

NETWORKING AND SYSTEM ADMINISTRATION LAB RECORD

Submitted By,
Haritha Krishnan
R Mca A-S2
Roll No: 40

Motherboard

A motherboard (also called mainboard, main circuit board, system board, baseboard, planar board, logic board, or mobo) is the main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.

Components of a Motherboard.

1. CPU (Central Processing Unit) chip

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

2. RAM (Random Access Memory) slots

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

3. Southbridge/northbridge

They are the two chips in the core logic chipset on the motherboard. Typically, the southbridge implements the slower capabilities of the motherboard in a northbridge/southbridge chipset computer architecture. The northbridge, also known as host bridge or Memory Controller Hub, is connected directly to the CPU via the front-side bus (FSB). It is responsible for tasks requiring the highest performance. Together with the southbridge, they manage communications between the CPU and other motherboard components.

4. BIOS (Basic Input/Output System)

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

5. I/O port

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

6. USB (Universal Serial Bus)

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

7. CPU slot

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

8. PCI (Peripheral Component Interconnect) slot

Peripheral Component Interconnect is a local computer bus for connecting hardware to a computer. It supports all the functions of a processor bus. PCI is usually been called Conventional PCI to distinguish it from its successor PCI Express (PCIe, PCI-e or PCI-E).PCI Express is a high-speed serial computer expansion bus standard designed to replace the older PCI, PCI-X and AGP bus standard. It is a general-use motherboard interface for the graphics card, SSDs, hard drives, Wi-Fi as well as Ethernet hardware connections.

9. AGP (Accelerated Graphics Port) slot

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

10. ISA (Industry Standard Architecture) slot

ISA is the 16-bit internal bus of IMB PC/AT and similar computers that are based on Intel 80286 and its immediate successors during the 1980s. It was backward compatible with the 8-bit bus of the 8088-based IBM PC largely. There once was an attempt to extend ISA into a 32-bit bus, called Extended Industry Standard Architecture (EISA). The attempt wasn't very successful and the EISA was largely replaced by the later VESA Local Bus and the PCI bus.

11. Parallel port

A parallel port is a kind of interface for attaching peripherals on desktops. The name of this kind of port is derived from the way the data is sent. That is, the parallel ports send multiple

bits of data at the same time. Serial interfaces, on the contrary, send bits one data at once. To achieve parallel data transfer, there are multiple data lines in the parallel port cables. The parallel port cable is larger than the cable of a contemporary serial port, which only has one data line within.

12. FDC (Floppy-Disk Controller)

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

13. IDE (Integrated Drive Electronics) controller

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

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

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

15. Power supply connector

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

16. Mouse and keyboard ports

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

17. DIP (Dual In-line Package) switch

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

18. Jumper

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

19. Heat sink/heatsink (cooling system)

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

20. Clock generator

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

Daughter Cards

A daughterboard (or daughter board , daughter card , or daughtercard) 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 daughterboards 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.

Motherboard vs Daughter Board

The name of these two boards are quite interesting, right? The names have their own significance. As you know the motherboard is named like that because of its functionalities. It works as a heart of a system. Most of the components are connected to the motherboard and get their necessary power from it. The daughter board is named like that because of its functionalities too. A daughter board is connected to the motherboard or expansion card. It is smaller than the motherboard. The daughter board is directly connected to the motherboard by soldering. A daughter board extends the circuitry of the motherboard or expansion card in which it is plugged into.

Functionalities of a Daughter Board

A daughter board is a circuit board that is directly connected to the motherboard or expansion card by soldering. Sometimes, people think that daughter board and expansion card are same. But this not true. They have their own functionalities. Daughter board's functionalities are given below:

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

RAM Modules

A memory module or RAM (random-access memory) stick is a printed circuit board on which memory integrated circuits are mounted. Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, workstations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer.

Types of memory module include:

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

TransFlash Memory Module: The TransFlash product is an ultra small, semi-removable flash memory module based on the miniSD card and TriFlash designs for future mobile phone products, especially the transfer of personal content between TransFlash-enabled phones.

SIMM: A SIMM (single in-line memory module) is a module containing one or several random access memory (RAM) chips on a small circuit board with pins that connect to the computer motherboard. Since the more RAM your computer has, the less frequently it will need to access your secondary storage (for example, hard disk or CD-ROM), PC owners sometimes expand RAM by installing additional SIMMs.

DIMM: A DIMM or dual in-line memory module, commonly called a RAM stick, comprises a series of dynamic random-access memory integrated circuits. These modules are mounted on a printed circuit board and designed for use in personal computers, workstations, printers, and servers.

Bus Slots

Bus Slots or an expansion slot is connection or port located inside a computer on the motherboard or riser board that allows a computer 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.

The Types of PC Expansion Slots

PCI Express: The best type of expansion slot to have in your PC is the PCI Express, also written as PCIe. Without boring you, the PCI Express type of expansion slot communicates with the motherboard, and therefore with the microprocessor, both quickly and efficiently.

PCI: The PCI slot is the most common form of internal expansion for a PC. Some PCs have a mixture of PCI and PCI Express slots. If so, go with PCI Express when you have that option.

AGP: This type of expansion slot was specifically designed to deal with graphics adapters. In fact, AGP stands for Accelerated Graphics Port. Older PCs may sport this expansion slot, but the best video cards use PCI Express.

ISA: The most ancient type of expansion slot is the ISA, which stands for (get this) Industry Standard Architecture. That's because it never really had a name until another, better type of expansion slot came along. ISA slots hang around to be compatible with older expansion cards.

SMPS

The full form of SMPS is Switched Mode Power Supply also known as Switching Mode Power Supply. SMPS is an electronic power supply system that makes use of a switching regulator to transfer electrical power effectively. It is a PSU (power supply unit) and is usually used in computers to change the voltage to the appropriate range for the computer.

An SMPS adjusts output voltage and current between different electrical configurations by switching the basics of typically lossless storage such as capacitors and inductors. Ideal switching concepts determined by transistors controlled outside of their active state that have no resistance when 'on' and carry no current when 'off.' It is the idea why switches with an ideal function will operate with 100 per cent output, that is, all input energy is provided to the load; no power is wasted as dissipated heating. In fact, such ideal systems do not exist, which is why a switching power source cannot be 100 per cent proficient, but it is still a vital improvement in effectiveness over a linear regulator.

Working principles of SMPS

In the SMPS device, the switching regulators are used which switches on and off the load current to maintain and regulate the voltage output. Suitable power generation for a system is the mean voltage between off and on. Unlike the linear power supply, the SMPS carry transistor switches among low dissipation, full-on and full-off phase, and spend much less time in high dissipation cycles, which decreases depleted strength.

Benefits of SMPS

- The switch-mode power source is small in scale.
- The SMPS is very lightweight.
- SMPS power consumption is typically 60 to 70 per cent, which is ideal for use.
- SMPS is strongly anti-interference.
- The SMPS production range is large.

Limitations of SMPS

- The complexity of SMPS is very large.
- The production reflection is high and its control is weak in the case of SMPS.
- Use of SMPS can only be a step-down regulator.
- In SMPS, the voltage output is just one.

Internal storage devices

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

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

The main disadvantage of internal storage is that when the hard disk fails (and it will), all the data and applications may be lost.

This can be avoided to some extent by using more than one hard disk within the machine. Each hard disk has a copy of all the data, so if one fails the other can carry on. This is called a RAID array. An alternative is to use external drives for backup.

Interfacing ports.

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:

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

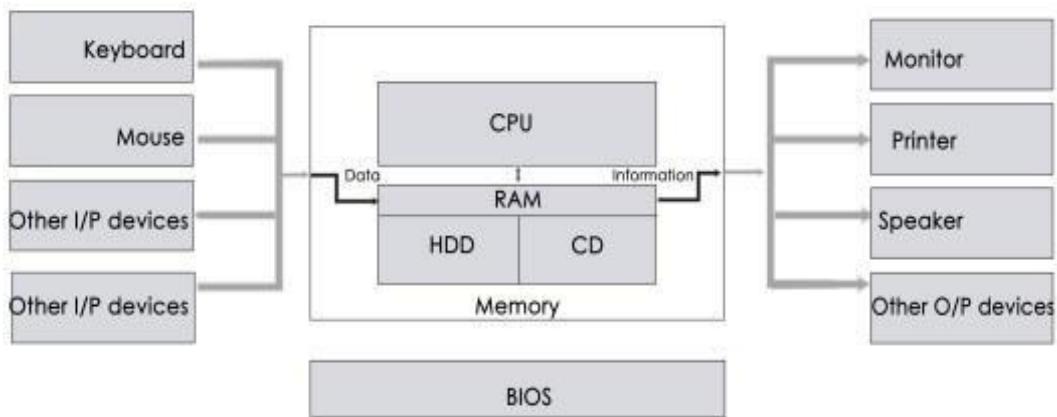
Ethernet Port: These are basically used to connect Ethernet cables to the computer. In this data may travel with a speed of 10mb/s to 100 mb/s based on the network bandwidth.

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.

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.



Basic hardware components

1. Input devices

An input device is any hardware device that sends data to a computer, allowing you to interact with and control it. Keyboard.

- Mouse.
- Joy Stick.
- Light pen.
- Digitizer
- Scanner.

Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Mouse

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed. Generally, it has two buttons called the left and the right button and a wheel is present between the buttons. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.

Joystick: Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions.

The function of the joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Light Pen

Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.

Scanner

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation. Scanner captures images from the source which are then converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

Digitizer

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at.

Digitizer is also known as Tablet or Graphics Tablet as it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for fine works of drawing and image manipulation applications.

2. Output devices

An output device is any piece of computer hardware equipment which converts information into human readable form.

- **Monitors**
- **Printers**

Monitors

Monitors, commonly called as Visual Display Unit (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

Printers

Printer is an output device, which is used to print information on paper. There are two types of printers –Impact Printers, Non-Impact Printers.

3. Secondary storage devices

Every computer also has another storage drive that's used for storing information on a long-term basis. This is secondary storage.

- Hard disk
- CD &, DVD

Hard disk: A hard disk drive is comprised of a stack of spinning metal disks known as platters. Each spinning disk has trillions of tiny fragments that can be magnetized in order to represent bits

CD &, DVD: CD stands for Compact Disc was the primary step towards the thought of digital coding of the info. DVD stands for Digital Versatile Disk provides another for the videotape utilized in tape recorder (Video container Recorder) and fixed storage utilized in computer because the videodisc will acquire seven times larger quantity of the info relative to CD.

4. Internal components

CPU: The CPU (Central Processing Unit or processor) is responsible for processing all information from programs run by your computer. The ‘clock speed’, or the speed at which the processor processes information, is measured in gigahertz (GHz). This means that a processor advertising a high GHz rating will likely perform faster than a similarly specified processor of the same brand and age.

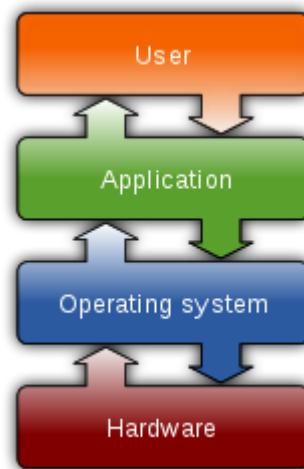
Motherboard: The motherboard is at the center of what makes a PC work. It houses the CPU and is a hub that all other hardware runs through. The motherboard acts as a brain; allocating power where it's needed, communicating with and coordinating across all other components – making it one of the most important pieces of hardware in a computer.

RAM: Random Access Memory, or RAM, is hardware found in the memory slots of the motherboard. The role of RAM is to temporarily store on-the-fly information created by programs and to do so in a way that makes this data immediately accessible. The

tasks that require random memory could be; rendering images for graphic design, edited video or photographs, multi-tasking with multiple apps open (for example, running a game on one screen and chatting via Discord on the other).

Operating System

An operating system is the most important software that runs on a computer. It manages the computer's memory and processes, as well as all of its software and hardware. It also allows you to communicate with the computer without knowing how to speak the computer's language. Without an operating system, a computer is useless.



- An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

Important functions of an operating System.

- Memory Management
- Processor Management
- Device Management
- File Management
- Security
- Control over system performance
- Job accounting
- Error detecting aids
- Coordination between other software and users

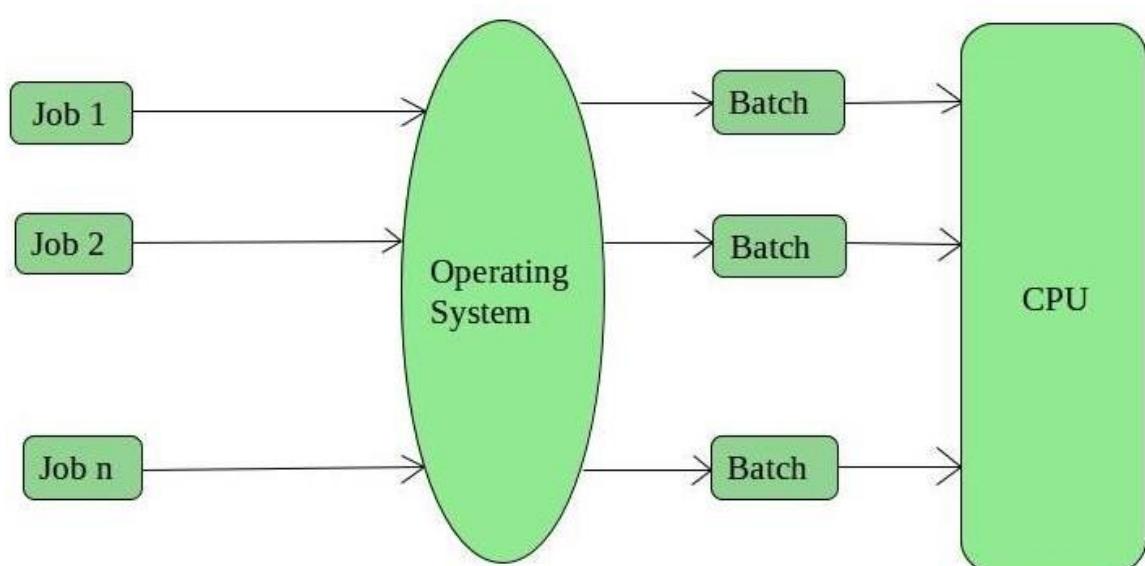
The operating system's job

Your computer's operating system (OS) manages all of the software and hardware on the computer. Most of the time, there are several different computer programs running at the same time, and they all need to access your computer's central processing unit (CPU), memory, and storage. The operating system coordinates all of this to make sure each program gets what it needs.

Types of operating systems

❖ Batch Operating System

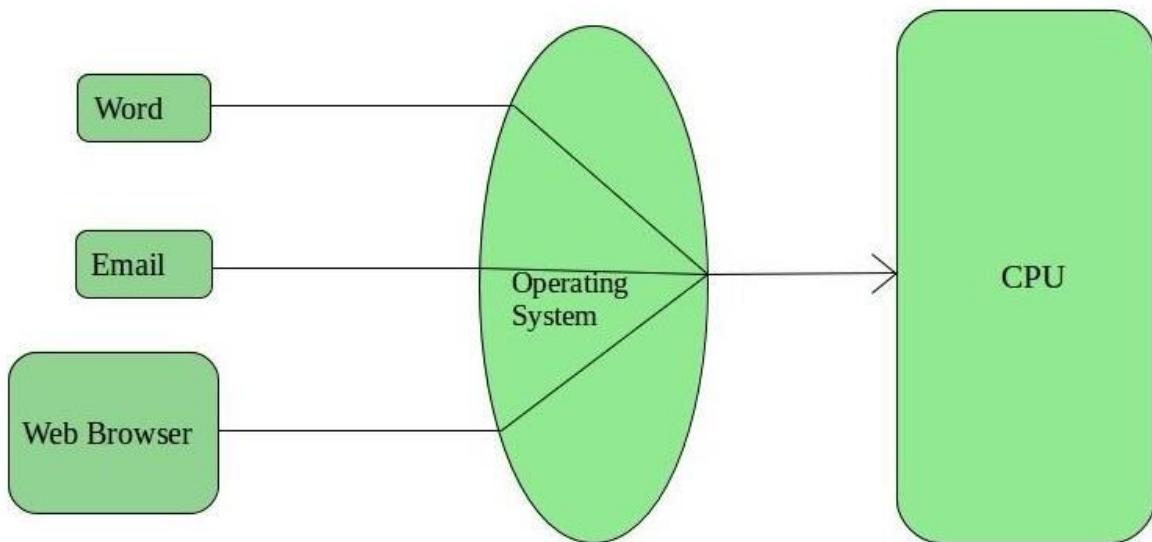
This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and group them into batches. It is the responsibility of the operator to sort jobs with similar needs.



Examples of Batch based Operating System: Payroll System, Bank Statements, etc.

❖ **Time-Sharing Operating Systems**

Each task is given some time to execute so that all the tasks work smoothly. Each user gets the time of CPU as they use a single system. These systems are also known as Multitasking Systems. The task can be from a single user or different users also. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to the next task.

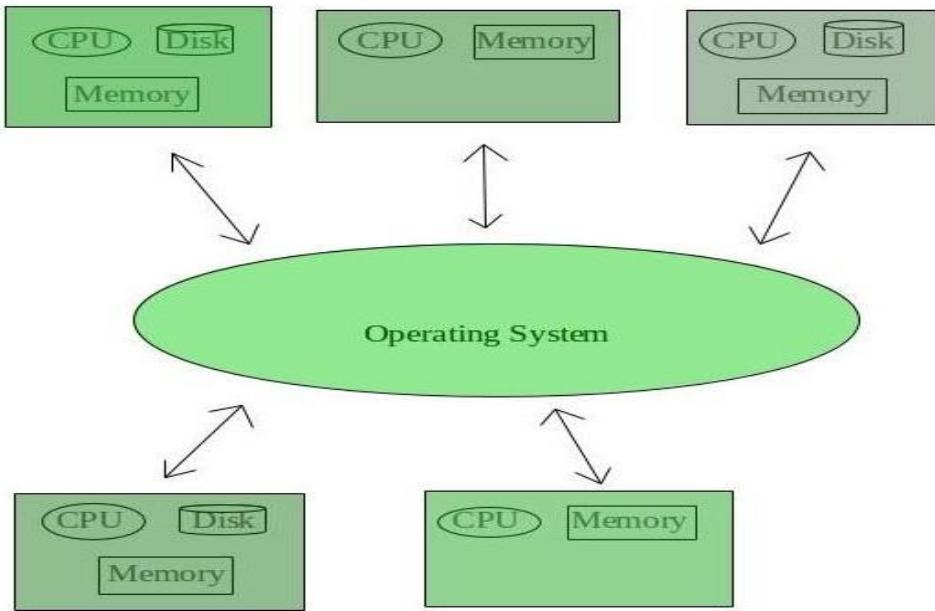


Examples of Time-Sharing OSs are: Multics, Unix, etc.

❖ **Distributed operating systems**

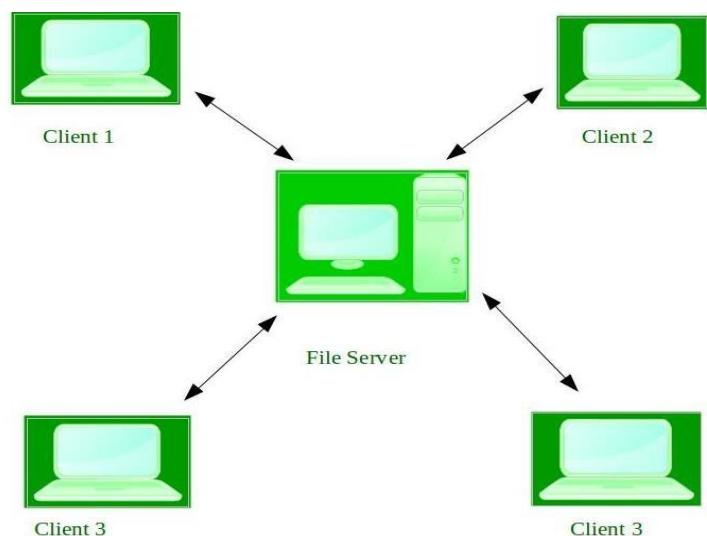
These types of the operating system is a recent advancement in the world of computer technology and are being widely accepted all over the world and, that too, with a great pace. Various autonomous interconnected computers communicate with each other using a shared communication network. Independent systems possess their own memory unit and CPU.

Examples of Distributed Operating System are- LOCUS, etc.



❖ **Network Operating System**

These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions. These types of operating systems allow shared access of files, printers, security, applications, and other networking functions over a small private network. One more important aspect of Network Operating Systems is that all the users are well aware of the underlying configuration, of all other users within the network, their individual connections, etc. and that's why these computers are popularly known as tightly coupled systems.

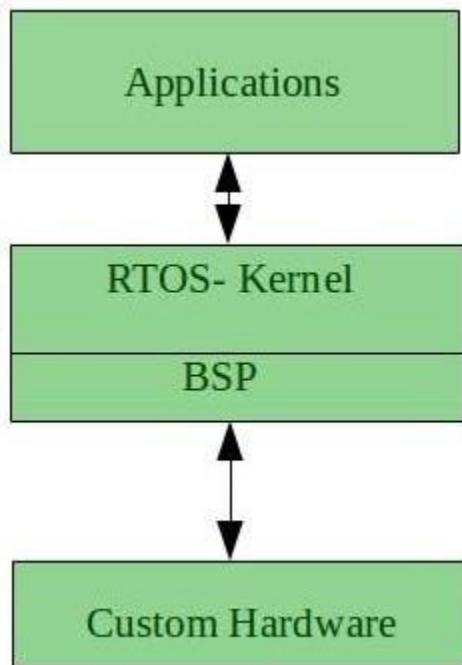


Examples of Network Operating System are: Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD, etc.

❖ **Real time operating system**

These types of OSs serve real-time systems. The time interval required to process and respond to inputs is very small. This time interval is called response time.

Real-time systems are used when there are time requirements that are very strict like missile systems, air traffic control systems, robots, etc.



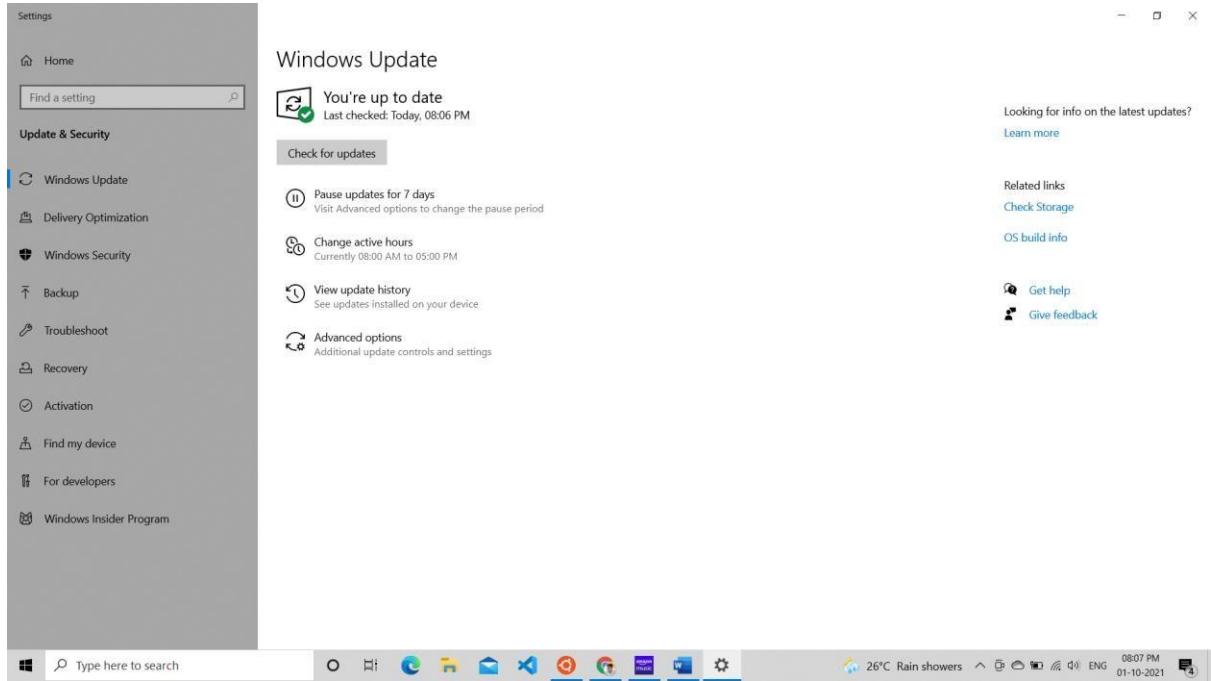
Examples of Real-Time Operating Systems are: Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

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).

```
Display usage information.
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".

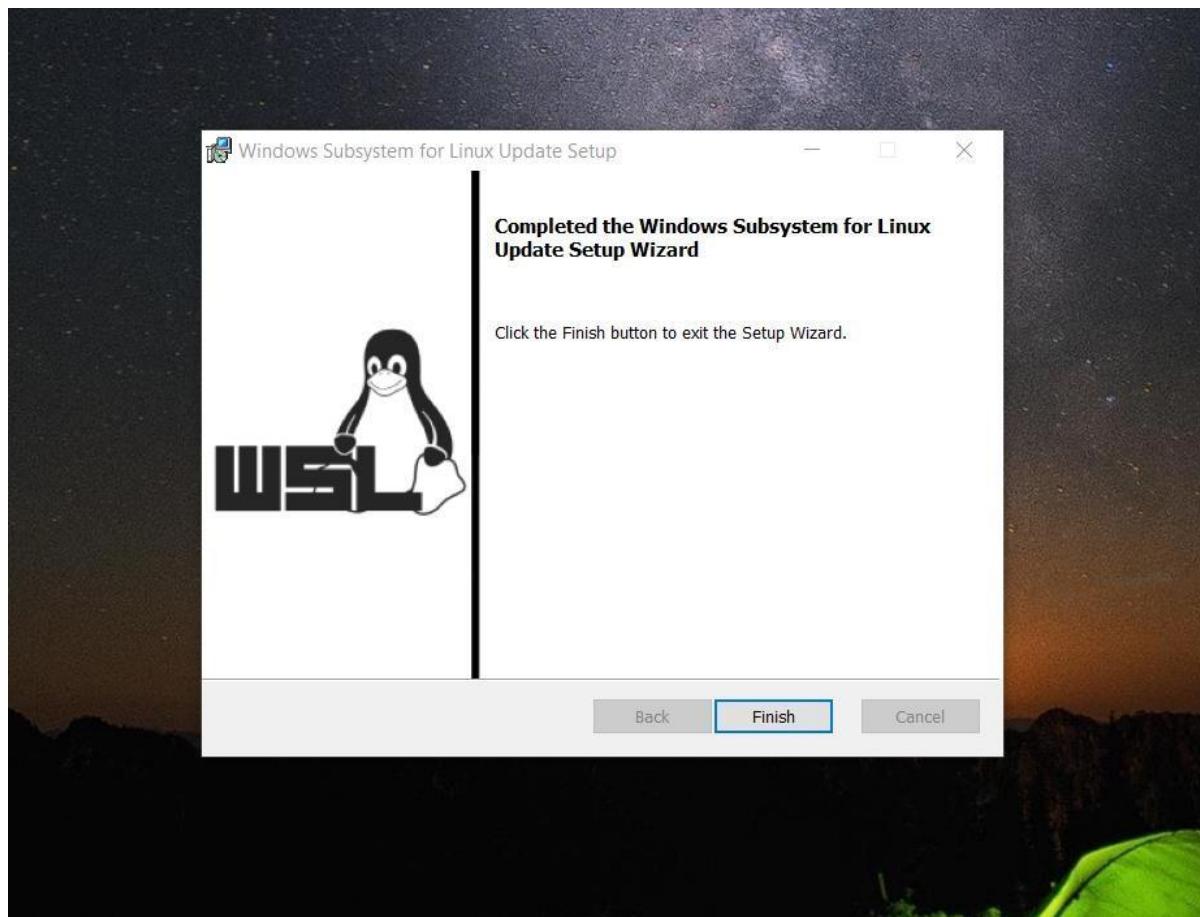
```
PS C:\Windows\system32> dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart

Deployment Image Servicing and Management tool
Version: 10.0.19041.844

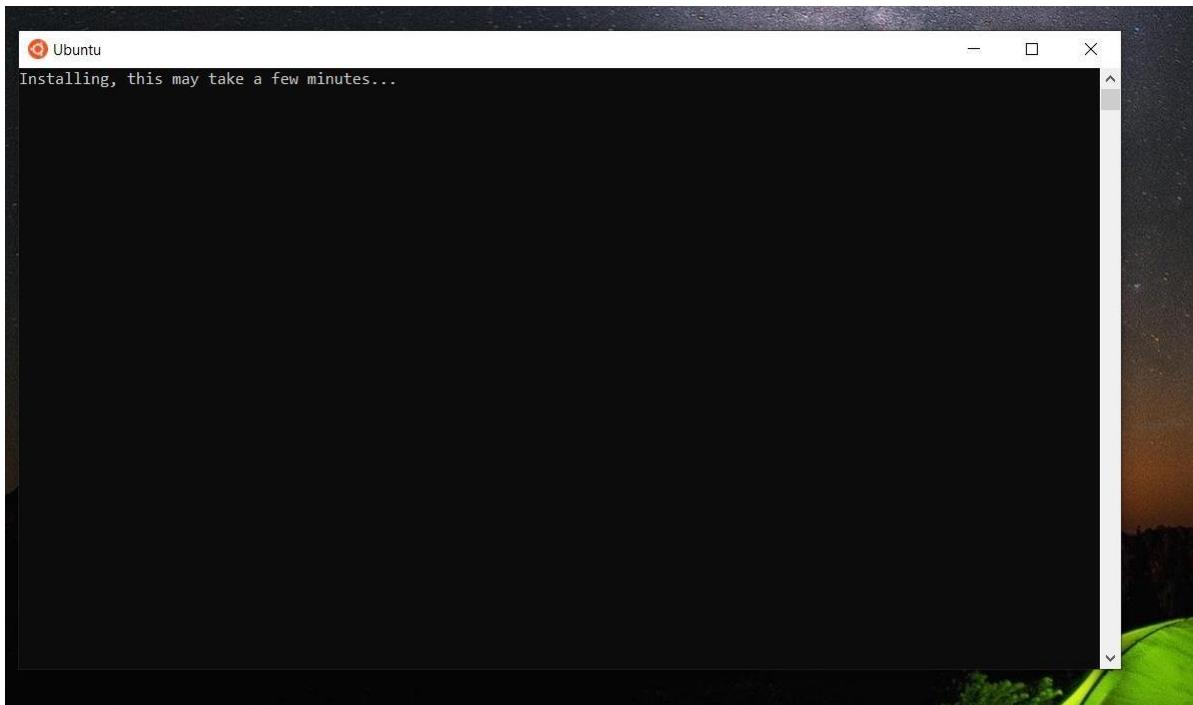
Image Version: 10.0.19043.1266

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.

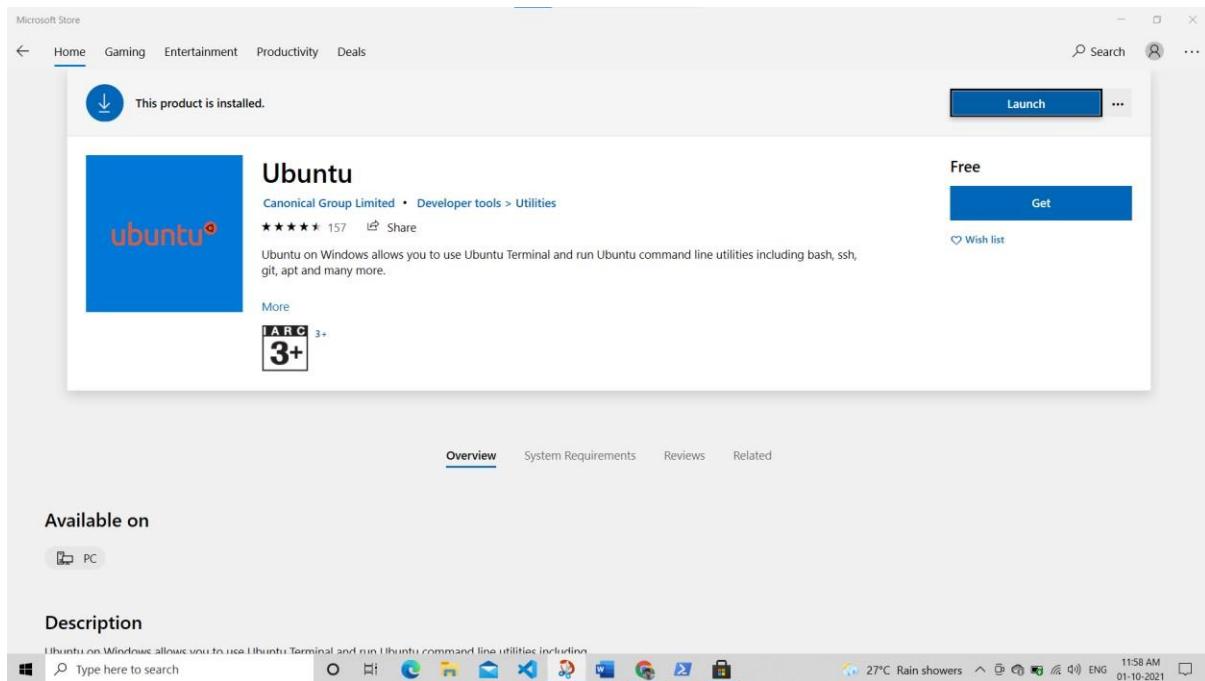
- In the PowerShell window run "wsl --set-default-version 2".

```
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.

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

Ok

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
```



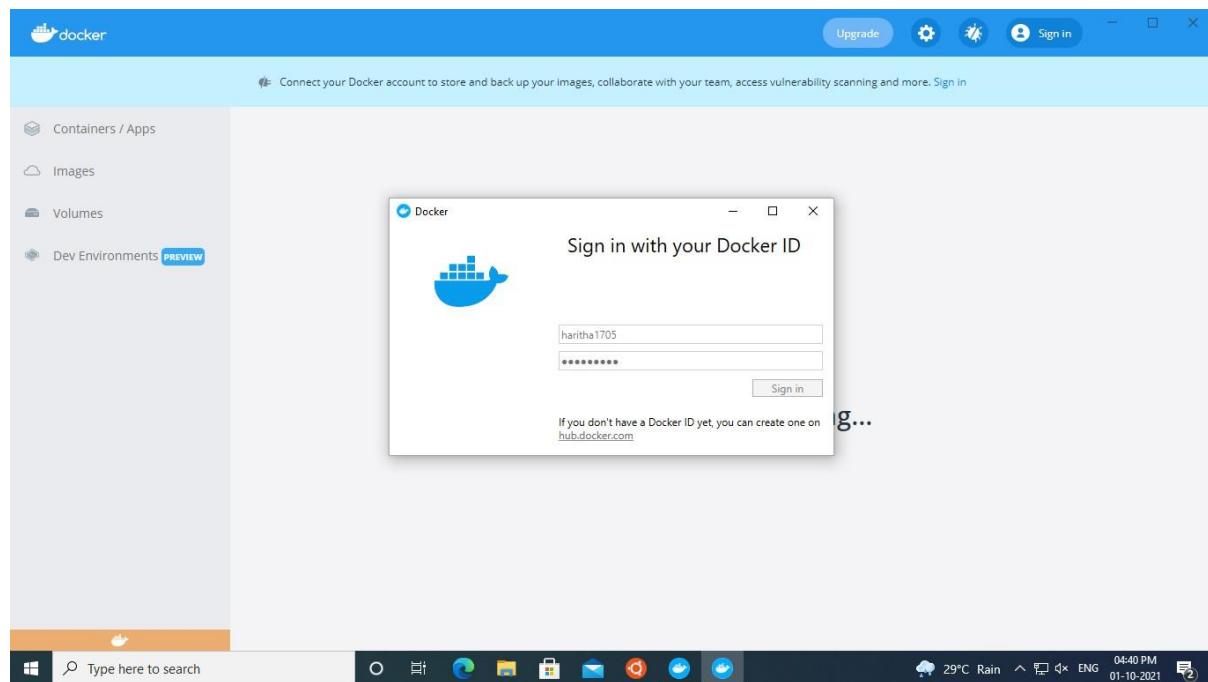
Docker Desktop 4.1.0

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.



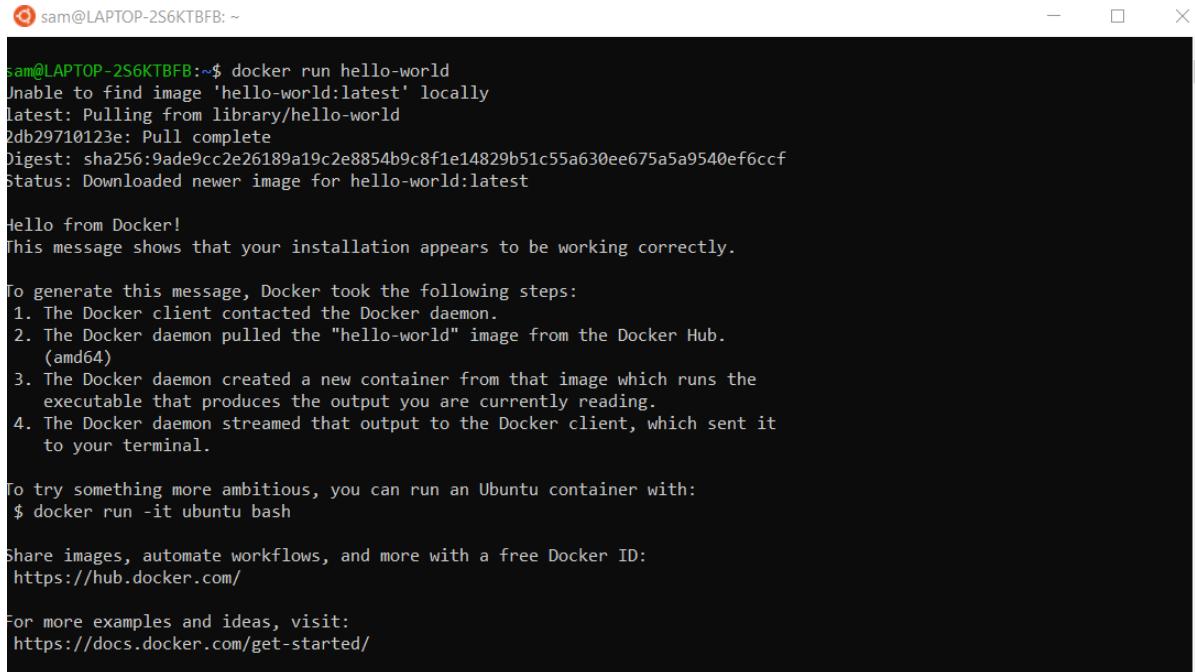
The screenshot shows the Docker desktop application interface. The left sidebar has a 'Containers / Apps' section with options for Images, Volumes, and Dev Environments (marked as PREVIEW). The main area displays two containers: 'wonderful_bhaskara/hello-world' (EXITED (0)) and 'objective_wing/ubuntu' (RUNNING). A search bar at the top says 'Search...'. The top right has 'Upgrade', 'Settings', 'Sign in', and other icons. The taskbar at the bottom shows various application icons.

The screenshot shows the Docker desktop application interface with the 'Images' tab selected in the sidebar. The main area is titled 'Images on disk' and shows '2 images' with a total size of '72.79 MB'. It includes tabs for 'LOCAL' and 'REMOTE REPOSITORIES'. A table lists the images:

NAME	TAG	IMAGE ID	CREATED	SIZE
hello-world	latest	feb5d9fea6a5	7 days ago	13.26 KB
ubuntu	latest	597ce1600cf4	about 9 hours ago	72.78 MB

At the bottom, there's a 'Connect to Remote Content' section with a 'Not connected' status, and several promotional checkboxes for Docker services like vulnerability scanning and backup.

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



```

sam@LAPTOP-2S6KTBFB:~$ 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

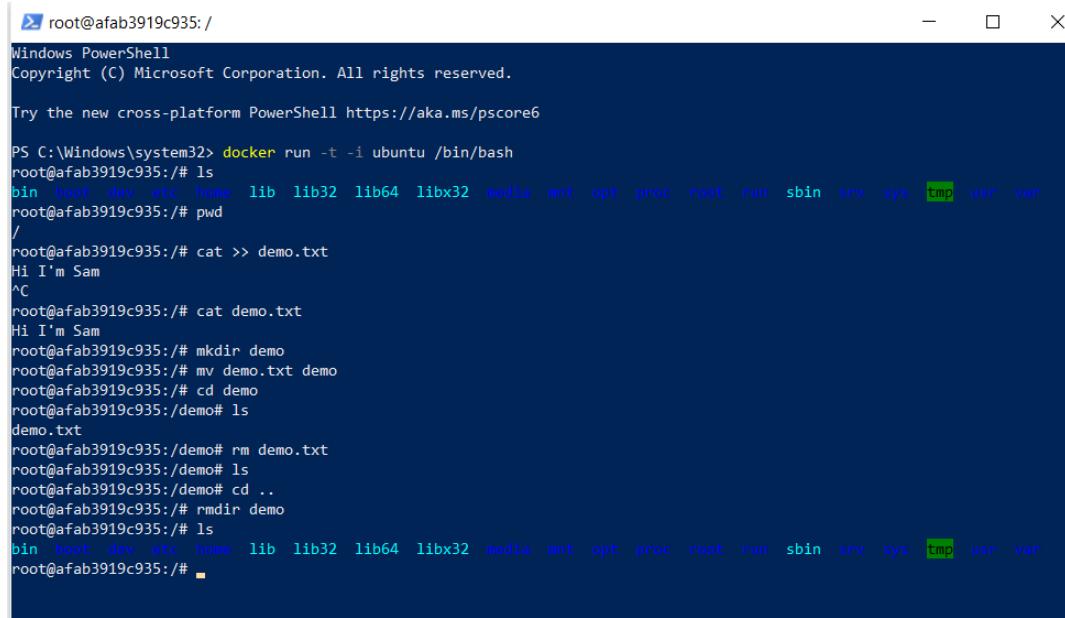
Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

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

```

Running the Ubuntu Machine

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



```

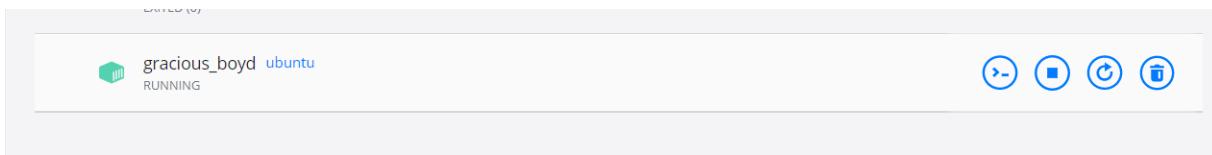
root@afab3919c935:/ 
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

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

PS C:\Windows\system32> docker run -t -i ubuntu /bin/bash
root@afab3919c935:/# ls
bin boot dev etc home lib lib32 lib64 libx32 media mnt opt proc root run sbin srv sys tmp usr 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 boot dev etc home lib lib32 lib64 libx32 media mnt opt proc root run sbin srv sys tmp usr var
root@afab3919c935:/#

```

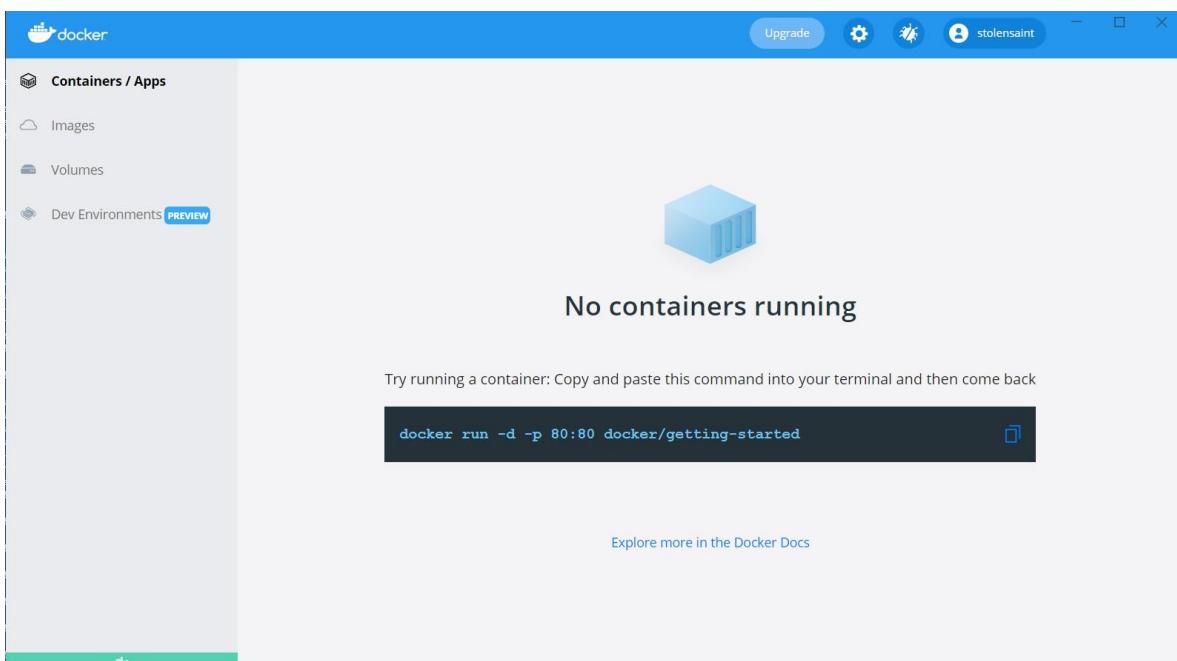
Docker GUI-Containers



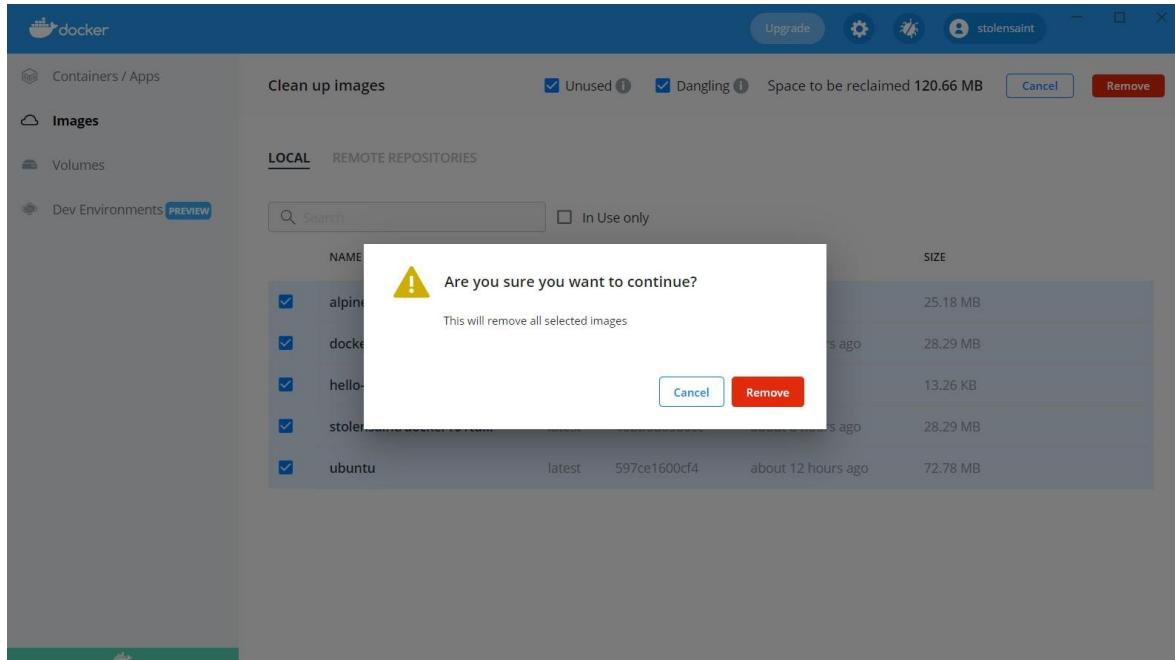
Removing All Containers

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

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
afab3919c935   ubuntu      "/bin/bash"        7 minutes ago   Exited (0) 2 minutes ago
1b0186a069a3   ubuntu      "bash"           6 hours ago    Exited (0) 6 hours ago
48ab9a4423d5   ubuntu      "bash"           8 hours ago    Exited (0) 7 hours ago
fd9061619454   ubuntu      "bash"           8 hours ago    Exited (0) 7 hours ago
398156a697cc   hello-world "/hello"         8 hours ago    Exited (0) 8 hours ago
a7e83e3eeda   docker101tutorial "/docker-entrypoint..." 8 hours ago    Exited (0) 8 hours ago
e750d0f55bb4   alpine/git  "git clone https://g..." 8 hours ago    Exited (0) 8 hours ago
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>
```



Cleaning Up Images



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
```

```
Your Details
Name: haritha
College: ajce
> █
```

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"
```

```
value of variable  
10
```

3. 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
```

```
user@user-VirtualBox:~$ gedit
^C
user@user-VirtualBox:~$ chmod u+x bash2.txt
user@user-VirtualBox:~$ ./bash2.txt
arithematic operations
Enter a number
5
Enter another number
3
Select operation
\n1.Addition\n2.Substration\n3.Multiplication\n4.Division
1
x+y=8
user@user-VirtualBox:~$
```

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

```
#!/bin/bash

echo "Finding a number"

echo "Enter a number"

read a

if [ $a == 5 ]; then

    echo "Number is found ;)"

else

    echo "Number is NOT found !"

fi
```

```
user@user-VirtualBox:~$ chmod u+x bash3.t
user@user-VirtualBox:~$ ./bash3.txt
Finding a number
Enter a number
3
Number is NOT found !
user@user-VirtualBox:~$ ./bash3.txt
Finding a number
Enter a number
5
Number is found ;)
user@user-VirtualBox:~$
```

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

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

```
echo "Time and Calendar"
```

```
echo "Today is $(date)"
```

```
echo ""
```

```
echo "Calendar :"
```

```
cal
```

```
^C
user@user-VirtualBox:~$ chmod u+x bash4.txt
user@user-VirtualBox:~$ ./bash4.txt
Time and Calendar
Today is Sunday 03 October 2021 01:54:31 PM IST
Calendar :
```

6. 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
```

```
user@user-VirtualBox
Even OR Odd
Enter a number
17
Number is odd
(bash4.txt: line 12)
```

7. 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
```

```
/root@root:~# ./check13
Check numbers
Enter first number:
1
Enter second number:
7
7 is greater
```

8. 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"
```

```
user@user-VirtualBox:~/Documents$ ./bash8
Sum of Numbers
"sum of first 10 numbers = 55"
```

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

```
#!/bin/bash

echo "AVG, SUM & Product of 4 No:"

echo "enter first number: "

read a

echo "Second number: "

read b

echo "Third number: "

read c

echo "Fourth number: "

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
```

```
AVG, SUM & Product of 4 No:
enter first number:
67
Second number:
78
Third number:
89
Fourth number:
34
The sum of these numbers is: 268
The average of these numbers is: 67.000000000000000000000000000000
The product of these numbers is: 15813876
```

10. 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
```

```
enter a:
3
enter b :
4
enter c :
2
Smallest of 3 4 2 is 2
```

11. 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"

```

```

user@user-VirtualBox:~$ ./t
Factorial
Enter a number
3
Factorial is 6
user@user-VirtualBox:~$ 

```

12. 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

```

```

user@user-VirtualBox:~$ ./palindrome12.sh
Palindrome or Not
Enter number to check
3673
Number is not Palindrome
user@user-VirtualBox:~$ 

```

13. 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

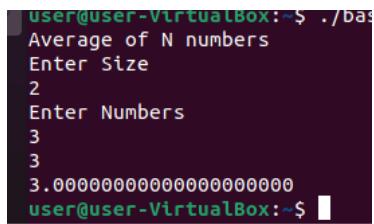
    sum=$((sum + num))

    i=$((i + 1))

done

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

echo $avg
```



```
user@user-VirtualBox:~$ ./bas
Average of N numbers
Enter Size
2
Enter Numbers
3
3
3.00000000000000000000000000000000
user@user-VirtualBox:~$
```

14. 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"

```

```

user@user-VirtualBox:~$ chmod u+
user@user-VirtualBox:~$ ./bash14
Sum of all digits
Enter a number:
11
Sum of digits is 2
user@user-VirtualBox:~$ 

```

15. 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"
```

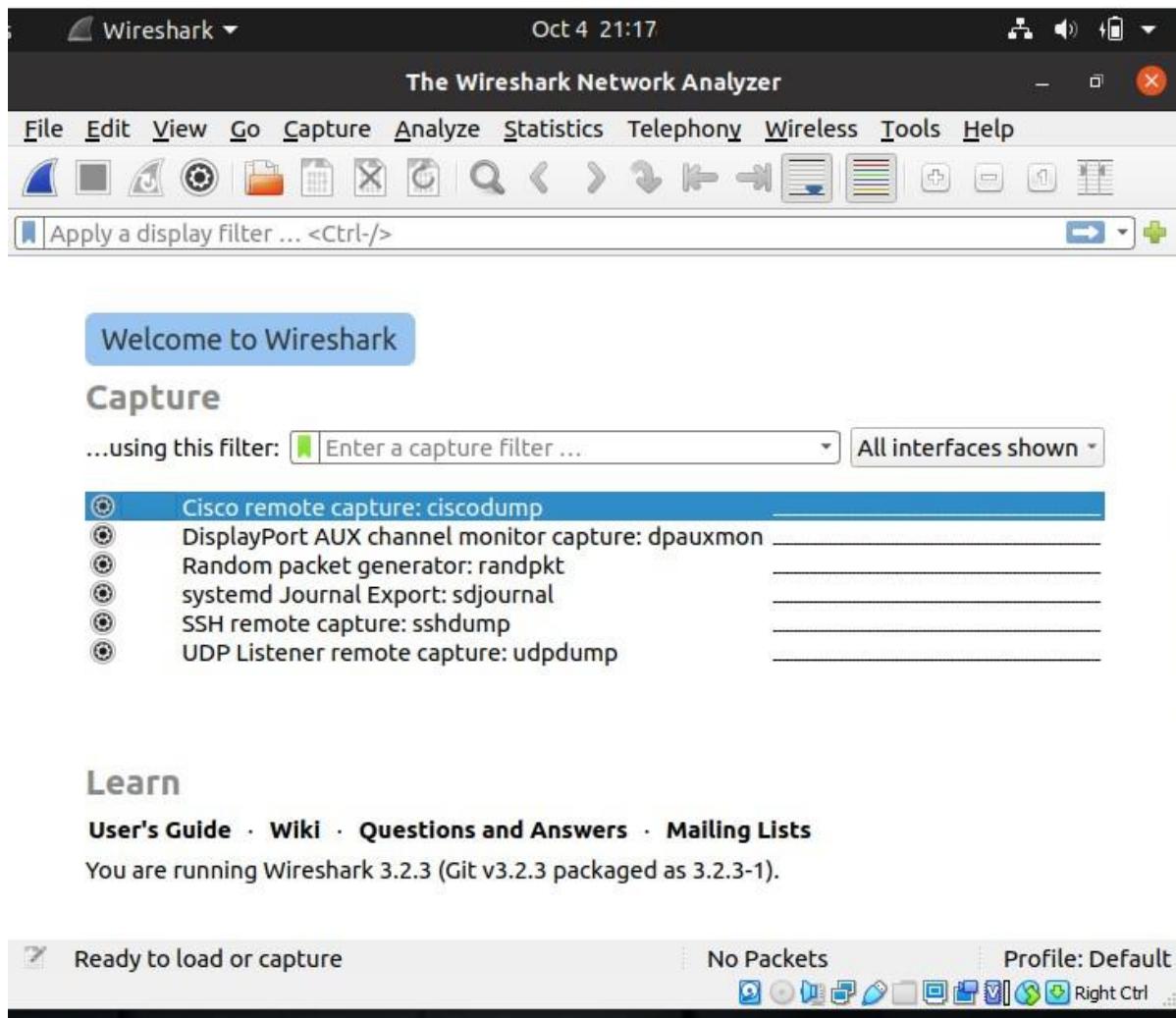
```
fi
```

```
user@user-VirtualBox:~$  
LEAP YEAR OR NOT  
Enter the year  
2004  
2004 is leap year  
user@user-VirtualBox:~$
```

```
sudo apt-get install wireshark
```

```
user@user-VirtualBox:~$ sudo apt install wireshark
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  file-roller libcurl4-openssl-dev libdouble-conversion3 liblua5.2-0 libpcre2-16-0
  libqt5core5a libqt5dbus5 libqt5gui5 libqt5multimedia5
  libqt5multimedia5-plugins libqt5multimediasupport5
  libqt5multimediawidgets5 libqt5network5 libqt5opengl5 libqt5printsupport5
  libqt5svg5 libqt5widgets5 libsmi2ldbl libsnaappy1v5 libspandsp2
  libssh-gcrypt-4 libwireshark-data libwireshark13 libwiretap10 libwsutil11
  libxcb-xinerama0 libxcb-xinput0 qt5-gtk-platformtheme qttranslations5-l10n
  wireshark-common wireshark-qt
Suggested packages:
  p7zip-full arj lha lzop lzop-ncompress rpm2cpio rzip sharutils unace unalz
  unar zoo 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:
  libcurl4-openssl-dev libdouble-conversion3 liblua5.2-0 libpcre2-16-0 libqt5core5a
  libqt5dbus5 libqt5gui5 libqt5multimedia5 libqt5multimedia5-plugins
  libqt5multimediasupport5 libqt5multimediawidgets5 libqt5network5
  libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgets5 libsmi2ldbl
  libsnaappy1v5 libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark13
  libwiretap10 libwsutil11 libxcb-xinerama0 libxcb-xinput0
  qt5-gtk-platformtheme qttranslations5-l10n wireshark wireshark-common
  wireshark-qt
The following packages will be upgraded:
  file-roller
```

```
user@user-VirtualBox:~$ sudo dpkg-reconfigure wireshark-common
[sudo] password for user:
```



Netcat

```
user@user-VirtualBox:~$ nc -z -v 10.0.2.255 20-80
nc: connect to 10.0.2.255 port 20 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 21 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 22 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 23 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 24 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 25 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 26 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 27 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 28 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 29 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 30 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 31 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 32 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 33 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 34 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 35 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 36 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 37 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 38 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 39 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 40 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 41 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 42 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 43 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 44 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 45 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 46 (tcp) failed: Network is unreachable
nc: connect to 10.0.2.255 port 47 (tcp) failed: Network is unreachable
```

Ansible Installation

```
  ... if 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" wit  
h 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) ...  
W: http://in.archive.ubuntu.com/ubuntu/pool/main/p/python-crypto/python3-crypto  
_2.6.1-13ubuntu2_amd64.deb: Automatically disabled Acquire::http::Pipeline-Dept  
t due to incorrect response from server/proxy. (man 5 apt.conf)  
on U10 haritha@haritha-VirtualBox:~$
```

Ansible Version

```
  h due to incorrect response from server/proxy. (man 5 apt.conf)  
haritha@haritha-VirtualBox:~$ ansible --version  
ansible 2.9.6  
  config file = /etc/ansible/ansible.cfg  
  configured module search path = ['/home/haritha/.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]  
haritha@haritha-VirtualBox:~$
```

Install Apache

- Update your system

```
sudo apt update
```

- Install Apache using apt:

```
sudo apt install apache2
```

- Confirm that Apache is now running with the following command:

```
sudo systemctl status apache2
```

- if it is not working

```
sudo systemctl start apache2
```

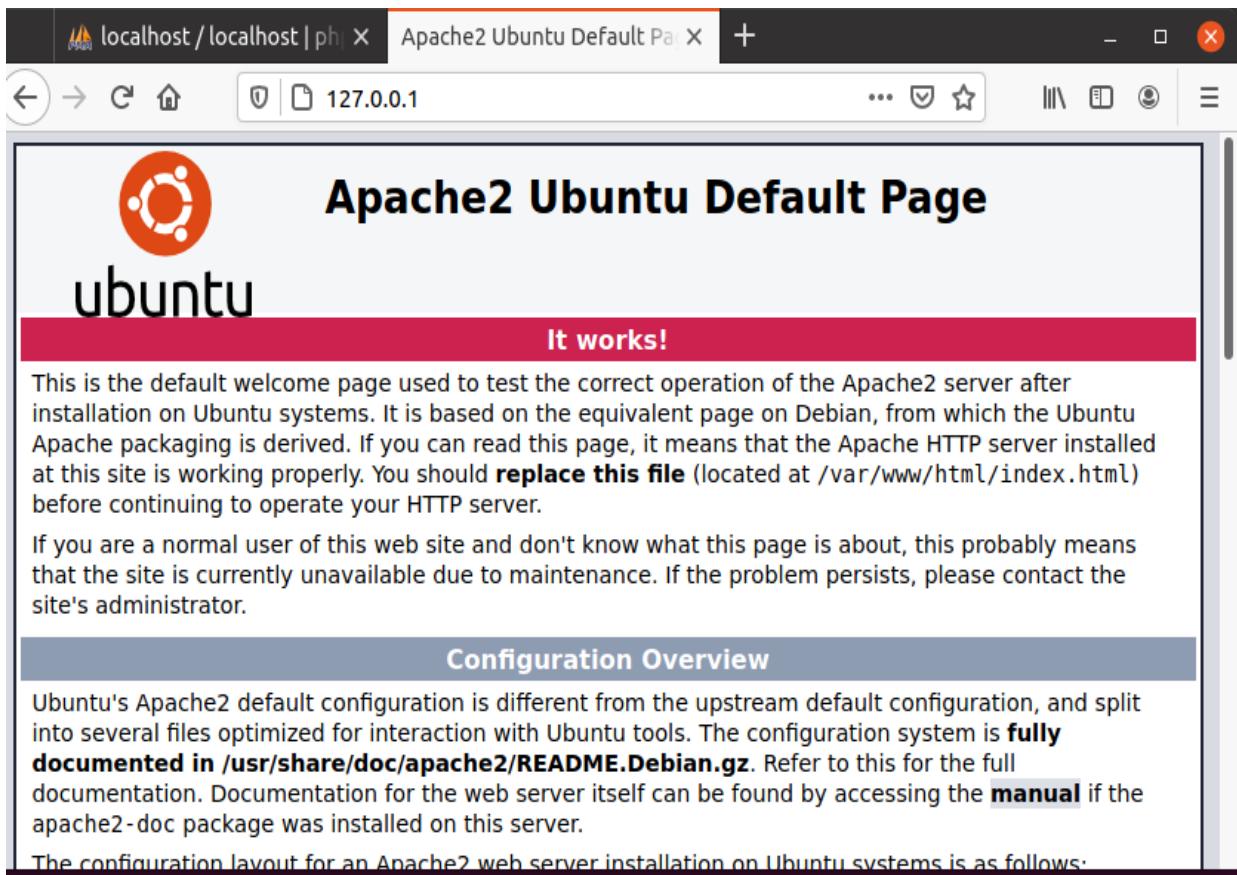
```
haritha@haritha-VirtualBox:~$ sudo systemctl status apache2
[sudo] password for haritha:
● apache2.service - The Apache HTTP Server
  Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor pres>
  Active: active (running) since Wed 2021-09-29 20:15:59 IST; 4min 15s ago
    Docs: https://httpd.apache.org/docs/2.4/
   Process: 668 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SU>
 Main PID: 807 (apache2)
     Tasks: 6 (limit: 2316)
    Memory: 19.1M
      CGroup: /system.slice/apache2.service
              ├─807 /usr/sbin/apache2 -k start
              ├─818 /usr/sbin/apache2 -k start
              ├─819 /usr/sbin/apache2 -k start
              ├─820 /usr/sbin/apache2 -k start
              ├─821 /usr/sbin/apache2 -k start
              └─822 /usr/sbin/apache2 -k start

Sep 29 20:15:49 haritha-VirtualBox systemd[1]: Starting The Apache HTTP Server>
Sep 29 20:15:59 haritha-VirtualBox apachectl[694]: AH00558: apache2: Could not>
Sep 29 20:15:59 haritha-VirtualBox systemd[1]: Started The Apache HTTP Server.
lines 1-19/19 (END)
```

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

`http://youripaddress`

(find out your ip address using ifconfig)



Install mariDB

- sudo apt install mariadb-server mariadb-client

Check mariadb Installation

- sudo systemctl status mysql

(if it is not working sudo systemctl start mysql)

```
haritha@haritha-VirtualBox:~$ sudo systemctl status mysql
● mariadb.service - MariaDB 10.3.31 database server
   Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor pre-
   Active: active (running) since Thu 2021-09-30 20:23:46 IST; 34min ago
     Docs: man:mysqld(8)
           https://mariadb.com/kb/en/library/systemd/
   Main PID: 777 (mysqld)
     Status: "Taking your SQL requests now..."
       Tasks: 30 (limit: 2316)
      Memory: 87.1M
        CGroup: /system.slice/mariadb.service
                  └─777 /usr/sbin/mysqld

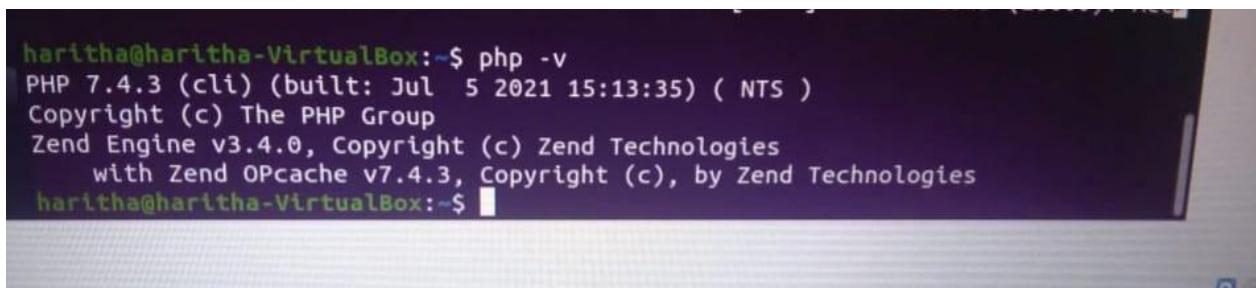
Sep 30 20:23:37 haritha-VirtualBox mysqld[777]: 2021-09-30 20:23:36 0 [Note] />
Sep 30 20:23:46 haritha-VirtualBox systemd[1]: Started MariaDB 10.3.31 database ser>
Sep 30 20:23:46 haritha-VirtualBox /etc/mysql/debian-start[970]: Upgrading MySQL >
Sep 30 20:23:48 haritha-VirtualBox /etc/mysql/debian-start[973]: Looking for '>
Sep 30 20:23:48 haritha-VirtualBox /etc/mysql/debian-start[973]: Looking for '>
Sep 30 20:23:48 haritha-VirtualBox /etc/mysql/debian-start[973]: Version check >
Sep 30 20:23:48 haritha-VirtualBox /etc/mysql/debian-start[973]: ERROR 1045 (2>
Sep 30 20:23:48 haritha-VirtualBox /etc/mysql/debian-start[973]: FATAL ERROR:>
Sep 30 20:23:48 haritha-VirtualBox /etc/mysql/debian-start[1003]: Checking for >
Sep 30 20:23:48 haritha-VirtualBox debian-start[1006]: ERROR 1045 (28000): Acces>
O Sep 30 20:23:48 haritha-VirtualBox debian-start[1006]: ERROR 1045 (28000): Acces>
```

Install PHP and commonly used modules

- sudo apt install php libapache2-mod-php php-ocache 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
```



haritha@haritha-VirtualBox:~\$ php -v
PHP 7.4.3 (cli) (built: Jul 5 2021 15:13:35) (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
haritha@haritha-VirtualBox:~\$

Open a browser

<http://127.0.0.1/phpinfo.php>

PHP Version 7.4.3

System	Linux ubuntu 5.8.0-43-generic #49~20.04.1-Ubuntu SMP Fri Feb 5 09:57:56 UTC 2021 x86_64
Build Date	Jul 5 2021 15:13:35
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/7.4/apache2
Loaded Configuration File	/etc/php/7.4/apache2/php.ini
Scan this dir for additional .ini files	/etc/php/7.4/apache2/conf.d
Additional .ini files parsed	/etc/php/7.4/apache2/conf.d/10-mysqlnd.ini, /etc/php/7.4/apache2/conf.d/10-opcache.ini, /etc/php/7.4/apache2/conf.d/10-pdo.ini, /etc/php/7.4/apache2/conf.d/15-xml.ini, /etc/php/7.4/apache2/conf.d/20-bz2.ini, /etc/php/7.4/apache2/conf.d/20-calendar.ini, /etc/php/7.4/apache2/conf.d/20-ctype.ini, /etc/php/7.4/apache2/conf.d/20-curl.ini, /etc/php/7.4/apache2/conf.d/20-dom.ini, /etc/php/7.4/apache2/conf.d/20-exif.ini, /etc/php/7.4/apache2/conf.d/20-ffi.ini, /etc/php/7.4/apache2/conf.d/20-finfo.ini, /etc/php/7.4/apache2/conf.d/20-ftp.ini, /etc/php/7.4/apache2/conf.d/20-gd.ini, /etc/php/7.4/apache2/conf.d/20-gettext.ini, /etc/php/7.4/apache2/conf.d/20-iconv.ini, /etc/php/7.4/apache2/conf.d/20-json.ini, /etc/php/7.4/apache2/conf.d/20-mbstring.ini, /etc/php/7.4/apache2/conf.d/20-phar.ini, /etc/php/7.4/apache2/conf.d/20-posix.ini, /etc/php/7.4/apache2/conf.d/20-readline.ini, /etc/php/7.4/apache2/conf.d/20-shmop.ini, /etc/php/7.4/apache2/conf.d/20-simplexml.ini, /etc/php/7.4/apache2/conf.d/20-zip.ini

arya@ubuntu:~\$

```
ayya@ubuntu:~$ sudo mysql -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 42
Server version: 10.3.31-MariaDB-0ubuntu0.20.04.1 Ubuntu 20.04

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

MariaDB [(none)]> create database sample;
Query OK, 1 row affected (0.000 sec)

MariaDB [(none)]> show databases;
+-----+
| Database      |
+-----+
| information_schema |
| mysql          |
| performance_schema |
| phpmyadmin     |
| sample         |
+-----+
5 rows in set (0.000 sec)

MariaDB [(none)]>
```

Check phpmyadmin

Open a browser

<http://localhost/phpmyadmin>

username : root

password : yourpassword

The screenshot shows the phpMyAdmin login interface. At the top is the logo with a sailboat icon and the text "phpMyAdmin". Below it is the heading "Welcome to phpMyAdmin". There is a "Language" dropdown menu set to "English". A large "Log in" button is prominently displayed. To the left of the "Log in" button is a "Language" link. Below the "Log in" button are two input fields: "Username" containing "root" and "Password" containing a series of dots. A "Go" button is located to the right of the password field.

localhost/phpmyadmin/server_databases.php

phpMyAdmin

Databases SQL Status User accounts Export Import Settings Replication More

Databases

Create database

Database name: utf8mb4_general_ci

Database	Collation	Action
information_schema	utf8_general_ci	<input type="button" value="Check privileges"/>
mysql	utf8mb4_general_ci	<input type="button" value="Check privileges"/>
performance_schema	utf8_general_ci	<input type="button" value="Check privileges"/>
phpmyadmin	utf8mb4_general_ci	<input type="button" value="Check privileges"/>
Total: 4	utf8mb4_general_ci	

Check all With selected:

Commands in windows and linux

1. Ping

```
C:\Users\Hari>ping

Usage: ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS]
           [-r count] [-s count] [[-j host-list] | [-k host-list]]
           [-w timeout] [-R] [-S srcaddr] [-c compartment] [-p]
           [-4] [-6] target_name

Options:
  -t      Ping the specified host until stopped.
          To see statistics and continue - type Control-Break;
          To stop - type Control-C.
  -a      Resolve addresses to hostnames.
  -n count Number of echo requests to send.
  -l size Send buffer size.
  -f      Set Don't Fragment flag in packet (IPv4-only).
  -i TTL  Time To Live.
  -v TOS  Type Of Service (IPv4-only). This setting has been deprecated
          and has no effect on the type of service field in the IP
          Header).
  -r count Record route for count hops (IPv4-only).
  -s count Timestamp for count hops (IPv4-only).
  -j host-list Loose source route along host-list (IPv4-only).
  -k host-list Strict source route along host-list (IPv4-only).
  -w timeout Timeout in milliseconds to wait for each reply.
  -R      Use routing header to test reverse route also (IPv6-only).
          Per RFC 5095 the use of this routing header has been
          deprecated. Some systems may drop echo requests if
          this header is used.
  -S srcaddr Source address to use.
  -c compartment Routing compartment identifier.
  -p      Ping a Hyper-V Network Virtualization provider address.
  -4      Force using IPv4.
  -6      Force using IPv6.
```

```
haritha@haritha-VirtualBox:~$ ping www.facebook.com
PING star-mini.c10r.facebook.com (157.240.228.35) 56(84) bytes of data.
64 bytes from edge-star-mini-shv-01-tir2.facebook.com (157.240.228.35): icmp_se
q=1 ttl=56 time=114 ms
64 bytes from edge-star-mini-shv-01-tir2.facebook.com (157.240.228.35): icmp_se
```

2. route

```

C:\Users\Hari>route
Manipulates network routing tables.

ROUTE [-f] [-p] [-4|-6] command [destination]
          [MASK netmask] [gateway] [METRIC metric] [IF interface]

  -f           Clears the routing tables of all gateway entries. If this is
               used in conjunction with one of the commands, the tables are
               cleared prior to running the command.

  -p           When used with the ADD command, makes a route persistent across
               boots of the system. By default, routes are not preserved
               when the system is restarted. Ignored for all other commands,
               which always affect the appropriate persistent routes.

  -4           Force using IPv4.

  -6           Force using IPv6.

  command      One of these:
                PRINT    Prints a route
                ADD     Adds a route
                DELETE   Deletes a route
                CHANGE   Modifies an existing route

  destination  Specifies the host.
  MASK         Specifies that the next parameter is the 'netmask' value.
  netmask       Specifies a subnet mask value for this route entry.
  gateway       Specifies gateway.
  interface     the interface number for the specified route.
  METRIC       specifies the metric, ie. cost for the destination.

All symbolic names used for destination are looked up in the network database
file NETWORKS. The symbolic names for gateway are looked up in the host name
database file HOSTS.

If the command is PRINT or DELETE. Destination or gateway can be a wildcard,
(wildcard is specified as a star '*'), or the gateway argument may be omitted.

If Dest contains a * or ?, it is treated as a shell pattern, and only
matching destination routes are printed. The '*' matches any string,
and '?' matches any one char. Examples: 157.*.1, 157.*, 127.*, *224*.

```

```

Pattern match is only allowed in PRINT command.

Diagnostic Notes:
  Invalid MASK generates an error, that is when (DEST & MASK) != DEST.
  Example> route ADD 157.0.0.0 MASK 155.0.0.0 157.55.80.1 IF 1
            The route addition failed: The specified mask parameter is invalid. (Destination & Mask) != Destination.

Examples:
> route PRINT
> route PRINT -4
> route PRINT -6
> route PRINT 157*      .... Only prints those matching 157*
> route ADD 157.0.0.0 MASK 255.0.0.0 157.55.80.1 METRIC 3 IF 2
      destination^      ^mask        ^gateway      metric^      ^
                                         Interface^
  If IF is not given, it tries to find the best interface for a given
  gateway.
> route ADD 3ffe::/32 3ffe::1

> route CHANGE 157.0.0.0 MASK 255.0.0.0 157.55.80.5 METRIC 2 IF 2
  CHANGE is used to modify gateway and/or metric only.

> route DELETE 157.0.0.0
> route DELETE 3ffe::/32

```

```

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

```

3. tracert

```
C:\Users\Hari>tracert

Usage: tracert [-d] [-h maximum_hops] [-j host-list] [-w timeout]
                [-R] [-S srcaddr] [-4] [-6] target_name

Options:
  -d           Do not resolve addresses to hostnames.
  -h maximum_hops Maximum number of hops to search for target.
  -j host-list   Loose source route along host-list (IPv4-only).
  -w timeout     Wait timeout milliseconds for each reply.
  -R           Trace round-trip path (IPv6-only).
  -S srcaddr    Source address to use (IPv6-only).
  -4           Force using IPv4.
  -6           Force using IPv6.
```

```
Processing triggers for man-db (2.9.1-1) ...
haritha@haritha-VirtualBox:~$ traceroute www.facebook.com
traceroute to www.facebook.com (157.240.228.35), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2)  1.568 ms  0.761 ms  1.895 ms
  2 _gateway (10.0.2.2)  34.044 ms  33.411 ms  33.097 ms
```

4. nslookup

```
C:\Users\Hari>nslookup
Default Server:  UnKnown
Address:  fec0:0:0:ffff::1

>
```

```
Processing triggers for man-db (2.9.1-1) ...
haritha@haritha-VirtualBox:~$ traceroute www.facebook.com
traceroute to www.facebook.com (157.240.228.35), 30 hops max, 60 byte packets
  1 _gateway (10.0.2.2)  1.568 ms  0.761 ms  1.895 ms
  2 _gateway (10.0.2.2)  34.044 ms  33.411 ms  33.097 ms
haritha@haritha-VirtualBox:~$ nslookup google.com
Server:          127.0.0.53
Address:         127.0.0.53#53

Non-authoritative answer:
Name:  google.com
Address: 142.250.196.14
Name:  google.com
Address: 2404:6800:4007:826::200e
```

5. ipconfig

```
C:\Users\Hari>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

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

Ethernet adapter VirtualBox Host-Only Network:

    Connection-specific DNS Suffix . . .
    Link-local IPv6 Address . . . . . : fe80::d1f9:268d:a2c6:d00b%7
    IPv4 Address. . . . . : 192.168.56.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter Wi-Fi:

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

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

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

```
haritha@haritha-VirtualBox:~$ sudo ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
        inet6 fe80::1dbc:3da3:bc25:fb9b prefixlen 64 scopeid 0x20<link>
          ether 08:00:27:06:7c:2f txqueuelen 1000 (Ethernet)
            RX packets 606 bytes 318356 (318.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 621 bytes 70222 (70.2 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000 (Local Loopback)
            RX packets 873 bytes 66220 (66.2 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 873 bytes 66220 (66.2 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

6. NetStat

```
C:\Users\Hari>NetStat
```

Active Connections

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:57859	kubernetes:57858	TIME_WAIT
TCP	127.0.0.1:57867	kubernetes:57866	TIME_WAIT
TCP	127.0.0.1:57870	kubernetes:57875	TIME_WAIT
TCP	127.0.0.1:57871	kubernetes:57873	TIME_WAIT
TCP	127.0.0.1:57873	kubernetes:57871	TIME_WAIT
TCP	127.0.0.1:57874	kubernetes:57872	TIME_WAIT
TCP	127.0.0.1:57875	kubernetes:57870	TIME_WAIT
TCP	127.0.0.1:57934	kubernetes:57935	ESTABLISHED
TCP	127.0.0.1:57935	kubernetes:57934	ESTABLISHED

```
Processing triggers for man-db (2.9.1-1) ...
haritha@haritha-VirtualBox:~$ netstat -l
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:mysql          0.0.0.0:*
tcp      0      0 localhost:domain        0.0.0.0:*
tcp      0      0 localhost:ipp           0.0.0.0:*
tcp6     0      0 [::]:http              [::]:*                LISTEN
tcp6     0      0 ip6-localhost:ipp       [::]:*                LISTEN
udp      0      0 0.0.0.0:49205         0.0.0.0:*
udp      0      0 localhost:domain        0.0.0.0:*
udp      0      0 0.0.0.0:mdns           0.0.0.0:*
```

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

1. Hostname

To communicate with each and other, the computer needs a unique address. A hostname can be alphabetic or alphanumeric and contain specific symbols used specifically to define a specific node or device in the network. For example, a hostname should have a domain name (TLD) of the top-level and a distance between one and 63 characters when used in a domain name system (DNS) or on the Internet.

```
haritha@haritha-VirtualBox:~$ hostname
haritha-VirtualBox
haritha@haritha-VirtualBox:~$
```

2. df

df is a standard Unix command used to display the amount of available disk space for file systems on which the invoking user has appropriate read access. df is typically implemented using the statfs or statvfs system calls.

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
udev	988244	0	988244	0%	/dev
tmpfs	203484	1340	202144	1%	/run
/dev/sda5	20123636	8354544	10723796	44%	/
tmpfs	1017412	0	1017412	0%	/dev/shm
tmpfs	5120	4	5116	1%	/run/lock
tmpfs	1017412	0	1017412	0%	/sys/fs/cgroup
/dev/loop1	56832	56832	0	100%	/snap/core18/2128
/dev/loop0	56832	56832	0	100%	/snap/core18/2066
/dev/loop3	224256	224256	0	100%	/snap/gnome-3-34-1804/72
/dev/loop2	224256	224256	0	100%	/snap/gnome-3-34-1804/66
/dev/loop6	52352	52352	0	100%	/snap/snap-store/518
/dev/loop5	66688	66688	0	100%	/snap/gtk-common-themes/1515
/dev/loop4	66432	66432	0	100%	/snap/gtk-common-themes/1514
/dev/loop7	52224	52224	0	100%	/snap/snap-store/547
/dev/loop9	33152	33152	0	100%	/snap/snapd/12883
/dev/loop8	33152	33152	0	100%	/snap/snapd/12704
/dev/sda1	523248	4	523244	1%	/boot/efi
tmpfs	203480	28	203452	1%	/run/user/1000

3.env

env is a shell command for Unix and Unix-like operating systems. It is used to either print a list of environment variables or run another utility in an altered environment without having to modify the currently existing environment.

```
haritha@haritha-VirtualBox:~$ env
SHELL=/bin/bash
SESSION_MANAGER=local/haritha-VirtualBox:@/tmp/.ICE-unix/1257,unix/haritha-Virt
ualBox:/tmp/.ICE-unix/1257
_WSREP_START_POSITION=
QT_ACCESSIBILITY=1
COLORTERM=truecolor
XDG_CONFIG_DIRS=/etc/xdg/xdg-ubuntu:/etc/xdg
XDG_MENU_PREFIX=gnome-
GNOME_DESKTOP_SESSION_ID=this-is-deprecated
LANGUAGE=en_IN:en
GNOME_SHELL_SESSION_MODE=ubuntu
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
XMODIFIERS=@im=ibus
DESKTOP_SESSION=ubuntu
SSH_AGENT_PID=1190
GTK_MODULES=gail:atk-bridge
PWD=/home/haritha
LOGNAME=haritha
XDG_SESSION_DESKTOP=ubuntu
XDG_SESSION_TYPE=x11
GPG_AGENT_INFO=/run/user/1000/gnupg/S.gpg-agent:0:1
XAUTHORITY=/run/user/1000/gdm/Xauthority
GJS_DEBUG_TOPICS=JS ERROR;JS LOG
```

4.Od

od is a command on various operating systems for displaying data in various human-readable output formats. The name is an acronym for "octal dump" since it defaults to printing in the octal data format.

```
haritha@haritha-VirtualBox:~$ od -b file2.txt
0000000 164 150 151 163 040 151 163 040 156 145 164 167 157 162 153 154
0000020 141 142 012 150 157 167 040 141 162 145 040 171 157 165 012 150
0000040 141 166 145 040 141 040 156 151 143 145 040 144 141 171 012 156
0000060 145 164 167 157 162 153 040 151 163 040 163 151 155 160 154 145
0000100 012
0000101
```

5.cal

cal will print a calendar of the current month.

```
haritha@haritha-VirtualBox:~$ cal
September 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
```

Q.No Questions

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

```
haritha@haritha-VirtualBox:~$ touch song2.mp3
haritha@haritha-VirtualBox:~$ touch song3.mp3
haritha@haritha-VirtualBox:~$ touch song4.mp3
haritha@haritha-VirtualBox:~$ touch song5.mp3
haritha@haritha-VirtualBox:~$ touch song6.mp3
haritha@haritha-VirtualBox:~$ ls
archive1.tar  Downloads  hari      Public    s2          song3.mp3  song6.mp3
Desktop       file2.txt  Music     rsa       song1.mp3  song4.mp3  Templates
Documents     file3.txt  Pictures  rsa.pub   song2.mp3  song5.mp3  Videos
haritha@haritha-VirtualBox:~$
```

```
haritha@haritha-VirtualBox:~$ touch snap1.mp3
haritha@haritha-VirtualBox:~$ touch snap2.mp3
haritha@haritha-VirtualBox:~$ touch snap3.mp3
haritha@haritha-VirtualBox:~$ touch snap4.mp3
haritha@haritha-VirtualBox:~$ touch snap5.mp3
haritha@haritha-VirtualBox:~$ touch snap6.mp3
haritha@haritha-VirtualBox:~$ ls
archive1.tar  file2.txt  Pictures  s2          snap4.mp3  song2.mp3  song6.mp3
Desktop       file3.txt  Public    snap1.mp3  snap5.mp3  song3.mp3  Templates
Documents     hari      rsa       snap2.mp3  snap6.mp3  song4.mp3  Videos
Downloads     Music     rsa.pub   snap3.mp3  song1.mp3  song5.mp3
```

```
haritha@haritha-VirtualBox:~$ touch film1.mp3
haritha@haritha-VirtualBox:~$ touch film2.mp3
haritha@haritha-VirtualBox:~$ touch film3.mp3
haritha@haritha-VirtualBox:~$ touch film4.mp3
haritha@haritha-VirtualBox:~$ touch film5.mp3
haritha@haritha-VirtualBox:~$ touch film6.mp3
haritha@haritha-VirtualBox:~$ ls
archive1.tar  file3.txt  film5.mp3  Public    snap2.mp3  song1.mp3  song6.mp3
Desktop       film1.mp3  film6.mp3  rsa       snap3.mp3  song2.mp3  Templates
Documents     film2.mp3  hari      rsa.pub   snap4.mp3  song3.mp3  Videos
Downloads     film3.mp3  Music     s2        snap5.mp3  song4.mp3
file2.txt     film4.mp3  Pictures  snap1.mp3  snap6.mp3  song5.mp3
```

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.

```
file2.txt      film4.mp3  Pictures  snap1.mp3  snap6.mp3  song5.mp3
haritha@haritha-VirtualBox:~$ mv song1.mp3 ./Music/
haritha@haritha-VirtualBox:~$ mv song2.mp3 ./Music/
haritha@haritha-VirtualBox:~$ mv song3.mp3 ./Music/
haritha@haritha-VirtualBox:~$ mv song4.mp3 ./Music/
haritha@haritha-VirtualBox:~$ mv song5.mp3 ./Music/
haritha@haritha-VirtualBox:~$ mv song6.mp3 ./Music/
haritha@haritha-VirtualBox:~$ ls -R Music
Music:
song1.mp3  song2.mp3  song3.mp3  song4.mp3  song5.mp3  song6.mp3
haritha@haritha-VirtualBox:~$ mv snap1.mp3 ./Pictures/
haritha@haritha-VirtualBox:~$ mv snap2.mp3 ./Pictures/
haritha@haritha-VirtualBox:~$ mv snap3.mp3 ./Pictures/
haritha@haritha-VirtualBox:~$ mv snap4.mp3 ./Pictures/
haritha@haritha-VirtualBox:~$ mv snap5.mp3 ./Pictures/
haritha@haritha-VirtualBox:~$ mv snap6.mp3 ./Pictures/
haritha@haritha-VirtualBox:~$ ls -R Pictures
Pictures:
snap1.mp3  snap2.mp3  snap3.mp3  snap4.mp3  snap5.mp3  snap6.mp3
haritha@haritha-VirtualBox:~$ mv film1.mp3 ./Videos/
haritha@haritha-VirtualBox:~$ mv film2.mp3 ./Videos/
haritha@haritha-VirtualBox:~$ mv film3.mp3 ./Videos/
haritha@haritha-VirtualBox:~$ mv film4.mp3 ./Videos/
haritha@haritha-VirtualBox:~$ mv film5.mp3 ./Videos/
haritha@haritha-VirtualBox:~$ mv film6.mp3 ./Videos/
haritha@haritha-VirtualBox:~$ ls -R Videos
Videos:
film1.mp3  film2.mp3  film3.mp3  film4.mp3  film5.mp3  film6.mp3
```

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.

```
haritha@haritha-VirtualBox:~$ mkdir {friends,family,work}
haritha@haritha-VirtualBox:~$ ls
archive1.tar  Downloads  file3.txt  Music      rsa       Templates
Desktop       family     friends    Pictures   rsa.pub    Videos
Documents     file2.txt  hari      Public    s2        work
haritha@haritha-VirtualBox:~$
```

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

```
haritha@haritha-VirtualBox:~$ mkdir {friends,family,work}
haritha@haritha-VirtualBox:~$ ls
archive1.tar  Downloads  file3.txt  Music      rsa      Templates
Desktop       family     friends   Pictures   rsa.pub  Videos
Documents     file2.txt  hari      Public    s2       work
haritha@haritha-VirtualBox:~$ cp Music/song1.mp3 friends
haritha@haritha-VirtualBox:~$ cp Music/song2.mp3 friends
haritha@haritha-VirtualBox:~$ cp Music/song3.mp3 friends
haritha@haritha-VirtualBox:~$ cp Music/song4.mp3 friends
haritha@haritha-VirtualBox:~$ cp Music/song5.mp3 friends
haritha@haritha-VirtualBox:~$ cp Music/song6.mp3 friends
haritha@haritha-VirtualBox:~$ ls -R friends
friends:
song1.mp3  song2.mp3  song3.mp3  song4.mp3  song5.mp3  song6.mp3
haritha@haritha-VirtualBox:~$
```

```
haritha@haritha-VirtualBox:~$ cp Pictures/snap1.mp3 family
haritha@haritha-VirtualBox:~$ cp Pictures/snap2.mp3 family
haritha@haritha-VirtualBox:~$ cp Pictures/snap3.mp3 family
haritha@haritha-VirtualBox:~$ cp Pictures/snap4.mp3 family
haritha@haritha-VirtualBox:~$ cp Pictures/snap5.mp3 family
haritha@haritha-VirtualBox:~$ cp Pictures/snap6.mp3 family
haritha@haritha-VirtualBox:~$ ls -R family
family:
snap1.mp3  snap2.mp3  snap3.mp3  snap4.mp3  snap5.mp3  snap6.mp3
haritha@haritha-VirtualBox:~$
```

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

```
haritha@haritha-VirtualBox:~$ rmdir {family,friends}
rmdir: failed to remove 'family': Directory not empty
rmdir: failed to remove 'friends': Directory not empty
haritha@haritha-VirtualBox:~$ rmdir family,friends
rmdir: failed to remove 'family,friends': No such file or directory
haritha@haritha-VirtualBox:~$ rm -r family friends
```

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

```
haritha@haritha-VirtualBox:~$ rm -r family friends
haritha@haritha-VirtualBox:~$ ls
archive1.tar  Downloads  hari      Public    s2       work
Desktop       file2.txt  Music      rsa      Templates
Documents     file3.txt  Pictures  rsa.pub  Videos
haritha@haritha-VirtualBox:~$
```

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

```
haritha@haritha-VirtualBox:~$ ls -al>allfiles.txt
haritha@haritha-VirtualBox:~$ ls
allfiles.txt  Documents  file3.txt  Pictures  rsa.pub    Videos
archive1.tar  Downloads  hari       Public     s2        work
Desktop      file2.txt  Music      rsa       Templates
haritha@haritha-VirtualBox:~$ ls -al
total 120
drwxr-xr-x  18 haritha haritha  4096 Aug 17 16:19 .
drwxr-xr-x  3 root   root    4096 Jun 13 23:06 ..
-rw-rw-r--  1 haritha haritha 1678 Aug 17 16:19 allfiles.txt
-rw-rw-r--  1 haritha haritha 10240 Aug 12 19:30 archive1.tar
-rw-----  1 haritha haritha 1195 Jun 21 22:04 .bash_history
-rw-r--r--  1 haritha haritha 220  Jun 13 23:06 .bash_logout
-rw-r--r--  1 haritha haritha 3771 Jun 13 23:06 .bashrc
drwx----- 11 haritha haritha 4096 Jun 13 23:42 .cache
drwx----- 14 haritha haritha 4096 Aug 12 20:04 .config
drwxr-xr-x  3 haritha haritha 4096 Jun 21 20:24 Desktop
drwxr-xr-x  2 haritha haritha 4096 Jun 13 23:39 Documents
drwxr-xr-x  2 haritha haritha 4096 Jun 13 23:39 Downloads
-rw-r--r--  1 haritha haritha 65  Jun 13 23:39 file3.txt
```

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

```
haritha@haritha-VirtualBox:~$ date
Tuesday 17 August 2021 04:32:37 PM IST
haritha@haritha-VirtualBox:~$ █
```

9. Add the user Juliet

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

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

```
haritha@haritha-VirtualBox:~$ cat/etc/passwd
bash: cat/etc/passwd: No such file or directory
haritha@haritha-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:/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
haritha:x:1000:1000:haritha,,,,:/home/haritha:/bin/bash
systemd-coredump:x:999:999:systemd Core Dumper:/:/usr/sbin/nologin
juliet:x:1001:1002:::/home/juliet:/bin/sh
haritha@haritha-VirtualBox:~$
```

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

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

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

```
haritha@haritha-VirtualBox:~$ sudo groupadd -g 30000 shakespeare
haritha@haritha-VirtualBox:~$
```

13. Create a supplementary group called artists.

```
haritha@haritha-VirtualBox:~$ sudo groupadd -g 50000 artists
haritha@haritha-VirtualBox:~$ cat /etc/groups
cat: /etc/groups: No such file or directory
haritha@haritha-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,haritha
tty:x:5:syslog
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
```

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

```
haritha@haritha-VirtualBox:~$ sudo groupadd -g 50000 artists
haritha@haritha-VirtualBox:~$ cat /etc/groups
cat: /etc/groups: No such file or directory
haritha@haritha-VirtualBox:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,haritha
tty:x:5:syslog
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
gdm:x:130:
lxd:x:131:haritha
haritha:x:1000:
sambashare:x:132:haritha
systemd-coredump:x:999:
student2:x:1001:
juliet:x:1002:
shakespeare:x:30000:
artists:x:50000:
haritha@haritha-VirtualBox:~$
```

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

```
haritha@haritha-VirtualBox:~$ sudo usermod -a -G shakespeare juliet
haritha@haritha-VirtualBox:~$ groups juliet
juliet : juliet shakespeare
haritha@haritha-VirtualBox:~$
```

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

```
haritha@haritha-VirtualBox:~$ id juliet
uid=1001(juliet) gid=1002(juliet) groups=1002(juliet),30000(shakespeare)
haritha@haritha-VirtualBox:~$
```

17. Add Romeo and Hamlet to the Shakespeare group

```
haritha@haritha-VirtualBox:~$ sudo usermod -a -G shakespeare Romeo
haritha@haritha-VirtualBox:~$ sudo usermod -a -G shakespeare Hamlet
usermod: user 'Hamlet' does not exist
haritha@haritha-VirtualBox:~$ sudo usermod -a -G shakespeare Hamlet
haritha@haritha-VirtualBox:~$ groups Romeo
Romeo : Romeo shakespeare
haritha@haritha-VirtualBox:~$ groups Hamlet
Hamlet : Hamlet shakespeare
haritha@haritha-VirtualBox:~$
```

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

```
hamlet : hamlet shakespeare
haritha@haritha-VirtualBox:~$ sudo useradd Reba
haritha@haritha-VirtualBox:~$ sudo useradd Dolly
haritha@haritha-VirtualBox:~$ sudo usermod -a -G artists Reba
haritha@haritha-VirtualBox:~$ sudo usermod -a -G artists Dolly
haritha@haritha-VirtualBox:~$ groups Reba
Reba : Reba artists
haritha@haritha-VirtualBox:~$ groups Dolly
Dolly : Dolly artists
haritha@haritha-VirtualBox:~$
```

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

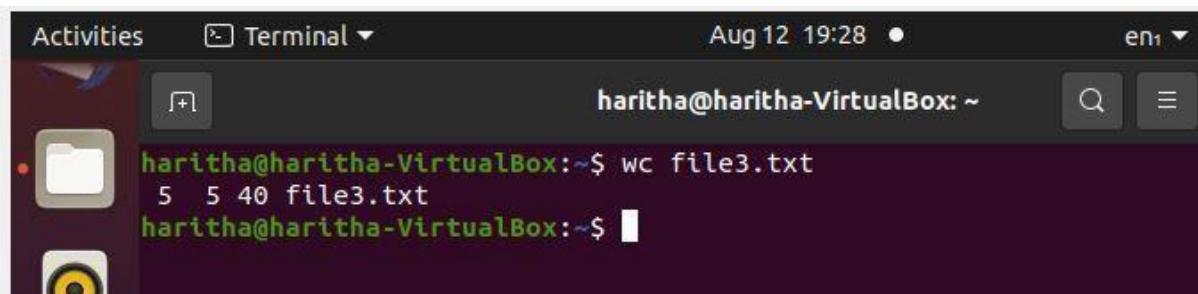
```
betty : betty getses  
haritha@haritha-VirtualBox:~$ cat /etc/group  
root:x:0:  
daemon:x:1:  
bin:x:2:  
sys:x:3:  
adm:x:4:syslog,haritha  
tty:x:5:syslog  
disk:x:6:  
lp:x:7:  
mail:x:8:  
news:x:9:  
uucp:x:10:  
man:x:12:  
proxy:x:13:
```

20. Attempt to remove user Dolly.

```
geoclue:x:127:  
pulse:x:128:  
pulse-access:x:129:  
gdm:x:130:  
lxd:x:131:haritha  
haritha:x:1000:  
sambashare:x:132:haritha  
systemd-coredump:x:999:  
student2:x:1001:  
juliet:x:1002:  
shakespeare:x:30000:juliet,Romeo,Hamlet  
artists:x:50000:Reba,Dolly  
Romeo:x:50001:  
Hamlet:x:1003:  
Reba:x:1004:  
Dolly:x:1005:  
haritha@haritha-VirtualBox:~$
```

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 inthe files specified in the file arguments.
- #wc state.txt
- #wc state.txt capital.txt
- wc -l state.txt
- wc -w state.txt capital.txt
- wc -c state.txt
- wc -m state.txt



A screenshot of a Linux desktop environment showing a terminal window. The terminal window title is "Terminal". The terminal content shows the command "wc file3.txt" being run, resulting in the output "5 5 40 file3.txt". The terminal window is part of a desktop interface with icons for Activities, Home, and Applications visible at the top.

```
Activities Terminal ▾ Aug 12 19:28 ● en1 ▾
haritha@haritha-VirtualBox:~$ wc file3.txt
5 5 40 file3.txt
haritha@haritha-VirtualBox:~$
```

2. tar

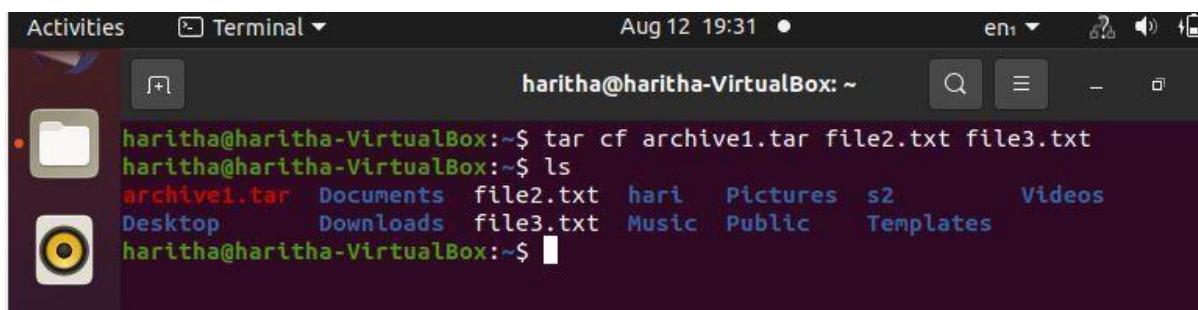
- The Linux ‘tar’stands for tape archive, is used to create Archive and extract the Archive files
- Linux tar command to create compressed or uncompressed Archive files
- Options:
 - c : Creates Archive
 - x : Extract the archive
 - f : creates archive with given filename.
 - t : displays or lists files in archived file
 - u : archives and adds to an existing archive file
 - v : Displays Verbose Information
 - A : Concatenates the archive files
 - z : zip, tells tar command that creates tar file using gzip
 - j : filter archive tar file using tbzip
 - W : Verify a archive file
 - r : update or add file or directory in already existed .tar file
- #tar cf archive.tar state.txt capital.txt //create archive file
- #ls archive.tar
- #tar tf /archive.tar // list contents of tar archive file
- Extract an archive created with tar
- #mkdir backup
- #cd backup
- #tar xf/home/meera/Documents/Meera_Linux/archive.tar

- **Compression Types**

```
gzip(z),bzip2(j), xz(J)
#tar czf /abc.tar.gz /etc
#tar cjf /abcd.tar.bz2 /etc
#tar cJf /abcde.tar.xz /etc
```

Extract an archive

```
#mkdir backup1
#cd backup1
#tar xzf /abc.tar.gz
#mkdir backup2
#cd backup2
#tar xjf /abcd.tar.bz2
#mkdir backup3
#cd backup3
#tar xJf /abcde.tar.xz
```

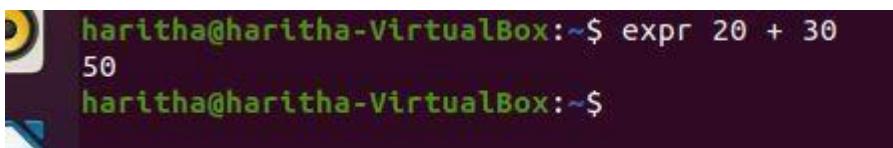


The screenshot shows a terminal window titled "Terminal" with the command "haritha@haritha-VirtualBox: ~". The user runs "tar cf archive1.tar file2.txt file3.txt" which creates the file "archive1.tar". Then, they run "ls" to list the contents of the current directory, which includes "archive1.tar", "Documents", "file2.txt", "hari", "Pictures", "s2", "Videos", "Desktop", "Downloads", "file3.txt", "Music", "Public", and "Templates".

```
haritha@haritha-VirtualBox:~$ tar cf archive1.tar file2.txt file3.txt
haritha@haritha-VirtualBox:~$ ls
archive1.tar  Documents  file2.txt  hari    Pictures  s2      Videos
Desktop       Downloads  file3.txt  Music   Public    Templates
haritha@haritha-VirtualBox:~$
```

3.expr

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



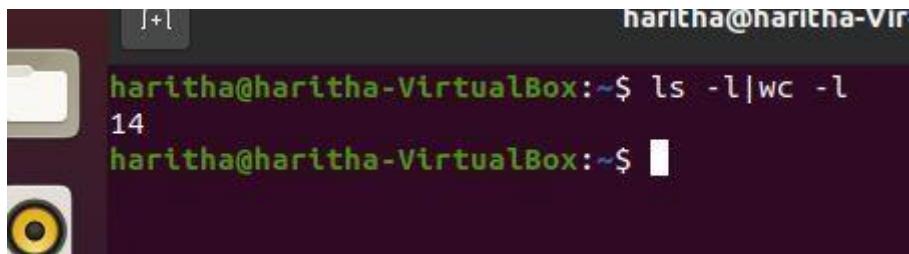
The screenshot shows a terminal window with the command "haritha@haritha-VirtualBox:~\$ expr 20 + 30" being run. The output is "50", followed by a new line. The prompt "haritha@haritha-VirtualBox:~\$" appears again.

```
haritha@haritha-VirtualBox:~$ expr 20 + 30
50
haritha@haritha-VirtualBox:~$
```

4. Redirections & Piping

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

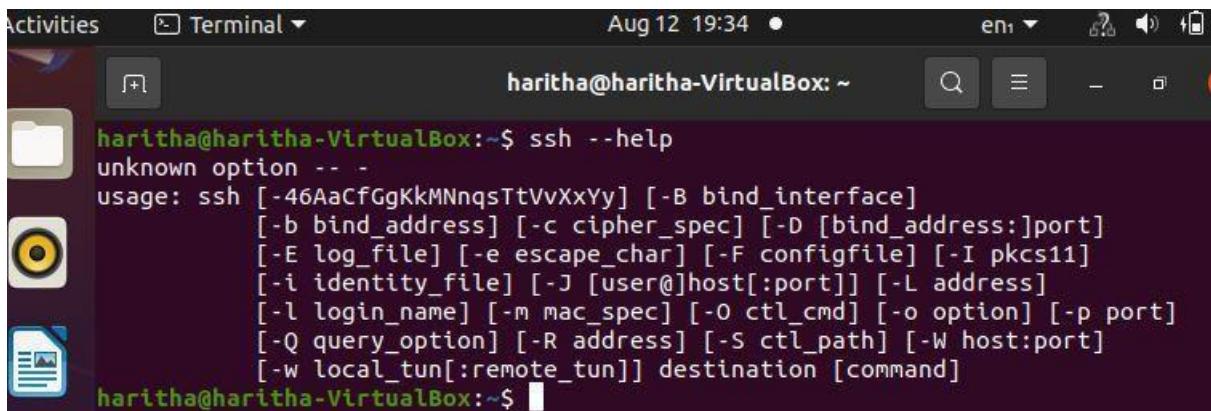
```
#ls -l | wc - l  
#cat /etc.passwd.txt | head -7 | tail -5
```



```
[+] haritha@haritha-Vir  
haritha@haritha-VirtualBox:~$ ls -l|wc -l  
14  
haritha@haritha-VirtualBox:~$ █
```

5. ssh

- **ssh** stands for “**S**ecure **sh**.**e**ll”
 - It is a protocol used to securely connect to a remote server/system.
 - ssh is secure in the sense that it transfers the data in encrypted form between the host and the client.
 - It transfers inputs from the client to the host and relays back the output. ssh runs at TCP/IP port 22.
- #ssh user_name@host(IP/Domain_name)
#ssh -X root@server1.example.com



```
Activities Terminal ▾ Aug 12 19:34 ● en1 ▾ ? ⓘ 🔍 - ⓘ haritha@haritha-VirtualBox: ~  
haritha@haritha-VirtualBox:~$ ssh --help  
unknown option -- -  
usage: ssh [-46AaCfGgKkMNnqsTtVvXxYy] [-B bind_interface]  
           [-b bind_address] [-c cipher_spec] [-D [bind_address:]port]  
           [-E log_file] [-e escape_char] [-F configfile] [-I pkcs11]  
           [-i identity_file] [-J [user@]host[:port]] [-L address]  
           [-l login_name] [-m mac_spec] [-O ctl_cmd] [-o option] [-p port]  
           [-Q query_option] [-R address] [-S ctl_path] [-W host:port]  
           [-w local_tun[:remote_tun]] destination [command]  
haritha@haritha-VirtualBox:~$ █
```

6. scp

- SCP (secure copy) is a command-line utility that allows you to securely copy files and directories between two locations.
- With scp, you can copy a file or directory:
- From your local system to a remote system.
- From a remote system to your local system.
- Between two remote systems from your local system.
- Remote file system locations are specified in format [user@]host:/path

Syntax:

```
scp [OPTION] [user@]SRC_HOST:]file1 [user@]DEST_HOST:]file2  
$scp/etc/yum.config/etc/hosts ServerX:/home/student  
$scp ServerX:/etc/hostname /home/student
```

```
[ haritha@haritha-VirtualBox:~$ ssh haritha@haritha-VirtualBox
ssh: connect to host haritha-virtualbox port 22: Connection refused
[ haritha@haritha-VirtualBox:~$ ssh -keygen
```

7.ssh-keygen

- ssh-keygen command to generate a public/private authentication key pair. Authentication keys allow a user to connect to a remote system without supplying a password. Keys must be generated for each user separately. If you generate key pairs as the root user, only the root can use the keys.
\$ssh-keygen -t rsa

```
SHA256:WGmxAIWGjPK8NfcbDlGtBYeuH5eHyA/MGmaRnYg6ah4 haritha@haritha-VirtualBox
The key's randomart image is:
+---[RSA 3072]----+
| o ..+o o+.
| o o o .o=o
| .o . . *+=
| o + *+-
| + o.O. o
| + * X +
| E . o * B .
| ... . +
| o.
+---[SHA256]----+
[ haritha@haritha-VirtualBox:~$ ]
```

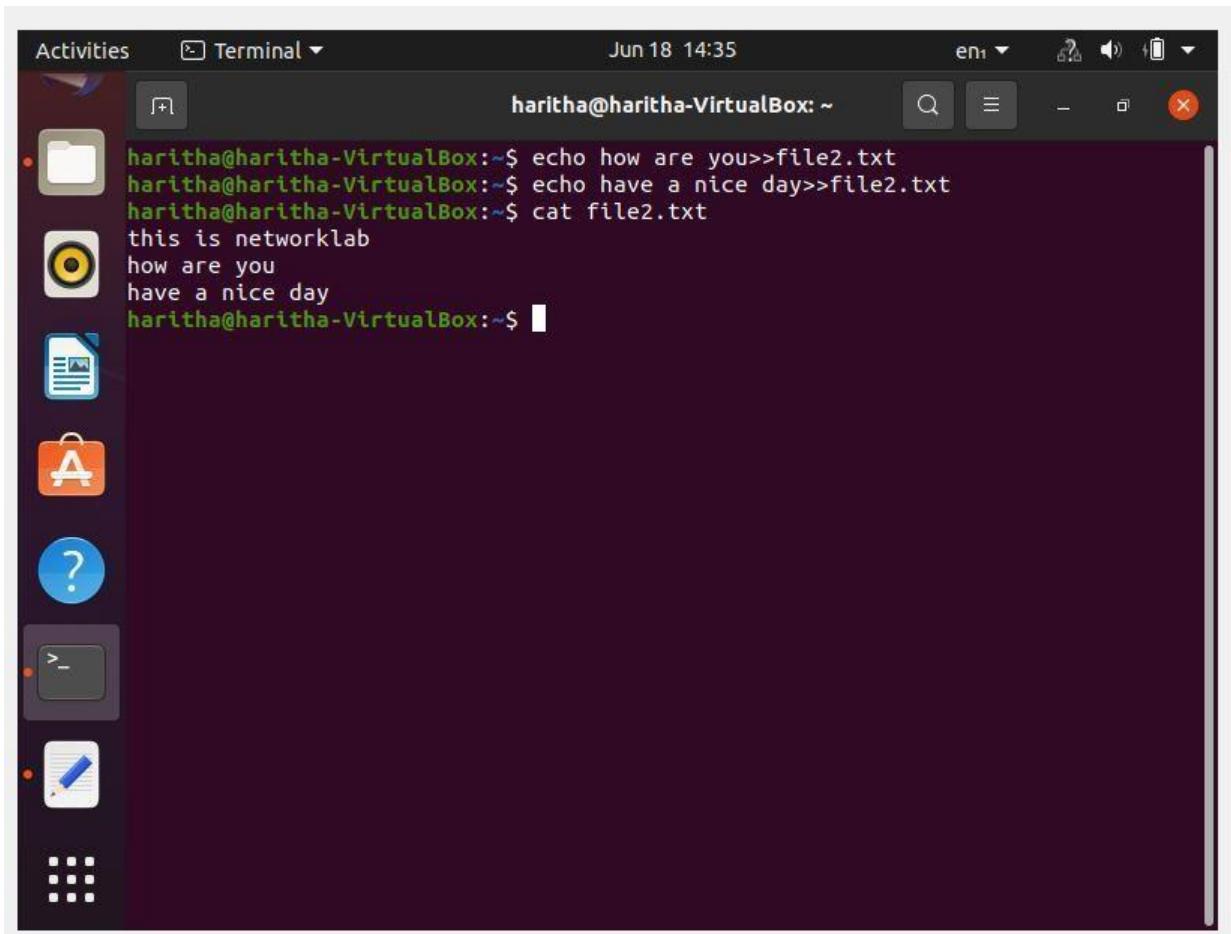
8. ssh-copy-id

- The ssh-copy-id command allows you to install an SSH key on a remote server's authorized keys.
- This command facilitates SSH key login, which removes the need for a password for each login, thus ensuring a password-less, automatic login process.

\$ssh-copy-id username@remote_host

echo

- **to move some data into a file**
- **to add a text**



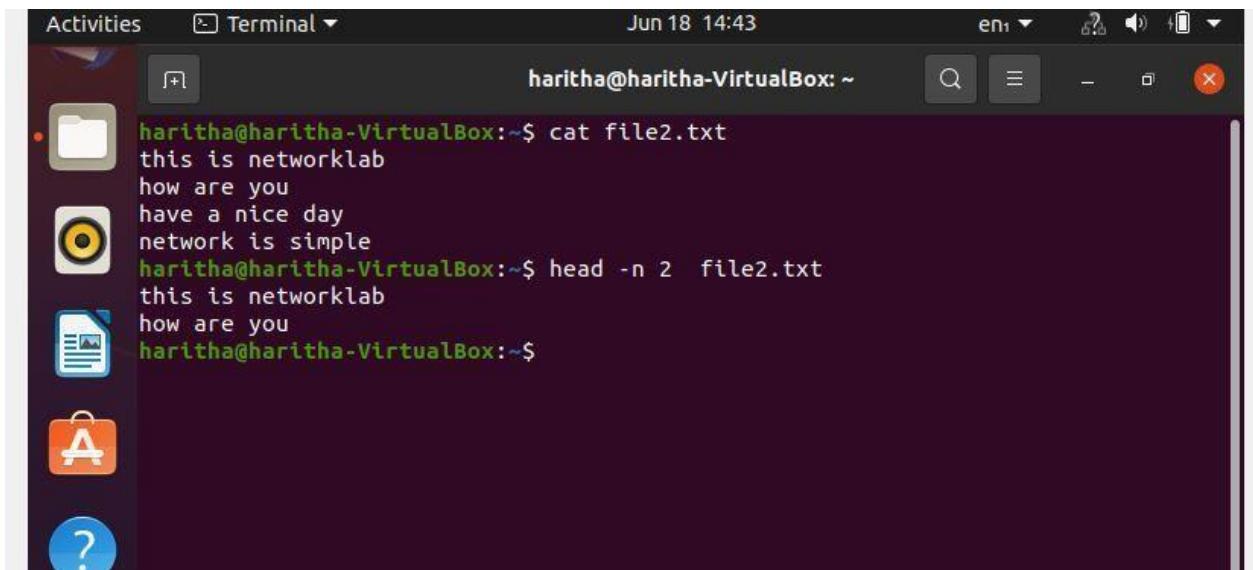
A screenshot of a Linux desktop environment showing a terminal window. The terminal window is titled "Terminal" and has the command "Activities" in its title bar. The terminal shows the following session:

```
haritha@haritha-VirtualBox:~$ echo how are you>>file2.txt
haritha@haritha-VirtualBox:~$ echo have a nice day>>file2.txt
haritha@haritha-VirtualBox:~$ cat file2.txt
this is networklab
how are you
have a nice day
haritha@haritha-VirtualBox:~$
```

The terminal window has a dark purple background. On the left side of the screen, there is a vertical dock with several icons: a folder, a target, a document, a terminal, a question mark, a terminal icon, and a text editor icon.

2) head

- **used to view the first lines of any text file**
- **default it shows 10 lines**

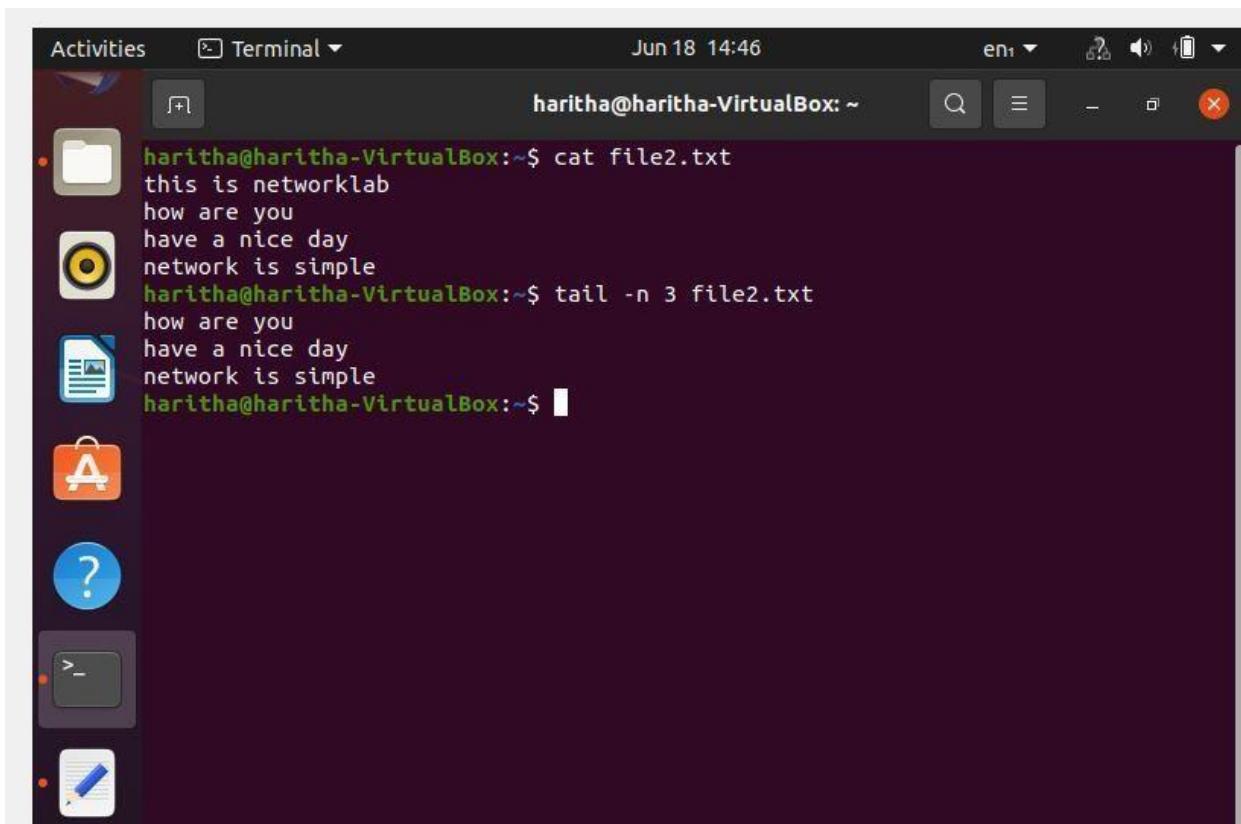


A screenshot of an Ubuntu desktop environment. On the left is a dock with icons for Home, Dash, Applications, and Help. The main area shows a terminal window titled "Terminal". The terminal output is as follows:

```
Activities Terminal Jun 18 14:43
haritha@haritha-VirtualBox:~$ cat file2.txt
this is networklab
how are you
have a nice day
network is simple
haritha@haritha-VirtualBox:~$ head -n 2 file2.txt
this is networklab
how are you
haritha@haritha-VirtualBox:~$
```

3) tail

- will display the last ten lines of a text files

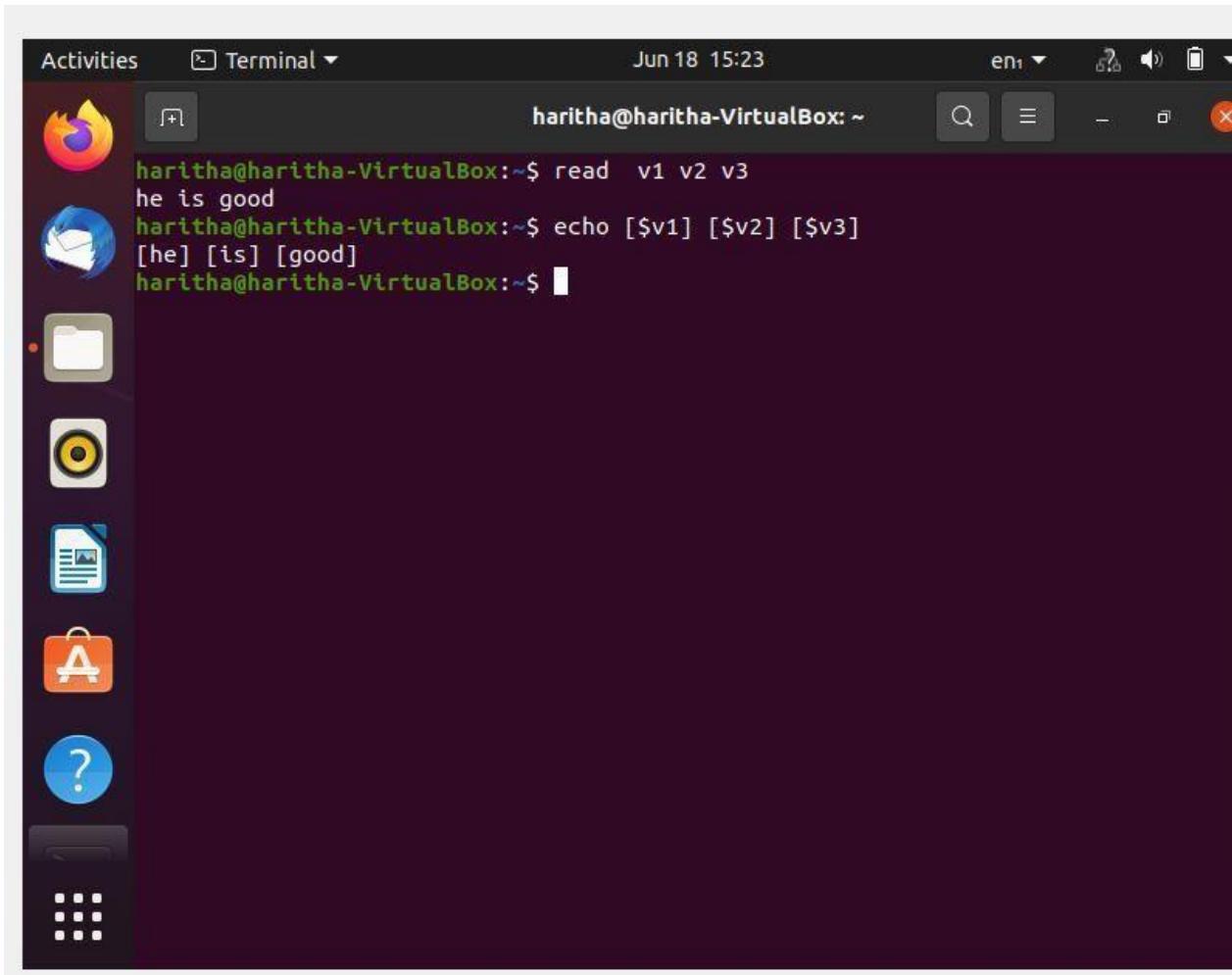


A screenshot of an Ubuntu desktop environment. On the left is a dock with icons for Home, Dash, Applications, Help, and a terminal icon. The main area shows a terminal window titled "Terminal". The terminal output is as follows:

```
Activities Terminal Jun 18 14:46
haritha@haritha-VirtualBox:~$ cat file2.txt
this is networklab
how are you
have a nice day
network is simple
haritha@haritha-VirtualBox:~$ tail -n 3 file2.txt
how are you
have a nice day
network is simple
haritha@haritha-VirtualBox:~$
```

4) read

- **read the contents of a line into a variable**

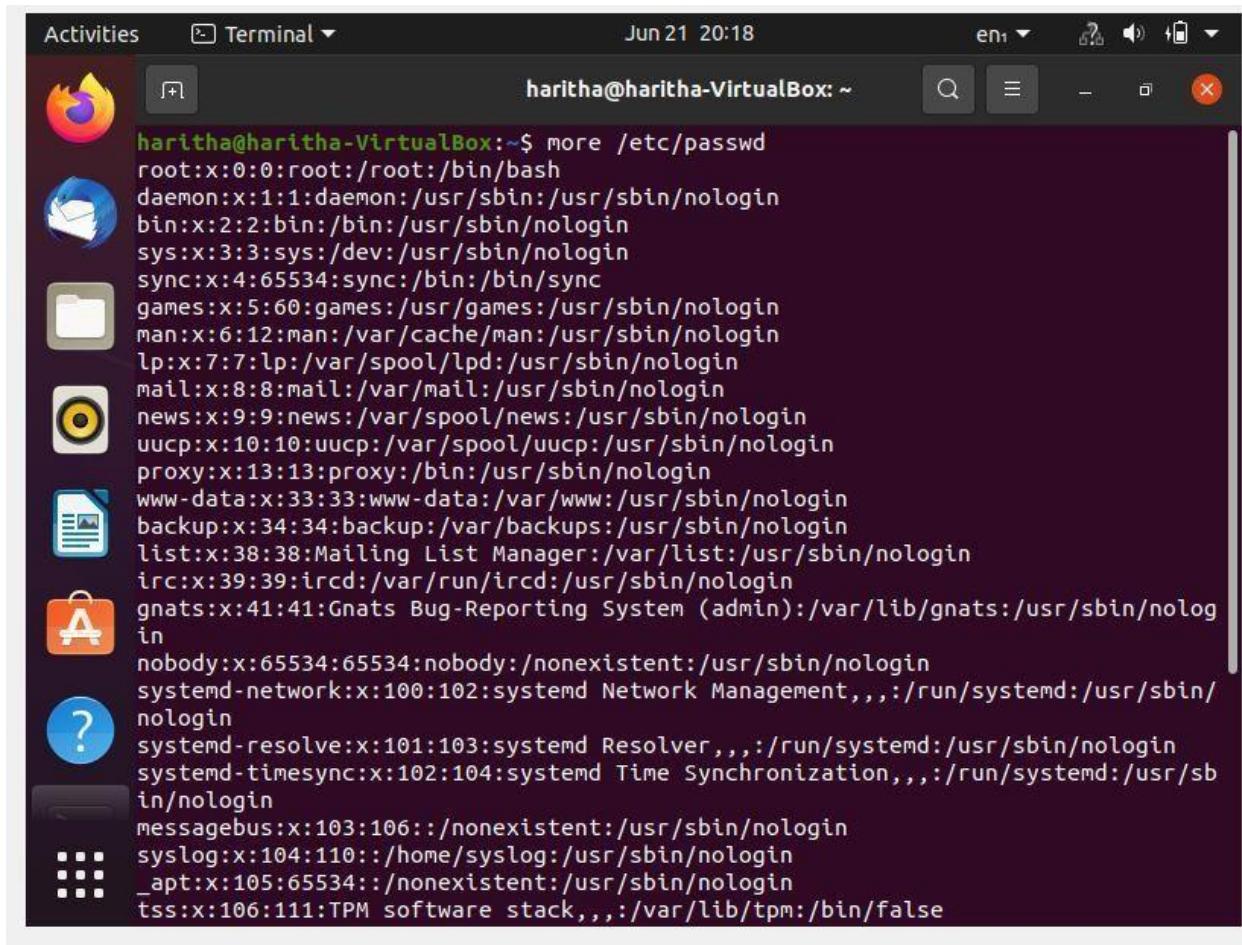


The screenshot shows a Linux desktop environment with a dark theme. On the left is a vertical dock containing icons for various applications: a browser (Firefox), a file manager, a terminal, a mail client, a file viewer, a text editor, and a help icon. The main window is a terminal titled "Terminal" with the command-line interface visible. The terminal window has a dark background with light-colored text. It displays the following session:

```
Activities Terminal Jun 18 15:23 haritha@haritha-VirtualBox: ~
haritha@haritha-VirtualBox:~$ read v1 v2 v3
he is good
haritha@haritha-VirtualBox:~$ echo [$v1] [$v2] [$v3]
[he] [is] [good]
haritha@haritha-VirtualBox:~$
```

5) more

- **displays content of the file.** Only difference is that in case of larger files cat command output will scroll off your screen while more command displays output one screenful at a time.
- Enter key : to scroll down page line by line
- Space bar : to go to next page
- b key : to go to the backward page
- /key : to search string

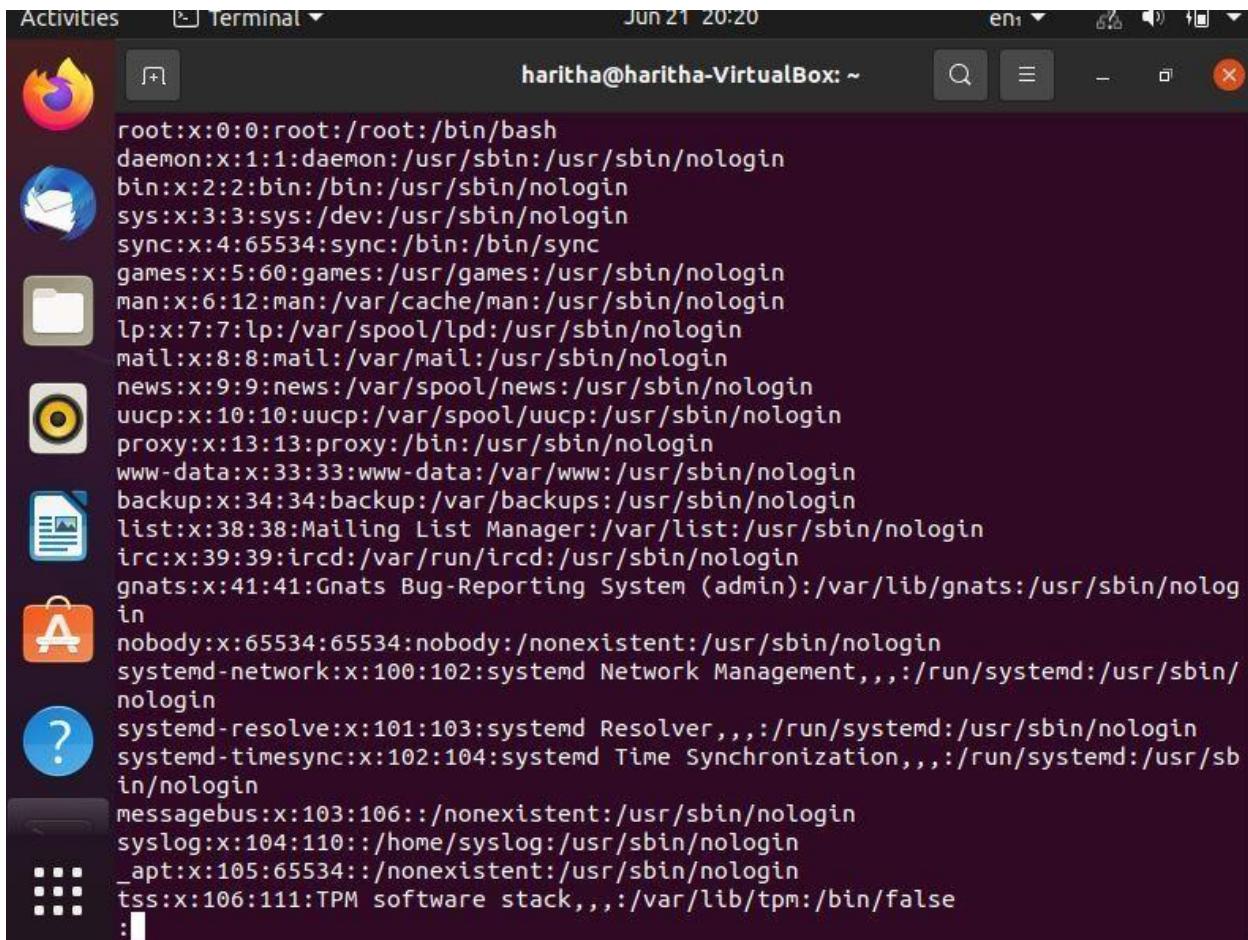


A screenshot of an Ubuntu desktop environment. In the top left corner, there's an 'Activities' button and a 'Terminal' button. The top right corner shows the date 'Jun 21 20:18', the network connection 'en1', and system icons for battery, signal, and volume. The main window is a terminal window titled 'Terminal'. The title bar also shows the user 'haritha@haritha-VirtualBox: ~'. The terminal window displays the output of the command 'more /etc/passwd'. The output lists various system users and their details, such as root, daemon, bin, sys, sync, games, man, lp, mail, news, uucp, proxy, www-data, backup, list, irc, gnats, nobody, systemd-network, and others. The terminal has a dark background with light-colored text.

```
haritha@haritha-VirtualBox:~$ more /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
```

6) less

- Automatically adjust with the width and height of terminal window

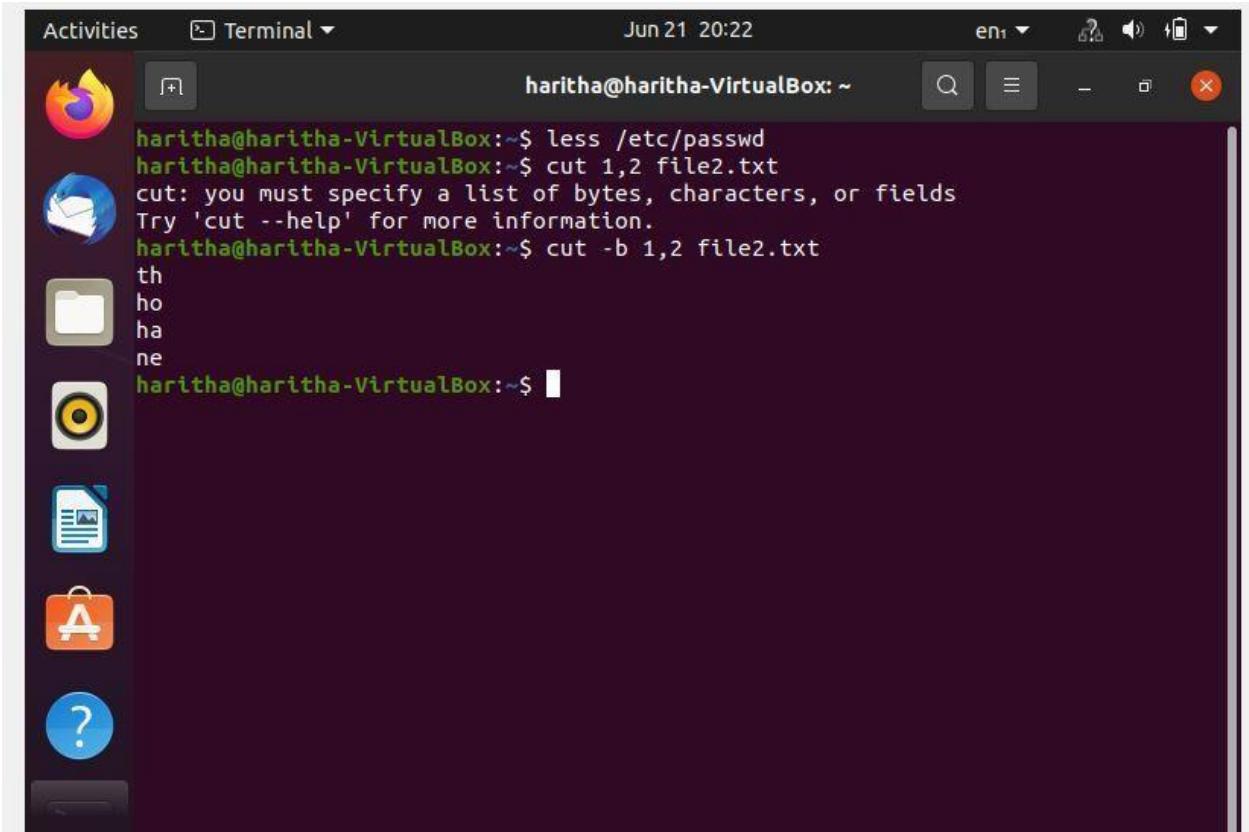


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window title is "Terminal" and the user is "haritha@haritha-VirtualBox". The terminal displays a list of system users and their details:

```
root:x:0:0: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
```

7) cut

- used for cutting out the section from each lines of files and writing the standard output.
- It can be used to cut parts of a line by byte position character and field

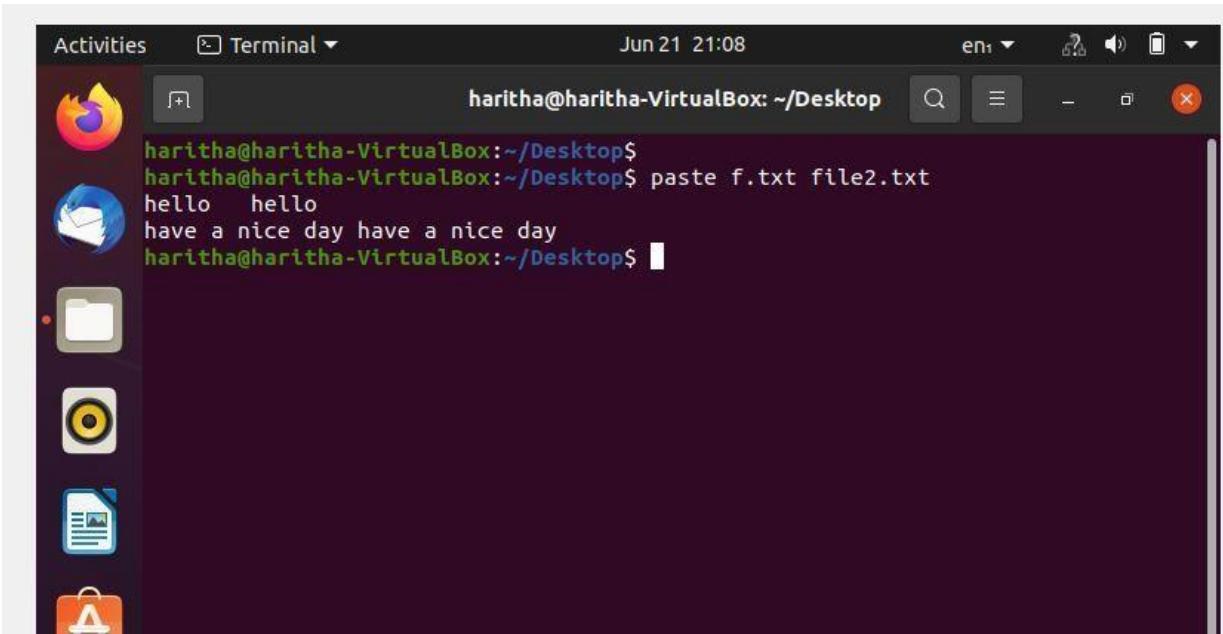


A screenshot of an Ubuntu desktop environment. On the left is a dock with icons for the Dash, Home, Applications, and Help. The main area shows a terminal window titled "Terminal". The terminal output is as follows:

```
Activities Terminal ▾ Jun 21 20:22 haritha@haritha-VirtualBox: ~ haritha@haritha-VirtualBox:~$ less /etc/passwd  
haritha@haritha-VirtualBox:~$ cut 1,2 file2.txt  
cut: you must specify a list of bytes, characters, or fields  
Try 'cut --help' for more information.  
haritha@haritha-VirtualBox:~$ cut -b 1,2 file2.txt  
th  
ho  
ha  
ne  
haritha@haritha-VirtualBox:~$
```

8) paste

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

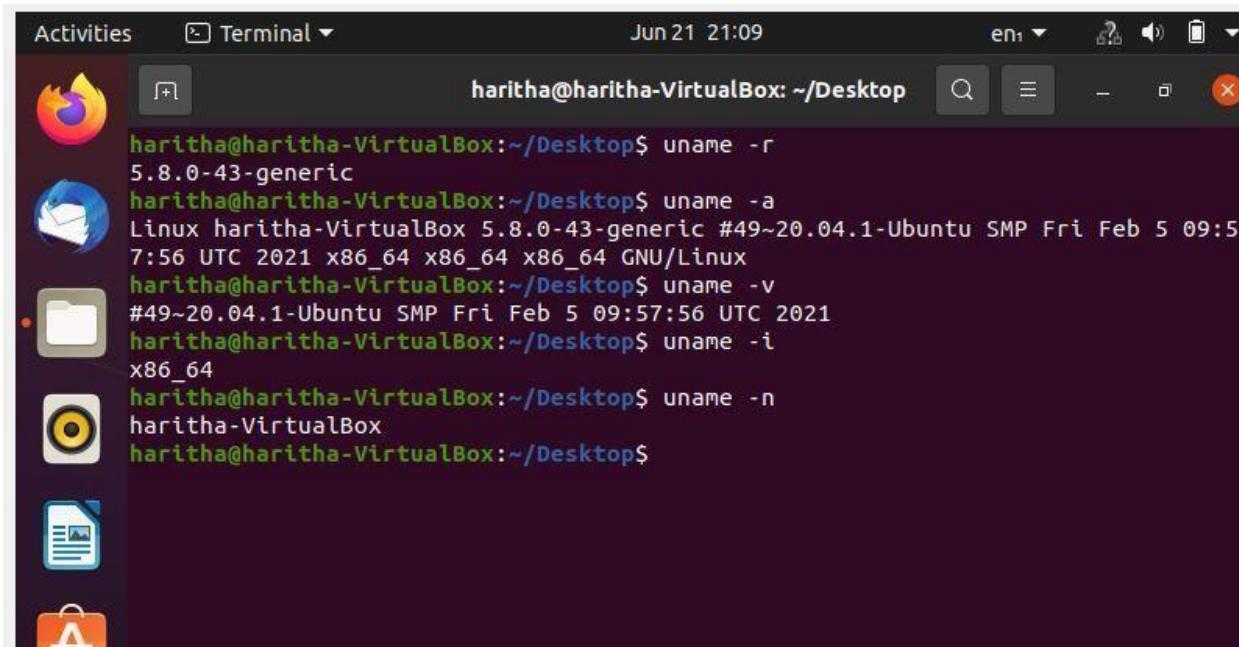


A screenshot of an Ubuntu desktop environment. On the left is a dock with icons for the Dash, Home, Applications, and Help. The main area shows a terminal window titled "Terminal". The terminal output is as follows:

```
Activities Terminal ▾ Jun 21 21:08 haritha@haritha-VirtualBox: ~/Desktop haritha@haritha-VirtualBox:~/Desktop$ paste f.txt file2.txt  
hello hello  
have a nice day have a nice day  
haritha@haritha-VirtualBox:~/Desktop$
```

9) uname

- will print detailed information about your linux system like machine name, operating system, kernel etc..



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

```
haritha@haritha-VirtualBox:~/Desktop$ uname -r  
5.8.0-43-generic  
haritha@haritha-VirtualBox:~/Desktop$ uname -a  
Linux haritha-VirtualBox 5.8.0-43-generic #49~20.04.1-Ubuntu SMP Fri Feb 5 09:5  
7:56 UTC 2021 x86_64 x86_64 x86_64 GNU/Linux  
haritha@haritha-VirtualBox:~/Desktop$ uname -v  
#49~20.04.1-Ubuntu SMP Fri Feb 5 09:57:56 UTC 2021  
haritha@haritha-VirtualBox:~/Desktop$ uname -i  
x86_64  
haritha@haritha-VirtualBox:~/Desktop$ uname -n  
haritha-VirtualBox  
haritha@haritha-VirtualBox:~/Desktop$
```

10) cp

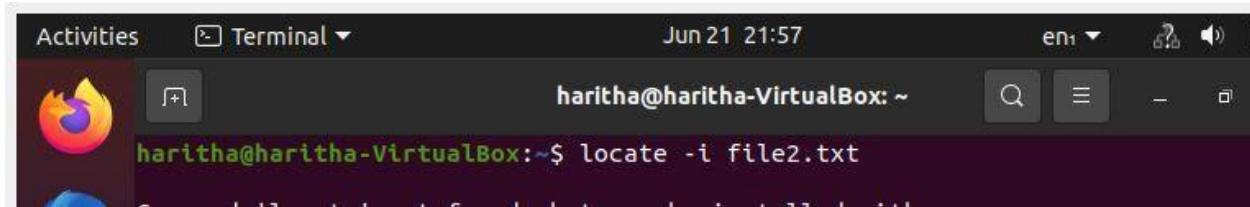
- used to copy files from the current directory to a different directory
- cp -i (will ask for user's consent in case of a potential file overwrite.)
- cp -p (will preserve source file mode, ownership and time stamp)
- cp -r (will copy directories recursively)
- cp -u (copies files only if the destination file is not existing or the source file is newer than the destination file)

11) mv

- to move files
- rename files

12) locate

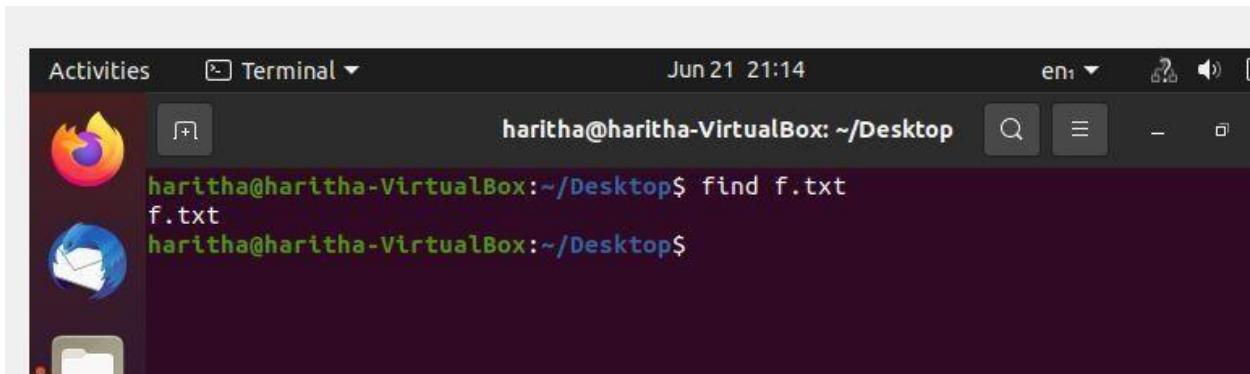
- to find a file
- locate -i filename (make it case insensitive you can search file if you don't remember its exact name)
- * (to search for a file that contains two or more words)



```
Activities Terminal Jun 21 21:57
haritha@haritha-VirtualBox:~$ locate -i file2.txt
```

13) find

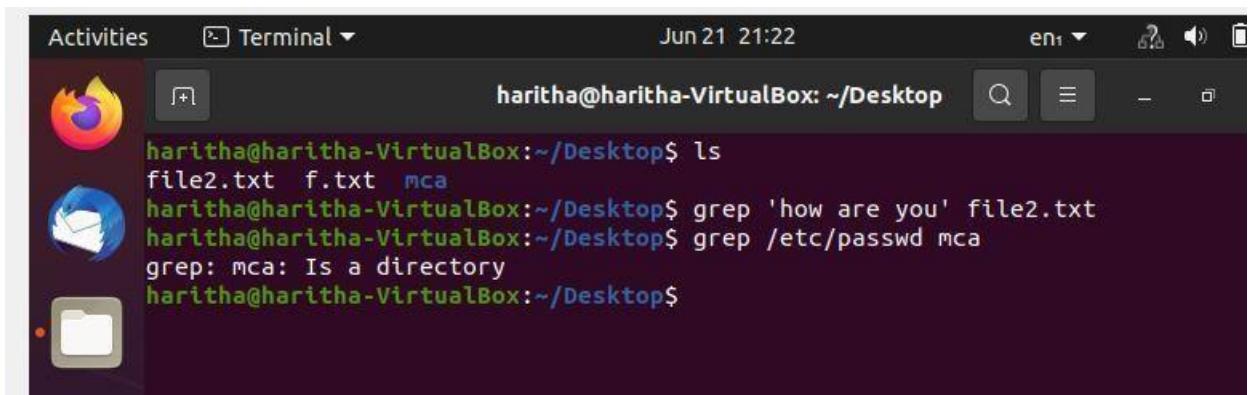
- To search for files or directories
- Find. -name filename (to find files in the current directory)



```
Activities Terminal Jun 21 21:14
haritha@haritha-VirtualBox:~/Desktop$ find f.txt
f.txt
haritha@haritha-VirtualBox:~/Desktop$
```

14) grep

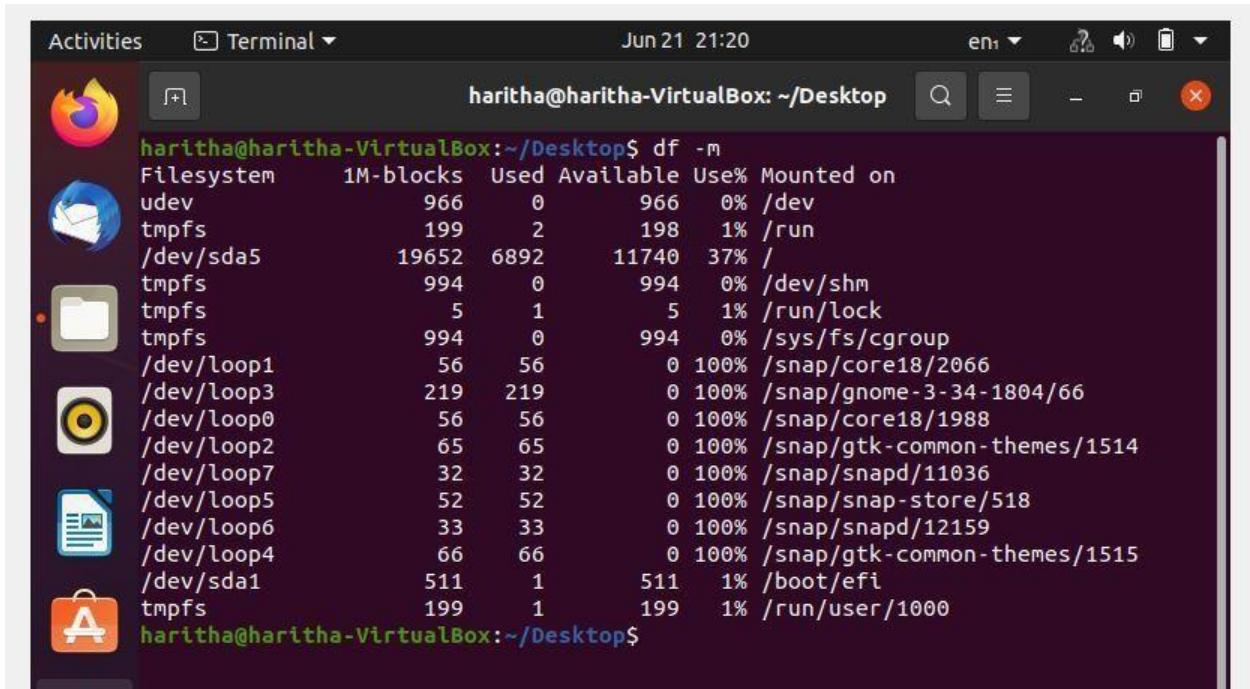
- Search through all the text in a given file



```
Activities Terminal Jun 21 21:22
haritha@haritha-VirtualBox:~/Desktop$ ls
file2.txt f.txt mca
haritha@haritha-VirtualBox:~/Desktop$ grep 'how are you' file2.txt
haritha@haritha-VirtualBox:~/Desktop$ grep /etc/passwd mca
grep: mca: Is a directory
haritha@haritha-VirtualBox:~/Desktop$
```

15) df

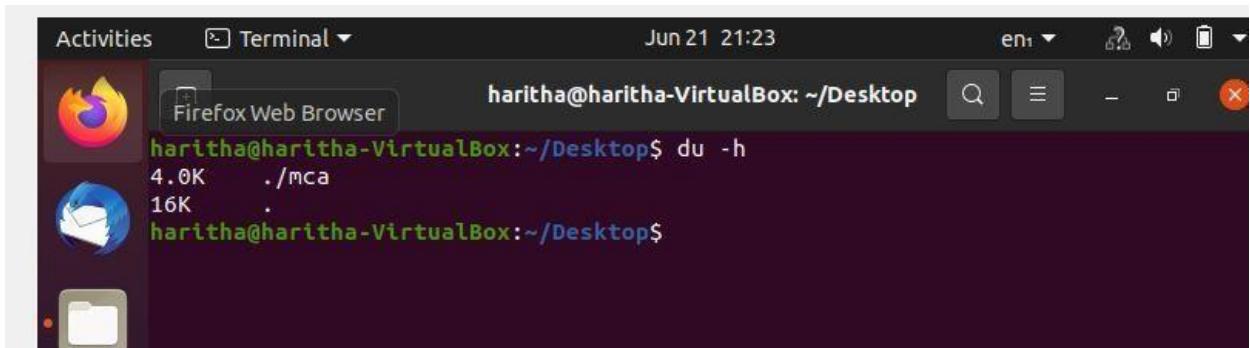
- To get report on the system's disk space usage shows in percentage and kbs.



```
Activities Terminal Jun 21 21:20 en1
haritha@haritha-VirtualBox: ~/Desktop$ df -m
Filesystem 1M-blocks Used Available Use% Mounted on
udev          966    0     966   0% /dev
tmpfs         199    2     198   1% /run
/dev/sda5    19652  6892   11740  37% /
tmpfs         994    0     994   0% /dev/shm
tmpfs          5    1      5   1% /run/lock
tmpfs         994    0     994   0% /sys/fs/cgroup
/dev/loop1       56    56     0 100% /snap/core18/2066
/dev/loop3       219   219     0 100% /snap/gnome-3-34-1804/66
/dev/loop0       56    56     0 100% /snap/core18/1988
/dev/loop2       65    65     0 100% /snap/gtk-common-themes/1514
/dev/loop7       32    32     0 100% /snap/snapd/11036
/dev/loop5       52    52     0 100% /snap/snap-store/518
/dev/loop6       33    33     0 100% /snap/snapd/12159
/dev/loop4       66    66     0 100% /snap/gtk-common-themes/1515
/dev/sda1      511    1     511   1% /boot/efi
tmpfs         199    1     199   1% /run/user/1000
haritha@haritha-VirtualBox: ~/Desktop$
```

16) du

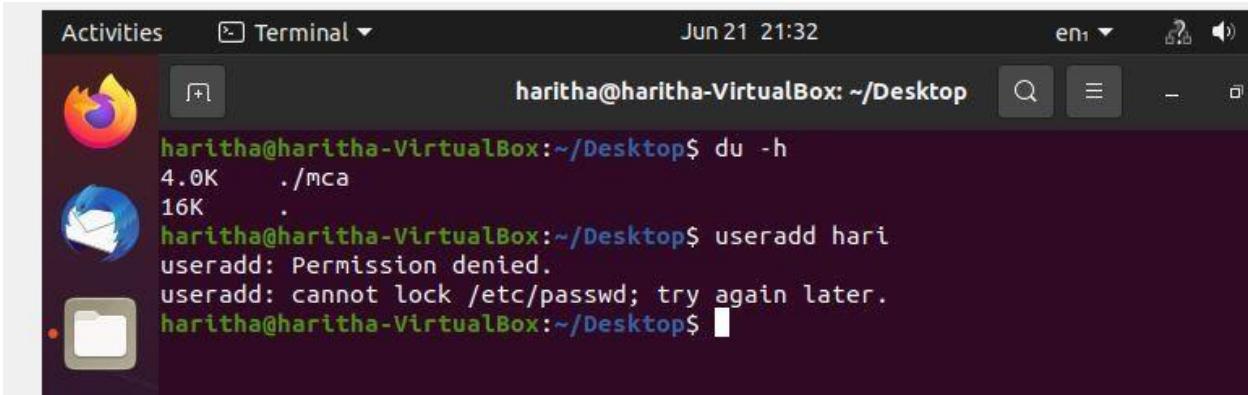
- to check how many space a file or directory takes.



```
Activities Terminal Jun 21 21:23 en1
Firefox Web Browser haritha@haritha-VirtualBox: ~/Desktop$ du -h
4.0K  ./mca
16K .
haritha@haritha-VirtualBox: ~/Desktop$
```

17) useradd

- available only for system admins.
- To create new user

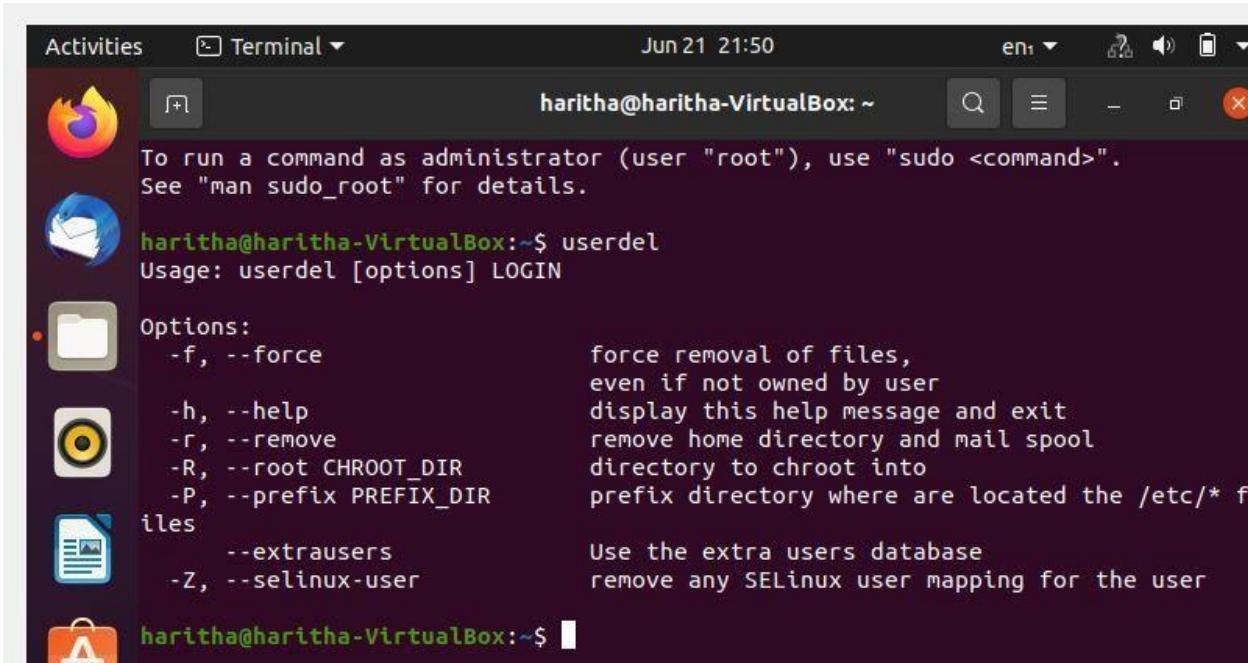


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window title is "Terminal" and the command line shows:

```
haritha@haritha-VirtualBox:~/Desktop$ du -h
4.0K    ./mca
16K    .
haritha@haritha-VirtualBox:~/Desktop$ useradd hari
useradd: Permission denied.
useradd: cannot lock /etc/passwd; try again later.
haritha@haritha-VirtualBox:~/Desktop$
```

18) userdel

- remove user or delete user account



A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window title is "Terminal" and the command line shows:

```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

haritha@haritha-VirtualBox:~$ userdel
Usage: userdel [options] LOGIN

Options:
  -f, --force          force removal of files,
                       even if not owned by user
  -h, --help           display this help message and exit
  -r, --remove         remove home directory and mail spool
  -R, --root CHROOT_DIR
  -P, --prefix PREFIX_DIR
  --extrausers         Use the extra users database
  -Z, --selinux-user  remove any SELinux user mapping for the user
```

19) sudo

- SuperUserDo ,enables you to perform tasks that require administrativeq or root permissions.

1. usermod

- usermod command is used to change the properties of a user in Linux through the command line
- command-line utility that allows you to modify a user's login information
- #usermod --help
- #usermod -u 2000 Tom

```
haritha@haritha-VirtualBox:~$ usermod --help
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
  Text Editor ,fix PREFIX_DIR
  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
```

1. groupadd

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

```
haritha@haritha-VirtualBox:~$ sudo groupadd student
[sudo] password for haritha:
haritha@haritha-VirtualBox:~$
```

2. group- s

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

```
haritha@haritha-VirtualBox:~$ sudo groupadd student
[sudo] password for haritha:
haritha@haritha-VirtualBox:~$ groups haritha
haritha : haritha adm cdrom sudo dip plugdev lpadmin lxd sambashare
haritha@haritha-VirtualBox:~$
```

3. groupdel

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

```
haritha@haritha-VirtualBox:~$ sudo groupdel student
haritha@haritha-VirtualBox:~$
```

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

```
haritha@haritha-VirtualBox:~$ sudo groupadd student
haritha@haritha-VirtualBox:~$ 
haritha@haritha-VirtualBox:~$ sudo groupmod -n student2 student
haritha@haritha-VirtualBox:~$
```

5. chmod

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

```
#chmod u+x test
#chmod g-rwx test
#chmod o-r test
```

```
haritha@haritha-VirtualBox:~$ chmod +rwx file3.txt
haritha@haritha-VirtualBox:~$
```

6. chown

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

```
haritha@haritha-VirtualBox:~$ chown haritha file3.txt
```

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

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

8. ps

- The ps command, **short for Process S, its 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
```

```
haritha@haritha-VirtualBox:~$ ps -a  
PID TTY      TIME CMD  
 764 tty2    00:00:29 Xorg  
 894 tty2    00:00:00 gnome-session-b  
2265 pts/0    00:00:00 ps
```

9. top

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

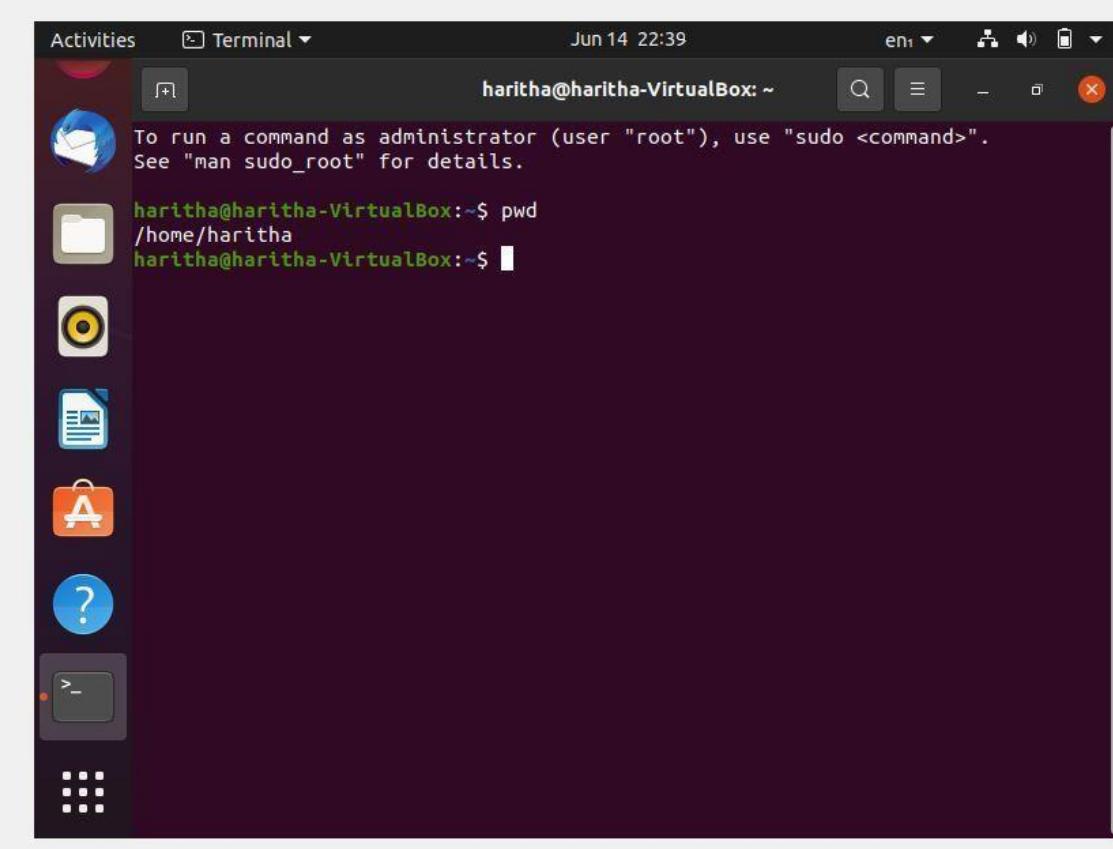
```
#top -u rose
```

```
haritha@haritha-VirtualBox:~$ top -u haritha
```

```
top - 20:06:45 up 44 min,  1 user,  load average: 0.15, 0.08, 0.09  
Tasks: 175 total,   1 running, 174 sleeping,   0 stopped,   0 zombie  
%Cpu(s):  2.1 us,  3.0 sy,  0.0 ni, 94.9 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st  
MiB Mem : 1987.1 total,   670.2 free,   690.4 used,   626.5 buff/cache  
MiB Swap:  929.4 total,   929.4 free,     0.0 used. 1137.2 avail Mem  
  
 PID USER      PR  NI      VIRT      RES      SHR S %CPU %MEM     TIME+ COMMAND  
1041 haritha    20   0  4193920  325696 121888 S  7.3 16.0  1:06.91 gnome-+  
 764 haritha    20   0   835604   69896  42364 S  4.0  3.4  0:34.06 Xorg  
1389 haritha    20   0   823288   51408  38924 S  1.0  2.5  0:09.15 gnome-+  
 767 haritha    20   0  10240  10704  2276 S  0.0  0.5  0:00.05 kworker/0:0
```

1.PWD (Print Working Word)

- ❖ Used to find the path of the current working directory
- ❖ Absolute path Which is basically a path of all the directories that start with a forward slash(\)
- ❖ Relative path defined as the path related to the present working directory From root directory



The screenshot shows a terminal window titled "Terminal" with the command "pwd" being run. The terminal output is as follows:

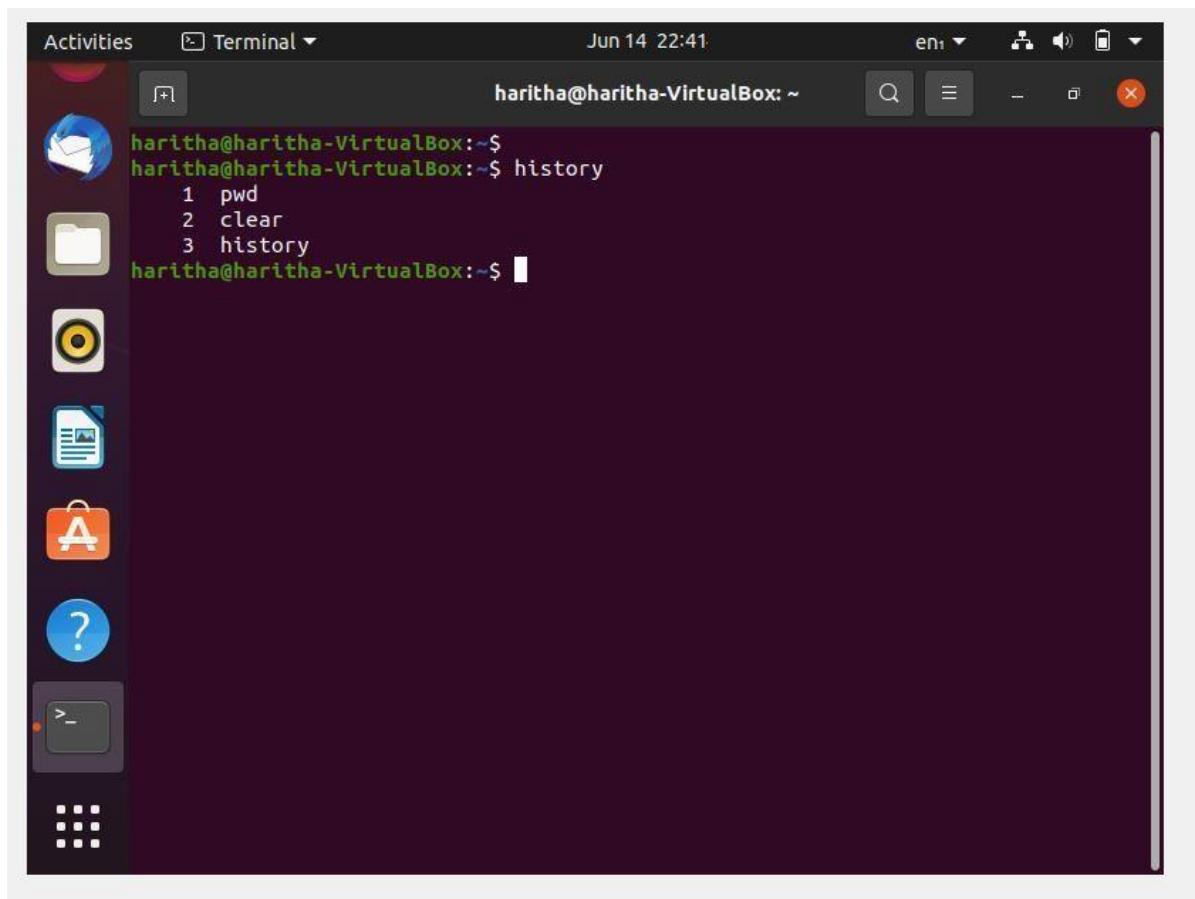
```
Activities Terminal Jun 14 22:39 haritha@haritha-VirtualBox: ~
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

haritha@haritha-VirtualBox:~$ pwd
/home/haritha
haritha@haritha-VirtualBox:~$
```

The terminal window has a dark background and light-colored text. It includes standard Linux terminal icons at the top and a vertical application menu on the left.

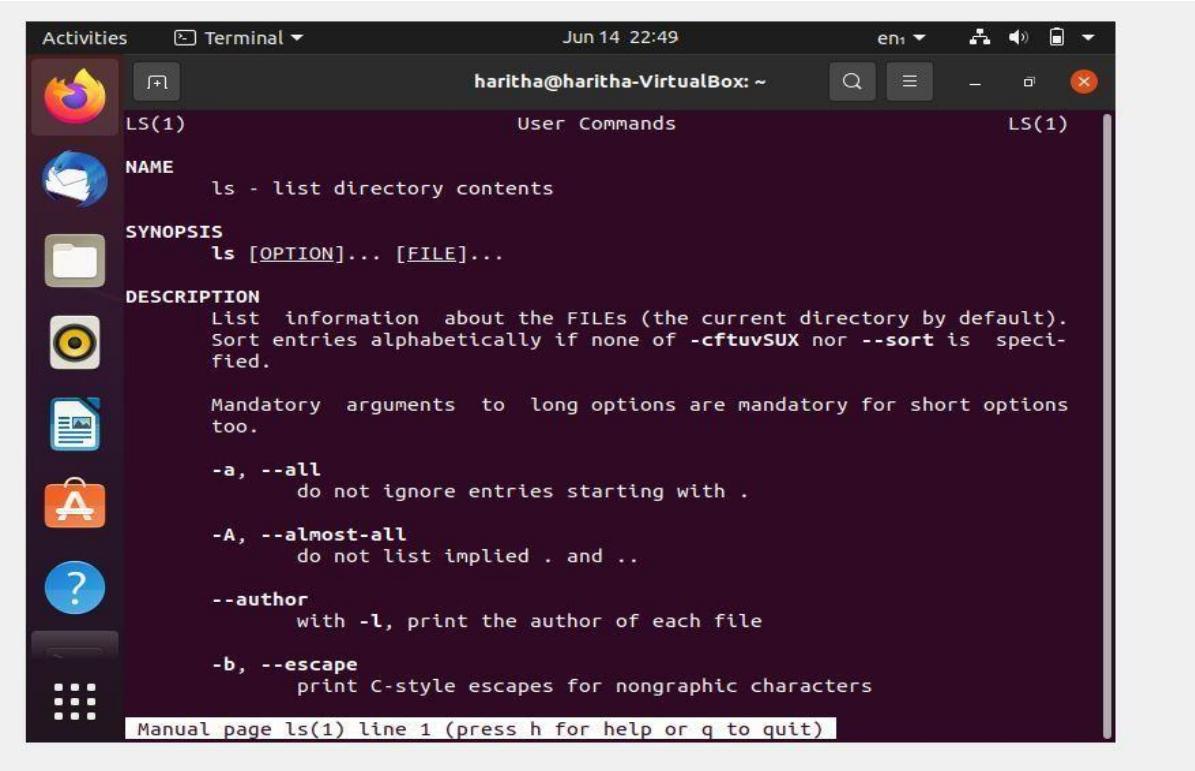
2. History

- ❖ To review the commands, you have entered before



3. Man

- ❖ Shows the manual instruction of the tail command
- ❖ Man, man to start learning about man utility



The image shows a screenshot of an Ubuntu desktop environment. A terminal window is open, displaying the man page for the 'ls' command. The terminal title bar shows 'Terminal' and the user 'haritha@haritha-VirtualBox: ~'. The man page content includes sections for NAME, SYNOPSIS, DESCRIPTION, and various options like -a, -A, --author, etc. The terminal window has a dark background with light-colored text. On the left side of the screen, there is a vertical dock with icons for various applications: a browser, file manager, terminal, messaging, calendar, and others.

```
NAME
ls - list directory contents

SYNOPSIS
ls [OPTION]... [FILE]...

DESCRIPTION
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

Mandatory arguments to long options are mandatory for short options too.

-a, --all
      do not ignore entries starting with .

-A, --almost-all
      do not list implied . and ..

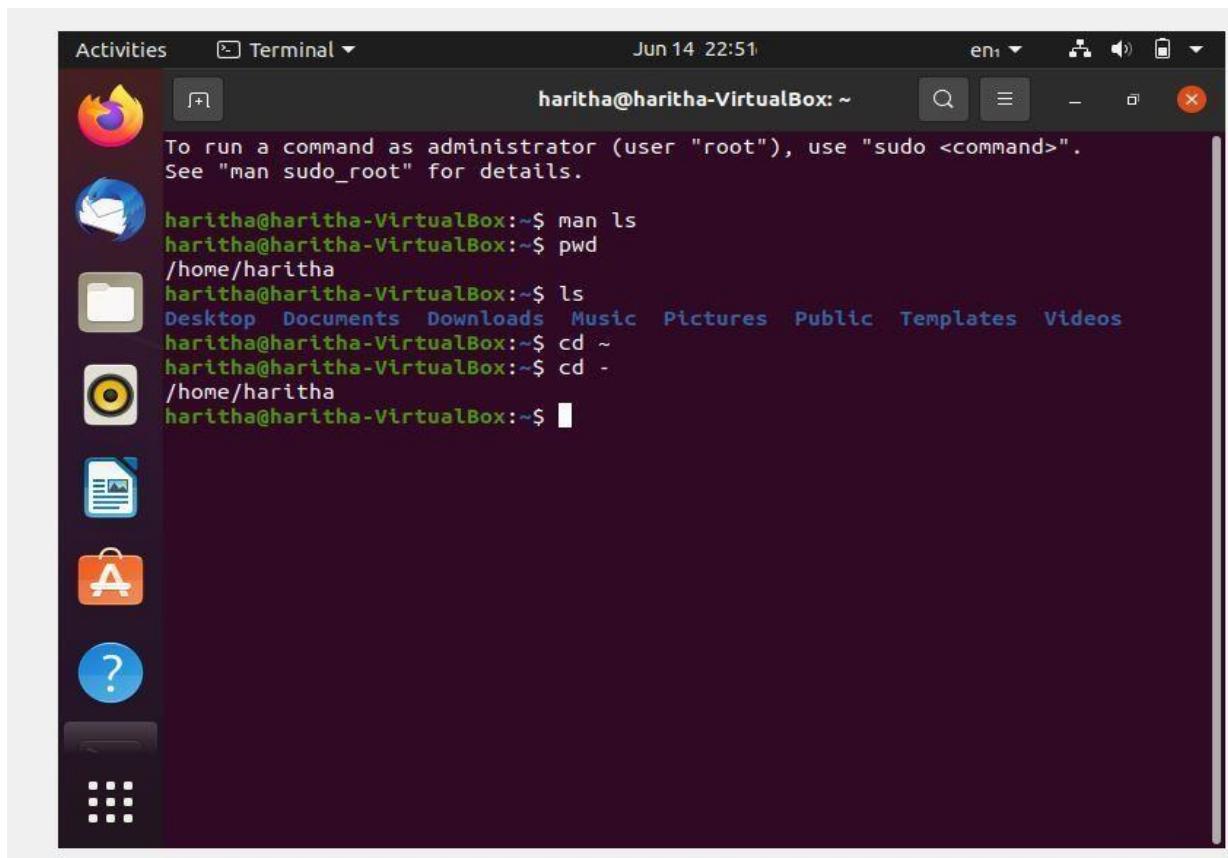
--author
      with -l, print the author of each file

-b, --escape
      print C-style escapes for nongraphic characters

Manual page ls(1) line 1 (press h for help or q to quit)
```

4. cd

- ❖ To navigate through the Linux files and directories
- ❖ Cd ... (to move one directory up)
- ❖ Cd ~ (to go straight to the home folder)
- ❖ Cd - (to move to a previous directory)

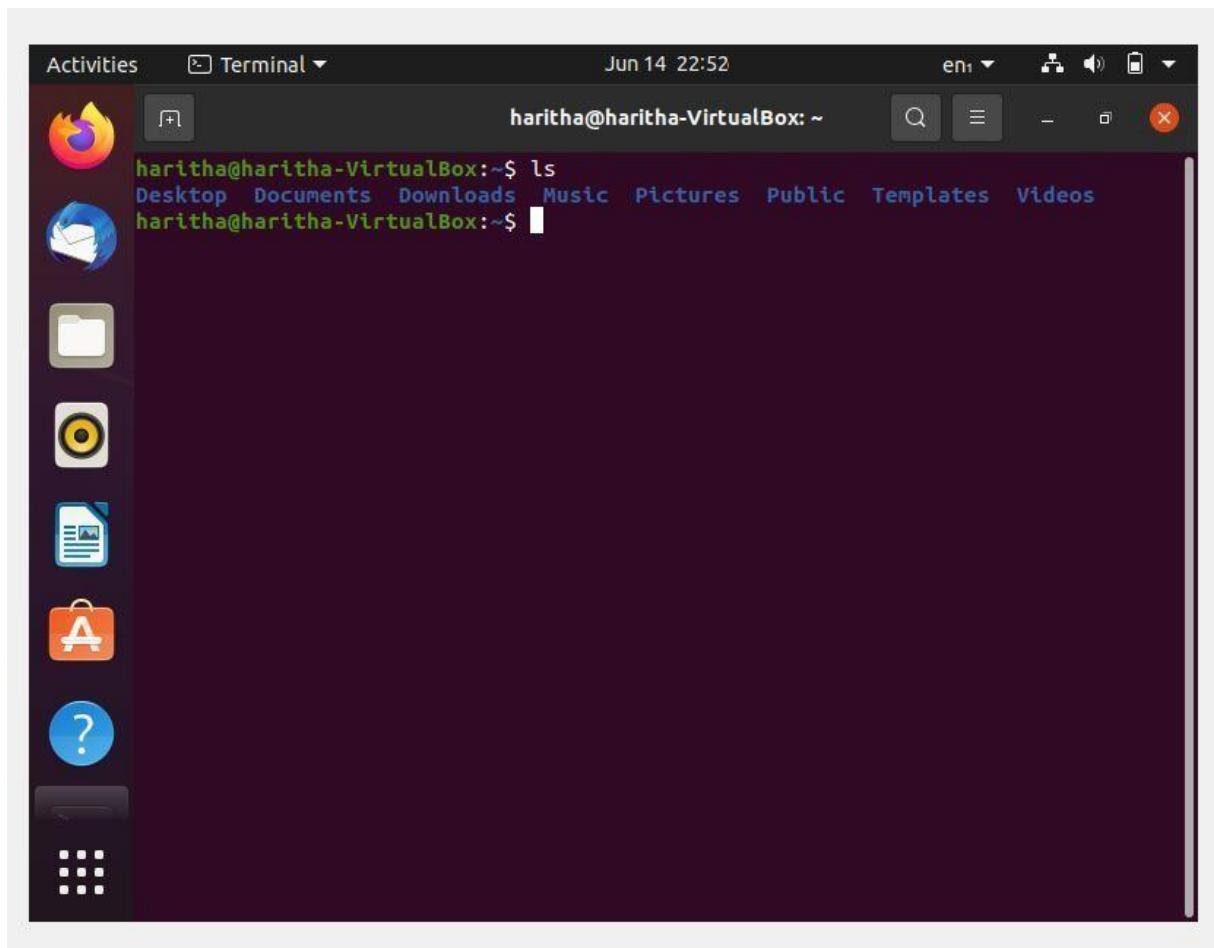
A screenshot of an Ubuntu desktop environment. On the left, there's a vertical dock with icons for various applications: a browser, email, file manager, terminal, documents, a web browser, a text editor, help, and dash. The main window is a terminal titled "Terminal" with the command "Activities". The terminal window shows the following text:

```
Activities Terminal ▾ Jun 14 22:51 haritha@haritha-VirtualBox: ~
[+]
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

haritha@haritha-VirtualBox:~$ man ls
haritha@haritha-VirtualBox:~$ pwd
/home/haritha
haritha@haritha-VirtualBox:~$ ls
Desktop Documents Downloads Music Pictures Public Templates Videos
haritha@haritha-VirtualBox:~$ cd ~
haritha@haritha-VirtualBox:~$ cd -
/home/haritha
haritha@haritha-VirtualBox:~$
```

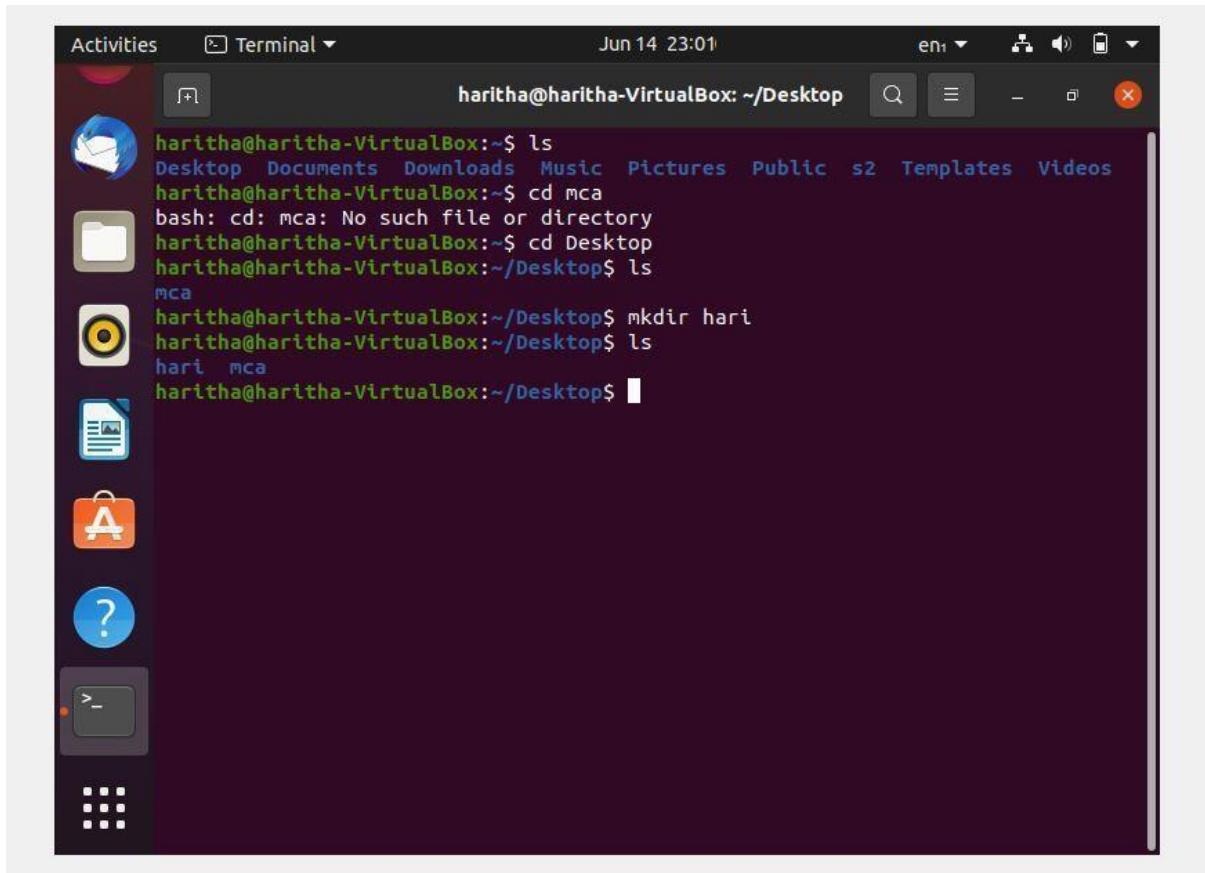
5. ls

- ❖ Used to view the content of the directory
- ❖ Ls –R (Will list all the files in the sub directory)
- ❖ Ls –a (long listing) → Ls –al (will show hidden files)



6. Mkdir

- ❖ To make a new directory
- ❖ Mkdir –p (to create a directory in between two existing directory)

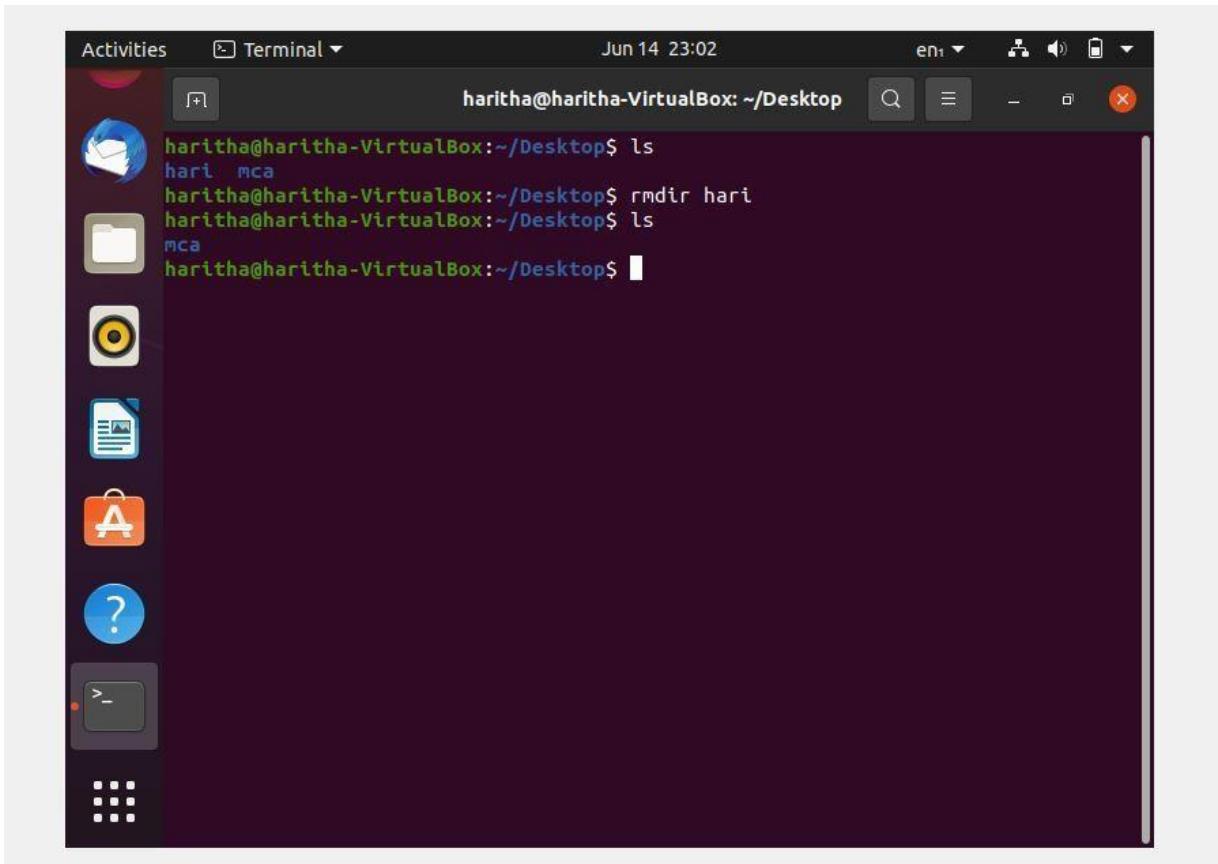


A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window is titled "Terminal" and has the command "haritha@haritha-VirtualBox: ~/Desktop". The terminal output shows the following commands and their results:

```
haritha@haritha-VirtualBox:~$ ls
Desktop Documents Downloads Music Pictures Public s2 Templates Videos
haritha@haritha-VirtualBox:~$ cd mca
bash: cd: mca: No such file or directory
haritha@haritha-VirtualBox:~$ cd Desktop
haritha@haritha-VirtualBox:~/Desktop$ ls
mca
haritha@haritha-VirtualBox:~/Desktop$ mkdir hari
haritha@haritha-VirtualBox:~/Desktop$ ls
hari mca
haritha@haritha-VirtualBox:~/Desktop$
```

7.rmdir

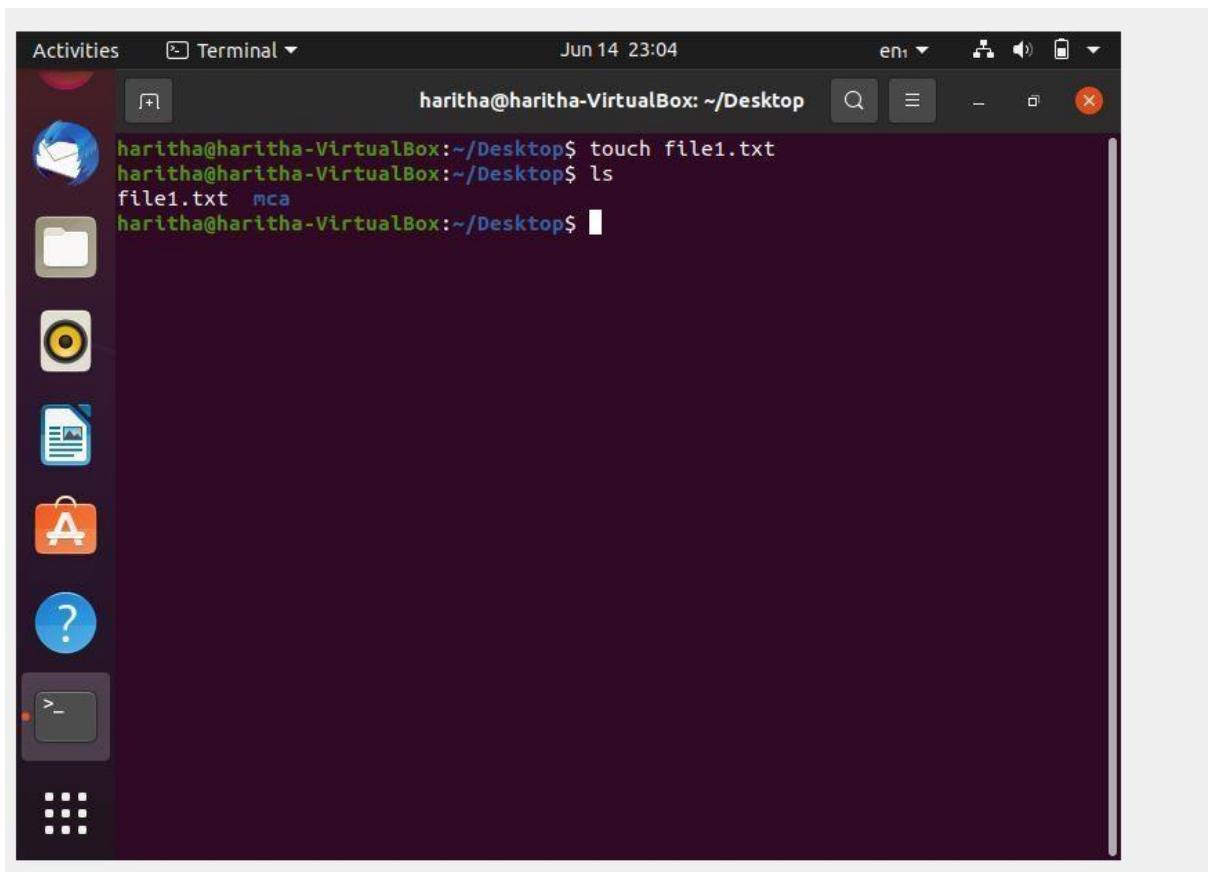
- ❖ To delete a directory (only allows you to delete empty directories)

A screenshot of an Ubuntu desktop environment. On the left, there's a vertical dock with icons for Dash, Home, Applications, and Help. The main area shows a terminal window titled "Terminal". The terminal output is:

```
Activities Terminal Jun 14 23:02
haritha@haritha-VirtualBox: ~/Desktop$ ls
hari mca
haritha@haritha-VirtualBox: ~/Desktop$ rmdir hari
haritha@haritha-VirtualBox: ~/Desktop$ ls
mca
haritha@haritha-VirtualBox: ~/Desktop$
```

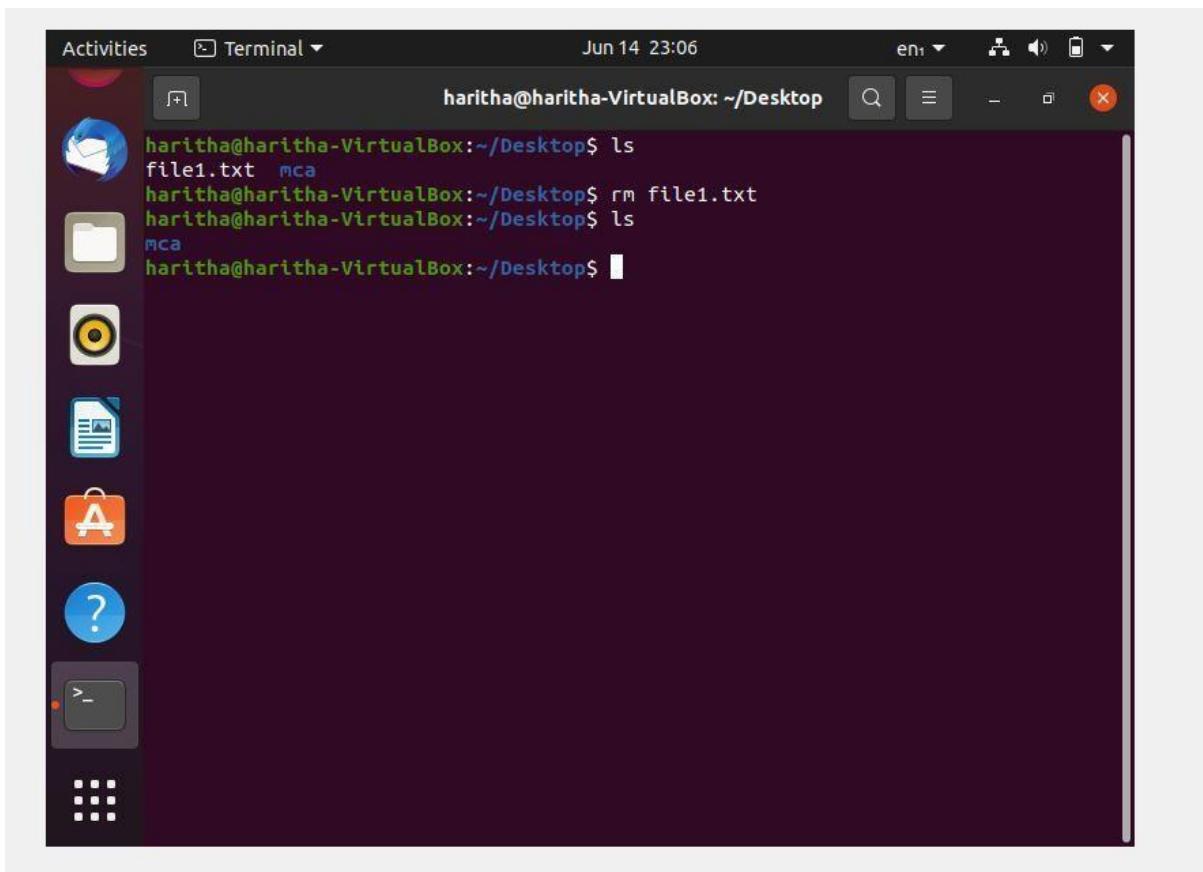
8.touch

- ❖ To create a blank new file



9. rm

- ❖ To delete directories and the contents within them
- ❖ Rm –r (to delete directory)
- ❖ Rm filename (to remove a file)



10. cat

- ❖ List the content of a file
- ❖ Cat >filename(create a new file)
- ❖ Cat filename1file name2>filename3(join two files and store the output)
- ❖ Cat filename | tr a-z A-Z

