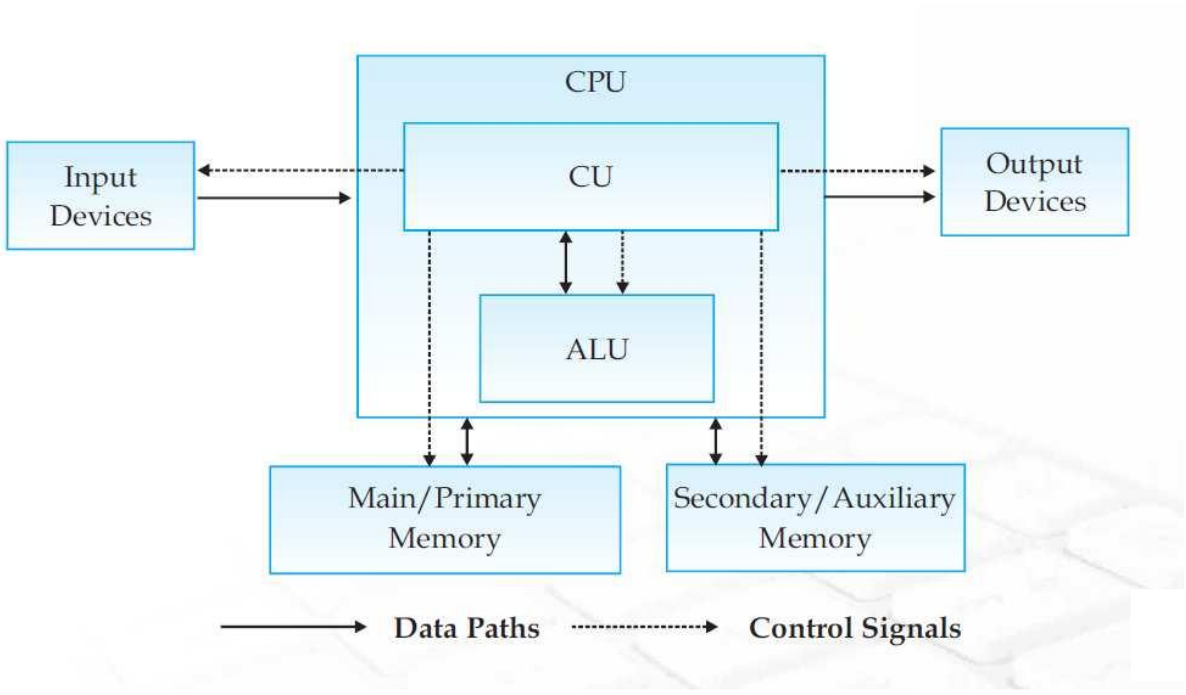
Unit-I
Introduction to Computer System
Hardware Concepts

A computer is an electronic device that processes input data and produces result (output) according to a set of instructions called program.
A computer performs basically five major functions irrespective of its size and make.

- ✓ It accepts data or instructions by way of input
- ✓ It stores data
- ✓ It processes data as required by the user
- ✓ It controls operations of a computer
- ✓ It gives results in the form of output
- ✓ In order to carry out the operations mentioned above the computer allocates the task among its various functional units.



Block diagram of functional units of a computer

A computer receives data and instructions through "Input Devices" which get processed in Central Processing Unit, "CPU" and the result is shown through "Output Devices". The "Main / primary Memory" and "Secondary / Auxiliary Memory" are used to store data inside the Secondary/Auxiliary

Input Devices

1. **Keyboard-** This is the most common input device which uses an arrangement of buttons or keys. Apart formal phablet keys (26 keys), there are several other keys for various purposes such as

a) **Number keys**

b) **Direction keys**
c) **Function keys**
d) **Other keys**

2. **Mouse** - A mouse is a pointing device that functions by detecting two-dimensional motion relative to its supporting surface. By default, the mouse is configured to work for the right hand.

3. Light Pen- It is a light sensitive stylus attached to a video terminal to draw pictures or to select menu options.

4. **Touch Screen -** This device allow interacting with the computer without any intermediate device. You may see it at as KIOSKS installed in various public places

5. **Graphics Tablet -** This device is used to enter data using a stylus. Most commonly it is used to enter digital signatures.

6. **Joystick -** It is an input device consisting of a stick that pivots on a base and translates its angle or direction as data. Joysticks are often used to control inputs in video games.

7. **Microphone -** It is used to input audio data into the computer. They are mainly used for sound recording.

8. O C R (Optical Character Reader) - It is used to convert images of text into machine editable text. It is widely used to convert books and documents into electronic files.

9. **Scanner -** It is a device that optically scans images, printed text or an object and converts it to a digital image.

10. **Smart card reader -** It is used to access the microprocessor of a smart card. There are two broad categories of smart cards - Memory cards and microprocessor cards. Memory cards contain only non-volatile memory storage components, and some specific security logic. Microprocessor cards contain volatile memory and microprocessor components.

11. **Bar Code Reader-** This device read the bar code as input data. It consists of a light source, a lens and a light sensor which translates optical impulses into electrical signals

12. **Biometric Sensors-** It is used to recognize individuals based on physical or behavioral traits. Biometric sensor is used to mark attendance of employees/students in organizations /institutions. It is also popular as a security device to provide restricted entry for secured areas.

13. **Web Camera-** This captures video as data for computer with reasonably good quality. It is commonly used for Web Chats.

CPU

It is responsible for processing the data and instruction. This unit can be divided into three sections:

- ✓ Control Unit
- ✓ Arithmetic and Logical Unit (ALU)
- ✓ Central Processing Unit

Control Unit - This unit coordinates various operations of the computer like:

- It directs the flow of data and instructions in the computer system

- It interprets the instructions of a program in storage unit and produces signals
- It executes the instructions

Arithmetic and Logical Unit- This unit is responsible for performing various Arithmetic operation subtraction, multiplication, division and relational operations such as equal to , greater than , less than, greater than or not equal to and logical operation etc.

Primary Memory Unit
The main or primary memory stores information (instruction and data)
The memory unit is divided into :
Random Access Memory (RAM)
Read Only Memory(ROM)

Random Access Memory is used for primary storage in computers to hold active information of data and instructions.
ROM (Read Only Memory) is used to store the instructions provided by the manufacturer, which holds the instructions to check basic hardware interconnected and to load operating system from appropriate storage device.

Memory: The elementary unit of memory is a bit. A group of 4 bits is called a nibble and a group of 8 bits is called a byte. One byte is the minimum space required to store one character.
Other units of memory are:
1 KB(Kilo Byte) = 210 bytes = 1024 bytes
1 MB(Mega Byte) = 210 KB = 1024 KB
1 GB(Giga Byte) = 210 MB = 1024 MB
1 TB(Tera Byte) = 210 GB = 1024 GB
1 PB(Peta Byte) = 210 TB = 1024 TB

Output Devices
These are used to display results on video display or are used to print the result. These can also be used to store the result for further use.
Monitor or VDU-It is the most common output device. It looks like a TV. Its display may be CRT, LCD, Plasma or touch sensitive.
Speakers-These are used to listen to the audio output of computer.
Printers-These are used to produce hard copy of output as text or graphics.
Dot Matrix Printer-This printer prints characters by striking an ink soaked ribbon against the paper.
Inkjet/Deskjet/Bubble jet printers-These all are low cost printers which use a controlled stream of ink for printing.
Laser Printers :- These printers use laser technology to produce printed documents. These are very fast printers and are used for high quality prints.
Plotters- These are used to print graphics. It is mainly used in computer aided designing.

Communication Bus:- In computer architecture, a bus is a system that transfers data between computer components or between computers.
Address Bus: This is a system of bus, which is used to specify the address of a memory location.

Data Bus-This system of bus is a medium, which transfer the data from one place to another in a computer system.
Control Bus-This system of bus carries the signals that give the report about the status of a device.
Ports - A motherboard has a set of connection points called ports to connect units such as disk, VDU, keyboard etc. In a parallel port data bits are transmitted in parallel (16 or 32 bits simultaneously) to peripherals via a set of parallel wires (called ribbon cables). Serial ports transmit single bits serially, one after another. Serial ports come in the form of 9-pin or 25-pin male connector. Faster peripherals such as hard disk are connected to parallel ports. Slower devices such as keyboard are connected to serial port. A standard serial port is known as Universal Serial Bus (USB)
RJ-45 Port-This port is used for Ethernet connections and can be used between computer and any networked device, such as a cable modem or a network hub.

USB stands for Universal Serial Bus, used for short distance digital data communications. This port allows data transfer between devices with little electric power.

Secondary Storage Devices
If we want to save data for future reference and retrieval then it needs to be saved in memory other than primary memory, which is called secondary memory, or auxiliary memory. Normally hard disk of computer is used as secondary memory but this is not portable so there are many other secondary storage media in use.
Hard disk-This is a high capacity storage device ranging from 1GB to Tera Bytes nowadays. Generally hard disks are sealed units fixed in the cabinet.
Compact Disk-Capacity of standard 120mm CD is 700MB. It is a thin optical disk which is commonly used to store audio and video data. Transfer speed is mentioned as multiple of 150 KB/s. 4x means 600 KB/s.
DVD-Digital Versatile Disc or Digital Video Disc
This is an optical disc storage device. It can be recorded on single side or on double side.
Its capacity may range from 4.7 GB to 8.5 GB

Memory Cards
This is small, portable memory, which can be plugged into a computer with USB Port. They have capacity lesser than hard disk but much larger than a floppy or CD. They are more reliable also. They are also called pen drive. These are data storage devices mainly used with digital cameras, computers, mobile
phones, music players, video game console etc. They offer high recordability with power free storage.

E-Waste-It refers to the discarded electronic devices such as old version computers, office electronic equipment , mobile phones, TVs and refrigerators.
E-waste disposable mechanism- E-waste contains metallic and nonmetallic components , alloys and compounds like Copper, Aluminum, Gold, Silver etc. E-waste management involves proper recycling and recovery of the disposed material.

Software Concepts & Productivity Tools

An ordered set of instructions given to the computer is known as a program and a set of such programs that governs the operation of a computer system and/or its related devices is known as Software.

Types of Software:

System Software:

Software can be divided into different types depending upon their uses and application- System Software &Application Software.

Software required to run and maintain basic components of computer system come under the category of system software whereas software required to solve some specific task of daily use is generally called ***application software.***

An operating system is an example of system software while documentation tool, a presentation tool, a spreadsheet tool are all examples of application software. Even your favorite computer game is an example of application software. Some common examples of System Software as follows :

1.**BIOS**- The basic input/output system (BIOS) is also commonly known as the System BIOS. The BIOS is boot firmware, a small program that controls various electronic devices attached to the main computer system. The BIOS sets the machine hardware into a known state to help the operating system to configure the hardware components. This process is known as booting, or booting up. BIOS programs are stored on a chip

2.**Operating System**- Operating system is a set of system programs that controls and coordinates the operations of a computer system. Operating systems perform all basic tasks, such as identifying basic input/output devices, accepting input from the input devices, sending results to the output devices, keeping track of files and directories on the disk, and controlling other peripheral devices such as disk drives and printers

Need for an Operating System

Operating system provides a software platform, on top of which, other programs, called application programs are run.

Major Functions of an Operating System

The functions of an operating system can be broadly outlined as follows:

- Communicate with hardware and the attached devices [Device Manager]
- Manage different types of memories [Memory Manager]
- Provide a user interface [Interface Manager]
- Provide a structure for accessing an application [Program Manager]
- Enable users to manipulate programs and data [Task Manager]
- Manage the files, folders and directory systems on a computer [File Manager]

Following types of operating system are generally available and used depending upon the primary purpose and application and the type of hardware attached to the computer:

Single User: Allows one user to operate the computer and run different programs on the computer. MS DOS is a common example of single user operating system.

Multi-user: Allows two or more users to run programs at the same time on a single computer system. Unix, Linux, Windows are common examples of multi user operating system.

Real time: Responds to input instantly. Real-time operating systems are commonly found and used in robotics, complex multimedia and animation, communications and has various military and government uses. LYNX and Windows CE are examples of real time operating systems.

3.**Device Driver** - A device driver is a system software that acts like an interface between the Device and the user or the Operating System. All computer accessories like Printer, Scanner, Web Camera, etc come with their own driver software.

4. Language Processor-A computer system understands only machine language or binary language, also known as Low Level Language(LLL). This language is extremely difficult to learn for a general programmer and thus there is a need for some special language that is easy to learn and understand for the programmer in order to interact with the computer system. These special languages or set of commands are collectively known as programming languages or High Level languages (HLL).

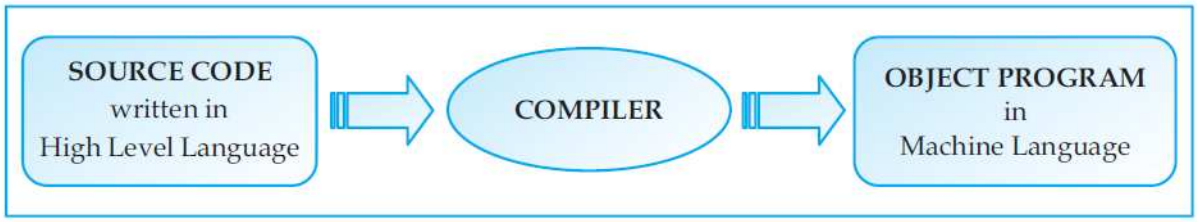
Some examples of High Level Programming

Languages are Basic, C, C++, JAVA, etc. These high level programming languages can easily be translated into machine language using Language Processors. These are:

Assembler - Assembler is a language processor, which translates a program written in assembly language into machine language.

Compiler - A compiler is a language processor which converts (or translates) the entire program written in high level language into machine language in one go.

Interpreter-This language processor converts a high level language program into machine language line by line as well as executes it.



Conversion of Source Code into Object Code

Application Software: Application software is a set of programs to carry out a specific task like word processor, spreadsheet, presentation tools, library management software, railway reservation, antivirus software, etc.

Application Software can be divided into different categories depending upon their uses as follows:

- Utility Software
- General Purpose Application Software
- Specific Purpose Application Software
- Developer Tools

Utility Software

We also require some additional software to keep our computer system efficient and trouble free. Generally these software come bundled with the Operating System Software but we can also use utility software provided by other vendors. Few examples of utility software are as follows:

- **Compression utility software:** Using this software, you can reduce (compress) the storage size of any computer program/file while not in use.
- **Backup utility software:** Though computer is in general a dependable device but it is always advisable to take regular back up of important data and programs stored in the computer. In case of any damage to the system, the back-up files can be restored and the important data can be recovered from the back-up files. This utility software facilitates

you to take regular back-up of important files and folders stored in a drive into another storage device

- **Disk De-fragmentation Utility software:** When computer system finds a file too large to store in a single location, it splits the file and stores it in pieces(called fragments), which are logically linked. This simply means that different parts of the file are scattered across the hard drive in noncontiguous locations. Disk de-fragmentation utility software speeds up the system by rearranging such fragmented files stored on a disk in contiguous locations in order to optimize the system performance.
- **Antivirus detection and protection software:** This utility software provides the user with a virus free work environment by restricting the entry of any unwanted program into the system.
- **Text Editor:** This utility software helps one to create, store or edit a basic text file examples of text editors are Notepad, Gedit and KWrite

General Purpose Application Software

Some of the application software are designed for general day to day applications and uses. Some of these popular general purpose application software are discussed below:

Word Processor: Word Processor is general purpose application software that facilitates the creation of text documents with extensive formatting.

Spreadsheet Tools: Spreadsheet Tool is general purpose application software that facilitates creation of tabular forms where some text and numerical values can be stored

. **Database Management System:** Database Management System is general-purpose application software that facilitates creation of computer programs that control the creation, maintenance, and the use of database for an organization and its end users.

Specific Purpose Application Software

Some application software are made for performing specific tasks generally used by the institutions, corporate, business houses, etc. e.g.

Inventory Management System & Purchasing System: Inventory Management System is generally used in departmental stores or in an institution to keep the record of the stock of all the physical resources.

Developer tools

When a programmer starts the process of writing a program to develop software for any type of application, he/she requires a series of software developing tools like code editor, debugger and compiler.

Integrated Development Environment

An Integrated Development Environment (IDE) is an application program that consists of all required software developing tools required for developing software as part of a single interface. It typically consists of the following tools:

- Source Code Editor
- Graphical User Interface (GUI) builder
- Compiler / Interpreter
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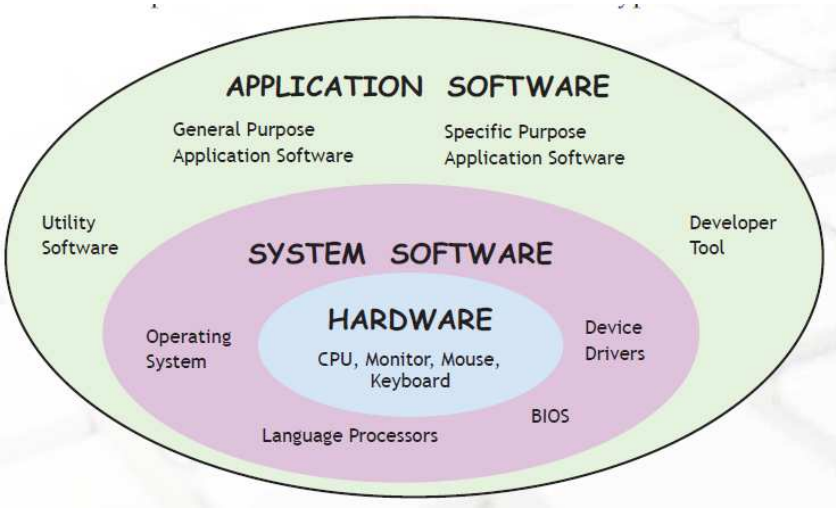
- Build Automation tool

Relationship between Hardware and different types of Software



Unit 2 Part 2 Flow of Control in C, C++, Java, and Code wiht programming

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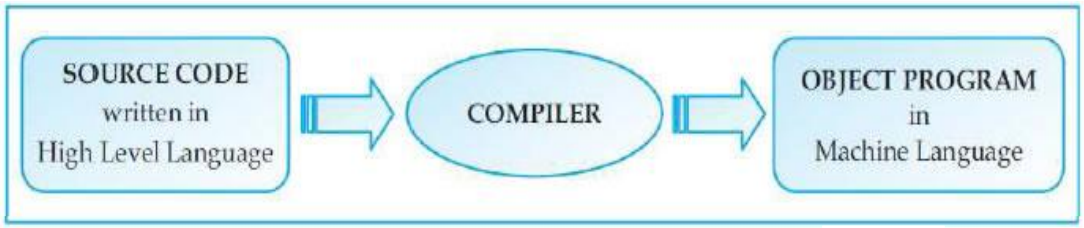

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