COMPUTER FUNDAMENTALS

CHAPTER-1

An Introduction to Computing and Programming

Introduction

A Computer is a programmable electronic machine used to store, retrieve and process data.

Full Form Of Computer

Full Form of Computer is "Common Operating Machine Purposely Used for Technological and Educational Research.

The First Computer that resembled the modern machines we see today was Invented by "Charles Babbage" between 1833 and 1871.

Central Processing Unit(CPU)

CPU is a Primary component of a Computer that act as its "Control Center." It is the "Brain" of the Computer.

Moniter

A Moniter is an electronic output device used to display information being entered and processes on a Computer.

Uninterruptible Power Supply(UPS)

An UPS is a device that allows a computer to keep running for at least a short time when incoming power is interrupted.

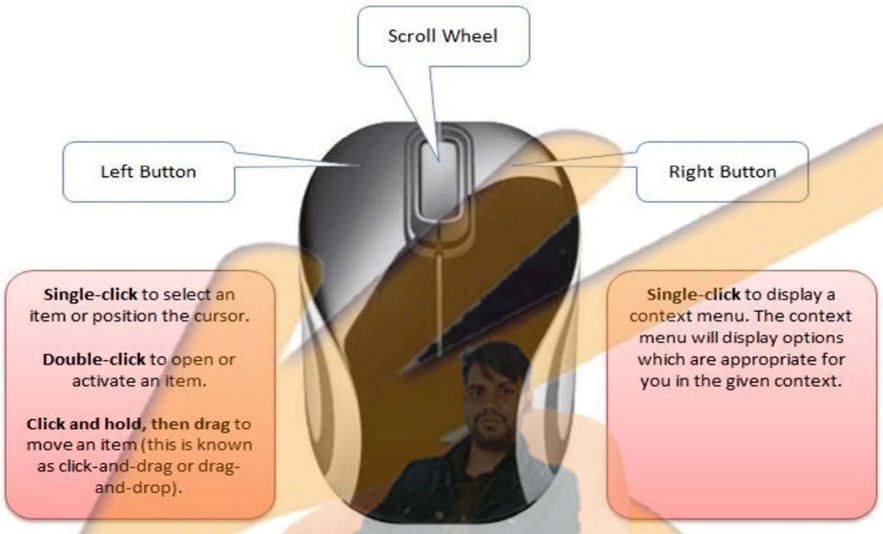
.

Keyboard

A computer keyboard is an input device used to enter characters and functions into the computer system by pressing buttons, or keys.

Mouse

A palm-sized, button-operated pointing device that can be used to move, select, activate, and change items on a computer screen.



Input and Output Devices

Input Devices

Input is any data that is sent to the computer for processing.

Output Devices

Output is the result of processed data that we can see through some other devices.

Generation Of Computer

Generation	Period	Technology
First Gen.	1946-1959	Vacuum Tube Based
Second Gen.	1957-1964	Transister Based Replaces Vacuum Tube
Third Gen.	1965-1970	Integrated circuit(IC) Technology Developed
Fourth Gen.	1970-1990	Microprocessors Developed
Fifth Gen.	1990-Present and Beyond	Use Of Bio-Chip+Artificial Intelligence Based

First Generation Of Computer

The period of first generation was from 1946-1959. The computers of first generation used vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit). These tubes, like electric bulbs, produced a lot of heat and the installations used to fuse frequently. Therefore, they were very expensive and only large organizations were able to afford it.
In this generation, mainly batch processing operating system was used. Punch cards, paper tape, and magnetic tape was used as input and output devices. The computers in this generation used machine code as the programming language.

First Generation Computer

Vaccum Tubes

A UNIVAC computer at the Census Bureau.

Second Generation Of Computer

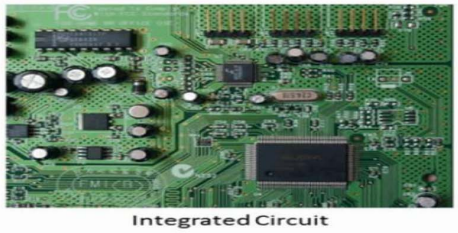
The period of second generation was from 1959-1965. In this generation, transistors were used that were cheaper, consumed less power, more compact in size, more reliable and faster than the first generation machines made of vacuum tubes. In this generation, magnetic cores were used as the primary memory and magnetic tape and magnetic disks as secondary storage devices.
In this generation, assembly language and high-level programming languages like FORTRAN, COBOL were used. The computers used batch processing and multiprogramming operating system.

Transistor

Third Generation Of Computer

Third-generation computers substituted integrated circuits (ICs) for transistors.
Numerous transistors, resistors, and capacitors, as well as the related circuitry,
are found in a single integrated circuit (IC). Jack Kilby was the man who created the IC.

Third generation Computer



Integrated Circuit

Fourth Generation Of Computer

The period of fourth generation was from 1971-1980. Computers of fourth generation used Very Large Scale Integrated (VLSI) circuits. VLSI circuits having about 5000 transistors and other circuit elements with their associated circuits on a single chip made it possible to have microcomputers of fourth generation.

Fourth generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to Personal Computer (PC) revolution. In this generation, time sharing, real time networks, distributed operating system were used. All the high-level languages like C, C++, DBASE etc., were used in this generation.

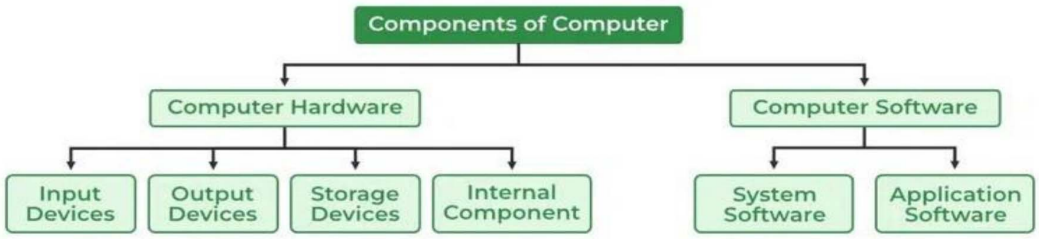
Fifth Generation Of Computer

The technology behind the fifth generation of computers is AI. It allows computers to behave like humans. It is often seen in programs like voice recognition, area of medicine, and entertainment. Within the field of game playing also it's shown remarkable performance where computers are capable of beating human competitors.

The speed is the highest, size is the smallest and area of use has remarkably increased within the fifth generation computers. Though not a hundred percent AI has been achieved to date but keeping in sight the present developments, it is often said that this dream also will become a reality very soon.

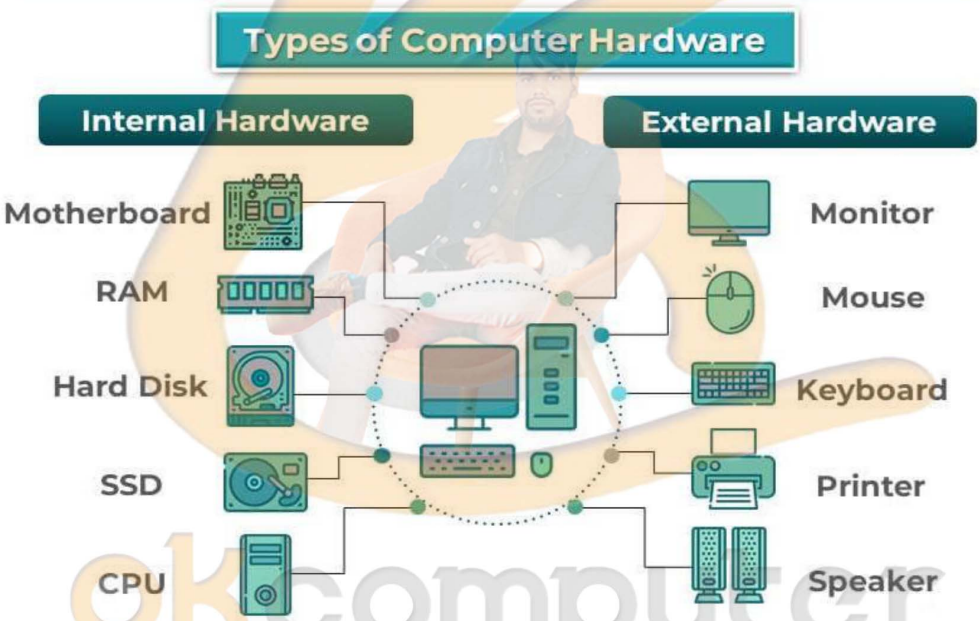
To summarize the features of varied generations of computers, it is often said that a big improvement has been seen so far because of the speed and accuracy of functioning care, but if we mention the dimensions, it's been small over the years. The value is additionally diminishing and reliability is increasing.


Fifth generation computers are in designing mode with Artificial Intelligence technology.



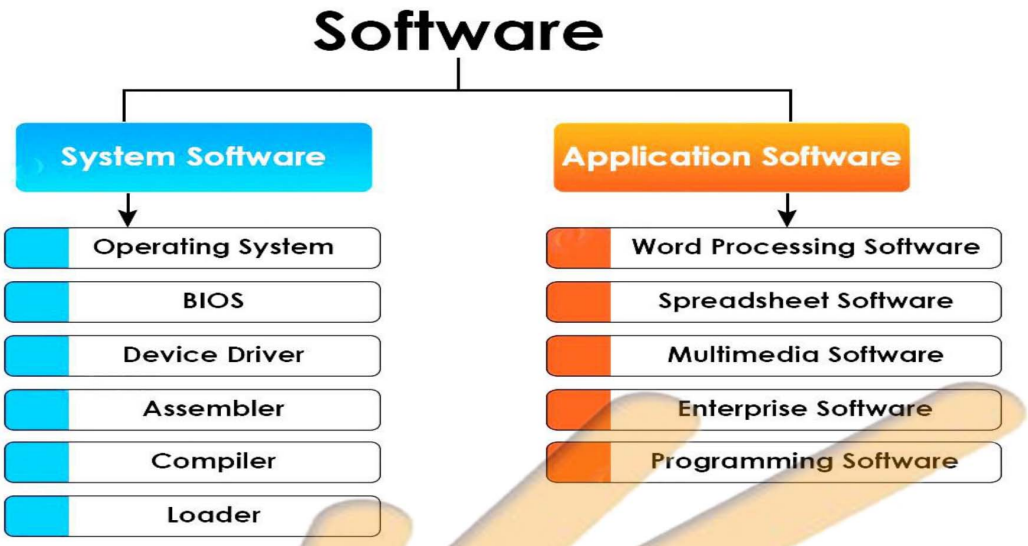
Computer Hardware

Hardware refers to the physical elements of a computer. Also referred to as the machinery or the equipment of the computer. Examples of hardware in a computer are the keyboard, the monitor, the mouse and the processing unit However, most of a computer's hardware cannot be seen; It's inside the computer case.



Computer Software

Computer software is a series of programs, data and instructions used in a computer's hardware to help the device operate and you complete tasks. Hardware is the physical components that comprise a computer, such as the graphics card, data storage and motherboard.



System Software

The software that runs the computer by activating, controlling, and coordinating the hardware is system software. They also control the application programs on the computer.
They differ according to the function they need to perform in the computer system.
Some of the examples are –

(a) Operating System

The most relevant example of system software is an operating system. It is an interface connecting the users to the computer hardware. Linux, Windows, Edge, etc. are a few famous operating systems that people use.

(b) BIOS

A basic input-output system is part of Read-Only Memory or flash memory. The first software that users activate at their computer is BIOS because it loads the drivers to assist storage of operating systems. It has a set of commands to make the devices perform effectively.

The starting up of a device refers to boot, the ROM commands automatic execution of loading boot in memory once the device starts.

Device Driver

It is responsible for controlling computer hardware by providing an interface. The kernel uses this software to communicate with the processor.
The operating systems usually have these drivers to work with hardware systems.

Assembler

It is a language program with input being an assembly and output being an object. The programmer has a basic interpretation machine that uses hardware for fundamental instructions. It uses machine language to get machine memory in place.

Compiler

System software that takes care of high-level languages by accepting the source program and producing a corresponding object program. An interpreter is a program responsible for executing a source program. FORTRAN, COBOL, etc. may designate to a compiler and its associated language.

Loader

A system software responsible for loading the program and executing it is a loader.
Absolute, relocating, and direct-linking are some of the loading schemes.
The assembler outputs the program to the device and the loader executes it.
This is a smaller program compared to the assembler.

Features Of System Software

1. They are very close to the system.
2. They have a very fast speed.
3. These are difficult to design and understand.
4. They are less interactive.
5. They have small size.
6. These are hard to manipulate.
7. They usually use low-level language.

Application Software

This type of software is for specific tasks related to end-users and their ease.
Unlike system software, a computer doesn't need them to function.
The users can install and uninstall this software according to their needs.
They may have only one program or a collection according to tasks.
Some of its types are –

Word Processing Software

This software is for creating editable documents that users can keep going back to.
They can add textual content or edit the existing one when necessary. Other than this, multiple other features are depending on the particular application.
Some examples are – Ms Word, Google Docs, Wordpad, etc.

Spreadsheet Software

This is for making spreadsheets and deals with information/data. It has grids and columns to tabulate all the data properly making it easy for the user to maintain records.
It enables data processing of even larger files.
There is an option to calculate using different formulas as well.
Some examples are – Ms Excel, Google Sheets, etc.

Multimedia Software

These are for editing videos, audios, and texts and allows users to combine all of them as well. They can improve their documents with interesting visuals and sounds using multimedia software.
Some examples are – VLC player, Premier Pro, Window Media Player, etc.

Enterprises Software

These are for particular business functions when the organizations have multiple tasks to take care of regularly. This may be for accounting, billing, inventory management, web traffic analysis, etc.
Some examples are – Mailchimp, Google analytics, customer support system, etc.

Programming Software

These are software for writing other programs by translating programming languages into machine language. The developers use them to create, debug, and maintain applications.

Programming or software development tools are a few other names for it. Some examples are – Eclipse, Coda, Notepad++, etc.

Features Of Application Software

1. Closer to the user.
2. Easy to design and understand.
3. Interactive.
4. Have a slow speed.
5. Usually use high-level language.
6. Easy to manipulate and use.
7. Need large storage space in a device.

Difference Between Computer Hardware and Software

Difference Between Computer Hardware and Software

Basis	Hardware	Software
Type	It is the physical part of the device that takes care of data processing.	It is internal to the computer that uses a set of instructions to command the device for different tasks.
Development	It is made by manufacturing.	It is made by developers and engineers.
Language	Uses binary codes to function.	Relies on high-level programming languages to function.
Function	Monitors machine-level tasks.	Monitors the hardware functioning.
Dependency	It depends on the software to execute the task.	It depends on hardware to process the information.
Tangible	They are tangible and thus we can see and touch hardware.	They are intangible and thus we can't see and touch software.
Use	Works for most of the computers in general as they have uniform architecture.	Is designed according to the computer system and updates according to user preference.
Categories	It mainly consists of input devices, output devices, storage, and internal components.	System software and Application software are two of its major types.
Components	Integrated Circuits, diodes, registers, crystals, insulators, etc.	Numbers, alphabets, symbols, keywords, etc.
Protection	The viruses cannot attack the hardware system.	The viruses can attack the software system.
Faults	They are very random and hard to find.	Usually have something to do with the system and troubleshoots automatically.
Transfer	Their electric transmission is possible from one place to another electrically using a network.	They can easily transfer from different locations using the network.
Durability	Depreciates over time.	Keeps updating with time.
Replacement	In case of damage, a new device replaces the hardware.	In case of damage, it undergoes reinstallation.
Examples	Keyboard, Monitor, Printer, CPU, Hard disk, ROM, etc.	Ms Word, Operating system, Photoshop, MySQL, etc.

Relationship between Hardware and Software

1. They depend on each other to make the computer system work efficiently.
2. The software needs the support of hardware to utilize its features.
3. Hardware needs programs to operate which only software can provide.
4. For specific tasks, multiple software needs to be loaded in the hardware to perform.
5. Hardware is a one-time investment while the software is a continuous one.
6. Software is an interface allowing users to use hardware.

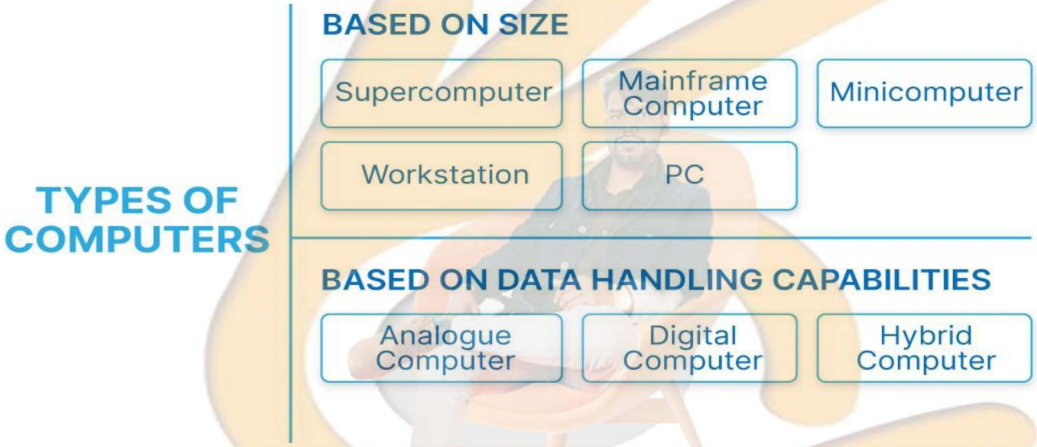
Conclusion

These are the two most fundamental concepts of computer aptitude. Not just for competitive exams but they are useful to understand the daily computer tasks as well.

This is why government exams like UPSC, RRB, RBI, Banking, etc. have this either in the computer aptitude or general knowledge section. All the applicants should know about these terms to improve their practical skills and their exam results.

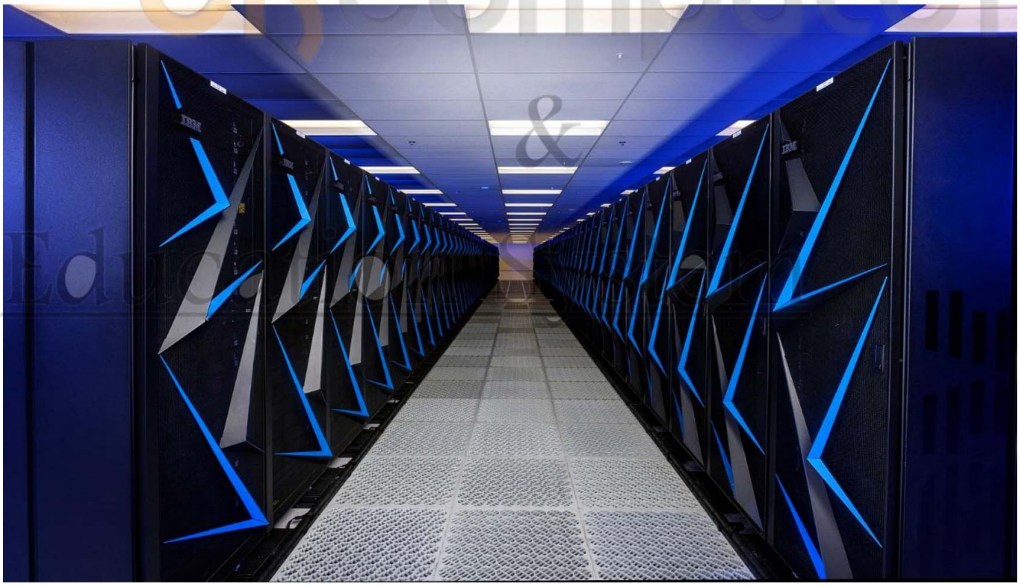
Types Of Computer

A computer is a device that converts data into meaningful information, processes the input based on the set of instructions provided by the user, and produces the desired output.
Computers are classified into two categories based on the size of computers and based on the data handling abilities of the computer, as shown in the image below:



Super Computer

Let's explain the type of computer known as a supercomputer and its significance in modern computing. Supercomputers are the largest and fastest computers, capable of processing trillions of functions in seconds. These computers are primarily used for data-intensive and computation-intensive scientific tasks such as password encryption and decryption, weather forecasting, exploring the solar system, molecular modeling, etc.



Some of the advantages of using this type of computer are:

1. Enables virtual testing
2. Calculates up to ten trillion individual calculations per second
3. Allows you to decrypt and encrypt your password easily
4. Solves more significant issues and can be used for research and development
5. Runs more problems in less time and has advanced graphic capabilities

Some of the disadvantages of using this type of computer are:

1. It is pricey and takes up a lot of space.
2. This type of computer necessitates the use of trained personnel.
3. It is not suitable for day-to-day operations and is best suited for specific applications.

Mainframe Computer

Mainframe computers have a large amount of memory and processors and can perform billions of transactions and simple calculations in real time. This type of computer is primarily used for transaction servers, commercial databases, and applications that require high reliability, security, and speed.

These are the computers to have when '0' downtime is acceptable.

Some of the advantages of using this type of computer are:

1. Manages terabytes of data in databases
2. Handles high-bandwidth communication with ease
3. Processes thousands of transactions per second on a large scale
4. Support thousands of users and application programs accessing numerous resources at the same time

Some of the disadvantages of using this type of computer are:

1. A mainframe computer has significantly more expensive than a regular computer.
2. A mainframe computer requires more space, and a regular person cannot perform maintenance.
3. Because of the hardware components, installing a mainframe computer is more complex than installing a regular computer.
4. Environmental constraints must be met when placing mainframe computers, such as the temperature of the surroundings should not be excessively high.

Mini Computer

Minicomputers are smaller, less expensive, and less powerful than mainframes or supercomputers but more pricey and powerful than personal computers.

These computers are multi-user systems with more than one user working simultaneously.

These computers are primarily used for engineering and scientific computations, file management, business transaction processing, and other similar tasks.

Some of the advantages of using these types of computers are:

1. Mini computers are inexpensive.
2. Suitable for both private and commercial usage
3. Due to their small size, it is easy to transport and use these types of computers.
4. This computer makes no noise during operation because it lacks heat dissipation via fans.

Some of the disadvantages of using these types of computers are:

1. These computers do not have either a CD or a DVD drive.
2. The screen size in these types of computers is small, as is the keyboard.
3. These computers cannot be upgraded because the hardware components inside are fixed.
4. Because they have limited RAM space, these computers cannot store large amounts of data.

Workstation

Now let's explain the type of computer known as a workstation and its significance in modern computing. A workstation is a computer or group of computers used primarily by a single user to perform professional or commercial work. These types of computers have more computational (processing) power than a standard PC. They are primarily used for video editing, playing high-graphic games, 3D animation, etc.

Some of the advantages of using these types of computers are:

1. These computers are designed to last a long time.
2. This computer performs better than a personal computer.
3. If an issue or problem arises in these computers, it is simple to diagnose.
4. These computers have a larger keyboard than a laptop and are simple to use.
5. It has more memory than a PC and multiple processors attached to it.
6. These computers are easily scalable as you necessitate more memory and processing power.

Some of the disadvantages of using these types of computers are:

1. Since these types of computers are larger than laptops, they are more challenging to transport.
2. These computers are extremely heavy, which makes them difficult to move and transport.

PC

A PC or personal computer or microcomputer, is a general-purpose computer for personal use. This type of computer comprises a CPU, memory, an input unit, and an output unit. This type of computer is appropriate for personal tasks such as watching a movie, completing an assignment, etc.

Some of the advantages of using these types of computers are:

1. These computers require little maintenance
2. These computers are small in size and very easy to use
3. This type of computer can be customized to meet the user's needs.
4. These computers have a large amount of disc space, allowing for storing a large amount of data.
5. These computers have more RAM, graphics cards, GPU, and hard drive slots, making them easily upgradeable.

Some of the disadvantages of using these types of computers are:

1. There is no battery backup on desktop computers.
2. A desktop PC requires a dedicated room to be installed.
3. A desktop PC always requires a separate mouse, keyboard, and monitor.

Analog Computer

These types of computers process analog data. (Analog data is constantly changing data that cannot have discrete values.) These computers read the continuous change in input, process it, and then output it.

Hybrid Computer

Now let's explain the type of computer known as a hybrid computer and its significance in modern computing. A hybrid computer is made after combining analog and digital computers. As a result, these computers are fast like analog computers and have memory and accuracy like digital computers.

These computers are commonly used in specialized applications requiring analog and digital data processing. A hybrid computer, for example, is used in hospitals to monitor patients' heartbeats.

Some of the advantages of using these types of computers are:

1. Allows for online data processing
2. It aids in the real-time solution of large equations.
3. These types of computers produce quick and accurate results.
4. It requires analog accuracy but digital computer speed.

Some of the disadvantages of using these types of computers are:

1. A hybrid computer is more expensive than an analog or digital computer.
2. Before designing a hybrid computer, proper planning for software, hardware, and other configurations is required.

Quantum Computer

It is a computer that uses quantum mechanics to store and process data. Unlike classical computers, which use bits to represent data (each bit can be either 0 or 1), quantum computers use qubits (quantum bits), which can be in superposition, meaning they can be both 0 and 1 simultaneously. This allows them to perform calculations much faster than classical computers.

Some of the advantages of using these types of computers are:

1. Quantum computers have the potential to solve complex problems much faster than classical computers due to their ability to perform multiple calculations at once.
2. They can also perform calculations practically impossible for classical computers to solve, such as breaking strong encryption codes.
3. Quantum computers could advance significantly in drug discovery, materials science, and artificial intelligence.

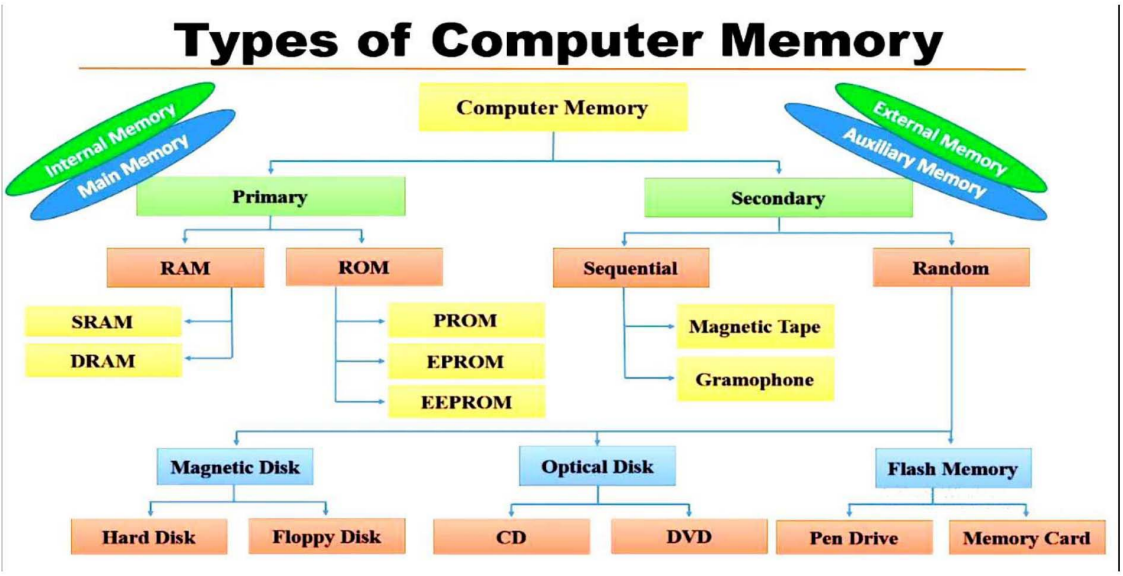
Some of the disadvantages of using these types of computers are:

1. Quantum computers are susceptible to their environment, and even small amounts of interference can cause calculation errors.
2. They are also costly and difficult to build, with many technical challenges that still need to be overcome.
3. The algorithms used to program quantum computers are still in the early stages of development, and how they will be integrated into existing computing systems is still being determined.

Different Types Of Memory in Computer

Types of Memory in Computers: There are two main types of computer memory: primary and secondary. The term "memory" can refer to primary memory or a specific type of it called "random access memory" (RAM). This type of memory is located on microchips that are very close to the computer's microprocessor.

In simple terms, computer memory is like a quick-access storage area where a computer keeps important instructions and data. It's crucial for a computer to work properly because it needs to store and use information instantly. Memory is used by the computer's operating system, hardware, and software to function effectively.



Primary Memory or RAM (Random Access Memory)

A computer's primary memory, also known as Random Access Memory (RAM), is a fast and volatile type of memory. It holds data and information while our computer is running, but everything stored in RAM is lost when the computer is turned off.

RAM plays a crucial role in enhancing the overall performance of the computer by allowing the CPU (Central Processing Unit) to quickly read and write data. This enables efficient multitasking and ensures smooth system performance. The size of RAM, or primary memory, is measured in gigabytes (GB) or terabytes (TB). There are two types of RAM: DRAM and SRAM.

DRAM stands for Dynamic Random Access Memory, and it's a type of RAM used for dynamic data storage. Each cell in DRAM holds one bit of information and is made up of a tiny capacitor and transistor. However, because of its volatile nature, the information in DRAM needs to be continuously refreshed to prevent data loss.

On the other hand, SRAM stands for Static Random Access Memory. It also stores data in memory but of a static nature, meaning the data remains active as long as there is a power supply. Although the same-sized SRAM chip can hold less data compared to DRAM, it has an advantage: it doesn't require continuous refreshing like DRAM does.

ROM (Read Only Memory)

Read-Only Memory (ROM) is a permanent type of storage in computers. It can only read the information stored in it and cannot be modified or written to. The data remains intact even after the computer is powered off, making it non-volatile.

There are five main types of ROM:

MROM: The oldest type of ROM where the data is set during the manufacturing process, and users cannot change it.
PROM: A digital ROM that allows writing information or programs only once using a special device.
Flash ROM: This ROM can be programmed in smaller units called sectors or blocks and is commonly used for data transfer between computers and digital devices.
EPROM: Data in this ROM can be erased and reprogrammed once. It can store data for around 10-20 years, and to reprogram it, a UV light is used for 40 minutes.
EEPROM: The full form of EEPROM is Electrically Erasable and Programmable Read Only Memory. It allows data to be erased and reprogrammed multiple times using electrical charges.

Secondary Memory

Secondary memory is a type of non-volatile storage used for long-term data storage in computers. It includes various storage devices like hard disk drives (HDDs), solid-state drives (SSDs), optical discs (CDs, DVDs, Blu-ray), USB flash drives, and memory cards. These secondary storage devices offer larger storage capacities compared to RAM but have slower access times. Here are the types of secondary memory:

Hard Disk: A permanent type of computer memory that stores programs, files, and data. It is located on the computer's motherboard and retains data even during power outages or when the system is turned off.
Compact Disc (CD): An optical disk storage device that can store various types of data, including audio, video, files, and other information. CDs use light to read and write data.
Pen Drive (USB Flash Drive): A portable device used as secondary memory in computers for permanently storing data. It is commonly known as a USB flash drive and is used for storing and transferring data.

Cache Memory

Cache memory in a computer is a small-sized chip-based memory located between the main memory and CPU, very close to the CPU chip. Its purpose is to boost the CPU's performance by providing high-speed temporary storage for frequently accessed data. All the instructions and data that the CPU frequently uses are stored in the Cache memory. There are three types of Cache memory: L1, L2, and L3 cache, each offering different levels of speed and capacity to optimize the computer's overall efficiency.

Virtual Memory

Virtual memory is like an extension of your computer's RAM. When your computer's RAM is not enough to handle all the programs running at once, the operating system uses a part of the hard drive as virtual memory. This temporary storage helps to hold data that would normally be stored in RAM. Thanks to virtual memory, your computer can handle larger programs and multitask more effectively, ensuring smoother performance even when dealing with numerous tasks simultaneously.

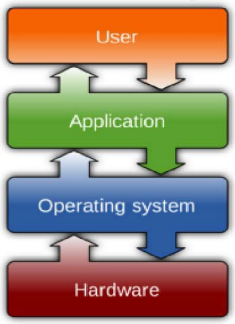
Difference Between Memory and Storage

Memory in a computer is commonly known as the primary storage, like RAM. It is where information is processed and accessed by users. However, it's important to know that primary memory is volatile, which means it can only hold data temporarily. Once the computer is turned off, the data stored in primary memory is lost.

In computers, storage refers to secondary memory, where data is kept. Common examples of storage are hard drives or hard disk drives (HDDs). Unlike primary memory, storage is nonvolatile, which means the information remains even after the computer is turned off and then back on. When a program is actively running, it stays in the computer's primary memory for quick access to data. However, once the program is closed, it is moved to secondary memory or storage for safekeeping until you need it again.

Operating System

An operating system (OS) is a program that acts as an interface between the system hardware and the user. Moreover, it handles all the interactions between the software and the hardware. All the working of a computer system depends on the OS at the base level. Further, it performs all the functions like handling memory, processes, the interaction between hardware and software, etc. Now, let us look at the functions of operating system.



Objectives of OS

The primary goals of an operating system are as follows:

Convenience – An operating system improves the use of a machine. Operating systems enable users to get started on the things they wish to complete quickly without having to cope with the stress of first configuring the system.
Efficiency – An operating system enables the efficient use of resources. This is due to less time spent configuring the system.
Ability to evolve – An operating system should be designed in such a way that it allows for the effective development, testing, and introduction of new features without interfering with service.
Management of system resources – It guarantees that resources are shared fairly among various processes and users.

Functions of Operating System

1. Memory Management

It is the management of the main or primary memory. Whatever program is executed, it has to be present in the main memory. Main memory is a quick storage area that may be accessed directly by the CPU. When the program is completed, the memory region is released and can be used by other programs. Therefore, there can be more than one program present at a time. Hence, it is required to manage the memory.

The operating system:

Allocates and deallocates the memory.
Keeps a record of which part of primary memory is used by whom and how much.
Distributes the memory while multiprocessing.
In multiprogramming, the operating system selects which processes acquire memory when and how much memory they get.

2. Processor Management/Scheduling

Every software that runs on a computer, whether in the background or in the frontend, is a process. Processor management is an execution unit in which a program operates. The operating system determines the status of the processor and processes, selects a job and its processor, allocates the processor to the process, and de-allocates the processor after the process is completed.

When more than one process runs on the system the OS decides how and when a process will use the CPU. Hence, the name is also CPU Scheduling. The OS:

Allocates and deallocates processor to the processes.
Keeps record of CPU status.
Certain algorithms used for CPU scheduling are as follows:

First Come First Serve (FCFS)
Shortest Job First (SJF)
Round-Robin Scheduling
Priority-based scheduling etc.
Purpose of CPU scheduling

Purpose of CPU scheduling

The purpose of CPU scheduling is as follows:

Proper utilization of CPU. Since the proper utilization of the CPU is necessary. Therefore, the OS makes sure that the CPU should be as busy as possible.
Since every device should get a chance to use the processor. Hence, the OS makes sure that the devices get fair processor time.
Increasing the efficiency of the system.

3. Device Management

An operating system regulates device connection using drivers. The processes may require devices for their use. This management is done by the OS. The OS:

Allocates and deallocates devices to different processes.
Keeps records of the devices.
Decides which process can use which device for how much time.

4. File Management

The operating system manages resource allocation and de-allocation. It specifies which process receives the file and for how long. It also keeps track of information, location, uses, status, and so on. These groupings of resources are referred to as file systems. The files on a system are stored in different directories. The OS:

Keeps records of the status and locations of files.
Allocates and deallocates resources.
Decides who gets the resources.

5. Storage Management

Storage management is a procedure that allows users to maximize the utilization of storage devices while also protecting data integrity on whatever media on which it lives. Network virtualization, replication, mirroring, security, compression, deduplication, traffic analysis, process automation, storage provisioning, and memory management are some of the features that may be included. The operating system is in charge of storing and accessing files. The creation of files, the creation of directories, the reading and writing of data from files and directories, as well as the copying of the contents of files and directories from one location to another are all included in storage management.

The OS uses storage management for:

Improving the performance of the data storage resources.
It optimizes the use of various storage devices.
Assists businesses in storing more data on existing hardware, speeding up the data retrieval process, preventing data loss, meeting data retention regulations, and lowering IT costs

What are the functions of Operating System

Security – For security, modern operating systems employ a firewall. A firewall is a type of security system that monitors all computer activity and blocks it if it detects a threat.

Job Accounting – As the operating system keeps track of all the functions of a computer system. Hence, it makes a record of all the activities taking place on the system. It has an account of all the information about the memory, resources, errors, etc. Therefore, this information can be used as and when required.

Control over system performance – The operating system will collect consumption statistics for various resources and monitor performance indicators such as reaction time, which is the time between requesting a service and receiving a response from the system.

Error detecting aids – While a computer system is running, a variety of errors might occur. Error detection guarantees that data is delivered reliably across susceptible networks. The operating system continuously monitors the system to locate or recognize problems and protects the system from them.

Coordination between other software and users – The operating system (OS) allows hardware components to be coordinated and directs and allocates assemblers, interpreters, compilers, and other software to different users of the computer system.

Booting process – The process of starting or restarting a computer is referred to as Booting. Cold booting occurs when a computer is totally turned off and then turned back on. Warm booting occurs when the computer is restarted. The operating system (OS) is in charge of booting the computer.

Types of Operating System

The operating system can be of different types. They are as follows:

1. Batch OS

In this system, the OS does not forward the jobs/tasks directly to the CPU. It works by grouping together similar types of jobs under one category. Further, we name this group as a 'batch'. Hence, the name batch OS.

Examples are the payroll system, bank statement, etc.

2. Time-Shared OS

When more than one task takes place on the system it is called time-shared OS. As multiple tasks can run at the system at a time as per requirement. Hence, they all share the CPU time one by one. Therefore, we also name it multitasking. The time that each task gets is called quantum.

A fixed interval of time is decided for each task. When the first task executes for that period of time, the second task executes, and so on.

Examples are UNIX etc.

3. Distributed OS

In this system, there is more than one CPU present. The OS distributes the tasks among all the processors. The processors do not share any memory or clock time. OS handles all communication between them through various communication lines.

Examples are LOCUS etc.

4. Network OS

They have two categories as follows:

a) Hard Real-Time Systems

In this, the time constraint is very short and strict. Even seconds of delay is not acceptable.

b) Soft Real-Time Systems

In this, the time constraint is not so short and strict.

Popular Operating Systems

Some of the most popular operating systems in use today include:

Windows: Windows is the most popular desktop operating system, used by over 1 billion users worldwide. It has a wide range of features and applications, including the Office suite, gaming, and productivity tools.
macOS: macOS is the desktop operating system used by Apple Mac computers. It is known for its clean, user-friendly interface and is popular among creative professionals.
Linux: Linux is an open-source operating system that is available for free and can be customized to meet specific needs. It is used by developers, businesses, and individuals who prefer an open-source, customizable operating system.
iOS: iOS is the mobile operating system used by Apple iPhones and iPads. It is known for its user-friendly interface, tight integration with Apple's hardware and software, and robust security features.
Android: Android is the most popular mobile operating system, used by over 2 billion users worldwide. It is known for its open-source nature, customization options, and compatibility with a wide range of devices.

Windows Operating System

Windows Operating System (OS) is a graphical user interface (GUI) based operating system developed by Microsoft Corporation. It is designed to provide users with a user-friendly interface to interact with their computers. The first version of the Windows Operating System was introduced in 1985, and since then, it has undergone many updates and upgrades. Windows Operating System is compatible with a wide range of hardware and software applications, making it a popular choice for both personal and business computing. It has a built-in security system to protect the computer from malware and viruses and provides a comprehensive file management system that makes it easy for users to organize and access their files. Windows Operating System also allows users to run multiple applications simultaneously, making it easy to work on multiple tasks at the same time.

Features of Windows Operating System

Here are some features of the Windows Operating System:

Control Panel: The control Panel is a centralized location within Windows where users can manage various system settings, including security and privacy, display, hardware and sound, and programs. It provides users with access to a range of tools and settings, making it easy to customize the Windows experience.
Internet Browser: An Internet Browser is a software application that allows users to access and browse the Internet. Windows provides a built-in internet browser called Microsoft Edge, which includes features such as tabbed browsing, search suggestions, and web notes.
File Explorer: File Explorer is a file management tool that allows users to browse, open, and manage files and folders on their computers. It provides a user-friendly interface for users to view and manage files and includes features such as search, copy, move, and delete.
Taskbar: Taskbar is a horizontal bar that appears at the bottom of the Windows desktop. It provides quick access to frequently used applications and displays open windows and programs. The taskbar also includes system icons such as volume, network, and battery status.
Microsoft Paint: Microsoft Paint is a graphics editing software that allows users to create and edit images. It provides users with basic drawing tools such as a pencil, brush, and eraser, and allows users to add shapes, text, and images to their designs.
Start Menu: Start Menu is a menu that appears when users click the Start button on the Windows taskbar. It provides access to frequently used applications, settings, and files, and includes a search bar that allows users to quickly find files and applications.
Task Manager: Task Manager is a system tool that allows users to view and manage running applications and processes. It provides users with information about CPU and memory usage and allows users to end unresponsive programs and processes.
Disk Cleanup: Disk Cleanup is a system tool that allows users to free up space on their hard drives by removing unnecessary files and data. It scans the system for temporary files, cache, and other unnecessary data, and provides users with the option to remove them.
Cortana: Cortana is a virtual assistant software that allows users to interact with their computers using voice commands. It provides users with access to information, and reminders, and can perform tasks such as sending

Various Versions of Windows Operating System

Here are some of the major versions of the Windows Operating System:

Windows 1.0: This was the first version of the Windows Operating System, released in 1985. It was a graphical user interf
calendar, and notepad.

Windows 2.0: This version was released in 1987, and introduced features such as support for VGA graphics, keyboard shortcuts, and improved memory management.

Windows 3.0: This version was released in 1990, and was the first widely successful version of the Windows Operating System. It introduced features such as Program Manager, and File Manager, and improved support for graphics and multimedia.

Windows 95: This version was released in 1995, and was a major milestone for Windows. It introduced the Start menu, taskbar, and support for plug-and-play devices. It also included the Internet Explorer web browser.

Windows 98: This version was released in 1998, and included improvements to the Start menu and taskbar, as well as support for USB devices.

Windows 2000: This version was released in 2000, and was designed for business use. It included features such as Active Directory, improved network support, and support for the NTFS file system.

Windows XP: This version was released in 2001, and was a major overhaul of the Windows interface. It introduced a new visual style, improved performance, and support for wireless networks.

Windows Vista: This version was released in 2006, and included a new interface called Aero, as well as improved security features.

Windows 7: This version was released in 2009, and included improvements to the Start menu, taskbar, and Aero interface. It also introduced new features such as Jump Lists and Libraries.

Windows 8: This version was released in 2012, and was designed for touchscreens and tablets. It introduced the Start screen, as well as new apps and features such as Charms and Snap.

Windows 10: This version was released in 2015. It includes a redesigned Start menu, support for virtual desktops, and new apps and features such as Cortana and the Edge browser.

Windows 11: It is the latest version of the Windows operating system, released by Microsoft in October 2021. It builds upon the foundation of Windows 10, with a focus on enhancing the user experience and improving performance and security.

Lunix Operating System

Linux is a powerful and flexible family of operating systems that are free to use and share. It was created by a person named Linus Torvalds in 1991. What's cool is that anyone can see how the system works because its source code is open for everyone to explore and modify. This openness encourages people from all over the world to work together and make Linux better and better. Since its beginning, Linux has grown into a stable and safe system used in many different things, like computers, smartphones, and big supercomputers. It's known for being efficient, meaning it can do a lot of tasks quickly, and it's also cost-effective, which means it doesn't cost a lot to use. Lots of people love Linux, and they're part of a big community where they share ideas and help each other out. As technology keeps moving forward, Linux will keep evolving and staying important in the world of computers.

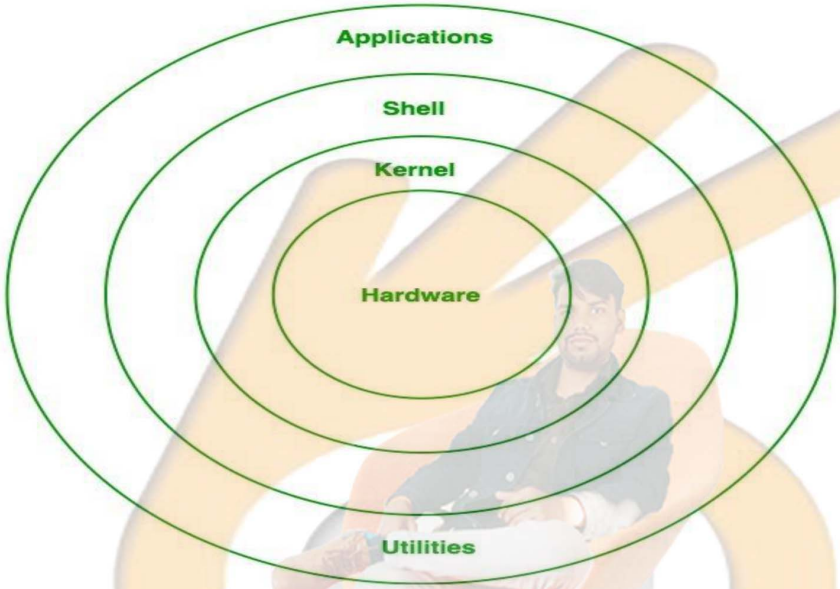
Linux Distribution

Linux distribution is an operating system that is made up of a collection of software based on Linux kernel or you can say distribution contains the Linux kernel and supporting libraries and software. And you can get Linux based operating system by downloading one of the Linux distributions and these distributions are available for different types of devices like embedded devices, personal computers, etc. Around 600 + Linux Distributions are available and some of the popular Linux distributions are:

1. **MX Linux**
2. **Manjaro**
3. **Linux Mint**
4. **elementary**
5. **Ubuntu**
6. **Debian**
7. **Solus**
8. **Fedora**
9. **openSUSE**
10. **Deepin**

Architecture of Linux

Linux architecture has the following components:



Kernel: Kernel is the core of the Linux based operating system. It virtualizes the common hardware resources of the computer to provide each process with its virtual resources. This makes the process seem as if it is the sole process running on the machine. The kernel is also responsible for preventing and mitigating conflicts between different processes. Different types of the kernel are:

Monolithic Kernel
Hybrid kernels
Exo kernels
Micro kernels

System Library:Linux uses system libraries, also known as shared libraries, to implement various functionalities of the operating system. These libraries contain pre-written code that applications can use to perform specific tasks. By using these libraries, developers can save time and effort, as they don't need to write the same code repeatedly. System libraries act as an interface between applications and the kernel, providing a standardized and efficient way for applications to interact with the underlying system.

Shell:The shell is the user interface of the Linux Operating System. It allows users to interact with the system by entering commands, which the shell interprets and executes. The shell serves as a bridge between the user and the kernel, forwarding the user's requests to the kernel for processing. It provides a convenient way for users to perform various tasks, such as running programs, managing files, and configuring the system.

Hardware Layer: The hardware layer encompasses all the physical components of the computer, such as RAM (Random Access Memory), HDD (Hard Disk Drive), CPU (Central Processing Unit), and input/output devices. This layer is responsible for interacting with the Linux Operating System and providing the necessary resources for the system and applications to function properly. The Linux kernel and system libraries enable communication and control over these hardware components, ensuring that they work harmoniously together.

System Utility: System utilities are essential tools and programs provided by the Linux Operating System to manage and configure various aspects of the system. These utilities perform tasks such as installing software, configuring network settings, monitoring system performance, managing users and permissions, and much more. System utilities simplify system administration tasks, making it easier for users to maintain their Linux systems efficiently.

Advantages of Linux

1. The main advantage of Linux is it is an open-source operating system. This means the source code is easily available for everyone and you are allowed to contribute, modify and distribute the code to anyone without any permissions.

2. In terms of security, Linux is more secure than any other operating system. It does not mean that Linux is 100 percent secure, it has some malware for it but is less vulnerable than any other operating system. So, it does not require any anti-virus softwar e.

3. The software updates in Linux are easy and frequent.

4. Various Linux distributions are available so that you can use them according to your requirements or according to your taste.

5. Linux is freely available to use on the internet.

6. It has large community support .

7. It provides high stability. It rarely slows down or freezes and there is no need to reboot it after a short time.

8. It maintains the privacy of the user.

9. The performance of the Linux system is much higher than other operating systems. It allows a large number of people to work at the same time and it handles them efficiently.

10. It is network friendly.

11. The flexibility of Linux is high. There is no need to install a complete Linux suite; you are allowed to install only the required components.

12. Linux is compatible with a large number of file formats.

13. It is fast and easy to install from the web. It can also install it on any hardware even on your old computer system.

14. It performs all tasks properly even if it has limited space on the hard disk.

Disadvantages of Linux

1. It is not very user-friendly. So, it may be confusing for beginners.

2. It has small peripheral hardware drivers as compared to windows.