

COMPUTER SYSTEMS

CHAPTER 2

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MEANING OF COMPUTER SYSTEMS

- Computer System is collection of Hardware (Physical Components), software(Programs like operating system and Applications) and User that work together to process data and perform tasks.

HARDWARE

- Hardware are physical components of computer system that can be seen and touched
- They are used for performing various tasks, including entering data, processing data and displaying data.

Physical Components

- **Computer Case or System Unit**
- Is the enclosure that houses the main internal components of a computer
- Its primary role is to protect and arrange these internal components and connect them to external components which are usually known as peripherals.

Internal Components

- **1. Motherboard**
- This serves as the primary circuit board that establishes connections and enables communication among all the other computer component
- **2. Processing unit (CPU)**
- **C**entral **P**rocessing **U**nit is the brain of the computer responsible for executing instructions.
- **3. Memory Include (RAM and ROM)**
 - (a) **R**andom **A**ccess **M**emory is temporary storage for data and instructions that the CPU is currently using.
 - (b) ROM- **R**ead **O**nly **M**emory contains permanent instructions that cannot be modified or altered.

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- **4.Storage Devices (Hard Disk Drives{HDD} Solid State Drives-{SSD})**
 - Are used for long term storage of data and programs
 - **5. Input/ Output Devices**
 - Allows users to interact with the system such as Keyboard, Mice, Monitors, Printers
 - **6. Cooling System**
 - The system unit often includes fans or other cooling mechanisms to prevent overheating of the components

- **7. Ports and Connectors**

- These are used to connect external devices, such as monitors, keyboards mice and USB devices to the computer.

- **8. Expansion Slots:**

- These slots enable the addition of extra components like graphics cards, sound card, Network Cards,

- **9. Power Supply Unit (PSU)**

- PSU provides electrical power to the computer system and its components

External Components

- External components or parts of computer system unit are typically those elements that are not housed within the computer Case

SOFTWARE

- This refers to the programs and instructions that tell the hardware what to do. Software include:
- **1. Operating System(OS)**
- Manages the computer's resources and provides a user interface.
- **2. Application Software**
- Programs designed for specific tasks like word processing, web browsing and information.

DATA

- These are the raw facts entered in to a computer system that is used to make decisions, solve problems or gain insights

USERS

- Refers to individuals who interact with and utilize the computer and its resources to perform various tasks and achieve specific objectives

GENERATIONS

- Computer Generation refers to the ongoing evolution and development of computers and computing technology over several generations.
- Each generation represents a significant leap in terms of hardware, software and overall computing abilities.

FIRST GENERATION

- i. These are computers that were developed between the 1940s -1950s
- ii. They were characterized by vacuum tubes as the primary electronic components
- iii. Computer were large, expensive and consumed a lot of power
- iv. Examples include the ENIAC and UNIVAC computers
- v. They had limited computational capabilities and were used primarily for Scientifics and military applications
- vi. They were using machine level language programming

SECOND GENERATION

- i. They were developed between 1950s -1960s
- ii. They used transistors instead of vacuum tubes
- iii. They had smaller sizes compared to the first generation computers
- iv. They had less power consumption
- v. Magnetic core memory was introduced, improving data storage
- vi. They used assembly languages and high level programming languages Fortrain and COBOL emerged
- vii. They had batch processing capability and the concept of operating systems began to develop

THIRD GENERATION

- i. They were developed between 1960s -1970s
- ii. They used Integrated Circuits(ICs)
- iii. They became smaller in size compared to the second Generation
- iv. Introduction of the IBM SYSTEM/ 360 SERIES AND EARLY MANIFRAMES
- v. They used high level programming languages like BASIC and PASCAL
- vi. Multiprogramming and time sharing operating systems allowed multiple Users to Interact with Single Computer simultaneously

FOURTH GENERATION

- i. They were developed between 1970s -1980s
- ii. They used very large Scale Integration(VLSI) technology that enabled the creation of microprocessors
- iii. Personal computer PCs like the IBM PC and Apple II were Introduced
- iv. They had Graphic User Interfaces (GUIs and Mouse was Invented
- v. High level language such C,C++ and JAVA gained popularity
- vi. Networking nad the Internet bagan to take shape

FIFTH GENERATION

- i. They were developed between 1980s-Present
- ii. They continued to deploy advancements in microprocessor design, storage and networking
- iii. PCs became more affordable and widespread
- iv. They was the rise of mobile computing, with laptops, smartphones and tablets
- v. Artificial intelligence (AI) and machine learning gained prominence
- vi. Cloud computing and virtualization changed how data and software are stored and managed

FUTURE GENERATIONS

- i. Quantum computing holds the promise of exponential processing power
- ii. Neuromorphic computing mimics human brain architecture for AI applications
- iii. Continued advancements in nanotechnology may lead to even smaller and more powerful computing devices
- iv. Increased emphasis on sustainability and energy efficiency in computing

CLASSIFICATION OF COMPUTER(types of Computers)

- Modern computers can be classified using different criteria
- There are four criteria:
 1. Classification based on performance / size
 2. Classification based on Portability
 3. Classification based Signal/ Operation Principle
 4. Classification based on Purpose

CLASSIFICATION BASED ON PERFORMANCE / SIZE

- *PERSONAL COMPUTERS/ MACROCOMPUTER*
- Personal computers (PCs) are small computers designed for personal use. Their small sizes, capabilities and affordable price make them useful and comfortable for personal use.
- Example of Personal Computers are Desktop and Laptop Computers

- ***WORKSTATION COMPUTERS***

- Workstation computer are desktop computers that are more powerful than normal PCS in term of processing power.
- This computers are mainly used by engineers and scientists for demanding tasks that require high processing power and high quality images.
- For example Computer Aided Design (**CAD**) used for engineering designs
- Computer Aid Manufacturing (**CAM**), used to automate manufacturing processes

- ***MINICOMPUTER***

- Minicomputer designed to support multiple users at a time.
- These computers have large storage capabilities and operate at a higher speed
- Minicomputers are used in systems that involve many users (Multi user systems).
- Minicomputers can be also used as servers in local Area Network

- ***MAINFRAME COMPUTERS***

- Mainframe computers are very powerful computer. They also have a very large storage capacity and they can handle the workloads of many users.
- Mainframe computers are commonly used to control large networks in business companies like Google, yahoo, Microsoft Network(MSN).
- Such companies have millions of users using computers concurrently

- ***SUPERCOMPUTERS***

- Supercomputers are the most powerful and most expensive computers.
- They are used for jobs requiring massive computational power like weather forecasting and engineering design.
- Supercomputers have higher processing speeds than all other computers.
- The main difference between supercomputers and mainframes is that supercomputers channel all their power into executing a few programs as fast as possible. In contrast, mainframes use their power to execute multiple programs concurrently

CLASSIFICATION BASED PORTABILITY

- *Desktop Computers*
- A desktop computer is a personal computer intended to regular use at a single location on a desk or table due to its size and power requirements. Desktop computers can be interconnected and can share resources such as printers.

- *Laptops Computers*

- A laptop computer is a portable personal computer suitable for mobile use as seen.
- Labtops are commonly used for various purposes such as work, education and other personal tasks.
- A laptop is made up of components like those of desktop computer namely the display, speakers, keyboard and mouse combined into a single device.

- ***Notebooks Computers***

- Notebooks computers are small compared to laptop computers. Besides the size and portability, the main difference between a notebook computer and a laptop is display screen.
- Notebook computers use various techniques known as flat panel technologies to produce a lightweight and non bulky display screen

- *Palmtops*

- Palmtops are small computer that literally fit in your palm. Compared to full size computers, palmtops are severely limited in functionality.
- They are commonly known as Personal Digital Assistant(PDAs).
- Due to advancement of mobile technologies the palmtop is being replaced with smartphones, which are even smaller. Smartphones are more advanced in terms of processing power, storage capacity and multitasking.

- *Tablets*

- A tablet is a mobile computer with a touchscreen display.
- Tablets are equipped with various sensors such as accelerometers, cameras and microphones allowing one to use finger or stylus gestures instead of a mouse and keyboard.
- Some tablet contain physical buttons which control basic features such as volume and power.

CLASSIFICATION BASED SIGNAL/ OPERATION PRINCIPLE (FUNCTIONALITY)

- ***1. ANALOG COMPUTERS***
- Analog computer can store data in the continuous form of physical quantities and performs computations with the help of measurements. Audio mixer is an example of analog computers



- ***2. DIGITAL COMPUTERS***

- Digital computers are the most common class of computers used today.
- They perform computational and logical operations with discrete quantities represented as numbers in digital form. (0's and 1's

- 3. ***HYBRID COMPUTERS***

- Desirable features of analog and digital computers can be combined to create a hybrid computers
- This computer performs arithmetic operations and measures different phenomena
- Example 1 **electrocardiogram (ECG)** this used to records electrical changes in a patient's heart
- 2. **Modem** used to converts digital signals into analog signals

CLASSIFICATION BASED ON PURPOSE

1. General Purpose computers

These are computers such as PC designed to perform various functions and operations because they can store and execute different programs in their internal storage.

Computers can be used to accomplish different tasks include writing and editing documents , playing music , watching movies and doing scientific computations

2. Special Purpose Computers

Special/ specific purpose are designed for specific tasks and their job is to solve a particular problem.

Example of Special Purpose Computers include Electronic Fiscal Devices (EFD) which is used in tax collection

CHARACTERISTICS OF COMPUTERS

- *Versatility*
- Computers are versatile in nature. They can perform different types of tasks with the same accuracy and efficiency.
- Also can be used in different areas like school, hospitals e.t.c
- Example you can use computer to prepare a letter and at the same time play music, print a document or follow an online class

- *Speed*

- Computers can process data very fast, at the rate of millions of instructions per second. Some calculations that seem impossible to complete in a short time are performed in a few second by a computer.
- Examples salary slips of thousands of employees and processing of examination results.

- ***Accuracy***

- The computer provides a high degree of accuracy.
- For example, the computer can accurately give the result of the division off any two numbers up to 10 decimal places.
- Computer can perform operations and process data faster nut with accurate results and no error. Results can be wrong only if incorrect data is fed to the computer.

- *Diligence*

- When used for a longer period the computer does not get tired or fatigued.
- It can perform long and complex calculations with the same speed and accuracy from the start till the end.

- *Storage Capability*

- Large volumes of data and information can be stored in the computer and retrieved whenever required.
- Primary memory store data temporarily while secondary memory store data permanently

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- *They can communicate*
 - Computers have the ability to communicate, but of course there needs some sort of connection (either Wired or Wireless connection). Two computers can be connected to send & receive data. Special softwares are used for text and video chat. Friends & family can connect over the internet and share files, photos & videos online.

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- *We can do multitasking*
 - Multitasking is also a computer characteristic. Computers can perform several tasks at a time.
 - For example you can listen to songs, download movies, and prepare word documents all at the same time.

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- *Dependency*
 - It functions as per the user's instruction, thus it is fully dependent on humans.
 - *Environment*
 - The operating environment of the computer should be dust free and suitable.

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- *No Intelligence*
 - Computers don't have any intelligence of their own.
 - They follow a set of instructions fed into them by manufacturer.
 - The user knows what to do and when to perform a specific task.

No IQ

Computer is a dumb machine and it cannot do any work without instruction from the user.

It performs the instructions at tremendous speed and with accuracy.

It is you to decide what you want to do and in what sequence. So a computer cannot take its own decision as you can.

No Feeling

It does not have feelings or emotion, taste, knowledge and experience.

Thus it does not get tired even after long hours of work. It does not distinguish between users.