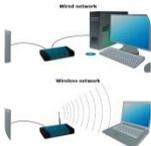


# Introduction to Computer Systems

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# Introducing Computer Systems

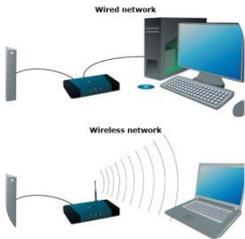


Exploring computers and uses



Looking inside the computers

# Exploring Computers and Uses



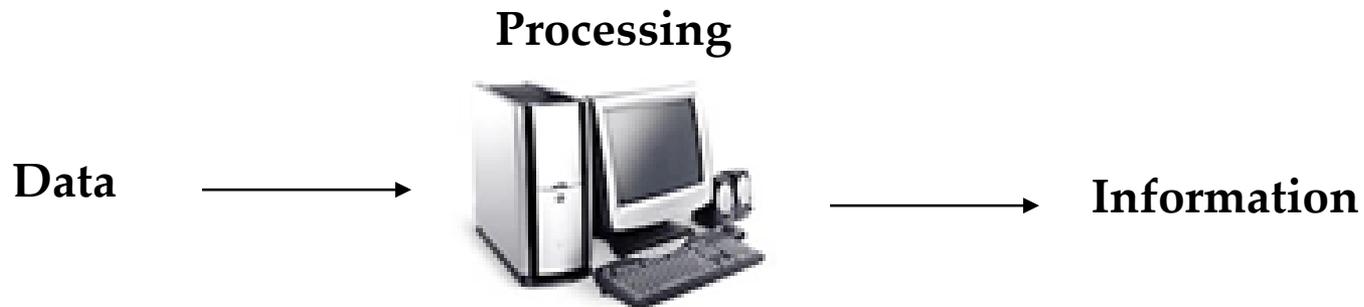
## Definitions



Computer for Individual Users  
Computer for Organization

# Computer

- A computer is a machine that reads, stores, manipulates and displays data.
- A computer is a machine that manipulates data according to a set of instructions called a computer program.
- The program has an executable form that the computer can use directly to execute the instructions.



# Computation

- "In a general way, we can define computing to mean any goal-oriented activity requiring, benefiting from, or creating computers.

Thus, computing includes:

- designing and building hardware and software systems for a wide range of purposes;
- processing, structuring, and managing various kinds of information;
- doing scientific studies using computers;
- making computer systems behave intelligently;
- creating and using communications and entertainment media;
- finding and gathering information relevant to any particular purpose, and so on.

# Computation

- The term "computing" is also synonymous with counting and calculating.
- The discipline of computing is the systematic study of algorithmic processes that describe and transform information: their theory, analysis, design, efficiency, implementation, and application.
- The fundamental question underlying all computing is "What can be (efficiently) automated?"

# Computation

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# Digital vs Analog Computers

- A digital computer uses distinct values to represent the data internally. All information are represented using the digits 0s and 1s
- Analog computer is a computer that represents data as variable across a continuous range of values.

## Characteristics of Computer systems

- **Speed:** The computer can process data very fast, at the rate of millions of instructions per second.
- **Accuracy:** Computer provides a high degree of accuracy.
- **Diligence:** Computers are capable of performing any task given to them repetitively.
- **Storage Capability:** Large volumes of data and information can be stored in the computer and also retrieved whenever required.
- **Versatility:** Computer is versatile in nature. It can perform different types of tasks with the same ease.

# History of Computer systems

## Two Eras:

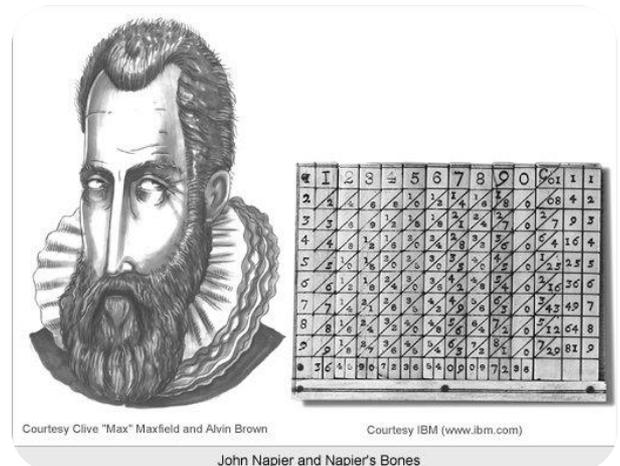
- Mechanical Age – Before 1945
- Electronic Age – After 1945

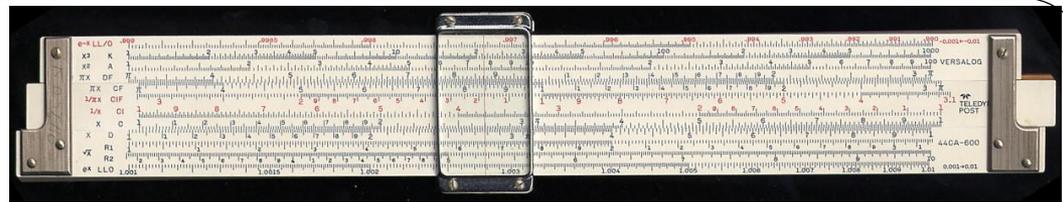
## Divided into different generations:

- First Generation ( 1940 – 1956 )
- Second Generation ( 1956 – 1963 )
- Third Generation ( 1964 – 1971 )
- Fourth Generation ( 1971 – 1977 )
- Fifth Generation ( 1977 – Todate )

# History of Computer systems

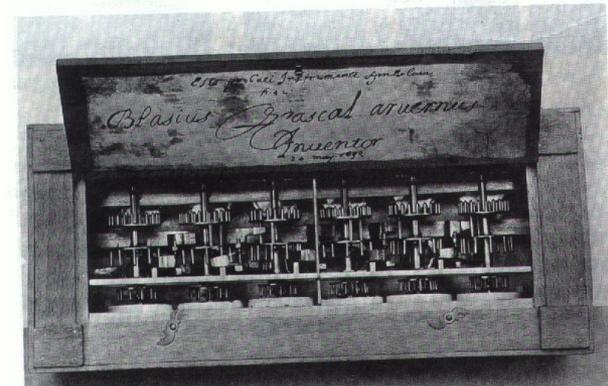
- Calculating Machines ABACUS was the first mechanical calculating device for counting of large numbers.
- Napier's Bones was a mechanical device built for the purpose of multiplication in 1617 AD. by an English mathematician John Napier.



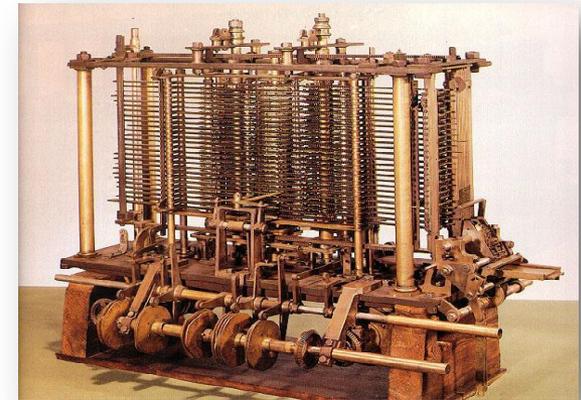
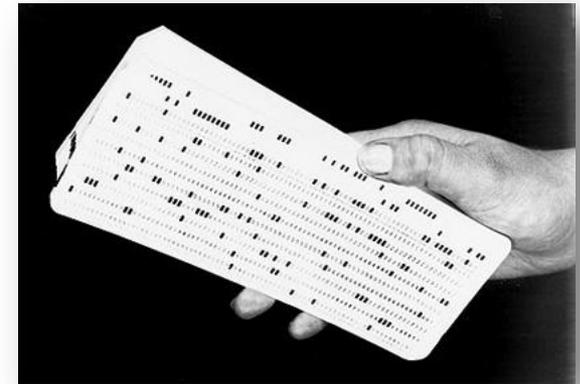


- Slide Rule was developed by an English mathematician Edmund Gunter in the 16th century.
- Pascal's Adding and Subtraction Machine was developed by Blaise Pascal. It could add and subtract. The machine consisted of wheels, gears and cylinders.
- Leibniz's Multiplication and Dividing Machine was a mechanical device that could both multiply and divide. The German philosopher and mathematician Gottfried Leibniz built it around 1673.

Figure 12-3 Pascal's Adding Machine



- Punch Card System was developed by Jacquard to control the power loom in 1801. He invented the punched card reader that could recognize the presence of hole in the punched card as binary one and the absence of the hole as binary zero.
- Babbage's Analytical Engine An English man Charles Babbage built a mechanical machine to do complex mathematical calculations, in the year 1823. The machine was called as difference engine.
- Hollerith's Punched Card Tabulating Machine was invented by Herman Hollerith. The machine could read the information from a punched card and process it electronically.

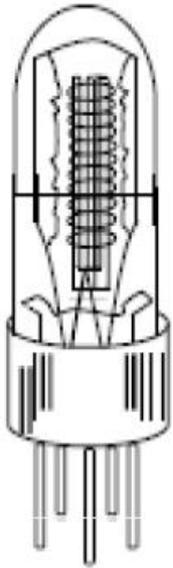


- **Abacus** ( 16<sup>th</sup> century )  
An early device to record numeric values
- **Blaise Pascal** ( middle 17<sup>th</sup> century )  
Mechanical (gear driven) device to add, subtract, divide & multiply
- **Joseph Jacquard** ( late 18<sup>th</sup> century )  
Jacquard's Loom, the punched card
- **Charles Babbage** ( 19<sup>th</sup> century )  
Analytical Engine, designed but never implemented
- **Alan Turing**  
Turing Machine, Artificial Intelligence Testing

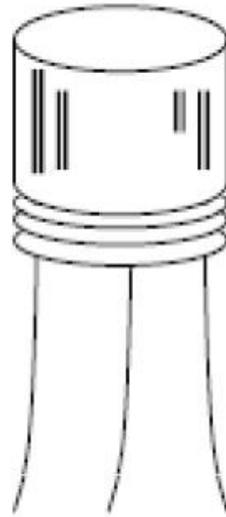
# Generation of Computers

- **Vacuum tube** 1946 – 1957
- **Transistors** 1958 – 1964
- **Small Scale Integration** 1965 – 1968
  - *Upto 100 devices*
- **Medium Scale Integration** 1968 – 1971
  - *100 – 3000 devices on a chip*
- **Large Scale Integration** 1972 – 1977
  - *3000 – 100,000 on a chip*
- **Very Large Scale Integration** 1978 to date
  - *100,000 – 100,000,000 devices on a chip*
- **Ultra Large Scale Integration**
  - *Above 100,000,000 devices on a chip*

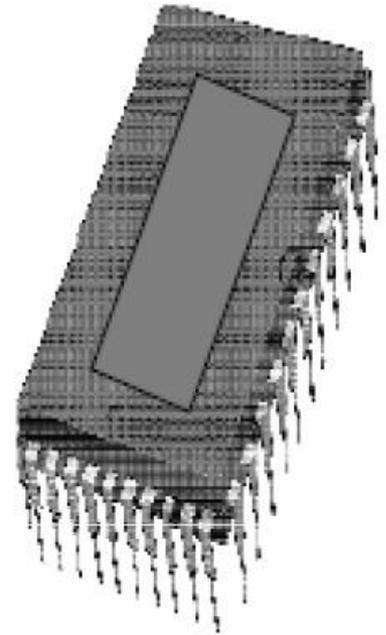
<b>Generation</b>	<b>Approximate Dates</b>	<b>Technology</b>	<b>Typical Speed ( Operation / Second )</b>
<b>1</b>	<b>1946-1957</b>	<b>Vacuum Tube</b>	<b>40,000</b>
<b>2</b>	<b>1958-1964</b>	<b>Transistor</b>	<b>200,000</b>
<b>3</b>	<b>1965-1971</b>	<b>Small and Medium Scale Integration</b>	<b>1,000,000</b>
<b>4</b>	<b>1972-1977</b>	<b>Large Scale Integration</b>	<b>10,000,000</b>
<b>5</b>	<b>1978- Onwards</b>	<b>Very Large Scale Integration</b>	<b>100,000,000</b>



a. Vacuum tube



b. Transistor



c. IC Chip

## Computer for individual user

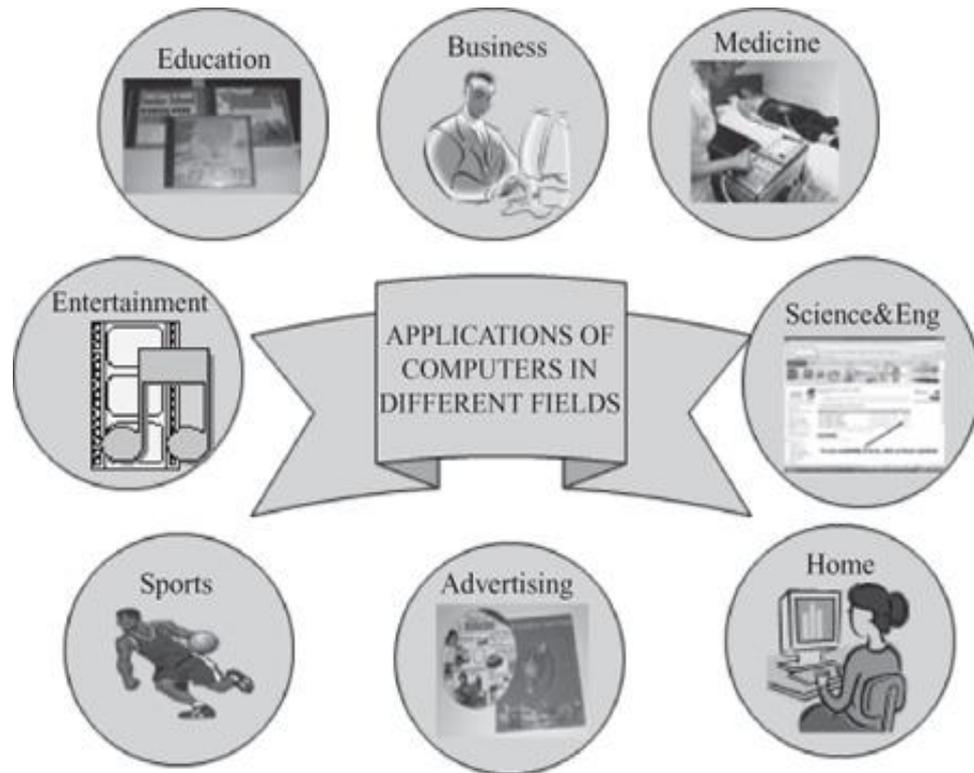
- **Desktop computers**
- **Workstations**
- **Notebook computers**
- **Tablet computers**
- **Handheld computers**
- **Smartphones**

# Computer for organizations

- **Network server**
- **Mainframe computers**
- **Minicomputers**
- **Super computers**

# Application of Computers

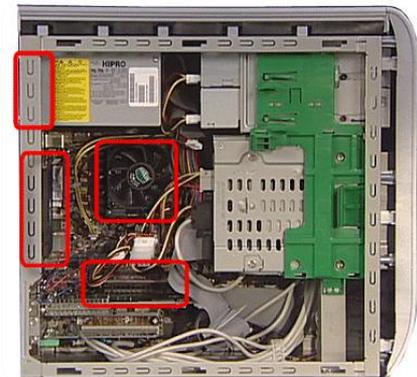
- Education
- Entertainment
- Sports
- Science and Engineering
- Medical
- Organization/Management
- Home



Inside the Computer



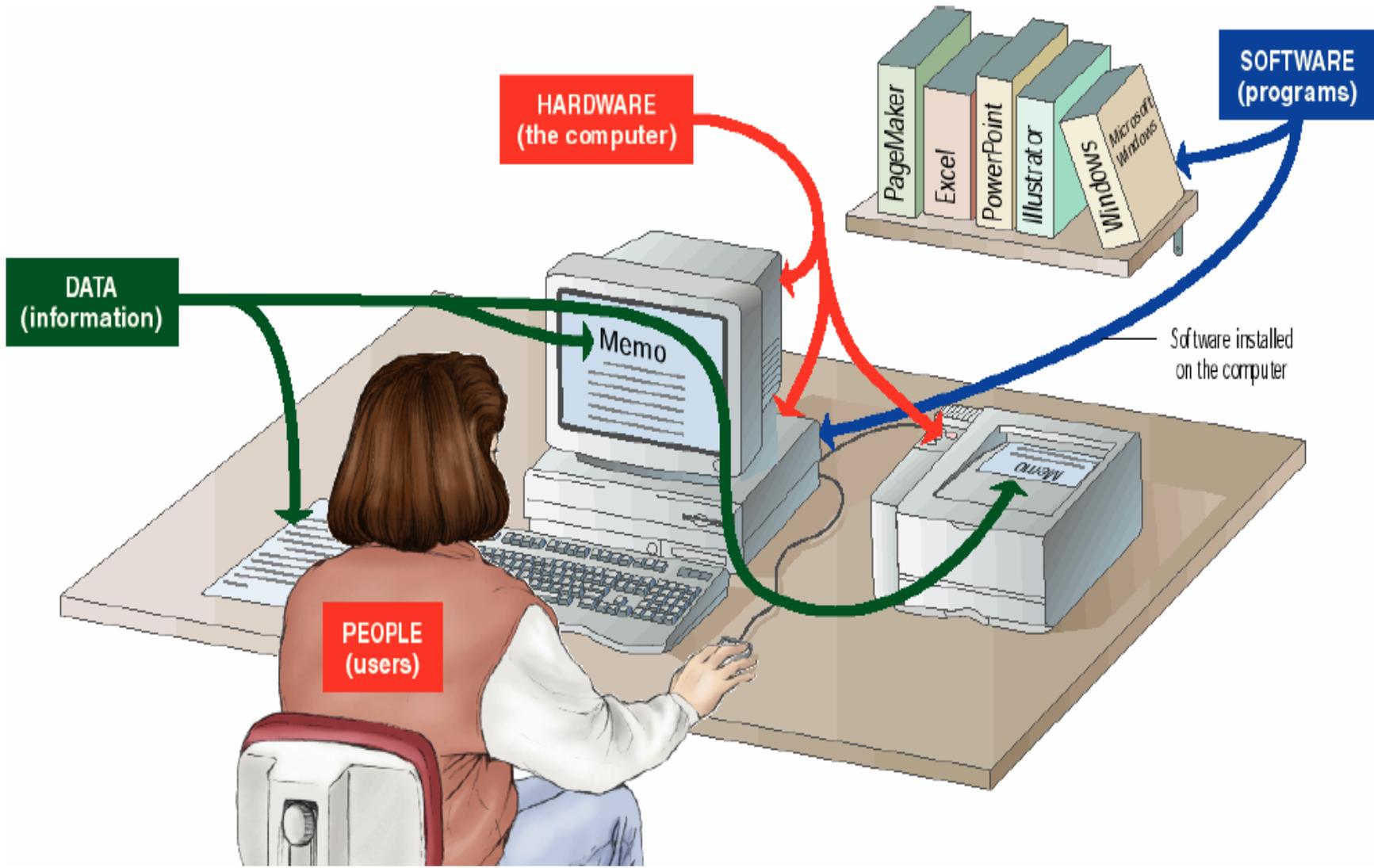
## Looking Inside the Computers



# Components of Computer Systems

- Hardware
- Software
- Data
- User





## Hardware

- **Hardware consists of the mechanical parts that make up the computer as a machine.**
- **The hardware consists of physical devices of the computer.**
- **The devices are required for input, output, storage and processing of the data. Keyboard, monitor, hard disk drive, floppy disk drive, printer, processor and motherboard are some of the hardware devices.**

## Software

- **Software is a set of instructions that tells the computer about the tasks to be performed and how these tasks are to be performed.**
- **Program is a set of instructions, written in a language understood by the computer, to perform a specific task.**
- **A set of programs and documents are collectively called software.**

## Data

- Data are isolated values or raw facts, which by themselves have no much significance.
- The data is provided as input to the computer, which is processed to generate some meaningful information.

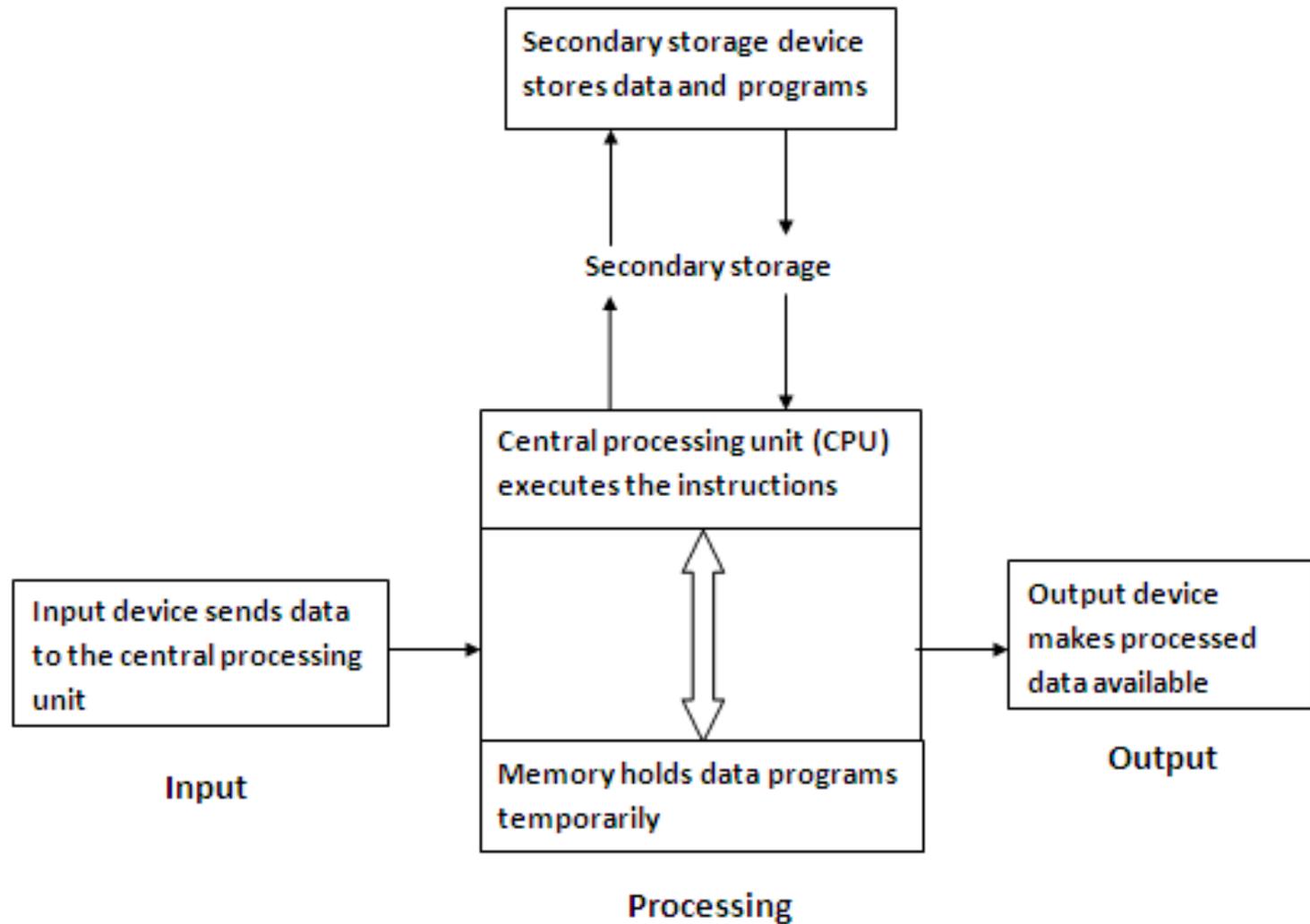
## User

- Users are people who write computer programs or interact with the computer.
- They are also known as skinware, liveware, humanware or peopleware.
- Programmers, data entry operators, system analyst and computer hardware engineers fall into this category.

# Input-Process-Output Concept

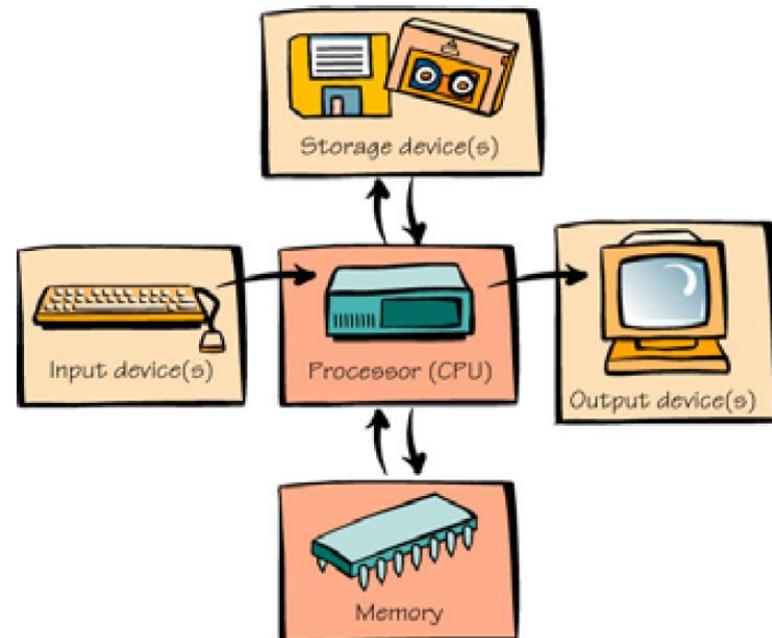
- **Input**
- **Process**
- **Output**
- **Storage**





# Essential Computer Hardware

1. Processor
2. Memory
3. Input and output
4. Storage



## Processing Devices / Processor

- Processor or central processing unit process the information, and perform all the necessary action or calculations.
- CPU is like the brain of computer
- Microprocessors
- Mother board is a rigid rectangular card containing the circuitry that connects the processor to the other hardware.



INTEL CORE DUO

# Memory Devices

- To store the information or data
- Memory is one or more sets of chips that store data and/or program instructions, either temporarily or permanently.
  - ❑ Primary storage devices
    - ❑ Random Access Memory
    - ❑ Read Only Memory
  - ❑ Secondary storage devices

# Primary Storage Devices

## RAM

- ✓ Temporary computer memory
- ✓ Store instruction for short period of time
- ✓ Quickly retrieve the information
- ✓ Volatile memory

## ROM

- ✓ Information is permanently store on the chip
- ✓ Contains startup instructions and other permanent data
- ✓ Non volatile memory

# Input Devices

- To accept information or data for processing from outer world
- Input devices are used in different ways
- Keyboard
- Pointing devices



# Output Devices

- To produce or transfer information or data after processing to outer world
- Output devices are used in present data in different ways
- Monitor – display screen
- Printer



# Storage Devices

- **The purpose of storage is to hold data permanently, even when the computer is turned off.**
  - ✓ **There is more room in storage than in memory**
  - ✓ **Contents are retained in storage when the computer is turned off, whereas programs or the data in memory disappear when you shut down the computer.**
  - ✓ **Storage devices operate much slower than memory chips, but storage is much cheaper than memory.**
    - *Magnetic devices*
    - *Optical devices*

## Basic Unit of Data Storage

- **Based on the number 1 and 0 (binary numbers), the computer can construct sophisticated ways of representing the data in the memory.**
- **It converts the numbers, alphabets and characters (and their combinations) into binary digits which enables us to represent the computer memory.**

## Bit

- **The binary number 1 or 0 is called a bit, which is a basic unit for storing data in the computer memory.**
- **The circuit being on or off at a time, a bit in the memory is always storing some kind of data.**

## Byte

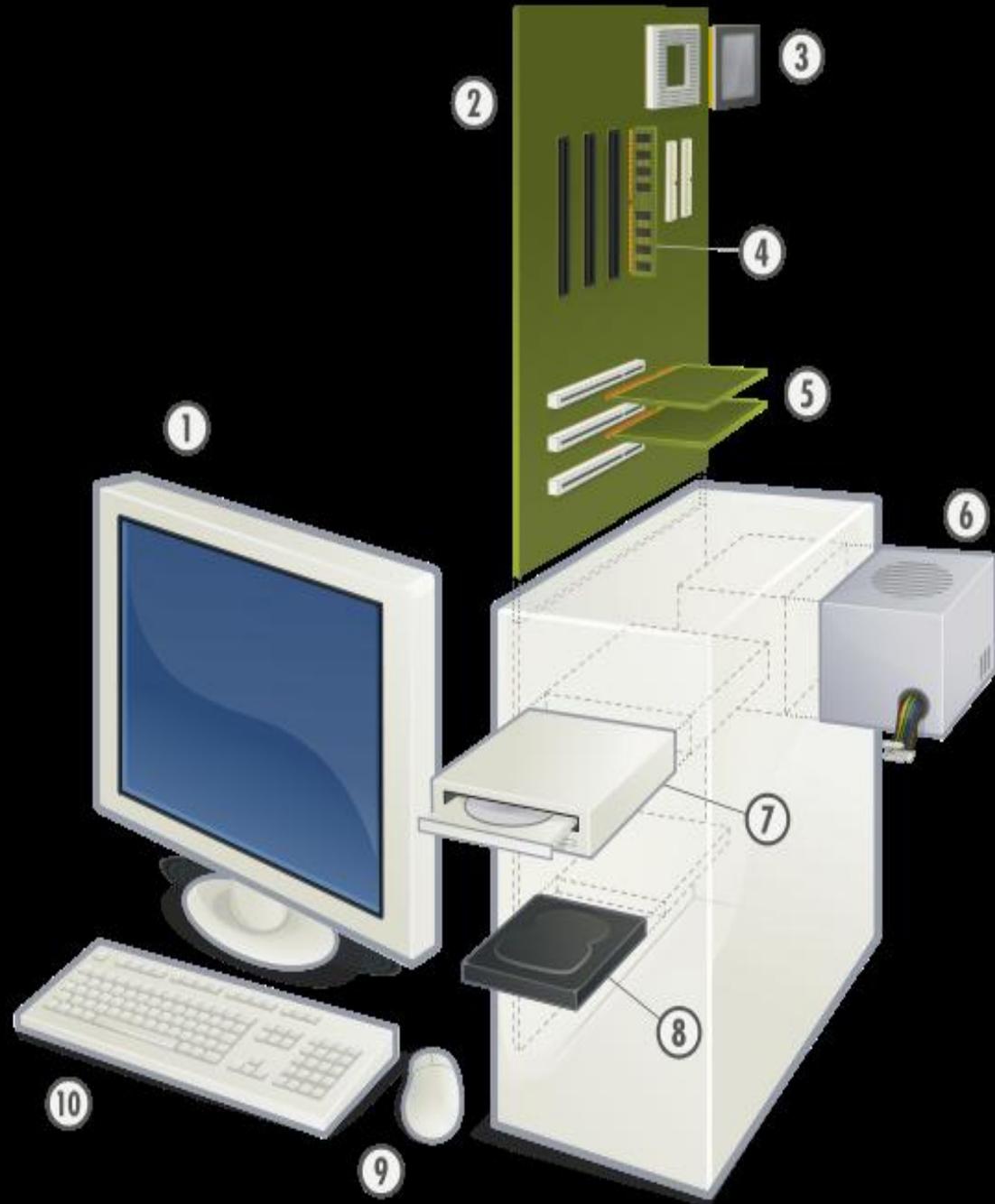
- **A byte is a combination of 8-bits, that can store a single character of data (a letter, numeral or special character).**
- **The capacity of the memory or the storage is expressed in terms of number of bytes it can hold or store.**

# Storage Capacity

Unit	Abbreviation	No. of Bytes(approx)	No. of Bytes
Kilobyte	K or KB	$2^{10}$	1024
Megabyte	M or MB	$2^{20}$	About one million
Gigabyte	G or GB	$2^{40}$	About one billion
Terabyte	T or TB	$2^{80}$	About one trillion

## Components :

1. Monitor
2. Motherboard
3. Micro Processing Unit
4. Main Memory(RAM)
5. Expansion Cards
6. Power Supply
7. Optical Disc Drive
8. Hard Disk Drive
9. Mouse
10. Key Board



## Hardware Devices

Following are the main hardware devices in any computer system:

- ❖ Input Devices i.e. Keyboards, Mouse, Microphones etc.
- ❖ Output Devices i.e. Printers, Speakers, Monitors etc.
- ❖ Main Memory comprising of RAM and ROM.
- ❖ Secondary Memory i.e. Hard Disk, Floppy Disk, Compact Disk etc.
- ❖ Inter Connectors i.e. Cables, Ports etc.
- ❖ Networking Devices i.e. Modem, Router etc.

# Software Applications:

## Classification:

It can be classified into two main categories;

- **System Software:**

It is used to control the usage and allocation of different hardware components and enables then other application to execute. For example operating systems, Drivers etc.

- **Application Software:**

It is the software that has been developed to solve specific problem or to provide audio, video, multimedia entertainment to the users.

# Input Devices



These devices are used to enter the data into the computer.

There are two ways of entering the data into the computer;

1. In the first case, the data goes directly to the computer from the source.
2. In the second case, we have to carry out some intermediate handling.

# Types of Input Devices

Generally, there are three types of input hardware.

1. Keyboards
2. Pointing Devices
3. Source Data Entry Devices

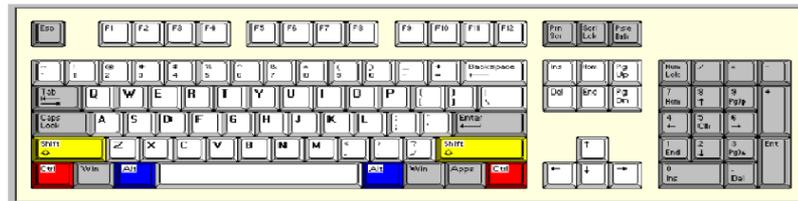


**Keyboards**

Its like a typewriter keypad to which some specials keys are added.

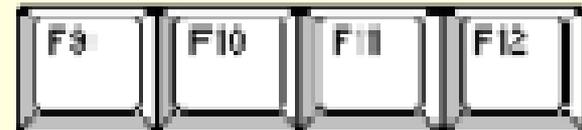
The keys normally available on the keyboards are;

- Numeric
- Alphabetic
- Function
- Additional Special Purpose keys



# Function Keys

- The function keys are an easy way to give certain commands to the computer.
- The particular software we use defines what each function key does.
- For example; F5 is to refresh the system; F2 is to go into the setup of the system etc.



# Main Keyboard

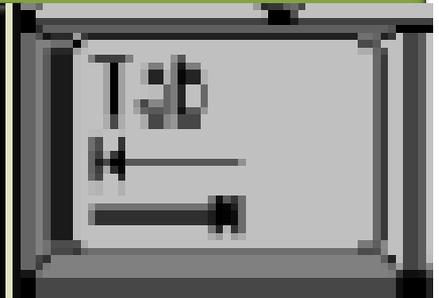
- The main keyboard includes the familiar keys found on the type writer keypad, as well as some special commands keys.
- The command keys have different uses/effects that depend upon the software being used.
- Some of the most common uses are listed here;

# Escape Key



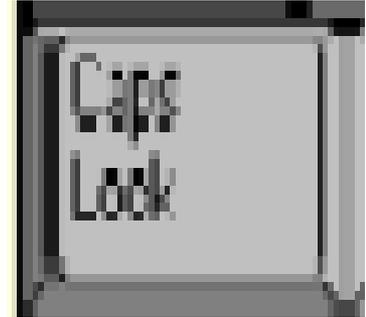
It is used in different ways by different programs; often it allows to “escape” to the previous screen of the program.

# Tab Key



It is used to tab across or move across the screen.

# Caps Lock



- When it is pressed, upper case letters are produced.
- Numbers and Symbols are not affected.
- The number or symbol shown on the bottom of a key is still produced.
- The status light under "Caps Lock" lights up.

# Shift Key



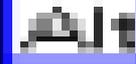
It is pressed in combination with other keys to produce upper case letter and upper symbols shown on the keys.

# Ctrl Key



It is pressed in combination with other keys to initiate commands as specified by the software.

# Alt Key



It is also used in combinations with other keys to initiate commands.

# Enter Key

A grey rectangular keycap with a white 'Enter' label and a small icon of a hand holding a sword.

It moves the cursor to the beginning of the new line. For instance it is used at the end of a paragraph.

# Backspace

A small, pixelated icon of a computer keyboard key. The key is white with a black border and features the word "Backspace" in a black, monospaced font. Below the text is a small horizontal line with a vertical tick on the left side, representing the key's travel or a cursor indicator.

**It is used to delete a character to the left of the cursor, moving the cursor back one position.**

**The cursor is the flashing indicator on the screen that shows where the next character will be inserted.**

# Numeric Keys

Depending upon the Num Lock Key status, numeric keys serve two purposes;

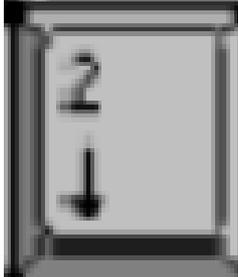
1. When the computer is in the Num Lock Mode, these keys can be used to enter numeric data and mathematical symbols (/for divided by, \* for multiplication, + for addition and – for subtraction)



**2. When the computer is not in the Num Lock Mode, the numeric keys can be used to move the cursor and perform other function, as below;**



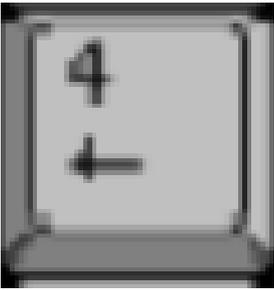
**This moves the cursor to the bottom right of the screen.**



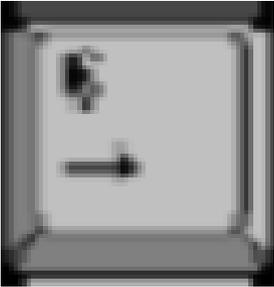
**This moves the cursor down one line.**



**This advances one full screen while the cursor stays at the same position.**



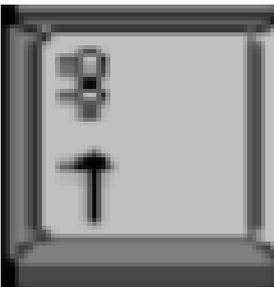
**This key moves the cursor one character to the left.**



**This key moves the cursor one character to the right.**



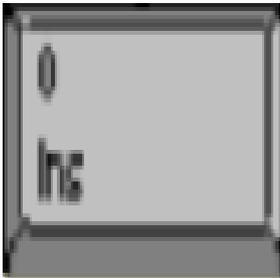
**This key moves the cursor to the top left corner of the screen in some programs.**



**This key moves the cursor one line up.**



This key backs up to the previous screen while the cursor stays at the same position.



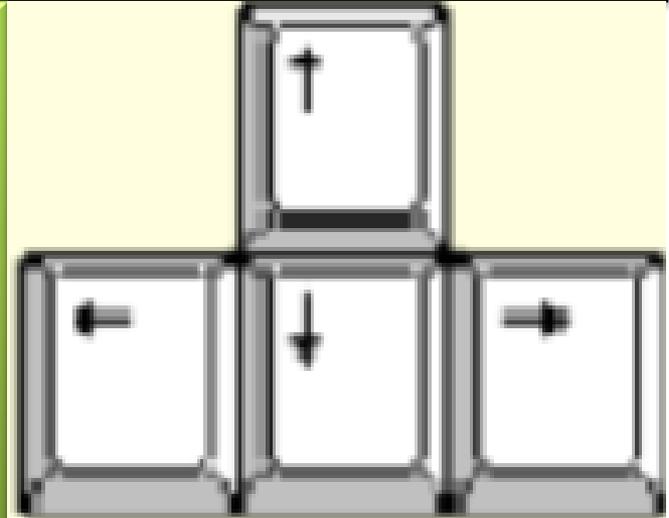
This key causes keyed characters to override the existing characters.



This key deletes a character, space or a selected text.

# Arrow Keys

The arrow keys move the cursor position.



# Special keys

These six keys, just above the arrow keys, perform the functions of numeric keys 0, decimal point, 7, 1, ,9 and 3.





This key causes the current screen display to be taken a copy of information or image on the screen.



This key causes the screen to pause when information is appearing too fast on the screen to read.

# Pointing Devices

Pointing devices control the position of the cursor or pointer on the screen.

They include;

- Mouse
- Trackball

# Mouse

- It is an input device that looks a little bit like a mouse.
- It has a ball on its underside that is rolled on flat surface or a mouse pad.
- The rolling movement causes a corresponding cursor movement on the screen.
- It enables us to reposition the cursor on the screen where ever we want.

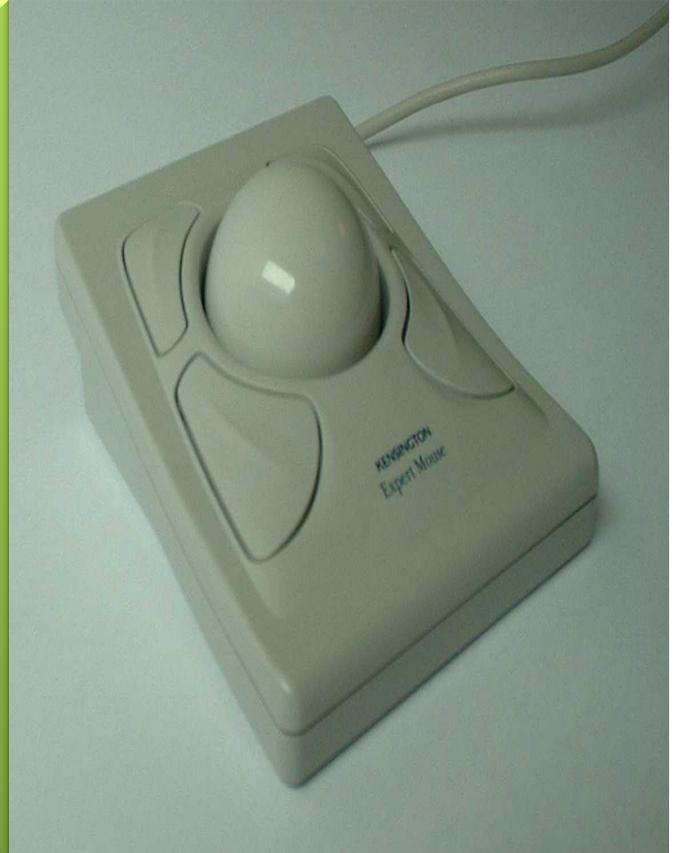


- It also has buttons on its top which communicate certain commands to the computer when pressed.
- In particular, button is often used to click on an icon to invoke the command.



# Trackball

- It is a moveable ball, on the top of a stationary device, that is rotated with fingers or palm of the hand.
- It looks like a mouse turned upside down.
- It has additional buttons whose functions vary according to the software.



# Source Data Entry Devices

These devices are used for direct data entry to the computer systems. Few of them are as under;

- Fax Machine
- Imaging System
- Audio Video Devices