Al-Mustaqbal University

College of Engineering and Technology

Department of Computer Techniques Engineering

Class: Second Class

Subject: Computer Architecture

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Lecture Address: Introduction to Computer System Organization

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Introduction to computer system Organization

What Is Computer System?

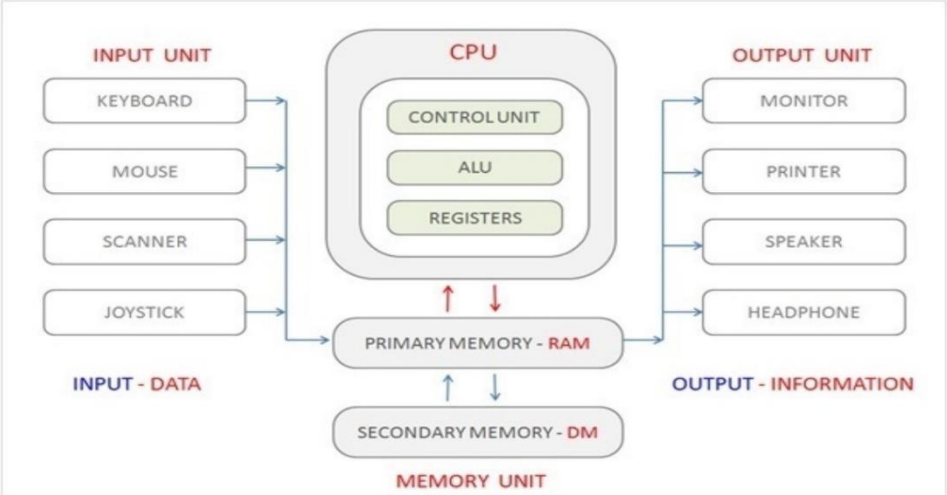
In this introduction to Computer System, we will discuss in detail what is a computer system, basics of computer, technical features of the computer system, computer hardware, computer software architecture and other important topics related to the computer system .

A computer system is defined as a digital electronic machine that can programmed to perform some operations as per the computer program instructions.

The computer system consist of both hardware and the software component
The computer hardware components are the physical components mounted within the computer case and some are also connected externally.

The computer system needs to be directed to perform various user specified operations.
And therefore , the computer system needs a program which directs the computer hardware . The computer program is also commonly referred to as software.

Computer System Block Diagram



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Introduction To Computer System

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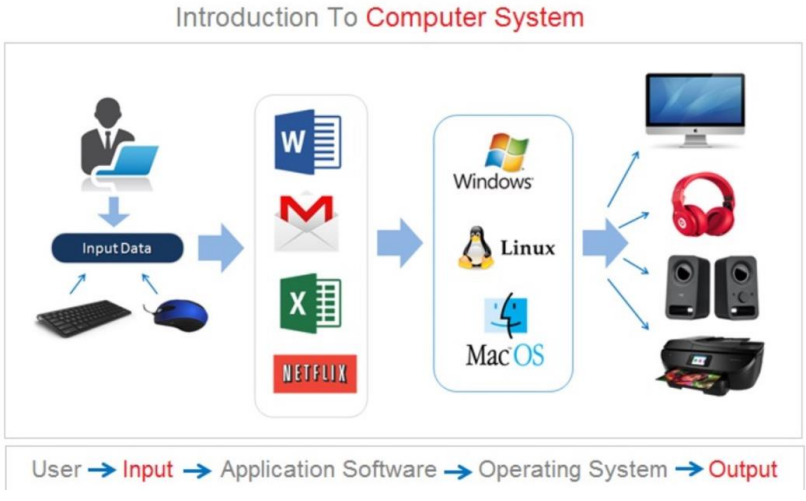
What Is Computer System ?
Computer Definition

A computer system is defined as a digital electronic device that can be programmed to accept inputs in term of data , then process this data as per the program instructions and provide the output in the desired format that can be used for some meaningful work.



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The computer user interacts with the system using an application software and provides the input data. The data is processed by the computer system with the help of application software.

The application software in turn interacts with the operating system and the processed data (or we can call program output) is then sent to the output device.

It is the application software that provides the instructions to the processor CPU to operate on the data as per the program instructions and produce the desired output.

The output device could be either a monitor , speaker, printer , storage device or any other output device.

Features Of The Computer System

- Computer System Is Programmable .
- Computer Accepts Raw Data And Produces Information.
- Computer System Is A Digital Machine.

• Computer System Is Programmable

The computer system consist of both software components and hardware components .

The hardware components are physical parts that we can touch and interact . Whereas , the software is essential to drive the hardware.

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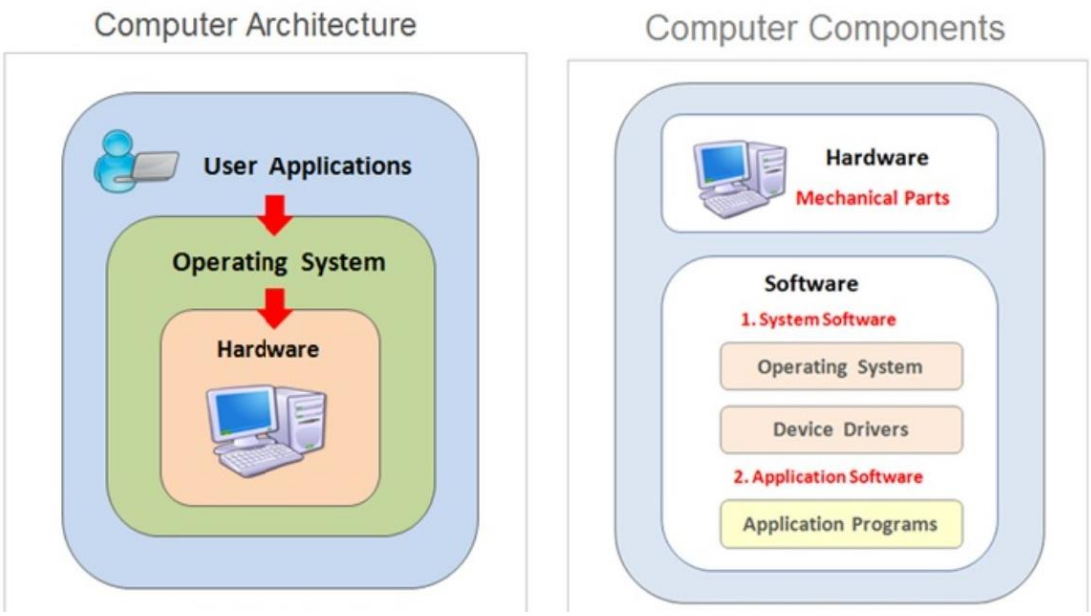
The computer program (software) is an essential components of every computer system which directs the computer to performs various tasks.



The Computer system is programmable. The computer will perform the tasks only as per the program instructions.

The accuracy of the output depends upon the accuracy of the program instructions. The computer will produce wrong result if either input data or the program instructions are inaccurate , this is called garbage in and garbage out.

And therefore ,the computer needs a program written in a programming language to execute a particular task on the computer system.

The Computer program directs the computer system through series of instructions. Each program instruction performs a specific part of the operation.

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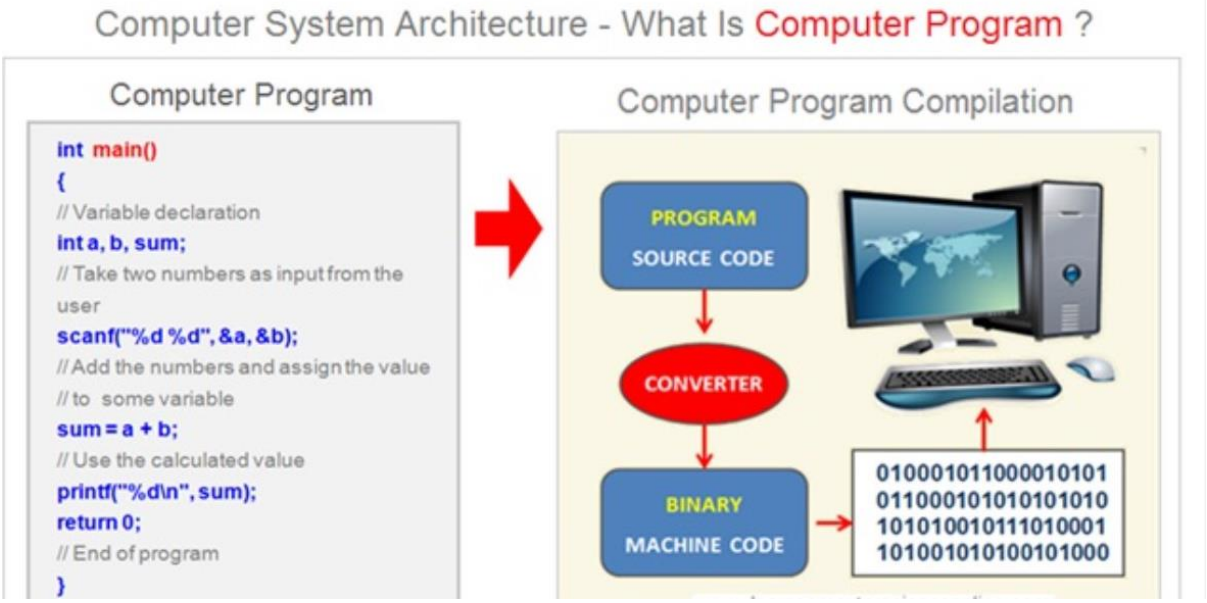

Functions of Computer

Computer are now extensively used in every field we can possibly think of. Computers can handle simple tasks as well as highly tasks without any problem . further , computer science is rapidly advancing both in terms of hardware and software.

A computer system is combination of hardware and software that performs a Multitude of functions . computer can be programmed to handle everything from basic data processing to advanced applications across various domains.

It has become an integral part of modern life, impacting how we work , communication , entertainment , manufacture , and conduct research. In computer architecture , every computer perform four basic functions necessary for computer to work and execute the program instructions.

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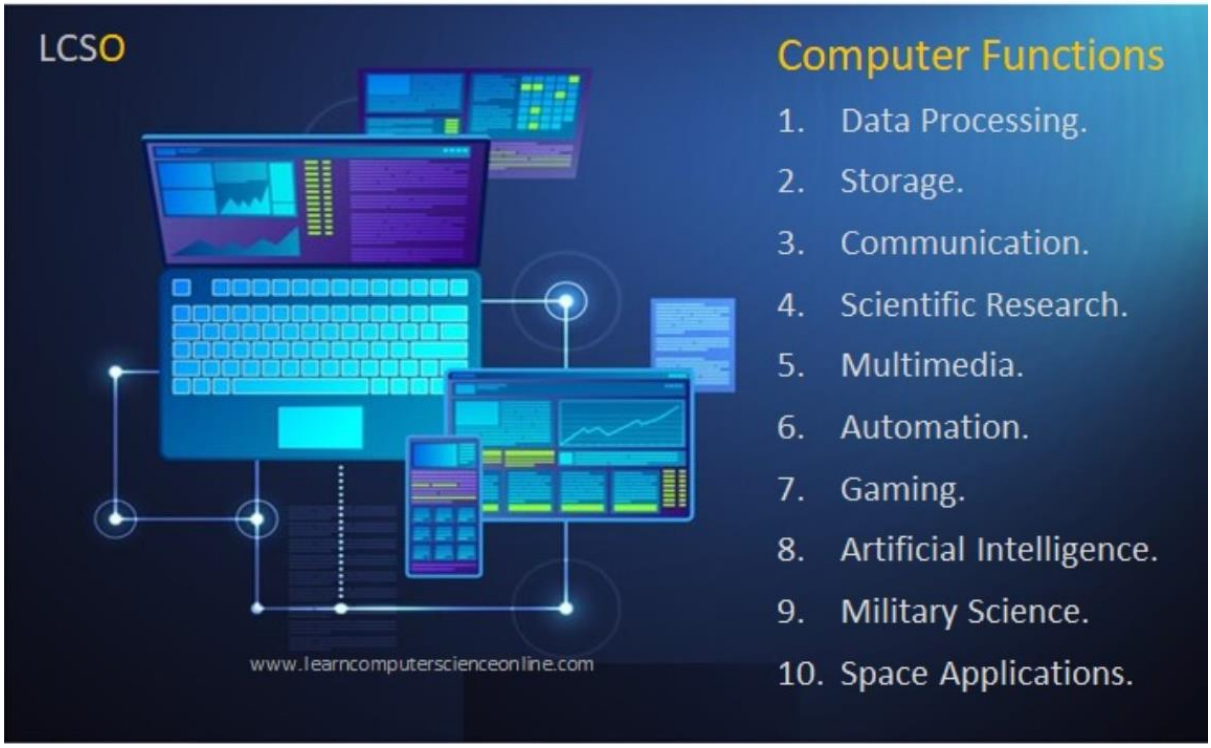

Applications Of Computer

1-Data Processing : Computer can process vast amount of data quickly and accurately.
Computer can operate on data , perform calculations, sort information , and make decision based on predefined algorithms

2- Storage : Computer can store data for immediate or long –term use. Computers are used to store and manage large volumes of data with the help of special software called Database Management System (DBMS). The DBMS can handle of types of data from text documents and images to software application and multimedia files.

3-Communication : Computers are essential for managing computer networks and communication , including email , messaging , video conferencing and internet browsing .

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4-Multimedia: Computer are extensively used to create , edit and play multimedia content including audio , video and images. Multimedia content is essential part of online education.

5- Automation : Computers can control , manage and automate a wide range of process, from industrial manufacturing , process management to home appliances.

6- Information Retrieval : they can access vast amount of data , extract information and knowledge on the internet and retrieve specific data through search engines.

7- Gaming : Computers are a popular platform for gaming , from simple browser games to virtual reality , 3D games with complex , graphics – intensive titles.

8- Research and Analysis : R&D is essential part of development of modern technology and scientific research . they play a crucial role in scientific research , data analysis , and simulations for various fields.

9- Creativity : Computers assist in graphic design , music composition , 3D modeling ,and various creative endeavors.

What Is Computer Program ?

The software components are computer programs . The program consist of set of instructions that directs the computer system hardware components to perform the desired operations.

The computer program are generally written using high level (human readable) programming language such as C , C++ , Java , python and many more.

However , a high level programs are first require to be converted into low level (machine code) machine instructions in the binary. The machine

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instructions in binary at can be directly decoded and executed by the computer . This conversion is called program compilation.

The computer system interprets these program instructions and then performs the desired operations . The CPU executes the program instructions one by one .

What is software?

Software is a set of instructions, data or programs used to operate computers and execute specific tasks

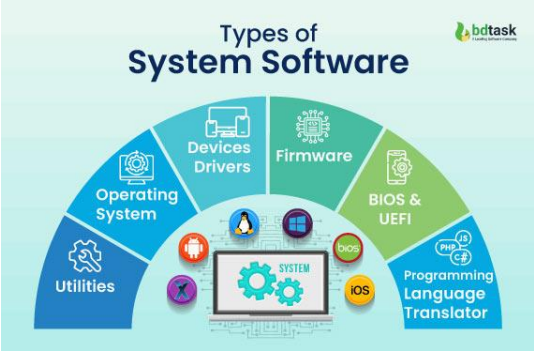
How does software work?

All software provides the directions and data computers need to work and meet users' needs. However, the two different types -- application software and system software -- work in distinctly different ways.:

What Is System Software?

The system software is basically a platform that controls and manages the hardware (processors, devices, memory). It also provides an interface to run the application software.

It's a media that connects users with the computer. However, users do not interact with the system directly. But they can interact using the GUI provided by the system software itself, The system software automatically runs on a computer system



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According to work, we can categorize System software into six types.

1.Operating Systems: The operating system or OS is system software that controls all the software resources and interacts with the hardware.

2.Language Translator: this type of system software is used for translating high-level programming languages into low-level machine languages.

3. Utility software: utility software is the software that optimizes, maintains, and controls computer resources. Antivirus software, backup software, etc., are examples of utility software.

4. Device Driver: a tiny program that helps to draw a communication connection between the computer and different external hardware devices (printers, scanners, and keyboards)

5.Firmware: a type of software that is embedded with hardware devices. Usually, it is stored in ROM and cannot be modified or deleted in any way.

6.BIOS and UEFI: The full form of BOIS(basic input/ output system) and UEFI (unified extensible firmware interface). It's a form of firmware code that starts working when the computer is powered on.

Features of System Software

- Written in a low-level language
- Close to the system
- Fastest software execution
- Difficult to design and understand
- Not interactive with users
- Create an interface between hardware and application software
- Small in size

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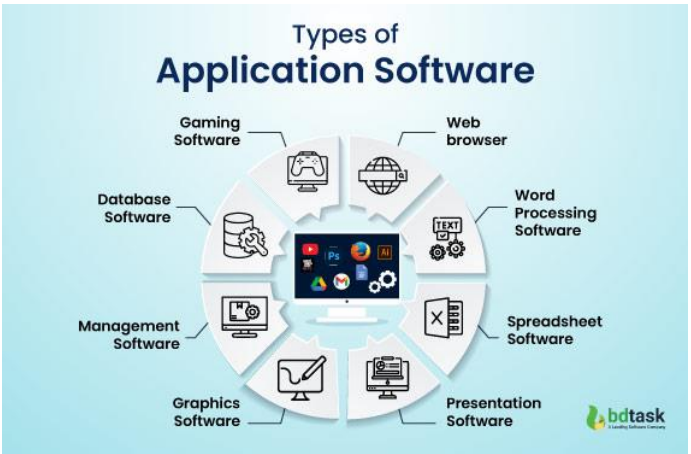
Function Of System Software

- Memory management
- Processor management
- File management
- Security
- Error-detecting aid
- Scheduling

What Is Application Software?

Application Software is the set of programs that runs as per the user's command to fulfill the following task. It runs on the platform designed by system software.

Unlike the system software, users can directly interact with the application software. Users can install the application software manually into their computer but cannot run it on a computer if the system software doesn't allow it.



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- Web browser: the browsers we use every day, such as Chrome, Firefox, Safari, etc., are application software.

- Word processing software: an application software that facilitates writing, creating, editing, saving, and printing documents. Ex: MS Word

- Spreadsheet software: another computer program that facilitates numerical function, accounting worksheet. Ex: MS Excel

- Presentation software: a computer program that facilitates different presentation graphics such as word series of pictures to support public speaking.

- Gaming Software: Need for Speed, Mine craft, Vice City, and millions of other games are also types of application software.

- Database Software: Database software is mainly used by mid to big-scaled institutions to save and maintain their data.

- Management Software: management software is also used by medium to large corporations to handle their everyday tasks.

- Graphics software: this type of software is used for creating and editing photos and videos.

- Multimedia software: text, audio, image, animation, video, etc., from playing to production of interactive content, all can be done.

Features of Application Software

- Written in high-level programming language
- Most of the time, it needs huge memory to install
- Easy to develop
- Made for end-users
- Create an interface between users and the system
- It can’t run without user interaction

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- Slower execution compared to the system software

Function Of Application Software

- Used for data analysis or information storage
- Document or project management
- Emails, text messaging, audio and video conferencing
- Graphics, animations, and video development
- Software for accounting, payroll, finance, eLearning and healthcare management

The Computer Accepts Raw Data And Produces Information

The computer system are versatile machines and can be used to perform number of operations. The data processing is one of most common application of the computer

For example, a company might use the computer system for managing employee records stored into the database , customer database, inventory management , billing , record keeping , payroll processing , accounting and many such applications.

In order to use the computer system for any database operations , a DBMS (Database Management System) software is required.

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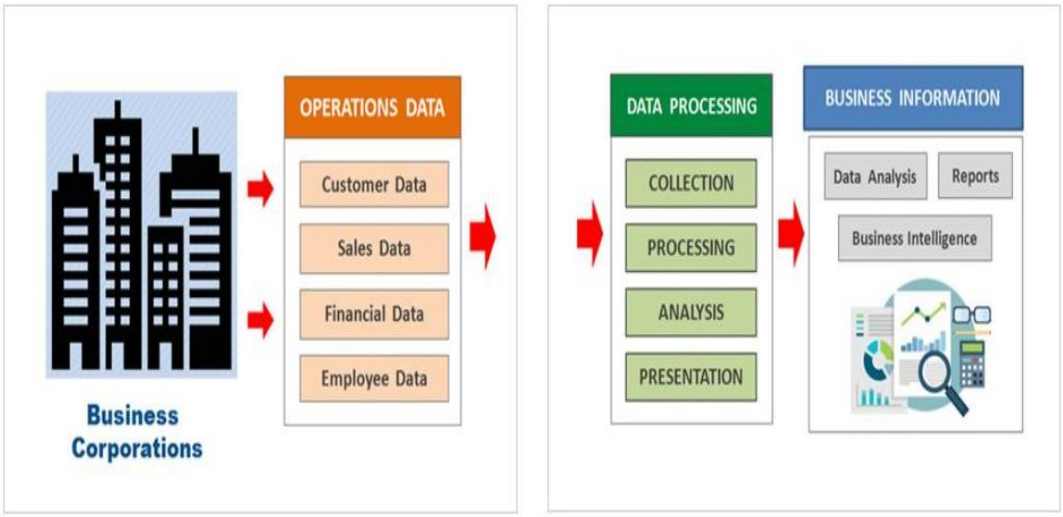

The computer system is also used to process the raw data and produce the information .

That can be used for some meaningful purpose.

The process data is called information , and the information can be used for some meaningful work such as decision making within an organization.

Computer System Is A Digital Machine

The computer is a digital electronic machine . Which means , computer can understand and execute instructions on binary , Which consist of only two numbers that is zero 0 and one 1 . The binary code is also referred as machine code or machine language.

The computer central processing unit (CPU) is the brain of the computer system . the CPU is responsible to perform both arithmetical and logical operations.

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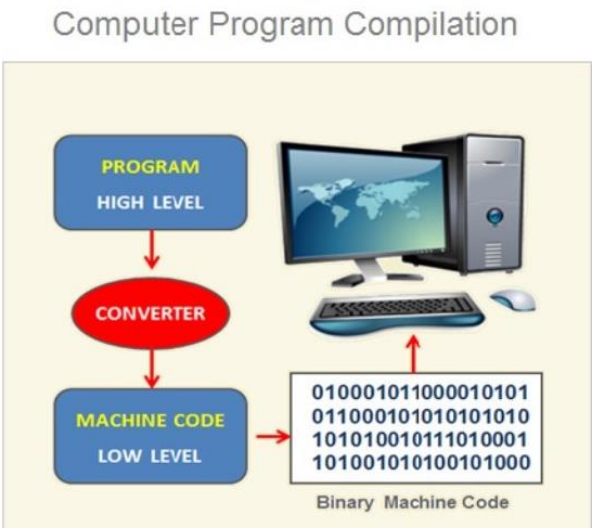

However , the computer micro-processor (CPU) can decoded and executed instructions only in the machine code in Binary.

So it doesn't really matter in which programming language you write the program code because eventually , all high level computer programs must be first converted into low level machine code in binary .

Why Computer Use Binary Number System?
But
what is Binary Number System ?

In mathematic a binary number is used to represent any number using only two numerical numbers that is 0 and 1 . And therefore , the binary number system is extensively used in the field of digital electronics due to ease of its straight forward implementation .

In digital electronics , it become very easy to define two states ON and OFF using binary , the number 1 is used to indicate ON whereas the number 0 represent OFF state

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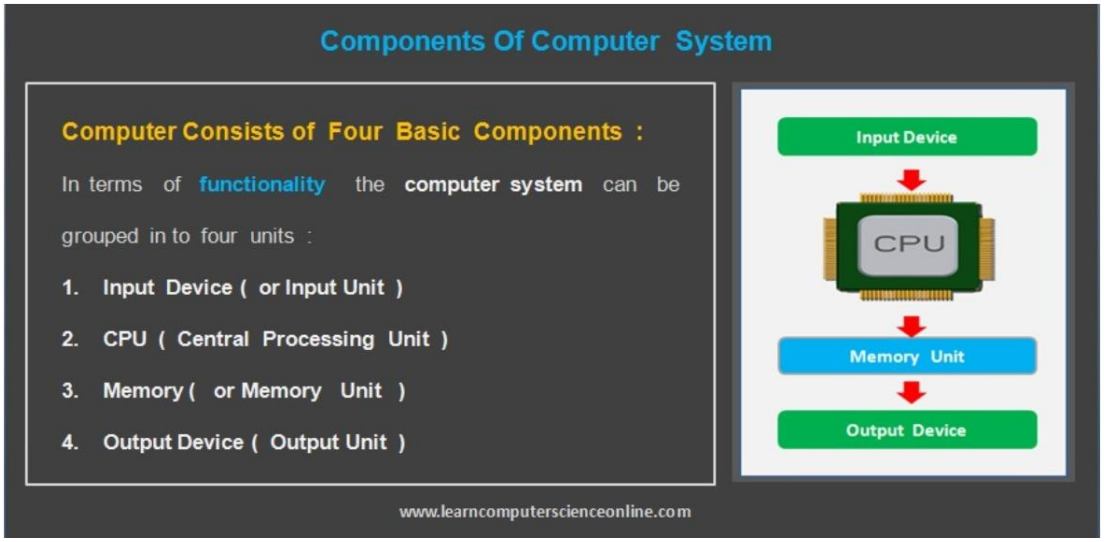
Number Systems

System	Base	Digits
Binary	2	0 1
Octal	8	0 1 2 3 4 5 6 7
Decimal	10	0 1 2 3 4 5 6 7 8 9
Hexadecimal	16	0 1 2 3 4 5 6 7 8 9 A B C D E F

Component Of Computer system



Input And Output Devises

Computer System Input Unit

The term "Input Unit" (Input Devises) refers to the input provided by the user by using any input devices such as keyboard, mouse , mike, camera or any storage device in the form of input data.

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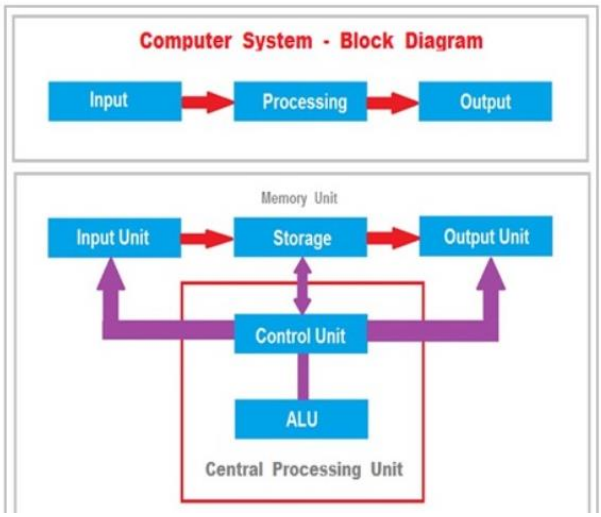
The input data is operated and processed by the Central Processing Unit (CPU) as per the program and sent to the output unit for further action.



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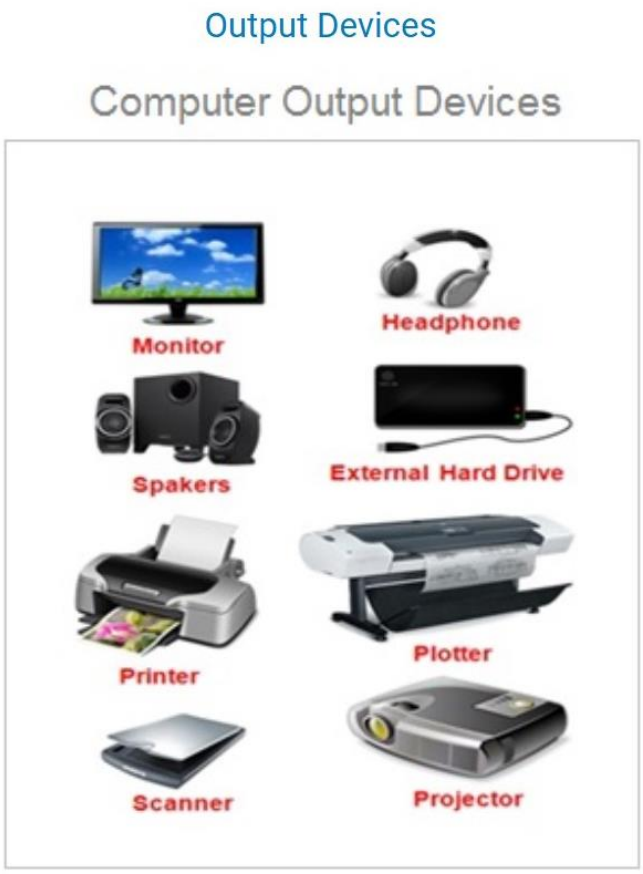
Computer System Output Unit

The term" Output Unit " refers to the output provided by the computer CPU after the processing the user data inputs.

This output is then sent to the output devices such as , printer, speaker, to provide desired output to the user . The output can also be stored on any storage device for future use.



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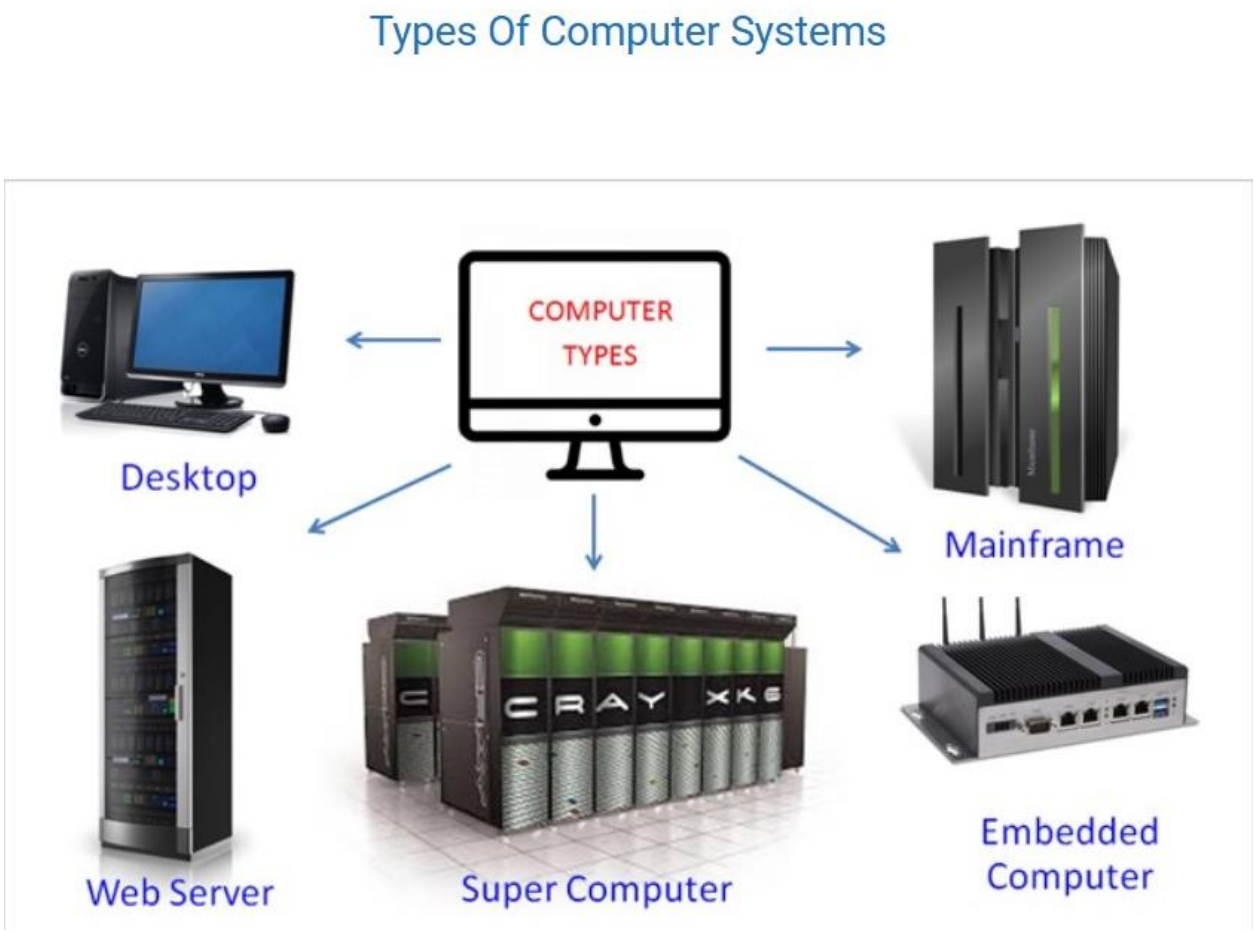
Types Of Computer System

Different types of computer system are used for various application in many fields . The system configuration can differ in terms of processor architecture, number of processor , memory size. Motherboard design and other factors.



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- Desktop Computer.
- Palmtop Computer.
- Workstation Computer.
- Web Server Computer.
- Mini Computer.
- Mainframe Computer.
- Super Computer.
- Embedded Computer.

Computer System Architecture

What is Computer System Architecture?

Question about the lecture :

1. What is a computer system?
2. What is the role of the software in a computer system?
3. Why is the computer referred to as a programmable machine?
4. What are the four basic functions of a computer system?
5. How does the input unit of a computer system interact with the CPU?

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