

SBC-1 Computer Fundamentals

Computer Fundamentals Objectives

In this subject, you will be able to:

1. Define a computer, identify its characteristics and functions;
2. List types of computers;
3. Explain hardware and software;
4. Recognize Input and Output units and devices

Introduction

The term computer is derived from the word 'compute', which means 'to calculate'. The impact of computers in our day-to-day life is tremendous and visible in all fields. Similarly in modern libraries, various activities are performed with the help of computers.

1. Perform complex and repetitive calculations rapidly and accurately.
2. Store large amount of data and information for subsequent manipulations.
3. Make Decisions
4. Provide information to the user.
5. Automatically correct or modify -by providing signals-certain parameters of a System under control.
6. Can draw complex graphics, animations
7. Converse with user through terminals.

Important of Computer

Engineers and scientists make use of high-speed computing capability of computers to solve their complex research and design problems. Many calculations that were previously beyond contemplation have now become possible.

Computers have helped automation of many industrial and business systems. They are used extensively in manufacturing and processing industries, power distributions systems, airline reservation systems, transportation systems, banking system and so on. Computer aided design (CAD) and Computer aided manufacture (CAM) are becoming popular among large industrial establishments.

Computers are used to teach the students. This is known as Computer Aided Learning (CAL). Computer has made possible the most significant achievement in the history of mankind i.e. the Internet - a worldwide network connecting millions of computers and millions of people. It must be remembered that computers are machines created and managed by man. It has no brain of its own. Computer is more Efficient than man but man is more Intelligent than computer.

Computer

Computer is an electronic device which is capable of receiving information or data and perform a series of operations in accordance with a set of operations. This produce results in the form of data or information. Computer is a machine capable of solving problems and manipulating data. It accepts and processes the data by doing some mathematical and logical operations and gives us the desired output.

Therefore, we may define a computer as an electronic device that transforms data into information. Data can be anything like marks obtained by you in various subjects, it can also be name, age, sex, weight, height, etc. of all the students in your class or income, savings, investments, etc. of a country.

Characteristics Of Computer

Let us now identify the major characteristics of a computer. These are:

- **Speed-** As you know computer can work very fast. It takes only a fraction of a second for calculations that manually take hours to complete. It takes few minutes for the computer to process huge amount of data and give the result.
- **Accuracy-** The degree of accuracy of computer is very high and every calculation is performed with the same accuracy. The accuracy level is determined on the basis of design of the computer. The errors in computer are mainly due to human and inaccurate data.
- **Diligence-** A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without any error.
- **Versatility-** The computer is highly versatile. You can use it for a number of tasks simultaneously such as, for inventory management, preparation of electrical bills, preparation of pay cheques, etc. Similarly, in libraries computer can be used for various library housekeeping operations like acquisition, circulation, serial control, etc. and also by students for searching library books on the computer terminal.
- **Power of Remembering-** Computer has the power of storing large amount of information or data. Any information can be stored and recalled whenever required for any numbers of years. It depends entirely upon you how much data you want to store in a computer and when to retrieve or delete stored data.
- **Dumb Machine with no IQ-** Computer is a dumb machine and it cannot do any work without instructions from the user. It performs the instructions at a tremendous speed and with great accuracy as it has the power of logic. It is for you to decide what you want to do and in which sequence. So, a computer cannot take decision of its own as human beings can take.
- **Storage-** The computer has an in-built memory where it can store huge amount of data. You can also store data in secondary storage devices such as CDs, DVDs, and pen drives which can be kept outside the computer and can be carried to other computers.

Generation Of Computers

The history of computer development is in reference to different generation of computing devices. The first-generation computers appeared in mid-1940s. The present-day computer, however, has undergone rapid changes for the last seven decades. This period, during which the evolution of computer took place, can be divided into five distinct phases known as Generations of Computers that are being presented in the table given below:-

| Generation | Period | Technology |
|-------------------|---------------|--|
| 1. First | 1946-59 | Based on vacuum tube technology |
| 2. Second | 1957-64 | Transistor based technology replaces vacuum tube |
| 3. Third | 1965-70 | Integrated circuit (IC) technology developed |

- | | | |
|-----------|----------------|----------------------------|
| 4. Fourth | 1970-90 | Microprocessors developed |
| 5. Fifth | 1990-till date | Use of Bio-Chip technology |

Computer System

A system in general is an assembly of methods, procedures or techniques that interact in a regulated manner to accomplish certain functions.

The total system of computer installation consists of three basic elements:

1. Hardware
2. Software
3. Human-ware

1. The **Hardware** consists of physical equipment and components of the computer system.
2. The **Software** consists of various kinds of programs (of instructions) that cause the hardware to function in a desired way.

Program- Program is nothing but a set of instruction that guides the computer components accordingly.

These instructions or programs are recorded in a form that can be understood by a computer. These programs are stored in main memory and executed under the command of CPU. This is known as STORED PROGRAM CONCEPT. In other words, a computer obeys the operator in all it's doings and hence any notion of mysteriousness about the computer should be dismissed. GIGO- GARBAGE IN IS GARBAGE OUT

3. The personnel referred to as **human-ware** are important elements who maintain the whole system. They include Operators, programmers, System Analysts etc.

Hardware

Hardware refers to the physical equipment used for the input, processing, output and storage activities of a computer system. It consists of mechanical and electronic devices, which we are able to see and touch easily. Some of them are central processing unit (CPU), primary storage devices, secondary storage devices, input and output unit and communication devices. These are explained below:

- **Central processing unit (CPU):** It manipulates the data and controls the tasks performed by the other components.
- **Primary memory (main memory):** It stores temporarily data and program instructions during the processing. These are RAM (Random Access Memory/Read-Write Memory), and ROM (Read-only-memory).
- **Secondary storage:** These store data and programs for future use. These are Hard Disk (Local Disk) and External Hard Disc, Optical Disks, (CDR, CDRW, DVD-R, DVD-RW), Pen Drive, Memory Cards, etc. Communication Devices: These are used for communication or flow of data from one computer to another computer. Some of them are Modem, Switch, Router, TV tuner card, etc.
- **I/O Device-** Communication devices

Central processing unit

Concepts Of Data Processing

It is a process of raw facts (data) into meaningful information

$X = 5; Y = 3; X + Y = 8$

Raw Facts Process = (Meaningful Information)

Data Processing Cycle

The functions performed by a Computer System are collectively known as data processing cycle. The three main functions in sequence are

INPUT: It includes Input function to capture data and convert them into machine-readable form.

1. **Processing:** A processing function to capture data and convert them into machine readable form and execute the instructions given regarding the data.
2. **Output:** Function that converts them to human readable.
3. **Information:** Information is organized or classified data so that it has some surprise value to the receiver.

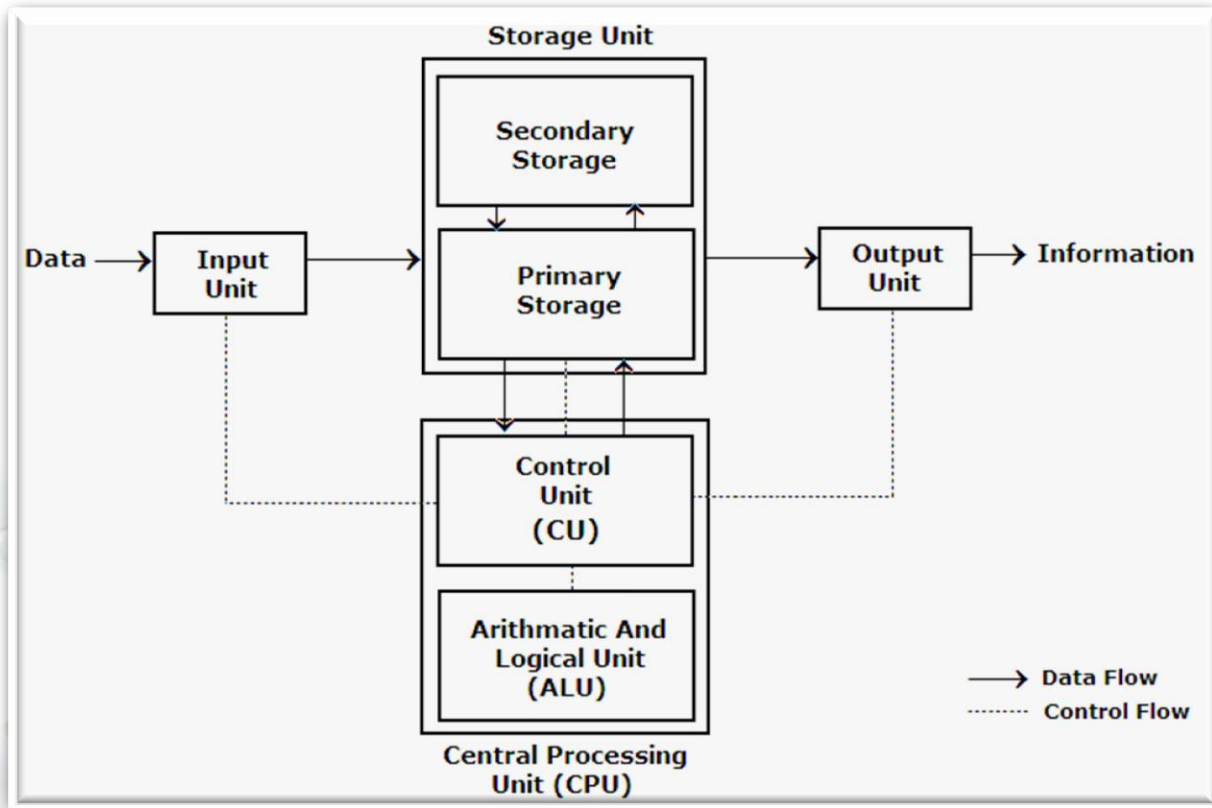
Data processing is actually the restructuring or recording of data by machine or by people, to increase their usefulness and value for some particular purpose.

Regardless of whether the system used to process data is manual or electronic, certain fundamentals operations must be performed.

A computer basically performs five major operations or functions such as :

1. Accepts data or instructions by way of input.
2. Stores data
3. Processes data as required by the user,
4. Gives results in the form of output, and
5. Controls all operations inside a computer.

Each of these operations are discussed and shown in the figure given below



Let us know the details of basic computer operations.

1. **Input-** This is the process of entering data and programs in the computer system. Therefore, the input unit takes data from us to the computer in an organized manner for processing.
2. **Storage-** The data and instructions are saved/ stored permanently in storage unit. The storage unit performs the following major functions:
 - All data and instructions, before and after processing, are stored here, and
 - Intermediate results of processing are also stored here.
3. **Processing-** The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. After this data is sent back to the storage unit.
4. **Output-** This is the process of producing results from the data for getting useful information. The output produced by the computer after processing is stored inside the computer before it is given to you in human readable form. The output is also stored inside the computer for further processing.
5. **Control-** Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

Electronic Data Processing

Earlier data processing was done on punched cards (Unit Record Method) using EAM (Electrical Accounting Machine) but as the companies grew its limitations began to surface.

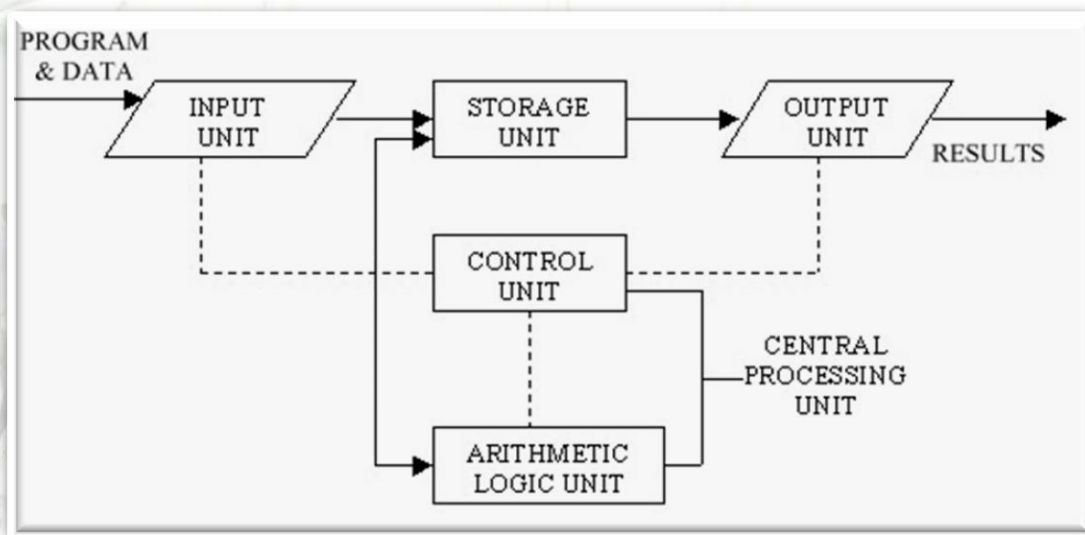
EDP offers better method of data processing at a low cost per unit processing as it relies on computer and principles of electronics for processing data. Calculations are performed at relatively very high speed and with unsurpassed accuracy. The development of modern business, Government and private organisations depend on the quality of data processed so it is impossible to go through a day with encountering data processing in some form.

Computer System

In order to carry out its operations, a computer system is divided into three separate units. They are:

1. Arithmetic logical unit
2. Control unit
3. Central processing unit

All these three units are known as functional units.



Arithmetic Logical Unit (ALU)- The processing of the data and instructions are performed by Arithmetic Logical Unit. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison. For processing, data is transferred from storage unit to ALU. After processing, the output is returned back to storage unit for further processing or for storing purpose.

Control Unit (CU)- The next component of computer is the Control Unit, which acts like the supervisor seeing that things are done in proper way. The control unit determines the sequence in which computer programs and instructions are to be executed. Activities like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them are carried out by CU. It coordinates the activities of computer's peripheral equipment which include input and output devices. Therefore, it is the manager of all the operations mentioned in the previous section.

Central Processing Unit (CPU)- The ALU and the CU of a computer system are jointly known as the central processing unit (CPU). You may call CPU as the brain of any computer system. It is just like brain that takes all major decisions, makes all sorts of

calculations and directs different parts of the computer functions by activating and controlling the operations. The CPU (Central Processing Unit) is the device that interprets and executes instructions.

A computer system includes a computer, peripheral devices, and software.

Computer Memory

Main Memory/Primary Storage

- **Semiconductor Memory or Integrated circuits (IC's):** They based on the concept of storage chips. The very thin silicon chip contains a number of small storage cells that can hold data. These units are constructed as integrated circuits, meaning that a number of transistors are combined together on a thin silicon wafer to form a complete set of circuits. The faster and more expensive chips are used in ALU and high-speed buffer storage section of the CPU, while the slower and less expensive chips are used in main memory section. Semiconductor device provide Volatile storage i.e., data stored would be lost in event of power failure .RAM and ROM are type of semiconductor memories.
- **Random Access Memory (RAM):** In this type of memory system access time is independent of the address of the word, that is, each storage location (address) inside the memory is easy to reach as any other location and it takes same amount of time. A RAM is extremely fast. They are also known as SIMM's - Single Inline Memory module/s.
Volatility: RAM is volatile. Its contents are lost when the equipment is turned off or there is power failure. Hence a backup Un-interruptible power supply (UPS) is recommended.
- **Read Only Memory (ROM):** The term read only means that stored information cannot be altered by regular program instructions. It is non-volatile .The information is stored permanently during manufacture. BIOS chip is one of the examples of ROM.
- **Cache Memory:** The chips used inside CU and A/LU are much faster in comparison to the main memory chip. To fill this gap a high speed memory capable of keeping up with CPU is used. So one can say it is a type of main memory. It generally holds data that is expected to be accessed again. The second access to the data will be very fast.
- **Registers And Buffers:** They temporary memory locations inside the A/LU meant for holding data bits, which are intermediate products of some calculations. The information is transferred at very high speed.

Secondary Storage

Also known as External Auxiliary Memory As the cost of RAM is very high and it is volatile. This drawback lead to development of Auxiliary / External memory for a performance storage as well as cheap media. Magnetic material was found to be cheap material and quite long lasting. Magnetic Tape and Magnetic Disks are commonly used storage devices.

Magnetic Disk: It is a circular platter of plastic, which is located with a magnetizable material. One of the key components of a magnetic disk is a conducting coil named as head, which performs the job of reading or writing on the magnetic surfaces. The head remains stationary while the disk rotates below it.

Logical Layout of a Magnetic Disk

Data is stored in a concentric set of rings, which are called tracks. The width of a track is equal to the width of the head. To minimise interference of magnetic fields and to minimise misalignment of the head, the adjacent heads are separated by inter-track gaps. As we go towards the outer tracks, the size of a track increases but to simplify electronics, the same number of bits are stored on each track. The data is transferred from and to the disk in blocks and is normally equal to a sector. A track is divided into 10 - 100 sectors of fixed or variable length. Two adjacent sectors are separated by inter-track gaps. This helps in reducing the precision requirement of sectors.

Winchester Disc: This is a sealed rigid magnetic oxide medium disk, which typically holds 10 to 600 MB of data. They are not removable from the drive since they are sealed; they are free from dust and other contaminations, which are likely in floppy. These provide substantially faster data access as compared to floppy disk. The data is stored in a Winchester disk in the same way as on the standard magnetic disk described in the previous section. These discs are more reliable in comparison to floppy disk.

Floppy disks: Consists of a flexible thin sheet of plastic material with a magnetic coating and grooves arranged in concentric circles with tracks. It is a convenient recording medium to transport information from one location to another. They are of two sizes 5.25 inches and 3.5 inches with memory capacity of 360 KB to 1.44 MB.

Optical Laser Disk: Optical laser disk storage is capable of storing vast amounts of data. Some computer engineers think that optical laser disk technology may eventually make magnetic and tape storage obsolete. With this technology, two lasers replace the read/write head used in magnetic storage. One laser beam writes to the recording surface by scoring microscopic pits in the disk, and another laser reads the data from the light-sensitive recording surface. A light beam is easily deflected to the desired place on the optical disk, so a mechanical access arm is not needed.

There are three main categories of optical laser disk:

- A. CD-ROM disk
- B. WORM disk
- C. Magneto-optical Disk

CD-ROM disks: This stands for Compact Disk Read Only Memory. The name implies its applications. The master copy is duplicated or "pressed" at the factory. Once inserted into the CD-ROM drive, the text, video images, and so on can be read into primary storage for processing or display. However, the data on the disk is fixed and it cannot be altered.

The capacity of a single CD-ROM is over 550 MB, which is equivalent to 250,000 pages of text or 1500 floppy disks.

WORM disks: It stands for Write once, read many optical laser disks. Companies to store their information use these. Once the data have been written to the medium, they can only be read, neither updated nor changed. It has a capacity of 200 MB. WORM disk can be used to store archival information.

Magneto-Optical Disk: Magneto-optical disk integrates optical and magnetic disk technology to enable read and writes storage. The 5.1/4" can store 1000 MB of data. However, the technology must be improved before the disk can experience wide spread acceptance. At present they are too expensive, access time is also not so fast. But it will certainly dominate the magnetic disk technology in the coming future.

Input And Output Unit

No matter how powerful the computer is, it is useless unless it is fed with data and programs. The input devices are those devices, which are used to enter data into the computer. Input Media can be of two types: Paper Based Media: Magnetic Based Media.

An input and output unit consists of two parts namely, input devices and output devices. Normally, an Input and output unit can control one or more peripheral devices.

1. **Input Devices-** Source data entry devices (Audio input –speech recognition; video input -digital camera; scanners - optical scanner OCR, OMR, MICR, Barcode Reader). Human data entry devices - keyboard, mouse, joystick, trackball, digitizing labels and; pick devices - light pen touch screens.
2. **Output Unit-** The output unit accepts output data from computer via output devices and transforms the data into human readable form. All the information inside the computer is in the form of binary digits (0 and 1). Output devices convert them to numbers, words, graphics, sound and motion which we can easily understand.

Input

Input Unit- The data is entered / input into the computer through input devices. The input devices translate the data / information from a natural language in which the user is working, into the machine language which the computer can understand. Computer language is in the form of binary code (0 and 1). Input devices are classified as follows:

Paper Based Media

- **Punched Cards:** The data is transcribed on cards in the form of holes (done through keypunch machine) via keyboard. This card when put in card reader, transfers the data into computer memory. One of the upper corner is cut angularly to aid in any card that might be upside down or backside forward.
- **Punched Paper Tapes:** Paper tape is another medium like cards, which we punch the data and feed into the computer but unlike cards, paper is continuous, strip of special

paper of width. Paper offers continuous recording of data, so the record length can be of any size. Paper tape reader is much similar to card reader.

Direct Data Entry:

It refers to entry of data directly into the computers through machine-readable source documents or through use of on-line terminals. DDE does not require manual transcription of data from original paper documents. There are certain devices which can scan source documents magnetically or optically to capture data for direct entry into the computer. Let's discuss each of these devices.

- **Optical Character Reader:** permits the direct reading of any printed character. No special ink is required. It reduces the input keying bottlenecks. It can read bar codes and merchandise tags to enter data directly into a computer system. It examines each character as if it were made up of tiny small /minute spots. Once the whole character scanned, the pattern detected is matched against a set of patterns stored in the computer whichever pattern it matches or nearly matches is considered to be character read. Patterns, which are not identified, are rejected. It can read at a rate of 2400 characters per second.
- **Optical Mark Reader:** This is literally what it says. The card or form is divided into boxes in which a mark is made by pencil or pen. A character is represented by making the correct combination of boxes in any one column as opposed to displacing holes from a punched card. Forms and cards are pre-printed for special purposes so that a mark can be made in a certain position to represent YES or NO. It can be very well used for sensing correctness of an examination answer book of objective type.
In one form of detection, the conductivity of graphite mark is sensed. This method necessitates the use of soft pencil. A deep in light reflectance indicates the presence of a mark. In this method mark other than by pencil may be accepted.
- **Magnetic Ink Character Reader:** Magnetic Ink Character Recognition is widely used by banks to process the tremendous volume of cheques being written each day. The cheques are pre-coded along the bottom with the bank identification number and the depositor's account no. These nos. and other special symbols are printed with special ink that contain magnetizable particles of iron oxide. Cheques are accumulated in batches and placed in an input hopper of a reader - sorter unit. As they enter the reading unit, cheques pass through a magnetized. Read heads are then able to interpret the characters as the cheques pass through the reading unit.

Keyboard- One of the common input devices, Its layout is like that of the traditional QWERTY typewriter with some additional command and function keys provided facility to provide data and command to computer in text form

Pointing Devices

Pointing devices are used for working in a display packages, in which we move to some area to select an option and move across the screen to select subsequent command. There are several pointing devices some of them are.

- **Mouse:** It is a handy device, which can be moved on a smooth flat surface to stimulate the movement of cursor that is desired on the display screen. It could be optical as well as mechanical. One can move the mouse, stop it at a point where cursor or pointer to be located and with the help of buttons make selection of pointer to be located and with the help of buttons make selection of choices. It is about a size of normal cake of bath soap that usually rolls on a rubber ball and has two or three buttons at the top.
Light Pen: It is a pen shaped device allowing natural movement on the Screen. It contains the light receptor and is activated by pressing the pen against the display screen. Receptor is a scanning beam which helps in locating the pens position suitable system software is provided to initiate necessary action. Generally used by graphic designers, illustrators, drafting Engineers.
- **Touch Screens:** Limited amount of data can be entered via terminal that has touch screen. The user simply touches the screen at the desired location (boxes) to point out the choices.

Voice Recognition

It works on the pattern of comparison of words spoken (sound waves) with the reference in the memory. But it is unreliable at present.

Output Devices

Terminals- It consists of VDU, a keyboard, and a communication link to hook the terminal up with the main computer system. There are generally used for REMOTE JOB ENTRY (RJE) purposes. Terminals may be dumb, smart, or intelligent.

- **Dumb Terminal:** It cannot do any processing of its own. It is only used for data entry through keyboard and retrieval on the monitor. E.g. the clerk on a dumb terminal retrieves flight information on airport.
- **Smart Terminal:** A smart terminal can input and retrieve data and also do some limited processing like editing or verifying data. However, it cannot do any programming. E.g. A point of sale (POS) terminal.
- **Intelligent Terminal:** It can input and receive data and do its own processing. This type of terminal is actually a microcomputer. They are expensive in comparison to dumb and smart terminal.

VDU- Visual display unit, commonly known as monitor, can be used both as input as well as output device. Uses a cathode ray tube to produce images.

Monitors can be classified on the basis of:

Resolution:

CGA (Color Graphic Adapter), EGA (Enhanced Graphic Adapter), VGA (Visual Graphic Adapter) and SVGA (Super VGA) with CGA having the least resolution and SVGA the highest resolution.

Color Facilities:

Monochrome monitor which displays output in one color only, usually green or white on black background. Color monitors, which can display multicolor outputs by combining red, blue and green in varying intensities.

Printers

They are used for producing output on paper. There are large variety of Printer and are classified according to their speed and quality.

Classification Of Printers on The Basis Of Printing Technology

1. Impact Printers
2. Non-Impact Printers

Impact Printers: Use variations of standard typewriter printing mechanism where a hammer strikes paper through inked ribbon

Non-Impact Printer: Uses chemical heat or electrical signals to etch or induce symbols on paper.

Character Forms-

- **Fully formed Characters:** Are constructed from solid lines and curves like the characters of typewriters
- **Dot Matrix Characters:** Is made up from a carefully arranged sequence of dots packed very close to each other. Print quality of dot matrix is poorer compared to fully formed characters.

Printing Sequence

- **Serial:** Serial printing is done character by character
- **Line:** Line printing forms an electric line and prints line at a time.
- **Page:** Page printer outputs a whole page of characters and images simultaneously during one cycle.

Types Of Printers

1. **Dot Matrix Printer:** These printers are relatively cheaper compared to other technologies. Its speed usually ranges between 30 to 600 cps. The printing head contains a vertical array of pins. As the head moves across the paper selected pins fire against an inked ribbon to form a pattern of dots on the paper. The term matrix arises from the checkerboard array of possible dot combinations, which is similar to a mathematical array of nos., called a matrix. Using 5 dot rows and 7 dot columns forms Capital letters. There are 9 pins in the print head. Bottom 2 pins are used to form the descenders of lower case letters such as p,q,y,g .

2. **Daisy Wheel Printers:** It is solid font character printer. It is so named because the print heads resemble a daisy flower with the printing arm appearing like the petal of flower. It can operate at faster speed upto 90 cps. The hub is continuously rotating at high speed and a hammer strikes appropriate character when it is in position.
3. **Thermal Printers:** A thermal printer uses hot needles pressed against heat sensitive paper in a dot matrix method to form characters. Little noise is associated with this type of printer as the thermal unit is much quieter.
4. **Ink Jet:** It produces character by spraying small ink droplets onto paper. A high frequency electrical generator causes a piezo electric crystal to vibrate and throw off tiny ink droplets supplied from a reservoir. The droplets are then charged by an electrode and guided by horizontal and vertical deflection plates in the precise manner to form the desired character on printer's speed of 40 - 300 cps with software control of style and size of characters.
5. **Laser Printer:** Laser writes the desired output image on a copier drum with a light beam that operates under the computer control. A difference in electric charge is created on those part of the drum surface exposed to the laser beam. These laser-exposed areas attract a toner that attaches itself to the laser generated charges on the drum. The toner is then permanently fused on paper with heat or pressure capable of printing 10 - 15 pages per minute.

Classification Of Computers

1. Based on operating principles:
2. Based on their application:
3. Based on processing capability & Size of the Computers

Based on operating principles:

1. **Analogue computers:** Computes by measuring. Such a computer functions by establishing similarities between two quantities. Result obtained from analogue is estimate and not exactly repeated e.g. thermometer sphygmomanometer (blood pressure) Used in solving differential equations.
2. **Digital computers:** Operates essentially by computing. All quantities are expressed as discrete digits or numbers of data (such as preparation of bills, ledgers, solution of simultaneous equation. It performs arithmetic and logic operations on the data provided. Digital data is represented as on or off. Results are precise and measurable.
3. **Hybrid computers:** Computers, which combine features of both analog and digital type, are called hybrid computers.
The majority of computers used in world today are digital.

Based on their application:

1. **Special purpose computers:** These are designed and built solely to cater to the requirements of a particular task or application. A special purpose computer does not possess unnecessary options and costs less.

2. **General purpose computers:** These are designed to meet the needs of many different applications. The instructions need to perform a particular task are not wired permanently into the internal storage. Rather they are read from an input device and placed into the internal memory until they are needed. When one job is over, instructions for another job can be loaded into the internal memory for processing. Thus this type of machine can be used to prepare pay bills, manage inventories, design graphics and so on.

Based on processing capability & Size of the Computers:

1. **Super Computer-** Supercomputers are fastest computers and are very expensive. These are employed for specialized applications that require immense amounts of mathematical calculations. For example, weather forecasting requires a supercomputer. Other uses of supercomputers include animated graphics, fluid dynamic calculations, nuclear energy research, and petroleum exploration.
2. **Mainframe Computer-** It is a very large and expensive computer and is capable of supporting hundreds, or even thousands of users simultaneously. In the hierarchy that starts with a simple microprocessor (in watches, for example) at the bottom and moves to supercomputers at the top, mainframes are just below supercomputers. In some ways, mainframes are more powerful than supercomputers because they support simultaneous programs. But supercomputers can execute a single program faster than a mainframe.
The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently.
3. **Mini Computer-** It is a mid sized computer in size and power. It lies between workstations and mainframes. In the past decade, the distinction between large minicomputers and small mainframes has blurred. In general, a minicomputer is a multiprocessing system capable of supporting from 4 to about 200 users simultaneously.
4. **Workstations-** It is a terminal or desktop computer in a network. In this context, workstation is just a generic term for a user's machine (client machine) in contrast to a "server" or "mainframe."
The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently.
5. **Micro Computer**
 - **Desktop Computer:** a personal or micro-mini computer sufficient to fit on a desk
 - **Laptop Computer:** a portable computer complete with an integrated screen and keyboard. It is generally smaller in size than a desktop computer and larger than a notebook computer.

- **Palmtop Computer/Digital Diary /Notebook /PDAs (Personal Digital Assistant):** a hand-sized computer, Palmtop, does not have keyboard, but its screen serves both as an input and output device.

Software

Software refers to collection of programs that are used to control the actions of computer hardware. A computer cannot do anything on its own. It has to be guided by the user. We have to give a sequence of instructions to the computer in order to do any specific job. Software is simply a computer program or a set of instructions. Software guides the computer at every step indicating where to start and stop during a particular job. The process of software development is called programming.

To help us understand the nature of all available software, we often classify them into:

1. System software
2. Application software

Each of these could be:

1. Customized
2. Off-shelf Packages

System Software:

Refers to collection of programs that control and co-ordinate the use of available resources. It acts as an interface between user/application and the available hardware. System Software are general purpose programs designed to perform tasks such as controlling all operations required to move data into and out of the computer. It communicates with keyboard, printer, card reader, disk, tapes, etc. It also monitors the use of various hardware's like memory, CPU, etc. System software acts as an interface between hardware and application software. Remember that it is not possible to run application software without system software. Some of the system softwares are Disc Operating System (DOS), Windows, Unix/Linux, MAC/OS X etc.

Operating System: Control and schedule the use of hardware. They are generally resident in the memory. They control the application software.

Translators: Converts a High-level language program into machine level Language. They are of two types.

- **Compiler:** Converts the entire source code into object code. It does not execute the program. Working is generally fast. E.g. C++
- **Interpreter:** Converts source code into object code line by line and execute it simultaneously. Working is slow. Debugging is easier. E.g. Basic.
- **Assembler:** Converts source code written in assembly language into machine language. E.g. MASM (Microsoft Assembly language).

Application Software:

Are defined as a set of programs, often written by software houses to perform a specified function. E.g. payroll, inventory, finances, designed mainly for use in more than one environment or organisation. Some of the application packages are:

- **Spreadsheets:** are programs equivalent to computerised ledger sheets. The display screen and computer screen is divided into cells organised into rows and column each cell is intersection of row and column which store one data item. Spreadsheet perform calculations and
- **Word-processor:** As the name suggests it process words. The word-processing packages allow the user to carry out several text manipulation operations e.g. WordStar by micropro, MS word by Microsoft, PageMaker by Aldus and Adobe.
- **DBMS:** refers to package that allows people to work with records. DBMS or Database management system deals with data processing. E.g. Dbase III+, FoxPro, paradox etc.
- **Business Suite:** It generally refers to collection of software for business purposes. It comprises of all the things that are necessary for electronically managing a business. It includes a word processor, a spreadsheet program, a data processor etc. e.g. Office 97, Lotus smart suite etc.
- **D.T.P.:** The use of Desktop Publishing software is growing rapidly in business these days. It is used for publishing attractive page layouts complete with pictures and text printed in a variety of fonts. A clipart gallery is generally used to insert graphics and pictures. E.g. PageMaker, CorelDraw, Ventura.
- **Utilities:** Utility software's are programs, which are provided by manufacturers for a specific type of work.
- **Antivirus:** Anti-virus software are the utilities provided for dealing with the computer viruses.
- **File & Disk compression Utilities:** are provided by the software companies to compress file and disks for maximum usage of space.

SBC-2 Operating System

An operating system is an interface between the user and the software of the computer. The user gives commands through the hardware and the computer understands it, through the OS.

It is a link of computer hardware to the computer's software and thus helping in perform functions in real-time. Some of the major examples of OS are – Microsoft, Mac OS, Linux.

Characteristics of the operating system

1. **Memory management** – As the name suggests it is responsible for the management of the memory of the computer. The OS handles both, the primary and secondary memory. The OS performs the allocation and deallocation of memory for different processes in the computer.
2. **Device management** -It also maintains the input/output traffic. Multiple inputs enter simultaneously. The OS decides which input needs to be processed first and which last. Accordingly, it assigns a particular process with the I/O device.
3. **Processor management** – There are always multiple processes going inside the computer simultaneously. The OS prioritizes and schedules the processes. It also assigns the time required to perform each process. It maintains the real-time status of the process. If one process is complete it schedules the next process in the pipeline.
4. **File management** – The computer stores all its files in a specific manner. The key function of the OS is to access these files in the fastest and the most efficient manner such that there is no delay in the execution of any program.
5. **Security** – The OS is not only responsible for storing and managing data, but also securing it. The OS has a built-in module that prevents any unauthorized access to the private data of the user.
6. **Deadlock prevention** – There are times when a single drive handles multiple processes. A deadlock situation occurs when a process enters into a waiting state. Meanwhile, the drive is held by another process.

Therefore, OS keeps a real-time check on all processes to prevent a deadlock situation.

These were the components of a single computer. But what happens when there are multiple users? How do multiple computers interact with one another? The concept of computer networking.

The main Operating Systems are:

1. Network Operating System- WINDOWS 2000, Unix, Linux

2. Desktop Operating System- WINDOWS, DOS (Disc Operating System), Mac OS

3. Mobile Operating System- Palm OS, Pocket PC,

Some of the operating system are presented in the following table along with their main characteristics:

- **DOS-** Single-User, Single tasking, Command line user interface, Disc Operating System (DOS) has been replaced by MS windows OS, Desktop OS
- **Mac OS-** Single-User, Multitasking, Graphic User Interface, Mac has easy- to- use Graphic User Interface (GUI), Desktop OS
- **MS Windows-** Single-User, Multitasking, Graphic User Interface, The first true MS Windows OS is Windows 95, Desktop OS
- **Linux-** Multiuser, multitasking, Command-line user interface, LINUX is open-source software, Network OS
- **UNIX-** Multiuser, multitasking, Command-line user interface, Unix has several versions but they lack interloper ability, Network OS
- **Palm OS/Pocket PC-** Single-User, Multitasking, Graphic User Interface, they are specifically designed for PDA, Mobile OS

Windows

Windows is an operating system that Microsoft has produced for use on personal computers. An operating system allows your computer to manage software and perform essential tasks. It is also a Graphical User Interface (GUI) that allows you to visually interact with your computer's functions in a logical, fun, and easy way interact with your computer's functions in a logical, fun, and easy way.

The first screen appears after you turn on the power of computer is a desktop

- If it is a shared PC; more than one user use it, or one user with password protected, you will arrive at Welcome Screen

Or

The Desktop- The Desktop is the main Windows screen (see image below). It is the work area where dialog boxes, windows, icons, and menus appear. Like an office desk, the Windows desktop contains items you can use to do your job. For instance, from your desktop, you can perform file-management tasks and run software applications. You can customize the appearance of the desktop to suit your preferences.

Desktop Icons- The Desktop is where you'll find icons (small pictures) for many of your most frequently used programs. You'll most likely see icons for Computer, Documents, Recycle Bin, and Internet Explorer.

- Allows you to see what drives are attached to your computer (for example, your local hard disk drive, your CD/DVD drives, any networked shared drives, and external drives, such as a USB flash drive). You can also view the files that are located on these drives.
- Supplies a 'catch-all' place for your personal files. Within here you can see your files, any shared files from other computer users and any music or pictures you may have stored. The Documents folder will sometimes be identified by your name instead of the word "Documents."
- Stores any files you delete until you empty it.
- Contains Windows' built in web browser that integrates with other Windows components (such as your folders and Documents).

The Desktop Components

The desktop for Windows consists of two main components

1- Icons: An icon is a graphic image, a small picture or object that represents a file, program, web page, or command. Icons help you execute commands, open programs or documents quickly. To execute a command by using an icon, click or double-click on the icon. It is also useful to recognize quickly an object in a browser list. For example, all documents using the same extension have the same icon.

We can classify icons as the following

- a. Folder Icons
- b. File Icons
- c. Shortcut Icons

What is the difference between a file, a folder, and a shortcut?

All the data on your hard drive consists of files and folders. The basic difference between the two is that files store data, while folders store files and other folders. The folders, often referred to as directories, are used to organize files on your computer. The folders themselves take up virtually no space on the hard drive. Files, on the other hand, is a collection of data. stored in one unit, identified by a filename. And filename period file extension can range from a few bytes to several gigabytes. They can be documents, programs, libraries, and other compilations of data. File name consists of two part name and extension

A shortcut is a link that points to a program on the computer. Shortcuts allow users to create links to their programs in any folder, Start bar, Taskbar, Desktop or other locations on their computer. A shortcut in Windows is commonly identified by a small arrow in the bottom corner of the icon.

Special Icons on the desktop

Recycle bin:

The Recycle Bin is a location (Folder) where deleted files are temporarily stored on Microsoft Windows. The Recycling Bin allows users to recover files that have been deleted in Windows.

This PC:

This PC allows the user to explore the contents of their computer drives as well as manage their computer files. Once My Computer is open you'll see all available drives on your computer. For most users, you'll only be concerned with the Local Disc (C:) drive, which is the hard drive and what stores all your files.

Icon Operations

Arrange Icons On the Desktop

- To change the arrangement of icons on the desktop do the following
 1. Right Click the desktop

2. Click Sort by
3. Select one of the 4 options to arrange icons from sub-menu
 - View/Hide Icons
 - 1- Right Click the desktop
 - 2- Click View
 - 3- Check to see if Auto Arrange has a check mark
- 4- If it does uncheck it
- Change Icon size
 1. Right Click the desktop
 2. Click View

Show the required size

- Auto Arrange Icon 1 - Right Click the desktop 2- Click View

Check to see if Auto Arrange has a check mark 4- If it does uncheck it

Start Menu Parts

The Start menu for Windows consists of many Parts, Use the Start menu to do these common activities:

- Start programs
- Open commonly used folders
- Search for files, folders, and programs
- Adjust computer settings
- Get help with the Windows operating system
- Turn off the computer
- Log off from Windows or switch to a different user account

Shutting Down the computer

At the bottom of the right pane is the Shut down button. Click the Shut down button to turn off your computer.

Clicking the arrow next to the Shut down button displays a menu with additional options for switching users, logging off, restarting, or shutting down.

- **Switch user:** If you have more than one user account on your computer, Fast User Switching is an easy way for another person to log on to the computer without logging you off or closing your programs and files.
- **Log off:** When you log off from Windows, all of the programs you were using are closed, but the computer is not turned off.
- **Lock:** Locking your PC is a good option if you'll be back soon. You'll have to enter your password when you come back, which helps keep your work more secure.
- **Restart:** The Restart button "reboots" your computer (it is sometimes called a "warm boot" or "soft boot.") That means it saves your information to the hard drive, turns off the computer for a moment, and then turns it back on again.
- **Sleep:** Clicking on Sleep puts your computer in a low-power state, but doesn't turn it off. The main advantage is that it allows you to get back to work quickly, without having to wait for the computer to do a full reboot

1. Moving a window

To move a window, point to its title bar with the mouse pointer. Then drag the window to the location that you want. (Dragging means pointing to an item, holding down the mouse button, moving the item with the pointer, and then releasing the mouse button.)

2. Changing the size of a window

- To make a window fill the entire screen, click its Maximize button or double-click the window's title bar.
- To return a maximized window to its former size, click its Restore button (this appears in place of the Maximize button). Or, double-click the window's title bar.
- To resize a window (make it smaller or bigger), point to any of the window's borders or corners. When the mouse pointer changes to a two headed arrow (see picture below), drag the border or corner to shrink or enlarge the window.
- A window that is maximized cannot be resized. You must restore it to its previous size first.

3. Hiding a window

- Hiding a window is called minimizing it. If you want to get a window out of the way temporarily without closing it, minimize it.
- To minimize a window, click its Minimize button. The window disappears from the desktop and is visible only as a button on the taskbar, the long horizontal bar at the bottom of your screen.
- To make a minimized window appear again on the desktop, click its taskbar button. The window appears exactly as it did before you minimized it.

4. Closing a window

- Closing a window removes it from the desktop and taskbar. If you're done with a program or document and don't need to return to it right away, close it.
- To close a window, click its Close button
- If you close a document without saving any changes you made, a message appears that gives you the option to save your changes.

Switching between windows

If you open more than one program or document, your desktop can quickly become cluttered with windows. Keeping track of which windows you have open isn't always easy, because some windows might partially or completely cover others.

Using the taskbar.

The taskbar provides a way to organize all of your windows. Each window has a corresponding button on the taskbar. To switch to another window, just click its taskbar button. The window appears in front of all other windows, becoming the active window—the one you're currently working in.

To easily identify a window, point to its taskbar button. When you point to a taskbar button, you'll see a thumbnail-sized preview of the window, whether the content of the window is a document, a photo, or even a running video. This preview is especially useful if you can't identify a window by its title alone.

- Using **Alt +Tab**. You can switch to the previous window by pressing Alt+Tab, or cycle through all open windows and the desktop by holding down Alt and repeatedly pressing Tab. Release Alt to show the selected window.

- Using Aero Flip 3D. Aero Flip 3D arranges your windows in a three dimensional stack that you can quickly flip through. To use Flip 3D:
- Hold down the Windows logo key & and press Tab to open Flip 3D.

Dialog boxes

A dialog box is a special type of window that asks you a question, allows you to select options to perform a task, or provides you with information. You'll often see dialog boxes when a program or Windows needs a response from you before it can continue.

Unlike regular windows, most dialog boxes can't be maximized, minimized, or resized. They can, however, be moved.

Working with Windows

Whenever you open a program, file, or folder, it appears on your screen in a box or frame called a window (that's where the Windows operating system gets its name). Because windows are everywhere in Windows, it's important to understand how to move them, change their size, or just make them go away. Parts of a window

Although the contents of every window are different, all windows share some things in common. For one thing, windows always appear on the desktop - the main work area of your screen. In addition, most windows have the same basic parts.

Window Accessories

1. **Calculator-** The calculator can help you calculate dates, convert currency, and if you're using the Standard mode, you can keep the calculator window on top of other windows.
2. **Notepad-** Notepad is a text editor, i.e., an app specialized in editing plain text. It can edit text files (bearing the ".txt" filename extension) and compatible formats, such as batch files, INI files, and log files. Notepad offers only the most basic text manipulation functions, such as finding and replacing text.
3. **Paint-** Paint is a versatile and user-friendly graphics editing app in Windows for you to create, edit, and manipulate images and drawings. Paint is great for simple image cropping, resizing, drawing, and adding basic shapes and text to images.
4. **Windows Movie Maker-** You can use Windows Movie Maker to capture audio and video to your computer from a video camera, Web camera, or other video source, and then use the captured content in your movies. You can also import existing audio, video, or still pictures into Windows Movie Maker to use in the movies you create.
5. **WordPad-** WordPad is a free word processing program, that is part of the Microsoft Windows program. A word processor is a program used to process, format, and store documents like letters, memos, reports, resumes and many more. It is also capable of producing a printed version, when its done.

Start Button- Clicking the Start button opens up what is called the Start menu. The Start menu is used to access your programs, settings, printers, and more. Place the mouse pointer on the My Computer option in the Start menu and click once. This will show you the details of your computer.

Windows Easy to Access

1. **Magnifier-** Magnifier, formerly Microsoft Magnifier, is a screen magnifier app intended for visually impaired people to use when running Microsoft Windows. When it is running, it creates a bar at the top of the screen that greatly magnifies where the mouse is.
2. **Narrator-** Narrator lets you use your PC without a mouse to complete common tasks if you're blind or have low vision. It reads and interacts with things on the screen, like text and buttons. Use Narrator to read and write email, browse the internet, and work with documents.
3. **On Screen Keyboard-** It displays a visual keyboard with all the standard keys, so you can use your mouse or another pointing device to select keys, or use a physical single key or group of keys to cycle through the keys on the screen.

Windows System

1. **Command Prompt-** In Windows operating systems, the Command Prompt is a program that emulates the input field in a text-based user interface screen with the Windows Graphical User Interface (UI). It can be used to perform entered commands and perform advanced administrative functions.
2. **Control Panel-** The Control Panel is a component of Microsoft Windows that provides the ability to view and change system settings. It consists of a set of applets that include adding or removing hardware and software, controlling user accounts, changing accessibility options, and accessing networking settings.
3. **File Explore-** The File Explorer works by giving you access to all of your computer's folders and files. It will list the available folders within your computer, allowing you to open them up one at a time. You can then double-click on any file or folder to open it up in order to view its contents.
4. **Run-** The Run command on an operating system such as Microsoft Windows and Unix-like systems is used to directly open an application or document whose path is known.
5. **Task Manager**
6. **This PC-** "This PC" is your entire computer, with all the drives it has.
7. **Windows Administrator Tool-** It allows the admin to manage several parameters of the operating system for quick troubleshooting. Some of the most commonly used Windows 10 admin tools are as follows: Defragment and Optimize Drives - Disk fragmentation occurs when a file is broken up into pieces to fit on the disk.

Windows Administrator Tool

1. **Back Up-** Windows Backup can help back up other Windows settings for you, such as your installed apps, your Wi-Fi network and password information, and other settings such as language preference or your wallpaper settings. Again, just toggle these settings On or Off.
2. **Character Map-** Character Map is a utility included with Microsoft Windows operating systems and is used to view the characters in any installed font, to check what keyboard input (Alt code) is used to enter those characters, and to copy characters to the clipboard in lieu of typing them.
3. **Disk Defragment -** Defragmentation organizes storage on your computer by consolidating files and other data saved on your hard drive. When there's not enough space on your disk to store an entire file in one place, the file is broken down into smaller pieces called fragments. Defragmentation puts those pieces back together.

4. **Disk Cleanup**- Disk Cleanup helps free up space on your hard disk, creating improved system performance. Disk Cleanup searches your disk and then shows you temporary files, Internet cache files, and unnecessary program files that you can safely delete. You can direct Disk Cleanup to delete some or all of those files.

Introduction of Folder

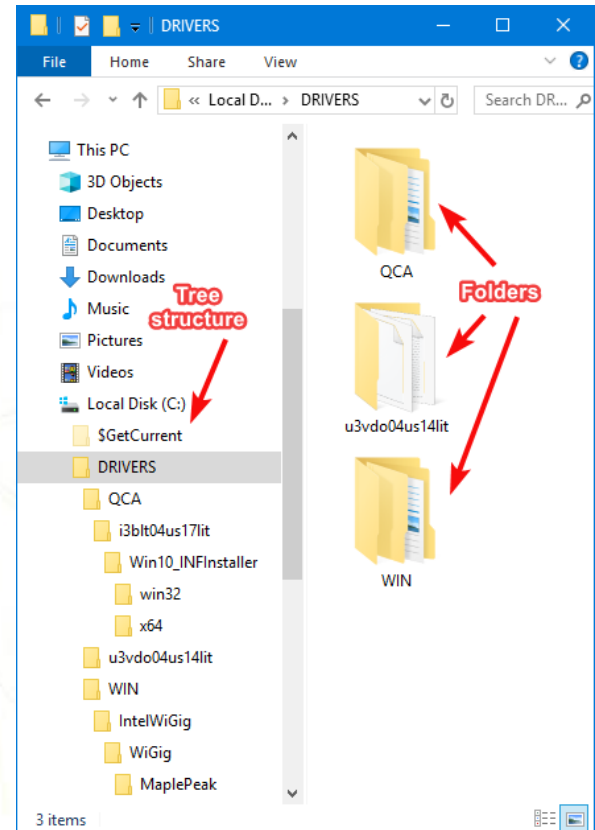
- Initially, **folders** were called **directories**. But, once graphical user interfaces became the norm, the term was replaced with folders.
- In Windows and other operating systems, a folder is a place where you can store files and other folders (subfolders).
A folder is not just an attribute of the files and folders contained in it, but a separate object that can exist even if no files are contained inside.
- The ability of folders to contain subfolders leads to a hierarchy that is called a **tree**.
- Each tree of folders in Windows has a root folder that is not contained in any other folder.
- There is one folder tree structure for each partition on your drives in Windows. When a partition is formatted for the first time, the root folder is created to allow Windows to use it.

What can you do with folders?

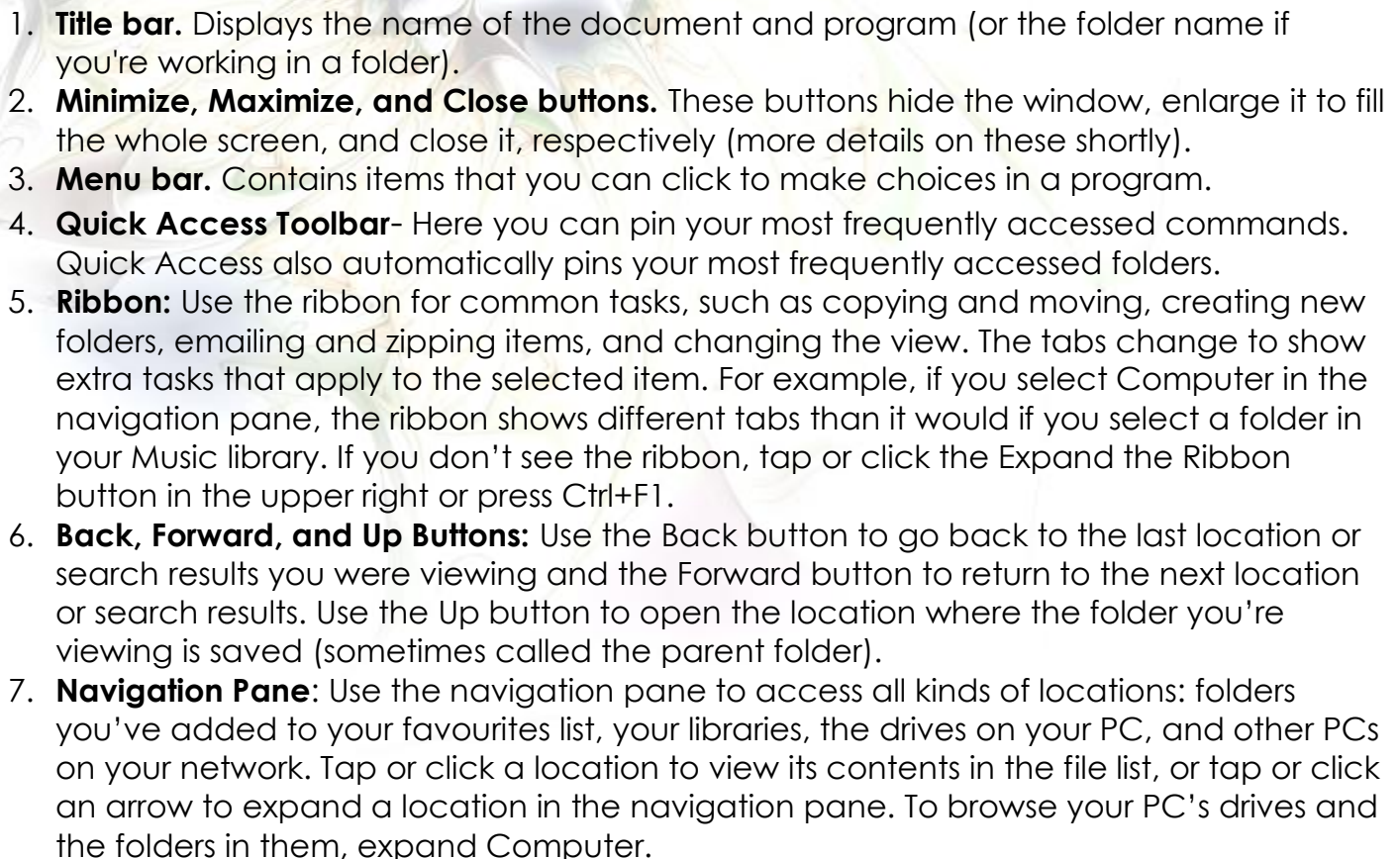
- The **tree structure** suggests the main benefit of folders: to organize your files. You can create folders to store and organize your pictures, your documents, your videos, and so on. Folders are also used to separate the files created by different users. For example, Windows creates separate folders for each user account on your computer, so that files and settings do not get mixed between users.
- File**- File can be described as a set of related data/information and is stored on secondary storage device. A file can be a data/information file or program file and can contain data in any format. For example, text files, audio files, executable program files and so on.

Difference between File and Folder- Following are the important difference between File and Folder.

- Extension** Files may or may not have extensions. Folders do not have extensions.
- Container** A File can not contain another file/folder. A folder can contain any number of file/folders.
- Memory size** A file has certain size and memory consumption. A folder has no size of its own. It derives the size from the files it contains.
- Attributes** Name, Extension, Date, Time, Length and Protection (Read-Only, hidden etc.). Name, Date, Time and Protection (Read-Only, hidden etc.)



- ## Folder Explorer



8. **Address Bar:** Use the address bar to enter or select a location. Tap or click a part of the path to go to that level, or tap or click at the end of the path to select the path for copying.
9. **Search Box:** Enter a word or phrase in the search box to look for an item in the current folder or library. The search begins as soon as you begin typing—so if you enter “B,” for example, all the files with names starting with the letter B will appear in the file list. For more info, see Searching for files in File Explorer.
10. **Quick Access-** Here you can find your most frequently accessed folders, and the ones you have pinned show up here, which is a new feature in Windows 10.
11. **OneDrive synced folders-** If you have a Microsoft Account setup with your Windows 10 PC, you can have your files stored in the online storage service and have them synced to your computer.
12. **This PC-** In previous versions of Windows, this was called Computer Explorer. Here you can view and manage your internal storage and attached storage devices, including optical media.
13. **File List:** This is where the contents of the current folder or library are displayed. It's also where your search results appear when you enter a search term in the search box.
14. **Column Headings:** In Details view, you can use the column headings to change how the files in the file list are organized. For example, you can tap or click the Date modified heading to sort by date (with the files you worked on most recently at the top). If you tap or click the column heading again, the files are sorted with the oldest ones at the top. Press and hold or right-click a column heading to select other columns to add. To learn how to switch to Details view, see “Change the view” later in this topic.
15. **Scroll bar.** Let's you scroll the contents of the window to see information that is currently out of view.
16. **Borders and corners.** You can drag these with your mouse pointer to change the size of the window.
17. **Status Bar:** Use the status bar to quickly see the total number of items in a location, or the number of selected items and their total size.
18. **Details Pane:** Use the details page to see the most common properties associated with the selected file. File properties provide more detailed info about a file, such as an author, the date you last changed the file, and any descriptive tags you might have added to the file. If you don't see the details pane, tap or click the View tab, and then tap or click Details pane.
19. **Preview Pane:** Use the preview pane to see the contents of a file, such as an Office document, without opening it in an app. If you don't see the preview pane, tap or click the View tab, and then tap or click Preview pane.

Viewing and arranging files and folders

When you open a folder or library, you can change how the files look in the window. For example, you might prefer larger (or smaller) icons or a view that lets you see different kinds of information about each file. To make these kinds of changes, use the Views button in the toolbar.

Each time you click the left side of the Views button, it changes the way your files and folders are displayed by cycling through five different views: Large Icons, List, a view called Details

that shows several columns of information about the file, a smaller icon view called Tiles, and a view called Content that shows some of the content from within the file. If you click the arrow on the right side of the Views button, you have more choices. Move the slider up or down to fine tune the size of the file and folder icons. You can see the icons change size as you move the slider.

Working with file and folder

1. Selecting

- **Single object-** To select a single object, click on it once.
- **Multiple object-** There are several ways to select Multiple files or folders.
- To select a consecutive group of files or folders, click the first item, press and hold down the Shift key, and then click the last item.
- To select Multiple files or folders that are near each other, drag the mouse pointer to create a selection around the outside of all the items that you want to include.
- To select non-consecutive files or folders, press and hold down the Ctrl key, and then click each item that you want to select.
- To select all of the files or folders in a window, on the toolbar, click Organize, and then click Select all. If you want to exclude one or more items from your selection, press and hold down the Ctrl key, and then click the items.

2. Rename

- Click the file or folder to select it
- Click the organize button on the toolbar, and then click Rename
- With the name selected highlights, type a new name, or click to position the insertion point, and then edit the name.
- Press Enter

Notes:

- Right-click the file or folder you want to rename, click Rename, type a name, and then press Enter.
- You can also select the file, then press F2, type a name, and then press Enter.
- File names can be up to 255 characters. You can use spaces and underscores in names, but you can't use the following characters: * : < > | ? " \ or /. Remember the best way to keep your files organized is with a consistent naming convention.

3. Copying

When you copy an item, the original item remains in its original location— plus you have the new copy

- Open the location that contains the file you want to copy.
- Right-click the file, and then click Copy.
- Open the location where you want to store the copy.
- Right-click an empty space within the location, and then click Paste. The copy of the original file is now stored in the new location. Notes:
- Another way to copy and paste files is to use the keyboard shortcuts Ctrl+C (Copy) and Ctrl + V (Paste).
- You can also press and hold the right-mouse button and then drag the file to the new location. When you release the mouse button, click Copy here.

4. Moving (cut)

Moving a file (or folder) is different from copying it. Moving cuts the item from its previous location and places it in a new location. Copying leaves the original item where it was and creates a copy of the item elsewhere. In other words, when you copy something you end up with two of it. When you move something, you only have the one thing.

- Open the drive or folder containing the file or folder you want to move.
- Select the files or folders you want to move.
- Click the Organize button on the toolbar, and then click Cut.
- Display the destination folder where you want to move the files or folder.
- Click the Organize button on the toolbar, and then click Paste.

5. Copy or Move a File or Folder Using Drag and Drop

- Open the drive or folder containing the file or folder you want to copy or move.
- Select the files or folders you want to copy or move.
- In the Navigation pane, point to a folder list to display the expand and collapse arrows.
- Click the arrows to display the destination folder, and then click the destination folder.
- Right-click the selected files or folders, drag to the destination folder, and then click Copy Here or Move Here.

Notes: To move the selected items, drag them to the destination folder. To copy the items, hold down the Ctrl key while you drag.

Another way to copy and paste files is to use the keyboard shortcuts **Ctrl + X** (Cut) and **Ctrl + V** (Paste). Pay attention to pop-up messages that appear when dragging—you can use these to find out what will happen when you release the mouse button.

6. Create a Folder

- Open the drive or folder where you want to create a folder.
- Click the New folder button on the toolbar.
- With the New Folder name selected, type a new name.
- Press Enter.

Notes:

Right-click a blank area on the desktop or in the folder window, point to New, and then click Folder.

7. Deleting

- Select the file or folder.
- Click the Organize button and select Delete from the pull-down menu.
- After you select delete a confirmation message appears.

Notes:

- You can also delete a file or folder by press right click on the item and then click delete.
- Or press Del buttons on the keyboard.
- The easiest way to delete on the desktop by drag and drop it to recycle Bin.
- When you delete a file or folder from your hard disk, it's not deleted right away. Instead, it's stored in the Recycle Bin until the Recycle Bin is emptied.
- If you delete a file or folder from a network folder or from a USB flash drive, it might be permanently deleted rather than being stored in the Recycle Bin.

- If a file can't be deleted, it might be in use by a program that's currently running. Try closing the program or restarting your computer to fix the problem. For more information.

Note: To permanently delete a file without first moving it to the Recycle Bin, select the file, and then press Shift + Delete.

Permanently delete files from the Recycle Bin • When you delete a file, it's usually moved to the Recycle Bin so that you can restore the file later if necessary.

- To permanently remove files from your computer and reclaim any hard disk space they were using, you need to delete the files from the Recycle Bin. You can delete individual files from the Recycle Bin or empty the entire Recycle Bin at once.
- Open the Recycle Bin by double-clicking the Recycle Bin on the desktop.

Do one of the following:

- To permanently delete one file, click it, press Delete, and then click Yes.
- To delete all of the files, on the toolbar, click Empty the Recycle Bin, and then click Yes.

Notes:

You can empty the Recycle Bin without i & Empty Recycle Bin opening it by right-clicking the Recycle Bin and then clicking Empty Recycle Bin. • You can permanently delete a file from your computer without sending it to the Recycle Bin by clicking the file and then pressing Shift + Delete.

8. Restore item from recycle Bin

Open the Recycle Bin by double-clicking the Recycle Bin on the desktop.

Do one of the following:

- To restore a file, click it, and then, on the toolbar, click Restore this item.
- To restore all of the files, make sure that no files are selected, and then, on the toolbar, click Restore all items.
- The files will be restored to their original locations on your computer.

Note

Deleted files do not stay in the Recycle Bin indefinitely. By default, the deleted files in the Recycle Bin can occupy 10% of your hard disk space. When you've deleted enough files to exceed this 10%, the oldest files in the Recycle Bin are automatically and permanently deleted from your hard disk.

9. Opening an existing file or folder

To open a file, double-click it. The file will usually open in the program that you used to create or change it. For example, a text file will open in your word-processing program.

10. Search for a file and folder

Windows provides several ways to find files and folders. There isn't one best way to search—you can use different methods for different situations.

A. Use the search box on the Start menu

You can use the search box on the Start menu to find files, folders, programs, and e-mail messages stored on your computer.

- Click the Start button and then type a word or part of a word in the search box.
- Search results appear as soon as you start typing in the search box.

as you start typing in the search box. As you type, items that match your text will appear on the Start menu. The search results are based on text in the file name, text in the file, tags, and other file properties.

B. Use the search box in a folder or library

Browsing for the file might mean looking through hundreds of files and subfolders. To save time and effort, use the search box at the top of the open window.

The search box filters the current view based on text that you type. The search looks for text in the file name and contents; and in the file properties, such as in tags. In a library, the search includes all folders included in the library as well as subfolders within those folders. To search for a file or folder by using the search box:

- Type a word or part of a word in the search box.
- As you type, the contents of the folder or library are filtered to reflect each successive character you type. When you see the file that you want, stop typing.

For example, now, suppose that you're looking for your invoice files, so you type "invoice11 in the search box. As you type, the view is automatically filtered and you see something like this:

Notes:

- You can use a question mark (?) as a wildcard for a single character and an asterisk (*) as a wildcard for any number of characters.
- The easiest way to start search window is by press F3
- If you know which file type it is, you can just enter the file extension ("JPG" for example) in the search box.
- You can also use other techniques in the search box to quickly narrow down a search. For example, if you're searching for a file based on one or more of its properties (such as a tag or the date the file was last modified), you can use search filters to specify the property in your search. Or, you can type keywords in the search box to narrow down your results even further.

Working with Control Panel

You can use Control Panel to change settings for Windows. These settings control nearly everything about how Windows looks and works, and you can use them to set up Windows so that it's just right for you.

Open Control Panel by clicking the Start button and then clicking Control Panel.

You can display Control Panel screen with different view types as follow Open control Panel by.

There are two ways to find Control Panel items:

- o Use search: To find a setting you're interested in or a task you want to perform, type a word or phrase in the search box. For example, type "sound" to find specific settings for your sound card, system sounds, and the volume icon on the taskbar.
- o Browse: you can explore Control Panel by clicking different categories (for example, System and Security, Programs, or Ease of Access), and viewing common tasks listed under each category or, under View by, click either Large icons or Small icons to view a list of all Control Panel items.

- The following table gives you a description of all the Control Panel categories, including the various programs you can find by clicking each category's hyperlink*.

Category Name

| Category Name | ... To Display These Groups of Links |
|---------------|--------------------------------------|
|---------------|--------------------------------------|

| | |
|--------------------------------|--|
| System and Security | Action Center, Windows Firewall, System, Windows Update, Power Options, Backup and Restore, BitLocker Drive Encryption, and Administrative Tools |
| User Accounts | User Accounts, Windows CardSpace, Credential Manager, and Mail (32-bit) |
| Network and Internet | Network and Sharing Center, Homegroup, and Internet Options |
| Appearance and Personalization | Personalization, Display, Desktop Gadgets, Taskbar and Start Menu, Ease of Access Center, Folder Options, and Fonts |
| Hardware and Sound | Devices and Printers, AutoPlay, Sound, Power Options, Display, and Windows Mobility Center |
| Clock, Language, and Region | Date and Time, and Region and Language |
| Programs | Programs and Features, Default Programs, and Desktop Gadgets |
| Ease of Access | Ease of Access Center and Speech Recognition |

Control Panel

The Control Panel is a component of Microsoft Windows that provides the ability to view and change system settings. It consists of a set of applets that include adding or removing hardware and software, controlling user accounts, changing accessibility options, and accessing networking settings. Additional applets are provided by third parties, such as audio and video drivers, VPN tools, input devices, and networking tools.

1. **Programs and Feature-** This opens the Uninstall a Program applet. May be used to uninstall installed programs, or add or remove features from Windows
2. **Date and Time-** Opens the Date and Time applet. Allows you to set date and time, change time zone, add additional clocks, and sync Internet time.
3. **Device Manager-** The Device Manager lists all installed hardware. May be used to install and remove devices, install drivers, and more
4. **Display-** provides you with options to set display related settings such as the color profile or scaling. Loads the Settings app on Windows 10.
5. **Firewall-** Opens the Windows Firewall. Turn it on or off, and open the advanced settings to block or allow connections.
6. **Infrared-** Lets you manage infrared devices.

7. **Internet Options-** Opens the classic Internet Options window. Manage Internet settings that Internet Explorer and other browsers may use.
 8. **Controllers-** Manage game controllers connected to the operating system
 9. **Keyboard-** Change keyboard repeat delay and rate, cursor blink rate, and check installed keyboard hardware.
 10. **Language-** control input.dll Opens the Language control panel applet. Add, remove or change the priority of languages.
 11. **Mouse-** The mouse controls enable you to change mouse icons, button behavior, wheel scrolling, and more.
 12. **Network-** Opens the Network and Sharing Center. May use it to add a new network, set up connections, and manage existing networks
 13. **Network Connections-** Lists all known network connections and their status.
 14. **Power-** Opens the Power Options. Set a power plan, and customize it.
 15. **Region-** The Region control panel applets lets you change date and time formats, and your location
 16. **Screensaver-** Opens the Screensaver dialog to enable, disable and configure screensavers.
 17. **Sound-** The Sound properties lists all playback and recording devices, options to configure those, and manage sounds and communications.
 18. **System Properties-** lists information about the device and Windows, and links to other control panel areas.
 19. **Tablet PC-** Only available if you run in tablet PC mode.
 20. **Location Information-** Set your country, area code, carrier code and dial number for telephony and modem services.
 21. **Security and Maintenance-** Manage Security and Maintenance related features
 22. **User Accounts-** Opens the list of user accounts on the system.
- Internet.

1. Change desktop background (wallpaper)

Your desktop background (also called wallpaper) can be a digital picture from your personal collection or one that comes with Windows. You can also select a color for your desktop background or use a color to frame your background picture. Windows comes with lots of desktop background choices.

- To change the desktop background

Open Desktop Background by clicking the Start button, clicking Control Panel, clicking Appearance and Personalization, clicking Personalization, and then clicking Desktop Background.

1. Click the picture or color you want for your desktop background. If the picture you want to use is not in the list of desktop background pictures, click the Picture location down arrow to view other categories, or click Browse to search for the picture on your computer. When you find the picture you want, double-click it. It will become your desktop background and appear in the list of desktop backgrounds.
2. Under How should the picture be positioned, choose to have the picture fit the screen, tile, or be centered on the screen, and then click OK.

Note:

You can make any picture stored on your computer (or a picture you are currently viewing) your desktop background by rightclicking the picture, and then clicking Set as Desktop Background.

2. Change screen saver

Windows comes with several screen savers. You can also create your own screen savers from personal pictures you've saved on your computer, or some software companies might develop additional screen savers for download or purchase.

To change a screen saver

1. Open Screen Saver Settings by clicking the Start button, clicking Control Panel, clicking Appearance and Personalization, clicking Personalization, and then clicking Screen Saver.
2. Under Screen saver, in the drop-down list, click the screen saver you want to use.
3. Click Preview to see what your chosen screen saver will look like.
4. Click OK.

Note:

- To clear a screen saver, move your mouse or press any key.
- You can change wallpaper and screen saver by right click on the desktop and then choose personalize

How to use the taskbar

You can customize the taskbar, including the way taskbar buttons look, how they group together when you have more than one window open, change where the taskbar is on your desktop, and decide what icons and apps are on it.

1. Rearrange taskbar buttons

- To rearrange the order of app buttons on the taskbar, drag a button from its current position to a different position on the taskbar. You can rearrange apps as often as you like.
- All open files from the same app are always grouped together, even if you didn't open them one after the other. This is so you can see all of the previews for that app at the same time.

2. Move the taskbar

- Usually, you can find the taskbar at the bottom of the desktop, but you can move it to the sides or top of the desktop. Before you can move the taskbar, you need to unlock it.
- Press and hold or right-click an empty space on the taskbar. If Lock the taskbar has a check mark next to it, the taskbar is locked. You can unlock it by tapping or clicking Lock the taskbar, which removes the check mark.
- To move the taskbar Do one of the following:
 - o Tap an empty space on the taskbar, and then drag it to one of the four edges of the desktop. When the taskbar is where you want it, let go.
 - (If you're using a mouse, click an empty space on the taskbar, and then hold down the mouse button as you drag the taskbar to one of the four edges of the desktop. When the taskbar is where you want it, release the mouse button.)

3. Change how taskbar buttons appear

- You can choose how buttons are grouped together when there's more than one window open, and change the size of taskbar button icons.

1. On the Taskbar tab, select one of the options from the Taskbar buttons list:

- Always combine, hide labels

This is the default setting. Each app appears as a single, unlabeled button, even when multiple windows for that app are open.

- Combine when taskbar is full

This setting shows each window as an individual, labeled button. When the taskbar becomes crowded, apps with multiple open windows collapse into a single app button, tap or clicking the button displays a list of the windows that are open.

Never combine

This setting shows each window as an individual, labeled button, and never combines them, no matter how many windows are open. As more apps and windows open, buttons get smaller, and eventually the buttons will scroll.

2. To use small taskbar button icons, select the Use small taskbar buttons check box. To use large icons, clear the check box.
3. Tap or click OK.

Pin an app to the taskbar

You can pin an app directly to the taskbar for quick and easy access.

- Swipe in from the right edge of the screen, and then tap Search. (If you're using a mouse, point to the upper-right corner of the screen, move the mouse pointer down, and then click Search.) In the search box, enter the name of the app you want to pin. Then on the search results page, tap or click the app to open it on the desktop.
- On the desktop, press and hold or right-click the app's button on the taskbar to open the app's Jump List (a list of shortcuts to recently opened files, folders, and websites), and then tap or click Pin this program to taskbar.
- To remove a pinned app from the taskbar, open the app's Jump List, and then tap or click Unpin this program from taskbar.

Some Notes: around Windows

1. Surpass basic math Calculator has several dynamic new features - click the View menu to check them out. Unit conversion translates Celsius to Fahrenheit, kilometers to miles, meters to feet, grams to ounces, joules to BTUs, and more. You can use the new calculation worksheets to quickly compute everyday stuff like fuel economy and auto lease payments. The Programmer and Statistics modes handle the geekier tasks.
2. Drag files from Jump Lists With Jump Lists, you get a quick-access list of your most frequently or recently used files. Just look for the right pointing arrow next to programs on your Start menu or left-click a program on the taskbar. You can use Jump Lists to open files and programs in just a few clicks. Even better, you can drag items from Jump Lists into open folders or email.

3. Preview your files

Another great time saver is the file preview pane within a folder or library. Use it to see a file's contents without opening the file in a program. You can open the preview pane in a window by pressing Alt + P. Items such as photos and PDF files will be previewed in this area when you click them. Learn more about using files and folders, including the preview pane.

4. Easily customize your Sticky Notes

Now you can make the Sticky Notes you keep on your desktop even handier. You can format the text and change its color, as well as resize, collapse, and flip through several

Sticky Notes. If you have a Tablet PC or touchscreen, you can use multiple input (pen and touch) methods within a single note.

Notes: Open Sticky Notes by tapping the Start button. In the search box, type Sticky Notes, and then tap Sticky Notes in the list of results.

To create additional notes, click the New Note button. You can also open a new note by pressing Ctrl + N.

Windows logo key keyboard shortcuts

- | | |
|--|--|
| 1. Windows logo key | Open or close Start. |
| 2. Windows logo key + A | Open Action center. |
| 3. Windows logo key + B | Set focus in the notification area. |
| 4. Windows logo key + C | Open Cortana in listening mode. |
| 5. Windows logo key + Shift + C | Open the charms menu. |
| 6. Windows logo key + D | Display and hide the desktop. |
| 7. Windows logo key + Alt + D | Display and hide the date and time on the desktop. |
| 8. Windows logo key + E | Open File Explorer. |
| 9. Windows logo key + F | Open Feedback Hub and take a screenshot. |
| 10. Windows logo key + G | Open Game bar when a game is open. |
| 11. Windows logo key + H | Start dictation. |
| 12. Windows logo key + I | Open Settings. |
| 13. Windows logo key + J | Set focus to a Windows tip when one is available. |
| 14. Windows logo key + K | Open the Connect quick action. |
| 15. Windows logo key + L | Lock your PC or switch accounts. |
| 16. Windows logo key + M | Minimize all windows. |
| 17. Windows logo key + O | Lock device orientation. |
| 18. Windows logo key + P | Choose a presentation display mode. |
| 19. Windows logo key + Ctrl + Q | Open Quick Assist. |
| 20. Windows logo key + R | Open the Run dialog box. |
| 21. Windows logo key + S | Open search. |
| 22. Windows logo key + Shift + S | Take a screenshot of part of your screen. |
| 23. Windows logo key + T | Cycle through apps on the taskbar. |
| 24. Windows logo key + U | Open Ease of Access Center. |
| 25. Windows logo key + V | Open the clipboard. |
| 26. Windows logo key + Shift + V | Cycle through notifications. |
| 27. Windows logo key + X | Open the Quick Link menu. |
| 28. Windows logo key + Y | Switch input between Windows Mixed Reality and your desktop. |
| 29. Windows logo key + Z | Show the commands available in an app in full-screen mode. |
| 30. Windows logo key + period (.) or semicolon (;) | Open emoji panel. |
| 31. Windows logo key + comma (,) | Temporarily peek at the desktop. |
| 32. Windows logo key + Pause | Display the System Properties dialog box. |
| 33. Windows logo key + Ctrl + F | Search for PCs (if you're on a network). |
| 34. Windows logo key + Shift + M | Restore minimized windows on the desktop. |

35. Windows logo key + number Open the desktop and start the app pinned to the taskbar in the position indicated by the number. If the app is already running, switch to that app.
36. Windows logo key + Shift + number Open the desktop and start a new instance of the app pinned to the taskbar in the position indicated by the number.
37. Windows logo key + Ctrl + number Open the desktop and switch to the last active window of the app pinned to the taskbar in the position indicated by the number.
38. Windows logo key + Alt + number Open the desktop and open the Jump List for the app pinned to the taskbar in the position indicated by the number.
39. Windows logo key + Ctrl + Shift + number Open the desktop and open a new instance of the app located at the given position on the taskbar as an administrator.
40. Windows logo key + Tab Open Task view.
41. Windows logo key + Up arrow Maximize the window.
42. Windows logo key + Down arrow desktop window. Remove current app from screen or minimize the
43. Windows logo key + Left arrow side of the screen. Maximize the app or desktop window to the left
44. Windows logo key + Right arrow side of the screen. Maximize the app or desktop window to the right
45. Windows logo key + Home Minimize all except the active desktop window
46. (restores all windows on second stroke).
47. Windows logo key + Shift + Up arrow Stretch the desktop window to the top and bottom of the screen.
48. Windows logo key + Shift + Down arrow Restore/minimize active desktop windows vertically, maintaining width.
49. Windows logo key + Shift + Left arrow or Right arrow Move an app or window in the desktop from one monitor to another.
50. Windows logo key + Spacebar Switch input language and keyboard layout.
51. Windows logo key + Ctrl + Spacebar Change to a previously selected input.
52. Windows logo key + Ctrl + Enter Turn on Narrator.
53. Windows logo key + Plus (+) Open Magnifier.
54. Windows logo key + forward slash (/) Begin IME reconversion.
55. Windows logo key + Ctrl + V Open shoulder taps.
56. Windows logo key + Ctrl + Shift + B Wake PC from blank or black screen

Dialog box keyboard shortcuts

1. F4 Display the items in the active list.
2. Ctrl + Tab Move forward through tabs.
3. Ctrl + Shift + Tab Move back through tabs.
4. Ctrl + number (number 1–9) Move to nth tab.
5. Tab Move forward through options.
6. Shift + Tab Move back through options.

- | | |
|---|---|
| 7. Alt + underlined letter used with that letter. | Perform the command (or select the option) that is |
| 8. Spacebar | Select or clear the check box if the active option is a check box. |
| 9. Backspace | Open a folder one level up if a folder is selected in the Save As or Open dialog box. |
| 10. Arrow keys | Select a button if the active option is a group of option buttons. |

File Explorer keyboard shortcuts

- | | |
|------------------------------|---|
| 1. Alt + D | Select the address bar. |
| 2. Ctrl + E | Select the search box. |
| 3. Ctrl + F | Select the search box. |
| 4. Ctrl + N | Open a new window. |
| 5. Ctrl + W | Close the active window. |
| 6. Ctrl + mouse scroll wheel | Change the size and appearance of file and folder icons. |
| 7. Ctrl + Shift + E | Display all folders above the selected folder. |
| 8. Ctrl + Shift + N | Create a new folder. |
| 9. Num Lock + asterisk (*) | Display all subfolders under the selected folder. |
| 10. Num Lock + plus (+) | Display the contents of the selected folder. |
| 11. Num Lock + minus (-) | Collapse the selected folder. |
| 12. Alt + P | Display the preview panel. |
| 13. Alt + Enter | Open the Properties dialog box for the selected item. |
| 14. Alt + Right arrow | View the next folder. |
| 15. Alt + Up arrow | View the folder that the folder was in. |
| 16. Alt + Left arrow | View the previous folder. |
| 17. Backspace | View the previous folder. |
| 18. Right arrow | Display the current selection (if it's collapsed), or select the first subfolder. |
| 19. Left arrow | Collapse the current selection (if it's expanded), or select the folder that the folder was in. |
| 20. End | Display the bottom of the active window. |
| 21. Home | Display the top of the active window. |
| 22. F11 | Maximize or minimize the active window. |

Taskbar keyboard shortcuts

- | | |
|---|---|
| 1. Shift + click a taskbar button | Open an app or quickly open another instance of an app. |
| 2. Ctrl + Shift + click a taskbar button | Open an app as an administrator. |
| 3. Shift + right-click a taskbar button | Show the window menu for the app. |
| 4. Shift + right-click a grouped taskbar button | Show the window menu for the group. |
| 5. Ctrl + click a grouped taskbar button | Cycle through the windows of the group. |

Settings keyboard shortcuts

- | | |
|------------------------------------|--|
| 1. Ctrl + Alt + mouse scroll wheel | Zoom in and out using the mouse scroll wheel |
| 2. Windows logo key + Ctrl + M | Open Magnifier settings |

3. Ctrl + Alt + arrow keys
4. Ctrl + Alt + I
5. Ctrl + Alt + F
6. Ctrl + Alt + L
7. Ctrl + Alt + D
8. Ctrl + Alt + M
9. Ctrl + Alt + R
10. Shift + Alt + arrow keys
11. Ctrl + Alt + Spacebar
screen view

- Pan in the direction of the arrow keys
- Invert colors
- Switch to full screen view
- Switch to lens view
- Switch to docked view
- Cycle through views
 - Resize the lens with the mouse
 - Resize the lens with the keyboard
 - Quickly see the entire desktop when using full

SBC-3 Computer Networking

When multiple computer systems are connected over through a communication channel to share information and resources it is called a computer network.

Computer networks can be classified based on requirements.

Classifications of computer network

1. **WAN** – WAN or Wide Area Network is the connection of computers over a large geographical area such as a state, country, or even whole wide world. The WAN uses various types of communication channels like airwaves, telephone lines, or airwaves to interconnect different computer systems.
2. **LAN** – LAN or the local area network is the connection of computers over a restricted area. Such as a school, university campus, an office building. Any geographical area within the radius of 10kms.
3. **MAN** – MAN or the metropolitan area network connects computers over a large city or campus.
4. **PAN** – PAN stands for personal area network. These devices connected belong to a single user. Such as pc connected to the printer, fax machine, video game console, etc. which can be connected both with wires and wirelessly.
5. **Wide Area Network (WAN):**
WAN are Communications that cover long distances across town or countries. It usually involves mainframes and satellites. Transmission channels are coaxial cables or microwaves.

Classification of Computer Network Based on Topology

The computer network can also be classified based on its topology. Topology is the spatial arrangement of computers. The arrangement is –

1. **Bus topology** – The computers connected to a single communication line. Moreover, this one is less expensive to install as it contains only a single line.
2. **Star topology** – The computers are connected to a single point or hub, and the arrangement looks like a star thus the name. this topology is the easiest to build and implement.
3. **Ring topology** – A ring topology can be imagined as a bus topology in a closed loop. The first and last of computers are connected to form a ring. The resource is shared from one system to another with intermediate systems in between.
4. **Mesh topology** – In this, each computer is connected creating a mesh or a net-like structure.

It should be kept in mind that no topology is better than the other. Each topology has its use and advantage and is used according to the requirement. All

computer networks need to be connected globally. This can be made possible using the internet.

Internet

Internet- Internet is a world-wide global system of interconnected computer networks. Internet uses the standard Internet Protocol (TCP/IP). Every computer in internet is identified by a unique IP address. IP Address is a unique set of numbers (such as 110.22.33.114) which identifies a computer location. A special computer DNS (Domain Name Server) is used to give name to the IP Address so that user can locate a computer by a name. For example, a DNS server will resolve a name <http://www.ucidream.com> to a particular IP address to uniquely identify the computer on which this website is hosted. Internet is accessible to every user all over the world.

Internet Evolution- The concept of Internet was originated in 1969 and has undergone several technological & Infrastructural changes as :

The origin of Internet devised from the concept of Advanced Research Project Agency Network (ARPANET). ARPANET was developed by United States Department of Defense. Basic purpose of ARPANET was to provide communication among the various bodies of government. Initially, there were only four nodes, formally called Hosts. In 1972, the ARPANET spread over the globe with 23 nodes located at different countries and thus became known as Internet. By the time, with invention of new technologies such as TCP/IP protocols, DNS, WWW, browsers, scripting languages etc., Internet provided a medium to publish and access information over the web.

Extranet- Extranet refers to network within an organization, using internet to connect to the outsiders in controlled manner. It helps to connect businesses with their customers and suppliers and therefore allows working in a collaborative manner.

Extranet vs Intranet- Extranet- Internal network that can be accessed externally. Extranet is extension of company's Intranet. For limited external communication between customers, suppliers and business partners.

Intranet- Internal network that cannot be accessed externally. Only limited users of a company. Only for communication within a company.

The internet is a global system where computer networks are connected and the world wide web. These computers are connected with either cable, telephone channels, or even wirelessly.

It is a medium to share resources from one point to another point. Secondly, is a physical infrastructure that connects all the computers and devices and does not belong to a single person.

It is a client-server based system where the laptops or our PCs act as the clients and they are connected to the internet through a local ISP (internet service provider). The server is the computer that holds all the websites and information. All the servers are stored at a place called the data centre.

But how are these clients and servers are identified in such a vast network? It is through the IP (internet protocol) address of the computer. The IP address is provided by the ISP of that computer. An IP is the address of each computer just like the addresses of our home to identify where are we located. An IP address is a string of numbers.

The server can find us using the IP address and similarly we can find the websites using their domain names. Domain names are also IP addresses. However, they are very long to remember thus easier way is to type the domain name such as Facebook.com, Youtube.com, Wikipedia, etc. The internet only understands IP address therefore, whenever you enter the domain name, the internet searches its IP address from a large directory -DNS (domain name server). It acts just like the phonebook directory. DNS contains all the numbers of the people.

Domain Name System Architecture

The Domain name system comprises of Domain Names, Domain Name Space, Name Server that have been described below:

Domain Names- Domain Name is a symbolic string associated with an IP address. There are several domain names available; some of them are generic such as com, edu, gov, net etc, while some country level domain names such as au, in, za, us etc.

The Generic Top-Level Domain names- Com-Commercial business, Edu- Education, Gov- U.S. government agency, Int+ International entity, Mil- U.S. military, Net- Networking organization, Org- Non-profit organization

The Country top-level domain names- Au- Australia, in - India, cl- Chile, fr- France, us- United States, za- South Africa, uk- United Kingdom, jp+ Japan, es- Spain, de- Germany, ca- Canada, ee- Estonia, hk- Hong Kong

Domain Name Space- The domain name space refers a hierarchy in the internet naming structure. This hierarchy has multiple levels (from 0 to 127), with a root at the top.

Name Server- Name server contains the DNS database. This database comprises of various names and their corresponding IP addresses. Since it is not possible for a single server to maintain entire DNS database, therefore, the information is distributed among many DNS servers. Hierarchy of server is same as hierarchy of names. The entire name space is divided into the zones

Zones- Zone is collection of nodes (sub domains) under the main domain. The server maintains a database called zone file for every zone. The information about the nodes in the sub domain is stored in the servers at the lower levels however; the original server keeps reference to these lower levels of servers.

Types of Name Servers

These are the three categories of Name Servers that manages the entire Domain Name System- Root Server, Primary Server and Secondary Server

1. **Root Server-** Root Server is the top level server which consists of the entire DNS tree. It does not contain the information about domains but delegates the authority to the other server
2. **Primary Servers-** Primary Server stores a file about its zone. It has authority to create, maintain, and update the zone file.
3. **Secondary Server-** Secondary Server transfers complete information about a zone from another server which may be primary or secondary server. The secondary server does not have authority to create or update a zone file.

DNS Working

DNS translates the domain name into IP address automatically. Here the steps included in domain resolution process-

1. When we type www.ucidream.com into the browser, it asks the local DNS Server for its IP address.
2. Here the local DNS is at ISP end.
3. When the local DNS does not find the IP address of requested domain name, it forwards the request to the root DNS server and again enquires about IP address of it.
4. The root DNS server replies with delegation that I do not know the IP address of www.tutorialspoint.com but know the IP address of DNS Server.
5. The local DNS server then asks the com DNS Server the same question.
6. The com DNS Server replies the same that it does not know the IP address of www.tutorialspoint.com but knows the address of tutorialspoint.com.
7. Then the local DNS asks the tutorialspoint.com DNS server the same question.
8. Then ucidream.com DNS server replies with IP address of www.ucidream.com.
9. Now, the local DNS sends the IP address of www.ucidream.com to the computer that sends the request.

Internet Services

1. **Communication Services**- There are various Communication Services available that offer exchange of information with individuals or groups. These are various these services:
2. **Electronic Mail**- Used to send electronic message over the internet.
3. **Telnet**- Used to log on to a remote computer that is attached to internet.
4. **Newsgroup**- Offers a forum for people to discuss topics of common interests.
5. **Internet Relay Chat (IRC)**- Allows the people from all over the world to communicate in real time.
6. **Mailing Lists**- Used to organize group of internet users to share common information through e-mail.
7. **Internet Telephony (VoIP)**- Allows the internet users to talk across internet to any PC equipped to receive the call.
8. **Instant Messaging**- Offers real time chat between individuals and group of people. Eg. Yahoo messenger, MSN messenger.
9. **Information Retrieval Services**- There exist several Information retrieval services offering easy access to information present on the internet. These are various these services:
10. **File Transfer Protocol (FTP)**- Enable the users to transfer files.
11. **Archie**- It's updated database of public FTP sites and their content. It helps to search a file by its name.
12. **Gopher**- Used to search, retrieve, and display documents on remote sites.
13. **Very Easy Rodent Oriented Netwide Index to Computer Achieved (VERONICA)**- VERONICA is gopher-based resource. It allows access to the information resource stored on gopher's servers.
14. **Web Services**- Web services allow exchange of information between applications on the web. Using web services, applications can easily interact with each other. The web services are offered using concept of Utility Computing.
15. **World Wide Web (WWW)**- WWW is also known as W3. It offers a way to access documents spread over the several servers over the internet. These documents may contain texts, graphics, audio, video, hyperlinks. The hyperlinks allow the users to navigate between the documents.

16. **Video Conferencing-** Video conferencing or Video teleconferencing is a method of communicating by two-way video and audio transmission with help of telecommunication technologies.

Internet Protocols

1. **Transmission Control Protocol (TCP)-** Transmission Control Protocol (TCP) corresponds to the Transport Layer of OSI Model. TCP is a reliable and connection-oriented protocol. TCP offers- Stream Data Transfer, Reliability, Efficient Flow Control, Full-duplex operation and Multiplexing. TCP offers connection oriented end-to-end packet delivery. TCP ensures reliability by sequencing bytes with a forwarding acknowledgement number that indicates to the destination the next byte the source expect to receive. It retransmits the bytes not acknowledged within specified time period.
2. **Internet Protocol (IP)-** Internet Protocol is connectionless and unreliable protocol. It ensures no guarantee of successful transmission of data. In order to make it reliable, it must be paired with reliable protocol such as TCP at the transport layer.
3. **User Datagram Protocol (UDP)-** Like IP, UDP is connectionless and unreliable protocol. It doesn't require making a connection with the host to exchange data. Since UDP is unreliable protocol, there is no mechanism for ensuring that data sent is received. UDP transmits the data in form of a datagram. The UDP datagram consists of five parts as shown in the following diagram:
4. **File Transfer Protocol (FTP)-** FTP is used to copy files from one host to another. FTP offers the mechanism for the same in following manner:
FTP creates two processes such as Control Process and Data Transfer Process at both ends i.e., at client as well as at server. FTP establishes two different connections: one is for data transfer and other is for control information. Control connection is made between control processes while Data Connection is made between client and server. FTP uses port 21 for the control connection and Port 20 for the data connection.
5. **Trivial File Transfer Protocol (TFTP)-** Trivial File Transfer Protocol is also used to transfer the files but it transfers the files without authentication. Unlike FTP, TFTP does not separate control and data information. Since there is no authentication exists, TFTP lacks in security features therefore it is not recommended to use TFTP.
6. **Telnet-** Telnet is a protocol used to log in to remote computer on the internet. There are a number of Telnet clients having user friendly user interface. The following diagram shows a person is logged in to computer A, and from there, he remote logged into computer B.
7. **Hyper Text Transfer Protocol (HTTP)-** HTTP is a communication protocol. It defines mechanism for communication between browser and the web server. It is also called request and response protocol because the communication between browser and server takes place in request and response pairs.
8. **HTTP request comprises of lines which contains-** Request line, Header Fields and Message body
 - **HTTP Response-** Like HTTP request, HTTP response also has certain structure. HTTP response contains- Status line, Headers and Message body
 - **Email-** Email is a service which allows us to send the message in electronic mode over the internet. It offers an efficient, inexpensive and real time mean of distributing information among people.

E-mail Protocols

- **SMTP**- SMTP stands for Simple Mail Transfer Protocol. It was first proposed in 1982. It is a standard protocol used for sending e-mail efficiently and reliably over the internet.
- **IMAP**- IMAP stands for Internet Message Access Protocol. It was first proposed in 1986. There exist five versions of IMAP as follows- Original IMAP, IMAP2, IMAP3, IMAP2bis and IMAP4
- **POP**- POP stands for Post Office Protocol. It is generally used to support a single client. There are several versions of POP but the POP 3 is the current standard.

E-mail Security

E-mail Hacking- Email hacking can be done in any of the following ways- Spam, Virus and Phishing

- **Spam**- E-mail spamming is an act of sending Unsolicited Bulk E-mails (UBI) which one has not asked for. Email spams are the junk mails sent by commercial companies as an advertisement of their products and services.
- **Virus**- Some emails may incorporate with files containing malicious script which when run on your computer may lead to destroy your important data.
- **Phishing**- Email phishing is an activity of sending emails to a user claiming to be a legitimate enterprise. Its main purpose is to steal sensitive information such as usernames, passwords, and credit card details. Such emails contain link to websites that are infected with malware and direct the user to enter details at a fake website whose look and feels are same to legitimate one.
- **E-mail Spamming and Junk Mails**- Email spamming is an act of sending Unsolicited Bulk E-mails (UBI) which one has not asked for. Email spams are the junk mails sent by commercial companies as an advertisement of their products and services.
- **Spams may cause the following problems**- It floods your e-mail account with unwanted e-mails, which may result in loss of important e-mails if inbox is full. Time and energy is wasted in reviewing and deleting junk emails or spams. It consumes the bandwidth that slows the speed with which mails are delivered. Some unsolicited email may contain virus that can cause harm to your computer.
- **E-mail Providers**- There are several email service providers available in the market with their enabled features such as sending, receiving, drafting, storing an email and much more.
The popular email service providers- Gmail, Hotmail, Yahoo Mail, iCloud Mail, ATM Mai, Mail.com and GMX Mail, Short-mail, Inbox.com, Facebook Messages, My Way Mail etc.

Website Designing

Web designing has direct link to visual aspect of a web site. Effective web design is necessary to communicate ideas effectively. Web designing is subset of web development. However, these terms are used interchangeably.

Wireframe- Wireframe refers to a visual guide to appearance of web pages. It helps to define structure of web site, linking between web pages and layout of visual elements. Web development

Web development refers to building website and deploying on the web. Web development requires use of scripting languages both at the server end as well as at client end.

- **Web Development Process-** Web development process includes all the steps that are good to take to build an attractive, effective and responsive website.
- **Web development tools-** Web development tools helps the developer to test and debug the web sites. Now a days the web development tool come with the web browsers as add-ons. All web browsers have built in tools for this purpose. These tools allow the web developer to use HTML, CSS and JavaScript etc.. These are accessed by hovering over an item on a web page and selecting the "Inspect Element" from the context menu.
- **Features-** Following are the common features that every web development tool exhibits:
- **HTML and the DOM-** HTML and DOM viewer allows you to see the DOM as it was rendered. It also allows to make changes to HTML and DOM and see the changes reflected in the page after the change is made.

Websites Hosting

Web hosting is a service of providing online space for storage of web pages. These web pages are made available via World Wide Web. The companies which offer website hosting are known as Web hosts. The servers on which web site is hosted remain switched on 24 x7. These servers are run by web hosting companies. Each server has its own IP address. Since IP addresses are difficult to remember therefore, webmaster points their domain name to the IP address of the server their website is stored on. It is not possible to host your website on your local computer, to do so you would have to leave your computer on 24 hours a day. This is not practical and cheaper as well. This is where web hosting companies comes in. Types of Hosting available as per the need-

- **Shared Hosting-** In shared hosting, the hosting company puts thousand of website on the same physical server. Each customer has their own allocation of physical web space and a set of bandwidth limit. As all websites share same physical memory, MYSQL server and Apache server, one website on the server experiencing high traffic load will affect performance of all websites on the server.
- **Virtual Private Server (VPS)-** It is also known as Virtual Dedicated Server. It is a server which is partitioned into smaller servers. In this customer is given their own partition, which is installed with its own operating system. Unlike shared hosting, VPS doesn't share memory or processor time rather it allocates certain amount of memory and CPU to use which means that any problem on a VPS partition on the same drive will not affect other VPS customers.
- **Dedicated Server-** In this kind of hosting, single dedicated server is setup for just one customer. It is commonly used by the businesses that need the power, control and security that a dedicated server offers.
- **Reseller Hosting-** A reseller acts as a middle man and sells hosting space of someone else's server.
- **Grid Hosting-** Instead of utilizing one server, Grid Hosting spreads resources over a large number of servers. It is quite stable and flexible. The servers can be added or taken away from the grid without crashing the system.

World Wide Web

A technical definition of the World Wide Web is: all the resources and users on the Internet that are using the Hypertext Transfer Protocol (HTTP). A broader definition comes from the organization that Web inventor Tim Berners-Lee helped found, the World Wide Web Consortium (W3C). The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge. In simple terms, The World Wide Web is a way of exchanging information between computers on the Internet, tying them together into a vast collection of interactive multimedia resources. Internet and Web is not the same thing: Web uses internet to pass over the information.

WWW Evolution- World Wide Web was created by Timothy Berners Lee in 1989 at CERN in Geneva. World Wide Web came into existence as a proposal by him, to allow researchers to work together effectively and efficiently at CERN. Eventually it became World Wide Web.

Identifiers and Character Set- Uniform Resource Identifier (URI) is used to uniquely identify resources on the web and UNICODE makes it possible to built web pages that can be read and write in human languages.

Syntax- XML (Extensible Markup Language) helps to define common syntax in semantic web. Data Interchange+ Resource Description Framework (RDF) framework helps in defining core representation of data for web. RDF represents data about resource in graph form.

Taxonomies- RDF Schema (RDFS) allows more standardized description of taxonomies and other ontological constructs.

Ontologies- Web Ontology Language (OWL) offers more constructs over RDFS. It comes in following three versions- OWL Lite for taxonomies and simple constraints. OWL DL for full description logic support. OWL for more syntactic freedom of RDF

Rules- RIF and SWRL offers rules beyond the constructs that are available from RDFs and OWL. Simple Protocol and RDF Query Language (SPARQL) is SQL like language used for querying RDF data and OWL Ontologies.

Proof- All semantic and rules that are executed at layers below Proof and their result will be used to prove deductions.

Cryptography- Cryptography means such as digital signature for verification of the origin of sources is used.

WWW Operation- WWW works on client- server approach. Here explains how the web works: User enters the URL (say, <http://www.ucidream.com>) of the web page in the address bar of web browser. Then browser requests the Domain Name Server for the IP address corresponding to www.ucidream.com. After receiving IP address, browser sends the request for web page to the web server using HTTP protocol which specifies the way the browser and web server communicates. Then web server receives request using HTTP protocol and checks its search for the requested web page. If found it returns it back to the web browser and close the HTTP connection. Now the web browser receives the web page, It interprets it and display the contents of web page in web browser's window.

Web Browsers

web Browser is an application software that allows us to view and explore information on the web. User can request for any web page by just entering a URL into address bar. Web browser can show text, audio, video, animation and more. It is the responsibility of a web browser to interpret text and commands contained in the web page. Earlier the web browsers were text-based while now a days graphical-based or voice-based web browsers

are also available. Web browser available today- Internet Explorer, Google Chrome, Mozilla Firefox, Netscape Navigator, Opera, Safari, Sea Monkey, K-meleon.

Web Server- Web server is a computer where the web content is stored. y web server is used to host the web sites but there exist other web servers also such as gaming, storage, FTP, email etc. Web site is collection of web pages while web server is a software that respond to the request for web resources.

Web Server Working- Web server respond to the client request in either of the following two ways- Sending the file to the client associated with the requested URL. Generating response by invoking a script and communicating with database

Architecture- Web Server Architecture follows the following two approaches:

Concurrent Approach- Concurrent approach allows the web server to handle multiple client requests at the same time. It can be achieved by following methods:

Multi-processing- In this a single process (parent process) initiates several single-threaded child processes and distribute incoming requests to these child processes. Each of the child processes are responsible for handling single request. It is the responsibility of parent process to monitor the load and decide if processes should be killed or forked.

Multi-threaded- Unlike Multi-process, it creates multiple single-threaded process.

Hybrid- It is combination of above two approaches. In this approach multiple process are created and each process initiates multiple threads. Each of the threads handles one connection. Using multiple threads in single process results in less load on system resources.

Proxy Server

Proxy server is an intermediary server between client and the internet. Proxy servers offers the following basic functionalities- Firewall and network data filtering. Network connection sharing. Data caching. Proxy servers allow to hide, conceal and make your network id anonymous by hiding your IP address.

Purpose of Proxy Servers- Following are the reasons to use proxy servers- Monitoring and Filtering, improving performance, Translation, Accessing services anonymously and Security.

Search Engines

Search Engine refers to a huge database of internet resources such as web pages, newsgroups, programs, images etc. It helps to locate information on World Wide Web. User can search for any information by passing query in form of keywords or phrase. It then searches for relevant information in its database and return to the user.

Search Engine Components- There are three basic components of a search engine Web Crawler, Database and Search Interfaces

1. **Web crawler-** It is also known as spider or bots. It is a software component that traverses the web to gather information.
2. **Database-** All the information on the web is stored in database. It consists of huge web resources.
3. **Search Interfaces-** This component is an interface between user and the database. It helps the user to search through the database.

Internet Collaboration

1. **Online Chatting-** Online chatting is a text-based communication between two or more people over the network. In this, the text message is delivered in real time and people

get immediate response. Telomeric was the world first online chat system. It was developed by Doug Brown and David R. Woolley in 1973.

2. **Instant Messaging (IM)**- Instant messaging is a software utility that allows IM users to communicate by sending text messages, files, and images.
3. **Internet Relay Chat (IRC)**- Internet Relay Chat is a protocol developed by Oikarinen in August 1988. It defines set of rules for communication between client and server by some communication mechanism such as chat rooms, over the internet. IRC consist of separate networks of IRC servers and machines. These allow IRC clients to connect to IRC. IRC client runs a program client to connect to a server on one of the IRC nets. After connecting to IRC server on IRC network, user can join with one or more channels and converse over there.
4. **Video Conferencing**- Video conferencing or Video teleconferencing is a method of communicating by two-way video and audio transmission with help of telecommunication technologies.

Mailing List

In order to send same email to a group of people, an electron list is created which is know as Mailing List. It is the list server which receives and distributes postings and automatically manages subscriptions. Mailing list offers a forum, where users from all over the globe can answer questions and have them answered by others with shared interests.

Types of Mailing List- The various types of mailing lists:

1. **Response List**- It contains the group of people who have responded to an offer in some way. These people are the customers who have shown interest in specific product or service.
2. **Compiled List**- The compiled list is prepared by collecting information from various sources such as surveys, telemarketing etc.
3. **Announcements**- These lists are created for sending out coupons, new product announcements and other offers to the customers.
4. **Discussion List**- This list is created for sharing views on a specific topic suchas computer, environment, health, education etc.

Usenet (USEr NETwork)

Like mailing lists Usenet is also a way of sharing information. It was started by Tom Truscott and Jim Ellis in 1979. Initially it was limited to two sites but today there are thousands of Usenet sites involving millions of people. Usenet is a kind of discussion group where people can share views on topic of their interest. The article posted to a newsgroup becomes available to all readers of the newsgroup.

Microsoft Edge Shortcut Key

Press this key

1. Ctrl + D
2. Ctrl + I
3. Ctrl + J
4. Ctrl + H
5. Ctrl + P
6. Ctrl + F

To do this

Add current site to favorites or reading list
Open favorites pane
Open downloads pane
Open history pane
Print the current page
Find on page

| | |
|-------------------------------------|--|
| 7. Alt + C | Open Cortana |
| 8. Ctrl + Shift + R | Enter reading view |
| 9. Ctrl + T | Open a new tab |
| 10. Ctrl + Shift + T | Reopen the last closed tab |
| 11. Ctrl + W or Ctrl + F4 | Close the active tab |
| 12. Ctrl + K | Duplicate tab |
| 13. Ctrl + N | Open a new window |
| 14. Ctrl + Shift + P | Open a new InPrivate Browsing window |
| 15. Ctrl + Tab | Switch to the next tab |
| 16. Ctrl + Shift + Tab | Switch to the previous tab |
| 17. Ctrl + 1, 2, 3, and so on | Switch to a specific tab number |
| 18. Ctrl + 9 | Switch to the last tab |
| 19. Ctrl + Plus (+) | Zoom in (25%) |
| 20. Ctrl + Minus (-) | Zoom out (25%) |
| 21. Ctrl + 0 (zero) | Reset zoom level |
| 22. Backspace or Alt + Left arrow | Go back |
| 23. Alt + Right arrow | Go forward |
| 24. F5 or Ctrl + R | Refresh the page |
| 25. Esc | Stop loading the page |
| 26. Ctrl + L or Ctrl + O (letter O) | Select the URL in the address bar to edit |
| 27. Ctrl + Shift + L | Open address bar query in a new tab |
| 28. Ctrl + E | Open a search query in the address bar |
| 29. Ctrl + Enter | Add www. to the beginning and .com to the end of text typed in the address bar |
| 30. Ctrl + click | Open link in a new tab |
| 31. Ctrl + Shift + click | Open link in a new tab and switch to that tab |
| 32. Alt + Shift + click | Open link in a new window |
| 33. Ctrl + Shift + M | Start creating web notes |
| 34. Ctrl + Alt + M | Copy selected content into a web note |
| 35. F12 | Open F12 Developer Tools |
| 36. Ctrl + U | View source |
| 37. F6 | Toggle focus between webpage content and the address bar |
| 38. F7 | Turn caret browsing on for the active tab |
| 39. Ctrl + Shift + Delete | Show controls to clear browsing data |
| 40. Alt + N | Move focus to notification or download (if available) |

When reading books in Microsoft Edge:

| | |
|---------------------|--------------------------------------|
| 1. Alt + T | Open or close the table of contents |
| 2. Ctrl + B | Open or close your list of bookmarks |
| 3. Ctrl + Shift + D | Add or remove a bookmark |
| 4. Ctrl + Shift + O | Open or close Options |
| 5. Ctrl + Shift + Y | Open or close the reading bar |
| 6. Ctrl + Shift + U | Open Books in the Hub |
| 7. Ctrl + Shift + G | Start read aloud |
| 8. F11 | Enter or exit full-screen reading |

- 9. Left or Up arrow, or Page Up Go to next page
- 10. Right or Down arrow, or Page Down Go to previous page
- 11. Home Go to beginning of book
- 12. End Go to end of book
- 13. Ctrl + F Search the book
- 14. Ctrl + Shift + S Save the book locally (for books not purchased in the Microsoft Store)
- 15. Ctrl + G Go to page (when the book supports page lists)
- 16. Alt + A Open the Notes panel

When reading fixed-layout books in Microsoft Edge:

- 1. Ctrl + Shift + A Toggle between "fit to width" and "fit to page" layout
- 2. F8 Toggle between one-page and two-page layouts

When reading PDF documents in Microsoft Edge:

- 1. Ctrl + G Go to a specific page number
- 2. Alt + T Open or close the table of contents
- 3. Ctrl + F Search the document
- 4. Ctrl + Plus (+) or Ctrl + Minus (-) Zoom in / zoom out
- 5. Ctrl + Shift + A Toggle between "fit to width" and "fit to page" layout
- 6. F8 Toggle between one-page and two-page layouts
- 7. F9 Rotate PDF
- 8. F11 Enter or exit full-screen reading
- 9. Ctrl + Shift + G Start read aloud
- 10. Ctrl + Shift + M Add notes to PDF books
- 11. Ctrl + Shift + S Save a copy of the PDF document