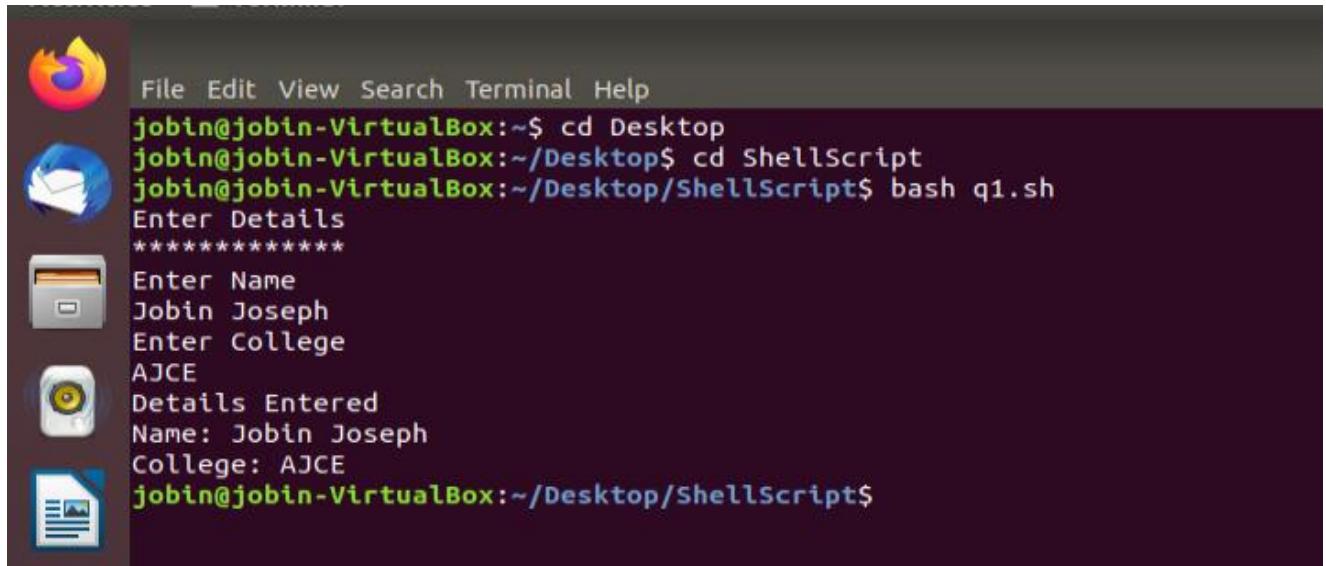
Experiment 10

Question

Shell Scripting Lab Assignments

1. Write a shell script to ask your name, and college name and print it on the screen.

```
#!/bin/bash
echo Enter Details
echo ****
echo Enter Name
read n
echo Enter College
read c
echo Details Entered
echo Name: $n
echo College: $c
```



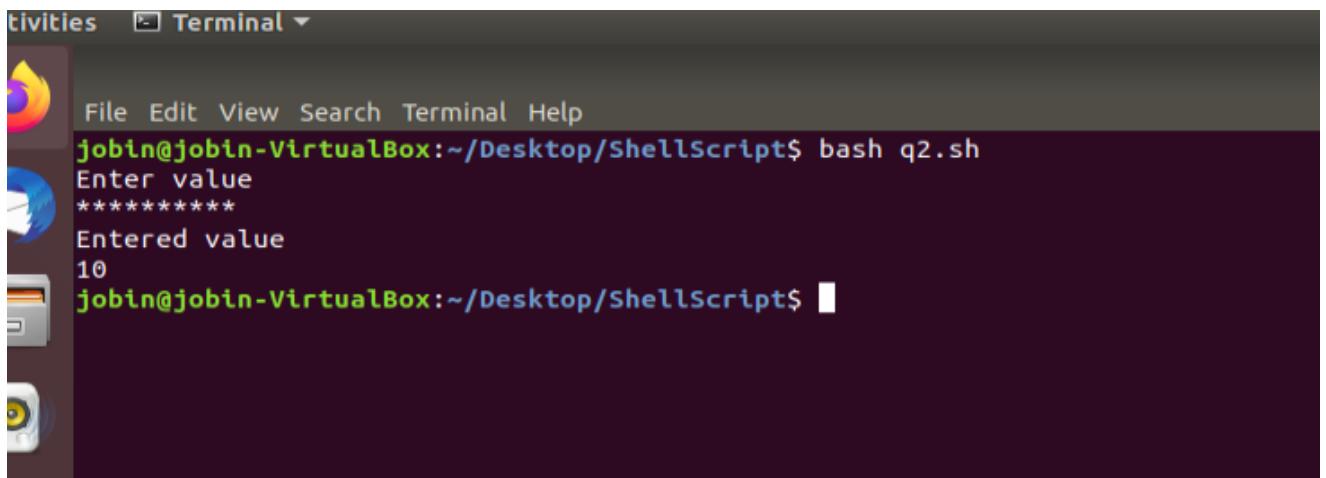
A screenshot of a Linux desktop environment with a dark theme. On the left, there is a dock with icons for a browser, file manager, terminal, and other applications. The terminal window is open and shows the following session:

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ cd Desktop
jobin@jobin-VirtualBox:~/Desktop$ cd ShellScript
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q1.sh
Enter Details
*****
Enter Name
Jobin Joseph
Enter College
AJCE
Details Entered
Name: Jobin Joseph
College: AJCE
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

2. Write a shell script to set a value for a variable and display it on command line interface.

```
#!/bin/bash
echo Enter value
echo ****
```

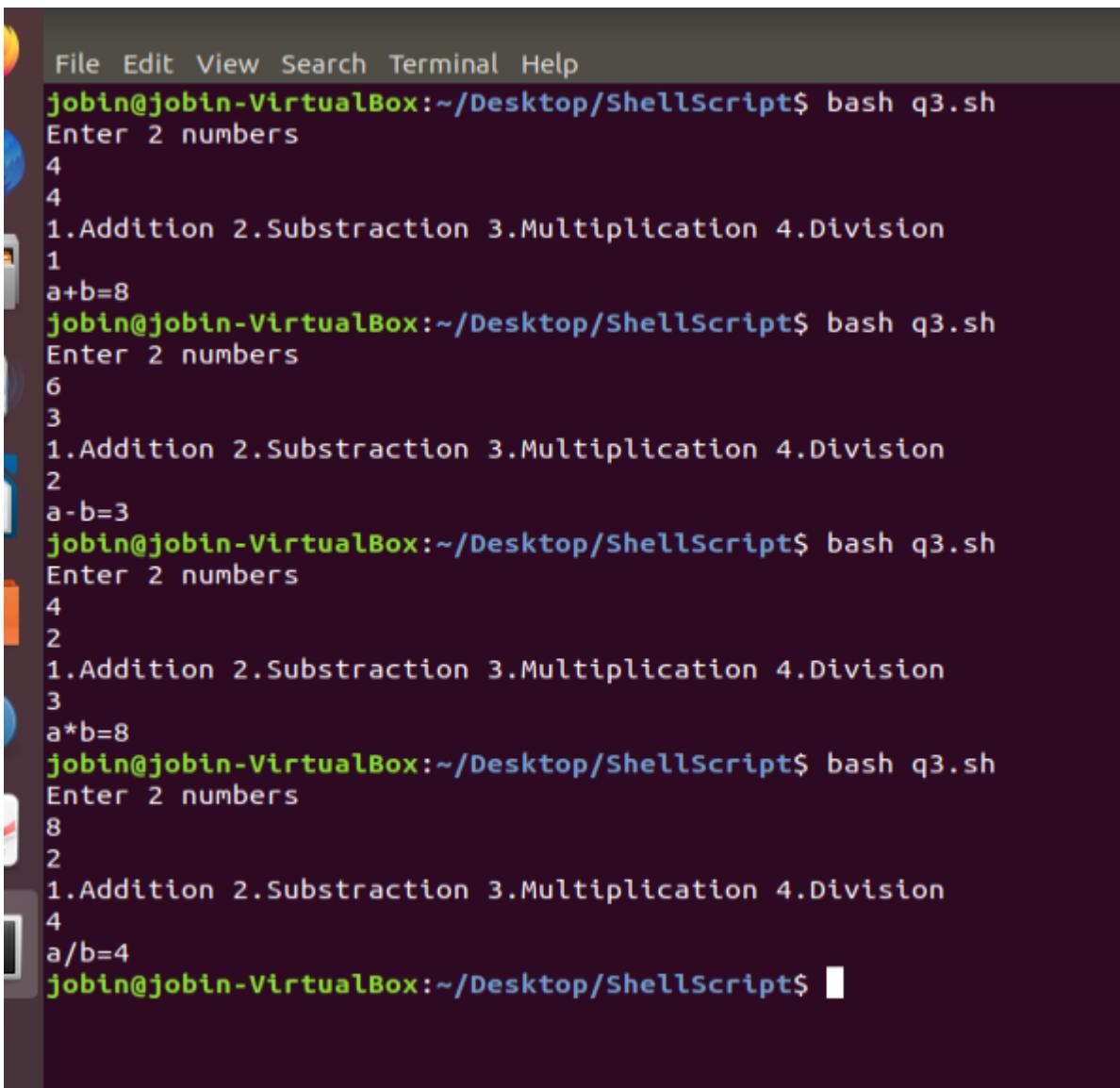
```
a=10  
echo Entered value  
echo $a
```



```
Activities Terminal ▾  
File Edit View Search Terminal Help  
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q2.sh  
Enter value  
*****  
Entered value  
10  
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

3. Write a shell script to perform addition, subtraction, multiplication, division with two numbers that is accepted from user.

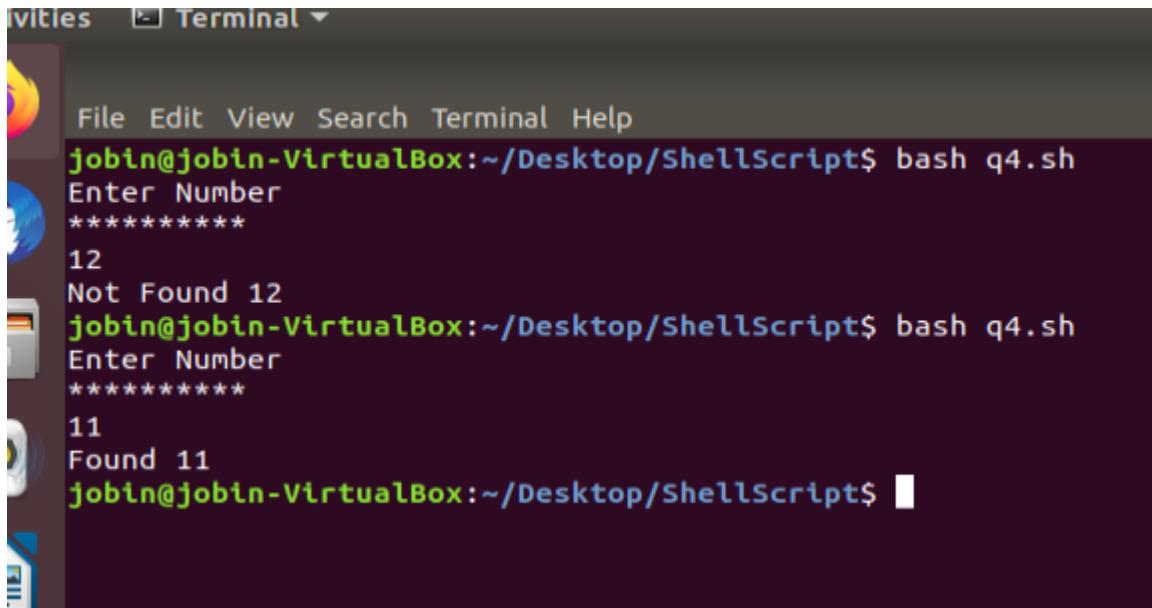
```
#!/bin/bash  
echo "Enter 2 numbers"  
read a  
read b  
echo "1.Addition 2.Subtraction 3.Multiplication 4.Division"  
read op  
case "$op" in  
"1") echo "a+b=\"$((a+b))\"";;  
"2") echo "a-b=\"$((a-b))\"";;  
"3") echo "a*b=\"$((a*b))\"";;  
"4") echo "a/b=\"$((a/b))\"";;  
esac
```



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q3.sh
Enter 2 numbers
4
4
1.Addition 2.Subtraction 3.Multiplication 4.Division
1
a+b=8
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q3.sh
Enter 2 numbers
6
3
1.Addition 2.Subtraction 3.Multiplication 4.Division
2
a-b=3
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q3.sh
Enter 2 numbers
4
2
1.Addition 2.Subtraction 3.Multiplication 4.Division
3
a*b=8
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q3.sh
Enter 2 numbers
8
2
1.Addition 2.Subtraction 3.Multiplication 4.Division
4
a/b=4
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

- 4. Write a shell script to check the value of a given number and display whether the number is found or not.**

```
#!/bin/bash
echo Enter Number
echo *****
read a
if [ $a == 11 ]; then
    echo Found $a
else
    echo Not Found $a
fi
```

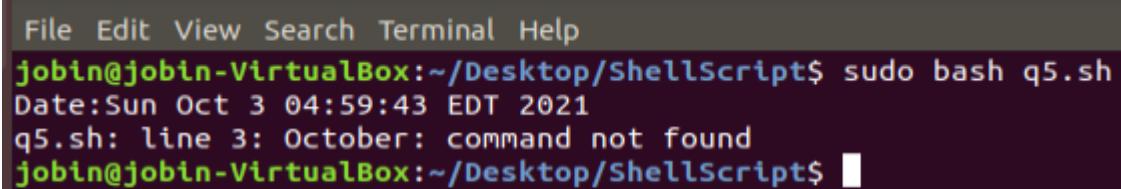


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window titled "Terminal". The terminal window has a dark background and contains the following text:

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q4.sh
Enter Number
*****
12
Not Found 12
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ bash q4.sh
Enter Number
*****
11
Found 11
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

5. Write a shell script to display current date, calendar.

```
#!/bin/bash
echo Date:$(date)
$(cal)
```



A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window has a dark background and contains the following text:

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q5.sh
Date:Sun Oct 3 04:59:43 EDT 2021
q5.sh: line 3: October: command not found
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

6. Write a shell script to check a number is even or odd.

```
#!/bin/bash
echo Enter No
echo *****
read n
x=$((n%2))
if [ $x -eq 0 ]; then
    echo Even
else
    echo Odd
fi
```

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q6.sh
Enter No
*****
5
Odd
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q6.sh
Enter No
*****
2
Even
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

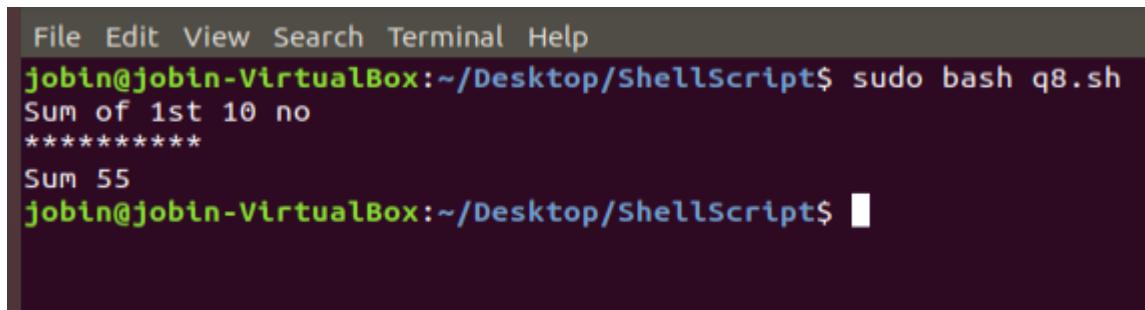
7. Write a shell script to check a number is greater than, less than or equal to another number.

```
#!/bin/bash
echo Enter Number
echo *****
read n1
read n2
if [ $n1 -gt $n2 ]; then
    echo $n1 is Greater
else
    echo $n2 is greater
fi
```

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q7.sh
Enter Number
*****
7
9
9 is greater
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q7.sh
Enter Number
*****
8
4
8 is Greater
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

8. Write a shell script to find the sum of first 10 numbers.

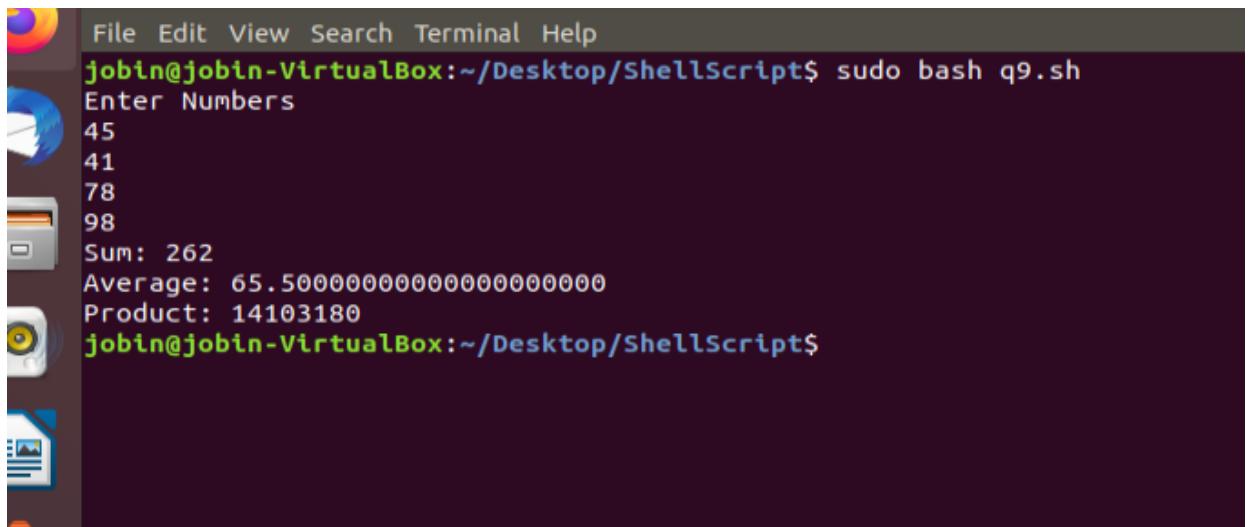
```
#!/bin/bash
echo Sum of 1st 10 no
echo *****
s=0
for ((i=1;i<=10;i++))
do
s=`expr $s + $i`
done
echo Sum $s
```



The screenshot shows a terminal window with a dark background and light-colored text. At the top, there's a menu bar with options: File, Edit, View, Search, Terminal, and Help. Below the menu, the terminal prompt is "jobin@jobin-VirtualBox:~/Desktop/ShellScript\$". The user then runs the command "sudo bash q8.sh". The script outputs "Sum of 1st 10 no", followed by five asterisks ("*****"), then "Sum 55", and finally ends with the prompt "jobin@jobin-VirtualBox:~/Desktop/ShellScript\$".

9. Write a shell script to find the sum, the average and the product of the four integers entered.

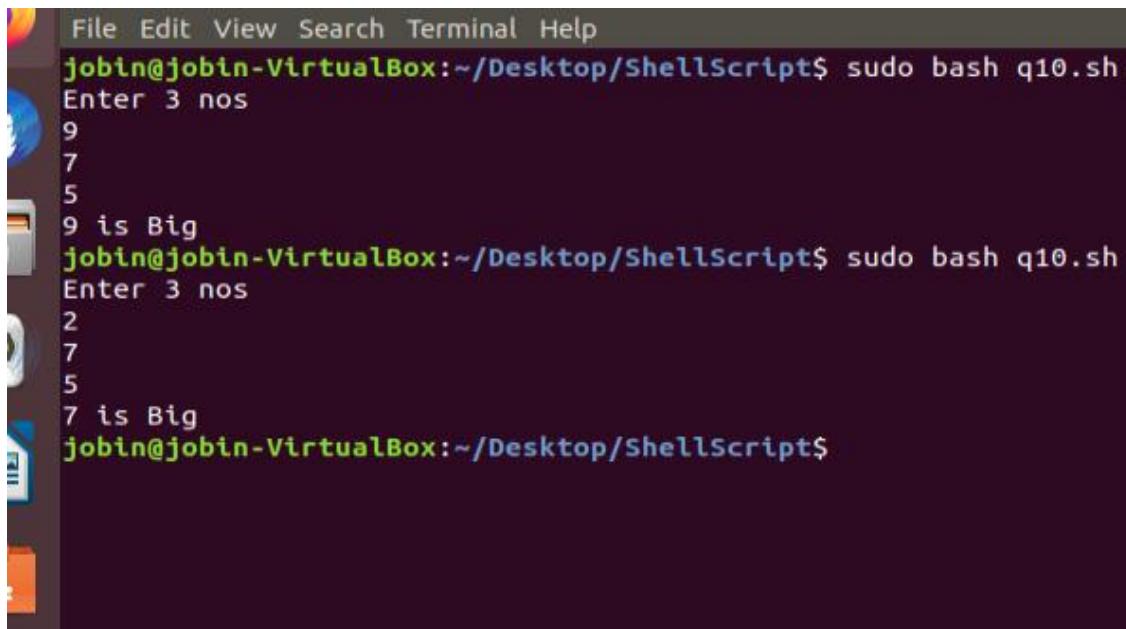
```
#!/bin/bash
echo Enter Numbers
read n1
read n2
read n3
read n4
sum=$(( $n1 + $n2 + $n3 + $n4 ))
avg=$( echo $sum / 4 |bc -l )
pdt=$(( $n1 * $n2 * $n3 * $n4 ))
echo Sum: $sum
echo Average: $avg
echo Product: $pdt
```



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q9.sh
Enter Numbers
45
41
78
98
Sum: 262
Average: 65.500000000000000000000000000000
Product: 14103180
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

10. Write a shell script to find the smallest of three numbers.

```
#!/bin/bash
echo Enter 3 nos
read a
read b
read c
if [ $a -gt $b ]; then
    if [ $a -gt $c ]; then
        echo $a is Big
    else
        echo $c is Big
    fi
elif [ $b -gt $c ]; then
    echo $b is Big
else
    echo $c is Big
fi
```



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q10.sh
Enter 3 nos
9
7
5
9 is Big
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q10.sh
Enter 3 nos
2
7
5
7 is Big
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

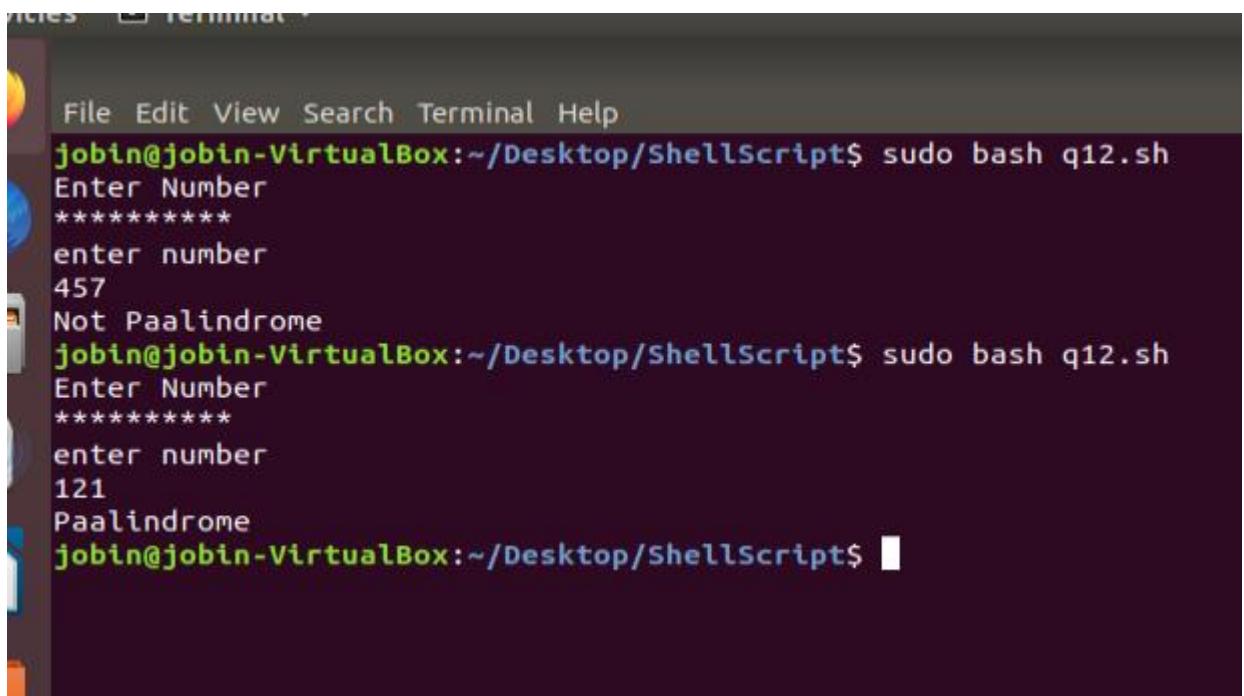
11. Write a shell program to find factorial of given number.

```
#!/bin/bash
echo Factorial
echo Enter No
read n
f=1
for((i=2;i<=n;i++))
{
    f=$((f * i)) #f=f*i
}
echo Factorial: $f
```

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q11.sh
Factorial
Enter No
8
Factorial: 40320
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q11.sh
Factorial
Enter No
4
Factorial: 24
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

12.Write a shell program to check a number is palindrome or not.

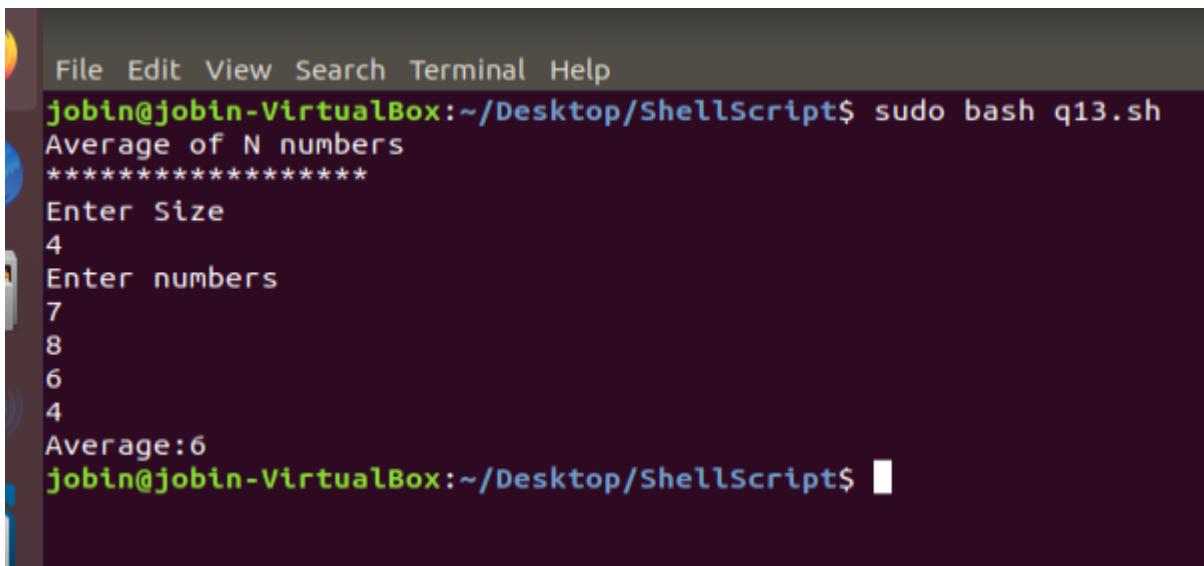
```
#!/bin/bash
echo Enter Number
echo *****
echo enter number
read n
r=$(echo $n | rev)
if [ $n -eq $r ]; then
    echo Paalindrome
else
    echo Not Paalindrome
fi
```



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q12.sh
Enter Number
*****
enter number
457
Not Paalindrome
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q12.sh
Enter Number
*****
enter number
121
Paalindrome
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

13. Write a shell script to find the average of the numbers entered in command line.

```
#!/bin/bash
echo Average of N numbers
echo ****
echo Enter Size
read s
sum=0
echo Enter numbers
for(( i=0;i<s;i++ ))
do
    read num
    sum=$((sum + num))
done
avg=$(( $sum/$s))
echo Average:$avg
```



```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q13.sh
Average of N numbers
*****
Enter Size
4
Enter numbers
7
8
6
4
Average:6
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

14.Write a shell program to find the sum of all the digits in a number

```
#!/bin/bash
echo "Sum of digits"
echo Enter Number
read n
s=0

while [ $n -gt 0 ]
do
    mod=$((n % 10))
    s=$((s + mod))
    n=$((n / 10))
done
echo Sum: $s
```

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q14.sh
Sum of digits
Enter Number
456
Sum: 15
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q14.sh
Sum of digits
Enter Number
842
Sum: 14
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

15. Write a shell Script to check whether given year is leap year or not.

```
#!/bin/bash
echo LEAP YEAR or NOT
echo Year
read y
a=`expr $y % 4`
b=`expr $y % 100`
c=`expr $y % 400`
if [ $a -eq 0 -a $b -ne 0 -o $c -eq 0 ]; then
    echo $y is Leap year
else
    echo Not Leap year
fi
```

```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q15.sh
LEAP YEAR or NOT
Year
1977
Not Leap year
jobin@jobin-VirtualBox:~/Desktop/ShellScript$ sudo bash q15.sh
LEAP YEAR or NOT
Year
2000
2000 is Leap year
jobin@jobin-VirtualBox:~/Desktop/ShellScript$
```

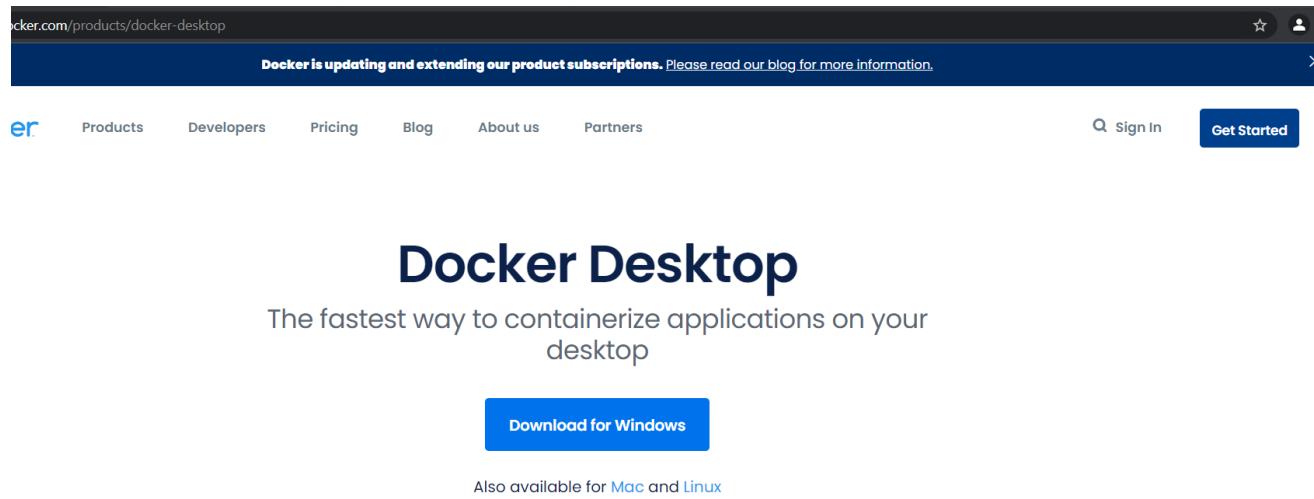
Experiment 11

Question

1. Install Docker application to your system and run a docker image instance in your system from docker hub.

Step-I

Download Docker Desktop installer for Windows from
<https://desktop.docker.com/win/main/amd64/Docker%20Desktop%20Installer.exe>



The Docker Subscription Service Agreement has been updated.

Step-II

Open the .exe file and follow the steps after clicking install button.



Installing Docker Desktop 4.1.0 (69386)



Docker Desktop 4.1.0

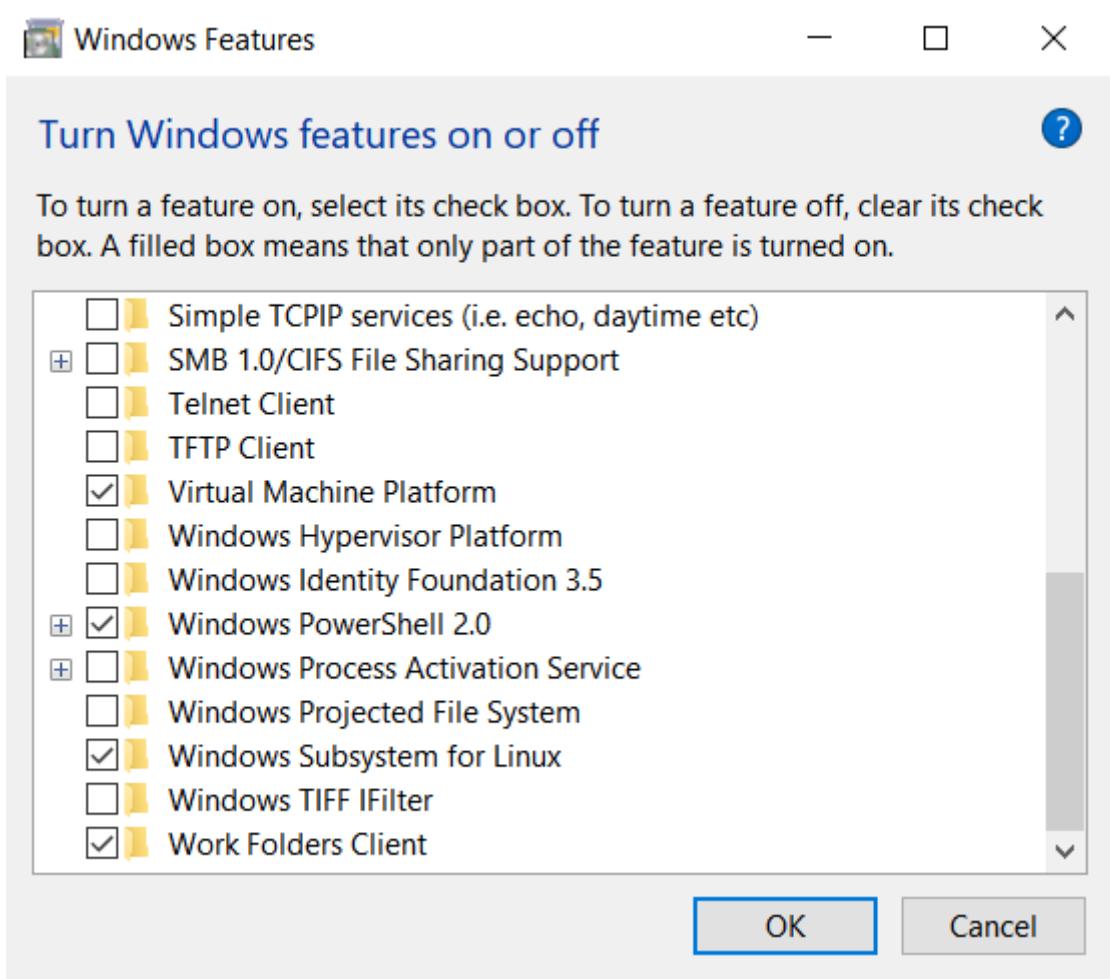
Unpacking files...

```
Unpacking file: resources/docker-desktop.iso  
Unpacking file: resources/ddvp.ico  
Unpacking file: resources/config-options.json  
Unpacking file: resources/componentsVersion.json  
Unpacking file: resources/bin/docker-compose  
Unpacking file: resources/bin/docker  
Unpacking file: resources/.gitignore  
Unpacking file: InstallerCli.pdb  
Unpacking file: InstallerCli.exe.config  
Unpacking file: frontend/vk_swiftshader_icd.json  
Unpacking file: frontend/v8_context_snapshot.bin  
Unpacking file: frontend/snapshot_blob.bin  
Unpacking file: frontend/resources/regedit/vbs/util.vbs  
Unpacking file: frontend/resources/regedit/vbs/regUtil.vbs
```

Step-III

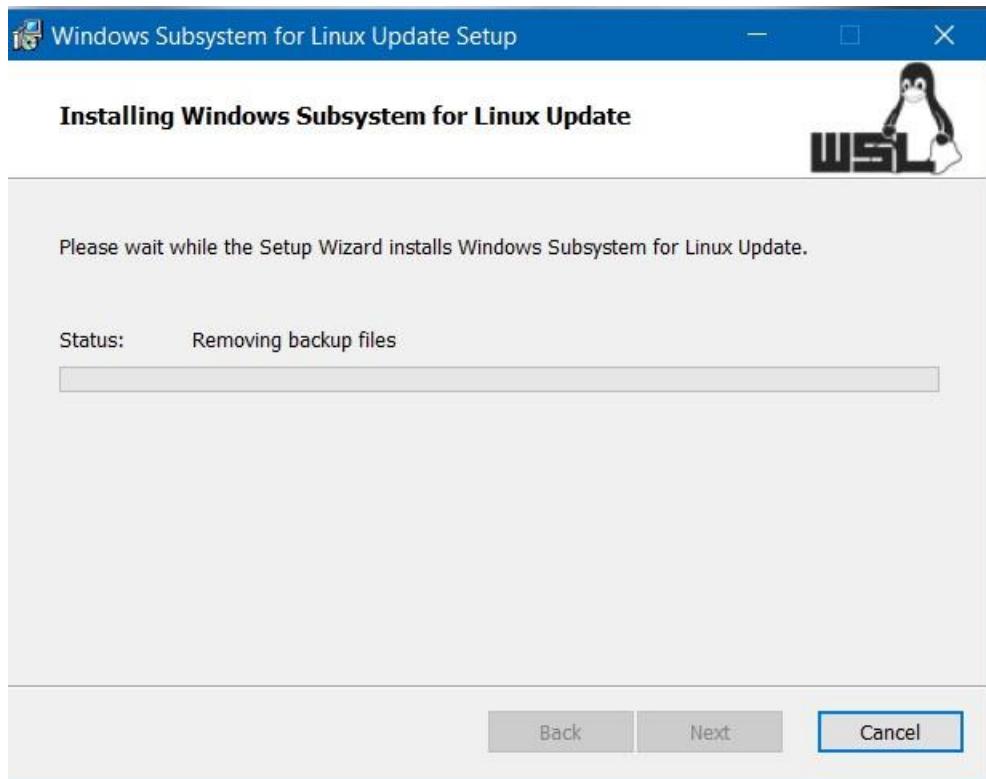
Once installed go to programs and features and click turn on windows features on or off

Scroll to the bottom and select windows subsystem for Linux



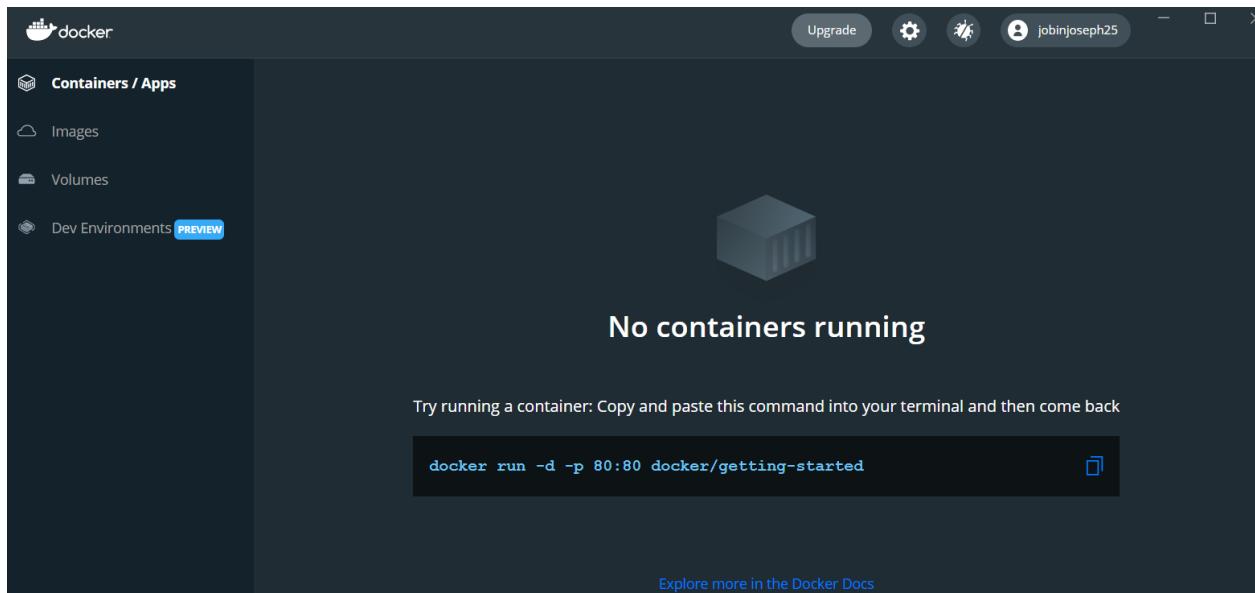
Step-IV

If any WSL 2 error occurs download windows subsystem for linux update package and install the .exe file, after the installation restart the windows device.



Step-V

Once installed, open the docker desktop app, and signin using the dockerID



Step-VI

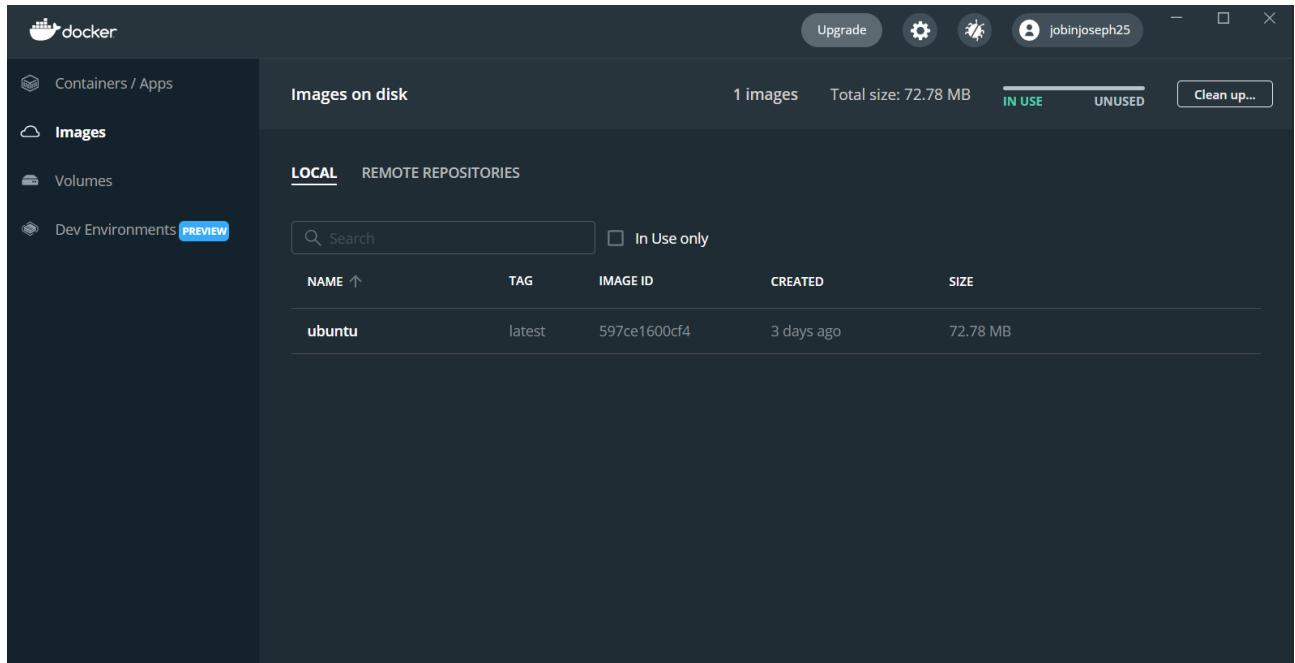
Now pull any image from docker hub using the docker pull command in the command prompt (eg: docker pull ubuntu)

```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.19042.1165]
(c) Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
f3ef4ff62e0d: Pull complete
Digest: sha256:44ab2c3b26363823dcb965498ab06abf74a1e6af20a732902250743df0d4172d
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest

C:\WINDOWS\system32>
```

Now in the images tab an image of ubuntu will be displayed, we can run the ubuntu instance using the cli.



Experiment 12

Questions

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

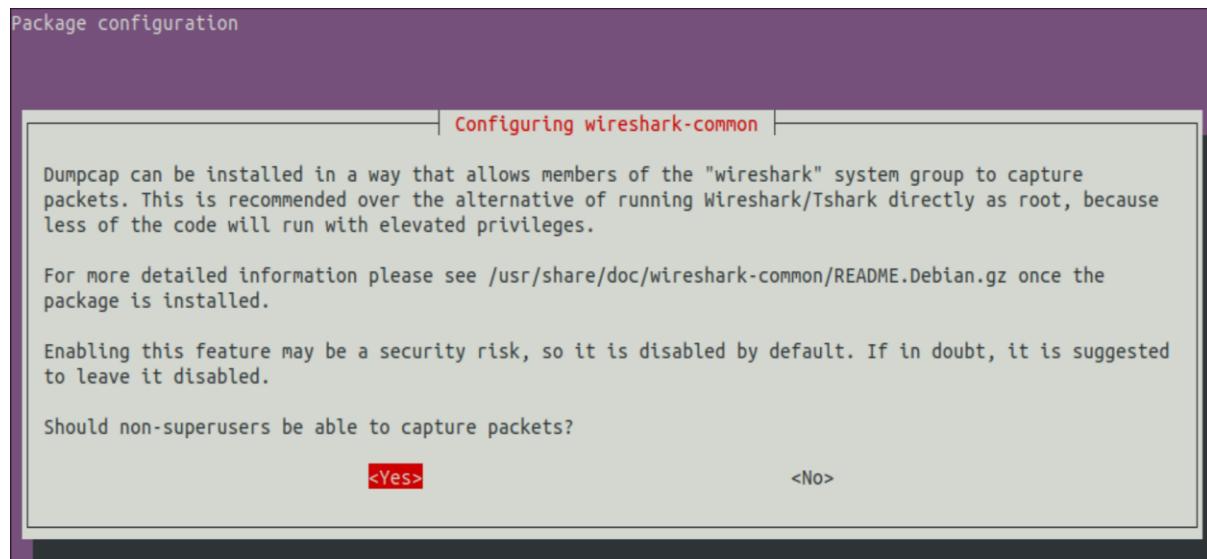
1. Sudo apt-get install wireshark

```
jobin@jobin-VirtualBox:~$ sudo apt install wireshark
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gir1.2-geocodelib-1.0 libegl-mesa libwayland-egl1-mesa ubuntu-web-launchers
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libdb-ares2 libdouble-conversion1 libmaxminddb0 libnl-route-3-200 libqgsttools-p1 libqt5core5a libqt5dbus5 libqt5gui5 libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgetss5 libsmi2ldbl libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-qts5-gtk-platformtheme qttranslations5-l10n wireshark-common wireshark-qt
Suggested packages:
  mmbdb-bin qt5-image-formats-plugins qtwayland5 snmp-mibs-downloader wireshark-doc
The following NEW packages will be installed:
  libdb-ares2 libdouble-conversion1 libmaxminddb0 libnl-route-3-200 libqgsttools-p1 libqt5core5a libqt5dbus5 libqt5gui5 libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgetss5 libsmi2ldbl libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-qt
0 upgraded, 31 newly installed, 0 to remove and 107 not upgraded.
Need to get 30.2 MB of archives.
After this operation, 149 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libdouble-conversion1 amd64 2.0.1-4ubuntu1 [33.0 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libqt5core5a amd64 5.9.5+dfsg-0ubuntu2.6 [2,035 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libqt5dbus5 amd64 5.9.5+dfsg-0ubuntu2.6 [195 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libqt5network5 amd64 5.9.5+dfsg-0ubuntu2.6 [634 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxcb-xinerama0 amd64 1.13-2-ubuntu18.04 [5,264 B]
Get:6 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libqt5gui5 amd64 5.9.5+dfsg-0ubuntu2.6 [2,568 kB]
Get:7 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libqt5widgetss5 amd64 5.9.5+dfsg-0ubuntu2.6 [2,203 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libqt5svg5 amd64 5.9.5-0ubuntu1 [128 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libmaxminddb0 amd64 1.3.1-1 [25.6 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libnl-route-3-200 amd64 3.2.29-0ubuntu3 [146 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libqt5multimedias5 amd64 5.9.5-0ubuntu1 [293 kB]
Get:12 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libqt5opengl5 amd64 5.9.5+dfsg-0ubuntu2.6 [132 kB]
Get:13 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libqt5mediawidgetss5 amd64 5.9.5-0ubuntu1 [36.6 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libqgsttools-p1 amd64 5.9.5-0ubuntu1 [72.4 kB]
Get:15 http://us.archive.ubuntu.com/ubuntu bionic/universe amd64 libteamedmultimedia5 amd64 5.9.5-0ubuntu1 [104 kB]
```

2. sudo dpkg-reconfigure wireshark-common

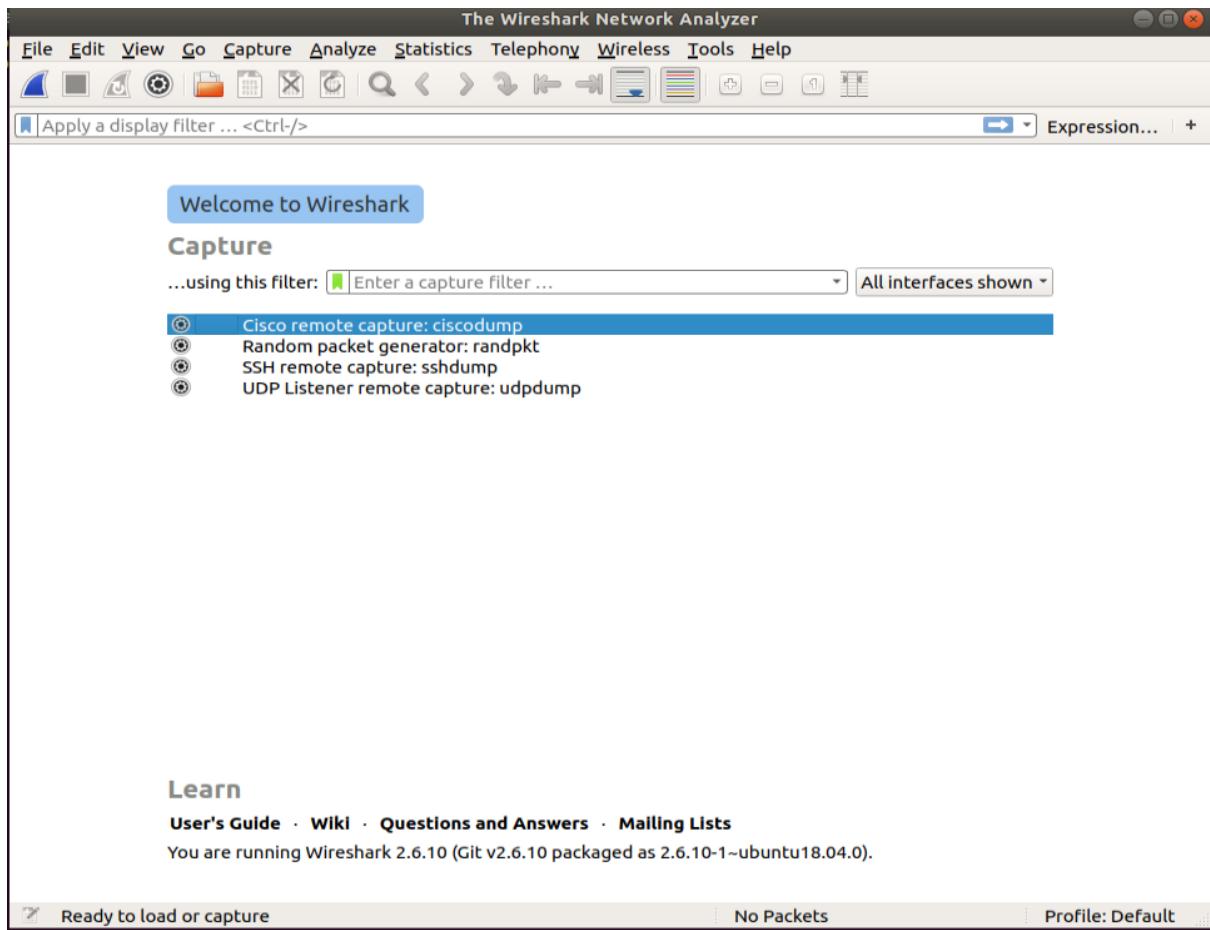
```
File Edit View Search Terminal Help
jobin@jobin-VirtualBox:~$ sudo dpkg-reconfigure wireshark-common
jobin@jobin-VirtualBox:~$
```

3. Select Yes and press enter



4. Open wireshark from the applist





5. Analyzing network packet stream

