CHAPTER 2

COMPUTER SYSTEM

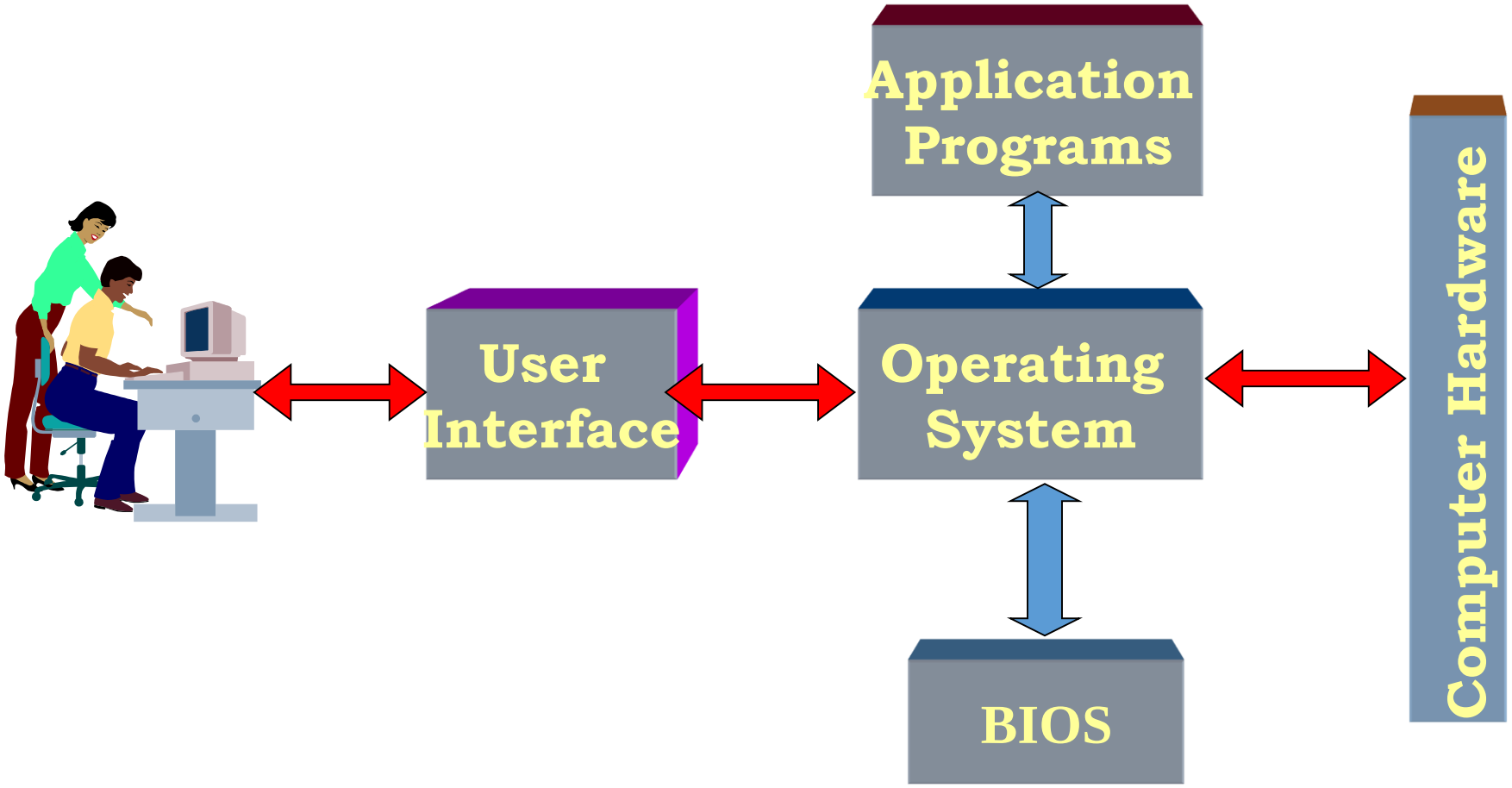
What is a System?

- A System is a set of interrelated and interdependent components that work together to accomplish common goal (aim).
- The components of the system are called subsystems.
- A subsystem is a set of elements, which is a system itself, and a component of a larger system.
- E.g. Political system, Bank System, Ecosystem, **information systems,** Biological system

THE COMPUTER SYSTEM

- The computer system is a group of components, consisting of subsystems or procedures that work in a coordination fashion to achieve some objective.
- A computer system composed of components that are classified as ***Computer hardware*** and ***Computer software***.

HW and SW Relationships

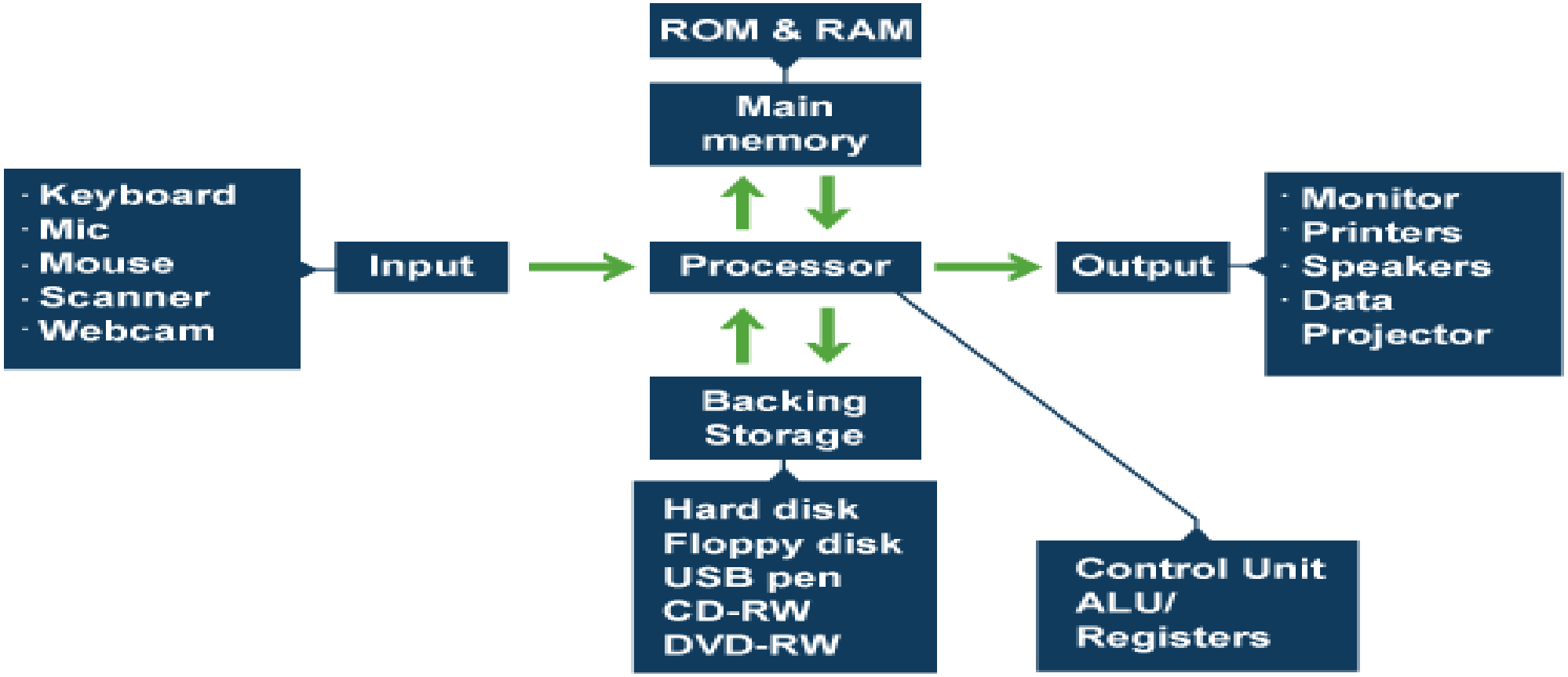


COMPUTER HARDWARE

Computer Hardware

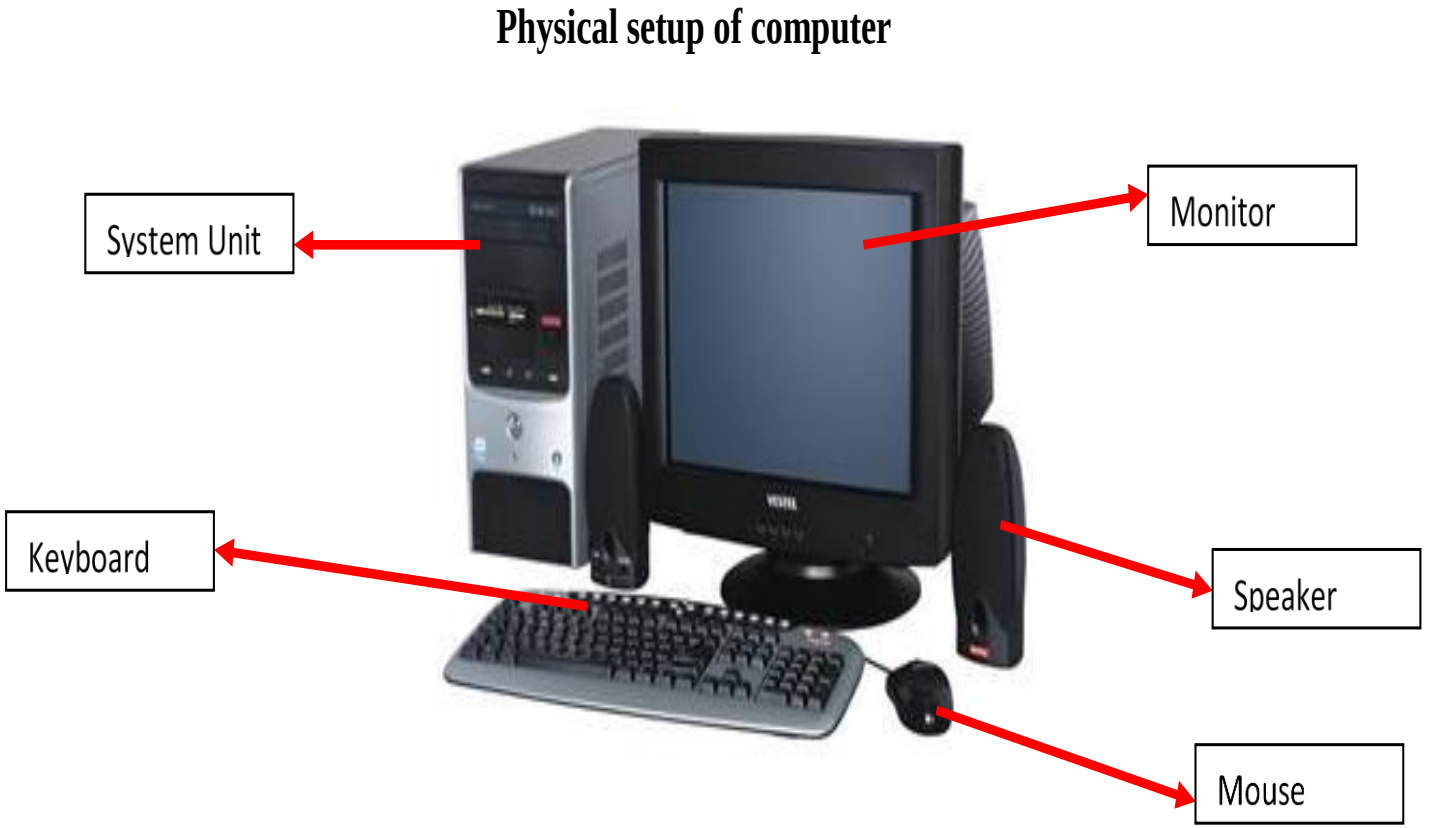
- Hardware is the physical part of the computer
- Computer hardware is organized based on the basic functions of computer systems irrespective of their size and makeup:
- These are
  - accept data or instructions by way of input,
  - store data,
  - process data
  - give results in the form of output, and
  - control all operations inside a computer.

Block diagram of a typical computer system



The Physical and operational Setup of Computer

- Externally, the computer is consists of the System Unit, monitor, keyboard, and the mouse.



Computer Hardware

- Computer hardware is the physical part of the computer that you see, you use to and the parts you can touch.
- The hardware part of a computer system is composed of a number of interacting physical parts based on the need of the information flow.

Components of Computer Hardware

- **System Unit: -** Houses all the major components of the computer
- **On front**: On/off switch, reset button, status indicators (power, HDD), floppy drives, CD-ROM drivers, and tape cassettes.
- **Expansion slot**: user to plug in expansion cards
- **Expansion cards:** are small circuit boards that are used to upgrade a computer.
- **Power Supply: -** converts alternating current (AC) into direct current (DC) electricity that can be used by computer. Also lowers voltage level.

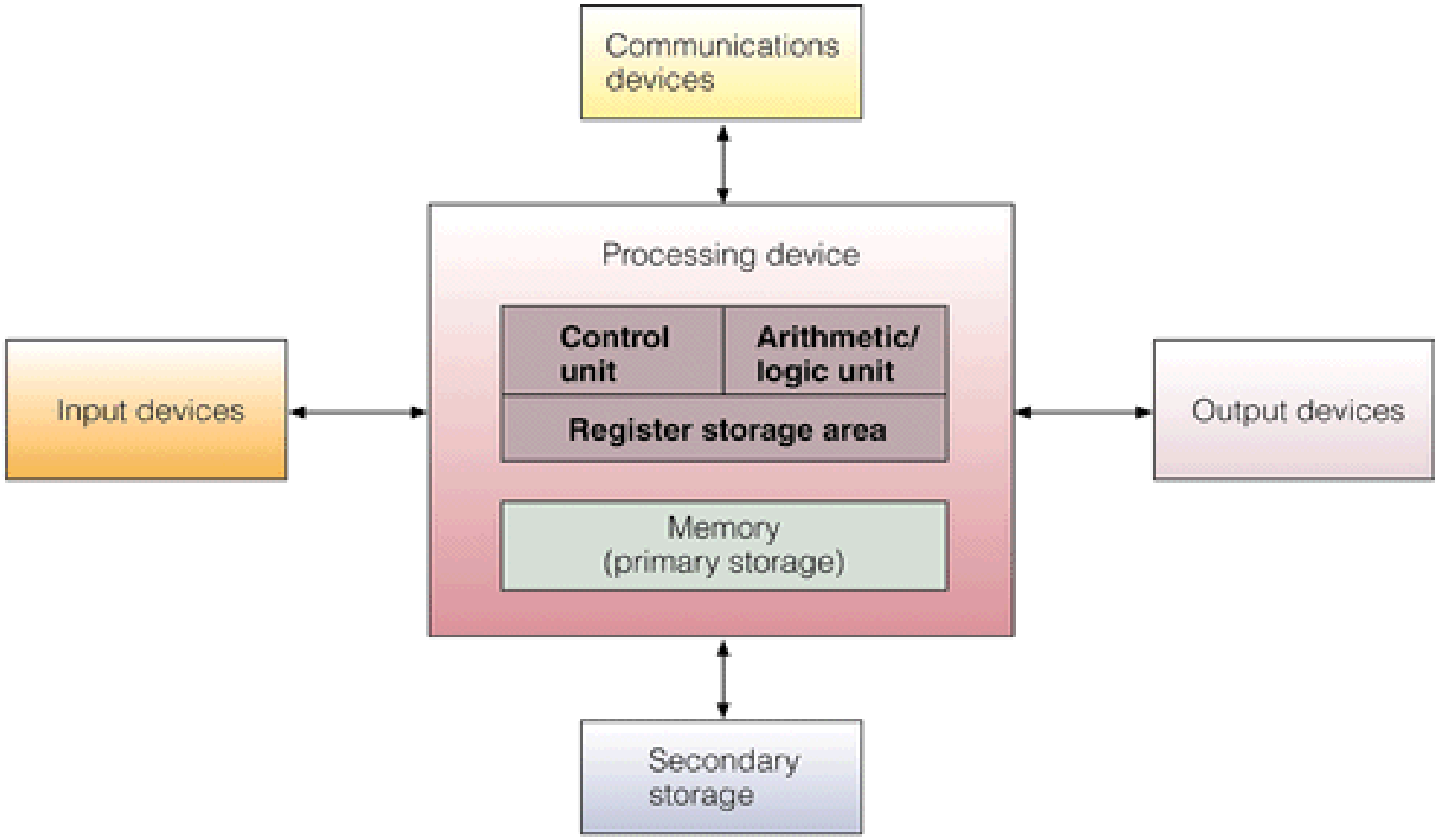
Components of Computer Hardware

- **Motherboard: -** a board into which most of the basic components of the computer are built. It contains components such as **CPU, Expansion slot** and so on**.**
- **CPU: -** central element in the system which is the brain of the computer. Connected number of peripheral devices to get data into and out of the computer and to store data and program.

Computer Hardware

- Internal architecture of computer differs from one system model to another. However, the basic organization remains the same for all computer system.
- Computers organized from four basic functional units such as:
    i. Input units
    ii. Output units
    iii. CPU(processing unit)
    iv. Storage units.

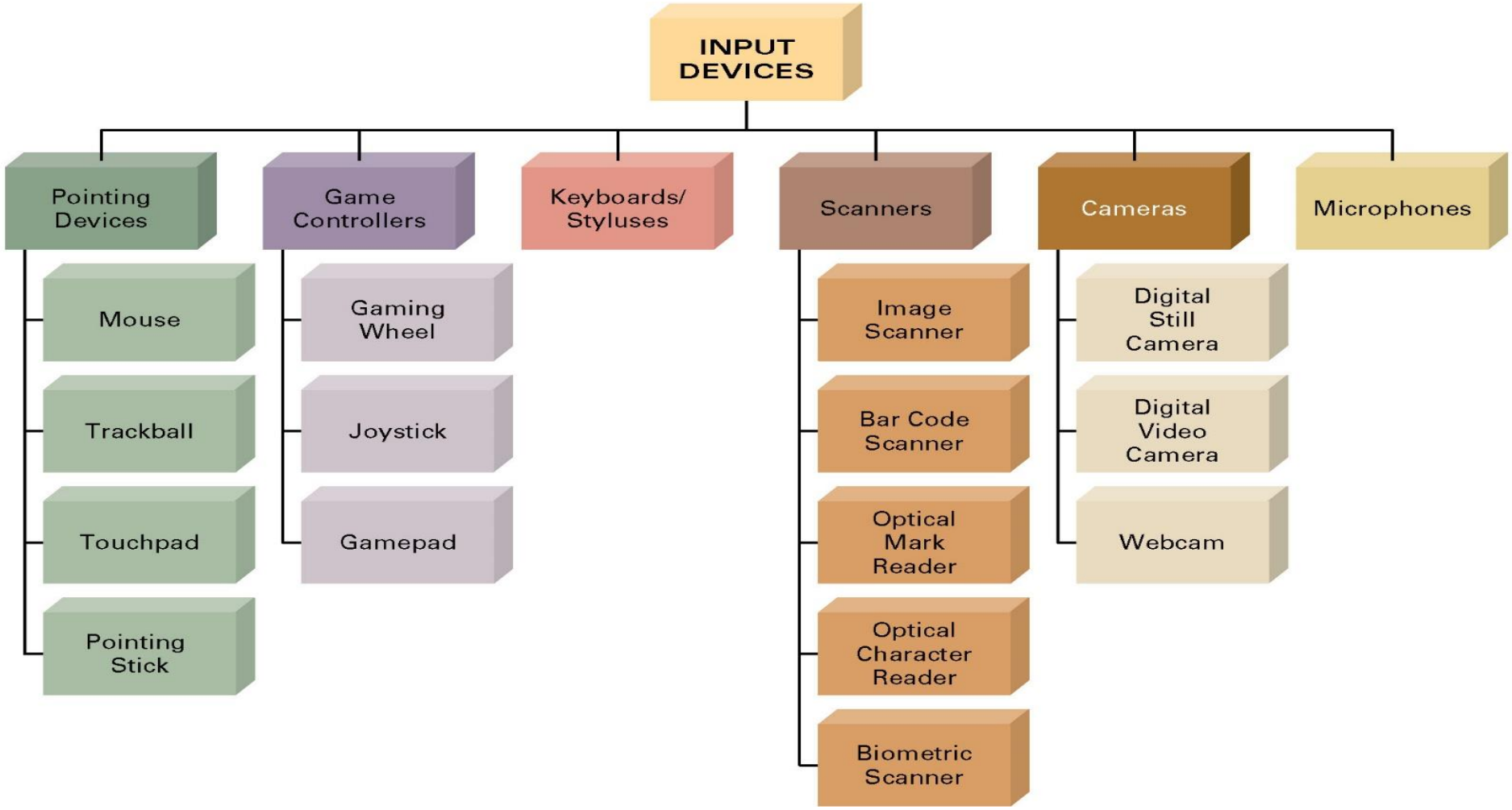
Computer System Component



Input Devices/Unit

- It is the unit used to enter data into the computer so that it can be processed.
- It converts information from a form suitable to human beings to one understandable by the computer.
- Common Input Devices are:

Categories of Input Devices



Input Devices for Data

- ***Keyboards*** – most frequently input devices for notebooks and desktops to enter information and commands
- ***Stylus*** – most frequently used input devices for *PDAs (Personal digital assistant)* and tablet PCs to enter information and commands

Input Devices for Commands

Pointing Device – used to input commands

- ***Mouse*** – device you use to click on icons and buttons
- ***Trackball*** – similar to a mechanical mouse, but with the ball on top

Input Devices for Commands

- ***Touchpad*** – dark rectangle you use to move the cursor with your finger
- ***Pointing stick*** – a little rod, used mostly on notebooks

Game Controllers

- ***Game controller –*** used for gaming to control screen action
  - ***Gaming wheel*** – steering wheel and foot pedals for virtual driving

Scanners

- ***Scanners*** – used to convert information that exists in visible form into electronic form
  - ***Image scanner*** – captures images, photos, text, and artwork
  - ***Bar code scanner*** – reads information in the form of vertical bars
  - ***Optical mark reader*** – detects the presence or absence of a mark
  - ***Optical character reader*** – reads characters that appear on paper or sales tag
  - ***Biometric scanner*** – scans a human physical attribute, like a fingerprint or iris, for security purposes

Digital Cameras

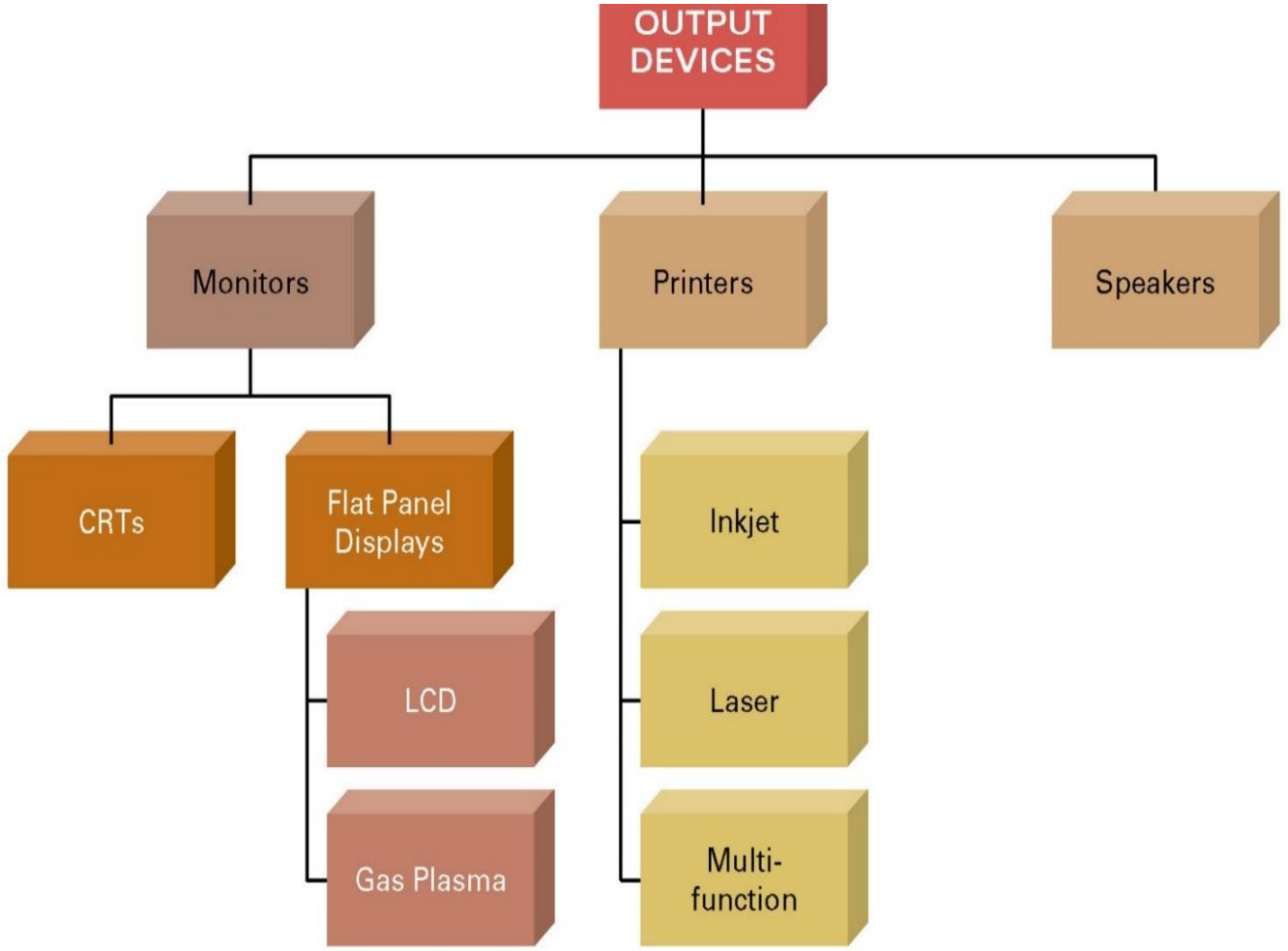
- ***Digital camera*** – captures still image or video as a series of 1s and 0s
  - ***Digital still camera*** – digitally captures still images in varying resolutions
  - ***Digital video camera*** – captures video digitally
  - ***Webcam*** – captures digital video for the Web

OUTPUT Devices

- Used to get data out of a computer so that it can be examined, analyzed or distributed to others.
- Convert the result of the only-machine understandable form to a form understandable by human beings.

OUTPUT Devices

Categories of Output Devices



Monitors

- ***CRT*** (*cathode ray tube*)– monitors that look like traditional TV sets
- ***Flat-panel display*** – thin, lightweight monitors that take up much less space than CRT.

  Types of flat-panel displays

  - ***Liquid crystal display (LCD) monitor*** – sends electricity through crystallized liquid between layers of glass or plastic
  - ***Gas plasma display*** – sends electricity through gas trapped between layers of glass or plastic
  - **Light-Emitting Diode** (**LED**) **Monitor**. **LED** computer **monitors** do not use cold-cathode technology and fluorescent technology. Instead, light diodes illuminate the screen in one of two different ways, or a combination of both.

Monitors

Monitors Are Common Output Devices

LED

LCD

CRT

Printers

- In computers, a printer is a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper.
- Printers vary in size, speed, and cost.
- more expensive printers are used for higher-resolution color printing.

Printers

- ***Resolution of a printer*** – the number of dots per square inch (dpi) it produces
- Types of Printers
  - ***Inkjet printer*** – makes images by forcing ink through nozzles
  - ***Laser printer*** – forms images using the same electrostatic process that photocopiers use
  - ***Multifunction printer*** – scan, copy, and fax, as well as print

Central Processing Unit (CPU)

- CPU is the brain of any computer system. It is just like brain that takes all major decisions, makes all sorts of calculations and directs different parts of the computer functions by activating and controlling the operations.
- The task of performing operations like arithmetic and logical operations is called processing.
- The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit

Central Processing Unit-CPU

- Is the most costly component of the computer system
- Consists of the Control Unit & the Arithmetic Logic Unit
- The two parts work together to electronically control the function of the computer.
- The different parts are inter connected by a cable like device called BUS, which is used to facilitate communications between the parts.
- Buses are used to transfer data, address and control code (signal).

The Central Processing Unit (CPU)

Central processing unit (CPU)

- CPU Is made up of three major parts
  - Register: memory in CPU, provides fast accesses, working table of the CPU
  - Arithmetic and Logic Unit: performs required micro operations for executing the instruction
  - Control Unit: supervises the transfer of information among the registers and other devices

The Arithmetic Logical Unit (ALU)

- After you enter data through the input device it is stored in the primary storage unit.
- The actual processing of the data and instruction are performed by Arithmetic Logical Unit.
- The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison.

The Arithmetic Logical Unit (ALU)

- Data is transferred to ALU from storage unit when required.
- After processing the output is returned back to storage unit for further processing or getting stored.
- Arithmetic logic unit
  - Arithmetic Unit
    - Performs mathematical calculations
    - Addition, Subtraction, Division…..
      - 1+2*3-4^2/2
  - Logic Unit
    - logical comparisons.
    - Is used to make a decision on the logical operation
    - AND,OR,>,<,>=,<=,==,!= ……

The Control Unit (CU)

- It performs all the control functions of the computer.
- The control unit determines the sequence in which computer programs and instructions are executed.
- CU coordinates the activities of computer's peripheral equipment as they perform the input and output.
- Therefore it is the manager of all computer operations

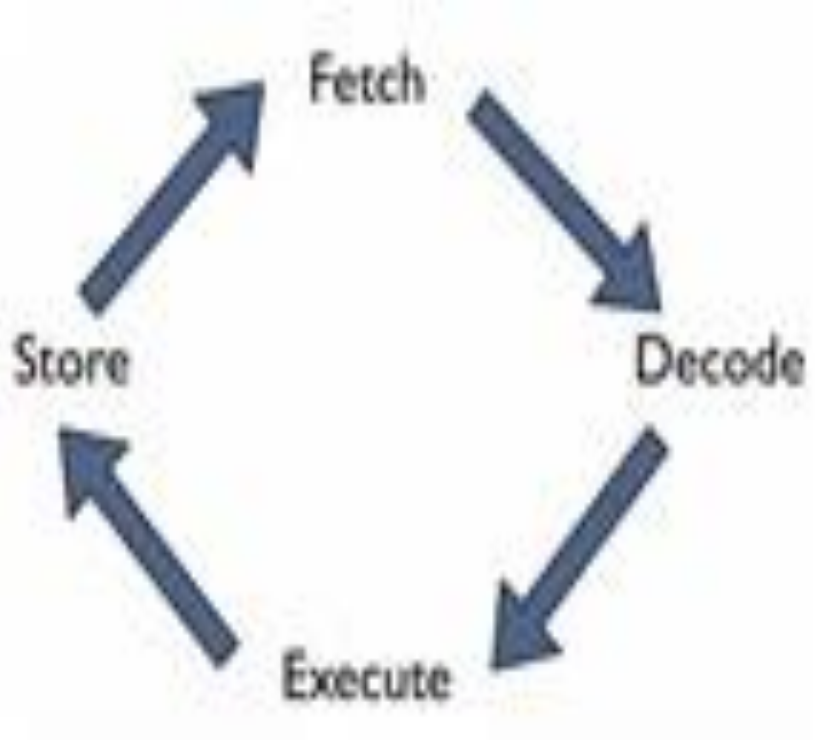
Control unit

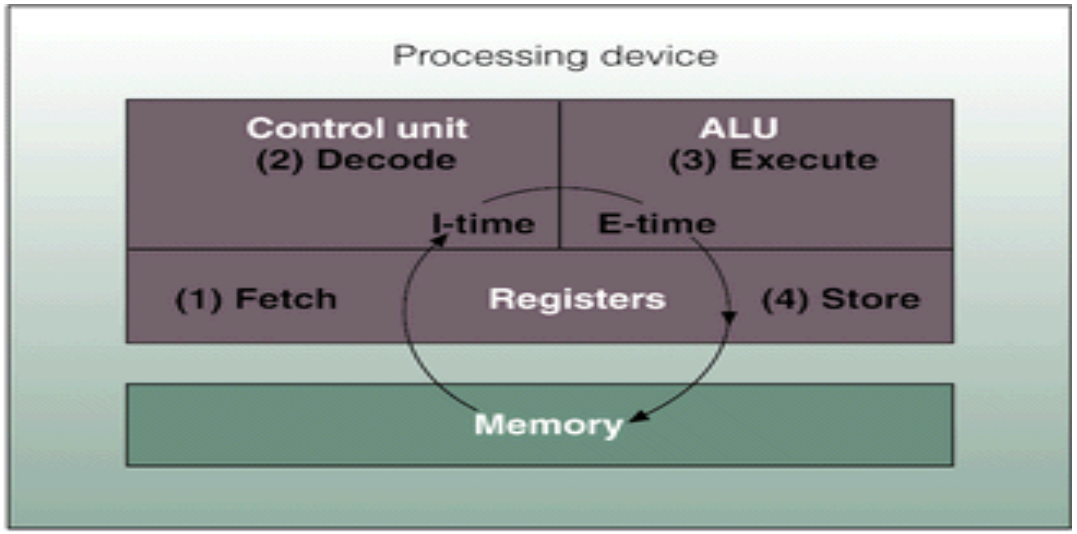
- As part of the CPU
  - accesses program instructions, decodes and coordinates instruction execution in the CPU.
- A ***machine cycle***, also called a *processor cycle* or a *instruction cycle*, is the basic operation performed *continuously and at a rate of millions per second* by the CPU.

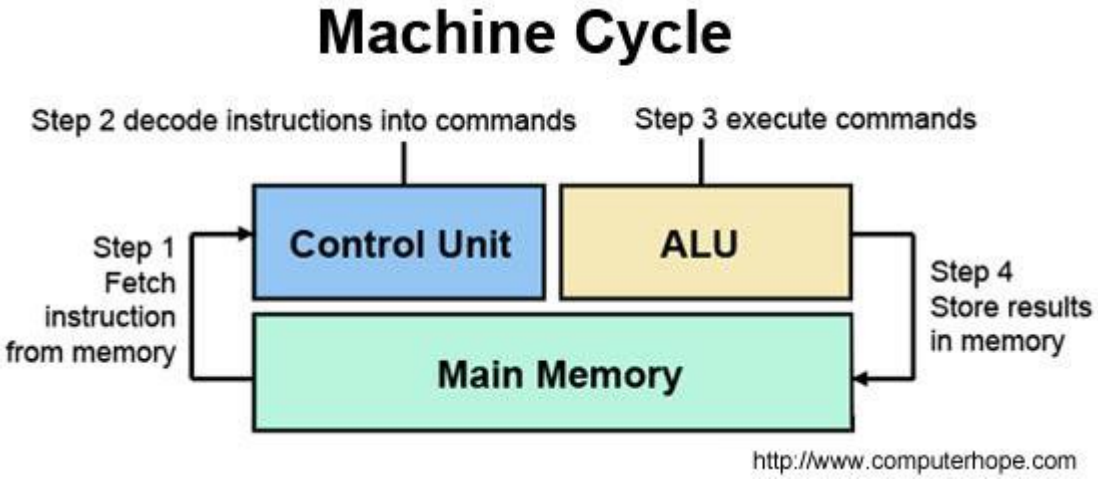
Control unit

- Machine cycle consists of two parts
  - An instruction Cycle (I-Cycle)
    - 1st part where the CU fetches instruction from main memory and decode the instruction (determine what it means)
  - The execution Cycle (E-Cycle)
    - 2nd stage where the ALU execute the instruction (perform action on data) and store the processed result in main memory or the register

- Instruction phase
  - Step 1: Fetch instruction
  - Step 2: Decode instruction
- Execution phase
  - Step 3: Execute the instruction
  - Step 4: Store the results







- Execution of an instruction
  - In the instruction phase, the computer's control unit fetches the instruction to be executed from memory.
  - Then the instruction is decoded so the central processor can understand what is to be done.
  - In the execution phase, the ALU does what it is instructed to do..
  - Then the results are stored in the registers/memory.
- The instruction and execution phases together make up one machine cycle.

Register

- Is a high-speed storage circuitry element that hold instruction and data while the processor is executing the instruction.

- Examples of Register
  - **Instruction Register** - Instruction placed here for analysis.
  - **Program Counter** - Which instruction will be performed next?
  - **Accumulator** - Results of intermediate computations kept here

Word length

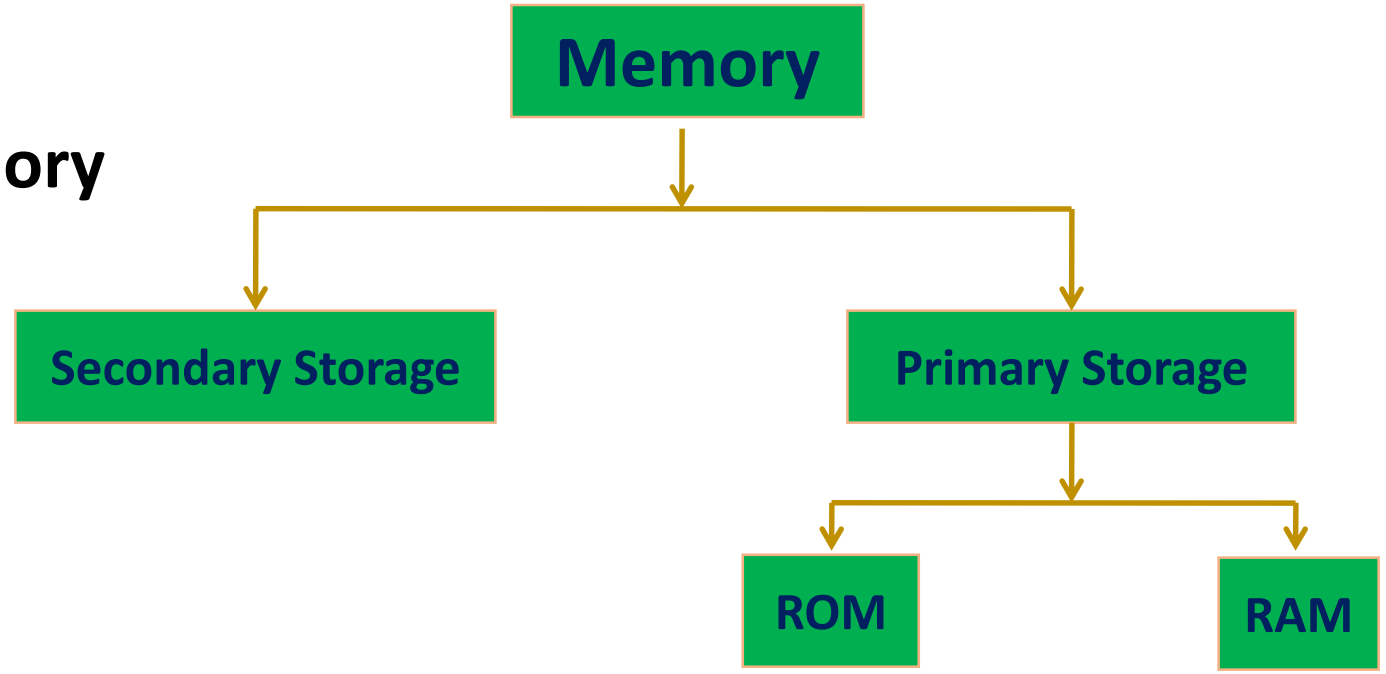
- A word is the number of bits that can be manipulated or stored at a time by the CPU, 8bit, 32bit, 64bit
- Data is moved within a computer system in units called **bits**, which is a binary digit – 0 or 1
- Another factor affecting overall system performance is **the number of bits the CPU can process at one time**, or the word length of the CPU.
  - CPUs have evolved to 8, 16, 32, and 64
- Bits (**B**inary Dig**its**): smallest form of data in a computer
  - Bits, can be “0” or “1”, “true” or “false”, “yes” or “no”, or “on” or “off”.
- Word: number of bits that can be processed as a unit

Measuring the speed of CPU

- Hertz or per second is used as unit to measure the processing capability of CPU.
  - Kilo = Khz ~ 1000hz
  - Mega =Mhz
  - Giga = Ghz
  - Terra
  - Peta

MEMORY SYSTEM IN A COMPUTER

- A personal computer must have a means of storing information and instructions so that it can perform processing tasks on the data.
  - **Primary/main Memory**
  - **Secondary/Auxiliary Memory**



Main Memory/Primary Memory

RAM-Random Access Memory

- The primary storage is referred to as random access memory (RAM) because it is possible to randomly select and use any location of the memory directly store and retrieve data.
- The storage of data and instructions inside the primary storage is temporary.
- It disappears from RAM as soon as the power to the computer is switched off.

Main Memory or Primary Memory

RAM-Random Access Memory

- The memories which loose their content on failure of power supply are known as **volatile** memories .
- RAM is volatile memory.
- Holds instructions and data elements which are currently being used by the computer.
- It is the memory which is directly accessible by the control unit and ALU.

RAM

ROM - Read only memory

- ROM is integrated into the circuitry of the computer and can not be altered without altering the computer circuitry.
- The memories, which do not loose their content on failure of power supply, are known as **non-volatile** memories.
- ROM is non-volatile memory.
- The storage of program and data in the ROM is permanent.

ROM - Read only memory

- The ROM stores some standard processing programs supplied by the manufacturers to operate the personal computer.
- The ROM can only be read by the CPU but it cannot be changed.
- The basic input/output program is stored in the ROM that examines and initializes various equipment attached to the PC when the switch is made ON.

ROM

- A permanent memory that provides startup instructions when the computer is turned on.
- You can not store any data in ROM.
- The instructions in ROM are set by the manufacturer and cannot be changed by the user.
- Every computer needs an operating system. This is a special computer program that must be loaded into memory as soon as the computer is turned on.

- ROM is Pre-programmed and now technology allows
  - PROM: programmable ROM
    - Only written once
  - EPROM: erasable PROM
    - Use ultraviolet light to erase data
  - EEPROM: electronically EPROM
    - Can be erased using electronic impulses (higher voltages)

- PROM: programmable ROM
  - You know that it is not possible to modify or erase programs stored in ROM, but it is possible for you to store your program in PROM chip.
  - Once the programs are written it cannot be changed and remain intact even if power is switched off.
  - Therefore programs or instructions written in PROM or ROM cannot be erased or changed

EPROM (Erasable programmable ROM)

- Overcomes the problem of PROM & ROM.
- EPROM chip can be programmed time and again by erasing the information stored earlier in it.
- Information stored in EPROM can be erased by exposing the chip to ultraviolet light for some time and reprogrammed using a special programming facility.
- When the EPROM is in use information can only be read.

Cache memory

- Placed between the CPU and main memory
- Is faster than RAM and closer to the CPU
- Enhances the performance of the PC
- RAM is much slower than the CPU- so slow that the CPU must insert wait-state for memory to catch up.

Cont…

- Cache (pronounced as cash) is therefore, a technique of improving memory performance by keeping a limited amount of frequently used information
- Cache is a bridge between a slow device (RAM) and a fast one (CPU)

SECONDARY STORAGE DEVICE/SSD

- Huge volume of data are stored on permanent basis and transferred to the primary storage as and when required.
- Due to high price of a primary storage memory of a computer system, the need to have other type of storage to hold large amount of data in a less expensive and yet accessible manner is evident. Hence secondary storage device were created with this need in mind.
- Most widely used secondary storage devices are *magnetic tapes* and *magnetic disk*.

Secondary Storage Device

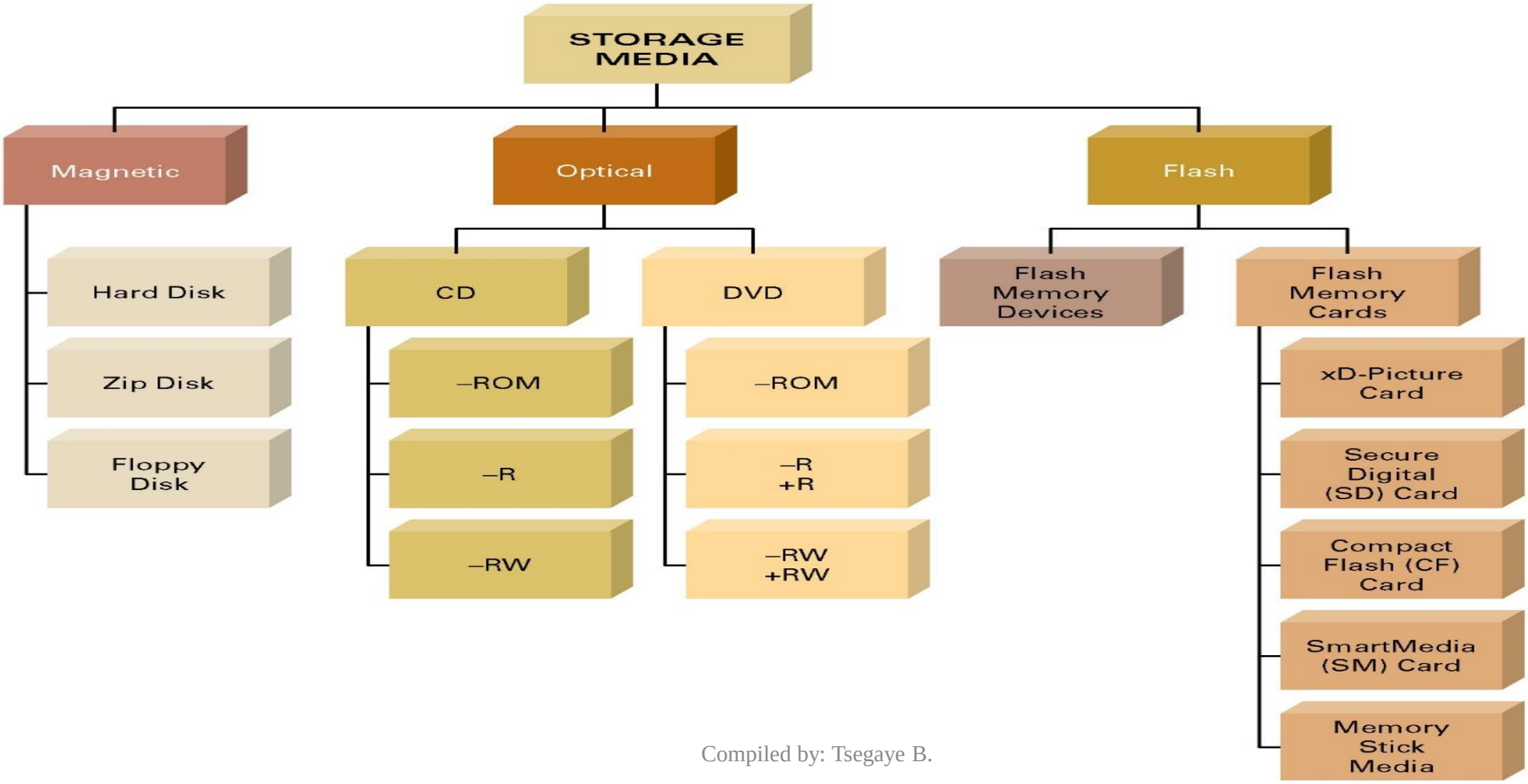
- Storage devices hold data, even when the computer is turned off.
- Data can be accessed in Direct or Sequential way.
- There are several types of SSD used today in the world, each of these can be compared to each other in terms
  - Data Accesses Mode (method)
  - Access time (speed)
  - Transfer rate
  - Capacity (storage)
  - Cost
  - Additional
    - Size
    - Removability

The storage device performs the following major functions:

- ✓All data and instructions are stored here before and after processing.
- ✓Intermediate results of processing are also stored here.

Categories of Storage Devices

Categories of Storage Media



Access Methods

- The way the device allows access to the data stored on it.
  - Sequential access
    - Data is stored sequentially
    - Search for data is slow
    - Used with magnetic tape
    - Punched cards
  - Direct/Random access
    - Where a reading device can directly go to the data
    - Search for data is faster

Random Processing Medias

- ✓ Magnetic media
  - Magnetic Disk
    - Hard Disk
    - Floppy Disk
  - Magnetic Tape
- ✓ Optical Storage Media
- ✓ Flash Memory media
  - Flash Drive
  - Flash Memory cards

Magnetic Tape

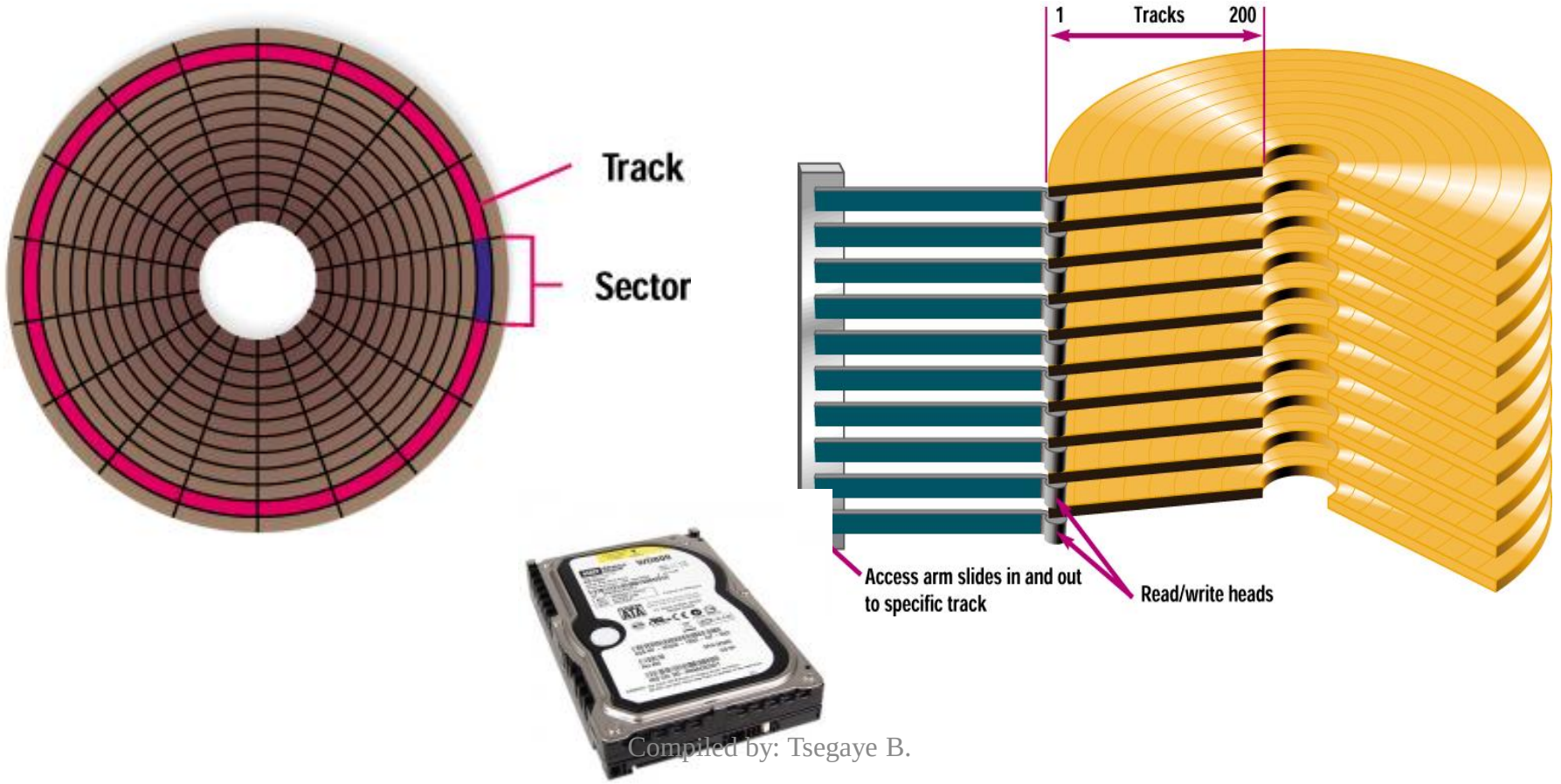
- Magnetic Tape is a recording medium that used for recording analogue or digital data.
- The capacity of tape media are generally on the same order as hard disk drives (The largest being about 5 Terabytes in 2011).
- Magnetic Tapes Generally transfer data a bit slower than hard drives, however magnetic tapes are cheaper and are more durable.

Hard Disk

- ***Hard disk*** – magnetic storage with one or more thin metal platters sealed inside the drive
- The hard disk drive is the main, and usually largest data storage device in a computer.
- It is a non-volatile, random access digital magnetic data storage device.
- Is generally the fastest of the SSD.
- Largest storage capacity, approximately the same as Magnetic Tapes.
- Hard drives however, are not very portable and are primarily used internally in a computer system.

Cont’d

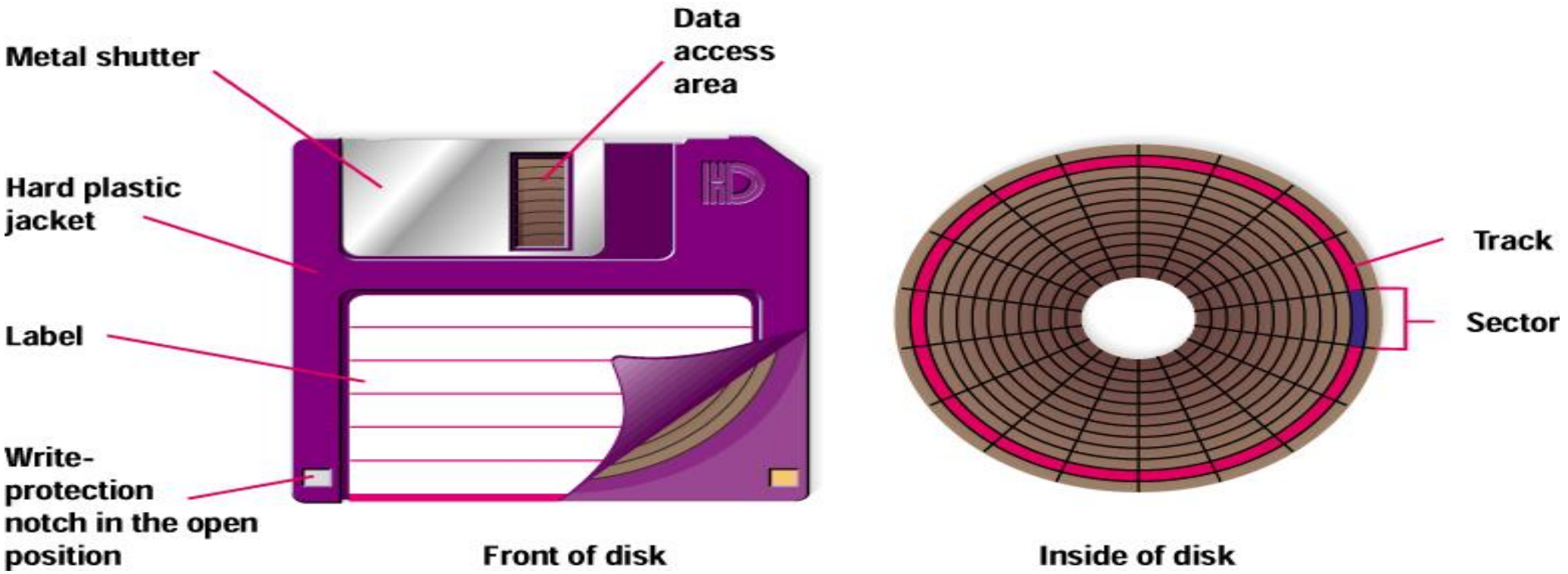
- A Hard Disk is divided into tracks and sectors.



- Data on this hard disk is positioned into these tracks and sectors.

Floppy

Floppy disk – removable storage medium that holds 1.44 MB



Optical/Laser Disks

- ***Optical storage media*** – plastic discs on which information is stored, deleted, and changed using laser technology
- Optical disk is an electronic data storage medium from which data is read and written to by using a low-powered laser beam.
- There are three basic types of optical disks:
  - Read-only optical disks
  - Write once read many Optical disks and
  - Rewritable Optical disks.
- Three main types of optical disks are:
  - CD
  - DVD
  - Blu-ray

CD-Compact Disk

- A standard data storage capacity up to 700 MB of data, or about 70 minutes of audio.
- There are three types of CD:
  - CD-ROM
    - CD-Read Only Memory and they function the same way Read Only Memory Does
  - CD-R
    - CD-Recordable of the type of Write Once Read Many times(WORM)
  - CD-RW
    - CD-Rewritable, these disks can be erased and rewritten at any time.

DVD-Digital Versatile/Video Disk

- an optical disc storage media format that can be used for data storage. The DVD supports disks with capacities of 4.7 GB to 17 GB.
- A standard DVD disc store up to 4.7 GB of data.
- There are three types of DVD's:
  - DVD-ROM
    - CD-Read Only Memory and they function the same way Read Only Memory Does
  - DVD-R
    - CD-Recordable of the type of Write Once Read Many times (WORM)
  - DVD-RW
    - CD-Rewritable, these disks can be erased and rewritten at any time.


TOY STORY 2
TOY STORY
NORTON
Windows95

Blu-ray

- New standard in storage
- Blu-Ray
  - New disks use blue laser light instead of the red laser light used in traditional CD players
  - Disks may ultimately hold
    - Over 30GB on one-sided disks
    - Over 50GB on two-sided disks

Flash Drive

- A flash drive is a small external storage device, typically the size of a human thumb that consists of flash memory.
- USB flash drives are removable and rewritable reads and writes to flash memory.
- They are inexpensive and durable.
  - USB Flash drives vary in sizes from 8 Megabytes to 512 Gigabytes. More commonly used sizes vary from 2 Gigabytes -16 Gigabytes.

Flash Memory cards

- Flash memory is a EEPROM non-volatile computer storage chip. These Memory cards currently vary in sizes between 1GB -16GB

Magnetic Storage Media

- ***Zip disk*** – high capacity (100 MB, 250 MB, and 750 MB) removable storage medium

Storage Capacity

- Byte – The amount of space in memory or on a disk needed to store one character. 8 bits = 1 Byte

	Exact Number of bytes	Approximation
Kilobyte	2^{10} bytes	10^{3} bytes
Megabyte	2^{20} bytes	10^{6} bytes
Gigabyte	2^{30} bytes	10^{9} bytes
Terabyte	2^{40} bytes	10^{12} bytes
Petabyte	2^{50} bytes	10^{15} bytes
Exabyte	2^{60} bytes	10^{18} bytes

Flash Memory Devices and Cards

- ***Flash memory device*** – very small storage device that plugs into USB port
- ***Flash memory card*** – high capacity storage laminated inside a small piece of plastic

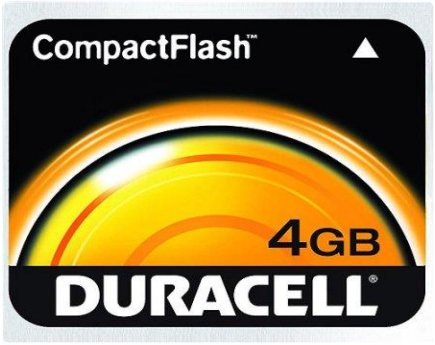
Flash Memory Cards

- ***xD-Picture card*** – rectangular; smaller than a penny and about as thick with one curved side

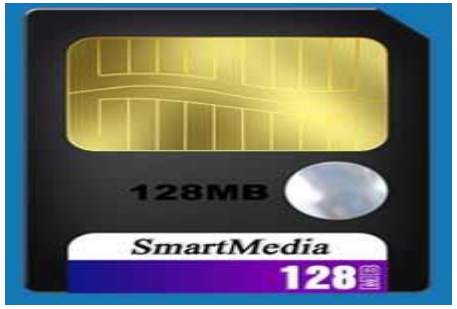
- ***Secure Digital (SD) card*** and ***MultiMediaCard (MMC***) – look the same but SD has copy protection; are both larger and thicker than a quarter (but rectangular)

Flash Memory Cards

- ***Compact Flash (CF) card***



- ***Smart Media (SM) card***



- ***Memory Stick Media card***

Computer Software

Computer Software

- The computer hardware is an electronic device which has the potential of performing the task of solving a problem. However, one has to give precise instructions to the hardware in order to solve problem.
- The finite set of instructions (steps) that the computer follow to perform a given job is called a ***program***.
- Any program to be executed first it should resided / loaded in the memory.

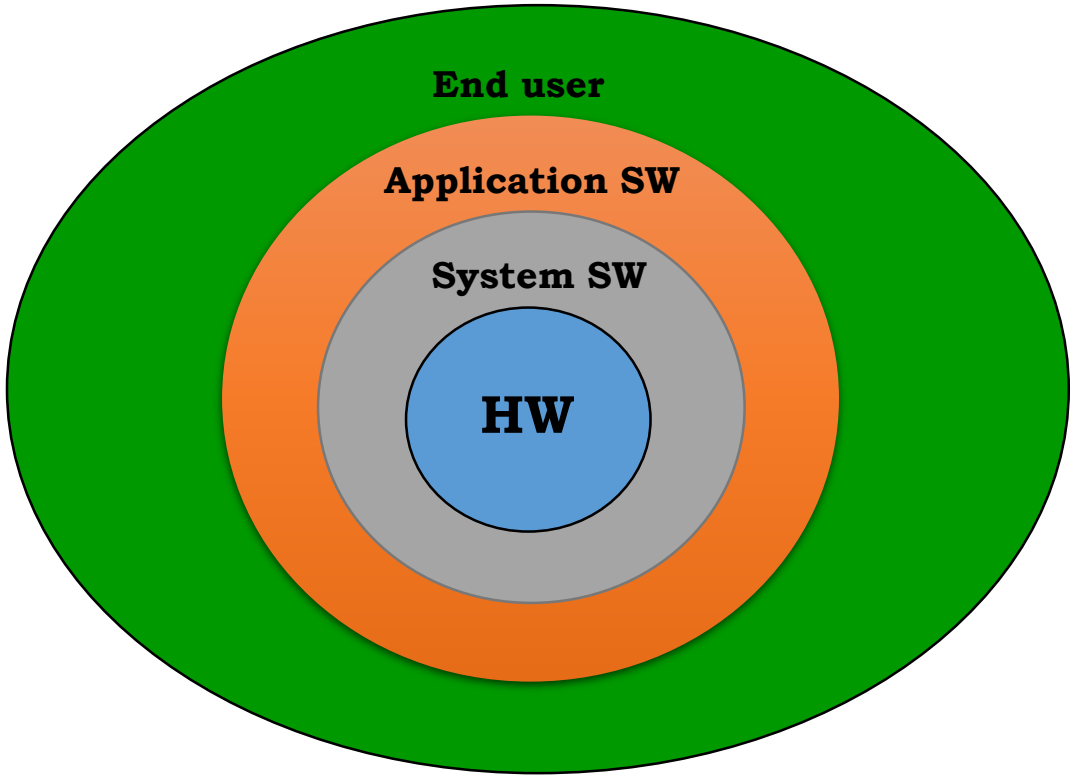
Computer Software

- Software is a collection of programs and routines that support the operations of performing a task using a computer.
- Software also includes documentations, rules and operational procedures.
- Software makes the interface between the user and the electronic components of the computer.
- Software and Hardware have to work together to produce meaningful result.

Computer Software

- Software refers to the set of computer programs, procedures that describe the programs, how they are to be used.
- software is the collection of programs, which increase the capabilities of the hardware.
- Software guides the computer at every step where to start and stop during a particular job.
- The process of software development is called *programming*.

Software



SOFTWARE TYPES

Computer software is normally classified into two broad categories.

- Application Software
- System software

Application Software

- Application software is software developed to do user specific tasks such as word processing, spreadsheet and database management.
- It is developed using the language software
- Among the most common software that fall in this group include Microsoft word, Microsoft Excel; MS-Access, Auto CAD, Peachtree etc.

Application Software

- For example, payroll is an application software for an organization to produce pay slips as an output.
- Application software is useful for word processing, billing system, accounting, producing statistical report, analysis of numerous data in research, weather forecasting, etc.

Application Software

- Auto CAD, Peachtree
- Graphics Creation and Manipulation
- Peachtree
- Animation and 3D Graphics
- Website Creation and Management
- Financial Management
- Internet Connectivity
- Video Editing
- Microsoft word,
- MS-Access, Microsoft Excel
- Educational Games and Tutorials

Application Software is divided into two categories:

- User-designed application software
  - Software that is created or designed by big companies and government department
- Ready-made application software
  - A collection of programs designed for general use

User Designed Application Software

- Also known as Tailor-Made Software
- These type of software are designed and developed specifically for the company or organization
- Advantages
  - The Company will get the exact software/system that they need
  - The software will work exactly how they want it to work
  - The software will only have the features that they specifically need in their business
- Disadvantages
  - Takes a long time to develop
  - Costs a great deal of money to develop
  - Company needs to employ a team of people such as analysts and programmers
  - There will be little in the way of user support and online help

Ready-Made Designed Application Software

- Also known as Package Software or Package
- It usually comes with manuals
  - Manuals are instruction on how to run the application software
- Examples are Word Processing, PowerPoint and the like.
- Package is generally written by a team of computer specialists.
- A company or organization which writes packages is called a software house
- A package is specific to an operating system

Cont'd..

- Advantages of using Ready-Made Packages
  - User-friendly
  - Cheap
  - Easily Available
- Disadvantages of using Ready-Made Packages
  - Rigid
  - Functions cannot be changed
  - Some may not suit own specific requirement

Other types of Application Software

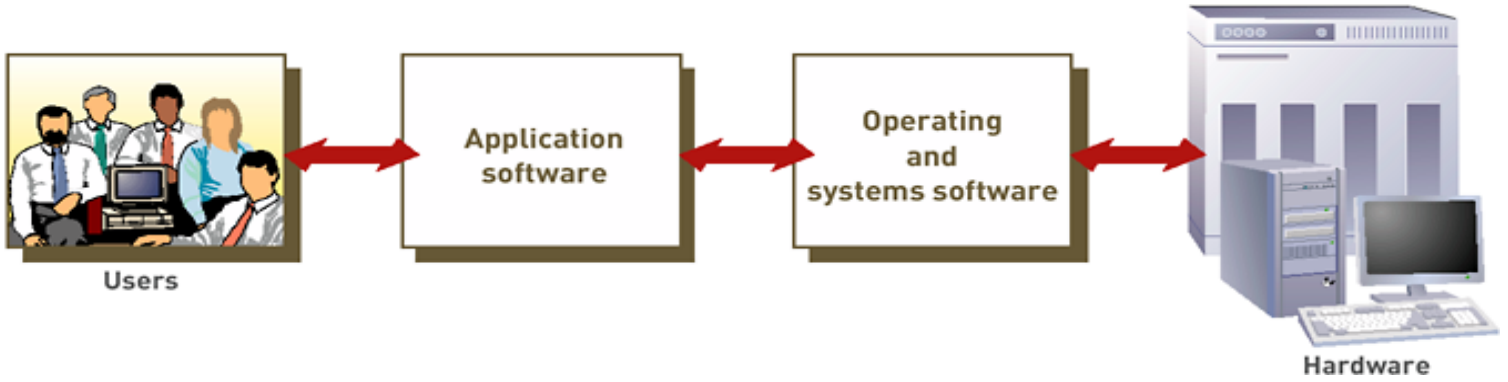
- Workgroup Application Software
- Personal Application Software
- Enterprise Application Software

System software

- The system software handles the computer hardware so that the user can operate the computer with little knowledge about the computer hardware.
- For example, the user is not concerned where the file is saved on the hard disk. This is the responsibility of the system software to check the hard disk and space on the free space of the hard disk.
- It Constitutes those programs which facilitates the work of the computer hardware.

System software

- It organizes and manages the machine's resources, handles the input/output devices.
- It controls the hardware by performing functions that users shouldn't have to or are unable to handle.
- System programs make complex hardware more user friendly.



System software

- It acts as intermediate between the user and the hardware.
- It enables the computer understand programming languages i.e. it serves as means of communication between user and a computer.
- The important categories of system software are:
    - Operating system
    - Language software
    - Utilities

Operating system (OS)

- An operating system is a program that acts as the link between you, the computer's software and hardware resources.
- OS is the foundation software onto which all other application programs are loaded.
- OS is the master program of your system that allows you to run application programs.

Operating system

- Operating System software manages most of your computer's activities, including the allocation of computer resources, maintenance of files, and running of application software.
- The first segment of the operating system software is contained in the ROM of your computer. This software tests the internal components and circuitry of the computer when it is turned on.

Types of OS

Windows OS

- Most popular operating system.
- Supports a vast array of application software and peripheral devices.

Example of MS OS

- MS-DOS
  - MS-DOS 1.x
  - MS-DOS 2.x – Support for 10 MB hard disk drives
  - MS-DOS 3.x
  - MS-DOS 4.0 (multitasking) and MS-DOS 4.1

Types of OS

Microsoft Windows operating system

- Windows 1.0 (1985)
- Windows 2.0 (1987)
- Windows 3.x (1990, 1992)
- Windows 95 (1995)
- Windows 98 (1998)
- Windows 2000 (2000)
- Windows ME (2000)
- Windows XP (2001)
- Windows Vista (2006)
- Windows 7 (2009)
- Windows 8 (2012)
- Windows 8.1 (2013)
- Windows 10 (2015)
- Windows 10 (Anniversary Update) (2016)

Types of OS

LINUX

- Developed by Linus Torvalds in 1991
- Open-source product
- Only the kernel of an OS
- Several distributions available with capabilities/applications that form a complete OS

Examples:

- Caldera
- OPENSUSE,
- MINT,
- UBUNTU ,
- FEDORA ,
- Slackware,
- RedHat Linux,
- CentOS,
- Debian

Types of OS

Mac OS X:

- For Macintosh computers.
- Proprietary system.
- Mac OS X
  - Jaguar (OS X.2)
  - Panther (OS X.3)
  - Tiger (OS X.4)
  - Yosemite
  - Mavericks
  - Mountain Lion
  - Lion
  - Snow Leopard

Function of Operating system

An operating system has the following functions

- Coordinates, or supervises the activity of the computer system.
- Decides where programs and data should be stored in the computer memory.
- Handles communications among the computer components, applications software and the user.
- Controls the saving and retrieving of files to and from disks in the disk drive.
- It performs all its controlling tasks without the involvement or awareness of the user.
- Handles the process of preparing a disk for use, the copying, renaming, erasing task of a file.
- Perform common computer hardware functions
- Provide a user interface and input/output management
- Provide a degree of hardware independence
- Manage system memory
- Manage processing tasks
- Provide networking capability
- Control access to system resources
- Manage files

Utilities

- Help to perform maintenance or correct problems with a computer system
  - Utilities includes device drivers and Troubleshooting capabilities.
  - Utilities provide file management capabilities such as copying, moving or renaming a file.
  - Norton Utilities includes an undelete function that can recover deleted files.
  - Virus-detection and recovery utilities
  - Spam and pop-up blocker utilities
  - Network and Internet utilities

Language Software/Programming Language

- Language software are used by programmers to develop application software and translate programs to machine code.
- Basic building blocks of any software.
- Programming languages allow a programmer to write instructions that a computer can understand.
- Language software is a generic name consisting of various programs that serve as editors & translators to develop programs in a number of programming languages.

Language Software/Programming Language

Programming languages

- Machine language
- Assembly language
- High level language

Machine Language (Low-level language)

- A computer's machine language consists of strings of binary numbers and is the only language that the CPU directly understands.
- Machine language uses machine codes (strings of binary digits) to write computer programs. Early computer programs were written using machine language.
- Each instruction tells the CPU what to do, the length, and location of the data fields that are involved in the operation
- Typical operation involve reading, adding, subtracting, writing.

Assembly Language (low level language)

- Assembly language is a bit higher than machine language, but it is still ‘low’ in the sense that the programmer must spend some time thinking of the instructions that the particular computer can execute, rather than spending all his time in solving the problem.
- This language lies between high-level languages and machine languages

High Level Programming Language

- It is human Oriented Language because it is more related with human language. It is machine independent. A programmer may not be needed to know the details of the internal logical structure of a computer.
- It is block structured that composed of blocks starting with BEGIN and terminating with END. It can be used for scientific and file processing applications.
- The high level programming languages are problem oriented unlike the machine language, which is machine oriented programming language.

Language Software Translators

- **Translator**:- is a program that converts one or more languages to another language. The three types of translators are assemblers, Compilers and interpreters.
  1. **Assemblers**:- is a program that translates assembly languages into machine code.
  2. **Compiler**:-is a program that translates a high level language into machine code. (PASCAL, FORTRAN, COBOL)
  3. **Interpreter**:- is a program that translates each instruction of high level language & executes the instruction before translating the next instruction

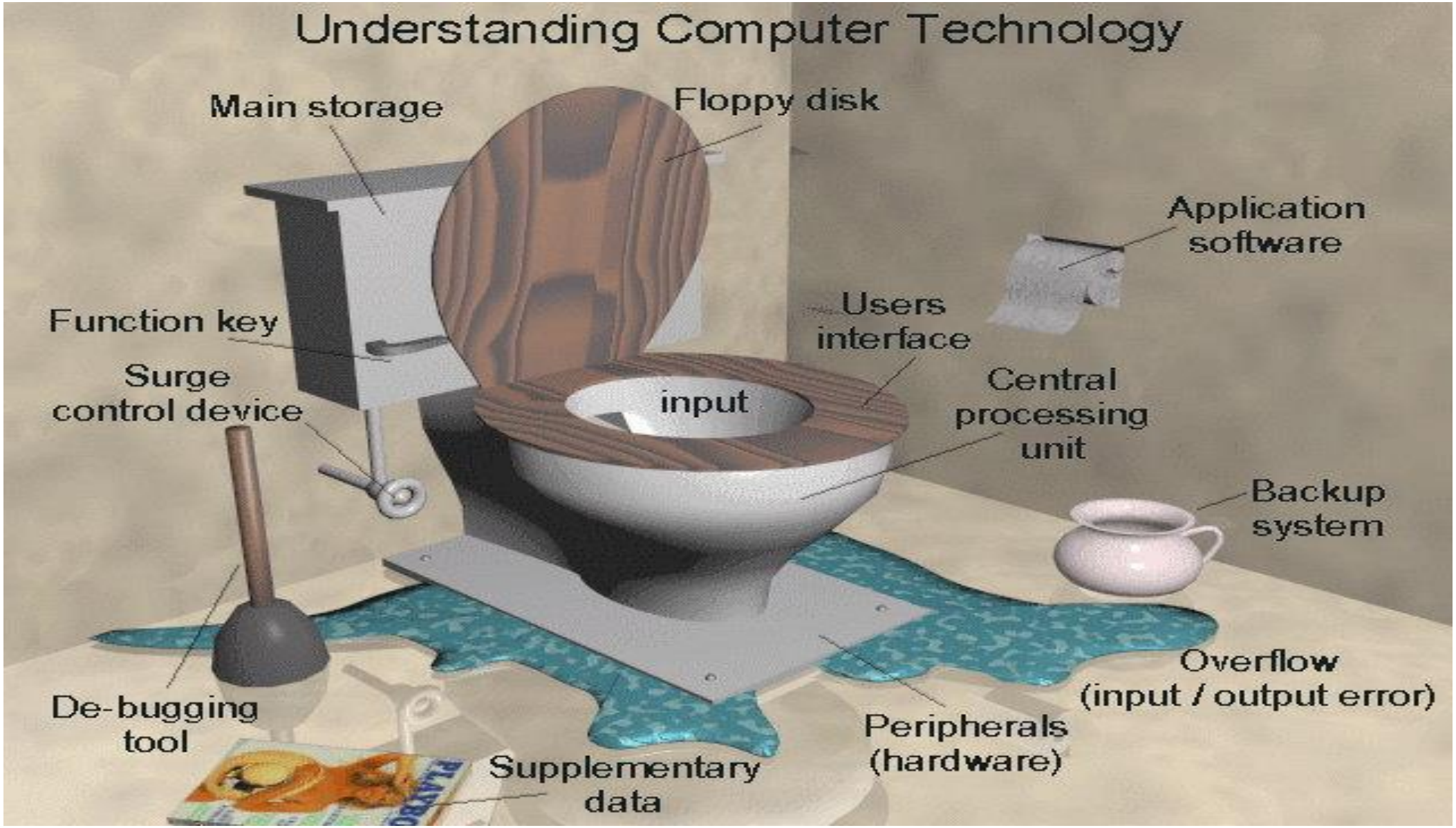
Programming Languages Generations

- 1st generation
  - machine language
  - instructions coded using combinations of 0's & 1's
- 2nd generation
  - assembly languages (low-level symbolic language)
  - Replaced binary digits with mnemonics (e.g "ADD") programmers could more easily understand
  - one assembly language instruction is translated into one machine language instruction

- 3rd generation
  - high-level symbolic languages
  - one instruction generates multiple machine language instructions
  - Continued trend to more symbolic code (e.g. COBOL, BASIC, FORTRAN)
- 4th generation programming languages
  - non-procedural languages
  - code “what” not “how”
  - Languages that are less procedural and even more English-like than third-generation languages

- 5th generation languages…
  - Combines rule-based code generation, component management, visual programming techniques, and reuse management
  - Knowledge-based management
    - An approach to the development of computer programs in which you do not tell a computer how to do a job, but what you want it to do

Summary


Understanding Computer Technology
Main storage
Floppy disk
Application software
Users interface
Function key
Surge control device
input
Central processing unit
Backup system
De-bugging tool
Overflow (input / output error)
Peripherals (hardware)
Supplementary data