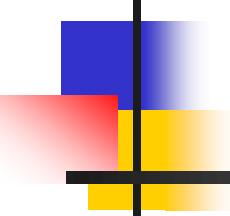


Introduction to Computers

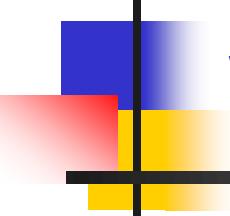


What Is A Computer?

A computer is an electronic device, operating under the control of instructions (software) stored in its own memory unit, that can accept data (input), manipulate data (process), and produce information (output) from the processing. Generally, the term is used to describe a collection of devices that function together as a system.

Devices that comprise a computer system



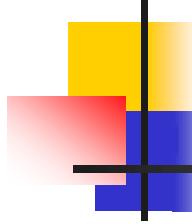


What Does A Computer Do?

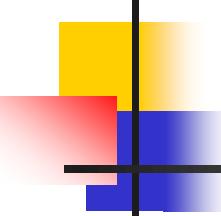
Computers can perform four general operations, which comprise the information processing cycle.

- Input
- Process
- Output
- Storage

What Do Computers Do?

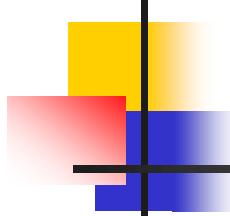
 Input, Process, Output, & Store
data





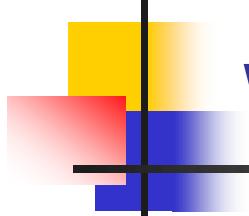
Data and Information

- All computer processing requires **data**, which is a collection of raw facts, figures and symbols, such as numbers, words, images, video and sound, given to the computer during the input phase.
- Computers manipulate data to create information. **Information** is data that is organized, meaningful, and useful.
- During the output Phase, the information that has been created is put into some form, such as a printed report.
- The information can also be put in computer storage for future use.



Why Is A Computer So Powerful?

- The ability to perform the information processing cycle with amazing speed.
- Reliability (low failure rate).
- Accuracy.
- Ability to store huge amounts of data and information.
- Ability to communicate with other computers.

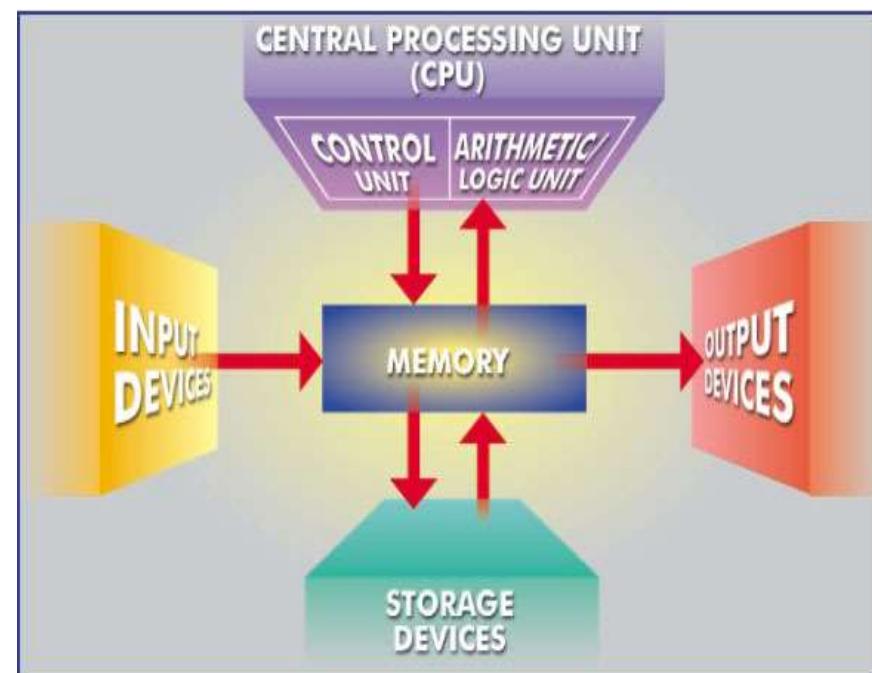


How Does a Computer Know what to do?

- It must be given a detailed list of instructions, called a **compute program** or **software**, that tells it exactly what to do.
- Before processing a specific job, the computer program corresponding to that job must be stored in memory.
- Once the program is stored in memory the compute can start the operation by executing the program instructions one after the other.

What Are The Primary Components Of A Computer ?

- Input devices.
- Central Processing Unit (containing the control unit and the arithmetic/logic unit).
- Memory.
- Output devices.
- Storage devices.



Uses of Computer

PC at Home

Common uses for the computer within the home

- Computer games
- Working from Home
- Banking from Home
- Connecting to the Web



Uses of Computer

Office Applications

Stock Control

Stock control is ideal for automation and in many companies it is now completely computerized. The stock control system keeps track of the number of items in stock and can automatically order replacement items when required.

Accounts / Payroll

In most large organizations the accounts are maintained by a computerized system. Due to the repetitive nature of accounts a computer system is ideally suited to this task and accuracy is guaranteed.

Uses of Computer

Automated Production Systems

Many car factories are almost completely automated and the cars are assembled by computer-controlled robots. This automation is becoming increasingly common throughout industry.

Design Systems

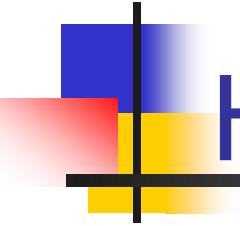
Many products are designed using CAD (Computer Aided Design) programs to produce exact specifications and detailed drawings on the computer before producing models of new products.

Uses of Computer

Computers in Daily Life

- Accounts
- Games
- Educational
- On-line banking
- Smart ID cards
- Supermarkets
- Working from home (Tele-working)
- Internet





History of Computers

COMPUTER

From the Latin word
“computare”

to reckon – to sum up

Webster's Dictionary defines "computer" as any programmable electronic device that can store, retrieve, and process data

The Old Oxford English dictionary describes a computer as a **person** employed to make calculations.

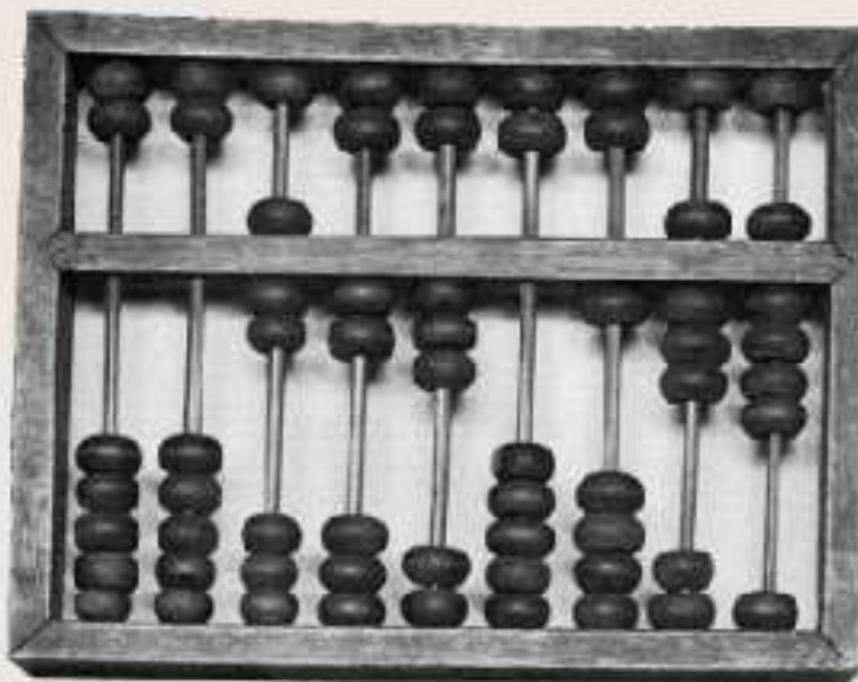


Before the machines, people were hired to do calculations.



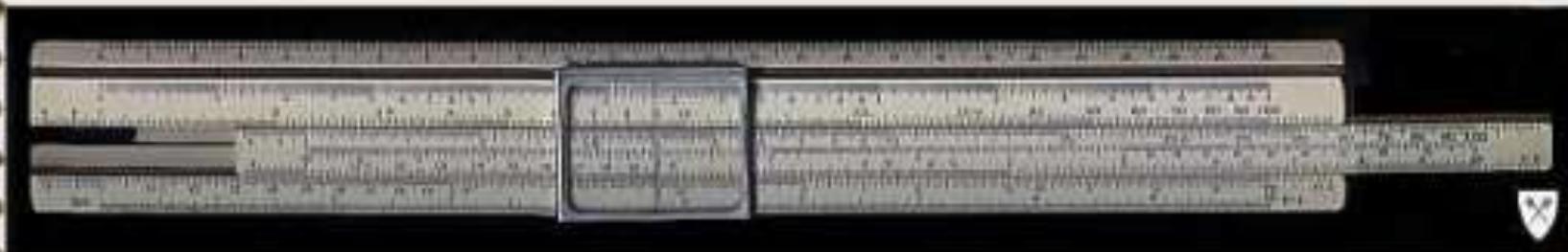
Abacus 3000 BC

The Abacus, a simple counting aid, was most likely invented in Babylonia.



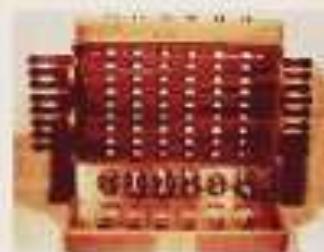
the slide rule 1622

- The **slide rule** is a mechanical precursor of the pocket calculator. It was invented in England by William Oughtred and was very commonly used until the 1970s when it was made obsolete for most purposes by electronic calculators.



1623 - 1833

- 1623: **Wilhelm Schickard**, a professor at the University of Tübingen, Germany, builds the first mechanical calculator. It can work with six digits, and carries digits across columns



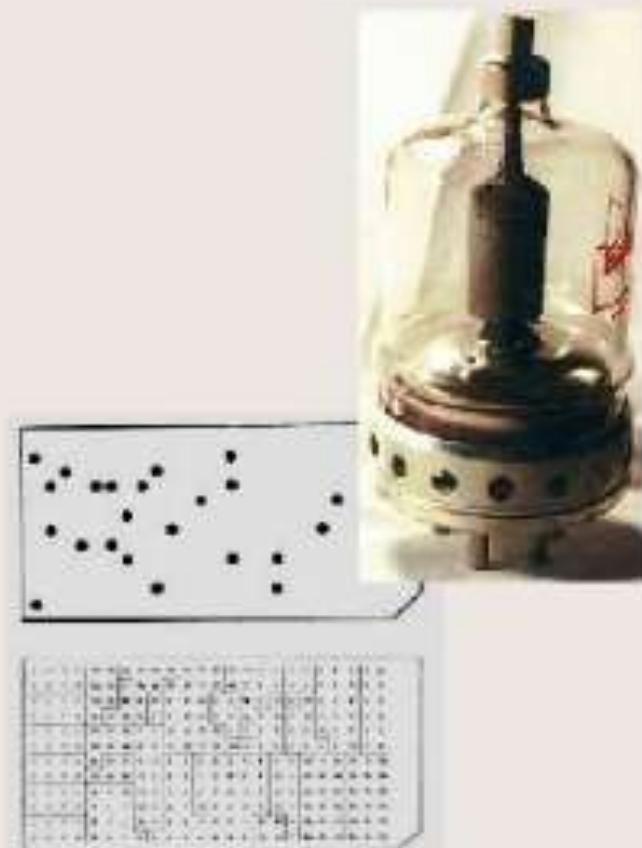
- 1640: **Blaise Pascal** invents the first commercial calculator, a hand powered adding machine
- 1673: **Gottfried Leibniz** builds a mechanical calculating machine that multiplies, divides, adds and subtracts
- 1780: American **Benjamin Franklin** discovers electricity
- 1801: a Frenchman, **Joseph-Marie Jacquard** builds a loom that weaves by reading punched holes stored on small sheets of hardwood.

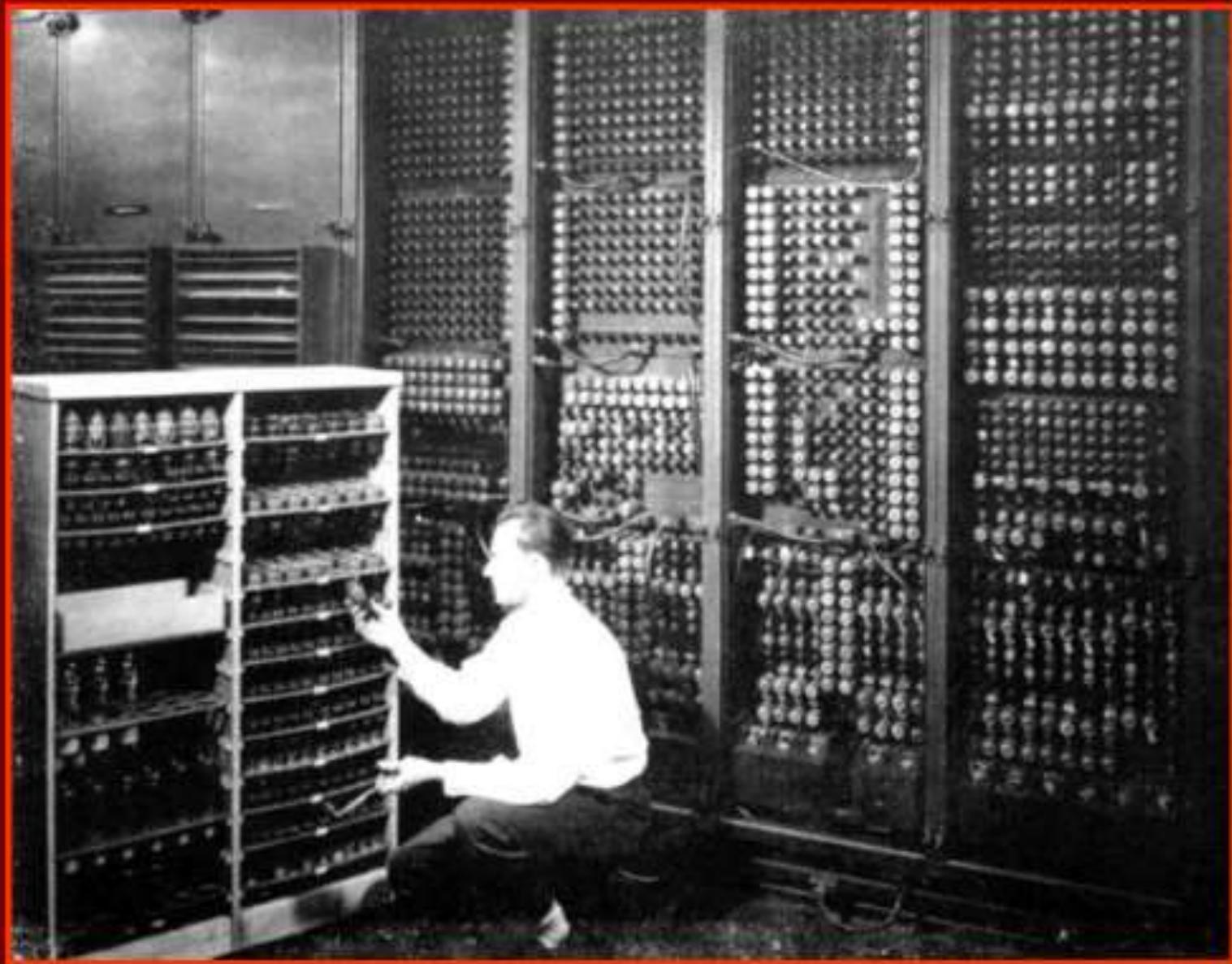


- 1833: **Charles Babbage** designs the Analytical Machine that follows instructions from punched-cards. It is the first general purpose computer

First Generation Computers 1940-1956: Vacuum Tubes

The first computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. They were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions. First generation computers relied on machine language to perform operations, and they could only solve one problem at a time. Input was based on punched cards and paper tape, and output was displayed on printouts.

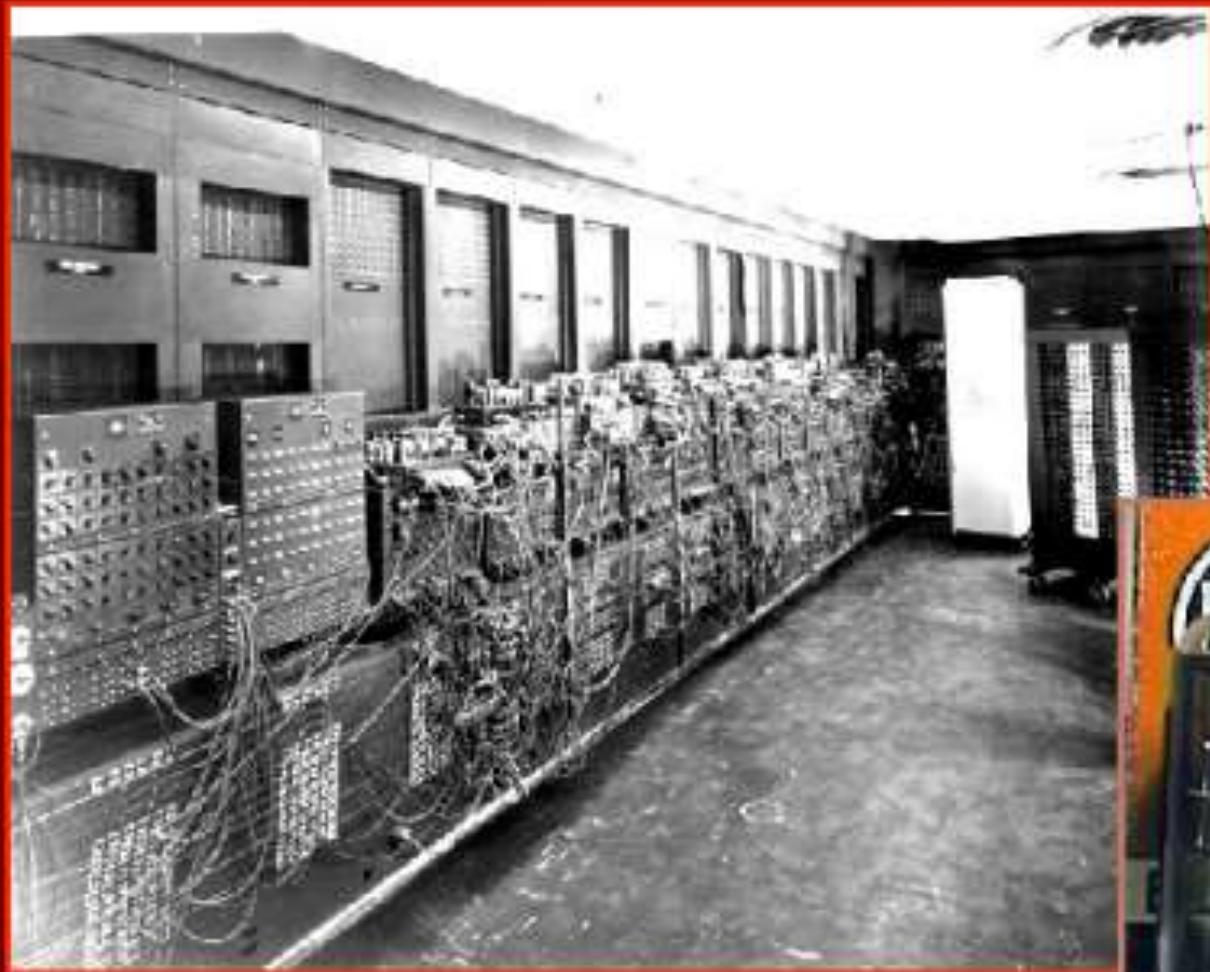




The ENIAC computer, University of Pennsylvania, 1945

ENIAC

Cost: about
\$486,000



Size: over 100 feet long, filling a 30 ft. x 50 ft. room.

Height: 10 feet. Depth: about 3 feet. Weight: about 30 tons.



Second Generation Computers- 1956-1963: Transistors

Transistors replaced vacuum tubes and ushered in the second generation of computers. The transistor was invented in 1947 but did not see widespread use in computers until the late 50s. The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat that subjected the computer to damage, it was a vast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output.

In 1959 IBM shipped its
first transistorized, or
second generation,
computers –
The IBM 1401



Third Generation Computers – 1964-1971: Integrated Circuits

In 1961, the development of the integrated circuit by Robert Noyce of Fairchild Semiconductor, was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.



Fourth Generation computers – 1971-Present: Microprocessors

- The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer on a single chip.



Osborne I – the first “laptop”

- 1981: Adam Osborne completed the first portable computer, which weighed 24 pounds and cost \$1,795. The price made the machine especially attractive, as it included software worth about \$1,500. The machine featured a 5-inch display, 64 kilobytes of memory, a modem, and two 5 1/4-inch floppy disk drives.



TODAY



CD / DVD



P D A



Flat Screens



MP3 players



U S B connectivity



Electronic Tablets

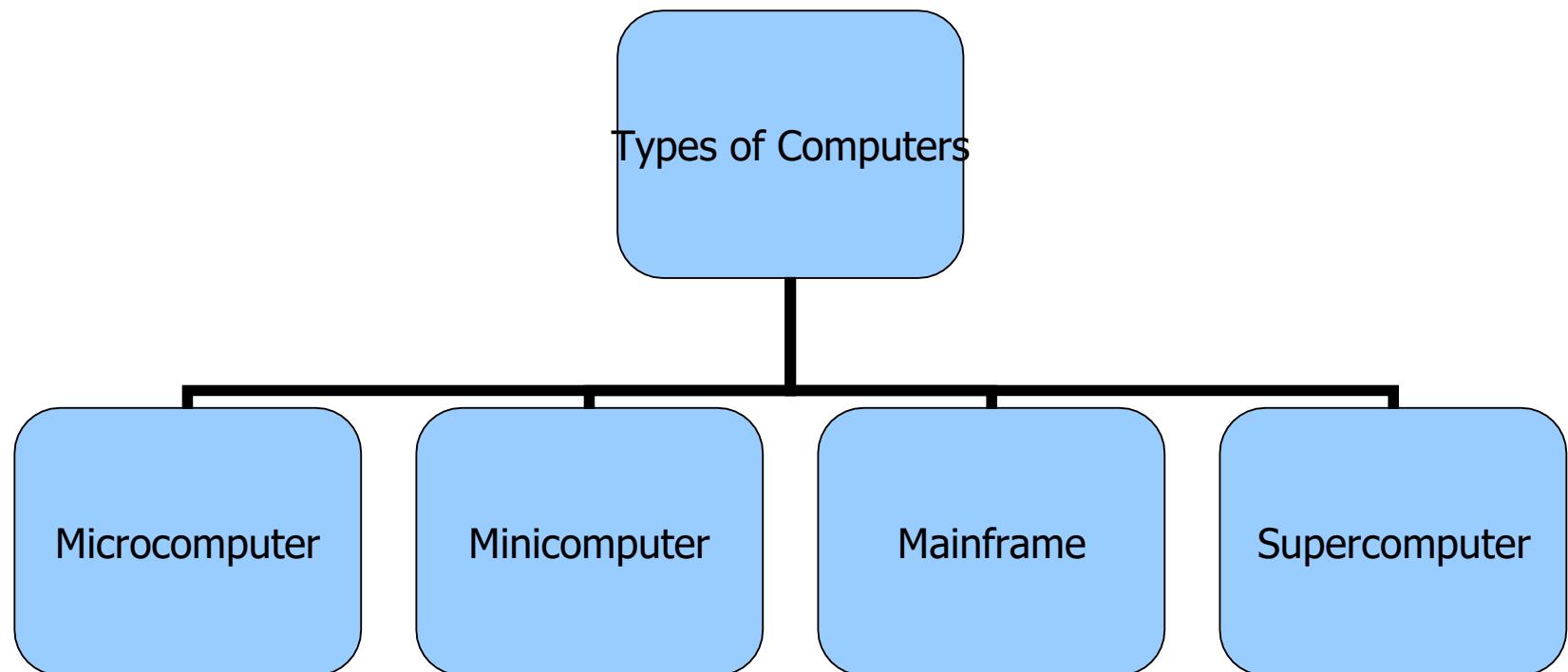


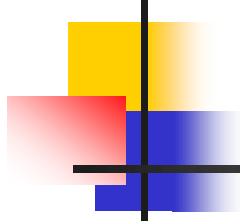
scanner

TOMORROW ...???



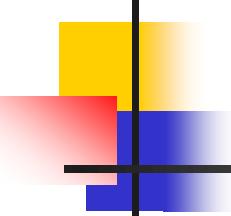
Types of Computers





Microcomputer

- Can be classified into:
 - Desktop PCs
 - sits on desks, rarely moved, large and bulky.
 - Memory capacity, graphics capacity and software availability vary from one computer to another Used both for business and home applications



Microcomputer

- Portable PCs

- Can be moved easily from place to place
- Weight may varies
- Small PCs are popular known as laptop
- Widely used by students, scientist, reporters, etc

Microcomputer Model

Desktop



Laptop



Notebook

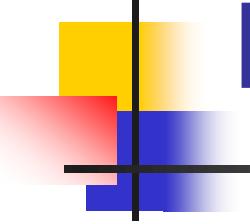


Subnotebook



Palmtop





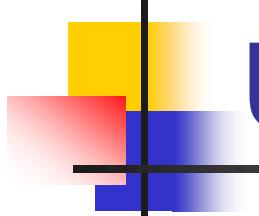
Microcomputer

■ Advantages

- Small size
- Low cost
- Portability
- Low Computing Power
- Commonly used for personal applications

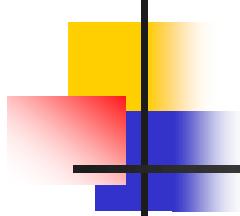
■ Disadvantages

- Low processing speed



Uses of Microcomputer

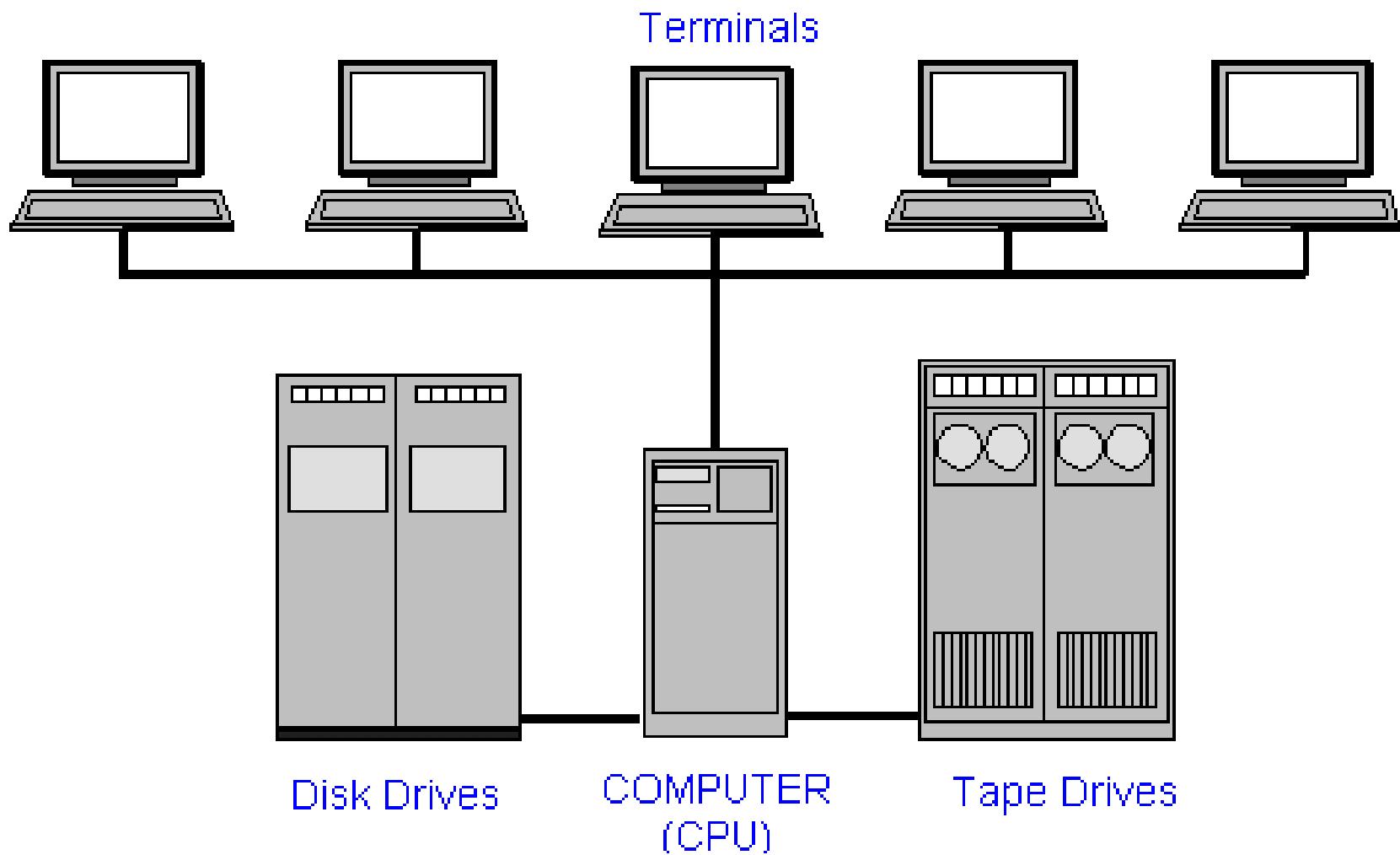
- Word Processing
- Home entertainment
- Home banking
- Printing
- Surfing the internet
- etc

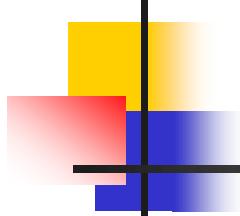


Minicomputer

- Medium sized computer
- Also called the minis
 - e.g. IBM36, HP9000, etc
- Computing power lies between microcomputer and mainframe computer



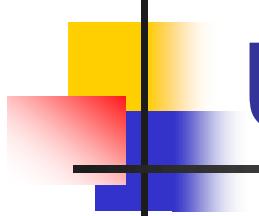




MiniComputer

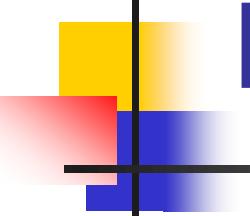
■ Characteristics

- Bigger size than PCs
- Expensive than PCs
- Multi-User
- Difficult to use
- More computing power than PCs
- Used by medium sized business organizations, colleges, libraries and banks.



Uses of Minicomputer

- Control of Automated Teller Machine (ATMs)
- Payroll
- Hospital patients registration
- Inventory Control for supermarket
- Insurance claims processing
- Small bank accounting and customer details tracking



Minicomputer

- **Advantage**

- Cater to multiple users
- Lower costs than mainframes

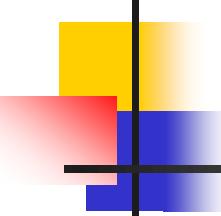
- **Disadvantage**

- Large
- Bulky

Mainframe

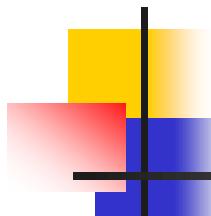
- Known as **enterprise servers**
- Occupies entire rooms or floors
- Used for centralized computing
- Serve distributed users and small servers in a computing network





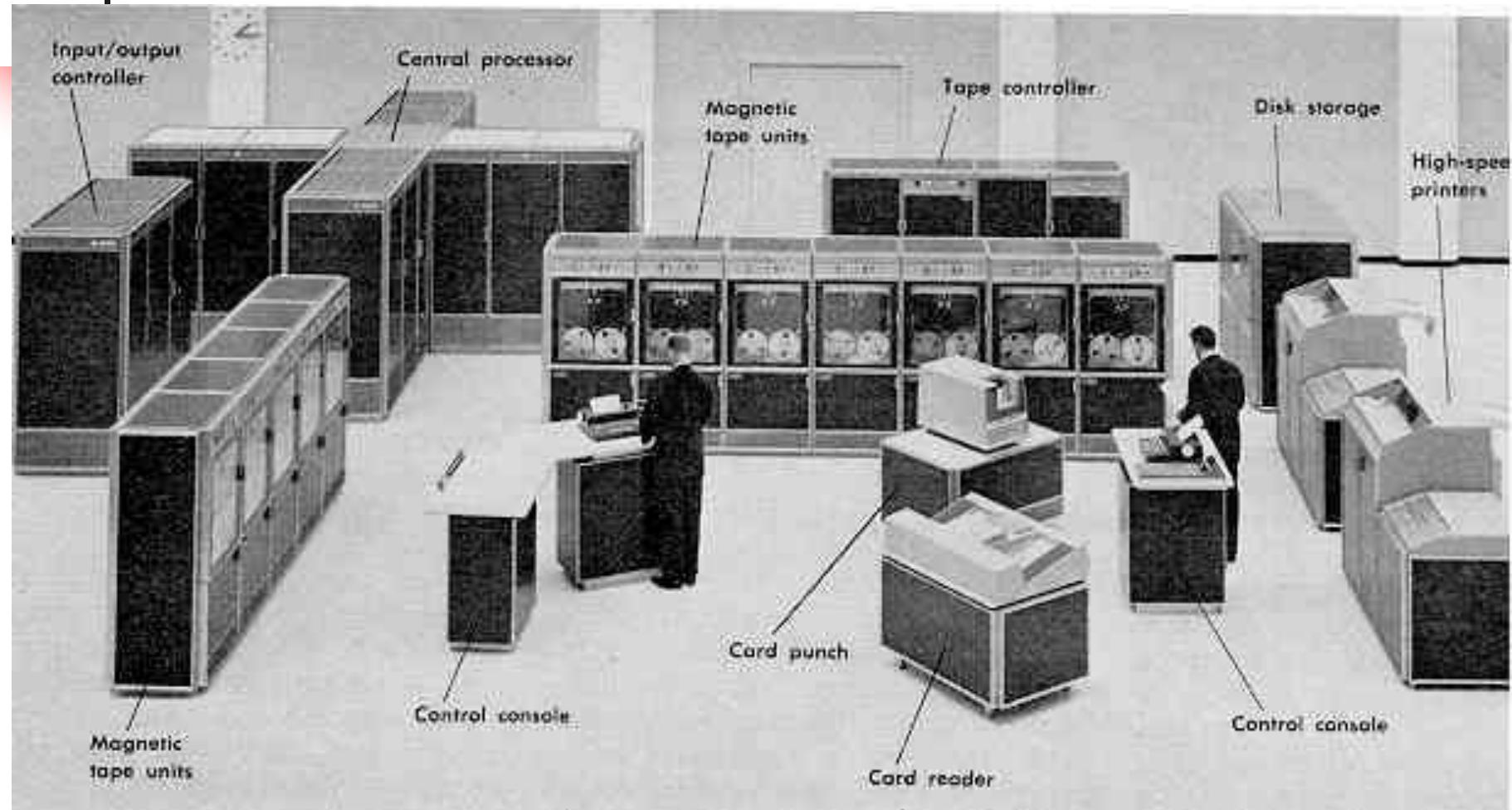
Main Frame

- Large, fast and expensive computer
- Cost millions of dollar
 - e.g. IBM3091, ICL39, etc
- Characteristics:
 - Bigger in size than minicomputers
 - Very expensive
 - Support a few hundred users simultaneously (Multi-Users)
 - Difficult to use
 - More computing power than minicomputers
 - Have to be kept in a special air-conditioned room
 - Used in big business organizations and government departments

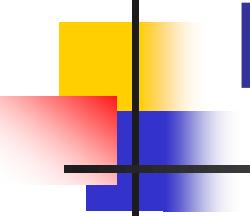


Areas where mainframes are used

- Airline reservation
- Big banks with hundreds of branches located all over the world
- Big universities with thousands of enrollment
- Natural gas and oil exploration companies
- Space Vehicle control
- Weather forecasting
- Animated Cartoon
- Some mainframes are designed to be extremely fast and called super computers. It is used for space launching, monitoring and controlling.







Mainframe

- **Advantage**

- Supports many users and instructions
- Large memory

- **Disadvantage**

- Huge size
- Expensive

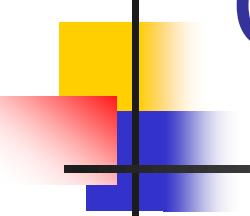
Supercomputer

- Fastest and expensive
- Used by applications for molecular chemistry, nuclear research, weather reports, and advanced physics
- Consists of several computers that work in parallel as a single system



Super Computer

- **Advantage**
 - Speed
- **Disadvantage**
 - Generate a large amount of heat during operation



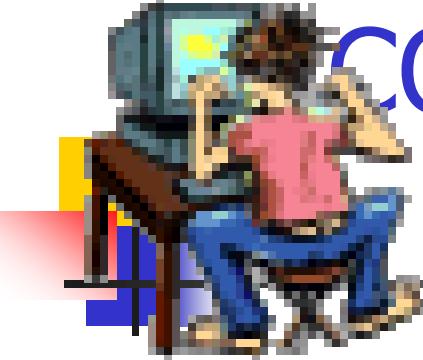
Computer System

A computer system consists of three primary units:

Input units – accept data

Processor unit – processes data by performing comparisons and calculations

Output units – present the results

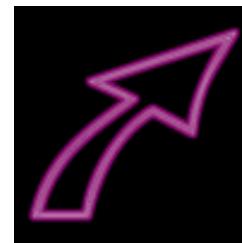


COMPUTER SYSTEM

MONITOR



PROCESSOR



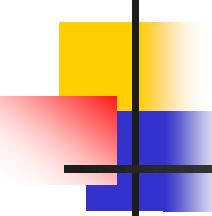
KEYBOARD



Storage
devices



PRINTER



Input Devices

Data are facts, numbers and characters that are entered into the computer via keyboard.

Other types of input devices are mouse, joystick, light pens, scanners, camera, etc.



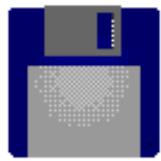
Computer Input Devices

Keyboard

- Mouse/Trackball
- Joystick
- Light pen
- Pointing Stick
- Touchpad

- Touch screen
- Bar code reader
- Scanner
- Microphone
- Graphics Tablet
- Digital Cameras





Processor Unit

Two main parts:

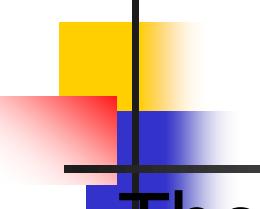
CPU – where the actual processing takes place; and

Main memory – where data are stored.

The contents of main memory can be transferred to **auxiliary storage devices** such as hard disks, floppy diskettes, zip disks, compact disks, or USB flash disk.



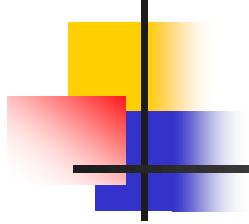
Central Processing Unit



The microprocessor, the brains of the computer. Referred to a CPU or processor

Housed on a tiny silicon chip

Chip contains millions of switches and pathways that help your computer make important decisions.

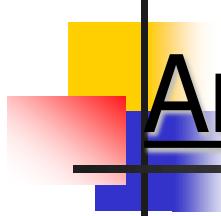


CPU knows which switches to turn on and which to turn off because it receives its instructions from computer programs (software).

CPU has two primary sections:

Arithmetic/logic unit

Control unit



Arithmetic/logic unit (ALU):

- Performs arithmetic computations and logical operations; by combining these two operations the ALU can execute complex tasks.
 - Arithmetic operations include addition, subtractions, multiplication, and division.
 - Logical operations involve comparisons.



Control Unit: is the “boss” and coordinates all of the CPU’s activities.

Uses programming instructions, it controls the flow of information through the processor by controlling what happens inside the processor.

We communicate with the computer through programming languages.

Examples: COBOL, C++,
HTML, Java Script or
VisualBasic.net

Memory

Found on the motherboard



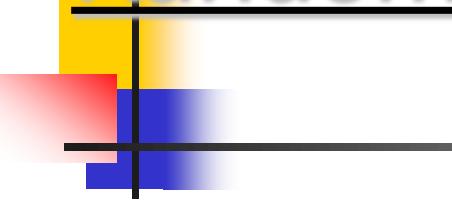
Short term

Random Access Memory (RAM)

Long term

Read Only Memory (ROM)

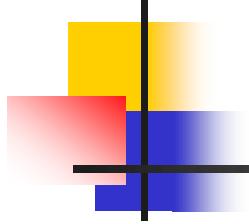
Random Access Memory (RAM)



Memory on the motherboard that is short term; where data, information, and program instructions are stored temporarily on a RAM chip or a set of RAM chips. Known as the main memory.

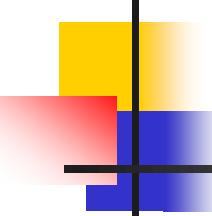
This memory is considered volatile.

The computer can read from and write to RAM.



When the computer is turned off or if there is loss of power, whatever is stored in RAM disappears.

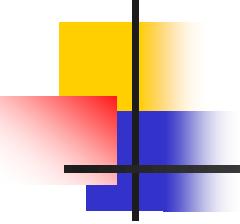
“Temporary Memory” – Short Term



Read-Only Memory (ROM)

Memory on the motherboard that is long term; where the specific instructions that are needed for the computer to operate are stored.

This memory is nonvolatile and your computer can only read from a ROM chip.



The instructions remain on the chip regardless if the power is turned on or off.

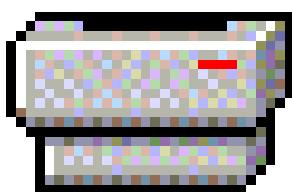
Most common is the BIOS ROM; where the computer uses instructions contained on this chip to boot or start the system when you turn on your computer.

“Permanent Memory” – Long Term



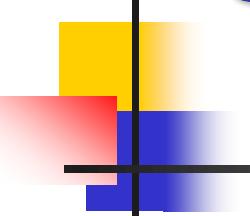
Output Unit

After the data has been processed, the results are output in the form of useful information.



Output units such as **monitors** and **printers** make the result accessible for use by people.

Computer Output Devices

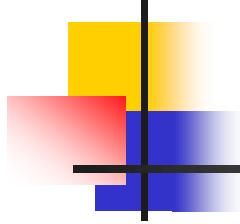


Monitor: screen that display information such as text, numbers, and pictures-softcopy.

Speakers: allow you to hear voice, music, and other sounds from your computer.

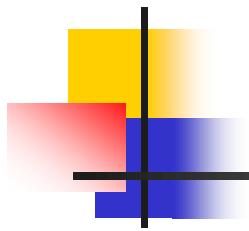
Printer: gives you information from the computer in printed form – hardcopy.

Modem: allows you to use your computer to communicate with other computers.



Input Devices

- Keyboard.
- Mouse.



The Parts of a Computer System

- A complete computer system includes four distinct parts:

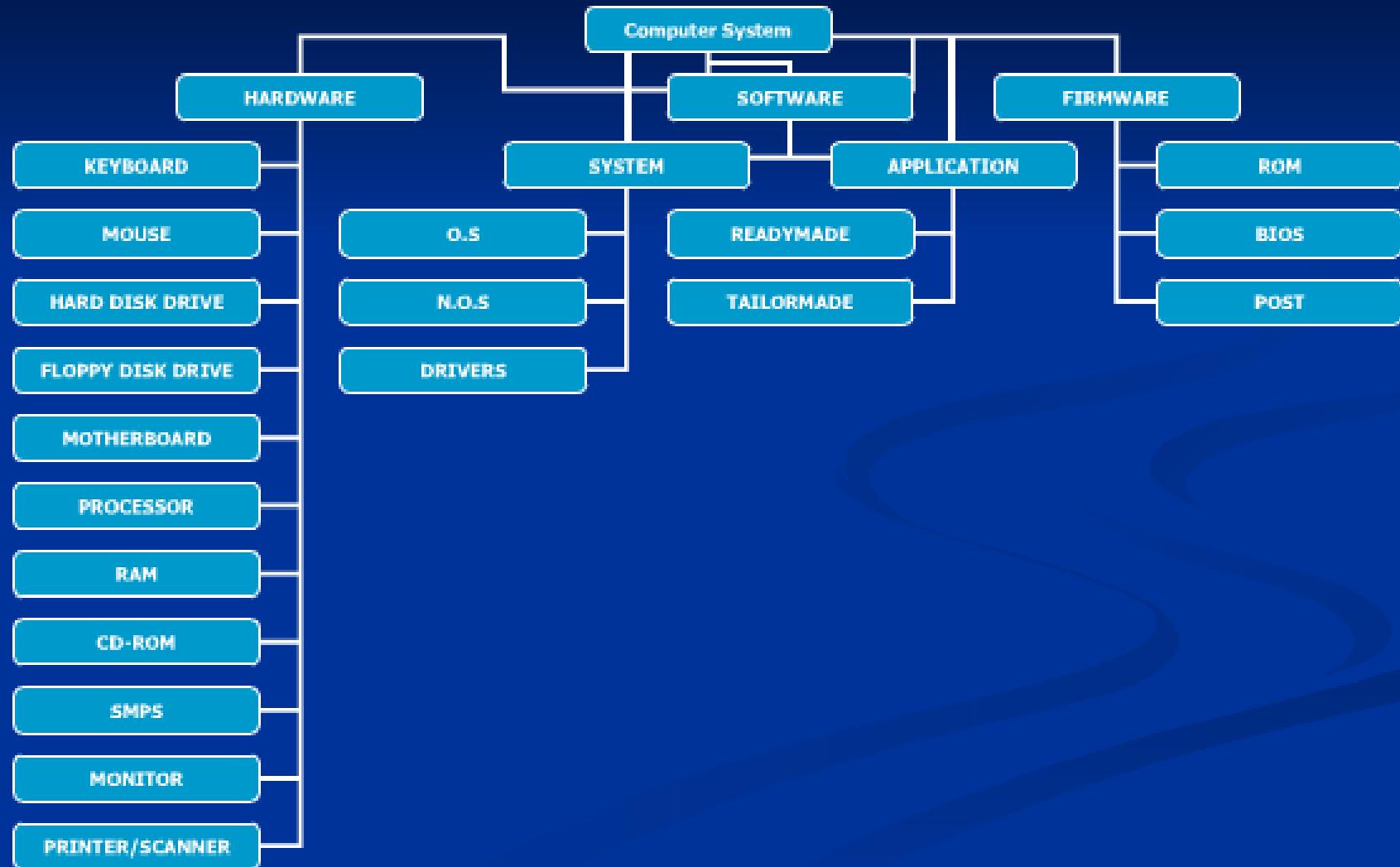
Hardware

Software

Firmware

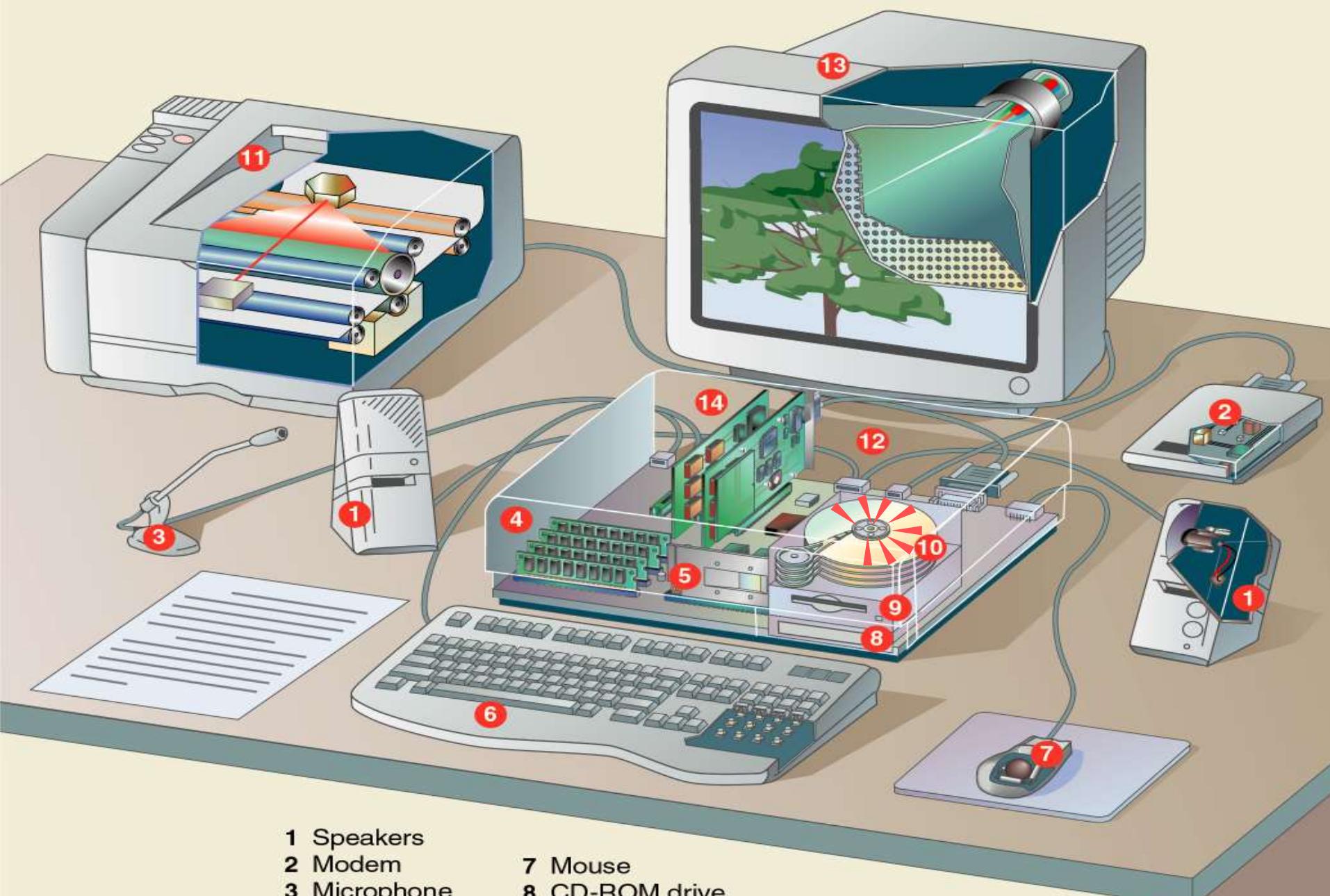
User

Computer System



What is a Hardware?

- Hardware is the general term that is used to describe physical artifacts of a technology.
- A computer's hardware consists of electronic devices; the parts you can see and touch.



1 Speakers

2 Modem

3 Microphone

4 RAM

5 CPU

6 Keyboard

7 Mouse

8 CD-ROM drive

9 Diskette drive

10 Hard drive

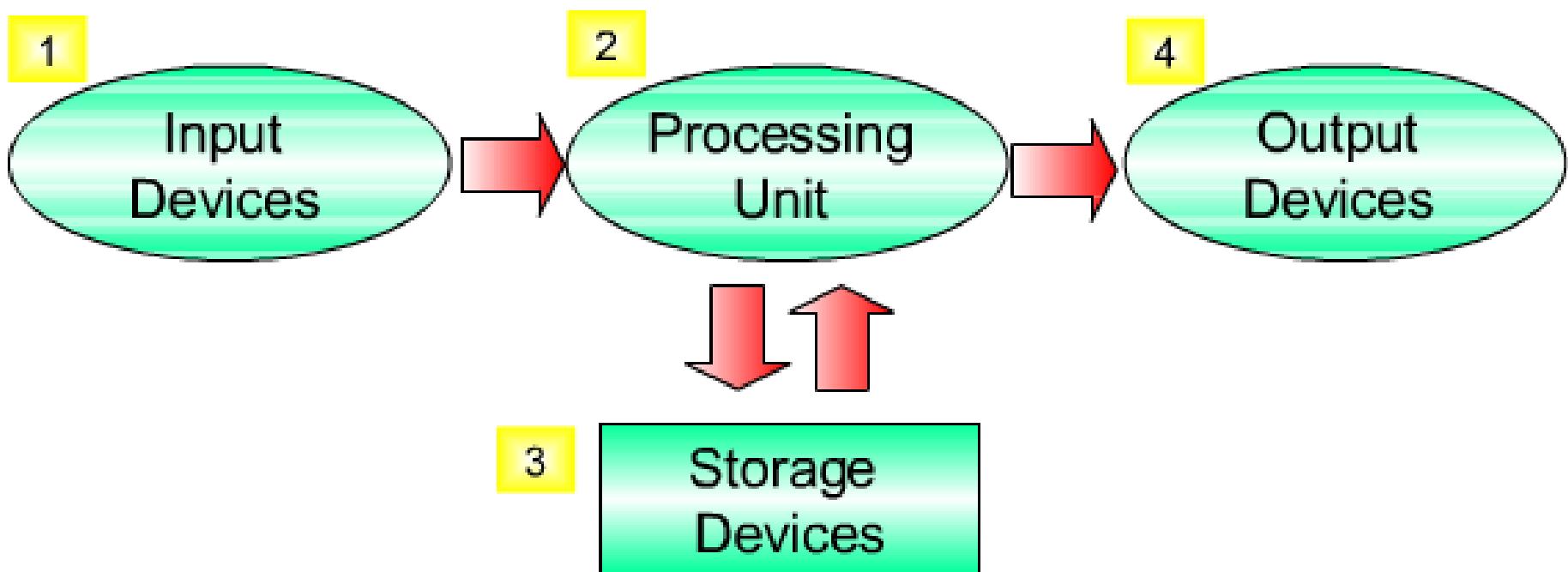
11 Printer

12 Ports

13 Monitor

14 Expansion board

Classification of Hardware



1.KEYBOARD

Keyboard is the primary input device of the PC. You use the keyboard to enter commands and type text. The keyboards on computers are similar to typewriters. However, a computer has many additional keys. Computer keyboards have not changed a lot since they were introduced. The only changes have been additions to the number of keys in the original keyboards. Present day keyboards have 101 or more keys. Each of these keys performs a different operation.



Types of Keyboards

Type of Keys



TYPE OF KEYBOARD

1. AT Keyboard
2. P/2 Keyboard
3. USB Keyboard

AT Keyboard

■ AT (Advanced Technology) Keyboard

The 5-pin DIN connector was widely in use in the past. The DIN stands for Deutsche Industries Norm. This type of connector is rarely used nowadays.

(Male connector)



PS/2 Keyboard

■ PS/2 (Personal Standard/2)

IBM introduced the PS/2 port on the back of PCs to connect devices such as the mouse and the keyboard. The PS/2 port supports the 6-pin PS/2 connector, which is very popular in the present. It has replaced most of the 5-pin DIN connectors. The 6-pin PS/2 connector is also known as the 6-pin mini DIN connector.



USB Keyboard

- USB (Universal Serial Bus) Keyboard

The 4-pin USB connector for keyboards is fast replacing the 6-pin PS/2 port as the most widely used connector for keyboards. The USB keyboard is connected to the USB port on the back of the computer and tends to be the fastest.



2.MOUSE

- Douglas Engelbart invented the computer mouse in 1963. It is a device that enables a computer user to move the cursor or pointer to a specific point on the screen. It was given its name because of its appearance and movement, which are similar to those of a mouse. When you move the mouse, the cursor on the screen also moves in the same direction. The mouse is the most used input device after the keyboard. The mouse is particularly important for Graphical User Interface (GUI) applications. You can also use the mouse for drawing objects on the screen by using the mouse as a pencil or paintbrush



Types of Mice

Types of Mouse Devices

There are different types of mouse devices that are widely in use at present. The connected mouse has been replaced to a great extent with cordless and optical mouse devices

Mechanical Mouse

Optomechanical Mouse

Optical Mouse

Cordless Mouse

Mechanical Mouse

A mechanical mouse is the oldest type of mouse available today. This type of mouse consists of a rubber or metal ball on the underside. The mouse is placed on a mouse pad. As the mouse is moved, the ball rolls in the appropriate direction. This type of mouse has mechanical sensors that detect the direction of movement of the mouse and send signals to the computer to move the pointer accordingly.

Optomechanical Mouse

- The Optomechanical mouse is similar to the mechanical mouse. However, this type of mouse makes use of optical sensors instead of mechanical sensors. The optomechanical mouse is more accurate than the mechanical mouse.

Optical Mouse

- An Optical Mouse uses laser technology to detect the movement of the mouse. It is the most accurate and precise type of mouse. The optical mouse has no moving parts. The optical mouse must be moved along a special mouse pad that has grids on its surface. The grids on the mouse pad provide a frame of reference for the working of the mouse.

Cordless Mouse

- A cordless mouse establishes an infrared or radio link with a transceiver (transmitter/receiver) that is connected to the computer through a cable. Cordless mouse are very convenient and easy to use. Cordless mouse operate on batteries.

Mouse Connectors

- Serial Connector
- PS/2 Connector
- USB Connector

Serial Connector

- The serial mouse connects to the serial port on the computer. This type of connection offers low speed and hence it is being replaced with other connections like the PS/2 and USB ports.



PS/2 Connector

- The PS/2 mouse port on the back of the PC connects to the mouse. This port was originally invented so that other devices like modems could use the serial port. The PS/2 port was also known as the mouse port. This is the most widely used port for connection of a mouse to the computer.



USB Connector

- Some types of mouse devices connect to the computer through the USB port. The USB connection offers good speed.



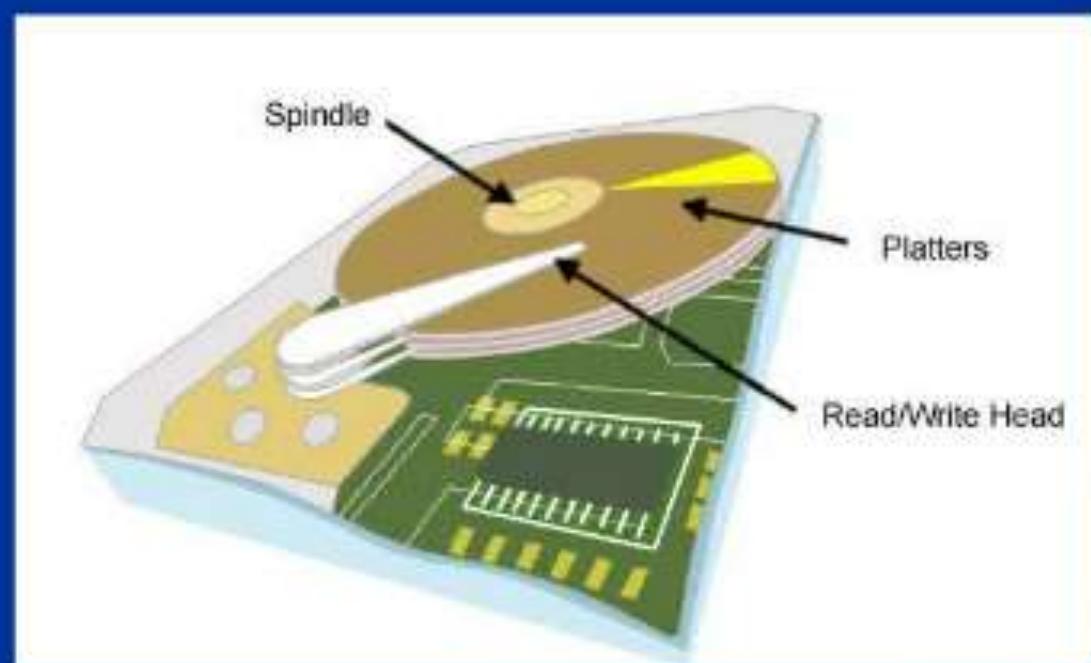
3. Hard Disk Drive

- A hard disk is the primary and permanent data storage device that is placed in the system. It is similar to a human brain where all the past and present events are stored. It is made up of a magnetic material that helps in storing data for the system by following the magnetic recording techniques. A hard disk stores data from 1 GB to 160 GB or even more depending on the capacity of the hard disk. A hard disk consists of several circular platters and each platter has read/write heads on both the sides of it. The platters are divided into concentric rings, called as tracks, and each track is divided into number of sectors. The read/write heads examines and then records the data in these sectors.



Components of the Hard Disk

- The different components such as the platters, the read / write head and the head actuator form the hard disk. These components are sealed inside the hard disk compartment known as Head Disk Assembly (HAD)



Platters

- The platters are round disks that are made up of metal or glass. The platters of glass are preferred, as the shape of the glass does not change when the hard disk heats up. The platters in the hard disk are stacked over each other. The size of the platter determines the size of the hard disk

Read/Write Head

- The Read/Write head is used to read the data stored on the hard disk and also write the data to the hard disk. While reading, the head converts the data from binary to a magnetic pulse. The magnetic pulse charges the magnetic coating on the platter and stores the data on the disk. While reading data from the disk, the head reads the magnetic data stored on the disk and converts them to binary and sends it to the system. Every platter in the hard disk has two read/write heads one on each side of the platter. While the disk is reading or writing data to the disk the head does not touch the disk. However, when the disk stops spinning the head gently rests on the stationary disk.

Logic Board

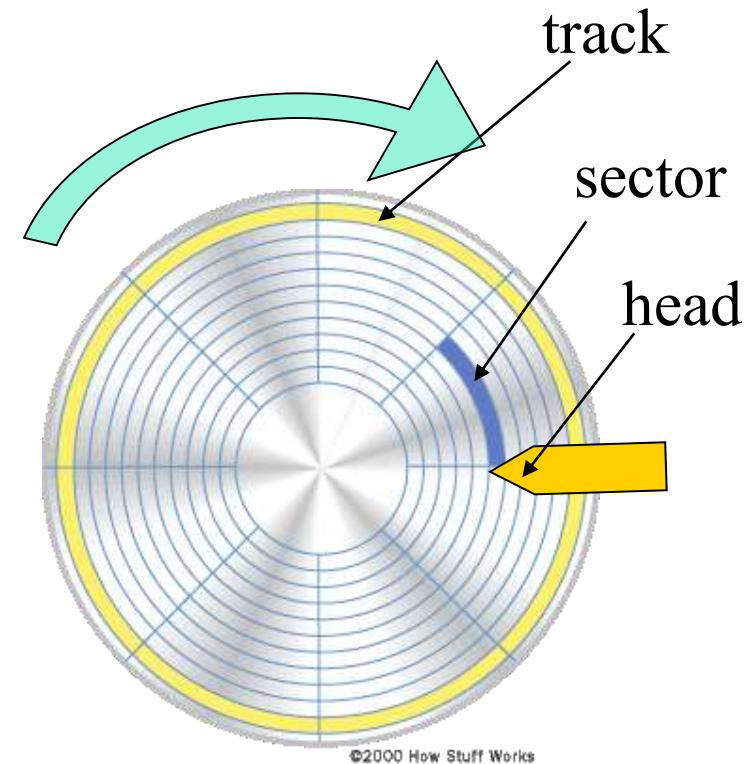
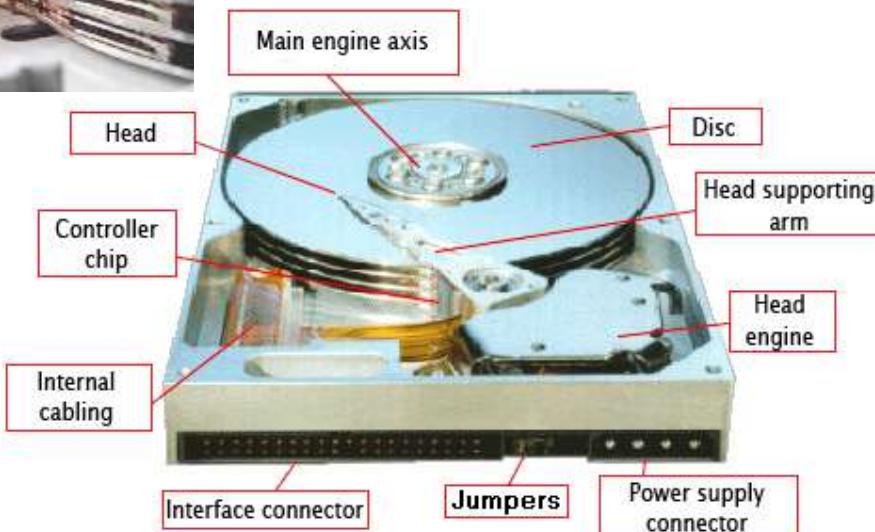
- The Logic Board contains the circuit for controlling the hard disk. All the connectors from the system connect to the logic board. The logic board stores the data on the hard disk platters. Sometimes the logic board of the hard disk may fail due to surges in the power supply. In such a case you can replace the logic board of the hard disk.

Hard Disk Jumpers

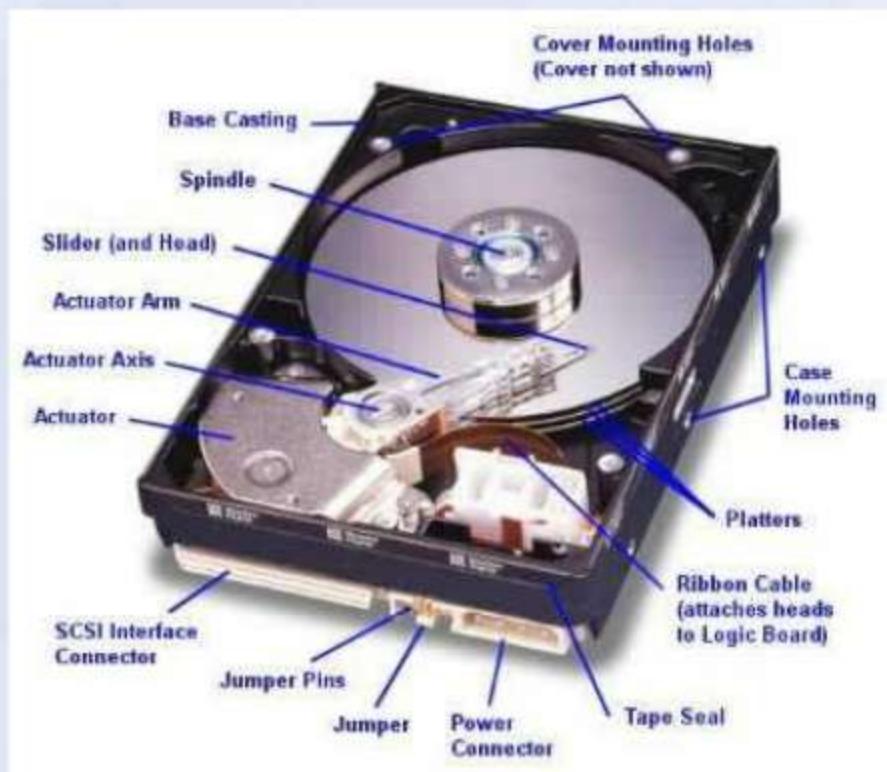
- You can also set the hard disk to master, slave or cable select as per the jumper settings displayed on a label affixed on the top cover of the hard disk. If you have two hard disks installed on the system, you must set the jumper of one hard disk to master and the jumper of the other hard disk to slave. This ensures that the correct hard disk responds to the system calls. The system considers the master first and then the slave while assigning drive letters. The system also boots the primary partition from the hard disk set as master.



HD



Hard Disk Inside



Types of Hard Disks

- The different hard disks specify the speed at which the hard disk transfers data and the reliability of the hard disk in storing the data if the hard disk crashes.

Advanced Technology Attachment (ATA)

Serial ATA (SATA)

Small Computer Systems Interface (SCSI)

Advanced Technology Attachment (ATA)

- The ATA transfers data between the hard disk and the system using 16 bits with speeds of upto 100 MB per second. You can connect two hard disks to a single controller on the system. You must set the hard disk to master or slave using the jumpers on the hard disk, so that the system can identify the required hard disk. This hard disk uses a 40-pin connector to connect to the system. And 4 Pins Power Connector.



Serial ATA(SATA)

- The Serial ATA transfers data between the hard disk and the system using only 1 bit at a time with the speed of upto 600 MB per second. You can connect only one Serial ATA hard disk to a single controller on the system, thus this hard disk does not have settings such as master, slave or cable select. The Serial ATA hard disk uses a 7 wire cable to connect to the system. And 15 Pins or 4 Pins Power Connector.



Serial ATA(SATA)

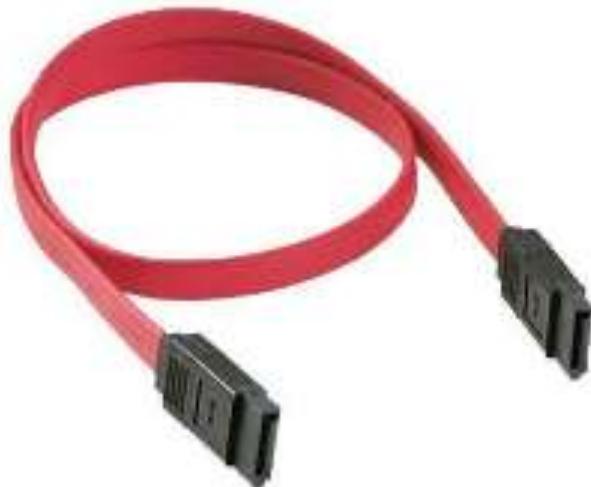
- The Serial ATA transfers data between the hard disk and the system using only 1 bit at a time with the speed of upto 600 MB per second. You can connect only one Serial ATA hard disk to a single controller on the system, thus this hard disk does not have settings such as master, slave or cable select. The Serial ATA hard disk uses a 7 wire cable to connect to the system. And 15 Pins or 4 Pins Power Connector.



SATA Connector



Sata Cables



5.CD-ROM AND CD WRITER DRIVES

Introduction :

- The data stored on the CD can last for many years. The CD can store large amounts of data and is used to distribute software, music, and movies. The CD drive reads the data stored on the CD. The CD-ROM drive can only read data from a CD. Today CD-R and CD-RW drives are available that can read, and also burn data on a CD.



CD Drive



CDs



DVDS

■ CD-ROM Disc

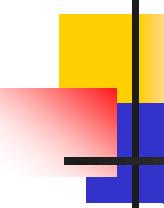
The 3.5 inch floppy disk stores about 1.44 MB of data. This enabled users to only copy files of small size on the floppy disk. The CD stores more data than the floppy disk. The CD holds about 650 - 700 MB of data. The CD is made out of a clear piece of polycarbonate plastic. The CD has different layers that enable the CD drive to read data from the CD. The layers that make up the CD depend on the type, and the number of times that you can write data on the CD.

Optical Discs

Use laser technology to read and write data on silver platters

Compact Disk (CD) can store 650MB to 800MB of information and data. CD-ROM (Read Only Memory) can only read data from a CD-ROM.

You can store data on a CD only if you have a CD Burner and CD-R (writable) or CD-RW (rewritable) CD.



DVD (Digital Versatile Disk) is the size of a regular CD and can be played in a regular in a DVD movie player.

DVD can store 4.8GB to 8.0GB of information and data. DVD-ROM is readable only (a movie DVD).

You can store data on a DVD only if you have a **DVD Burner** and

DVD+R/DVD-R (writable)
or DVD-RW
(rewritable) DVD.

■ CD-ROM Drive

The CD-ROM drive can read data from the CD-ROM disc and the Audio CD. You can use this drive to install software from a CD and play music from an Audio CD.

The speed of the CD drive specifies the amount of data the CD drive reads from the CD in a second. This speed is called the transfer speed of the CD drive. The original speed of the CD drive is 150 KB per second. The speed of the CD drive is specified using a number followed by X. For example, if the speed of the CD drive is specified as 52X, then the CD drives reads data from the CD at a speed of 52X. The number specifying the speed of the CD drive must be multiplied with the original speed of 150 KB per second, to get the speed of the CD drive. For example if the speed of the CD drive is specified as 12X, then the transfer speed is $12 \times 150 = 1,800$ kbps.

Connectors

- The IDE cable connects the CD drive to the motherboard. The CD drive uses the 40 pin connector. You must ensure that the marking on the IDE cable is on the same side of the power supply cable when inserting it in the CD drive. The CD-ROM drive is also equipped with output connections for sound. You can connect the cable from here to the sound card or the sound output device.





Jumper

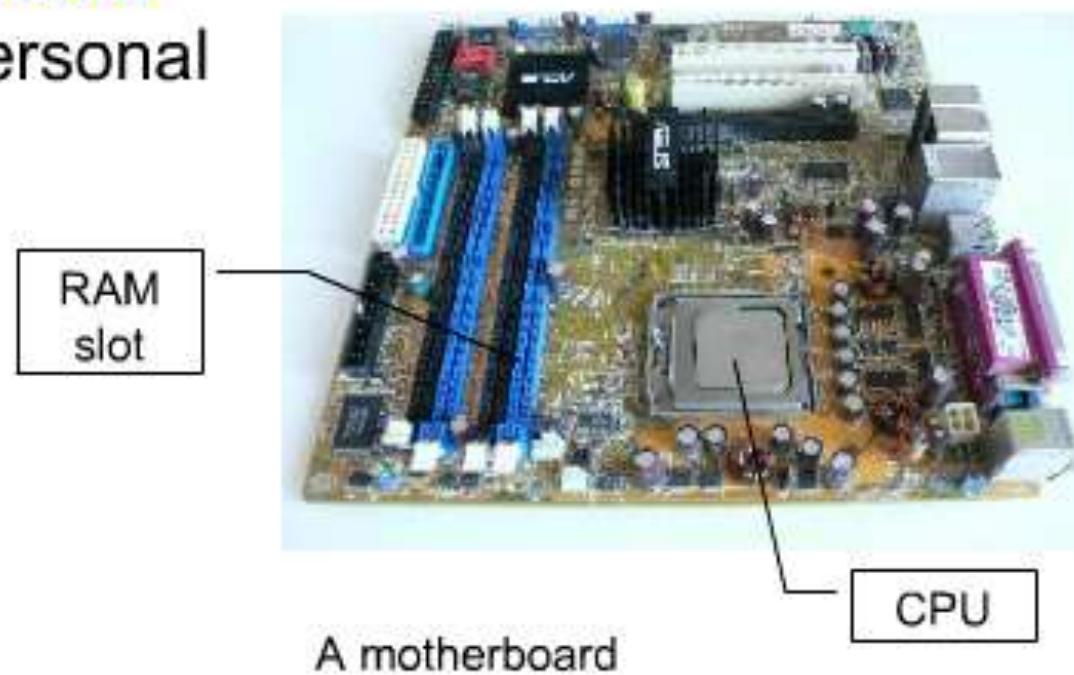
DVD ROM AND COMBO DRIVES

■ Introduction :

- Digital Versatile Disk or Digital Video Disk (DVD) is a form of digital storage. DVD is used to stores music, video, games, and multimedia applications. The DVD is similar to the CD in appearance and structure. The DVD offers higher capacity and better quality as compared to the CD. The DVD storage capacity is seven times that of a CD. To play a DVD, a DVD ROM drive is used. In addition, combo drives are available that play DVDs as well as CDs.

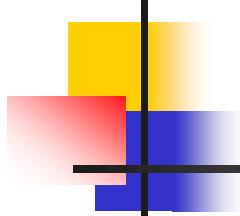
What is a motherboard?

- A **motherboard** is the *central circuit board* making up a personal computer.



Motherboard

- A personal computer is built with the CPU, main memory, and other essential components on the motherboard.
- Other components such as external storage, controllers for video display and sound, and peripheral devices are typically attached to the motherboard via edge connectors and cables.
- In modern computers it is increasingly common to *integrate these "peripherals" into the motherboard.*



PC Subsystems

- **Motherboard** – The main circuit board of a microcomputer



Form Factors of Motherboard

- The form factor of a motherboard refers to its physical shape, layout, and the positioning of the components on it. The form factor of the motherboard determines the type of system case it will fit into. Some motherboards that have the same functionality can be packaged in different form factors. The only major difference between such motherboards will be the form factor. Motherboards are available in different forms. Are as follow:-

Advanced Technology (AT)

Baby AT

Advanced Technology Extended (ATX) Form Factor

Advanced Technology (AT) Form Factor

- The AT form factor is also known as the full-size AT form factor. This form factor matches the original IBM AT motherboard in structure and layout. This type of motherboard is very large and is about 12 inches wide and 13.8 inches deep. The AT form factor is not used much by present-day motherboard manufacturers. This type of motherboard does not fit into most of the popular system cases and its size also makes installation and troubleshooting difficult.

Baby AT Form Factor

- The baby AT form factor was the most popular till recently. This form factor is very much similar to the original IBM XT motherboard structure. The baby AT form factor fits into most of the system cases. A baby AT motherboard is 8.5 inches wide and about 13 inches long. The length of baby AT motherboards is not fixed

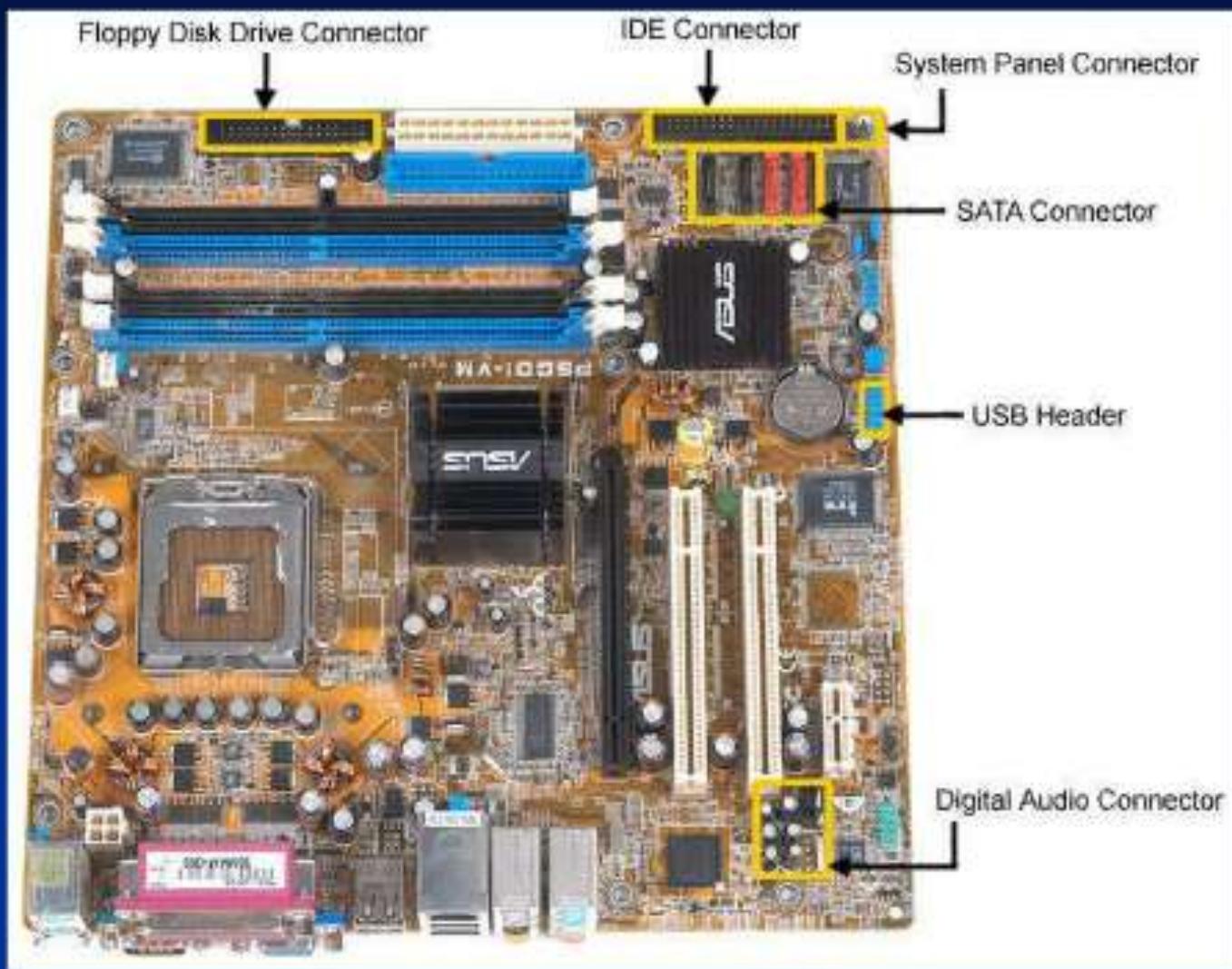
Advanced Technology Extended (ATX) Form Factor

- Intel invented the ATX form factor in the year 1995. The ATX and mini ATX form factors are the most popular ones presently. The ATX form factor has many of the best features of the LPX and AT form factors. The ATX form factor is not compatible with the LPX or AT form factors. As a result, new system cases and power supplies were designed to match this form factor. These cases and power supplies have now become quite common. The ATX

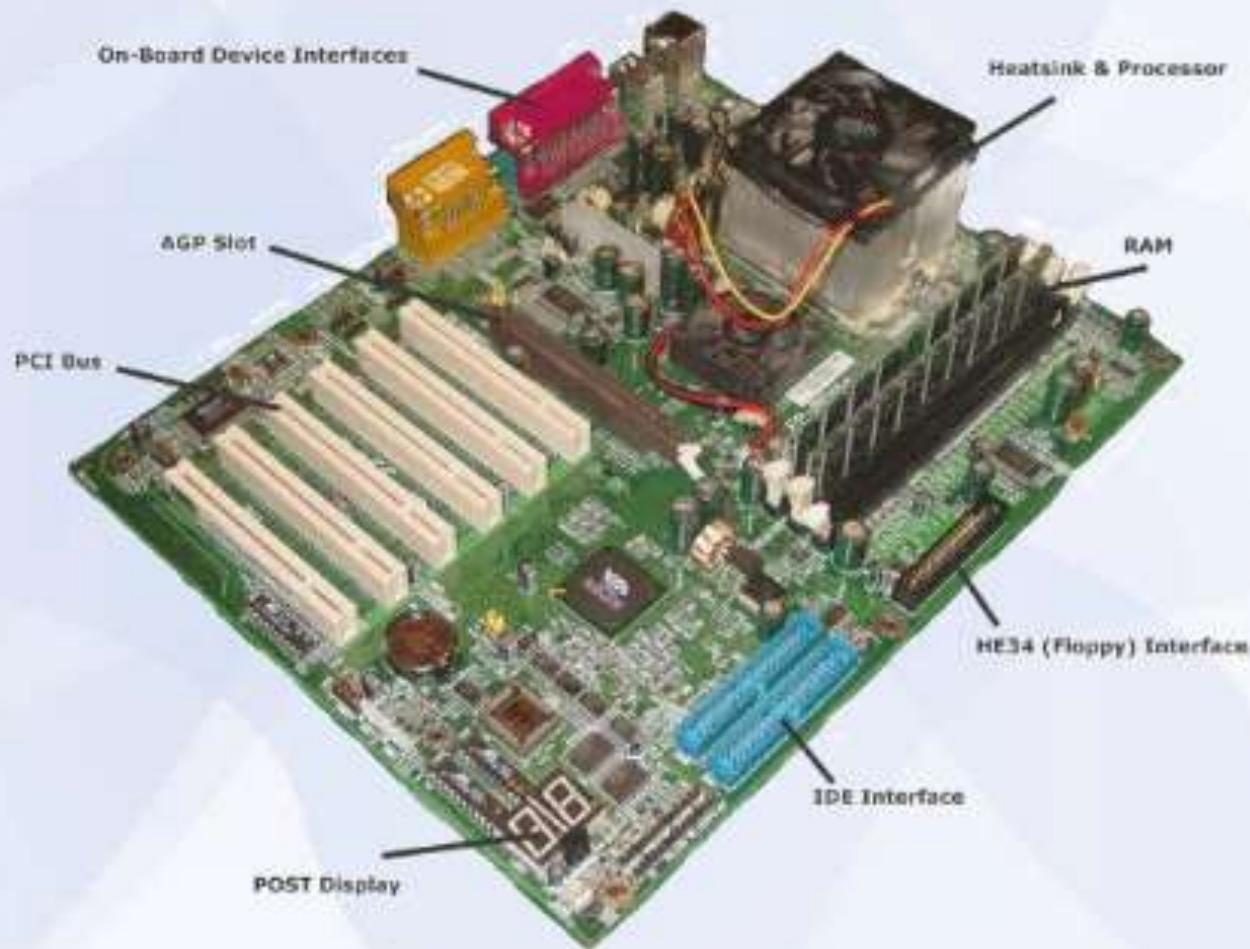
Components of a Motherboard

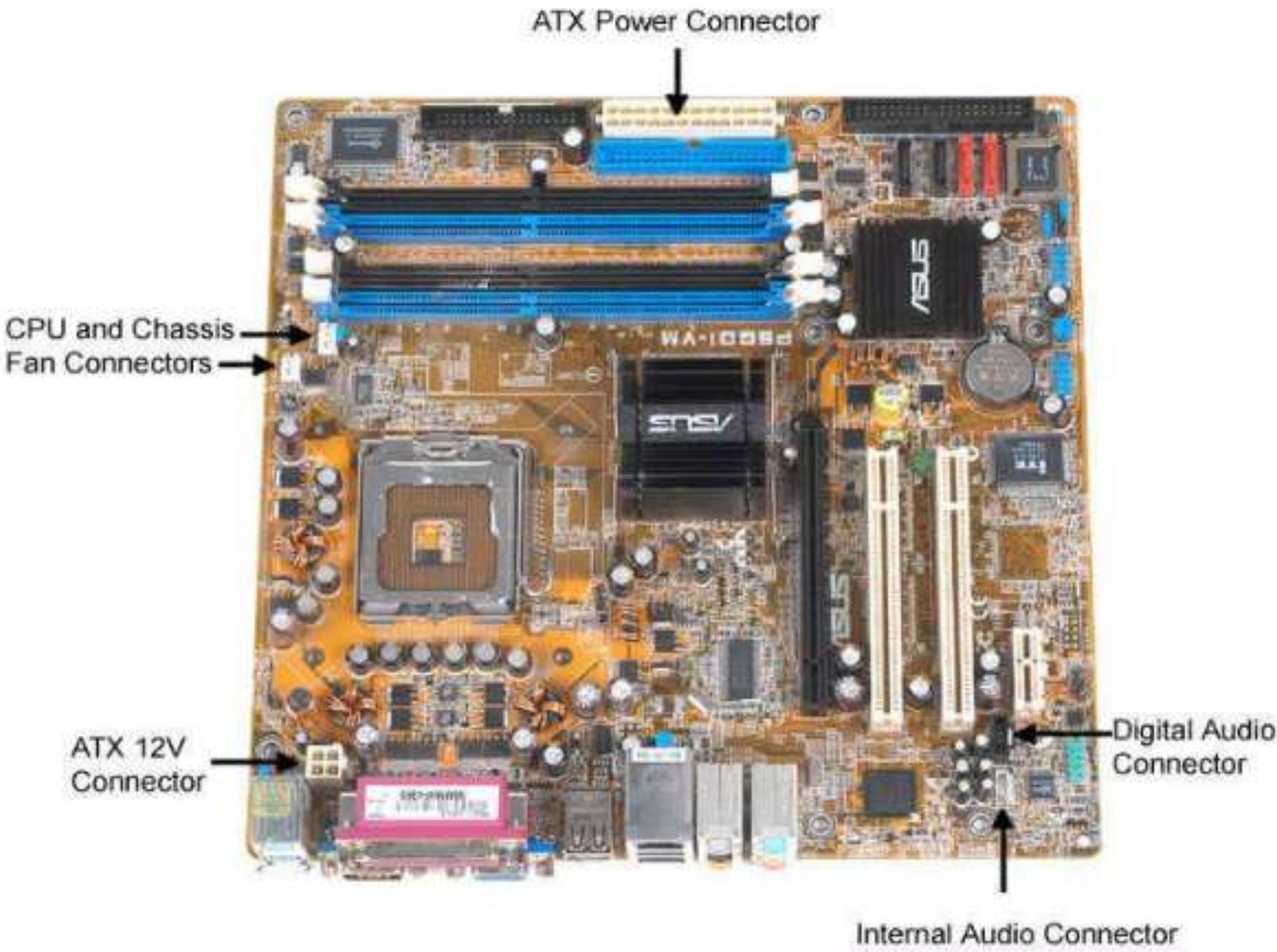
- The motherboard has several connectors, jumpers and expansion slots for connecting various components of the system. You can connect various devices of the system to the connectors and expansion slots of the motherboard. You can configure the motherboard using the jumpers.

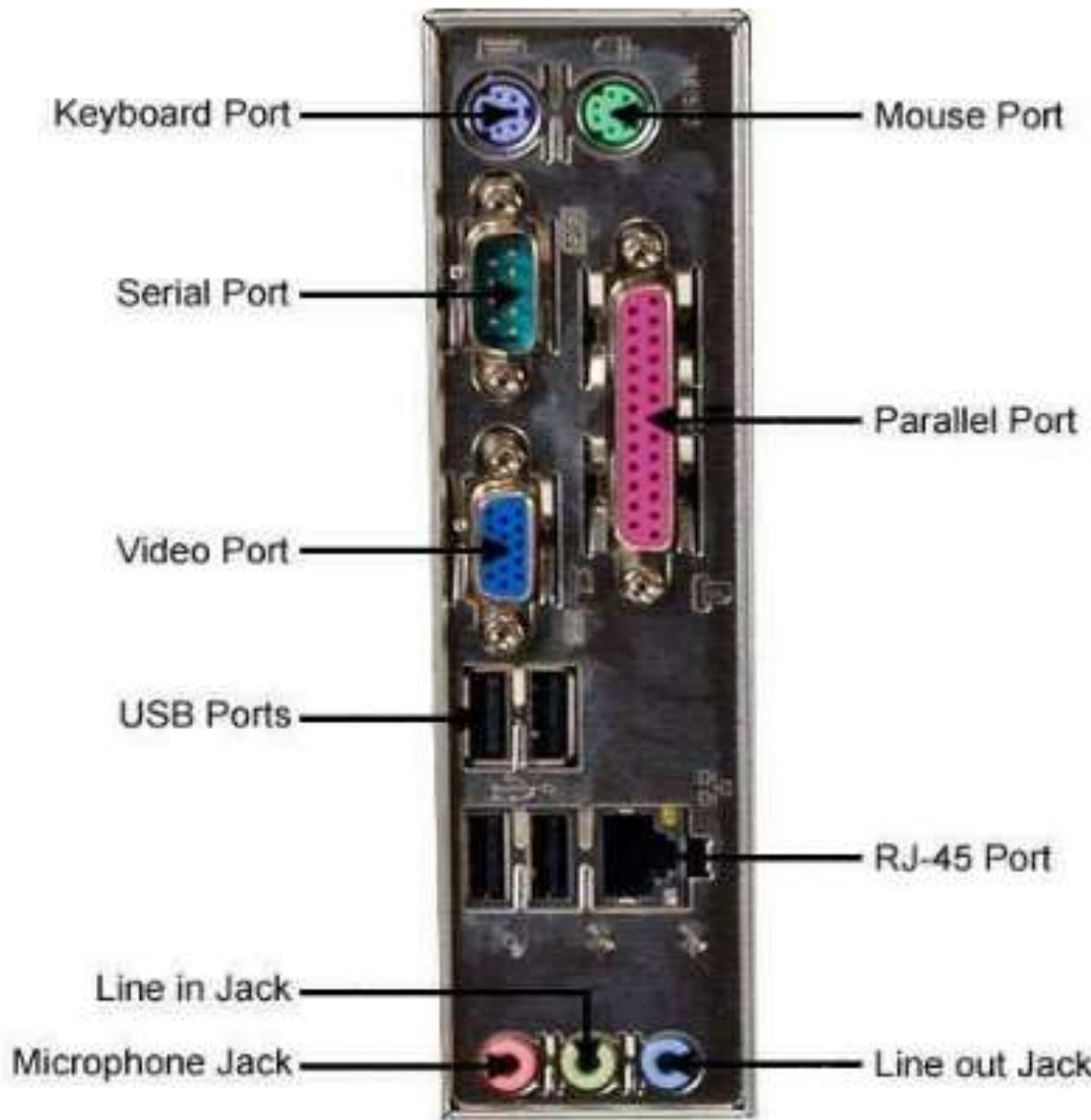
■ Connector



Mother Board







Expansion Slots

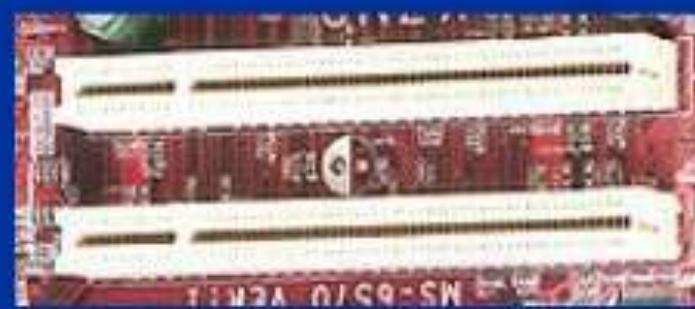
- The expansion slots on a motherboard enable you to connect the expansion cards to the motherboard. The different PCI cards include LAN card, SCSI card and USB card. The cards must comply with PCI specifications. The motherboard has an Accelerated Graphics Port (AGP) slot. You can connect AGP cards that are compatible with your motherboard, to the AGP slot.

Bus Standards

- There are different types of I/O buses that transfer data across components of the system. The different buses have different widths and speeds. The common bus standards are:

Peripheral Component Interconnect (PCI) Local Bus

- Is the most popular I/O bus. It has the same speed and width as the VESA local bus. Some PCI buses have a width of 64 bits. It provides much better performance as compared to the VESA local bus. It has separate circuitry that controls it. PCI generally supports 3 or 4 slots. You can connect video cards, SCSI host adapters and network cards to the PCI expansion slot.



Accelerated Graphics Port (AGP) Bus

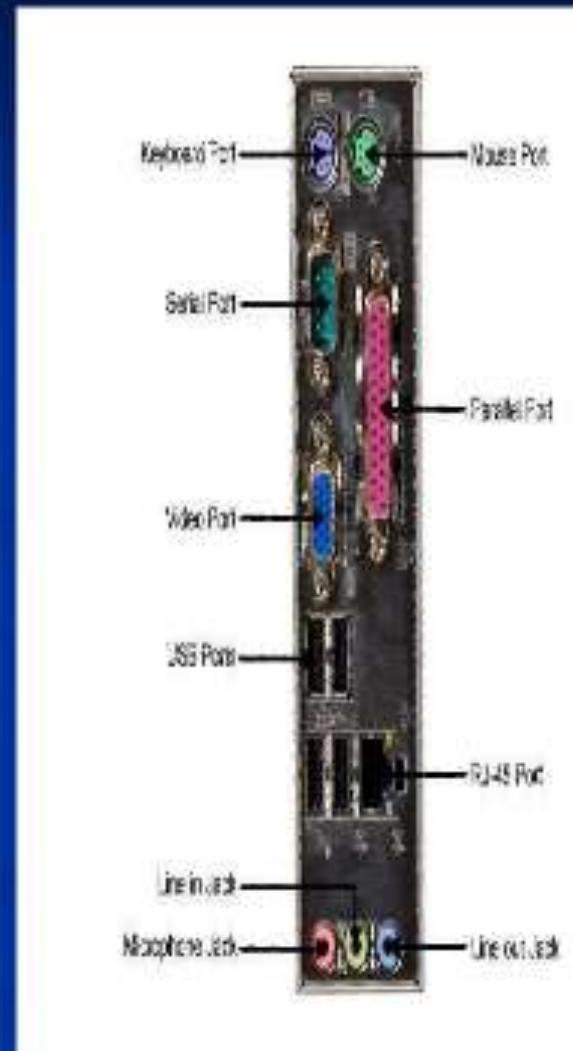
- Provides high performance graphics capabilities to a system. This bus forms a dedicated path between the chipset and the graphics subsystem. The AGP bus enables creation of 3D graphics.



I/O PORTS AND DEVICES

Introduction :

- Input/Output ports (I/O) enable you to connect hardware devices such as the keyboard, mouse, printer and scanners to the system. It is the entry and exit point for data from the system. I/O ports give you freedom in choosing and installing the device because if you have only few ports you can select a device that is available for that port.



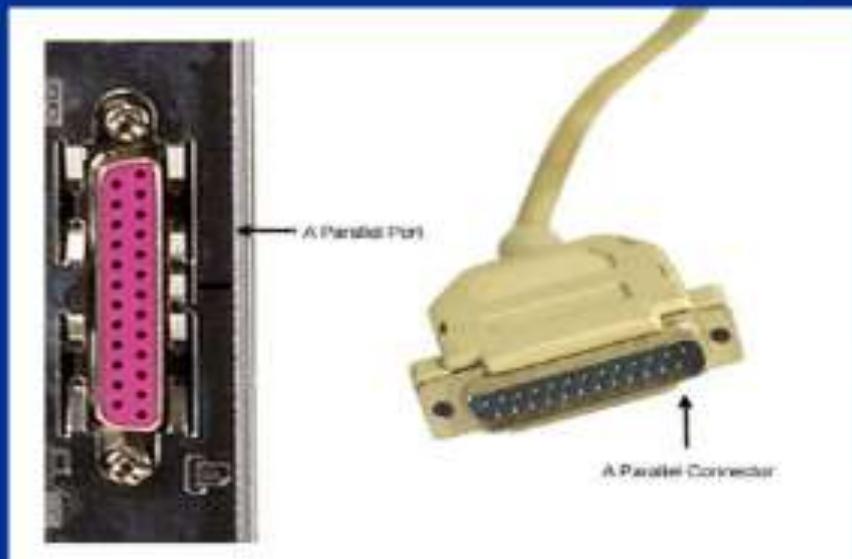
Serial Ports

- A serial port is like a single lane road that sends and receives one bit of data at a time. Thus, the eight bits of data in one byte travel one bit at a time, one behind the other. The serial port connector also known as the Communication or COM port can have 9 or 25 pins. A serial port is used to connect devices such as the mouse and modems to the system.



Parallel Ports

- The parallel port is like an eight lane road that transmits eight bits of data at a time. It is like eight cars moving on a wide road side by side. The parallel port connector has 25 pins to connect devices such as printers, scanners, external hard drives, and tape backup devices.



PS/2 Port

- The PS/2 port is used to connect the keyboard and mouse to the system. The ports are available in a color that matches the color of the plug connecting the mouse and keyboard. This port uses 6 pins to connect the device.



Universal Serial Bus (USB) Ports

- The USB port is a rectangular port that is used to connect a variety of devices to the system. The USB port also supplies power to the device such as the web camera, if the device does not use an external power source. To use the USB device you must just plug the device into the USB port, as most USB devices offer Plug-and-Play support. However, you must install the USB driver before using the USB port.



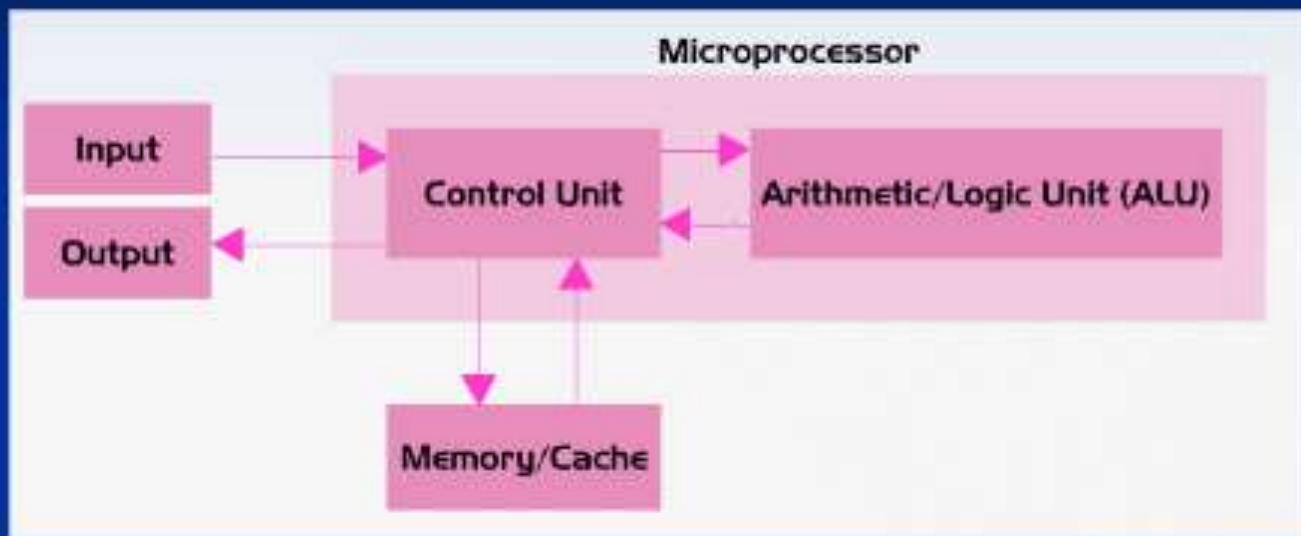
7.MICROPROCESSORS

- Computer is capable of performing complex tasks, such as managing the brake system of a car. These tasks are processed by the Central Processing Unit (CPU). The CPU comprises of the microprocessor. The microprocessor accepts input from the user in the form of the data and instructions. It processes the data using the instructions and sends the processed information to the output device. The microprocessor controls the system, therefore it is important to understand its working. The choice of the microprocessor also depends on computing needs

TYPE



Microprocessor



What are Intel CPU Families for Desktop Computers?

There are 3 Intel CPU families for desktop computers:

1. Core Processor

<http://www.intel.com/products/desktop/processors/index.htm>

2. Pentium Processor

<http://www.intel.com/products/desktop/processors/pentium.htm>

3. Celeron

<http://www.intel.com/products/desktop/processors/celeron.htm>

What are AMD CPU Families for Desktop Computers?

There are 3 AMD CPU Families for Desktop Computers:

1. Athlon 64 FX

http://www.amd.com/us-en/Processors/ProductInformation/0,,30_11&

2. Athlon 64 x 2 Dual – Core

http://www.amd.com/us-en/Processors/ProductInformation/0,,30_11&

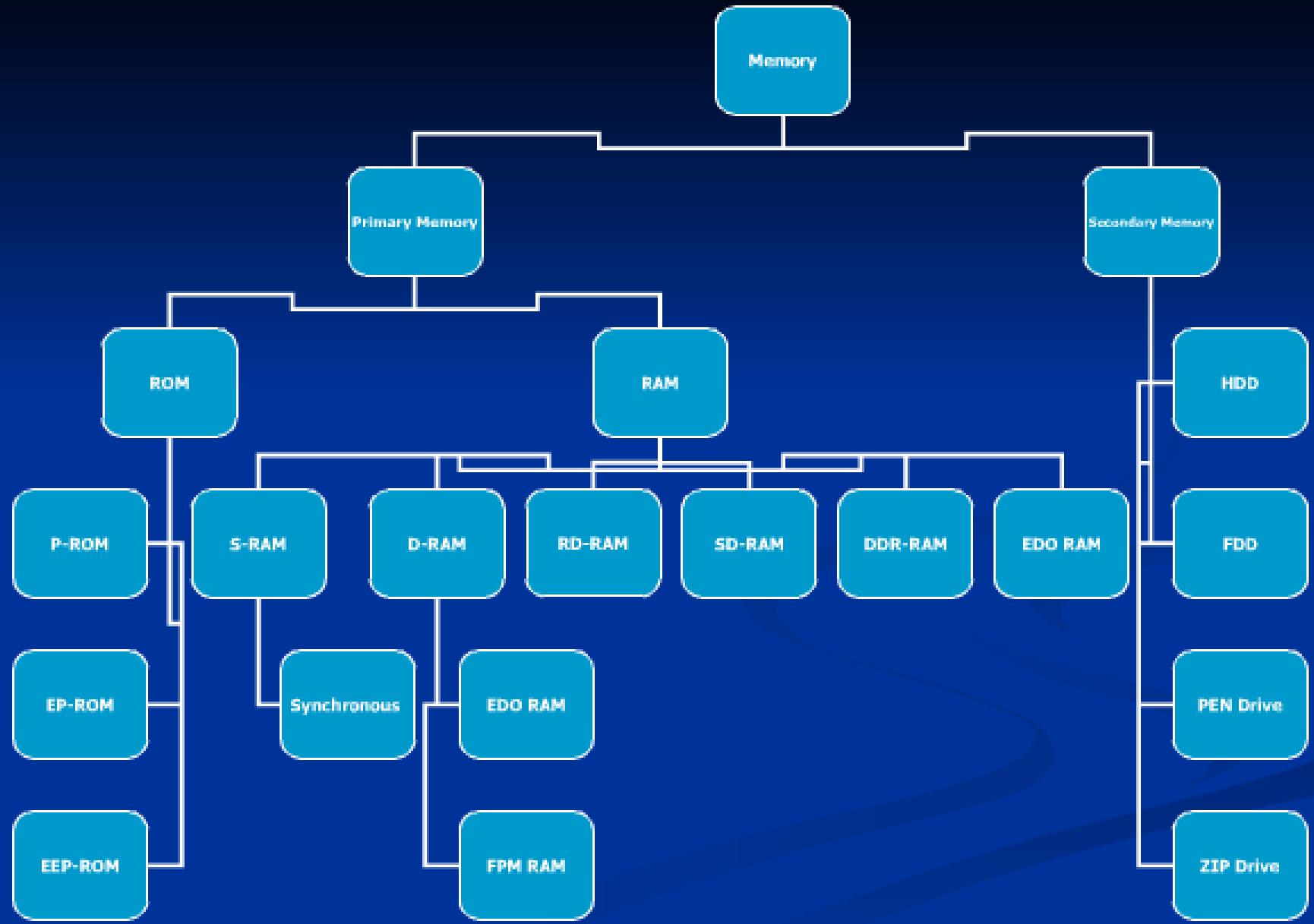
3. Athlon 64

http://www.amd.com/us-en/Processors/ProductInformation/0,,30_11&

8. Memory

■ **Introduction :**

- Memory is one of the functions of the brain that enables to store and remember the past events. Similarly, in computers the term memory refers to a chip that stores data. It also enables us to retrieve the stored data. The processor retrieves the information stored in the memory for processing the data. The storage capacity of a memory depends on the type of the memory package used



Physical Memory

Physical memory comprises of memory chips. Physical memory stores programs and data that the microprocessor requires. Therefore, it enables the microprocessor to access the required programs and data quickly. The different types of physical memory are:

- **Read Only Memory (ROM)**
- **Random Access Memory (RAM)**

Type of ROM

1. P-ROM (Programmable Read-Only Memory)
2. EP-ROM (Erasable Programmable Read-Only Memory)
3. EEP-ROM (Electrically Erasable Programmable Read-Only Memory)

Random Access (RAM)

- Random access means any byte can be accessed in any order. The microprocessor can read and write programs and data to the RAM. It is a type of a volatile memory and therefore it is referred to as a temporary data storage area

Type of RAM

1. S-RAM
2. D-RAM
3. DDR-RAM
4. RD-RAM

S-RAM (Static Random Access Memory)

- This memory is referred to as Static because of the fact that it does not require refreshing like DRAM. SRAM stores the data as long as the power is supplied to the system. This is because SRAM is made up of transistors that do not require refreshing. SRAM is used as the computer's cache memory.



D-RAM

(Dynamic Random Access Memory)

- Today, most PCs use DRAM as the temporary data storage area. DRAM stores data in the memory cells. Each memory cell contains a transistor and a capacitor. Capacitors lose their charge quickly and as a result, they need to be refreshed. Refreshing helps to retain the data in the memory. The life of data in DRAM is very short for about few milliseconds. In order to retain the data, the storage cells need to be refreshed after few milliseconds. Because of the constant refreshing of cells, this memory is referred to as Dynamic RAM

SD-RAM

(Synchronous Dynamic Random Access Memory)

- SDRAM synchronizes the memory speed with the CPU clock speed. The speed of the SDRAM depends on the speed of the CPU bus. It is faster than SRAM, DRAM, EDO DRAM, and VRAM memories. The data transfer speed of SDRAM is measured in nanoseconds and megahertz units. It runs with an average speed of 133 MHz.



DDR-RAM

(Double Data Rate Random Access Memory)

- It is the latest version of SDRAM. DDR is synchronous with the system clock. As a result, the data transfer rate of DDR is faster than SDRAM. It is almost twice the speed of the SDRAM. This memory chip consumes less power. DDR memory supports error correction code and non-parity. The server uses the error correction code, normally called as ECC.



Memory Socket



Technipedia.com

Flash Memory

- Flash memory is used in the digital camera, cellular phones, LAN switches, PC Cards for notebooks, and video games. This memory performs the action in a flash and as a result, it is termed as the flash memory. Flash memory is a non-volatile memory. It is a type of EEPROM consisting of blocks. EEPROM is erased and reprogrammed in blocks. Flash memory is faster than EEPROM since it is reprogrammed at the block level whereas EEPROM is reprogrammed at the byte level

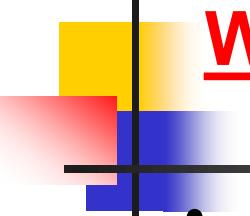
9. SMPS (Switch Mode Power Supply)

- The power supply unit supplies power to the different system components such as the motherboard and the device drives. You must protect the system from extreme temperature changes like overheating using cooling devices. You can also use a UPS to protect the system from power fluctuations.



Type of Power Supply

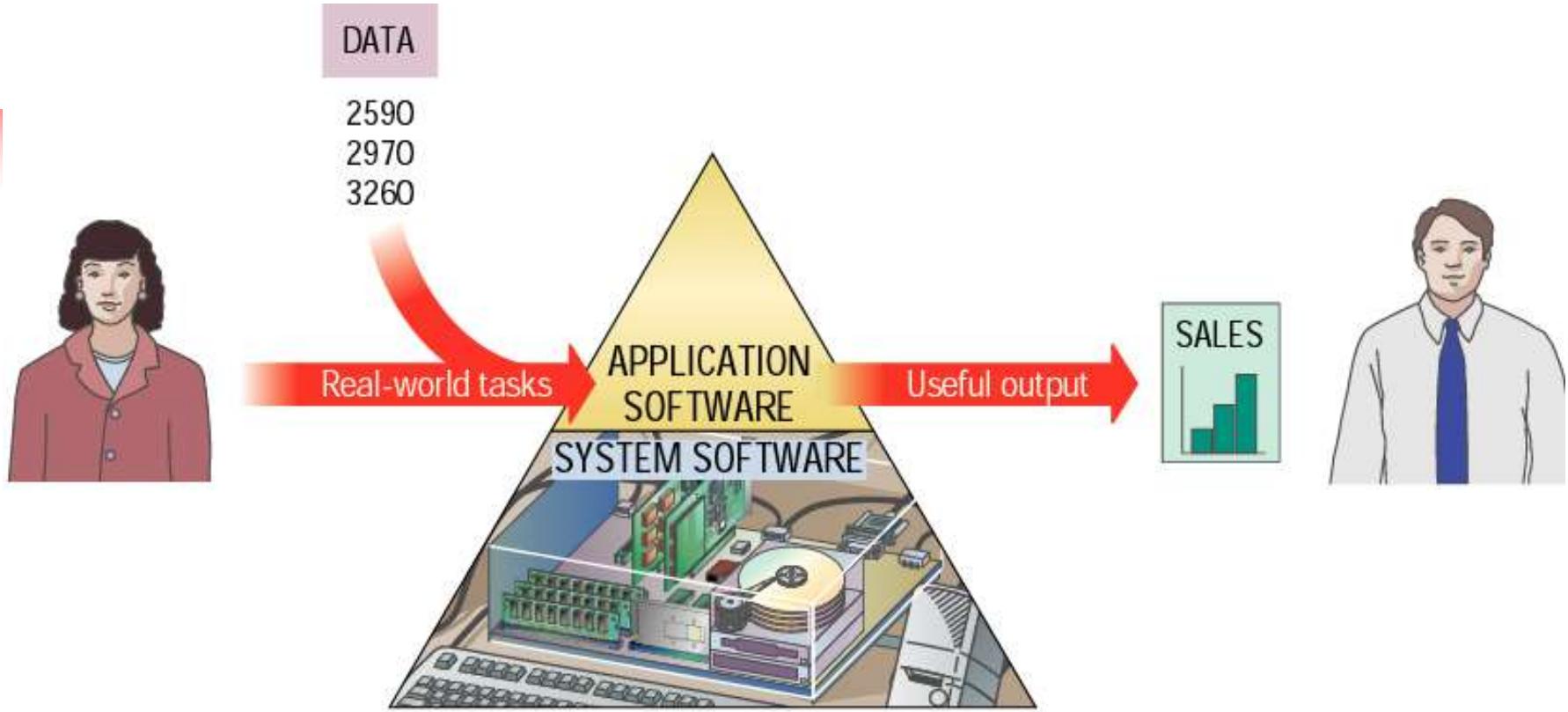
- Personal Computer / Extended Technology (PC/XT)
- Advanced Technology (AT) Form Factor
- Advanced Technology Extended (ATX) Form Factor



Bringing the Machine to Life –

What is Software?

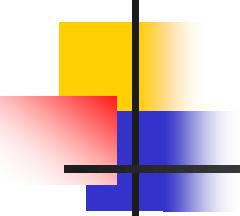
- **Software is a set of electronic instructions that tells the computer how to do certain tasks. A set of instructions is often called a program.**
- **When a computer is using a particular program, it is said to be running or executing the program.**
- **The two most common types of programs are system software and application software.**



Bringing the Machine to Life – System Software

- **System software exists primarily for the computer itself, to help the computer perform specific functions.**
- **One major type of system software is the operating system (OS). All computers require an operating system.**
- **The OS tells the computer how to interact with the user and its own devices.**
- **Common operating systems include Windows, the Macintosh OS, OS/2, and UNIX .**

Bringing the Machine to Life - Applications



- Application Software consists of programs that tell a computer how to produce information
- Application software tells the computer how to accomplish tasks the user requires, such as creating a document or editing a graphic image.
- Some important kinds of application software are:

Word processing programs

Database management

Graphics programs

Web design tools and browsers

Communications programs

Entertainment and education

Spreadsheet software

Presentation programs

Networking software

Internet applications

Utilities

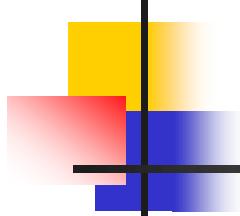
Multimedia authoring

OS (Operating System)

- OS is program that act as an intermediary between a user of a computer and component of the computer Hardware.
- There are two Goal of OS 1) **Primary Goal** to make the computer system convenient to use for the use. 2) **Secondary Goal** is to use the computer Hardware.
- OS controls and co-ordinate the use of the computer Hardware in among the various application program for the various user of the computer.
- OS is one program running at all times on the computer i.e. Kernel with all the other program.

Function Of OS

1. OS provide the method for other programs to communication with the hardware of computer.
2. It create a user interface and to enables user to make changes in the computer.
3. OS must enables user to determine the installed programs and then, use, and shutdown the program of their own choice.
4. OS should enables user to add, move and delete the installed program and data.



Firmware

- Firmware are programs that are permanently written and stored in memory

BIOS

- The BIOS software enables you to control the system and the different hardware components without loading the operating system. The BIOS contains the code required to operate the hardware devices connected to the system such as the keyboard, mouse and the different ports connected to the system. The BIOS chip is of two types.

Operating Systems and BIOS

- Hardware in a PC does not know the software and BIOS is the interface between hardware and software.
- BIOS is also called firmware due to its integration with hardware.
- BIOS contains all the code required to control the keyboard, display screen, disk drivers, serial communications and a number of miscellaneous functions.
- BIOS is typically placed in a ROM chip that comes with the computer it is often called a ROM BIOS which ensures that the BIOS will always be available and will not be damaged by disk failures.

CMOS

(Complementary Metal Oxide Semiconductor)

The CMOS is the memory located on the motherboard that stores the BIOS settings. The CMOS has a size of 64 bits. When the system starts the BIOS loads the settings from the CMOS. The CMOS requires a power source to store the settings. It receives power from a battery that is installed on the motherboard. This battery must be replaced when it becomes weak or you may lose the stored BIOS settings. You can clear the BIOS settings stored in the CMOS using the jumpers located on the motherboard or by removing the battery from the motherboard.



POST (Power-On Self-Test)

- When the system starts, the BIOS runs the power-on self-test (POST) to test the hardware connected to the system. These are the testing routines that are stored in ROM BIOS. When POST detects an error either from the Keyboard, Mouse, Display or Memory or various other component it produces an error warning in the form of Message or Beep sound.

Starting a PC for the First Time

- When we start the PC, the Basic Input Output System (BIOS) runs a test to check if all the peripheral devices, memory and hardware of the PC are working properly. This test is called the Power On Self Test (POST). The PC will boot only if the results of the test are positive. If any of the above components of the PC are not in proper condition, the PC will give some warning signals like beeps. In some cases, if the problem is serious, the PC will not boot at all. The POST happens as soon as the PC starts and before most of the components of the PC start. The errors that cause the system to stop booting are of two types – fatal and non-fatal. In case of fatal errors, the boot process stops immediately. The following are the functions performed by POST:
 - Checking the motherboard
Comparing the system configuration with the PC Configuration Program to find any changes made
 - Checking the memory devices and drives
 - Checking the system memory
 - Starts the display and audio devices
- In case there are no errors in the system configuration or devices, a single beep follows the POST. Then the booting process of the PC starts and the operating system is loaded.

Phoenix - AwardBIOS CMOS Setup Utility

- ▶ Standard CMOS Features
- ▶ BIOS Features
- ▶ Advanced BIOS Features
- ▶ Advanced Chipset Features
- ▶ Integrated Peripherals
- ▶ Power Management Setup
- ▶ PnP/PCI Configurations
- ▶ PC Health Status

- ▶ Frequency/Voltage Control
- Load Fail-Safe Defaults
- Load Optimized Defaults
- Set Supervisor Password
- Set User Password
- Save & Exit Setup
- Exit Without Saving

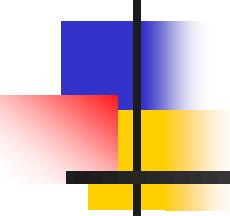
Esc : Quit

↑ ↓ ← → : Select Item

F10 : Save & Exit Setup

Time, Date, Hard Disk Type...

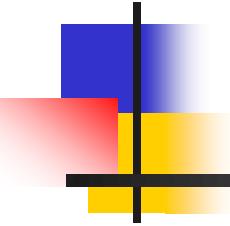
Right-Pointing Arrow



Computer Software

Computer software is the key to productive use of computers. Software can be categorized into two types:

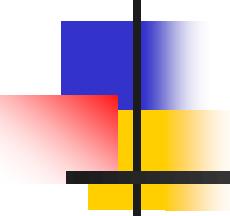
- Operating system software
- Application software.



Operating System Software

Operating system software tells the computer how to perform the functions of loading, storing and executing an application and how to transfer data.

Today, many computers use an operating system that has a graphical user interface (GUI) that provides visual clues such as icon symbols to help the user. Microsoft **Windows 98** is a widely used graphical operating system. **DOS** (Disk Operating System) is an older but still widely used operating system that is text-based.

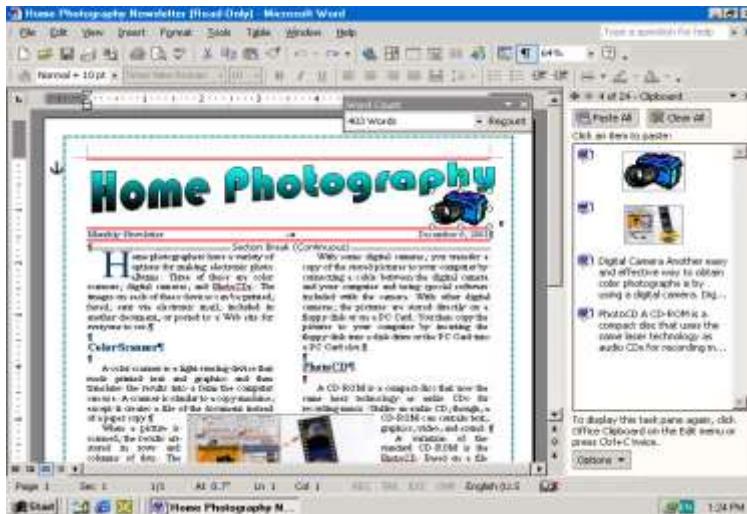


Application Software

Application Software consists of programs that tell a computer how to produce information. Some of the more commonly used packages are:

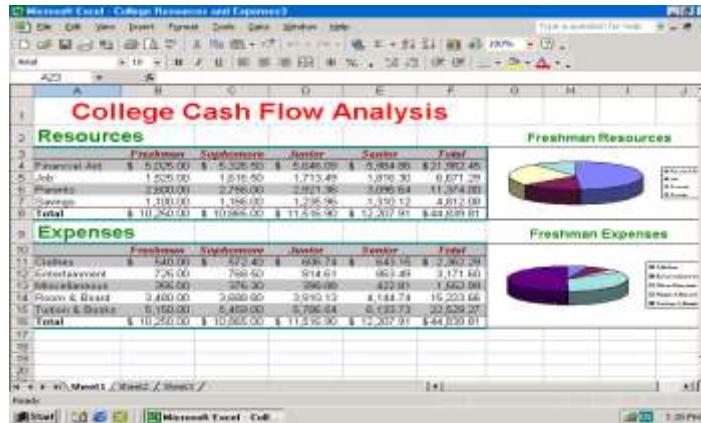
- **Word processing**
- **Electronic spreadsheet**
- **Database**
- **Presentation graphics**

Word Processing



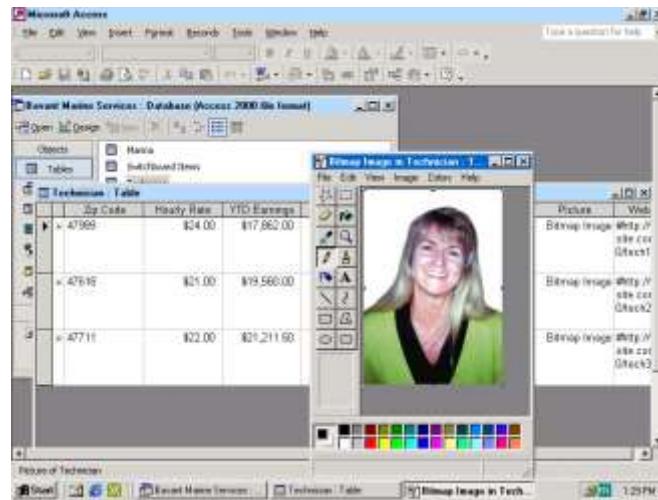
- Word Processing software is used to create and print documents. A key advantage of word processing software is that users easily can make changes in documents.

Electronic Spreadsheets



- Electronic spreadsheet software allows the user to add, subtract, and perform user-defined calculations on rows and columns of numbers. These numbers can be changed and the spreadsheet quickly recalculates the new results.

Database Software



- Allows the user to enter, retrieve, and update data in an organized and efficient manner, with flexible inquiry and reporting capabilities.

Presentation Graphics



- Presentation graphic software allows the user to create documents called slides to be used in making the presentations. Using special projection devices, the slides display as they appear on the computer screen.