



INFORMATICS PRACTICES

Computer System

By

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CONCEPTS

Introduction to Computer

Evolution of Computer

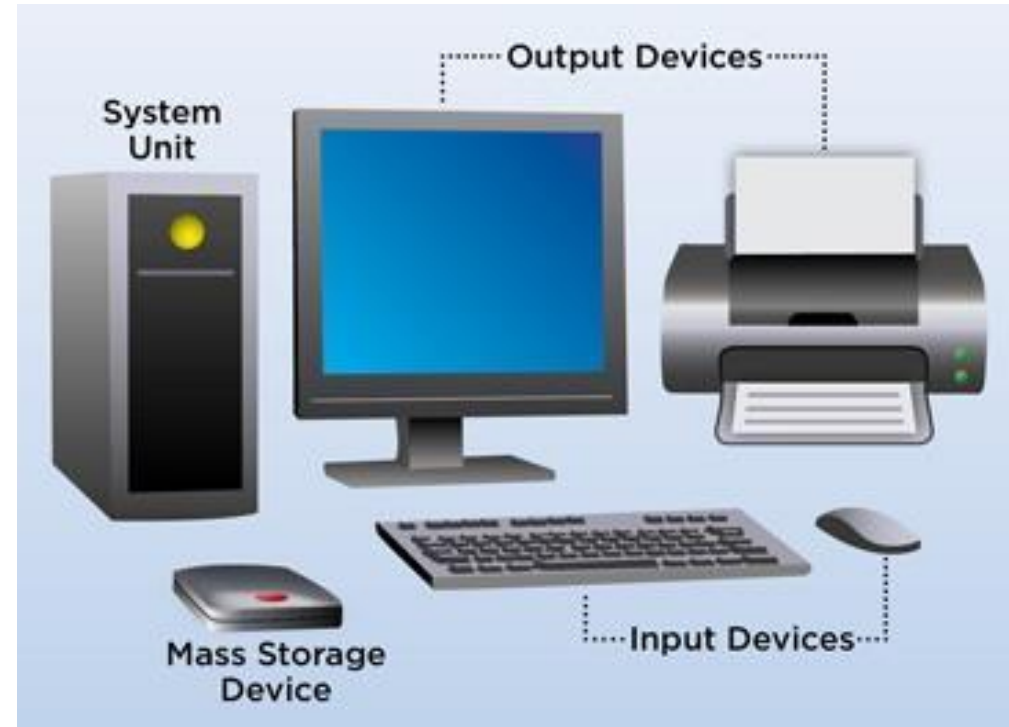
Input and Output devices

Computer Memory

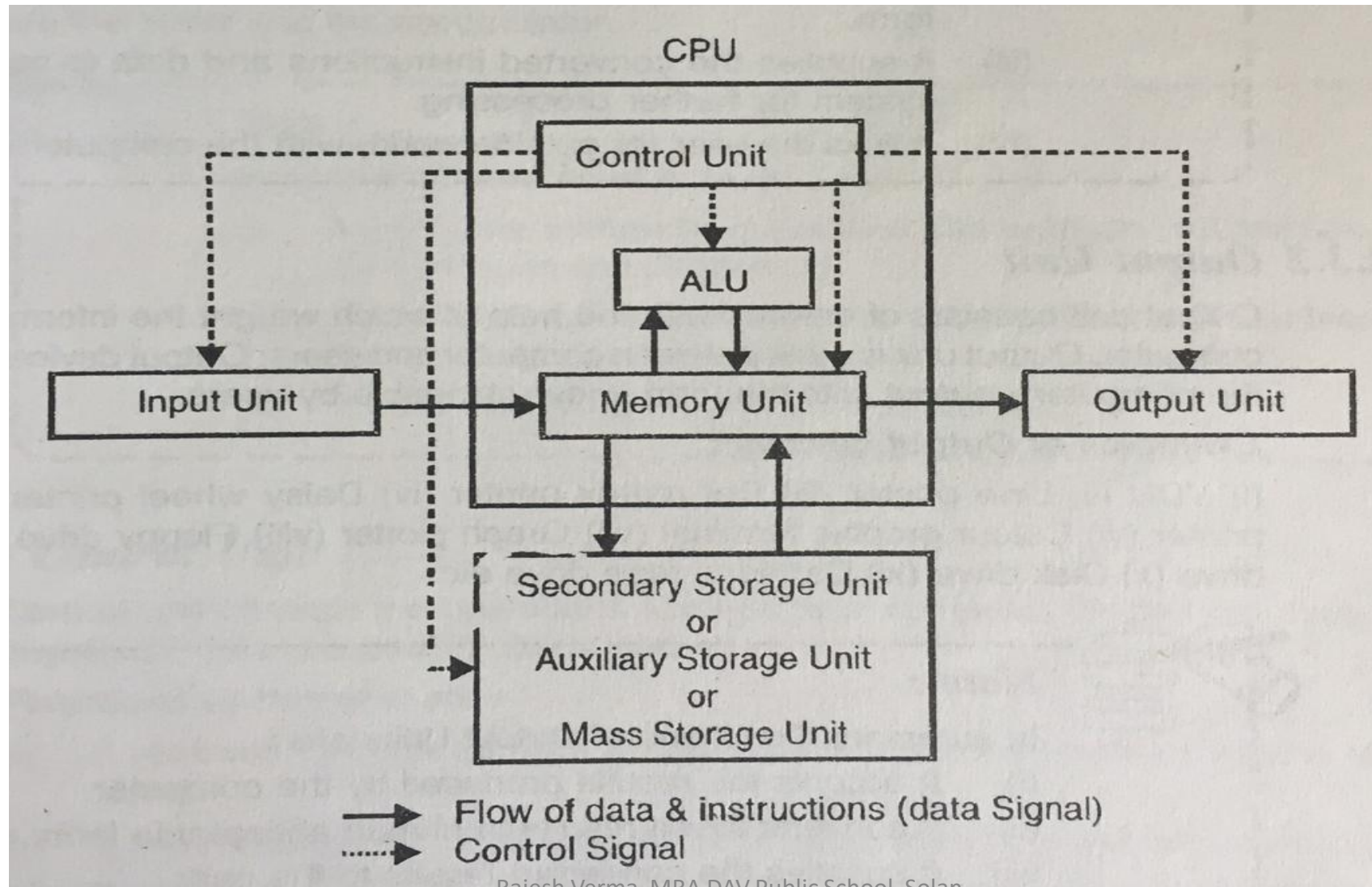
Software

Introduction to Computer

- *A Computer is an electronic machine that allows the user to store, retrieve and process data.*



Block diagram of Computer System



Computer System

- **Input Unit** : It is responsible for taking input for the computer.
- **Output Unit** : The device that receive data from a computer system to display.
- **Central Processing Unit**: It is the electronic circuit of a computer that carries out the actual processing and usually referred to as the Brain of the computer. The CPU has two main components: **a) Arithmetic and Logical Unit** : ALU performs all the arithmetic and logic operations that need to be done as per the instruction in a program. **B) Control Unit**: CU control sequential instruction execution, Interprets instructions and guides data flow through the computers memory. CPU is also known as microprocessor
- **Primary Memory**: It is the internal volatile memory where data and instructions are stored during processing.
- **Secondary Memory**: It refers to the external storage device which provides permanent memory to the computer system.

Computer system interconnection

The computer system is a combination of a few devices. Some of the devices can be connected as and when required. So in this section let's discuss Introduction to Computer System with computer system interconnection.

The internal devices

The computer system has the following internal devices:

Motherboard

The motherboard is a circuitry board of the computer system. All the devices are connected with this board internally or externally. It provides slots, connectors, and ports to connect devices.

SMPS

It stands for switch mode power supply. It is attached with a power cable from outside and connected with the motherboard through a connector.

Hard Disk

A hard disk is the main storage device of the computer. It is connected to the slot on the motherboard and to SMPS.

CPU

The CPU is connected or attached to the CPU socket. On top of the CPU, a fan is attached to provide cooling to the CPU.

RAM

RAMs are attached to RAM slots on the motherboard.

Ports

Ports allow one to attach external devices to the computer. These ports are generally found at the backside of the cabinet. Ports have either holes or pins to attach a device.

Input Devices

The devices through which control signals are sent to the computer are termed as Input devices. These devices convert the input data into a digital form that is acceptable by the computer system.



Keyboard



Mouse



Scanner



Touch Screen

Input Devices

Input Devices are used to accept data from the user. Some input devices are used to enter data directly and some devices provide a platform for input. These devices you must know for Introduction to Computer System. They are as follows:

Keyboard

Keyboards are necessary input devices for computers. They look like a standard typewriter. They consist of alphabets keys (a to z), numeric keys(0 to 9), ctrl, shift, alt, windows key, etc.

Mouse

A mouse is a pointing device that is used to accept commands in computers through click or movement.

Scanner

A scanner is used to scan either text or graphics. There are three basic types of scanners available:

OCR

It stands for Optical Character Reader. It scans only text from the document. It is faster than other scanners.

Input Devices

MICR

It stands for Magnetic Ink Character Recognizer. It can read graphics as well as text from the document.

BCR

It stands for Bar Code Reader. It reads a bar code sticker available with white and black strips on any product.

Touch Screen

It is the most popular input device found on smartphones, monitors, tablets, etc. It accepts input by touching the screen. Virtual keyboards are available on-screen to enter data.

Joy Stick

Joysticks are used to play video games on computers. They are used to control the pointers and characters of games through its buttons.

Light Pen

It is a digital or smartpen that is used to capture handwriting or brush stroke on the computer along with the digital notebook.

WebCam

WebCam or WebCamera is a device used to capture video or images of users.

Output Devices

The device that receives data from the computer system for display, physical production etc. is called output devices. It converts digital information into human understandable form.



Display monitor



Speaker



Printer



3D printer

Output Devices

Output Devices are used to store the result of the user's work. Let's discuss few output devices for Introduction to Computer System. Few of them are as follows:

Monitor

The monitor or VDU (Visual Display Unit) is an output device that displays data on the screen. It is available in different types such as CRT (Cathode Ray Tube), LCD (Liquid Crystal Display), LED (Light Emitting Diode).

The printer

The printer provides data on paper. It is also available in many shapes and sizes with different types such as Dot Matrix Printer, Laser Printer, Inkjet Printer, etc.

Speaker

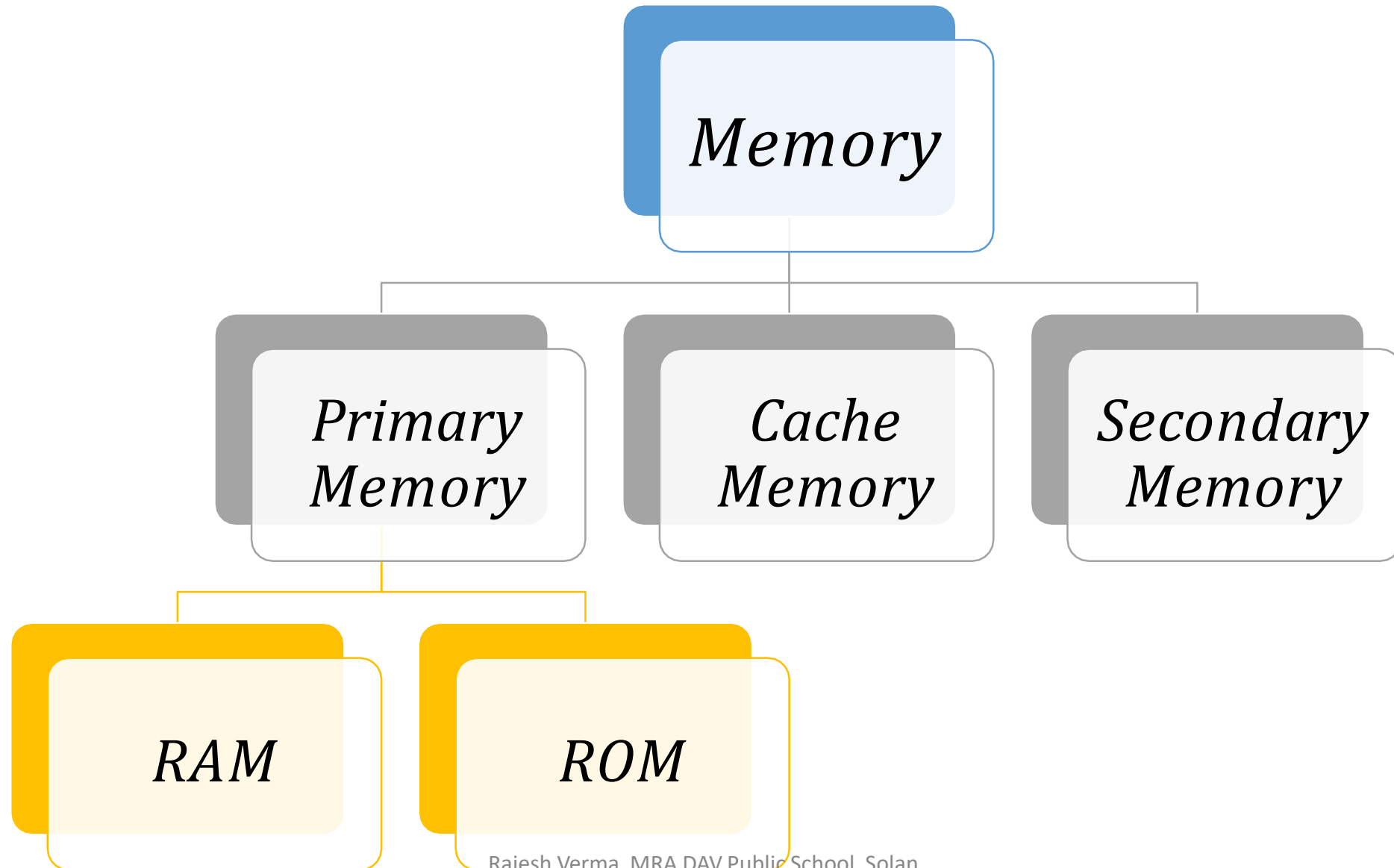
Speakers are used to listening to audio from computers. They are also available in different designs, sizes, and shapes.

Plotter

The plotter is also an output device like a printer, used to print graphics from the computer.

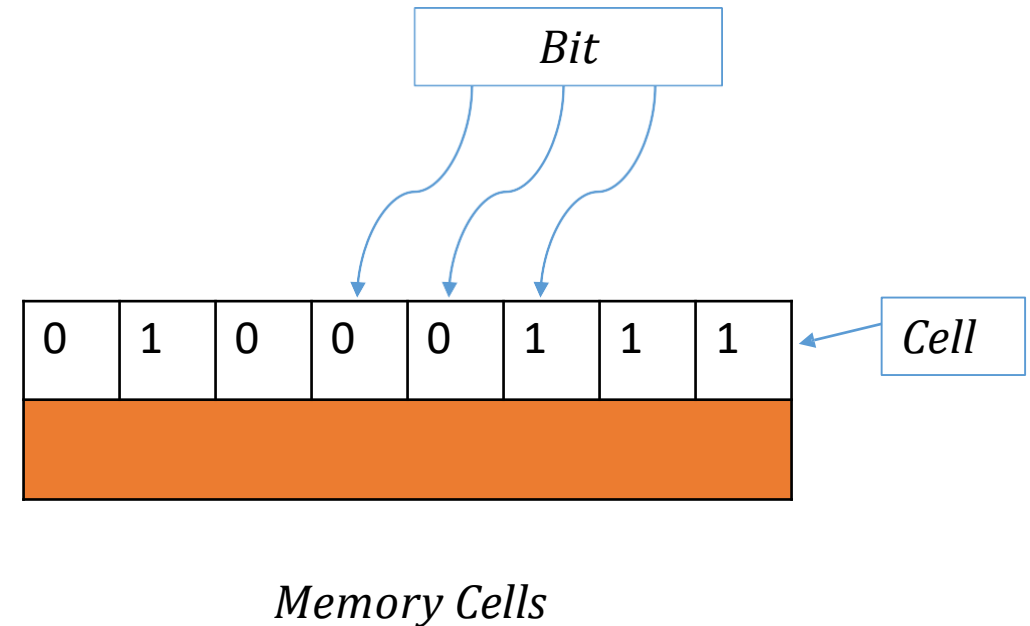
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Types of Memory



Computer Memory

*Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored. The memory is divided into large number of small parts called cells. Each location or cell has a unique address, which varies from zero to memory size minus one. For example, if the computer has 64k words, then this memory unit has $64 * 1024 = 65536$ memory locations. The address of these locations varies from 0 to 65535.*



Unit of Memory

A bit is an elementary unit of Memory. Eight bits together form a byte. One byte is the smallest unit which can represent a data item or a character.

A group of 8 bits is called a byte and a group of 4 bits is called nibble.

Unit	Short name	Full Name	Unit	Short Name	Full Name
1 bit	bit	Binary Digit	2^{10} i.e. 1024 GB	1 TB	Terra Byte
8 bits	1 byte	Byte	2^{10} i.e. 1024 TB	1 PB	Peta Byte
2^{10} i.e. 1024 Bytes	1 KB	Kilo Byte	2^{10} i.e. 1024 PB	1 EB	Exa Byte
2^{10} i.e. 1024 KB	1 MB	Mega Byte	2^{10} i.e. 1024 EB	1 ZB	Zetta Byte
2^{10} i.e. 1024 MB	1GB	Giga Byte	2^{10} i.e. 1024 ZB	1 YB	Yotta Byte

Unit of Computer Memory Measurements

Primary Memory

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.



Characteristics of Main or Primary Memory

- *These are semiconductor memories.*
- *It is known as the main memory.*
- *Usually volatile memory.*
- *Data is lost in case power is switched off.*
- *It is the working memory of the computer.*
- *Faster than secondary memories.*
- *A computer cannot run without the primary memory.*

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up the CPU. It acts as a buffer between the CPU and the main memory. It is used to hold those parts of data and program which are most frequently used by the CPU. The parts of data and programs are transferred from the disk to cache memory by the operating system, from where the CPU can access them.



Advantages and Disadvantage of Cache Memory

Advantages of cache memory

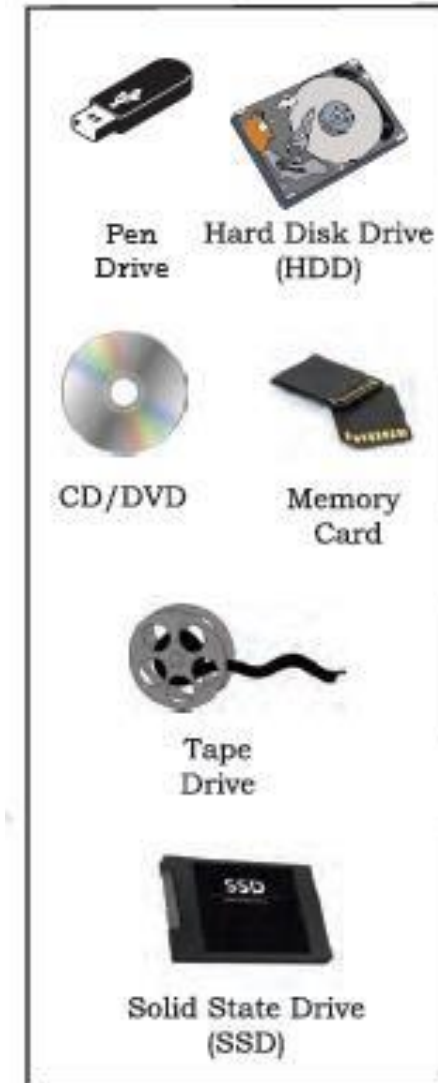
- *Cache memory is faster than main memory.*
- *It consumes less access time as compared to main memory.*
- *It stores the program that can be executed within a short period of time.*
- *It stores data for temporary use.*

Disadvantages of cache memory

- *Cache memory has limited capacity.*
- *It is very expensive.*

Secondary Memory

This type of memory is also known as external memory or non-volatile. It is slower than the main memory. These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.



Characteristics of Secondary Memory

- *These are magnetic and optical memories.*
- *It is known as the backup memory.*
- *It is a non-volatile memory.*
- *Data is permanently stored even if power is switched off.*
- *It is used for storage of data in a computer.*
- *Computer may run without the secondary memory.*
- *Slower than primary memories.*

Data Transfer Between Memory and CPU

Data transfer between different components of a computer system using physical wires called bus.

Bus is of three types:

Data Bus: Transfer data between different components.

Address Bus : Transfer addresses between CPU and Main Memory.

Control Bus : Controls bus to communicate control signals between different components of a computer.

Micro Processor

A processor which is implemented on a single microchip is called Microprocessor.

Microprocessor Specifications :

Microprocessor are classified on the basis of different features which include chip type , Word Size, Memory Size, Clock Speed.

Word Size : Maximum number of bits that a microprocessor can process at a time. E.g 8 bits, 16 bits, 32 bits and 64 bits.

Memory Size : Size of RAM

Clock Speed: Computer have internal clock that has generates pluses at regular intervals of time. Clock speeds means number of pluses generated per second by the clock inside a computer.

Evolution of Computer



1940-1956

Big and clumsy computers
Electric failure
Store program concept
Machine language
Lot of heat
Used vacuum tubes
ENIAC, EDVAC, EDSAC, UNIVAC



1956-63

Transistors
Smaller in size
Low Electric consumption
Lesser heat
Machine and assembly language
IBM1400, 7000 series



1964-1971

Computer smaller, faster and reliable
Lower power consumption
High level language
Storage up to 100mb
IC is used
IBM-360 series, ICL-1900



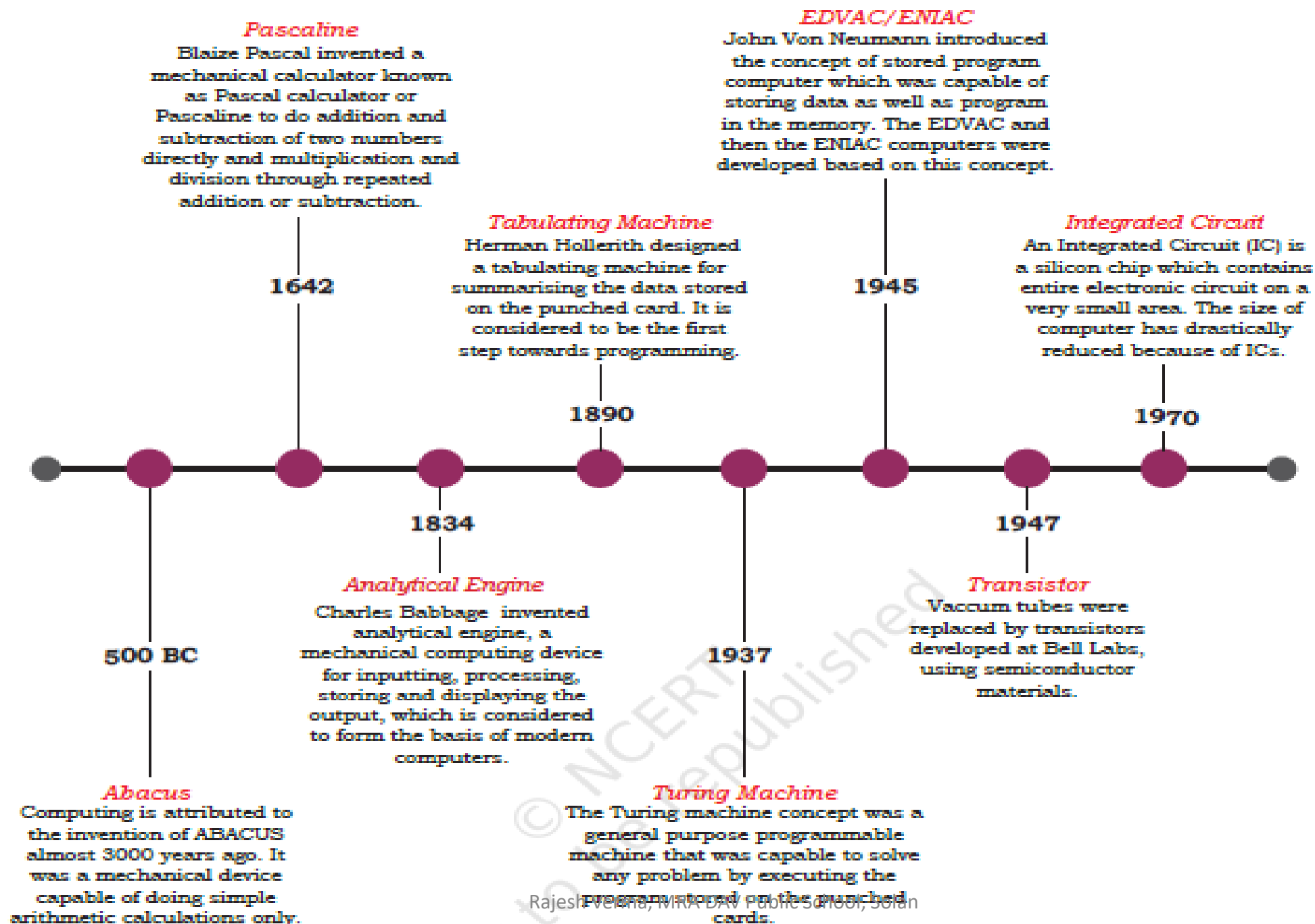
1971-Present

Large and Very Large Integrated circuits
Portable computers
High storage capacity
Programming in high level language
Pentium, AMD



Present and Beyond

Parallel processing
Superconductors
AI and Robotics devices



Computer System and Data

- ***Data Capturing***: Data Capture is any method of collecting information and then changing it into a form that can be read and used by a computer.
- ***Data Storage***: Data storage is the collective methods and technologies that capture and retain digital information on electromagnetic, optical or silicon-based storage media.
- ***Data Retrieval***: Data Retrieval refers to the process of obtaining stored data from a storage device and making it available to the CPU.

Hardware

Hardware represents the physical and tangible components of a computer, i.e. the components that can be seen and touched.

Examples of Hardware are the following –

- ✓ *Input devices – keyboard, mouse, etc.*
- ✓ *Output devices – printer, monitor, etc.*
- ✓ *Secondary storage devices – Hard disk, CD, DVD, etc.*
- ✓ *Internal components – CPU, motherboard, RAM, etc.*

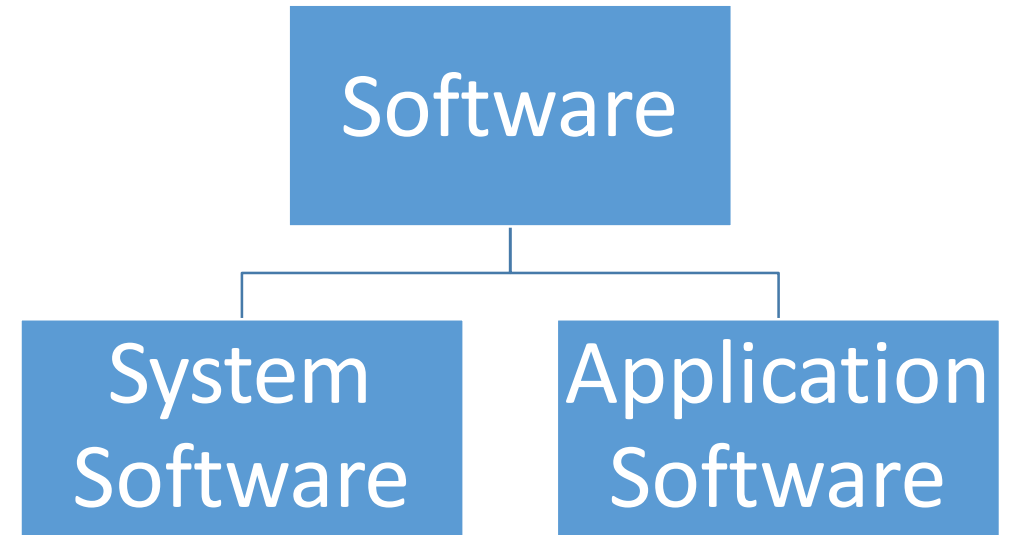


Relationship between Hardware and Software

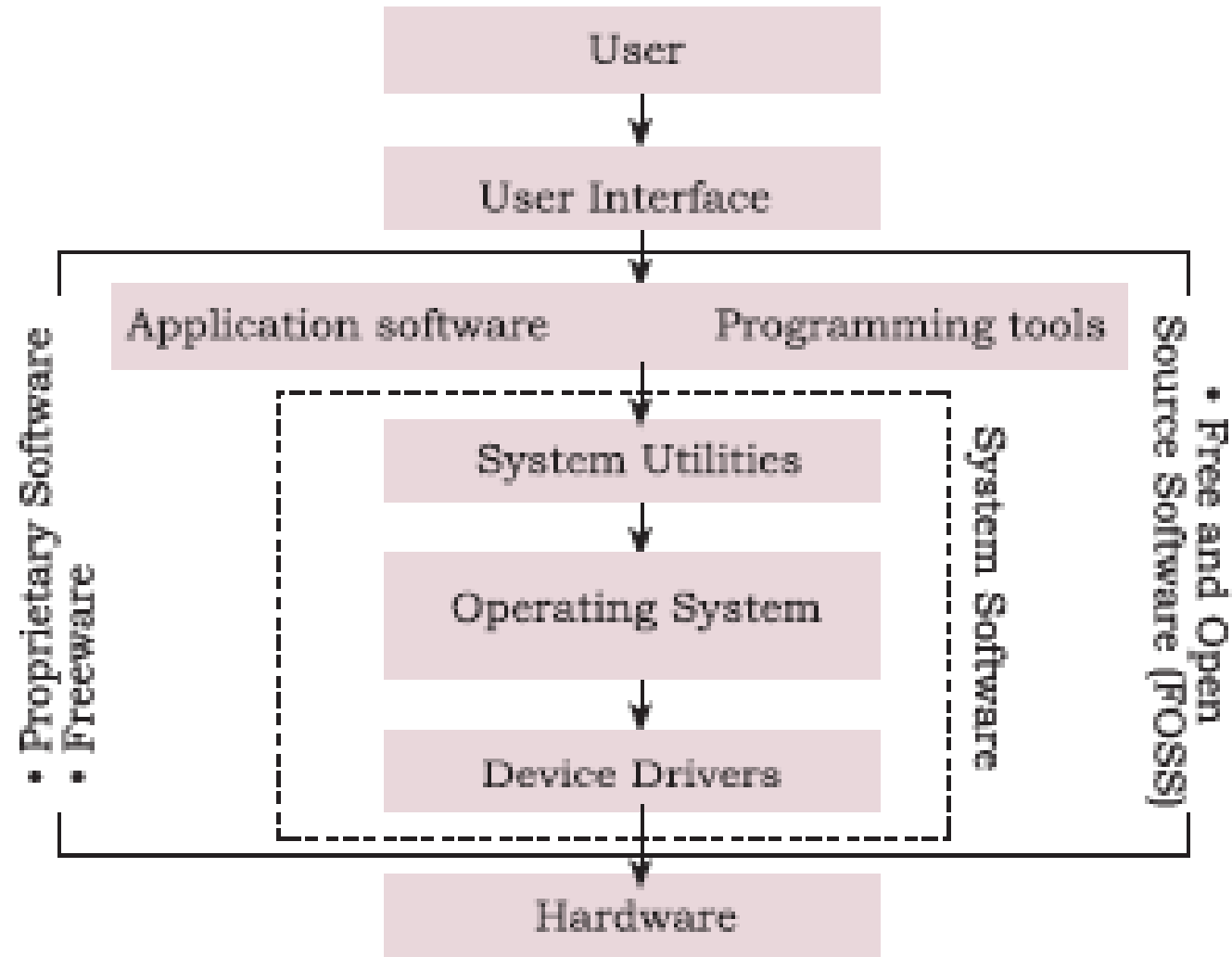
- *Hardware and software are mutually dependent on each other. Both of them must work together to make a computer produce a useful output.*
- *Software cannot be utilized without supporting hardware.*
- *Hardware without a set of programs to operate upon cannot be utilized and is useless.*
- *To get a particular job done on the computer, relevant software should be loaded into the hardware.*
- *Hardware is a one-time expense.*
- *Software development is very expensive and is a continuing expense.*
- *Different software applications can be loaded on a hardware to run different jobs.*
- *A software acts as an interface between the user and the hardware.*
- *If the hardware is the 'heart' of a computer system, then the software is its 'soul'. Both are complementary to each other.*

Software

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.



Categorisation of software



System Software

The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software is generally prepared by the computer manufacturers. These software products comprise of programs written in low-level languages, which interact with the hardware at a very basic level. System software serves as the interface between the hardware and the end users.

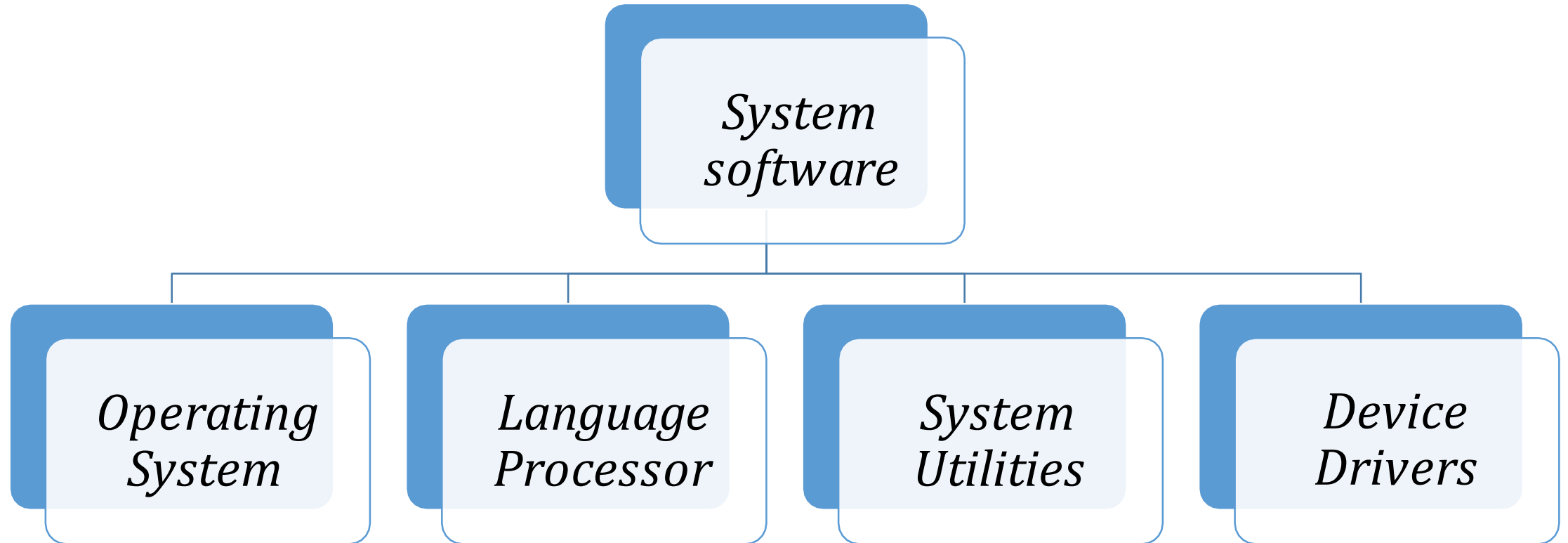
Some examples of system software are Operating System, Compilers, Interpreter, Assemblers, etc.



Features of a system software

- ✓ Close to the system
- ✓ Fast in speed
- ✓ Difficult to design
- ✓ Difficult to understand
- ✓ Less interactive
- ✓ Smaller in size
- ✓ Difficult to manipulate
- ✓ Generally written in low-level language

Subcategories of System software



Operating System

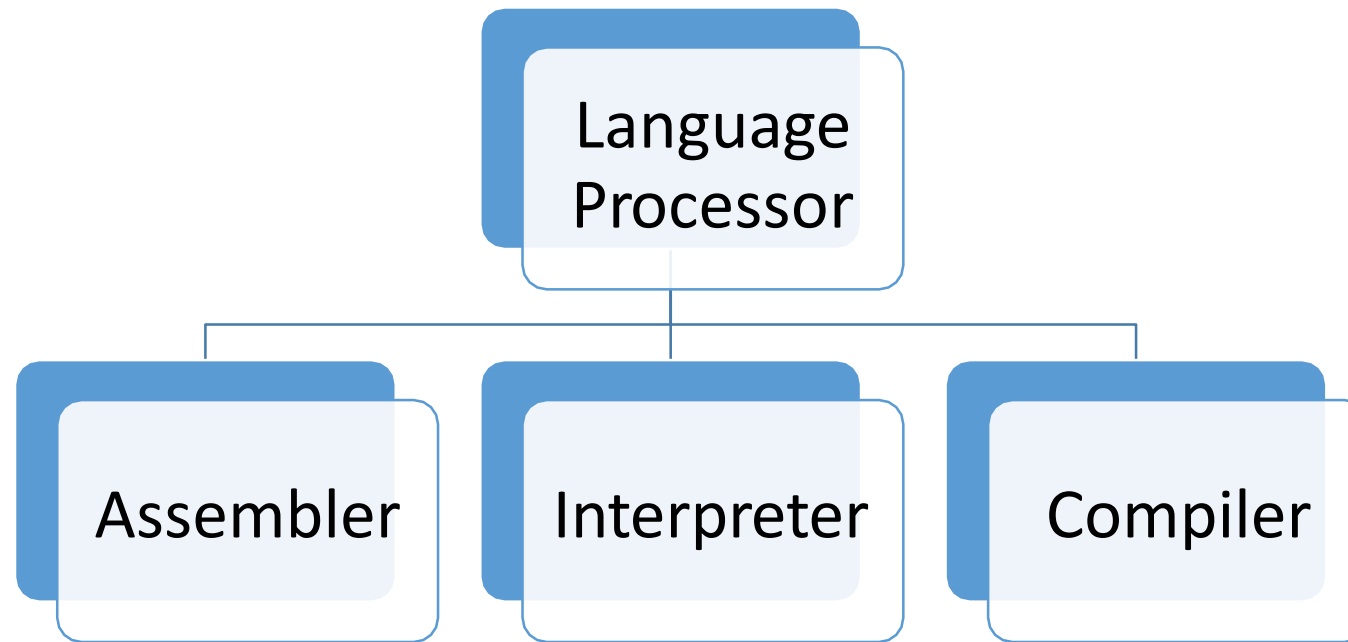
- *An operating System is a program which acts as an interface between a user and the hardware.*

Examples of Operating Systems are : Microsoft Windows, Linux, MacOS, Android OS etc.



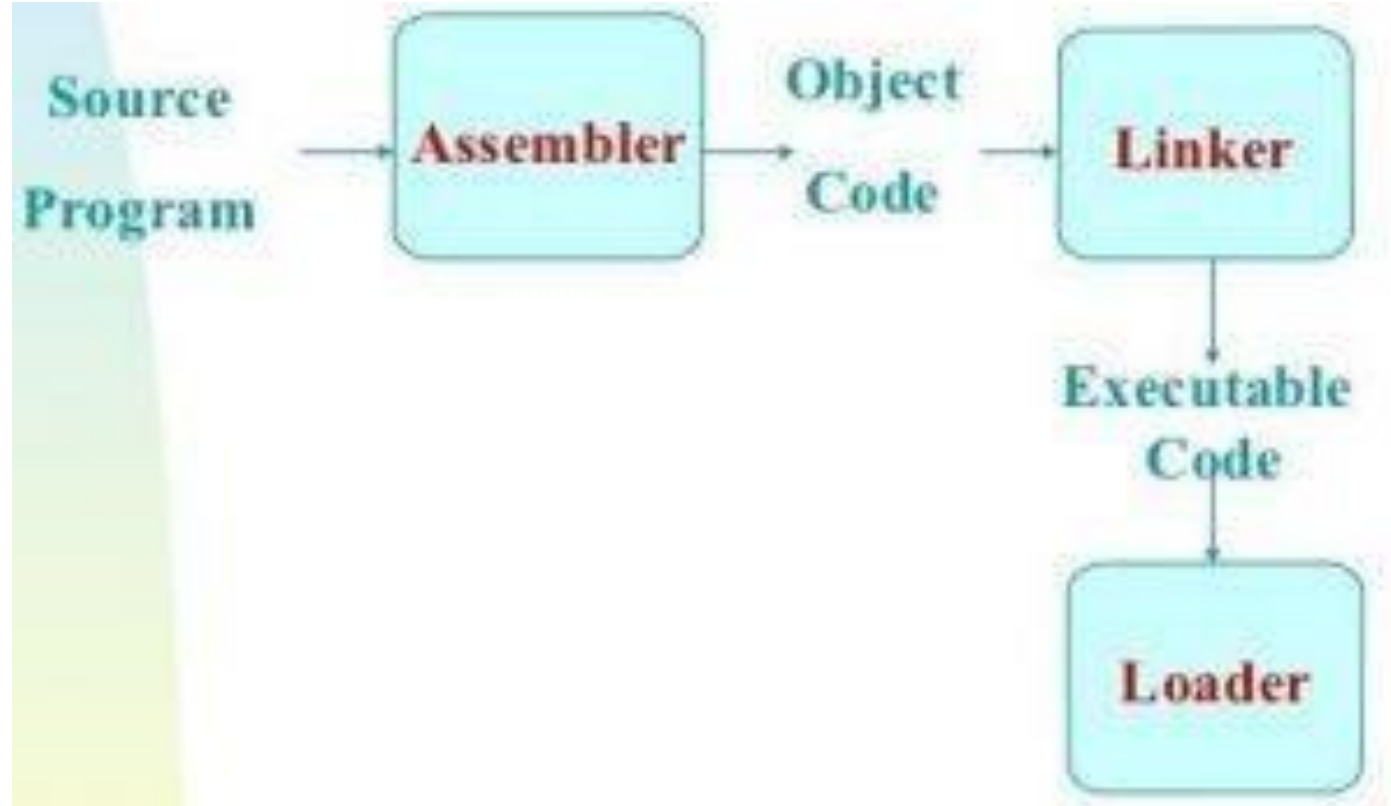
Language Processor

- *Language processor is a type of software that is used to translate a program from a high-level language into a low-level language.*



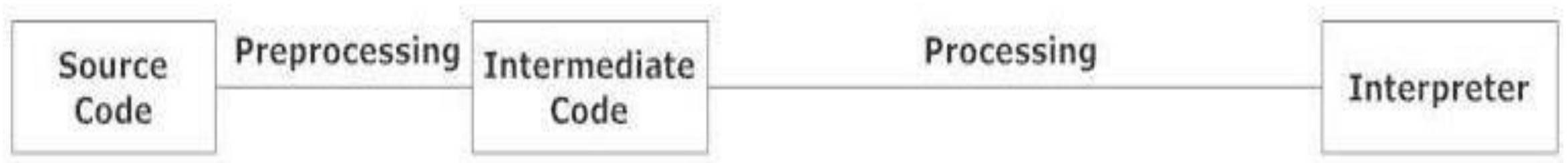
Assembler

An assembler is translating program that converts assembly language programs into machine language



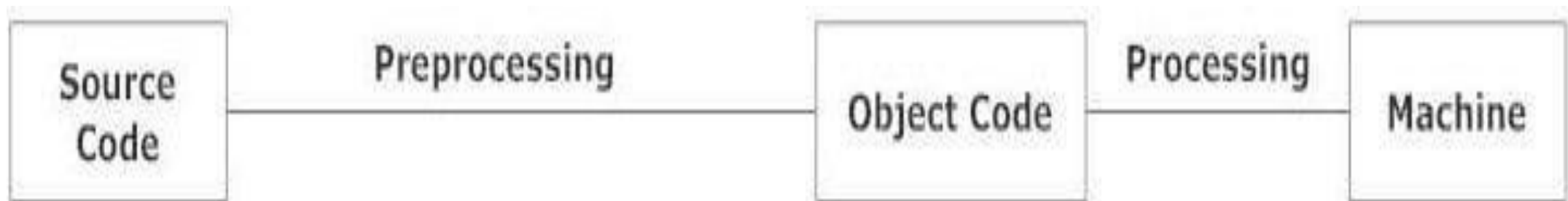
Interpreter

An interpreter is a type of system software that translate and executes instructions written in a computer program line by line.



Compiler

A compiler is a program that converts the instructions of high-level language into machine language as a whole. A high-level language program is called a source program. Compiler converts source program into machine code. This machine code is known as an object program.



Difference between Compiler and Interpreter

Compiler

The compiler converts a program into machine code as a whole

The compiler creates object code file

A compiler converts a high-level program that can be executed many times

Programs execution is fast

Compiler displays syntax errors after compiling the whole program

Interpreter

Interpreter converts the program into machine code statement by statement

Interpreter does not create object code file

An interpreter converts high-level program each time it is executed.

Programs execution is slow

Interpreter displays syntax error on each statement of program

System Utilities

Utilities software are those helpful programs that ensure the smooth functioning of the computer.

Examples Antivirus software, File Management Tools, Compression tools, Disk Management tools

Device Drivers

Device Drivers are the programs that store instructions to drive and use different hardware devices.

Application Software

- *Application software products are designed to satisfy a particular need of a particular environment.*
- *An application software is the set of programs necessary to carry out operations for a specified application.*



Two types of Application software

- **General Purpose Software:** *General purpose application software is a type of application that can be used for a variety of tasks. It is not limited to one particular function. For example, a word processor, Spreadsheet, DBMS, Graphics, Multimedia, Web browsers, Desktop Publishing software.*
- **Customised software:** *Special purpose application software is a type of software created to execute one specific task. For Example School Software, Accounting Software etc.*

Proprietary, Free and Open Source Software

- ***Open source software:*** OOS refers to software whose source code is available to customers and it can be modified and redistributed without any limitation.
- ***FLOSS (Free Libre and Open Source Software)*** : The term FLOSS is used to refer to a software which is both free software as well as open source software. For example Linux OS, MYSQL, OpenOffice.org.
- ***Proprietary Software:*** It is the software that is neither open nor freely available. Its use is regulated through a license and further distribution and modification is either forbidden. For example Microsoft Windows, Adobe software, etc.
- ***Freeware:*** Freeware are the software which permits redistribution but not modification.
- ***Free Software:*** It means the software is freely accessible and can be freely used, changed, improved, copied and distributed by all who wish to do so.

Assignments

1. Draw the block diagram of a computer system. Briefly write about the functionality of each component.
2. What are various categories of software?
3. Define Compiler, Interpreter and Assembler.
4. Name the input or output device used to do the following:
 - a) To output audio
 - b) To enter textual data
 - c) To make hard copy of a text file
 - d) To display the data or information
 - e) To enter audio-based command
 - f) To build 3D models
 - G) To assist a visually- impaired individual in entering data
5. What is the function of memory? What are its measuring units?