

Networking & System Administration Lab Record

Submitted by:

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RMCA:S2:A

Rollno:42

1) Prepare a detailed note on computer hardware and various operating systems.

Computer Hardware

Computer hardware (usually simply called **hardware** when a computing context is concerned) is the collection of physical elements that constitutes a computer system. Computer hardware is the physical parts or components of a computer, such as the monitor, mouse, keyboard, computer data storage, hard disk drive (HDD), graphic cards, sound cards, memory, motherboard, and so on, all of which are physical objects that are tangible. In contrast, software is instructions that can be stored and run by hardware.

Software is any set of machine-readable instructions that directs a computer's processor to perform specific operations. A combination of hardware and software forms a usable computing system.

Different systems

Hardware represents the physical and tangible components of a computer, i.e. the components that can be seen and touched.

Examples of Hardware are the following –

- **Input devices** – keyboard, mouse, etc.
- **Output devices** – printer, monitor, etc.
- **Secondary storage devices** – Hard disk, CD, DVD, etc.
- **Internal components** – CPU, motherboard, RAM, etc.

There are a number of different types of computer system in use today.

Personal computer

Hardware of a modern personal computer: 1. Monitor 2. Motherboard 3. CPU 4. RAM 5. Expansion cards 6. Power supply 7. Optical disc drive 8. Hard disk drive 9. Keyboard 10. Mouse.

Inside a custom-built computer: power supply at the bottom has its own cooling fan.

The personal computer, also known as the PC, is one of the most common types of computer due to its versatility and relatively low price. Laptops are generally very similar, although may use lower-power or reduced size components.

Case

The computer case is a plastic or metal enclosure that houses most of the components. Those found on desktop computers are usually small enough to fit under a desk, however in recent years more compact designs have become more common place, such as the all-in-one style designs from Apple, namely the iMac. Though a case can basically be big or small, what matters more is which form factor of motherboard it's designed for. Laptops are computers that usually come in a clamshell form factor, again however in more recent years deviations from this form factor have started to emerge such as laptops that have a detachable screen that become tablet computers in their own right.

Power supply

A power supply unit (PSU) converts alternating current (AC) electric power to low-voltage DC power for the internal components of the computer. Laptops are capable of running from a built-in battery, normally for a period of hours.

Mainboard

The motherboard is the main component of a computer. It is a large rectangular board with integrated circuitry that connects the other parts of the computer including the CPU, the RAM, the disk drives(CD, DVD, hard disk, or any others) as well as any peripherals connected via the ports or the expansion slots.

Components directly attached to or part of the motherboard include:

- The **CPU** (Central Processing Unit) performs most of the calculations which enable a computer to function, and is sometimes referred to as the “brain” of the computer. It is usually cooled by a heat sink and fan. Most newer CPUs include an on-die Graphics Processing Unit (GPU).
- The **Chipset**, which includes the north bridge, mediates communication between the CPU and the other components of the system, including main memory.
- The **Random-Access Memory** (RAM) stores the code and data that are being actively accessed by the CPU.
- The **Read-Only Memory** (ROM) stores the BIOS that runs when the computer is powered on or otherwise begins execution, a process known as Bootstrapping, or “booting” or “booting up”. The **BIOS** (Basic Input Output System) includes boot firmware and power management firmware. Newer motherboards use Unified Extensible Firmware Interface (UEFI) instead of BIOS.
- **Buses** connect the CPU to various internal components and to expand cards for graphics and sound.
- The CMOS battery is also attached to the motherboard. This battery is the same as a watch battery or a battery for a remote to a car’s central locking system. Most batteries are CR2032, which powers the memory for date and time in the BIOS chip.

Expansion cards

An expansion card in computing is a printed circuit board that can be inserted into an expansion slot of a computer motherboard or backplane to add functionality to a computer system via the expansion bus. Expansions cards can be used to obtain or expand on features not offered by the motherboard.

Storage devices

Computer data storage, often called storage or memory, refers to computer components and recording media that retain digital data. Data storage is a core function and fundamental component of computers. The price of solid-state drives (SSD), which store data on flash memory, has dropped a lot in recent years, making them a better choice than ever to add to a computer to make booting up and accessing files faster.

- Fixed media
 - Data is stored by a computer using a variety of media. Hard disk drives are found in virtually all older computers, due to their high capacity and low cost, but solid-state drives are faster and more power efficient, although currently more expensive than hard drives, so are often found in more expensive computers. Some systems may use a disk array controller for greater performance or reliability.
- Removable media

- To transfer data between computers, a USB flash drive or Optical disc may be used. Their usefulness depends on being readable by other systems; the majority of machines have an optical disk drive, and virtually all have a USB port.

Input and output peripherals

Input and output devices are typically housed externally to the main computer chassis. The following are either standard or very common to many computer systems.

- Input
 - Input devices allow the user to enter information into the system, or control its operation. Most personal computers have a mouse and keyboard, but laptop systems typically use a touchpad instead of a mouse. Other input devices include webcams, microphones, joysticks, and image scanners.
- Output device
 - Output devices display information in a human readable form. Such devices could include printers, speakers, monitors or a Braille embosser.

Mainframe computer

A mainframe computer is a much larger computer that typically fills a room and may cost many hundreds or thousands of times as much as a personal computer. They are designed to perform large numbers of calculations for governments and large enterprises.

Departmental computing

In the 1960s and 1970s more and more departments started to use cheaper and dedicated systems for specific purposes like process control and laboratory automation.

Supercomputer

A supercomputer is superficially similar to a mainframe, but is instead intended for extremely demanding computational tasks. As of November 2013, the fastest supercomputer in the world is the Tianhe-2, in Guangzhou, China.

The term supercomputer does not refer to a specific technology. Rather it indicates the fastest computers available at any given time. In mid 2011, the fastest supercomputers boasted speeds exceeding one petaflop, or 1000 trillion floating point operations per second. Super computers are fast but extremely costly so they are generally used by large organizations to execute computationally demanding tasks involving large data sets. Super computers typically run military and scientific applications. Although they cost millions of dollars, they are also being used for commercial applications where huge amounts of data must be analyzed. For example, large banks employ supercomputers to calculate the risks and returns of various investment strategies, and healthcare organizations use them to analyze giant databases of patient data to determine optimal treatments for various diseases and problems incurring to the country.

Hardware upgrade

When using computer hardware, an upgrade means adding new hardware to a computer that improves its performance, adds capacity or new features. For example, a user could perform a hardware upgrade to replace the hard drive with a SSD to get a boost in performance or increase the amount of files that may be stored. Also, the user could increase the RAM so the computer may run more smoothly. The user could add a USB 3.0 expansion card in order to fully use USB 3.0 devices. Performing such hardware upgrades may be necessary for older computers to meet a programs' system requirements.

Relationship between Hardware and Software

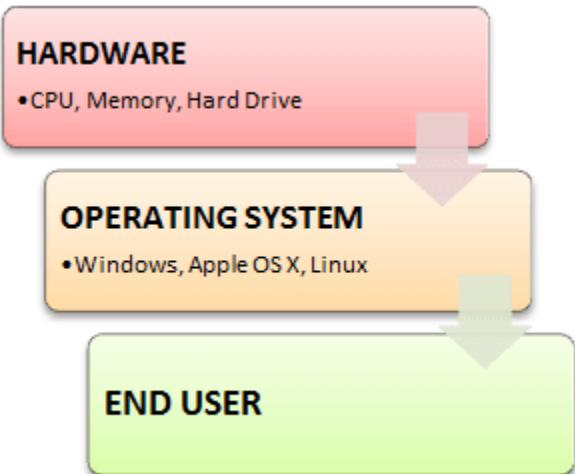
- Hardware and software are mutually dependent on each other. Both of them must work together to make a computer produce a useful output.
- Software cannot be utilized without supporting hardware.
- Hardware without a set of programs to operate upon cannot be utilized and is useless.
- To get a particular job done on the computer, relevant software should be loaded into the hardware.
- Hardware is a one-time expense.
- Software development is very expensive and is a continuing expense.
- Different software applications can be loaded on a hardware to run different jobs.
- A software acts as an interface between the user and the hardware.
- If the hardware is the 'heart' of a computer system, then the software is its 'soul'. Both are complementary to each other.

What is Operating System? Types of OS, Features and Examples

What is an Operating System?

An **Operating System (OS)** is a software that acts as an interface between computer hardware components and the user. Every computer system must have at least one operating system to run other programs. Applications like Browsers, MS Office, Notepad Games, etc., need some environment to run and perform its tasks.

The OS helps you to communicate with the computer without knowing how to speak the computer's language. It is not possible for the user to use any computer or mobile device without having an operating system.



Introduction to Operating System

History Of OS

- Operating systems were first developed in the late 1950s to manage tape storage
- The General Motors Research Lab implemented the first OS in the early 1950s for their IBM 701
- In the mid-1960s, operating systems started to use disks
- In the late 1960s, the first version of the Unix OS was developed
- The first OS built by Microsoft was DOS. It was built in 1981 by purchasing the 86-DOS software from a Seattle company
- The present-day popular OS Windows first came to existence in 1985 when a GUI was created and paired with MS-DOS.

Types of Operating System (OS)

Following are the popular types of Operating System:

- Batch Operating System
- Multitasking/Time Sharing OS
- Multiprocessing OS
- Real Time OS
- Distributed OS
- Network OS
- Mobile OS

Batch Operating System

Some computer processes are very lengthy and time-consuming. To speed the same process, a job with a similar type of needs are batched together and run as a group.

The user of a batch operating system never directly interacts with the computer. In this type of OS, every user prepares his or her job on an offline device like a punch card and submit it to the computer operator.

Multi-Tasking/Time-sharing Operating systems

Time-sharing operating system enables people located at a different terminal(shell) to use a single computer system at the same time. The processor time (CPU) which is shared among multiple users is termed as time sharing

Real time OS

A real time operating system time interval to process and respond to inputs is very small. Examples: Military Software Systems, Space Software Systems are the Real time OS example.

Distributed Operating System

Distributed systems use many processors located in different machines to provide very fast computation to its users.

Network Operating System

Network Operating System runs on a server. It provides the capability to serve to manage data, user, groups, security, application, and other networking functions.

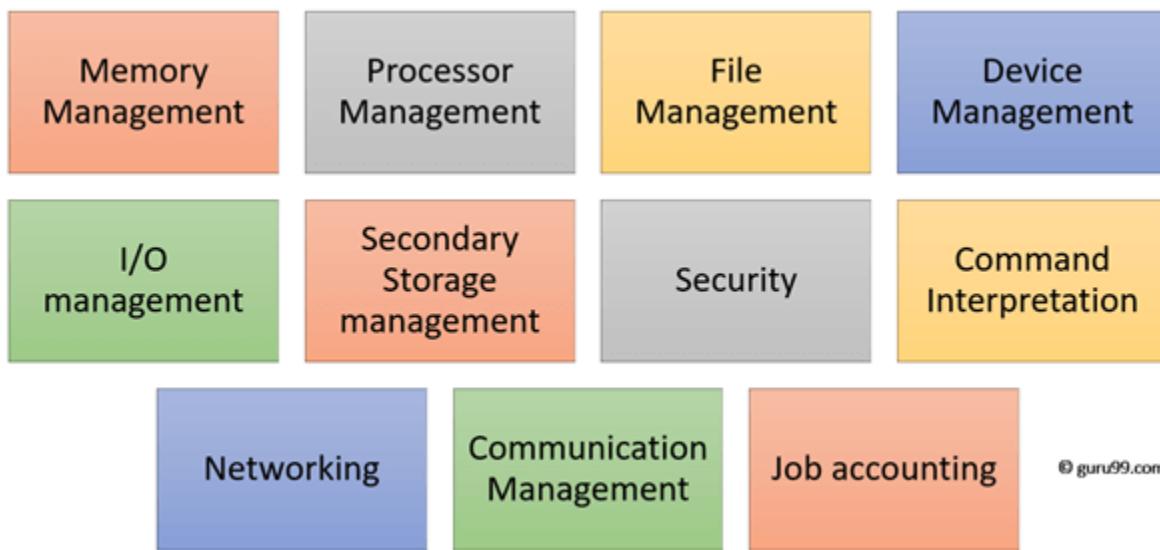
Mobile OS

Mobile operating systems are those OS which is especially that are designed to power smartphones, tablets, and wearables devices.

Some most famous mobile operating systems are Android and iOS, but others include BlackBerry, Web, and watchOS.

Functions of Operating System

Below are the main functions of Operating System:



Functions of Operating System

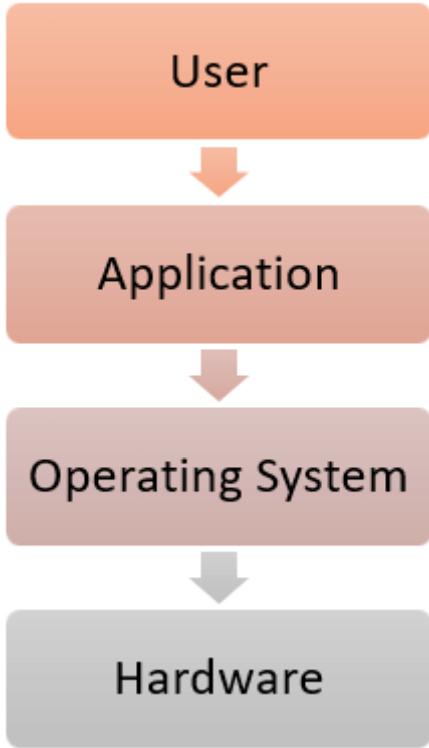
In an operating system software performs each of the function:

1. **Process management**:- Process management helps OS to create and delete processes. It also provides mechanisms for synchronization and communication among processes.
2. **Memory management**:- Memory management module performs the task of allocation and de-allocation of memory space to programs in need of this resources.
3. **File management**:- It manages all the file-related activities such as organization storage, retrieval, naming, sharing, and protection of files.
4. **Device Management**: Device management keeps tracks of all devices. This module also responsible for this task is known as the I/O controller. It also performs the task of allocation and de-allocation of the devices.
5. **I/O System Management**: One of the main objects of any OS is to hide the peculiarities of that hardware devices from the user.
6. **Secondary-Storage Management**: Systems have several levels of storage which includes primary storage, secondary storage, and cache storage. Instructions and data must be stored in primary storage or cache so that a running program can reference it.
7. **Security**:- Security module protects the data and information of a computer system against malware threat and authorized access.
8. **Command interpretation**: This module is interpreting commands given by the user and acting system resources to process that commands.
9. **Networking**: A distributed system is a group of processors which do not share memory, hardware devices, or a clock. The processors communicate with one another through the network.
10. **Job accounting**: Keeping track of time & resource used by various job and users.
11. **Communication management**: Coordination and assignment of compilers, interpreters, and another software resource of the various users of the computer systems.

Features of Operating System (OS)

Here is a list important features of OS:

- Protected and supervisor mode
- Allows disk access and file systems
- Device drivers Networking Security
- Program Execution
- Memory management Virtual Memory Multitasking
- Handling I/O operations
- Manipulation of the file system
- Error Detection and handling
- Resource allocation
- Information and Resource Protection



Advantage of using Operating System

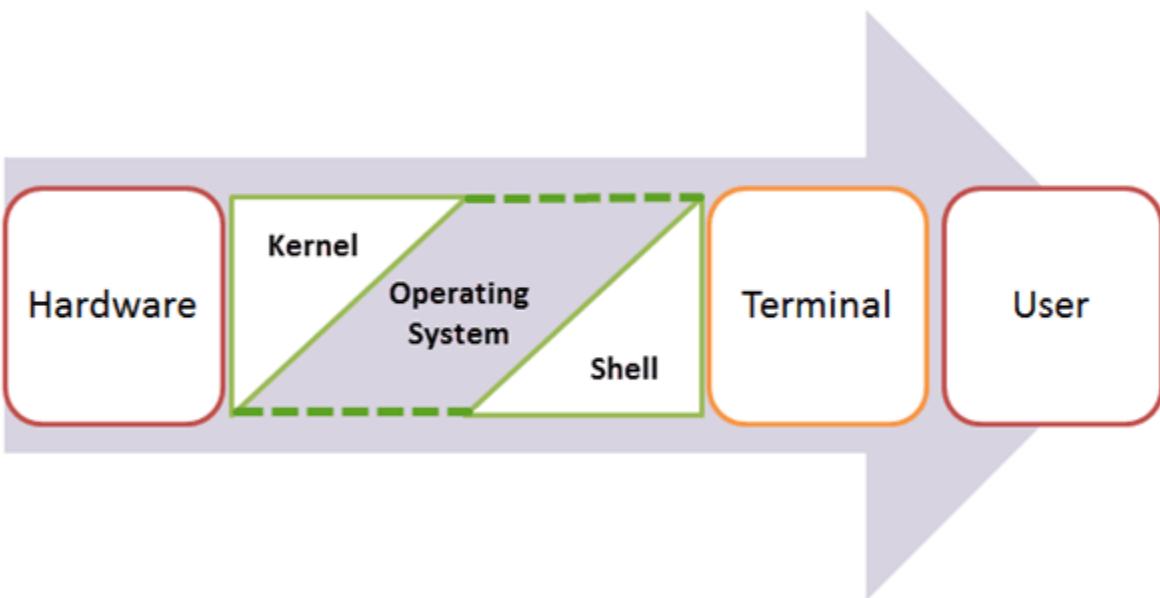
- Allows you to hide details of hardware by creating an abstraction
- Easy to use with a GUI
- Offers an environment in which a user may execute programs/applications
- The operating system must make sure that the computer system convenient to use
- Operating System acts as an intermediary among applications and the hardware components
- It provides the computer system resources with easy to use format
- Acts as an mediator between all hardware's and software's of the system

Disadvantages of using Operating System

- If any issue occurs in OS, you may lose all the contents which have been stored in your system
- Operating system's software is quite expensive for small size organization which adds burden on them. Example Windows
- It is never entirely secure as a threat can occur at any time

What is a Kernel?

The kernel is the central component of a computer operating systems. The only job performed by the kernel is to manage the communication between the software and the hardware. A Kernel is at the nucleus of a computer. It makes the communication between the hardware and software possible. While the Kernel is the innermost part of an operating system, a shell is the outermost one.



Introduction to Kernel

Features of Kernel

- Low-level scheduling of processes
- Inter-process communication
- Process synchronization
- Context switching

Types of Kernels

There are many types of kernels that exists, but among them, the two most popular kernels are:

1. Monolithic

A monolithic kernel is a single code or block of the program. It provides all the required services offered by the operating system. It is a simplistic design which creates a distinct communication layer between the hardware and software.

2. Microkernels

Microkernel manages all system resources. In this type of kernel, services are implemented in different address space. The user services are stored in user address space, and kernel services are stored under kernel address space. So, it helps to reduce the size of both the kernel and operating system.

Assignment2

4/5/21:Advanced computer networks Lab:assignment 2

Prepare note on

1. Components of a Motherboard

2. RAM Modules

3. Daughter Cards

4. Bus Slots

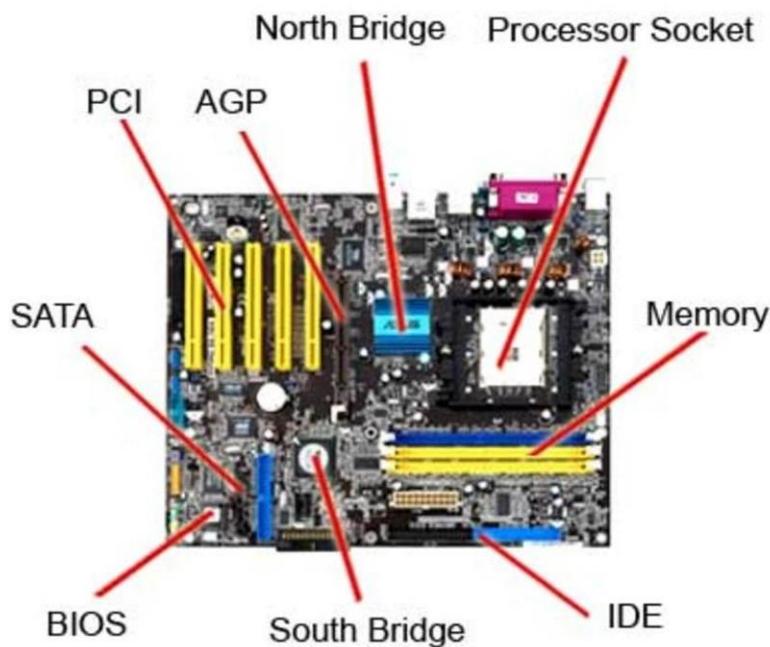
5. SMPS

6. Internal storage devices

7. Interfacing ports

1.Computer Motherboard Components

The Parts of a Computer Motherboard



Some of the major components of a motherboard.

The Computer Mother Board

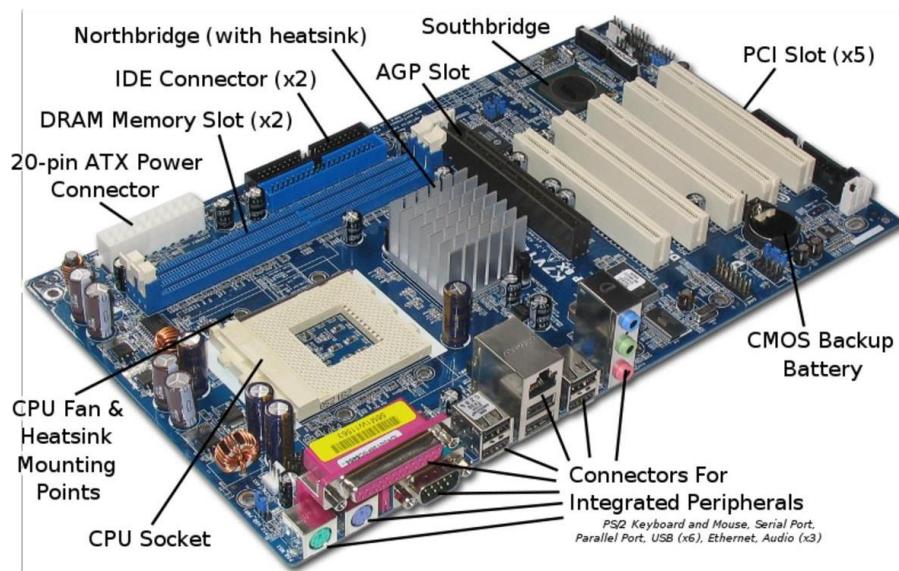
What is a Motherboard?

The motherboard is a thin **printed circuit board** (PCB) which links all different components inside your computer. So, we can say the motherboard acts as a hub in a network. People call motherboard with a different name like mainboard, logic board, baseboard, system board, mobo, etc.

Numerous major components, crucial for the functioning of the computer, are attached to the motherboard. These include the processor, memory, and expansion slots. The motherboard connects directly or indirectly to every part of the PC.

The type of motherboard installed in a PC has a great effect on a computer's system speed and expansion capabilities.

Major Motherboard Components and Their Functions



A labeled ASRock K7VT4A Pro Mainboard.

Central Processing Unit (CPU)

The Computer's Microprocessor

Also known as the microprocessor or the **processor**, the CPU is the computer's brain. It is responsible for fetching, decoding, and executing program instructions as well as performing mathematical and logical calculations.

The processor chip is identified by the processor type and the manufacturer. This information is usually inscribed on the chip itself. For example, Intel 386, Advanced Micro Devices (AMD) 386, Cyrix 486, Pentium MMX, Intel Core 2Duo, or Core i7.

If the processor chip is not on the motherboard, you can identify the processor socket as socket 1 to Socket 8, LGA 775 among others. This can help you identify the processor that fits in the socket. For example, rPGA 988A/Socket G1 will fit any of the following processors;

- Intel Core i7 (600, 700, 800, 900 series)
- Intel Core i5 (400, 500 series)
- Intel Core i3 (300 series)
- Intel Pentium (P6000 series)
- Intel Celeron (P4000 series)

Random Access Memory (RAM)

The Computer Memory

Random Access Memory, or RAM, usually refers to computer chips that temporarily store dynamic data to enhance computer performance while you are working.

In other words, it is the working place of your computer, where active programs and data are loaded so that any time the processor requires them, it doesn't have to fetch them from the hard disk.

Random-Access Memory is volatile, meaning it loses its contents once power is turned off. This is different from non-volatile memory, such as hard disks and flash memory, which do not require a power source to retain data.

When a computer shuts down properly, all data located in RAM is returned to permanent storage on the hard drive or flash drive. At the next boot-up, RAM begins to fill with programs automatically loaded at startup, a process called booting. Later on, the user opens other files and programs that are still loaded in memory.

Basic Input/output System (BIOS)

The BIOS

BIOS stands for Basic Input/Output System. BIOS is a "read-only" memory, which consists of low-level software that controls the system hardware and acts as an interface between the operating system and the hardware.

Most people know the term BIOS by another name—device drivers, or just drivers. BIOS is essentially the link between the computer hardware and software in a system.

All motherboards include a small block of Read-Only Memory (ROM) which is separate from the main system memory used for loading and running software. On PCs, the BIOS contains all the code required to control the keyboard, display screen, disk drives, serial communications, and a number of miscellaneous functions.

The system BIOS is a ROM chip on the motherboard used during the startup routine (boot process) to check out the system and prepare to run the hardware.

The BIOS is stored on a ROM chip because ROM retains information even when no power is being supplied to the computer.

Complimentary Metal Oxide Semiconductor Random Access Memory (CMOS RAM)

Photo Showing the CMOS Battery



A CMOS Battery.

Patkay

The CMOS Battery

Motherboards also include a small separate block of memory made from CMOS RAM chips which are kept alive by a battery (known as a CMOS battery) even when the PC's power is off. This prevents reconfiguration when the PC is powered on.

CMOS devices require very little power to operate.

The CMOS RAM is used to store basic information about the PC's configuration for instance:-

- Floppy disk and hard disk drive types
- Information about CPU

- RAM size
- Date and time
- Serial and parallel port information
- Plug and Play information
- Power Saving settings

Other Important data kept in CMOS memory is the time and date, which is updated by a Real-Time Clock (RTC).

Cache Memory

The Level 2 Cache Memory on an Old Motherboard



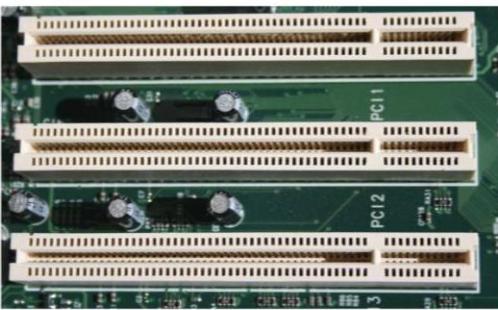
L2 cache on an old motherboard.

The Computer Cache Memory

Cache memory is a small block of high-speed memory (RAM) that enhances PC performance by pre-loading information from the (relatively slow) main memory and passing it to the processor on demand.

Most CPUs have an internal cache memory (built into the processor) which is referred to as Level 1 or primary cache memory. This can be supplemented by external cache memory fitted on the motherboard. This is the Level 2 or secondary cache. In modern computers, Levels 1 and 2 cache memory are built into the processor die. If a third cache is implemented outside the die, it is referred to as the Level 3 (L3) cache.

Expansion Bus



PCI slots.

The Expansion Buses

An expansion bus is an input/output pathway from the CPU to peripheral devices and it is typically made up of a series of slots on the motherboard. Expansion boards (cards) plug into the bus.

PCI is the most common expansion bus in a PC and other hardware platforms. Buses carry signals such as data, memory addresses, power, and control signals from component to component. Other types of buses include ISA and EISA.

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

This [introduction to computer bus](#) article covers all of them including the new types.

The Computer Chip-sets

A **chipset** is a group of small circuits that coordinate the flow of data to and from a PC's key components. These key components include the CPU itself, the main memory, the secondary cache, and any devices situated on the buses.

A chipset also controls data flow to and from hard disks and other devices connected to the IDE channels.

A computer has got two main chipsets:

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

The CPU Clock

The CPU clock synchronizes the operation of all parts of the PC and provides the basic timing signal for the CPU. Using a quartz crystal, the CPU clock breathes life into the microprocessor by feeding it a constant flow of pulses.

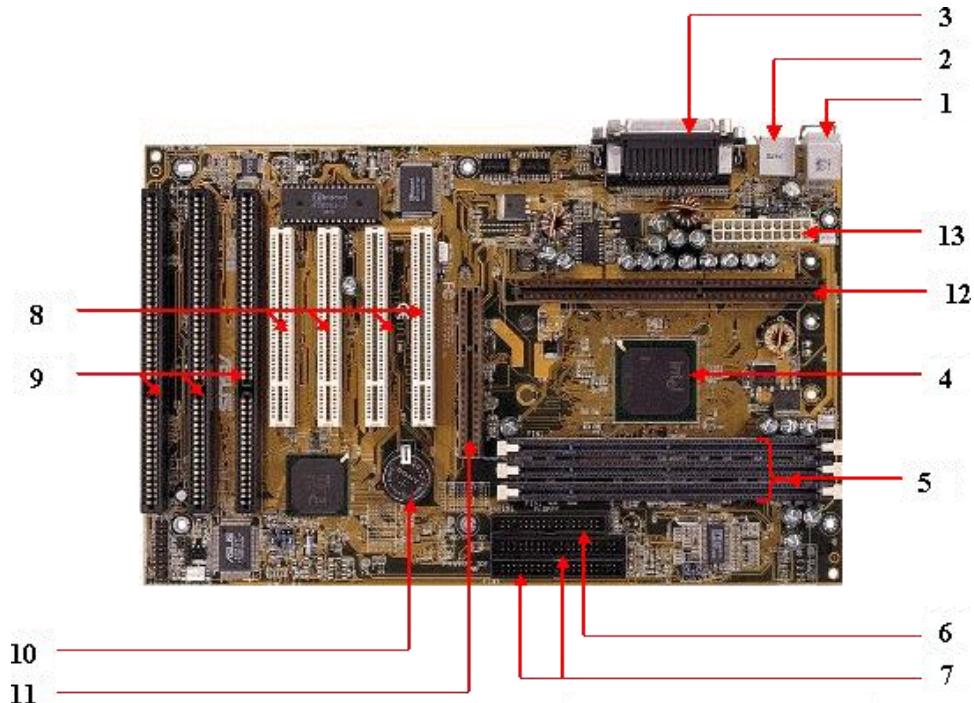
For example, a 200 MHz CPU receives 200 million pulses per second from the clock. A 2 GHz CPU gets two billion pulses per second. Similarly, in any communications device, a clock may be used to synchronize the data pulses between sender and receiver.

A "real-time clock," also called the "system clock," keeps track of the time of day and makes this data available to the software. A "time-sharing clock" interrupts the CPU at regular intervals and allows the operating system to divide its time between active users and/or applications.

The Switches and Jumpers

- **DIP** (Dual In-line Package) switches are small electronic switches found on the circuit board that can be turned on or off just like a normal switch. They are very small and so are usually flipped with a pointed object, such as the tip of a screwdriver, a bent paper clip, or a pen top. Take care when cleaning near DIP switches, as some solvents may destroy them. Dip switches are obsolete and you will not find them in modern systems.
- **Jumper pins** are small protruding pins on the motherboard. A jumper cap or bridge is used to connect or short a pair of jumper pins. When the bridge is connected to any two pins, via a shorting link, it completes the circuit and a certain configuration has been achieved.
- **Jumper caps** are metal bridges that close an electrical circuit. Typically, a jumper consists of a plastic plug that fits over a pair of protruding pins. Jumpers are sometimes used to configure expansion boards. By placing a jumper plug over a different set of pins, you can change a board's parameters.

MOTHERBOARD



1. Mouse & keyboard

2. USB

3. Parallel port

4. CPU Chip

5. RAM slots

6. Floppy controller

7. IDE controller

8. PCI slot

9. ISA slot

10. CMOS Battery

11. AGP slot

12. CPU slot

13. Power supply plug in

1. Mouse & keyboard: Keyboard Connectors are two types basically. All PCs have a Key board port connected directly to the motherboard. The oldest, but still quite common type, is a special DIN, and most PCs until recently retained this style connector. The AT-style keyboard connector is quickly disappearing, being replaced by the smaller mini DIN PS/2-style keyboard connector.

You can use an AT-style keyboard with a PS/2-style socket (or the other way around) by using a converter. Although the AT connector is unique in PCs, the PS/2-style mini-DIN is also used in more modern PCs for the mouse. Fortunately , most PCs that use the mini-DIN for both the keyboard and mouse clearly mark each mini-DIN socket as to its correct use. Some keyboards have a USB connection, but these are fairly rare compared to the PS/2 connection keyboards.

2. USB (Universal serial bus): USB is the General-purpose connection for PC. You can find USB versions of many different devices, such as mice, keyboards, scanners, cameras, and even printers. a USB connector's distinctive rectangular shape makes it easily recognizable.

USB has a number of features that makes it particularly popular on PCs. First, USB devices are hot swappable. You can insert or remove them without restarting your system.

3. Parallel port: Most printers use a special connector called a parallel port. Parallel port carry data on more than one wire, as opposed to the serial port, which uses only one wire. Parallel ports use a 25-pin female DB connector. Parallel ports are directly supported by the motherboard through a direct connection or through a dangle.

4. CPU Chip : The *central processing unit*, also called the *microprocessor* performs all the calculations that take place inside a pc. CPUs come in Variety of shapes and sizes. Modern CPUs generate a lot of heat and thus require a cooling fan or heat sink. The cooling device (such as a cooling fan) is removable, although some CPU manufacturers sell the CPU with a fan permanently attached.

5. RAM slots: Random-Access Memory (RAM) stores programs and data currently being used by the CPU. RAM is measured in units called bytes. RAM has been packaged in many different ways. The most current package is called a 168-pin DIMM (Dual Inline Memory module).

6. Floppy controller: The floppy drive connects to the computer via a 34-pin *ribbon cable*, which in turn connects to the motherboard. A *floppy controller* is one that is used to control the floppy drive.

7. IDE controller: Industry standards define two common types of hard drives: EIDE and SCSI. Majority of the PCs use EIDE drives. SCSI drives show up in high end PCs such as network servers or graphical workstations. The EIDE drive connects to the hard drive via a 2-inch-wide, 40-pin ribbon cable, which in turn connects to the motherboard. *IDE controller* is responsible for controlling the hard drive.

8. PCI slot: Intel introduced the *Peripheral component interconnect* bus protocol. The PCI bus is used to connect I/O devices (such as NIC or RAID controllers) to the main logic of the computer. PCI bus has replaced the ISA bus.

9. ISA slot: (Industry Standard Architecture) It is the standard architecture of the Expansion bus. Motherboard may contain some slots to connect ISA compatible cards.

10. CMOS Battery: To provide CMOS with the power when the computer is turned off all motherboards comes with a battery. These batteries mount on the motherboard in one of three ways: the obsolete external battery, the most common onboard battery, and built-in battery.

11. AGP slot: If you have a modern motherboard, you will almost certainly notice a single connector that looks like a PCI slot, but is slightly shorter and usually brown. You also probably have a video card inserted into this slot. This is an *Advanced Graphics Port (AGP)* slot.

12. CPU slot: To install the CPU, just slide it straight down into the slot. Special notches in the slot make it impossible to install them incorrectly. So remember if it does not go easily, it is probably not correct. Be sure to plug in the CPU fan's power.

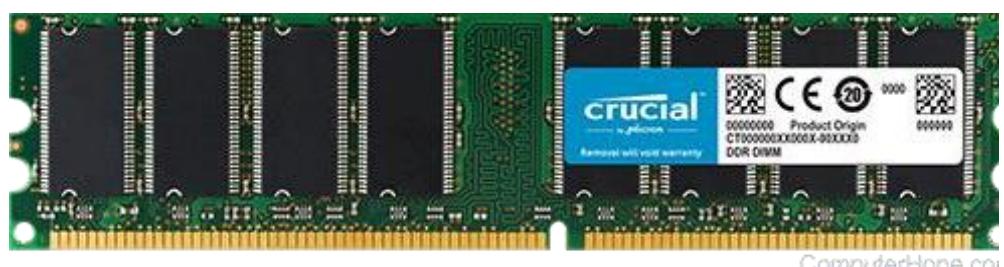
13. Power supply plug in: The Power supply, as its name implies, provides the necessary electrical power to make the pc operate. the power supply takes standard 110-V AC power and converts into 12-Volt, 5-Volt, and 3.3-Volt DC power.

2. RAM MODULES



Alternatively referred to as main memory, primary memory, or system memory, 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.

Types of RAM



Over the evolution of the computer, there have been different variations of RAM. Some of the more common examples are DIMM, RIMM, SIMM, SO-DIMM, and SOO-RIMM. Below is an example image of a 512 MB DIMM computer memory module, a piece of RAM found in older desktop computers. This memory module would be installed into one of the memory slots on a motherboard.

Computer DIMM or dual-inline memory module

Additional RAM information

As the computer boots, parts of the operating system and drivers are loaded into memory, which allows the CPU to process instructions faster and speed up the boot process. After the

operating system is loaded, programs you open like the browser you're using to view this page are also loaded into memory. If too many programs are open, the computer swaps the data in the memory between the RAM and the hard disk drive.

A computer's performance is largely attributed to the amount of memory contained within it. If a computer does not have the recommended memory to run the operating system and its programs, it results in slower performance. The more memory a computer has, the more information and software it can load and process quickly.

History of RAM

The first form of RAM came about in 1947 with the use of the Williams tube. It utilized a CRT (cathode ray tube); the data was stored on the face as electrically charged spots.

The second widely used form of RAM was magnetic-core memory, invented in 1947. Frederick Viehe is credited with much of the work, having filed for several patents relating to the design. Magnetic-core memory works through the use of tiny metal rings and wires connecting to each ring. One bit of data could be stored per ring and accessed at any time.

However, RAM, as we know it today, as solid-state memory, was first invented in 1968 by Robert Dennard. Known specifically as dynamic random-access memory, or DRAM, transistors were used to store bits of data.

What is internal memory and how is it different from external memory?

Computer memory is generally classified as either internal or external memory.

Internal memory, also called "main or primary memory" refers to memory that stores small amounts of data that can be accessed quickly while the computer is running.

External memory, also called "secondary memory" refers to a storage device that can retain or store data persistently. They could be embedded or removable storage devices. Examples include hard disk or solid state drives, USB flash drives, and compact discs.

What are the types of internal memory?

There are basically two kinds of internal memory: ROM and RAM.

ROM stands for read-only memory. It is non-volatile, which means it can retain data even without power. It is used mainly to start or boot up a computer.

Once the operating system is loaded, the computer uses RAM, which stands for random-access memory, which temporarily stores data while the central processing unit (CPU) is executing other tasks. With more RAM on the computer, the less the CPU has to read data from the external or secondary memory (storage device), allowing the computer to run faster. RAM is fast but it is volatile, which means it will not retain data if there is no power. It is therefore important to save data to the storage device before the system is turned off.

What are the types of RAM?

There are two main types of RAM: Dynamic RAM (DRAM) and Static RAM (SRAM).

DRAM (pronounced DEE-RAM), is widely used as a computer's main memory. Each DRAM memory cell is made up of a transistor and a capacitor within an integrated circuit, and a data bit is stored in the capacitor. Since transistors always leak a small amount, the capacitors will slowly discharge, causing information stored in it to drain; hence, DRAM has to be refreshed (given a new electronic charge) every few milliseconds to retain data.

SRAM (pronounced ES-RAM) is made up of four to six transistors. It keeps data in the memory as long as power is supplied to the system unlike DRAM, which has to be refreshed periodically. As such, SRAM is faster but also more expensive, making DRAM the more prevalent memory in computer systems.

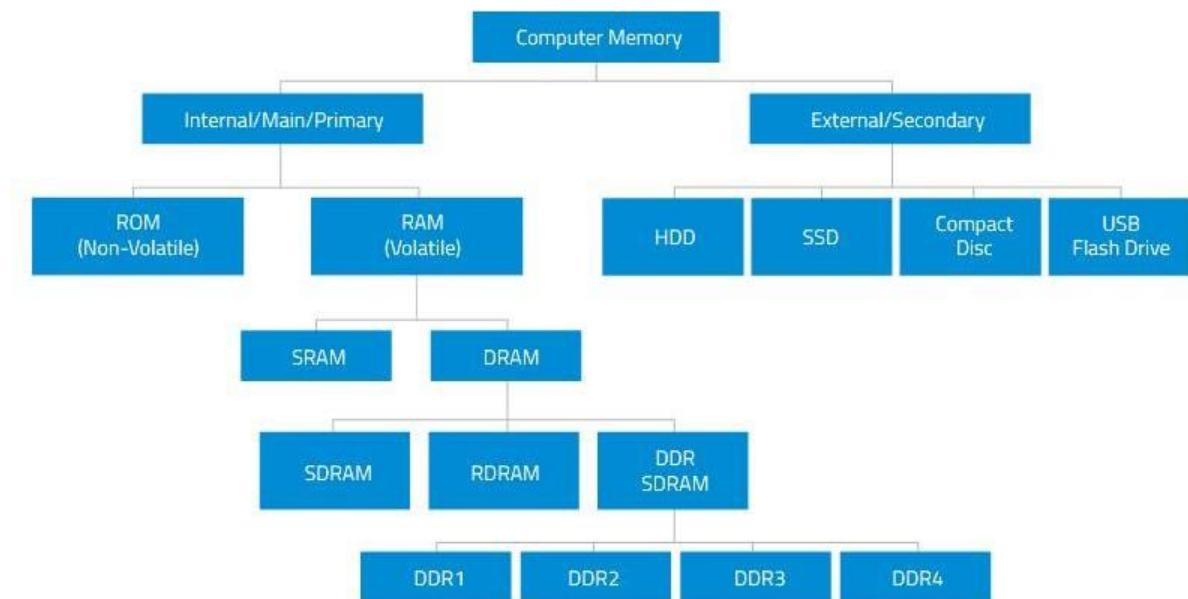
What are the common types of DRAM?

Synchronous DRAM (SDRAM) "synchronizes" the memory speed with CPU clock speed so that the memory controller knows the exact clock cycle when the requested data will be ready. This allows the CPU to perform more instructions at a given time. Typical SDRAM transfers data at speeds up to 133 MHz.

Rambus DRAM (RDRAM) takes its name after the company that made it, Rambus. It was popular in the early 2000s and was mainly used for video game devices and graphics cards, with transfer speeds up to 1 GHz.

Double Data Rate SDRAM (DDR SDRAM) is a type of synchronous memory that nearly doubles the bandwidth of a single data rate (SDR) SDRAM running at the same clock frequency by employing a method called "double pumping," which allows transfer of data on both the rising and falling edges of the clock signal without any increase in clock frequency.

DDR1 SDRAM has been succeeded by DDR2, DDR3, and most recently, DDR4 SDRAM. Although operating on the same principles, the modules are not backward-compatible. Each generation delivers higher transfer rates and faster performance. The latest DDR4 modules, for example, feature fast transfer rates at 2133/2400/2666 and even 3200 MT/s.



What are the types of DRAM packages?

Single In-Line Memory Module (SIMM)

SIMM modules were widely used from the late 1980s to 1990s, and are now obsolete. They typically had 32-bit data bus and were available in two physical types—30- and 72-pin.

Dual In-Line Memory Module (DIMM)

Current memory modules come in DIMMs. "Dual in-line" refers to pins on both sides of the modules. A DIMM originally had a 168-pin connector supporting 64-bit data bus, which is twice the data width of SIMMs. The wider bus means that more data can pass through a DIMM, translating to faster overall performance. Latest DIMMs based on fourth-generation double data rate (DDR4) SDRAM have 288-pin connectors for increased data throughput.

What are the common types of DIMM?

There are several DIMM architectures. Different platforms can accommodate different memory types so it is best to check which modules are supported on the motherboard. Here are the most common standard DIMMs, with a typical length of 133.35 mm and height of 30 mm.

3. DAUGHTER CARD

A daughterboard (or *daughter board* , *daughter card* , or *daughter card*) is a circuit board that plugs into and extends the circuitry of another circuit board. The other circuit board may be the computer's main board (its motherboard) or it may be another board or card that is already in the computer, often a sound card. The term is commonly used by manufacturers of wavetable daughter boards that attach to existing sound cards.

A mezzanine card is a kind of daughterboard that is installed in the same plane as but on a second level above the motherboard.

A printed circuit board that plugs into another circuit board (usually the motherboard). A daughtercard is similar to an expansion board, but it accesses the motherboard components (memory and CPU) directly instead of sending data through the slower expansion bus.

A daughtercard is also called a daughterboard.



A motherboard with daughterboard

4.BUS SLOTS

Alternatively known as a bus slot or expansion port, an expansion slot is a connection or port inside a computer on the motherboard or riser card. It provides an installation point for a hardware expansion card to be connected. For example, if you wanted to install a new video card in the computer, you'd purchase a video expansion card and install that card into the compatible expansion slot.

Computer expansion slots

AGP - Video card.

AMR - Modem, sound card.

CNR - Modem, network card, sound card.

EISA - SCSI, network card, video card.

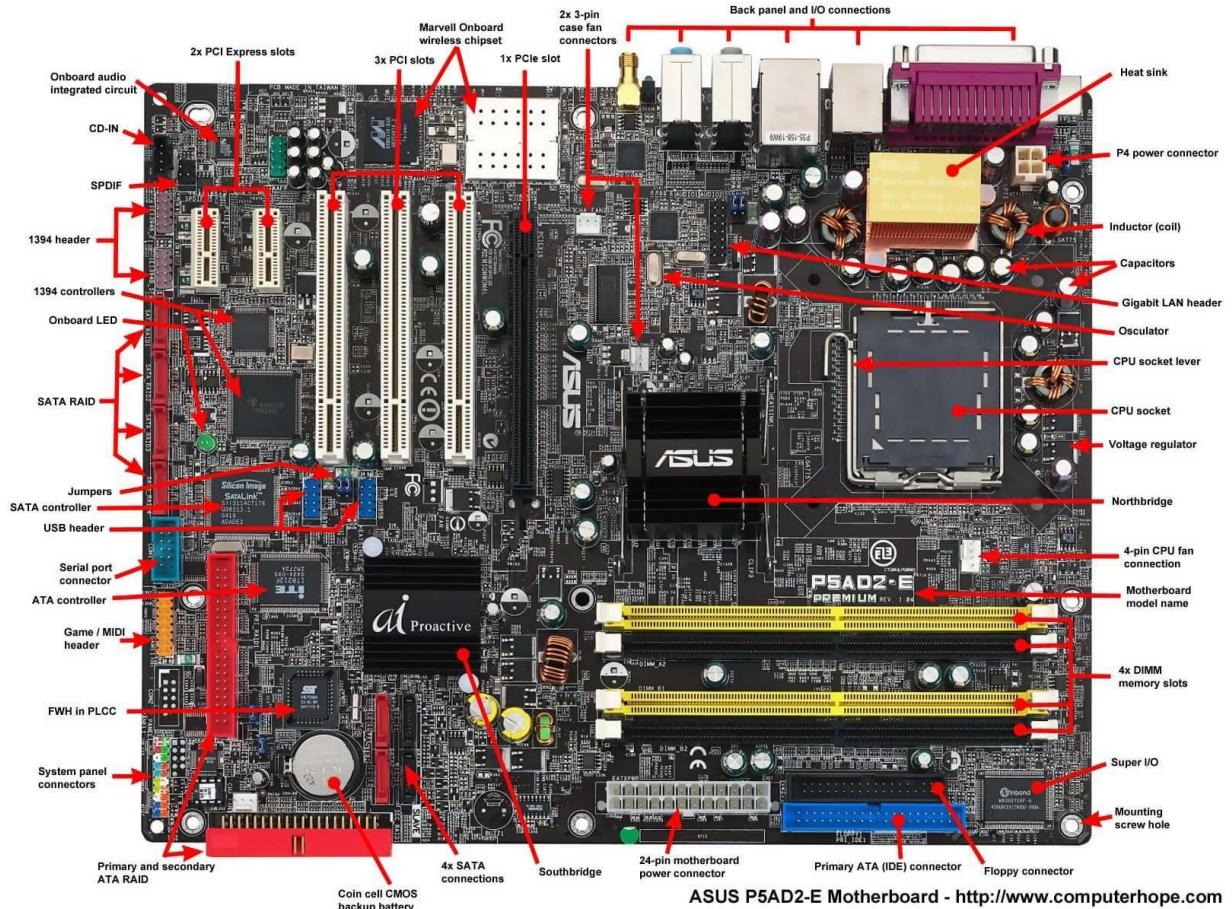
ISA - Network card, sound card, video card.

PCI - Network card, SCSI, sound card, video card.

PCI Express - Video card, modem, sound card, network card.

VESA - Video card.

Many of the expansion card slots above are obsolete. You're most likely only going to encounter AGP, PCI, and PCI Express when working with computers today. The picture below is an example of what expansion slots may look like on a motherboard. In this picture, there are three different types of expansion slots: PCI Express, PCI, and AGP.



5. SMPS: Switched-Mode Power Supply/ Switching Mode Power Supply

SMPS stands for Switched-Mode Power Supply. It is an electronic power supply that uses a switching regulator to convert electrical power efficiently. It is also known as Switching Mode Power Supply. It is power supply unit (PSU) generally used in computers to convert the voltage into the computer acceptable range.

This device has the power handling electronic components that converts electrical power efficiently. Switched Mode Power Supply uses a great power conversion technique to reduce overall power loss.



The SMPS device uses switching regulators that switches the load current on and off to regulate and stabilize the output voltage. The average of the voltage between the off and on produces the appropriate power for a device. Unlike the linear power supply, the pass transistor of SMPS switches between low dissipation, full-on and full-off mode, and spends very less time in the high-dissipation transitions, which minimizes wasted energy.

6. INTERNAL STORAGE DEVICES

Internal storage can mean several different things, but most often refers to a computer's internal hard drive. This is the primary storage device used to store a user's files and applications. If a computer has multiple internal hard drives, they are all considered part of the computer's internal storage.

Another popular type of internal storage is flash memory. It serves the same purpose as a hard drive, but stores data electronically rather than magnetically. Flash memory is the most common type of internal storage used by portable electronic devices, such as mobile phones and portable music players. Some computers now use flash drives rather than hard drives as well.

Internal storage can be contrasted with external storage, which includes devices such as external hard drives, network drives, and removable media, such as CDs and DVDs.

Primary storage

Main article: Computer memory

Primary storage (also known as main memory, internal memory or prime memory), often referred to simply as memory, is the only one directly accessible to the CPU. The CPU continuously reads instructions stored there and executes them as required. Any data actively operated on is also stored there in uniform manner.

Historically, early computers used delay lines, Williams tubes, or rotating magnetic drums as primary storage. By 1954, those unreliable methods were mostly replaced by magnetic core memory. Core memory remained dominant until the 1970s, when advances in integrated circuit technology allowed semiconductor memory to become economically competitive.

This led to modern random-access memory (RAM). It is small-sized, light, but quite expensive at the same time. (The particular types of RAM used for primary storage are also volatile, i.e. they lose the information when not powered).

As shown in the diagram, traditionally there are two more sub-layers of the primary storage, besides main large-capacity RAM:

Processor registers are located inside the processor. Each register typically holds a word of data (often 32 or 64 bits). CPU instructions instruct the arithmetic logic unit to perform various calculations or other operations on this data (or with the help of it). Registers are the fastest of all forms of computer data storage.

Processor cache is an intermediate stage between ultra-fast registers and much slower main memory. It was introduced solely to improve the performance of computers. Most actively used information in the main memory is just duplicated in the cache memory, which is faster, but of much lesser capacity. On the other hand, main memory is much slower, but has a much greater storage capacity than processor registers. Multi-level hierarchical cache setup is also commonly used—primary cache being smallest, fastest and located inside the processor; secondary cache being somewhat larger and slower.

Main memory is directly or indirectly connected to the central processing unit via a memory bus. It is actually two buses (not on the diagram): an address bus and a data bus. The CPU firstly sends a number through an address bus, a number called memory address, that indicates the desired location of data. Then it reads or writes the data in the memory cells using the data bus. Additionally, a memory management unit (MMU) is a small device between CPU and RAM recalculating the actual memory address, for example to provide an abstraction of virtual memory or other tasks.

As the RAM types used for primary storage are volatile (uninitialized at start up), a computer containing only such storage would not have a source to read instructions from, in order to start the computer. Hence, non-volatile primary storage containing a small startup program (BIOS) is used to bootstrap the computer, that is, to read a larger program from non-volatile secondary storage to RAM and start to execute it. A non-volatile technology used for this purpose is called ROM, for read-only memory (the terminology may be somewhat confusing as most ROM types are also capable of random access).

Many types of "ROM" are not literally read only, as updates to them are possible; however it is slow and memory must be erased in large portions before it can be re-written. Some embedded systems run programs directly from ROM (or similar), because such programs are rarely changed. Standard computers do not store non-rudimentary programs in ROM, and rather, use large capacities of secondary storage, which is non-volatile as well, and not as costly.

Recently, primary storage and secondary storage in some uses refer to what was historically called, respectively, secondary storage and tertiary storage.

Secondary storage



A hard disk drive with protective cover removed

Secondary storage (also known as external memory or auxiliary storage) differs from primary storage in that it is not directly accessible by the CPU. The computer usually uses its input/output channels to access secondary storage and transfer the desired data to primary storage. Secondary storage is non-volatile (retaining data when its power is shut off). Modern computer systems typically have two orders of magnitude more secondary storage than primary storage because secondary storage is less expensive.

In modern computers, hard disk drives (HDDs) or solid-state drives (SSDs) are usually used as secondary storage. The access time per byte for HDDs or SSDs is typically measured in milliseconds (one thousandth seconds), while the access time per byte for primary storage is measured in nanoseconds (one billionth seconds). Thus, secondary storage is significantly slower than primary storage. Rotating optical storage devices, such as CD and DVD drives, have even longer access times. Other examples of secondary storage technologies include USB flash drives, floppy disks, magnetic tape, paper tape, punched cards, and RAM disks.

Once the disk read/write head on HDDs reaches the proper placement and the data, subsequent data on the track are very fast to access. To reduce the seek time and rotational latency, data are transferred to and from disks in large contiguous blocks. Sequential or block access on disks is orders of magnitude faster than random access, and many sophisticated paradigms have been developed to design efficient algorithms based upon sequential and block access. Another way to reduce the I/O

bottleneck is to use multiple disks in parallel in order to increase the bandwidth between primary and secondary memory.

Secondary storage is often formatted according to a file system format, which provides the abstraction necessary to organize data into files and directories, while also providing metadata describing the owner of a certain file, the access time, the access permissions, and other information.

Most computer operating systems use the concept of virtual memory, allowing utilization of more primary storage capacity than is physically available in the system. As the primary memory fills up, the system moves the least-used chunks (pages) to a swap file or page file on secondary storage, retrieving them later when needed. If a lot of pages are moved to slower secondary storage, the system performance is degraded.

Tertiary storage

See also: Nearline storage and Cloud storage

A large tape library, with tape cartridges placed on shelves in the front, and a robotic arm moving in the back. Visible height of the library is about 180 cm.

Tertiary storage or tertiary memory[5] is a level below secondary storage. Typically, it involves a robotic mechanism which will mount (insert) and dismount removable mass storage media into a storage device according to the system's demands; such data are often copied to secondary storage before use. It is primarily used for archiving rarely accessed information since it is much slower than secondary storage (e.g. 5–60 seconds vs. 1–10 milliseconds). This is primarily useful for extraordinarily large data stores, accessed without human operators. Typical examples include tape libraries and optical jukeboxes.

When a computer needs to read information from the tertiary storage, it will first consult a catalog database to determine which tape or disc contains the information. Next, the computer will instruct a robotic arm to fetch the medium and place it in a drive. When the computer has finished reading the information, the robotic arm will return the medium to its place in the library.

Tertiary storage is also known as nearline storage because it is "near to online". The formal distinction between online, nearline, and offline storage is:[6]

Online storage is immediately available for I/O.

Nearline storage is not immediately available, but can be made online quickly without human intervention.

Offline storage is not immediately available, and requires some human intervention to become online.

For example, always-on spinning hard disk drives are online storage, while spinning drives that spin down automatically, such as in massive arrays of idle disks (MAID), are nearline storage. Removable media such as tape cartridges that can be automatically loaded, as in tape libraries, are nearline storage, while tape cartridges that must be manually loaded are offline storage.

Off-line storage

Off-line storage is a computer data storage on a medium or a device that is not under the control of a processing unit. The medium is recorded, usually in a secondary or tertiary storage device, and then physically removed or disconnected. It must be inserted or connected by a human operator before a computer can access it again. Unlike tertiary storage, it cannot be accessed without human interaction.

Off-line storage is used to transfer information, since the detached medium can easily be physically transported. Additionally, its useful for cases of disaster, where, for example, a fire destroys the original data, a medium in a remote location will be unaffected, enabling disaster recovery. Off-line storage increases general information security, since it is physically inaccessible from a computer, and data confidentiality or integrity cannot be affected by computer-based attack techniques. Also, if the information stored for archival purposes is rarely accessed, off-line storage is less expensive than tertiary storage

7.INTERFACE PORT

A **port** is basically a physical docking point which is basically used to connect the external devices to the computer, or we can say that A port act as an interface between the computer and the external devices, e.g., we can connect hard drives, printers to the computer with the help of ports.

Features of Computer ports:

- We can connect external devices to the computer with the help of ports and cables.
- These are basically slots on motherboard where we connect external devices, or we can plug in external devices through cables.
- Mouse, keyboards, printers, speakers are some examples of external devices that connected to the computer through ports.

Types of ports:

Serial ports –

A serial port is basically a serial communication interface through which information transforms one bit at a time. It is one of the oldest type of interfaces.

- These are basically used for external modems.

- These are basically available in two versions in market these are 9 pins, 25 pin models.
- Data travels at a speed of 115 kilo-bits per second.

Parallel ports –

A parallel port is basically a parallel communication interface through which information transforms multiple bits at a time.

- These are basically used to connect peripherals such as scanners or printers.
- These are also known as printer ports.
- These are available in a 25 pin model.
- Data travels at a speed of 150 kilo bits per second.

PS/2 ports –

These are basically 6 pin mini Din connector used to connect keyboard, mice to a PC compatible computers.

- These are basically used by old computers for connecting mouse or keyboard.
- These are called mouse ports.
- These ports are still favoured in organisation for security reason.
- These ports provides no restriction on key rollover.

Universal serial bus port –

It is basically a standard cable connection interface between computer and external device. USB is an industrial standard for short-distance digital data communication.

- Basically it can connect all types of external devices to the computer such as mouse, keyboard, printers, speakers etc.
- These ports were introduced in 1997.
- Minimum 2 ports are there in every computer system.
- Data basically travels at a speed of 14mb/s which is much faster than serial port.
- The devices that uses USB port gets power from a USB port.

VGA Ports –

VGA connector stands for Video Graphic Array connector, these are basically 15 pin connector available in many video-cards, computer, projectors etc.

- It is used to connect monitor to computer's video card.
- It is 15 pin connector.
- These were introduced by IBM in 1987.
- VGA basically utilizes analog signal hence it can only be used to lower resolution or we can say VGA is only capable of lowering the resolution.

These are some of the common ports available in computer system. Except these there are many more ports available in computer. These are as follows:

Modem Port:

These are basically used to connect PC's modem to telephone networks.

Ethernet Port:

These are basically used to connect Ethernet cables to the computer. In this data may travel with a speed of 10mb/s to 100 mb/s based on the network bandwidth.

Game Port:

These ports are available in computer to connect joysticks which are now replaced by USB.

Digital Video Interface or we can say DVI Port these are basically used to connect flat panel LCD Monitor to the computer's high end video graphics.

Sockets:

Sockets are basically used to connect microphone or speakers to the sound card of the computer.

Auto-detect or auto-detection ports are usually plug-and-play, but they offer another type of convenience. An auto-detect port may automatically determine what kind of device has been attached, but it also determines what purpose the port itself should have. For example, some sound cards allow plugging in several different types of audio speakers; then a dialogue box pops up on the computer screen asking whether the speaker is left, right, front, or rear for surround sound installations. The user's response determines the purpose of the port, which is physically a 1/8" tip-ring-sleeve mini jack. Some auto-detect ports can even switch between

ASSIGNMENT-3 Basic Linux Commands

1.usermod

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

```
jeena@jeena-VirtualBox:~/Networklab$ usermod -u
usermod: option requires an argument -- 'u'
Usage: usermod [options] LOGIN

Options:
  -b, --badnames          allow bad names
  -c, --comment COMMENT   new value of the GECOS field
  -d, --home HOME_DIR     new home directory for the user account
  -e, --expiredate EXPIRE_DATE set account expiration date to EXPIRE_DATE
  -f, --inactive INACTIVE  set password inactive after expiration
                           to INACTIVE
  -g, --gid GROUP          force use GROUP as new primary group
  -G, --groups GROUPS      new list of supplementary GROUPS
  -a, --append              append the user to the supplemental GROUPS
                           mentioned by the -G option without removing
                           the user from other groups
  -h, --help                display this help message and exit
  -l, --login NEW_LOGIN    new value of the login name
  -L, --lock                 lock the user account
  -m, --move-home           move contents of the home directory to the
                           new location (use only with -d)
  -o, --non-unique          allow using duplicate (non-unique) UID
  -p, --password PASSWORD   use encrypted password for the new password
  -R, --root CHROOT_DIR     directory to chroot into
  -P, --prefix PREFIX_DIR   prefix directory where are located the /etc/* files
  -s, --shell SHELL          new login shell for the user account
  -u, --uid UID              new UID for the user account
  -U, --unlock               unlock the user account
  -v, --add-subuids FIRST-LAST add range of subordinate uids
  -V, --del-subuids FIRST-LAST remove range of subordinate uids
  -w, --add-subgids FIRST-LAST add range of subordinate gids
  -W, --del-subgids FIRST-LAST remove range of subordinate gids
  -Z, --selinux-user SEUSER   new SELinux user mapping for the user account
```

```
jeena@jeena-VirtualBox:~/Networklab$ usermod -u 2000 jeena
usermod: user jeena is currently used by process 654
jeena@jeena-VirtualBox:~/Networklab$
```

1.groupadd

- groupadd command creates a new group account using the values specified on the command line and the default values from the system.

```
jeena@jeena-VirtualBox:~/Networklab$ sudo groupadd study
[sudo] password for jeena:
jeena@jeena-VirtualBox:~/Networklab$
```

2.groups

- print the groups a user is in

```
#groups alice
```

```
jeena@jeena-VirtualBox:~/Networklab$ groups jeena
jeena : jeena adm cdrom sudo dip plugdev lpadmin lxd sambashare
jeena@jeena-VirtualBox:~/Networklab$
```

3.groupdel

- groupdel command modifies the system account files, deleting all entries that refer to group. The named group must exist

```
#groupdel group3
```

```
jeena@jeena-VirtualBox:~/Networklab$ sudo groupdel study
[sudo] password for jeena:
Sorry, try again.
[sudo] password for jeena:
Sorry, try again.
[sudo] password for jeena:
jeena@jeena-VirtualBox:~/Networklab$
```

4.groupmod

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

```
#groupmod -n group1 group2
```

```
jeena@jeena-VirtualBox:~/Networklab$ sudo groupmod -n group1 jeena
jeena@jeena-VirtualBox:~/Networklab$
```

5.chmod

- To change directory permissions of file/ Directory in Linux.

- 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 tes

```
jeena@jeena-VirtualBox:~/Networklab$ chmod +rwx mk
jeena@jeena-VirtualBox:~/Networklab$
```

6.chown

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

```
jeena@jeena-VirtualBox:~/Networklab$ chown jeena lab.txt  
jeena@jeena-VirtualBox:~/Networklab$
```

7.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.

- #id

```
jeena@jeena-VirtualBox:~/Networklab$ id  
uid=1000(jeena) gid=1000(group1) groups=1000(group1),4(adm),24(cdrom),27(sudo),30(dip),46(plugdev),120(lpadmin),131(lxd),132(sambashare)  
jeena@jeena-VirtualBox:~/Networklab$
```

8.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
```

```
jeena@jeena-VirtualBox:~/Networklab$ ps -a  
PID TTY      TIME CMD  
 713 tty2    00:00:12 Xorg  
 845 tty2    00:00:00 gnome-session-b  
1557 pts/3    00:00:00 ps  
jeena@jeena-VirtualBox:~/Networklab$
```

9. top

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

```
#top -u
```

ASSIGNMENT-4 :Basic Linux Commands

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.



The screenshot shows a terminal window with the following session:

```
jeena@jeena-VirtualBox:~$ cd Networklab
jeena@jeena-VirtualBox:~/Networklab$ wc
JEENA
meenu
jeethu^C
jeena@jeena-VirtualBox:~/Networklab$ cat >mk
jeenamathew
^C
jeena@jeena-VirtualBox:~/Networklab$ wc -c mk
12 mk
jeena@jeena-VirtualBox:~/Networklab$
```

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

```
jeena@jeena-VirtualBox:~/Networklab$ cat > Archive1.tar
the world famous
^C
jeena@jeena-VirtualBox:~/Networklab$ ls Archive1.tar
Archive1.tar
jeena@jeena-VirtualBox:~/Networklab$
```

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.

```
jeena@jeena-VirtualBox:~/Networklab$ expr 10 + 18
28
jeena@jeena-VirtualBox:~/Networklab$
```

1. Redirections & Piping 7

- 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.

```
jeena@jeena-VirtualBox:~/Networklab$ ls -l | wc -l
5
jeena@jeena-VirtualBox:~/Networklab$
```

2.ssh-keygen

Ssh-keygen command to generate a public/private authentication

```
jeena@jeena-VirtualBox:~/Networklab$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/jeena/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/jeena/.ssh/id_rsa
Your public key has been saved in /home/jeena/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:Im96ErTzuXPRhtwBqY5gftKPJy5i8/J0YF3stj+0VvE jeena@jeena-VirtualBox
The key's randomart image is:
+---[RSA 3072]----+
|          .       |
|         . o      |
|        + .       |
|   o o + ..     |
| o *.=.+S+.o.   |
| + Ooo.=.+E     |
| + Boo.o       |
| .+o =oB.+     |
| ...=o=o=.o.   |
+---[SHA256]----+
jeena@jeena-VirtualBox:~/Networklab$
```

ASSIGNMENT-5 :Networking and system Administation Lab

1. Lab Assignment 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.mp3

c. Create six files with name of the form filmX.mp3 (In each set, replace X with the numbers 1 through 6)

```
jeena@jeena-VirtualBox:~$ touch snapx1.mp3 snapx2.mp3 snapx3.mp3 snapx4.mp3 snapx5.mp3 snapx6.mp3
jeena@jeena-VirtualBox:~$ touch song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3
jeena@jeena-VirtualBox:~$ ls
Desktop      filesong.mp3   jeena1       snapx1.mp3   snapx6.mp3   song4.mp3   v1
Documents    friends       Music        snapx2.mp3   song1.mp3   song5.mp3   v3.txt
Downloads    J             Networklab  snapx3.mp3   song2.mp2   song6.mp3   Videos
family       jeena        Pictures     snapx4.mp3   song2.mp3   songs      work
file1        JEENA        Public       snapx5.mp3   song3.mp3   Templates
jeena@jeena-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.

```
jeena@jeena-VirtualBox:~$ mkdir PICTURES1
jeena@jeena-VirtualBox:~$ mkdir VIDEOS1
jeena@jeena-VirtualBox:~$ mv song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3
song6.mp3 ./PICTURES1/
jeena@jeena-VirtualBox:~$ mv snapx1.mp3 snapx2.mp3 snapx3.mp3 snapx4.mp3 snapx5.
.mp3 snapx6.mp3 ./VIDEOS1/
jeena@jeena-VirtualBox:~$ ls -R PICTURES1
PICTURES1:
song1.mp3  song2.mp3  song3.mp3  song4.mp3  song5.mp3  song6.mp3
jeena@jeena-VirtualBox:~$ ls -R VIDEOS1
VIDEOS1:
snapx1.mp3  snapx2.mp3  snapx3.mp3  snapx4.mp3  snapx5.mp3  snapx6.mp3
jeena@jeena-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.

```
jeena@jeena-VirtualBox:~$ ls
Desktop      file1        jeena       Networklab  song2.mp2   v3.txt
Documents    filesong.mp3  JEENA      Pictures     songs      Videos
Downloads    friends       jeena1     PICTURES1  Templates  VIDEOS1
Family       J             Music      Public      v1         work
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~$ rm -r family friends
jeena@jeena-VirtualBox:~$ ls
Desktop    filesong.mp3  jeena1      PICTURES1  Templates  VIDEOS1
Documents   J           Music       Public     v1          work
Downloads   jeena       Networklab song2.mp2  v3.txt
file1       JEENA       Pictures    songs      Videos
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~/songs$ rmdir FAMILY FRIENDS
jeena@jeena-VirtualBox:~/songs$
```

```
jeena@jeena-VirtualBox:~$ rmdir family friends
rmdir: failed to remove 'family': No such file or directory
rmdir: failed to remove 'friends': No such file or directory
jeena@jeena-VirtualBox:~$
```

6. Redirect a long listing of all home directory files, including hidden, into a file named allfiles.txt.

Confirm that the file contains the listing.

```
jeena@jeena-VirtualBox:~$ ls -a | > allfiles.txt
jeena@jeena-VirtualBox:~$ ls
allfiles.txt  Documents  file1      J  JEENA  Music      Pictures  Public    songs     v1      Videos   work
Desktop      Downloads  filesong.mp3 jeena  jenai Networklab  PICTURES1 song2.mp2 Templates  v3.txt  VIDEOS1
jeena@jeena-VirtualBox:~$ cat allfiles.txt
cat: allfiles.txt: No such file or directory
jeena@jeena-VirtualBox:~$ ls -al
total 128
drwxr-xr-x  25 jeena group1 4096 Aug 17 20:35 .
drwxr-xr-x  3 root  root  4096 Jun 12 14:23 ..
-rw-r--r--  1 jeena group1  0 Aug 17 20:41 allfiles.txt
-rw-----  1 jeena group1 2821 Aug 17 20:30 .bash_history
-rw-r--r--  1 jeena group1 220 Jun 12 14:23 .bash_logout
-rw-r--r--  1 jeena group1 3771 Jun 12 14:23 .bashrc
drwxr-xr-x 12 jeena group1 4096 Jun 12 14:28 .cache
drwxr-xr-x 12 jeena group1 4096 Aug 17 20:32 .config
drwxr-xr-x  2 jeena group1 4096 Jun 12 14:27 Desktop
drwxr-xr-x  2 jeena group1 4096 Jun 12 14:27 Documents
drwxr-xr-x  2 jeena group1 4096 Jun 12 14:27 Downloads
drwxrwxr-x  2 jeena group1 4096 Jun 13 22:32 file1
-rw-r--r--  1 jeena group1  33 Aug 17 20:03 filesong.mp3
drwxr----- 3 jeena group1 4096 Jun 22 10:47 .gnupg
drwxr-xr-x  2 root  root  4096 Aug 13 10:28 J
drwxrwxr-x  2 jeena group1 4096 Jun 13 22:52 jeena
drwxrwxr-x  2 jeena group1 4096 Aug 17 19:26 JEENA
-rw-rw-r--  1 jeena group1  11 Jun 22 11:12 jenai
drwxr----- 3 jeena group1 4096 Jun 12 14:27 .local
drwxr-xr-x  2 jeena group1 4096 Jun 12 14:27 Music
drwxrwxr-x  2 jeena group1 4096 Aug 13 21:32 Networklab
drwxr-xr-x  2 jeena group1 4096 Jun 13 22:06 Pictures
drwxr-xr-x  2 jeena group1 4096 Aug 17 20:14 PICTURES1
-rw-r--r--  1 jeena group1  807 Jun 12 14:23 .profile
drwxr-xr-x  2 jeena group1 4096 Jun 12 14:27 Public
-rw-r--r--  1 jeena group1  0 Aug 17 20:09 song2.mp2
drwxr-xr-x  6 jeena group1 4096 Aug 17 20:27 songs
drwxr----- 2 jeena group1 4096 Aug 13 21:14 .ssh
-rw-r--r--  1 jeena group1  0 Aug 13 10:22 .sudo_as_admin_successful
drwxr-xr-x  2 jeena group1 4096 Jun 12 14:27 Templates
drwxrwxr-x  2 jeena group1 4096 Jun 22 10:53 v1
-rw-rw-r--  1 jeena group1  26 Jun 22 10:55 v3.txt
drwxr-xr-x  2 jeena group1 4096 Jun 12 14:27 Videos
drwxr-xr-x  2 jeena group1 4096 Aug 17 20:15 VIDEOS1
drwxr-xr-x  2 jeena group1 4096 Aug 17 19:53 work
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~$ date
Tuesday 17 August 2021 08:43:53 PM IST
jeena@jeena-VirtualBox:~$
```

8. Add the user Juliet .

```
jeena@jeena-VirtualBox:~$ sudo useradd juliet
[sudo] password for jeena:
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~$ sudo useradd juliet
[sudo] password for jeena:
jeena@jeena-VirtualBox:~$ cat /etc/passwd
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:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd:/usr/sbin/nologin
systemd-timesync:x:102:104:systemd Time Synchronization,,,:/run/systemd:/usr/sbin/nologin
messagebus:x:103:106:/nonexistent:/usr/sbin/nologin
syslog:x:104:110:/home/syslog:/usr/sbin/nologin
_apt:x:105:65534:/nonexistent:/usr/sbin/nologin
tss:x:106:111:TPM software stack,,,:/var/lib/tpm:/bin/false
uuid:x:107:114:/run/uuid:/usr/sbin/nologin
tcpdump:x:108:115:/nonexistent:/usr/sbin/nologin
avahi-autoipd:x:109:116:Avahi autoip daemon,,,:/var/lib/avahi-autoipd:/usr/sbin/nologin
usbmux:x:110:46:usbmux daemon,,,:/var/lib/usbmux:/usr/sbin/nologin
rtkit:x:111:117:RealtimeKit,,,:/proc:/usr/sbin/nologin
dnsmasq:x:112:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
cups-pk-helper:x:113:120:user for cups-pk-helper service,,,:/home/cups-pk-helper:/usr/sbin/nologin
speech-dispatcher:x:114:29:Speech Dispatcher,,,:/run/speech-dispatcher:/bin/false
avahi:x:115:121:Avahi mDNS daemon,,,:/var/run/avahi-daemon:/usr/sbin/nologin
kernoops:x:116:65534:Kernel Oops Tracking Daemon,,,:/usr/sbin/nologin
saned:x:117:123:/var/lib/saned:/usr/sbin/nologin
nm-openvpn:x:118:124:NetworkManager OpenVPN,,,:/var/lib/openvpn/chroot:/usr/sbin/nologin
hplip:x:119:7:HPLIP system user,,,:/run/hplip:/bin/false
whoopst:x:120:125:/nonexistent:/bin/false
colord:x:121:126:colord colour management daemon,,,:/var/lib/colord:/usr/sbin/nologin
geoclue:x:122:127:/var/lib/geoclue:/usr/sbin/nologin
pulse:x:123:128:PulseAudio daemon,,,:/var/run/pulse:/usr/sbin/nologin
gnome-initial-setup:x:124:65534::/run/gnome-initial-setup/:/bin/false
gdm:x:125:130:Gnome Display Manager:/var/lib/gdm3:/bin/false
jeena:x:1000:1000:Jeena Mathew,,,:/home/jeena:/bin/bash
systemd-coredump:x:999:999:systemd Core Dumper:/:/usr/sbin/nologin
juliet:x:1001:/home/juliet:/bin/sh
```

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

```
jeena@jeena-VirtualBox:~$ sudo passwd juliet
New password:
Retype new password:
passwd: password updated successfully
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~$ sudo groupadd -g 30000 Shakespeare
jeena@jeena-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,jeena
tty:x:5:syslog
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:jeena
floppy:x:25:
tape:x:26:
sudo:x:27:jeena
audio:x:29:pulse
dip:x:30:jeena
www-data:x:33:
backup:x:34:
operator:x:37:
list:x:38:
irc:x:39:
src:x:40:
gnats:x:41:
shadow:x:42:
utmp:x:43:
video:x:44:
sasl:x:45:
plugdev:x:46:jeena
staff:x:50:
games:x:60:
users:x:100:
nogroup:x:65534:
systemd-journal:x:101:
systemd-network:x:102:
systemd-resolve:x:103:
systemd-timesync:x:104:
crontab:x:105:
messagebus:x:106:
input:x:107:
kvm:x:108:
render:x:109:
syslog:x:110:
tss:x:111:
```

```
avahi-autoipd:x:116:
atkkit:x:117:
ssh:x:118:
netdev:x:119:
lpadmin:x:120:jeena
avahi:x:121:
scanner:x:122:saned
saned:x:123:
nm-openvpn:x:124:
whoopsie:x:125:
colord:x:126:
geoclue:x:127:
pulse:x:128:
pulse-access:x:129:
gdm:x:130:
lxde:x:131:jeena
sambashare:x:132:jeena
systemd-coredump:x:999:
group1:x:1000:
juliet:x:1001:
Shakespeare:x:30000:
jeena@jeena-VirtualBox:~$
```

12. Create a supplementary group called artists.

```
jeena@jeena-VirtualBox:~$ sudo groupadd Artists
jeena@jeena-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,jeena
tty:x:5:syslog
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:jeena
floppy:x:25:
tape:x:26:
sudo:x:27:jeena
audio:x:29:pulse
dip:x:30:jeena
www-data:x:33:
backup:x:34:
operator:x:37:
list:x:38:
irc:x:39:
src:x:40:
```

```
nm-openvpn:x:124:
whoopsie:x:125:
colord:x:126:
geoclue:x:127:
pulse:x:128:
pulse-access:x:129:
gdm:x:130:
lxde:x:131:jeena
sambashare:x:132:jeena
systemd-coredump:x:999:
group1:x:1000:
juliet:x:1001:
Shakespeare:x:3000:
Artists:x:3001:
jeena@jeena-VirtualBox:~$
```

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

```
nm-openvpn:x:124:  
whoopsie:x:125:  
colord:x:126:  
geoclue:x:127:  
pulse:x:128:  
pulse-access:x:129:  
gdm:x:130:  
lxde:x:131:jeena  
sambashare:x:132:jeena  
systemd-coredump:x:999:  
group1:x:1000:  
juliet:x:1001:  
Shakespeare:x:3000:  
Artists:x:3001:  
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~$ sudo usermod -G Shakespeare juliet  
jeena@jeena-VirtualBox:~$ cat /etc/group  
root:x:0:  
daemon:x:1:  
bin:x:2:  
sys:x:3:  
adm:x:4:syslog,jeena  
tty:x:5:syslog  
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:jeena  
floppy:x:25:  
tape:x:26:  
sudo:x:27:jeena  
audio:x:29:pulse  
dip:x:30:jeena  
www-data:x:33:  
backup:x:34:  
operator:x:37:  
_x0f_x:131?jeena  
sambashare:x:132:jeena  
systemd-coredump:x:999:  
group1:x:1000:  
juliet:x:1001:  
Shakespeare:x:3000:juliet  
Artists:x:3001:  
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~$ id -u juliet
1001
jeena@jeena-VirtualBox:~$ id -g juliet
3000
```

16. Add Romeo and Hamlet to the Shakespeare group.

```
jeena@jeena-VirtualBox:~$ sudo useradd Romeoo
jeena@jeena-VirtualBox:~$ sudo useradd Hamlet
jeena@jeena-VirtualBox:~$ sudo usermod -G Shakespeare Romeoo
jeena@jeena-VirtualBox:~$ sudo usermod -G Shakespeare Hamlet
jeena@jeena-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,jeena
tty:x:5:syslog
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:jeena
floppy:x:25:
tape:x:26:
sudo:x:27:jeena
audio:x:29:pulse
romeo:x:3001:juliet,Romeoo,Hamlet
hamlet:x:3002:juliet,Romeoo,Hamlet
```

```
sambashare:x:132:jeena
systemd-coredump:x:999:
group1:x:1000:
juliet:x:1001:
Shakespeare:x:3000:juliet,Romeoo,Hamlet
Artists:x:3001:
Romeo:x:3002:
Romeoo:x:1002:
Hamlet:x:1003:
jeena@jeena-VirtualBox:~$
```

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

```
jeena@jeena-VirtualBox:~$ sudo useradd Reba
jeena@jeena-VirtualBox:~$ sudo useradd Dolly
jeena@jeena-VirtualBox:~$ Elvis
Elvis: command not found
jeena@jeena-VirtualBox:~$ sudo useradd Elvis
jeena@jeena-VirtualBox:~$ sudo usermod -G Artists Reba
jeena@jeena-VirtualBox:~$ sudo usermod -G Artists Dolly
jeena@jeena-VirtualBox:~$ sudo usermod -G Artists Elvis
jeena@jeena-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,jeena
tty:x:5:syslog
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:jeena
floppy:x:25:
tape:x:26:
juliet:x:1001:
Shakespeare:x:3000:juliet,Romeoo,Hamlet
Artists:x:3001:Reba,Dolly,Elvis
Romeo:x:3002:
Romeoo:x:1002:
Hamlet:x:1003:
Reba:x:1004:
Dolly:x:1005:
Elvis:x:1006:
jeena@jeena-VirtualBox:~$
```

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

```
juliet:x:1001:
Shakespeare:x:3000:juliet,Romeoo,Hamlet
Artists:x:3001:Reba,Dolly,Elvis
Romeo:x:3002:
Romeoo:x:1002:
Hamlet:x:1003:
Reba:x:1004:
Dolly:x:1005:
Elvis:x:1006:
jeena@jeena-VirtualBox:~$
```

19. Attempt to remove user Dolly.

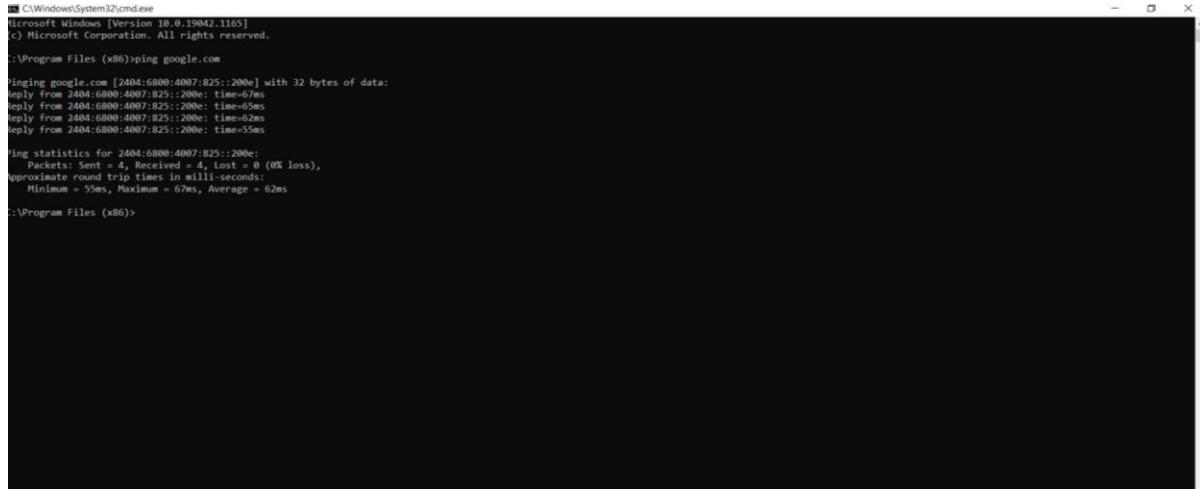
```
jeena@jeena-VirtualBox:~$ sudo userdel Dolly
jeena@jeena-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,jeena
tty:x:5:syslog
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:20:
fax:x:21:
voice:x:22:
cdrom:x:24:jeena
```

```
sambashare:x:132:jeena
systemd-coredump:x:999:
group1:x:1000:
juliet:x:1001:
Shakespeare:x:3000:juliet,Romeoo,Hamlet
Artists:x:3001:Reba,Elvis
Romeo:x:3002:
Romeooo:x:1002:
Hamlet:x:1003:
Reba:x:1004:
Elvis:x:1006:
jeena@jeena-VirtualBox:~$
```

Submission date :13-9-21//

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

Windows ,Ping



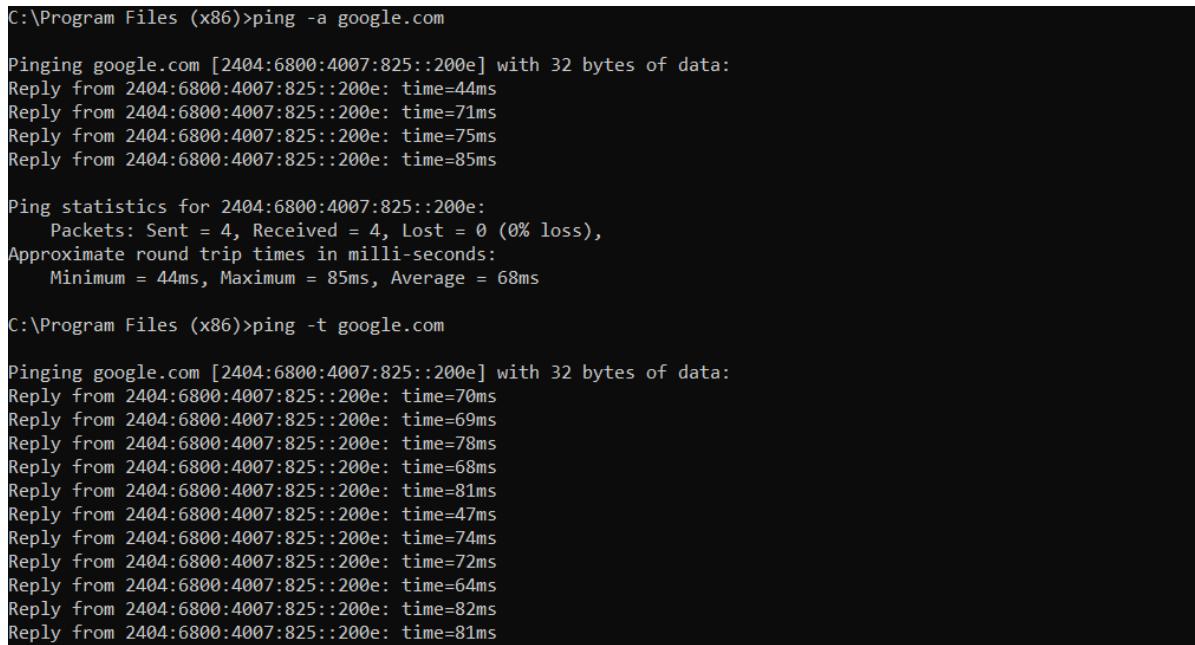
```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19042.1165]
(c) Microsoft Corporation. All rights reserved.

C:\Program Files (x86)\ping google.com

Pinging google.com [2404:6800:4007:825::200e] with 32 bytes of data:
Reply from 2404:6800:4007:825::200e: time=67ms
Reply from 2404:6800:4007:825::200e: time=65ms
Reply from 2404:6800:4007:825::200e: time=62ms
Reply from 2404:6800:4007:825::200e: time=55ms

Ping statistics for 2404:6800:4007:825::200e:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 55ms, Maximum = 67ms, Average = 62ms

C:\Program Files (x86)\>
```



```
C:\Program Files (x86)\>ping -a google.com

Pinging google.com [2404:6800:4007:825::200e] with 32 bytes of data:
Reply from 2404:6800:4007:825::200e: time=44ms
Reply from 2404:6800:4007:825::200e: time=71ms
Reply from 2404:6800:4007:825::200e: time=75ms
Reply from 2404:6800:4007:825::200e: time=85ms

Ping statistics for 2404:6800:4007:825::200e:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 44ms, Maximum = 85ms, Average = 68ms

C:\Program Files (x86)\>ping -t google.com

Pinging google.com [2404:6800:4007:825::200e] with 32 bytes of data:
Reply from 2404:6800:4007:825::200e: time=70ms
Reply from 2404:6800:4007:825::200e: time=69ms
Reply from 2404:6800:4007:825::200e: time=78ms
Reply from 2404:6800:4007:825::200e: time=68ms
Reply from 2404:6800:4007:825::200e: time=81ms
Reply from 2404:6800:4007:825::200e: time=47ms
Reply from 2404:6800:4007:825::200e: time=74ms
Reply from 2404:6800:4007:825::200e: time=72ms
Reply from 2404:6800:4007:825::200e: time=64ms
Reply from 2404:6800:4007:825::200e: time=82ms
Reply from 2404:6800:4007:825::200e: time=81ms
```

```
C:\Program Files (x86)>ping -j google.com

Pinging google.com [142.250.182.174] with 32 bytes of data:
General failure.
General failure.
General failure.
General failure.

Ping statistics for 142.250.182.174:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Program Files (x86)>ping -4 google.com

Pinging google.com [142.250.182.174] with 32 bytes of data:
Reply from 142.250.182.174: bytes=32 time=107ms TTL=111
Reply from 142.250.182.174: bytes=32 time=102ms TTL=111
Reply from 142.250.182.174: bytes=32 time=100ms TTL=111
Reply from 142.250.182.174: bytes=32 time=114ms TTL=111

Ping statistics for 142.250.182.174:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
  Minimum = 100ms, Maximum = 114ms, Average = 105ms

C:\Program Files (x86)>
```

Route

```
C:\Program Files (x86)>route print
=====
Interface List
13...f8 b4 6a 70 c1 47 ....Realtek Gaming GbE Family Controller
8...0a 00 27 00 00 08 ....VirtualBox Host-Only Ethernet Adapter
7...d4 d2 52 a7 c6 47 ....Microsoft Wi-Fi Direct Virtual Adapter
11...d6 d2 52 a7 c6 46 ....Microsoft Wi-Fi Direct Virtual Adapter #2
18...d4 d2 52 a7 c6 46 ....Intel(R) Wireless-AC 9560 160MHz
15...d4 d2 52 a7 c6 4a ....Bluetooth Device (Personal Area Network)
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask        Gateway       Interface Metric
          0.0.0.0        0.0.0.0    192.168.132.13  192.168.132.171    50
        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
        192.168.56.0    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
        192.168.132.0    255.255.255.0        On-link    192.168.132.171   306
 192.168.132.171  255.255.255.255  On-link    192.168.132.171   306
 192.168.132.255  255.255.255.255  On-link    192.168.132.171   306
        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    192.168.132.171   306
 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    192.168.132.171   306
=====

Persistent Routes:
  None

IPv6 Route Table
=====
Active Routes:
If Metric Network Destination      Gateway
18      66 ::/0                    fe80::b864:16ff:fe33:f09f
 1      331 ::1/128                On-link
18      66 2409:4073:2083:3395::/64 On-link
18      306 2409:4073:2083:3395:1df3:d43c:ed7a:6aac/128
                                         On-link
18      306 2409:4073:2083:3395:9081:c95d:fb2:c05c/128
                                         On-link
 8      281 fe80::/64              On-link
=====
```

```
C:\Program Files (x86)>route print -4
=====
Interface List
13...f8 b4 6a 70 c1 47 ....Realtek Gaming GbE Family Controller
 8...0a 00 27 00 00 08 ....VirtualBox Host-Only Ethernet Adapter
 7...d4 d2 52 a7 c6 47 ....Microsoft Wi-Fi Direct Virtual Adapter
11...d6 d2 52 a7 c6 46 ....Microsoft Wi-Fi Direct Virtual Adapter #2
18...d4 d2 52 a7 c6 46 ....Intel(R) Wireless-AC 9560 160MHz
15...d4 d2 52 a7 c6 4a ....Bluetooth Device (Personal Area Network)
 1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask        Gateway       Interface Metric
          0.0.0.0      0.0.0.0    192.168.132.13  192.168.132.171    50
         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
        192.168.56.0  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
        192.168.132.0  255.255.255.0        On-link  192.168.132.171    306
 192.168.132.171  255.255.255.255        On-link  192.168.132.171    306
 192.168.132.255  255.255.255.255        On-link  192.168.132.171    306
        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  192.168.132.171    306
 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  192.168.132.171    306
=====
Persistent Routes:
  None

C:\Program Files (x86)>
```

```
C:\Program Files (x86)>route print -6
=====
Interface List
 13...f8 b4 6a 70 c1 47 ....Realtek Gaming GbE Family Controller
  8...0a 00 27 00 00 08 ....VirtualBox Host-Only Ethernet Adapter
  7...d4 d2 52 a7 c6 47 ....Microsoft Wi-Fi Direct Virtual Adapter
 11...d6 d2 52 a7 c6 46 ....Microsoft Wi-Fi Direct Virtual Adapter #2
 18...d4 d2 52 a7 c6 46 ....Intel(R) Wireless-AC 9560 160MHz
 15...d4 d2 52 a7 c6 4a ....Bluetooth Device (Personal Area Network)
  1.....Software Loopback Interface 1
=====

IPv6 Route Table
=====
Active Routes:
 If Metric Network Destination      Gateway
 18     66 ::/0                      fe80::b864:16ff:fe33:f09f
   1    331 ::1/128                  On-link
 18     66 2409:4073:2083:3395::/64  On-link
 18     306 2409:4073:2083:3395:1df3:d43c:ed7a:6aac/128
                                         On-link
 18     306 2409:4073:2083:3395:9081:c95d:fb2:c05c/128
                                         On-link
   8    281 fe80::/64                On-link
 18     306 fe80::/64                On-link
   8    281 fe80::8c34:4a4b:ba8a:750e/128
                                         On-link
 18     306 fe80::9081:c95d:fb2:c05c/128
                                         On-link
   1    331 ff00::/8                On-link
   8    281 ff00::/8                On-link
 18     306 ff00::/8                On-link
=====

Persistent Routes:
  None
=====

C:\Program Files (x86)>
```

```
C:\Program Files (x86)>route print *157
=====
Interface List
13...f8 b4 6a 70 c1 47 ....Realtek Gaming GbE Family Controller
 8...0a 00 27 00 00 08 ....VirtualBox Host-Only Ethernet Adapter
 7...d4 d2 52 a7 c6 47 ....Microsoft Wi-Fi Direct Virtual Adapter
11...d6 d2 52 a7 c6 46 ....Microsoft Wi-Fi Direct Virtual Adapter #2
18...d4 d2 52 a7 c6 46 ....Intel(R) Wireless-AC 9560 160MHz
15...d4 d2 52 a7 c6 4a ....Bluetooth Device (Personal Area Network)
 1.....Software Loopback Interface 1
=====

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

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

C:\Program Files (x86)>
```

Tracert

```
C:\Program Files (x86)>tracert 192.168.1.1
```

```
Tracing route to 192.168.1.1 over a maximum of 30 hops
```

1	2 ms	2 ms	1 ms	192.168.132.13
2	*	*	*	Request timed out.
3	89 ms	63 ms	67 ms	10.72.238.163
4	75 ms	56 ms	73 ms	192.168.35.236
5	88 ms	76 ms	60 ms	192.168.35.241
6	67 ms	63 ms	53 ms	172.26.76.6
7	72 ms	76 ms	72 ms	172.26.76.19
8	93 ms	92 ms	142 ms	192.168.64.6
9	*	*	*	Request timed out.
10	*	*	*	Request timed out.
11	*	^C		

```
C:\Program Files (x86)>tracert www.google.com
```

```
Tracing route to www.google.com [2404:6800:4002:81f::2004]  
over a maximum of 30 hops:
```

1	3 ms	3 ms	2 ms	2409:4073:2083:3395::db
2	*	*	*	Request timed out.
3	547 ms	472 ms	478 ms	2405:200:366:a161:4::ff03
4	454 ms	94 ms	54 ms	2405:200:801:3500::1e4
5	84 ms	80 ms	97 ms	2405:200:801:3500::1e3
6	163 ms	82 ms	421 ms	2405:200:801:3500::1eb
7	*	*	*	Request timed out.
8	81 ms	84 ms	66 ms	2001:4860:1:1::8f2
9	119 ms	117 ms	122 ms	2404:6800:813d::1
10	*	*	*	Request timed out.
11	784 ms	397 ms	101 ms	2001:4860:0:133f::9
12	172 ms	115 ms	177 ms	2001:4860::9:4001:ddce
13	198 ms	111 ms	128 ms	2001:4860:0:11dd::1
14	122 ms	110 ms	111 ms	2001:4860:0:1::53a9
15	138 ms	123 ms	103 ms	del12s02-in-x04.1e100.net [2404:6800:4002:81f::2004]

```
Trace complete.
```

```
C:\Program Files (x86)>
```

```
C:\Program Files (x86)>tracert -d www.yahoo.com
```

```
Tracing route to new-fp-shd.wg1.b.yahoo.com [2406:2000:e4:1605::9001]
over a maximum of 30 hops:
```

1	2 ms	2 ms	1 ms	2409:4073:2083:3395::db
2	*	*	*	Request timed out.
3	78 ms	76 ms	64 ms	2405:200:366:a161:4::ff03
4	84 ms	66 ms	56 ms	2405:200:801:3500::1e0
5	174 ms	117 ms	105 ms	2405:200:801:3500::1e1
6	1302 ms	3570 ms	948 ms	2405:200:801:3500::1ef
7	*	*	*	Request timed out.
8	*	*	*	Request timed out.
9	*	*	*	Request timed out.
10	132 ms	152 ms	137 ms	2406:2000:f015:7::1
11	99 ms	121 ms	118 ms	2406:2000:e4:fe00::1
12	136 ms	123 ms	115 ms	2406:2000:e4:fa18::1
13	167 ms	147 ms	125 ms	2406:2000:e4:e208::1
14	118 ms	106 ms	110 ms	2406:2000:e4:1605::9001

```
Trace complete.
```

```
C:\Program Files (x86)>tracert 22.110.0.1
```

```
Tracing route to 22.110.0.1 over a maximum of 30 hops
```

1	3 ms	1 ms	4 ms	192.168.132.13
2	*	*	*	Request timed out.
3	83 ms	84 ms	78 ms	10.72.238.99
4	90 ms	130 ms	63 ms	192.168.35.236
5	130 ms	80 ms	83 ms	192.168.35.239
6	50 ms	62 ms	74 ms	172.26.76.6
7	171 ms	117 ms	157 ms	172.26.76.19
8	73 ms	61 ms	79 ms	192.168.64.4
9	247 ms	144 ms	165 ms	192.168.64.7
10	950 ms	171 ms	641 ms	172.31.2.73
11	120 ms	87 ms	100 ms	103.198.140.176
12	344 ms	324 ms	182 ms	103.198.140.106
13	280 ms	316 ms	318 ms	103.198.140.29
14	355 ms	359 ms	213 ms	103.198.140.106
15	246 ms	483 ms	315 ms	hurricane.mrs.franceix.net [37.49.232.13]
16	239 ms	304 ms	417 ms	port-channel1.core2.mrs1.he.net [184.104.197.42]
17	303 ms	322 ms	220 ms	ve952.core1.bio1.he.net [184.104.196.78]
18	513 ms	523 ms	322 ms	100ge0-30.core1.orf2.he.net [184.105.64.122]
19	428 ms	318 ms	612 ms	100ge15-1.core2.ash1.he.net [184.105.64.121]
20	*	*	*	Request timed out.
21	*	*	*	Request timed out.
22	*	*	*	Request timed out.
23	*	*	*	Request timed out.
24	*	*	*	Request timed out.
25	*	*	*	Request timed out.
26	*	*	*	Request timed out.
27	*	*	*	Request timed out.
28	*	*	*	Request timed out.
29	*	*	*	Request timed out.
30	*	*	*	Request timed out.

```
Trace complete.
```

Nslookup

```
C:\Program Files (x86)>nslookup
Default Server: UnKnown
Address: 192.168.132.13

>
>
C:\Program Files (x86)>nslookup google.com
Server: UnKnown
Address: 192.168.132.13

Non-authoritative answer:
Name: google.com
Addresses: 2404:6800:4007:817::200e
           142.250.194.238

C:\Program Files (x86)>nslookup -q=MX google.com
Server: UnKnown
Address: 192.168.132.13

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

C:\Program Files (x86)>
```

```
C:\Program Files (x86)>nslookup -type=ns google.com
Server: UnKnown
Address: 192.168.132.13

Non-authoritative answer:
google.com      nameserver = ns3.google.com
google.com      nameserver = ns4.google.com
google.com      nameserver = ns1.google.com
google.com      nameserver = ns2.google.com

C:\Program Files (x86)>
```

Ipconfig


```
C:\Program Files (x86)>ipconfig /allcompartments

Windows IP Configuration

====

Network Information for Compartment 1 (ACTIVE)
=====

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::8c34:4a4b:ba8a:750e%8
    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* 10:

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

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . :
    IPv6 Address. . . . . : 2409:4073:2083:3395:9081:c95d:fb2:c05c
    Temporary IPv6 Address. . . . . : 2409:4073:2083:3395:1df3:d43c:ed7a:6aac
    Link-local IPv6 Address . . . . . : fe80::9081:c95d:fb2:c05c%18
    IPv4 Address. . . . . : 192.168.132.171
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::b864:16ff:fe33:f09f%18
                                192.168.132.13

Ethernet adapter Bluetooth Network Connection:

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

```
C:\Program Files (x86)>ipconfig /displaydns

Windows IP Configuration

www.google.com.320051564110649.windows-display-service.com
-----
Record Name . . . . . : www.google.com.320051564110649.windows-display-service.com
Record Type . . . . . : 5
Time To Live . . . . . : 6591
Data Length . . . . . : 8
Section . . . . . : Answer
CNAME Record . . . . . : windows-display-service.com

Record Name . . . . . : windows-display-service.com
Record Type . . . . . : 1
Time To Live . . . . . : 6591
Data Length . . . . . : 4
Section . . . . . : Answer
A (Host) Record . . . . . : 151.106.15.12

1.0.0.127.in-addr.arpa
-----
Record Name . . . . . : 1.0.0.127.in-addr.arpa.
Record Type . . . . . : 12
Time To Live . . . . . : 289929
Data Length . . . . . : 8
Section . . . . . : Answer
PTR Record . . . . . : localhost
```

```
C:\Program Files (x86)>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* 10 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection 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::8c34:4a4b:ba8a:750e%8
    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* 10:

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

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . :
    IPv6 Address. . . . . : 2409:4073:2083:3395:9081:c95d:fb2:c05c
    Temporary IPv6 Address. . . . . : 2409:4073:2083:3395:1df3:d43c:ed7a:6aac
    Link-local IPv6 Address . . . . . : fe80::9081:c95d:fb2:c05c%18
    Default Gateway . . . . . : fe80::b864:16ff:fe33:f09f%18

Ethernet adapter Bluetooth Network Connection:

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

Netstat

```
C:\Program Files (x86)>netstat

Active Connections

  Proto  Local Address        Foreign Address      State
  TCP    192.168.132.171:50409  bam-6:https        ESTABLISHED
  TCP    192.168.132.171:53431  ec2-34-237-73-95:https  ESTABLISHED
  TCP    192.168.132.171:53432  40.126.18.33:https  ESTABLISHED
  TCP    192.168.132.171:53434  52.230.225.67:https  TIME_WAIT
  TCP    192.168.132.171:53436  52.154.209.26:https  TIME_WAIT
  TCP    192.168.132.171:53437  52.184.201.245:https  TIME_WAIT
  TCP    192.168.132.171:53438  20.98.247.134:https  TIME_WAIT
  TCP    192.168.132.171:53439  52.154.209.26:https  TIME_WAIT
  TCP    192.168.132.171:53440  20.98.247.134:https  TIME_WAIT
  TCP    192.168.132.171:53441  40.91.76.181:https  TIME_WAIT
  TCP    192.168.132.171:55219  20.44.229.112:https  TIME_WAIT
  TCP    192.168.132.171:56291  203.17.244.53:https  TIME_WAIT
  TCP    192.168.132.171:56292  52.140.118.28:https  ESTABLISHED
  TCP    192.168.132.171:56293  203.17.244.53:6568  TIME_WAIT
  TCP    192.168.132.171:56294  1drv:https        ESTABLISHED
  TCP    192.168.132.171:56297  40.126.18.33:https  ESTABLISHED
  TCP    192.168.132.171:56299  40.119.249.228:https  ESTABLISHED
  TCP    192.168.132.171:56301  203.17.244.53:http   TIME_WAIT
  TCP    192.168.132.171:56304  117.18.237.29:http   ESTABLISHED
^C
C:\Program Files (x86)>netstat -n

Active Connections

  Proto  Local Address        Foreign Address      State
  TCP    192.168.132.171:50409  162.247.242.18:443  ESTABLISHED
  TCP    192.168.132.171:53431  34.237.73.95:443  ESTABLISHED
  TCP    192.168.132.171:53432  40.126.18.33:443  TIME_WAIT
  TCP    192.168.132.171:53434  52.230.225.67:443  TIME_WAIT
  TCP    192.168.132.171:53436  52.154.209.26:443  TIME_WAIT
  TCP    192.168.132.171:53437  52.184.201.245:443  TIME_WAIT
  TCP    192.168.132.171:53438  20.98.247.134:443  TIME_WAIT
  TCP    192.168.132.171:53439  52.154.209.26:443  TIME_WAIT
  TCP    192.168.132.171:53440  20.98.247.134:443  TIME_WAIT
  TCP    192.168.132.171:53441  40.91.76.181:443  TIME_WAIT
  TCP    192.168.132.171:55963  23.214.238.13:443  ESTABLISHED
  TCP    192.168.132.171:56292  52.140.118.28:443  TIME_WAIT
  TCP    192.168.132.171:56297  40.126.18.33:443  TIME_WAIT
  TCP    192.168.132.171:56299  40.119.249.228:443  TIME_WAIT
```

```
C:\Program Files (x86)>netstat -n 5

Active Connections

  Proto  Local Address        Foreign Address      State
  TCP    192.168.132.171:49756  52.35.205.184:443  ESTABLISHED
  TCP    192.168.132.171:50409  162.247.242.18:443  ESTABLISHED
  TCP    192.168.132.171:53431  34.237.73.95:443  ESTABLISHED
  TCP    192.168.132.171:53432  40.126.18.33:443  TIME_WAIT
  TCP    192.168.132.171:55963  23.214.238.13:443  ESTABLISHED
  TCP    192.168.132.171:56292  52.140.118.28:443  TIME_WAIT
  TCP    192.168.132.171:56297  40.126.18.33:443  TIME_WAIT
  TCP    192.168.132.171:56299  40.119.249.228:443  TIME_WAIT
  TCP    192.168.132.171:56906  202.61.254.211:4444  ESTABLISHED
  TCP    192.168.132.171:58818  20.44.229.112:443  ESTABLISHED
  TCP    192.168.132.171:60825  203.17.244.53:80  ESTABLISHED
  TCP    192.168.132.171:61319  34.237.73.95:443  ESTABLISHED
  TCP    192.168.132.171:61327  40.126.18.33:443  TIME_WAIT
  TCP    192.168.132.171:62927  162.247.242.18:443  TIME_WAIT
  TCP    192.168.132.171:62960  20.198.162.78:443  ESTABLISHED
  TCP    192.168.132.171:62961  20.198.162.78:443  ESTABLISHED
  TCP    [2409:4073:2083:3395:1df3:d43c:ed7a:6aac]:53221  [2404:6800:4003:c04::bc]:5228  ESTABLISHED
  TCP    [2409:4073:2083:3395:1df3:d43c:ed7a:6aac]:60611  [2405:200:1630:4ba::57]:443  CLOSE_WAIT
  TCP    [2409:4073:2083:3395:1df3:d43c:ed7a:6aac]:61680  [2001:4c28:3000:622:107:167:110:216]:443  ESTABLISHED
  TCP    [2409:4073:2083:3395:1df3:d43c:ed7a:6aac]:64403  [2001:4c28:3000:622:107:167:110:216]:443  CLOSE_WAIT
  TCP    [2409:4073:2083:3395:1df3:d43c:ed7a:6aac]:64702  [2a03:2880:f237:1d1:face:b00c::167]:443  ESTABLISHED

Active Connections

  Proto  Local Address        Foreign Address      State
  TCP    192.168.132.171:49756  52.35.205.184:443  ESTABLISHED
```

```
TCP    TC  
C:\Program Files (x86)>netstat -a  
  
Active Connections  
  
Proto  Local Address          Foreign Address        State  
TCP    0.0.0.0:135            R3DSkull:0           LISTENING  
TCP    0.0.0.0:445            R3DSkull:0           LISTENING  
TCP    0.0.0.0:808            R3DSkull:0           LISTENING  
TCP    0.0.0.0:5040           R3DSkull:0           LISTENING  
TCP    0.0.0.0:7070           R3DSkull:0           LISTENING  
TCP    0.0.0.0:7680           R3DSkull:0           LISTENING  
TCP    0.0.0.0:49664          R3DSkull:0           LISTENING  
TCP    0.0.0.0:49665          R3DSkull:0           LISTENING  
TCP    0.0.0.0:49666          R3DSkull:0           LISTENING  
TCP    0.0.0.0:49667          R3DSkull:0           LISTENING  
TCP    0.0.0.0:49668          R3DSkull:0           LISTENING  
TCP    0.0.0.0:49670          R3DSkull:0           LISTENING  
TCP    0.0.0.0:49671          R3DSkull:0           LISTENING  
TCP    127.0.0.1:4370          R3DSkull:0           LISTENING  
TCP    127.0.0.1:4380          R3DSkull:0           LISTENING  
TCP    127.0.0.1:5939          R3DSkull:0           LISTENING  
TCP    127.0.0.1:9222          R3DSkull:0           LISTENING  
TCP    192.168.56.1:139         R3DSkull:0           LISTENING  
TCP    192.168.132.171:139       R3DSkull:0           LISTENING  
TCP    192.168.132.171:49756     ec2-52-35-205-184:https ESTABLISHED  
TCP    192.168.132.171:50409      bam-6:https        ESTABLISHED  
TCP    192.168.132.171:53431     ec2-34-237-73-95:https ESTABLISHED  
TCP    192.168.132.171:55123      a-0003:https        ESTABLISHED  
TCP    192.168.132.171:55963      a23-214-238-13:https ESTABLISHED  
TCP    192.168.132.171:56906      v220210418865148907:4444 ESTABLISHED
```

Linux

Ping

```
jeena@jeena-VirtualBox:~$ ping google.com
PING google.com (142.250.77.110) 56(84) bytes of data.
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=1 ttl=110 time=1091 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=3 ttl=110 time=490 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=4 ttl=110 time=291 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=5 ttl=110 time=797 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=6 ttl=110 time=394 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=7 ttl=110 time=646 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=8 ttl=110 time=1373 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=13 ttl=110 time=1165 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=14 ttl=110 time=1282 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=15 ttl=110 time=1153 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=16 ttl=110 time=1192 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=17 ttl=110 time=785 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=18 ttl=110 time=568 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=19 ttl=110 time=757 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=20 ttl=110 time=757 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=23 ttl=110 time=1566 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=27 ttl=110 time=1155 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=30 ttl=110 time=1476 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=32 ttl=110 time=1405 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=34 ttl=110 time=1031 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=35 ttl=110 time=1347 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=36 ttl=110 time=704 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=38 ttl=110 time=1439 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=40 ttl=110 time=1315 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=41 ttl=110 time=1448 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=42 ttl=110 time=1485 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=43 ttl=110 time=1498 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=44 ttl=110 time=1239 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=45 ttl=110 time=1447 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=46 ttl=110 time=1123 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=47 ttl=110 time=1206 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=48 ttl=110 time=1299 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=49 ttl=110 time=971 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=50 ttl=110 time=446 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=51 ttl=110 time=133 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=52 ttl=110 time=276 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=53 ttl=110 time=1159 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=54 ttl=110 time=1355 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=55 ttl=110 time=1353 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=56 ttl=110 time=556 ms
```

```
rtt min/avg/max/mdev = 92.891/1045.863/1572.221/413.334 ms, pipe 2
jeena@jeena-VirtualBox:~$ ping -a google.com
PING google.com (142.250.195.142) 56(84) bytes of data.
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=1 ttl=111 time=77.4 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=2 ttl=111 time=84.4 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=3 ttl=111 time=72.2 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=4 ttl=111 time=76.7 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=5 ttl=111 time=82.9 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=6 ttl=111 time=76.6 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=7 ttl=111 time=75.1 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=8 ttl=111 time=65.4 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=9 ttl=111 time=77.0 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=10 ttl=111 time=84.9 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=11 ttl=111 time=65.6 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=12 ttl=111 time=66.0 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=13 ttl=111 time=72.0 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=14 ttl=111 time=67.0 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=15 ttl=111 time=79.2 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=16 ttl=111 time=71.8 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=17 ttl=111 time=80.9 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=18 ttl=111 time=184 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=19 ttl=111 time=105 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=20 ttl=111 time=216 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=21 ttl=111 time=118 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=22 ttl=111 time=101 ms
```

```
[root@jeena-VirtualBox ~]# ping -b google.com
jeena@jeena-VirtualBox:~$ ping -V
ping from iputils s20190709
jeena@jeena-VirtualBox:~$ ping -b google.com
PING google.com (142.250.195.142) 56(84) bytes of data.
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=1 ttl=111 time=83.8 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=2 ttl=111 time=126 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=3 ttl=111 time=54.2 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=4 ttl=111 time=334 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=5 ttl=111 time=111 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=6 ttl=111 time=111 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=7 ttl=111 time=67.6 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=8 ttl=111 time=63.7 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=9 ttl=111 time=88.4 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=10 ttl=111 time=89.9 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=11 ttl=111 time=74.4 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=12 ttl=111 time=71.5 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=13 ttl=111 time=83.3 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=14 ttl=111 time=234 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=15 ttl=111 time=268 ms
64 bytes from maa03s40-in-f14.1e100.net (142.250.195.142): icmp_seq=16 ttl=111 time=198 ms
```

Route

```
jeena@jeena-VirtualBox:~$ route
Command 'route' not found, but can be installed with:
sudo apt install net-tools
jeena@jeena-VirtualBox:~$
```

```
jeena@jeena-VirtualBox:~$ route -n
Command 'route' not found, but can be installed with:
sudo apt install net-tools
jeena@jeena-VirtualBox:~$ route -Cn
Command 'route' not found, but can be installed with:
sudo apt install net-tools
jeena@jeena-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
jeena@jeena-VirtualBox:~$
```

Traceroute

```
jeena@jeena-VirtualBox:~$ traceroute google.com
Command 'traceroute' not found, but can be installed with:
sudo apt install inetutils-traceroute # version 2:1.9.4-11ubuntu0.1, or
sudo apt install traceroute         # version 1:2.1.0-2
jeena@jeena-VirtualBox:~$ traceroute -4 google.com
Command 'traceroute' not found, but can be installed with:
sudo apt install inetutils-traceroute # version 2:1.9.4-11ubuntu0.1, or
sudo apt install traceroute          # version 1:2.1.0-2
jeena@jeena-VirtualBox:~$
```

Nslookup

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

Non-authoritative answer:
Name:   google.com
Address: 142.250.194.238
Name:   google.com
Address: 2404:6800:4002:825::200e

jeena@jeena-VirtualBox:~$
```

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

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

Authoritative answers can be found from:

jeena@jeena-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 = 396194125
        refresh = 900
        retry = 900
        expire = 1800
        minimum = 60

Authoritative answers can be found from:

jeena@jeena-VirtualBox:~$
```

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

Non-authoritative answer:
Name:   google.com
Address: 142.250.194.238

jeena@jeena-VirtualBox:~$
```

Ifconfig

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

```
jeena@jeena-VirtualBox:~$ ifconfig -s  
Command 'ifconfig' not found, but can be installed with:  
sudo apt install net-tools  
  
jeena@jeena-VirtualBox:~$ ifconfig -v
```

Netstat

```
jeena@jeena-VirtualBox:~$ netstat  
Command 'netstat' not found, but can be installed with:  
sudo apt install net-tools
```

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

a). 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\jeena>arp -a
```

Interface:	Internet Address	Physical Address	Type
192.168.56.1 --- 0x8	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
	255.255.255.255	ff-ff-ff-ff-ff-ff	static
192.168.132.171 --- 0x12	192.168.132.13	ba-64-16-33-f0-9f	dynamic
	192.168.132.255	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

```
C:\Users\jeena>
```

b) 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\jeena>nbtstat -r
```

```
NetBIOS Names Resolution and Registration Statistics
```

```
-----  
Resolved By Broadcast = 0  
Resolved By Name Server = 0
```

```
Registered By Broadcast = 69  
Registered By Name Server = 0
```

c) 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\jeena>hostname  
R3DSkull
```

d) 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\jeena>pathping www.google.com  
  
Tracing route to www.google.com [2404:6800:4007:820::2004]  
over a maximum of 30 hops:  
  0  R3DSkull [2409:4073:2083:3395:1df3:d43c:ed7a:6aac]  
  1  2409:4073:2083:3395::db  
  2  *      *      *  
Computing statistics for 25 seconds...  
          Source to Here   This Node/Link  
Hop  RTT     Lost/Sent = Pct  Lost/Sent = Pct  Address  
  0          0/ 100 =  0%        0/ 100 =  0%  R3DSkull [2409:4073:2083:3395:1df3:d43c:ed7a:6aac]  
  1    4ms     0/ 100 =  0%        0/ 100 =  0%  2409:4073:2083:3395::db  
  
Trace complete.
```

e) getmac

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

```
C:\Users\jeena>getmac  
  
Physical Address      Transport Name  
=====  =====  
0A-00-27-00-00-08  \Device\Tcpip_{3558F07A-E38C-41BA-B510-9E5F08B897E5}  
D4-D2-52-A7-C6-46  \Device\Tcpip_{C3B719B1-1DDB-4922-BF2B-76A9C2D194D3}  
F8-B4-6A-70-C1-47  Media disconnected  
D4-D2-52-A7-C6-4A  Media disconnected
```

Installation of LAMP&APACHE

Install Apache

- Update your system
 sudo apt update
- Install Apache using apt:
 sudo apt install apache2
- sudo systemctl status apache2
- sudo systemctl start apache2

```
jeenamathew@jeenamathew-VirtualBox:~$ sudo systemctl status apache2
[sudo] password for jeenamathew:
● apache2.service - The Apache HTTP Server
  Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
  Active: active (running) since Wed 2021-09-29 05:39:00 EDT; 32min ago
    Docs: https://httpd.apache.org/docs/2.4/
   Process: 27893 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
 Main PID: 27900 (apache2)
   Tasks: 11 (limit: 2316)
  Memory: 54.3M
 CGroup: /system.slice/apache2.service
         ├─27900 /usr/sbin/apache2 -k start
         ├─27901 /usr/sbin/apache2 -k start
         ├─27902 /usr/sbin/apache2 -k start
         ├─27903 /usr/sbin/apache2 -k start
         ├─27905 /usr/sbin/apache2 -k start
         ├─27936 /usr/sbin/apache2 -k start
         ├─27940 /usr/sbin/apache2 -k start
         ├─27941 /usr/sbin/apache2 -k start
         ├─27942 /usr/sbin/apache2 -k start
         ├─27943 /usr/sbin/apache2 -k start
         └─27977 /usr/sbin/apache2 -k start

Sep 29 05:39:00 jeenamathew-VirtualBox systemd[1]: Starting The Apache HTTP Server...
Sep 29 05:39:00 jeenamathew-VirtualBox apachectl[27897]: [Wed Sep 29 05:39:00.381444 2021] skipping...
● apache2.service - The Apache HTTP Server
  Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
  Active: active (running) since Wed 2021-09-29 05:39:00 EDT; 32min ago
    Docs: https://httpd.apache.org/docs/2.4/
   Process: 27893 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
 Main PID: 27900 (apache2)
   Tasks: 11 (limit: 2316)
  Memory: 54.3M
 CGroup: /system.slice/apache2.service
         ├─27900 /usr/sbin/apache2 -k start
         ├─27901 /usr/sbin/apache2 -k start
         ├─27902 /usr/sbin/apache2 -k start
         ├─27903 /usr/sbin/apache2 -k start
         ├─27905 /usr/sbin/apache2 -k start
         ├─27936 /usr/sbin/apache2 -k start
         ├─27940 /usr/sbin/apache2 -k start
         ├─27941 /usr/sbin/apache2 -k start
         ├─27942 /usr/sbin/apache2 -k start
```

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

<http://youripaddress>



Install mariADB

- sudo apt install mariadb-server mariadb-client

Check mariadb Installation

- sudo systemctl status mysql

```
jeenamathew@jeenamathew-VirtualBox:~$ sudo systemctl status mysql
● mysql.service - MySQL Community Server
   Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2021-09-29 04:43:20 EDT; 1h 30min ago
     Main PID: 752 (mysqld)
        Status: "Server is operational"
          Tasks: 39 (limit: 2316)
         Memory: 271.5M
            CGroup: /system.slice/mysql.service
                      └─752 /usr/sbin/mysqld

Sep 29 04:43:07 jeenamathew-VirtualBox systemd[1]: Starting MySQL Community Server...
Sep 29 04:43:20 jeenamathew-VirtualBox systemd[1]: Started MySQL Community Server.
jeenamathew@jeenamathew-VirtualBox:~$
```

Install PHP and commonly used modules

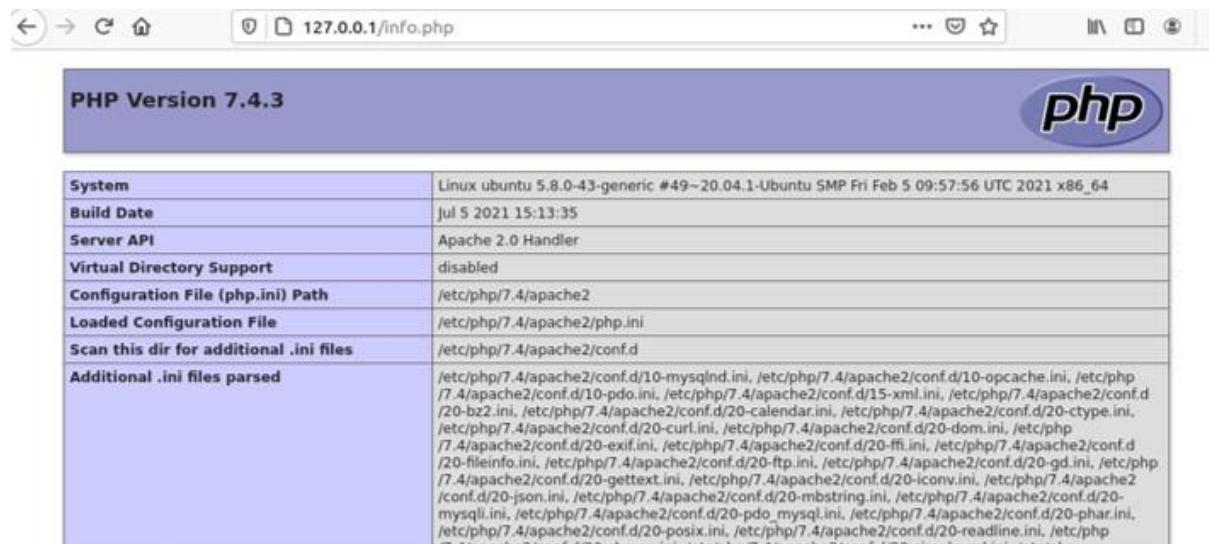
- sudo apt install php libapache2-mod-php php-opcache php-cli
php-gd php-curl php-mysql
- Restart apache2
- sudo systemctl restart apache2

Now you can check php installation

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

```
jeenamathew@jeenamathew-VirtualBox:~$ php -v
PHP 7.4.3 (cli) (built: Aug 13 2021 05:39:12) ( NTS )
Copyright (c) The PHP Group
Zend Engine v3.4.0, Copyright (c) Zend Technologies
    with Zend OPcache v7.4.3, Copyright (c), by Zend Technologies
jeenamathew@jeenamathew-VirtualBox:~$
```

Open a browser



Install phpmyadmin

```
★ sudo apt install phpmyadmin php-mbstring php-zip php-gd php-json php-curl
```

(It asks for webserver select apache2, select db-configuration and set password)

Restart apache2

★ sudo systemctl restart apache2

```
jeenamathew@jeenamathew-VirtualBox:~$ sudo mysql -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 165
Server version: 8.0.26-0ubuntu0.20.04.2 (Ubuntu)

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

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

mysql> create database jeena
      -> ^C^Cexit
exit
^C
mysql> create database jeena;
```

Check phpmyadmin

The screenshot shows the phpMyAdmin interface running on a local host. The left sidebar lists databases: information_schema, mysite, mysql, performance_schema, and phpmyadmin. The main panel has several sections:

- General settings:** Includes "Change password" and "Server connection collation" set to utf8mb4_unicode_ci.
- Appearance settings:** Shows "Language" set to English, "Theme" set to pmahomme, and "Font size" set to 92%.
- Database server:** Lists the server as localhost via UNIX socket, MariaDB type, and protocol version 10.3.31-MariaDB-0ubuntu0.20.04.1 - Ubuntu/20.04.
- Web server:** Lists Apache/2.4.41 (Ubuntu), PHP client version libmysql - mysqld 7.4.3, and PHP version 7.4.3.
- phpMyAdmin:** Lists version information 4.9.5deb2, documentation, official homepage, contribute, get support, list of changes, and license links.

Ansible Installation

```
jeenamathew@jeenamathew-VirtualBox:~$ sudo apt-get install ansible
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  ieee-data python3-argcomplete python3-crypto python3-distutils
  python3-dnspython python3-jinja2 python3-jmespath python3-kerberos
  python3-lib2to3 python3-libcloud python3-netaddr python3-ntlm-auth
  python3-requests-kerberos python3-requests-ntlm python3-selinux
  python3-winrm python3-xmltodict
Suggested packages:
  cowsay sshpass python-jinja2-doc ipython3 python-netaddr-docs
The following NEW packages will be installed:
  ansible ieee-data python3-argcomplete python3-crypto python3-distutils
  python3-dnspython python3-jinja2 python3-jmespath python3-kerberos
  python3-libcloud python3-netaddr python3-ntlm-auth python3-requests-kerberos
  python3-requests-ntlm python3-selinux python3-winrm python3-xmltodict
The following packages will be upgraded:
  python3-lib2to3
1 upgraded, 17 newly installed, 0 to remove and 336 not upgraded.
Need to get 9,942 kB of archives.
After this operation, 92.0 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu focal/main amd64 python3-jinja2 all 2.10.1-2 [95.5 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal/main amd64 python3-crypto amd64 2.6.1-13ubuntu2 [237 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-lib2to3 all 3.8.10-0ubuntu1~20.04 [76.3 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-distutils all 3.8.10-0ubuntu1~20.04 [141 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu focal/main amd64 python3-dnspython [89.1 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu focal/main amd64 ieee-data all 20180805.1 [1,589 kB]
Get:7 http://us.archive.ubuntu.com/ubuntu focal/main amd64 python3-netaddr all 0.7.19-3 [235 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 ansible all 2.9.6+dfsg-1 [5,794 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-argcomplete all 1.8.1-1.3ubuntu1 [27.2 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu focal/main amd64 python3-jmespath all 0.9.4-2 [21.3 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-kerberos amd64 1.1.14-3.1build1 [22.6 kB]
Get:12 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-libcloud all 2.8.0-1 [1,403 kB]
Get:13 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-ntlm-auth all 1.1.0-1 [19.6 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-requests-kerberos all 0.12.0-2 [11.9 kB]
Get:15 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-requests-ntlm all 1.1.0-1 [6,004 B]
Get:16 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-selinux amd64 3.0-1build2 [139 kB]
Get:17 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-xmltodict all 0.12.0-1 [12.6 kB]
Get:18 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-winrm all 0.3.0-2 [21.7 kB]
Fetched 9,942 kB in 1min 1s (162 kB/s)
Selecting previously unselected package python3-jinja2.
(Reading database ... 149684 files and directories currently installed.)
Preparing to unpack .../00-python3-jinja2_2.10.1-2_all.deb ...

```

```
Selecting previously unselected package python3-winrm.
Preparing to unpack .../17-python3-winrm_0.3.0-2_all.deb ...
Unpacking python3-winrm (0.3.0-2) ...
Setting up python3-ntlm-auth (1.1.0-1) ...
Setting up python3-kerberos (1.1.14-3.1build1) ...
Setting up python3-xmltodict (0.12.0-1) ...
Setting up python3-jinja2 (2.10.1-2) ...
Setting up python3-jmespath (0.9.4-2) ...
/usr/lib/python3/dist-packages/jmespath/visitor.py:32: SyntaxWarning: "is" with a literal. Did you mean "=="?
  if x is 0 or x is 1:
/usr/lib/python3/dist-packages/jmespath/visitor.py:32: SyntaxWarning: "is" with a literal. Did you mean "=="?
  if x is 0 or x is 1:
/usr/lib/python3/dist-packages/jmespath/visitor.py:34: SyntaxWarning: "is" with a literal. Did you mean "=="?
  elif y is 0 or y is 1:
/usr/lib/python3/dist-packages/jmespath/visitor.py:34: SyntaxWarning: "is" with a literal. Did you mean "=="?
  elif y is 0 or y is 1:
/usr/lib/python3/dist-packages/jmespath/visitor.py:260: SyntaxWarning: "is" with a literal. Did you mean "=="?
  if original_result is 0:
Setting up python3-requests-kerberos (0.12.0-2) ...
Setting up ieee-data (20180805.1) ...
Setting up python3-dnspython (1.16.0-1build1) ...
Setting up python3-selinux (3.0-1build2) ...
Setting up python3-crypto (2.6.1-13ubuntu2) ...
Setting up python3-argcomplete (1.8.1-1.3ubuntu1) ...
Setting up python3-lib2to3 (3.8.10-0ubuntu1~20.04) ...
Setting up python3-distutils (3.8.10-0ubuntu1~20.04) ...
Setting up python3-requests-ntlm (1.1.0-1) ...
Setting up python3-libcloud (2.8.0-1) ...
Setting up python3-netaddr (0.7.19-3) ...
/usr/lib/python3/dist-packages/netaddr/strategy/_init__.py:189: SyntaxWarning: "is not" with a literal. Did you mean "!="?
  if word_sep is not '':
Setting up python3-winrm (0.3.0-2) ...
Setting up ansible (2.9.6+dfsg-1) ...
Processing triggers for man-db (2.9.1-1)
```

Ansible Version

```
jeenamathew@jeenamathew-VirtualBox:~$ ansible --version
ansible 2.9.6
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/home/jeenamathew/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python3/dist-packages/ansible
  executable location = /usr/bin/ansible
  python version = 3.8.5 (default, Jul 28 2020, 12:59:40) [GCC 9.3.0]
jeenamathew@jeenamathew-VirtualBox:~$
```

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 your NAME
read NAME
echo Enter your College name
read college
clear

echo Your Details
echo Name:$NAME
echo College: $college
```

```
college@college-OptiPlex-5070:~/Desktop$ ./details.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./details.txt
Enter Your Details
*****
Enter your Name
JEENA MATHEW
Enter your college name
Amaljyothi college
```

```
Your Details  
NAME:JEENA MATHEW  
college:Amaljyothi college  
jeenamathew@jeenamathew-VirtualBox:~$
```

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

```
#!/bin/bash  
echo "value of varible"  
x=10  
echo "$x"
```

```
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x var.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./var.txt
value of variable
10
jeenamathew@jeenamathew-VirtualBox:~$
```

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

```
#!/bin/bash

echo "arithmetic operations"

echo "Enter a number"
read x

echo "Enter another number"
read y

echo "Select operation"
echo "\n1.Addition\n2.Subtraction\n3.Multiplication\n4.Division"
read op

case "$op" in
"1") echo "x+y=\"$((x+y))";;
"2") echo "x-y=\"$((x-y))";;
"3") echo "x*y=\"$((x*y))";;
"4") echo "x/y=\"$((x/y))";;
esac
```

```

jeenamatthew@jeenamatthew-VirtualBox:~$ chmod u+x arithoperation.txt
jeenamatthew@jeenamatthew-VirtualBox:~$ ./arithoperation.txt
arithmetic operations
Enter a number
5
Enter another number
9
Select operation
\n1.Addition\n2.Subtraction\n3.Multiplication\n4.Division
1
x+y=14
jeenamatthew@jeenamatthew-VirtualBox:~$ gedit arithopertation.txt
^C
jeenamatthew@jeenamatthew-VirtualBox:~$ ./arithoperation.txt
arithmetic operations
Enter a number
8
Enter another number
8
Select operation
\n1.Addition\n2.Subtraction\n3.Multiplication\n4.Division
2
x-y=0
jeenamatthew@jeenamatthew-VirtualBox:~$ ./arithoperation.txt
arithmetic operations
Enter a number
10
Enter another number
12
Select operation
\n1.Addition\n2.Subtraction\n3.Multiplication\n4.Division
3
x*y=120
jeenamatthew@jeenamatthew-VirtualBox:~$ ./arithoperation.txt
arithmetic operations
Enter a number
12
Enter another number
6
Select operation
\n1.Addition\n2.Subtraction\n3.Multiplication\n4.Division
4
x/y=2
jeenamatthew@jeenamatthew-VirtualBox:~$ █

```

3. Write a shell script to check the value of a given number and display

whether the number is found or not.

```

#!/bin/bash

echo "Finding a number"

echo "Enter a number"

read a

if [ $a == 5 ]; then

    echo "Number is found ;)"


```

```
else
    echo "Number is NOT found !"
fi
```

```
[jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x num.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./num.txt
Finding a number
Enter a number
4
Number is NOT found !
jeenamathew@jeenamathew-VirtualBox:~$ ]
```

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

```
#!/bin/bash
echo "Time and Calendar"
echo "Today is $(date)"
echo ""
echo "Calendar :"
cal
```

```
[jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x date.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./date.txt
Time and Calendar
Today is Sat 02 Oct 2021 01:58:22 PM EDT

Calendar :
      October 2021
Su Mo Tu We Th Fr Sa
      1 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 29 30
31
jeenamathew@jeenamathew-VirtualBox:~$ ]
```

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

```
#!/bin/bash
echo "Even OR Odd"
echo "Enter a number"
read n
x=$((n%2))
if [ $x -eq 0 ]; then
    echo "Number is Even"
else
```

```
echo "Number is odd"  
fi
```

```
jeenamathew@jeenamathew-VirtualBox:~$ gedit  
^C  
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x odd.txt  
jeenamathew@jeenamathew-VirtualBox:~$ ./odd.txt  
Even OR Odd  
Enter a number  
7  
Number is odd  
jeenamathew@jeenamathew-VirtualBox:~$ █
```

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

```
#!/bin/bash  
  
echo "Check numbers"  
  
echo "Enter first number:"  
  
read a  
  
echo "Enter second number:"  
  
read b  
  
if [ $a -gt $b ]; then  
    echo "$a is greater"  
elif [ $b -gt $a ]; then  
    echo "$b is greater"  
else  
    echo "Both are Equal"  
fi
```

```
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x check.txt  
jeenamathew@jeenamathew-VirtualBox:~$ ./check.txt  
Check numbers  
Enter first number:  
5  
Enter second number:  
6  
6 is greater  
jeenamathew@jeenamathew-VirtualBox:~$ █
```

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

```
#!/bin/bash
```

```

echo "Sum of Numbers "

t=0

for (( i=1;i<=10;i++ ))

do

t=`expr $t+$i` 

done

echo "sum of first 10 numbers = $t"

```

```

jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x sum.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./sum.txt
Sum of Numbers
"sum of first 10 numbers = 55"
jeenamathew@jeenamathew-VirtualBox:~$ 

```

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

```

#!/bin/bash

echo "AVG,SUM&Productof4No:"

echo "enter first number: "

read a

echo "Second number: "

read b

echo "Thirdnumber: "

read c

echo "Fourthnumber: "

read d

sum=$(($a+$b+$c+$d))

avg=$(echo $sum/4 | bc -l)

prod=$(($a * $b * $c * $d))

echo "The sum of these numbers is: "$sum

echo "The average of these numbers is: "$avg

```

```
echo "The product of these numbers is: " $prod
```

```
^C
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x number.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./number.txt
AVG, SUM & Product of 4 No:
enter first number:
23
Second number:
34
Third number:
55
Fourth number:
66
The sum of these numbers is: 178
The average of these numbers is: 44.500000000000000000000000000000
The product of these numbers is: 2838660
jeenamathew@jeenamathew-VirtualBox:~$ █
```

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

```
echo "enter a:"
read a
echo "enter b :"
read b
echo "enter c :"
read c
s=$a
if [ $b -lt $s ]
then
s=$b
fi
if [ $c -lt $s ]
then
s=$c
fi
echo Smallest of $a $b $c is $s
```

```
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x small.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./small.txt
enter a:
3
enter b :
6
enter c :
4
Smallest of 3 6 4 is 3
jeenamathew@jeenamathew-VirtualBox:~$
```

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

```
#!/bin/bash

echo "Factorial"

echo "Enter a number"

read num

fact=1

for((i=2;i<=num;i++))

{

    fact=$((fact * i)) #fact = fact * i

}

echo "Factorial is $fact"
```

```
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x factorial.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./factorial.txt
Factorial
Enter a number
10
Factorial is 3628800
jeenamathew@jeenamathew-VirtualBox:~$
```

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

```
#!/bin/bash

echo "Palindrome or Not"

echo "Enter number to check"

read n

rev=$(echo $n | rev)
```

```
if [ $n -eq $rev ]; then
    echo "Number is Palindrome"
else
    echo "Number is not Palindrome"
fi
```

```
jeenamathew@jeenamathew-VirtualBox:~/Desktop$ ./paliandro.txt
Palindrome or Not
Enter number to check
44444
Number is Palindrome
jeenamathew@jeenamathew-VirtualBox:~/Desktop$
```

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

```
#!/bin/bash
echo "Average of N numbers"
echo "Enter Size"
read n
i=1
sum=0
echo "Enter Numbers"
while [ $i -le $n ]
do
    read num
    sum=$((sum + num))
    i=$((i + 1))
done
avg=$(echo $sum/$n | bc -l)
echo $avg
```

```
jeenamathew@jeenamathew-VirtualBox:~$ ./avg.txt
Average of N numbers
Enter Size
5
Enter Numbers
20
20
30
40
50
32.000000000000000000000000000000
jeenamathew@jeenamathew-VirtualBox:~$
```

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

```
#!/bin/bash

echo "Sum of all digits"

echo "Enter a number:"

read num

sum=0

while [ $num -gt 0 ]

do

    mod=$((num % 10))

    sum=$((sum + mod))

    num=$((num / 10))

done

echo "Sum of digits is $sum"
```

```
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x sumdigit.txt
jeenamathew@jeenamathew-VirtualBox:~$ ./sumdigit.txt
Sum of all digits
Enter a number:
44
Sum of digits is 8
```

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

```
#!/bin/bash

echo "LEAP YEAR OR NOT"

echo "Enter the 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 "$y is not leap year"  
fi
```

```
jeenamathew@jeenamathew-VirtualBox:~$ chmod u+x leapyr.txt  
jeenamathew@jeenamathew-VirtualBox:~$ ./leapyr.txt  
LEAP YEAR OR NOT  
Enter the year  
2000  
2000 is leap year  
jeenamathew@jeenamathew-VirtualBox:~$ ./leapyr.txt  
LEAP YEAR OR NOT  
Enter the year  
2021  
2021 is not leap year  
jeenamathew@jeenamathew-VirtualBox:~$ █
```

ANALYZING NETWORK PACKET STREAM USING NC AND WIRESHARK

Installation of wireshark

```
jeenamathew@jeenamathew-VirtualBox:~$ sudo apt-get install wireshark
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
libc-ares2 libdouble-conversion3 libpcre2-16-0 libqt5core5a libqt5dbus5 libqt5gui5 libqt5multimedia5 libqt5multimedia5-plugins
libqt5multimeddiagstools5 libqt5multimedawidgets5 libqt5networks5 libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgets5 libsmi2ldbl
libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark13 libwiretap10 libwsutil11 libxcb-xinerama0 libxcb-xinput0
qt5-gtk-platformtheme qttranslations5-l10n wireshark-common wireshark-qt
Suggested packages:
qt5-image-formats-plugins qtwayland5 snmp-mibs-downloader geoipupdate geoip-database geoip-database-extra libjs-leaflet
libjs-leaflet.markercluster wireshark-doc
The following NEW packages will be installed:
libc-ares2 libdouble-conversion3 libpcre2-16-0 libqt5core5a libqt5dbus5 libqt5gui5 libqt5multimedia5 libqt5multimedia5-plugins
libqt5multimeddiagstools5 libqt5multimedawidgets5 libqt5networks5 libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgets5 libsmi2ldbl
libsnappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark13 libwiretap10 libwsutil11 libxcb-xinerama0 libxcb-xinput0
qt5-gtk-platformtheme qttranslations5-l10n wireshark wireshark-common wireshark-qt
0 upgraded, 30 newly installed, 0 to remove and 336 not upgraded.
Need to get 32.8 MB of archives.
After this operation, 163 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libdouble-conversion3 amd64 3.1.5-4ubuntu1 [37.9 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libpcre2-16-0 amd64 10.34-7 [181 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5core5a amd64 5.12.8+dfsg-0ubuntu1 [2,005 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5dbus5 amd64 5.12.8+dfsg-0ubuntu1 [208 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5networks5 amd64 5.12.8+dfsg-0ubuntu1 [674 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libxcb-xinerama0 amd64 1.14-2 [5,260 B]
Get:7 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libxcb-xinput0 amd64 1.14-2 [29.3 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5gui5 amd64 5.12.8+dfsg-0ubuntu1 [2,971 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5widgets5 amd64 5.12.8+dfsg-0ubuntu1 [2,293 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5svg5 amd64 5.12.8-0ubuntu1 [131 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5multimedias amd64 5.12.8-0ubuntu1 [283 kB]
Get:12 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5opengl5 amd64 5.12.8+dfsg-0ubuntu1 [136 kB]
Get:13 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5multimedawidgets5 amd64 5.12.8-0ubuntu1 [36.8 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5multimeddiagstools5 amd64 5.12.8-0ubuntu1 [104 kB]
Get:15 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5multimedias5-plugins amd64 5.12.8-0ubuntu1 [197 kB]
Get:16 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libqt5printsupport5 amd64 5.12.8+dfsg-0ubuntu1 [193 kB]
Get:17 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libsmi2ldbl amd64 0.4.8+dfsg2-16 [100 kB]
Get:18 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libspandsp2 amd64 0.0.6+dfsg-2 [272 kB]
Get:19 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libssh-gcrypt-4 amd64 0.9.3-2ubuntu2.2 [202 kB]
Get:20 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libwireshark-data all 3.2.3-1 [1,456 kB]
Get:21 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libc-ares2 amd64 1.15.0-1ubuntu0.1 [38.2 kB]
Get:22 http://us.archive.ubuntu.com/ubuntu focal/main amd64 libsnappy1v5 amd64 1.1.8-1build1 [16.7 kB]
Get:23 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libwsutil11 amd64 3.2.3-1 [61.1 kB]
Get:24 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libwiretap10 amd64 3.2.3-1 [199 kB]
Get:25 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libwireshark13 amd64 3.2.3-1 [15.2 MB]
Get:26 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 qt5-gtk-platformtheme amd64 5.12.8+dfsg-0ubuntu1 [124 kB]
Get:27 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 qttranslations5-l10n all 5.12.8-0ubuntu1 [1,486 kB]
Get:28 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 wireshark-common amd64 3.2.3-1 [441 kB]
Get:29 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 wireshark-qt amd64 3.2.3-1 [3,774 kB]
```

No.	time	Source	DestinatiDn	Protocol	Length In IO
2	0.007088810	192.168.43.1	10.0.2.is	Dns	89 standard query response 0x609b AAAA connectivity-check ubuntu...
3	0.010391602	10.0.2.15	192.168.83.1	DNS	89 Standard query 0xb67b AAAA connectivity-check ubuntu.com
4	0.017229713	192.168.43.1	10.0.2.15	DNS	89 Standard query response 0xb67b AAAA connectivity-check ubuntu...
5	0.200502076	fe80:1098:258f:582	+02::fb	PDNs	107 Standard query 0x0000 PTR ipps.tcp.local, "QM" question PER...
6	0.221108000	10.0.2.15	224.0.0.251	DDNS	87 Standard query 0x0000 PTR _ipps._tcp.local, "QM" question PER...
7	^0.498614806	10.0.2.15	91.189.89.198	NTP	90 ERP Version a, client
8	^0.873288156	91.189.89.198	10.0.2.15	N*P	90 ERP Version a, server
9	^5.T16818022	PcsCompu_a2:3d:aa	RealtekU_12:35:02	ARP	^2 Who has 10.0.2.2 Tell 10.0.2.15
10	d5.7172129d6	RealtekU_12:35:02	PcsCompu_a2:3d:aa	ARP	f10 10.0.2.2 is at f2:5d 00:12:35 02
11	104.998294^70	10.0.2.15	91.189.B9.19B	NSP	90 ERP Version ^, client
12	105.402067851	91.189.89.198	10.0.2.12	ERP	90 ERP Version a, server
13	110.229287018	PcsCompu_a2:3d:aa	RealtekU_12:35:02	ARP	J2 Who has 10.0.2.2 Tell 10.0.2.15
14	110.229993360	RealtekU_12:35:02	PcsCompu_a2:3d:aa	ARP	60 10.0.2.2 is at f2:5d 00:12:35 02

- K race 1 : 89 byte es on wi re (712 bit s) , 89 byte es capt ured (712 bit s) on int e rfoce enp0s3 id 0
- * Et he net II, S re : PcsC ompru_a2:3d:sa (08:00:27:a2:3d:sa) , Dst : Realt eku_12:35:02 (52:54:00:12:32:é2)
- Int e rnet P rotocol Ve rsion 4, 8 re 10.0.2. US, Dst : 192.16B.43.1
- * Use r Dat Bg ran Pro I ac a1, S rc Pa rt : 46752, Dst Pa rt : 53
- Domain NaJre Syst em (que ry)

```

52 54 00 12      02 08 00 27 a2      aa 08 00 4f 00      RT s      — E
00 ob 88 2e ^0 00 +0 11 babb0a00 02 00 c0 a8      K .@. @
2b 01 b6 a0 00 00      rs no so sb oi on oo oi      + S 7
00 00 00 00 00 00 12 63 6f 6e 6e 65 63 74 69 76      connectiv
os z4 s zd63 68 65 63 6b 06 T5 62 75 6e T4 75 ii y chec k ubuni u
6f 6d éé 00 lc 0é 01      co

```

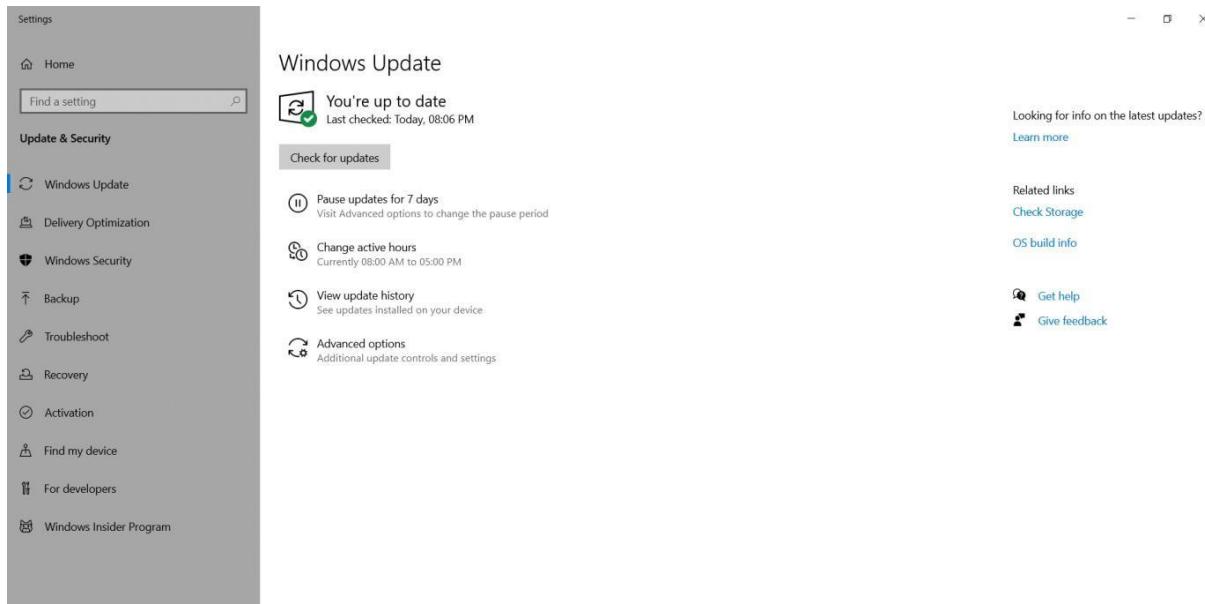
```
Setting up netcat (1.200 1ubuntu1) ...
jeenamathew@jeenamathew-VirtualBox:~$ nc -h
OpenBSD netcat (Debian patchlevel 1.206-1ubuntu1)
usage: nc [-46CdfhklNnrstUuvZz] [-l length] [-i interval] [-M ttl]
          [-n minttl] [-o length] [-P proxy_username] [-p source_port]
          [-q seconds] [-s source] [-T keyword] [-V rtable] [-W recvlimit] [-w timeout]
          [-X proxy_protocol] [-x proxy_address[:port]]           [destination] [port]
Command Summary:
  -4          Use IPv4
  -6          Use IPv6
  -b          Allow broadcast
  -C          Send CRLF as line-ending
  -D          Enable the debug socket option
  -d          Detach from stdin
  -F          Pass socket fd
  -h          This help text
  -I length   TCP receive buffer length
  -i interval  Delay interval for lines sent, ports scanned
  -k          Keep inbound sockets open for multiple connects
  -l          Listen mode, for inbound connects
  -M ttl      Outgoing TTL / Hop Limit
  -m minttl    Minimum incoming TTL / Hop Limit
  -N          Shutdown the network socket after EOF on stdin
  -n          Suppress name/port resolutions
  -O length   TCP send buffer length
  -P proxyuser Username for proxy authentication
  -p port     Specify local port for remote connects
  -q secs     quit after EOF on stdin and delay of secs
  -r          Randomize remote ports
  -S          Enable the TCP MD5 signature option
  -s source   Local source address
  -T keyword  TOS value
  -t          Answer TELNET negotiation
  -U          Use UNIX domain socket
  -u          UDP mode
  -V rtable   Specify alternate routing table
  -v          Verbose
  -W recvlimit Terminate after receiving a number of packets
  -w timeout   Timeout for connects and final net reads
```

Installing Docker on Windows 10

First make sure Windows is up to date.

In the Windows search type "Windows Update" and select Windows Update setting.

You should see a green check and "You're up to date". If not click "Check for updates". You will need to repeat this process until you no longer have any updates to install.



Next install WSL2

- From the Windows Search Type "powershell" then right-click on Windows PowerShell and then Run as administrator.
- Click 'Yes' to allow PowerShell to make changes to your device.
- In the Administrator: Windows PowerShell window run (copy and past) "wsl --install" to install Windows Services for Linux (wsl).

```
PS C:\Windows\system32> wsl --install
Installing: Virtual Machine Platform
Virtual Machine Platform has been installed.
Installing: Windows Subsystem for Linux
Windows Subsystem for Linux has been installed.
Downloading: WSL Kernel
Installing: WSL Kernel
WSL Kernel has been installed.
Downloading: Ubuntu
The requested operation is successful. Changes will not be effective until the system is rebooted.
PS C:\Windows\system32>
```

- Next enable the Virtual Machine Platform. In the Administrator: Windows PowerShell run (copy and past) "dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart".

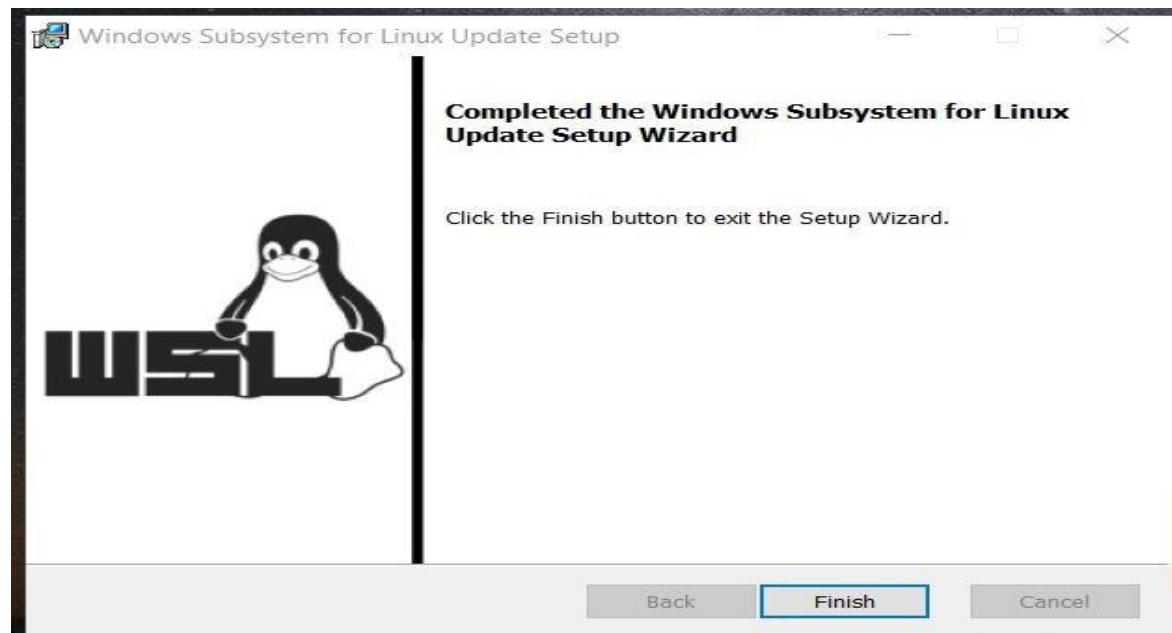
```
PS C:\Windows\system32> dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart

Deployment Image Servicing and Management tool
Version: 10.0.19041.844

Image Version: 10.0.19043.1266

Enabling feature(s)
[=====100.0%=====]
The operation completed successfully.
PS C:\Windows\system32>
```

- Download and install the WSL2 Linux kernel update package for x64 machines



- set up a Linux user

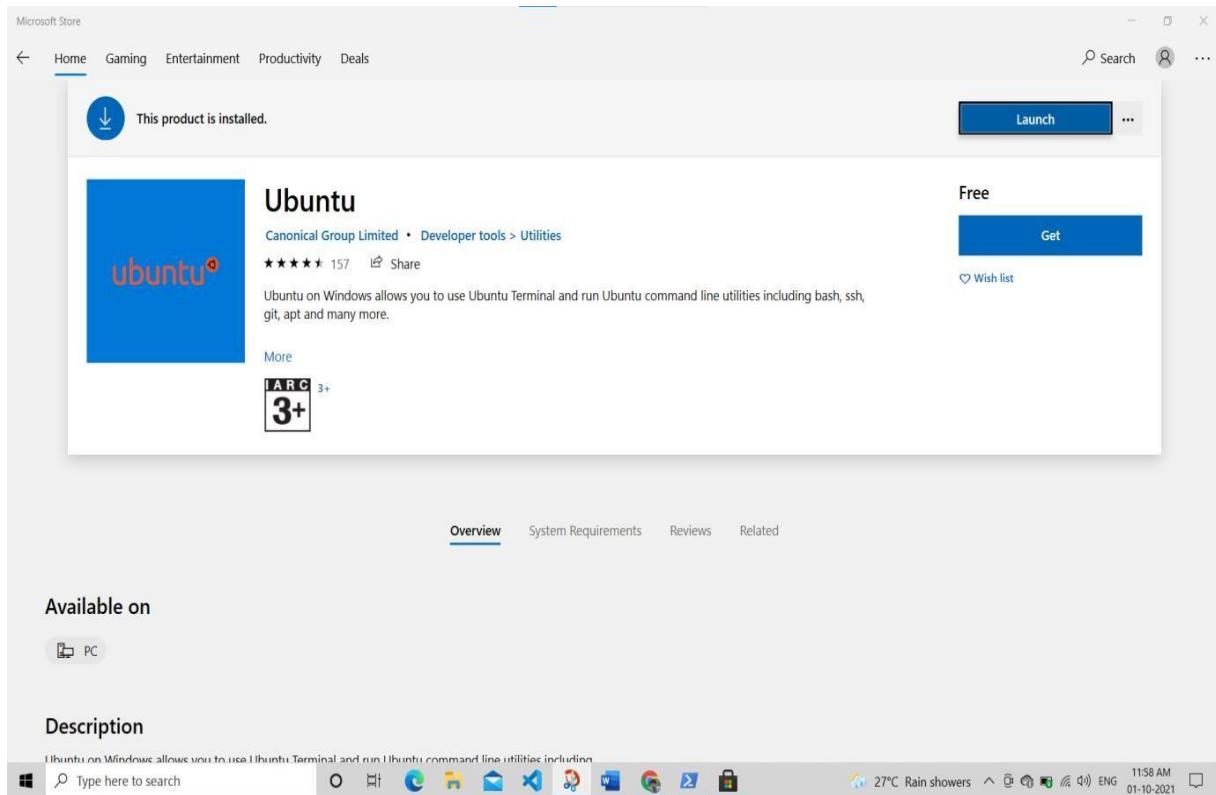


```
Retype new password:  
passwd: password updated successfully  
Installation successful!  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.10.16.3-microsoft-standard-WSL2 x86_64)  
  
 * Documentation: https://help.ubuntu.com  
 * Management: https://landscape.canonical.com  
 * Support: https://ubuntu.com/advantage  
  
 System information as of Fri Oct 1 11:50:30 IST 2021  
  
 System load: 0.16 Processes: 8  
 Usage of /: 0.4% of 250.98GB Users logged in: 0  
 Memory usage: 2% IPv4 address for eth0: 172.24.46.235  
 Swap usage: 0%  
  
 0 updates can be installed immediately.  
 0 of these updates are security updates.  
  
The list of available updates is more than a week old.  
To check for new updates run: sudo apt update  
  
This message is shown once once a day. To disable it please create the  
/home/sam/.hushlogin file.
```

- Reboot Windows.
- Again, from the Windows Search Type "powershell" then right-click on Windows PowerShell and then Run as administrator.
- In the PowerShell window run "**wsl --set-default-version 2**".

```
Windows PowerShell  
Copyright (C) Microsoft Corporation. All rights reserved.  
  
Try the new cross-platform PowerShell https://aka.ms/pscore6  
  
PS C:\Windows\system32> wsl --set-default-version 2  
For information on key differences with WSL 2 please visit https://aka.ms/wsl2  
The operation completed successfully.  
PS C:\Windows\system32>
```

- Next install a Linux distribution from the Microsoft Store



- You will now be able to run Linux commands in the Ubuntu terminal window.

Run a command as administrator (user "root"), use "sudo <command>".
"man sudo_root" for details.

```
LAPTOP-2S6KTBFB:~$ ls
LAPTOP-2S6KTBFB:~$ exit
```

Now you can install Docker Desktop for Windows

- Download the Docker Desktop for Windows installer from <https://www.docker.com/products/docker-desktop>

- Run the installer.



Configuration

- Install required Windows components for WSL 2
- Add shortcut to desktop



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
```

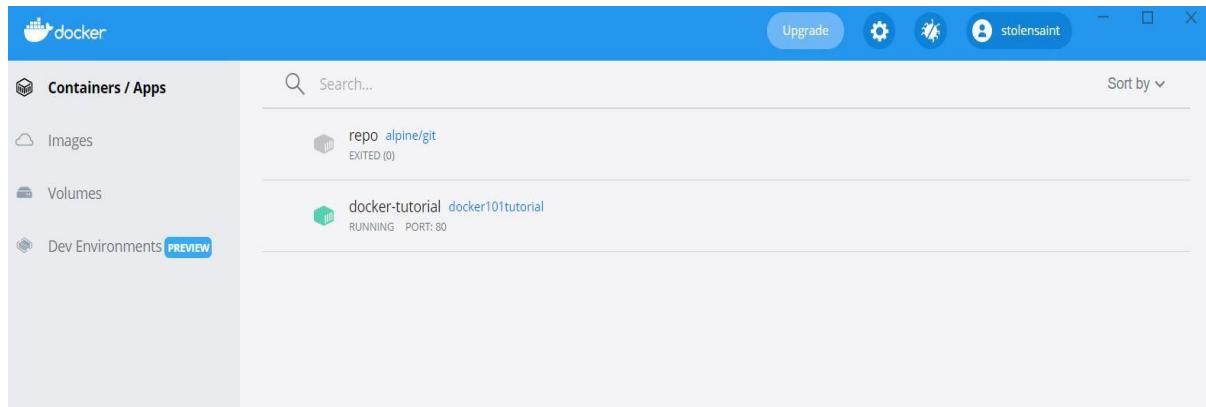
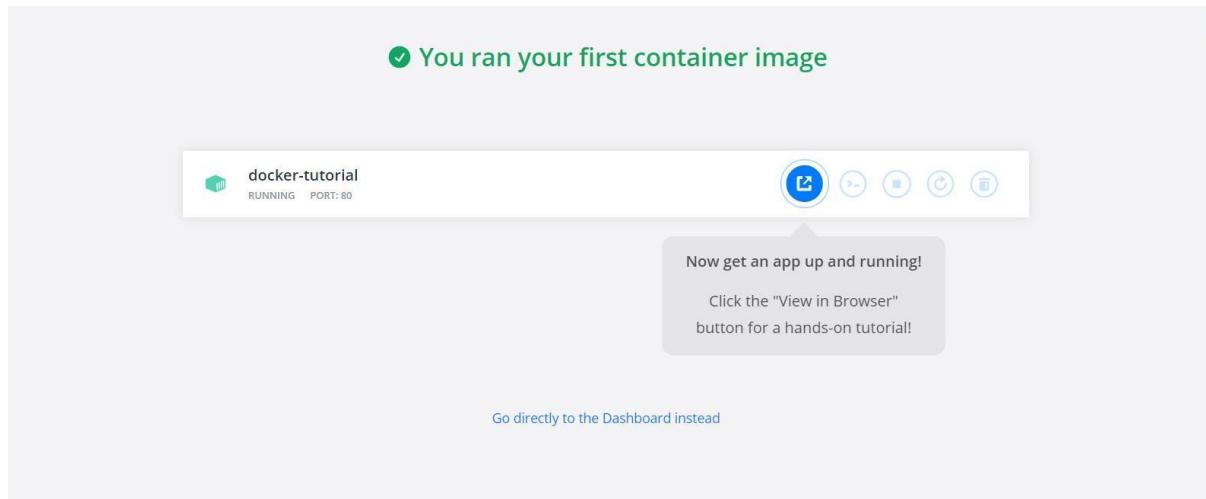


Installation succeeded

You must log out of Windows to complete installation.

[Close and log out](#)

- Reboot Windows.
- Login to Windows and let Docker finish setting up. This can take a few minutes depending on your machine.



- Run the docker “Hello World” from an Ubuntu Terminal run "docker run hello-world".

```
unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
2db29710123e: Pull complete
Digest: sha256:9ade9cc2e26189a19c2e8854b9c8f1e14829b51c55a630ee675a5a9540ef6ccf
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
 executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
 to your terminal.

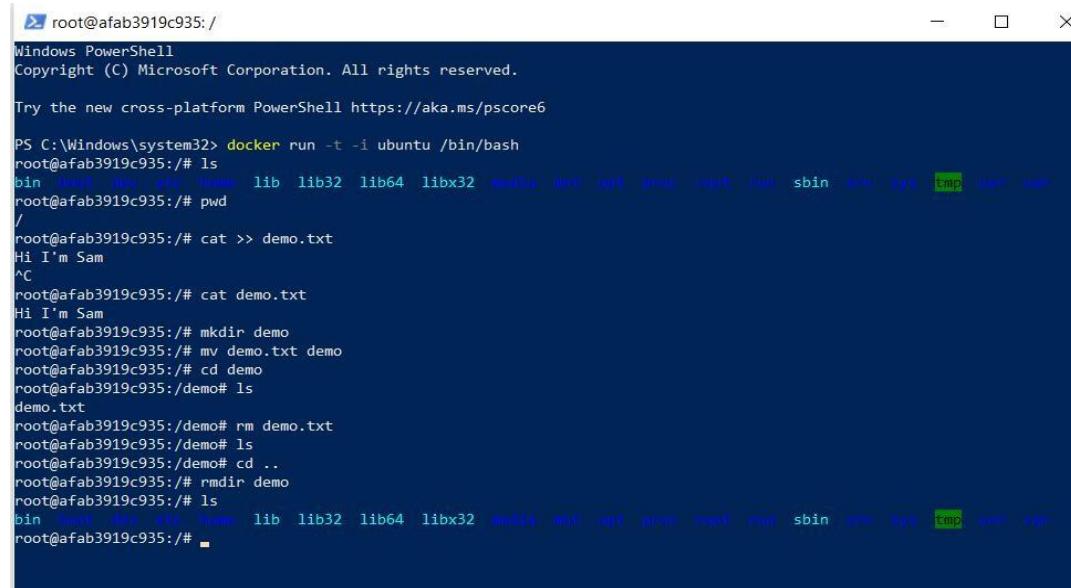
To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
```

Running Ubuntu Machine

- Run the command “**docker run -t -i ubuntu /bin/bash**” in powershell
- This is a Linux root bash, try some commands



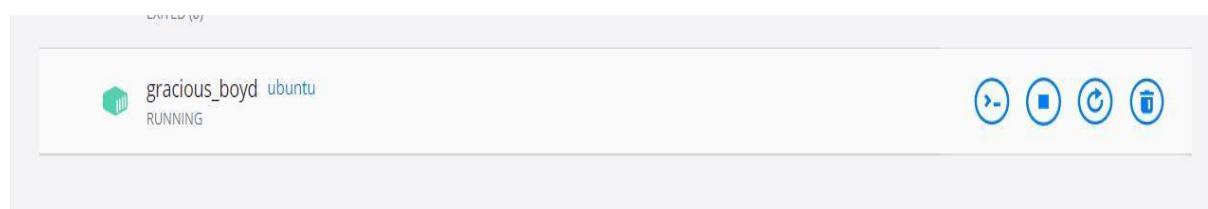
The screenshot shows a Windows PowerShell window with the title bar "root@afab3919c935: /". The command "docker run -t -i ubuntu /bin/bash" has been run, and the user is now in a root shell on a Ubuntu container. The terminal displays several commands being run:

```
root@afab3919c935: ~
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Windows\system32> docker run -t -i ubuntu /bin/bash
root@afab3919c935: ~
/bin/busybox: exec: /bin/sh: not found
root@afab3919c935: ~
root@afab3919c935: ~# ls
bin lib lib32 lib64 libx32 media etc var opt proc root run sbin arm sys tmp user var
root@afab3919c935: ~# pwd
/
root@afab3919c935: ~# cat >> demo.txt
Hi I'm Sam
^C
root@afab3919c935: ~# cat demo.txt
Hi I'm Sam
root@afab3919c935: ~# mkdir demo
root@afab3919c935: ~# mv demo.txt demo
root@afab3919c935: ~# cd demo
root@afab3919c935: ~/demo# ls
demo.txt
root@afab3919c935: ~/demo# rm demo.txt
root@afab3919c935: ~/demo# ls
root@afab3919c935: ~/demo# cd ..
root@afab3919c935: ~# rmdir demo
root@afab3919c935: ~# ls
bin lib lib32 lib64 libx32 media etc var opt proc root run sbin arm sys tmp user var
root@afab3919c935: ~#
```

Docker GUI-Containers



Removing All Containers

```
root@afab3919c935:/# exit
exit
PS C:\Windows\system32> docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
acious_boyd 8d21c1d81c22 ubuntu:latest "bash" 6 hours ago Exited (255) 8 minutes ago
busy_maxwell 1b0186a069a3 ubuntu "bash" 6 hours ago Exited (0) 6 hours ago
serene_dubinsky 48ab9a4423d5 ubuntu "bash" 7 hours ago Exited (0) 7 hours ago
serene_bhaskara fd9061619454 ubuntu "bash" 7 hours ago Exited (0) 7 hours ago
beautiful_tereshkova 398156a697cc hello-world "/hello" 8 hours ago Exited (0) 8 hours ago
jolly_torvalds a7e83e3eeda docker101tutorial "/docker-entrypoint..." 8 hours ago Exited (0) 7 hours ago
docker-tutorial e750d0f55bb4 alpine/git "git clone https://g..." 8 hours ago Exited (0) 8 hours ago
repo

PS C:\Windows\system32> docker rm -f busy_maxwell
busy_maxwell

PS C:\Windows\system32> docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
gracious_boyd afab3919c935 ubuntu "/bin/bash" 7 minutes ago Exited (0) 2 minutes ago
serene_dubinsky 1b0186a069a3 ubuntu "bash" 6 hours ago Exited (0) 6 hours ago
serene_bhaskara 48ab9a4423d5 ubuntu "bash" 8 hours ago Exited (0) 7 hours ago
beautiful_tereshkova fd9061619454 ubuntu "bash" 8 hours ago Exited (0) 7 hours ago
jolly_torvalds 398156a697cc hello-world "/hello" 8 hours ago Exited (0) 8 hours ago
docker-tutorial a7e83e3eeda docker101tutorial "/docker-entrypoint..." 8 hours ago Exited (0) 8 hours ago
repo

PS C:\Windows\system32> docker rm -f gracious_boyd
gracious_boyd

PS C:\Windows\system32> docker rm -f serene_dubinsky
serene_dubinsky

PS C:\Windows\system32> docker rm -f serene_bhaskara
serene_bhaskara

PS C:\Windows\system32> docker rm -f beautiful_tereshkova
beautiful_tereshkova

PS C:\Windows\system32> docker rm -f jolly_torvalds
jolly_torvalds

PS C:\Windows\system32> docker rm -f docker-tutorial
docker-tutorial

PS C:\Windows\system32> docker rm -f repo
repo

PS C:\Windows\system32> docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
PS C:\Windows\system32>
```

