

1 BASICS of COMPUTER SYSTEMS

- A **computer system** is a combination of multiple pieces of **hardware** and **software** required to process and store data using a computer.

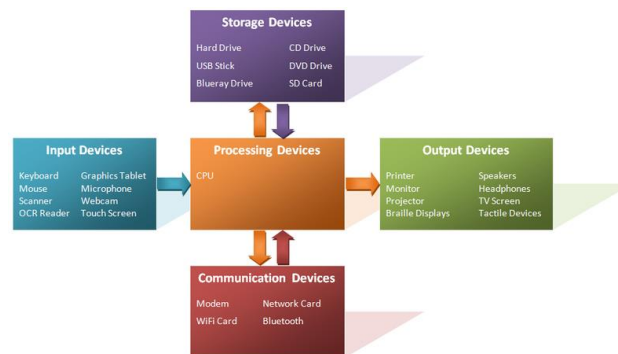
Computer hardware and software accomplish together three major operations:

- **1 Input:** Data items enter the computer system and are placed in memory, where they can be processed. Hardware devices that perform input operations include keyboards and mice. **Data items** include all the text, numbers, and other raw material that are entered into and processed by a computer, such as, facts and figures about entities, images, sounds, and a user's mouse or finger-swiping movements.
- **2 Processing:** Processing data items may involve organizing or sorting them, checking them for accuracy, or performing calculations with them. The hardware component that performs these types of tasks is the **central processing unit**, or **CPU**. Some devices, such as tablets and smartphones, usually contain multiple processors. Writing programs that efficiently use several CPUs requires special techniques.
- **3 Output:** After data items have been processed, the resulting information usually is sent to a printer, monitor, or some other output device so people can view, interpret, and use the results. Programming professionals often use the term data for input items, but use the term **information** for data that has been processed and output. Sometimes you place output on **storage devices**, such as your hard drive, flash media, or a cloud-based device. (The **cloud** refers to devices at remote locations accessed through the Internet.) When you send output to a storage device, sometimes it is used later as input for another program.



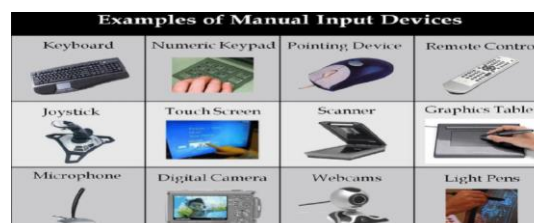
HARDWARE:

- **Hardware** is the collection of physical elements that constitutes a computer system. Computer hardware refers to the physical parts or components of a computer such as the monitor, mouse, keyboard, computer data storage, hard drive disk (HDD), system unit (graphic cards, sound cards, memory, motherboard and chips), etc. all of which are physical objects that can be touched.



Input Devices

Input device is any peripheral (piece of computer hardware equipment to provide data and control signals to an information processing system such as a computer or other information appliance. Input devices translate data from form that humans understand to one that the computer can work with. Most common are keyboard and mouse.



■ Central Processing Unit (CPU)

A CPU is the “brain” of a computer. It is responsible for all functions and processes. Regarding computing power, the CPU is the most important element of a computer system. The CPU is comprised of three main parts:

1. Arithmetic Logic Unit (ALU): Executes all arithmetic and logical operations. Arithmetic calculations like as addition, subtraction, multiplication and division. Logical operation like compare numbers, letters, or special characters
2. Control Unit (CU): Controls and co-ordinates computer components.
 - i. Read the code for the next instruction to be executed.
 - ii. Increment the program counter so it points to the next instruction.
 - iii. Read whatever data the instruction requires from cells in memory.
 - iv. Provide the necessary data to an ALU or register.
 - v. If the instruction requires an ALU or specialized hardware to complete, instruct the hardware to perform the requested operation.
3. Registers: Store the data that is to be executed next, "very fast storage area".

■ Storage Devices

Primary Memory:

1. RAM: Random Access Memory (RAM) is a storage device within the computer system responsible for storing data on a temporary basis. The data stored in RAM can be promptly written and read when needed by applications. It is volatile in nature, which means that data will be erased once supply to the storage device is turned off. RAM stores data randomly and the processor accesses these data randomly from the RAM storage. RAM is considered "random access" because you can access any memory cell directly if you know the row and column that intersect at that cell.

2. ROM (Read Only Memory): ROM is a permanent form of storage. ROM stays active regardless of whether power supply to it is turned on or off. ROM devices do not allow data stored on them to be modified.

Secondary Memory:

Stores data and programs permanently: it is retained after the power is turned off

1. Hard drive (HD): A hard disk is part of a unit, often called a "disk drive," "hard drive," or "hard disk drive," that store and provides relatively quick access to large amounts of data on an electromagnetically charged surface or set of surfaces.

2. Optical Disk: an optical disc drive (ODD) is a disk drive that uses laser light as part of the process of reading or writing data to or from optical discs. Some drives can only read from discs, but recent drives are commonly both readers and recorders, also called burners or writers. Compact discs, DVDs, and Blu-ray discs are common types of optical media which can be read and recorded by such drives. Optical drive is the generic name; drives are usually described as "CD" "DVD", or "Bluray", followed by "drive", "writer", etc. There are three main types of optical media: CD, DVD, and Blu-ray disc. CDs can store up to 700 megabytes (MB) of data and DVDs can store up to 8.4 GB of data. Blu-ray discs, which are the newest type of optical media, can store up to 50 GB of data.

3. Flash Disk: A storage module made of flash memory chips. Flash disks have no mechanical platters or access arms, but the term "disk" is used because the data are accessed as if they were on a hard drive. The disk storage structure is emulated.

SOFTWARE:

Software is a generic term for organized collections of computer data and instructions, often broken into two major categories: system software that provides the basic non-task-specific functions of the computer, and application software which is used by users to accomplish specific tasks.

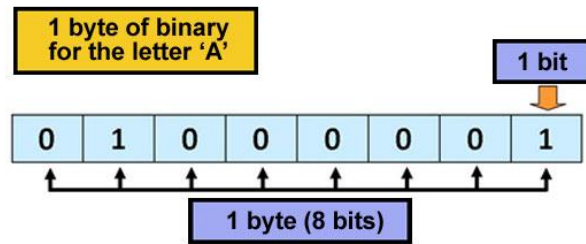
Software can be classified into two broad types:

- **System software** is responsible for controlling, integrating, and managing the individual hardware components of a computer system so that other software and the users of the system see it as a functional unit without having to be concerned with the low-level details such as transferring data from memory to disk, or rendering text onto a display. Generally, system software consists of an operating system and some fundamental utilities such as disk formatters, file managers, display managers, text editors, user authentication (login) and management tools, and networking and device control software.
- **Application software** is used to accomplish specific tasks other than just running the computer system. Application software may consist of a single program, such as an image viewer; a small collection of programs (often called a software package) that work closely together to accomplish a task, such as a spreadsheet or text processing system; a larger collection (often called a software suite) of related but independent programs and packages that have a common user interface or shared data format, such as Microsoft Office, which consists of closely integrated word processor, spreadsheet, database, etc.; or a software system, such as a database management system, which is a collection of fundamental programs that may provide some service to a variety of other independent applications.

	System Software	Application Software
	Computer software, or just software is a general term primarily used for digitally stored data such as computer programs and other kinds of information read and written by computers. App comes under computer software though it has a wide scope now.	Application software, also known as an application or an "app", is computer software designed to help the user to perform specific tasks.
Example:	<ol style="list-style-type: none"> 1) Microsoft Windows 2) Linux 3) Unix 4) Mac OSX 5) DOS 	<ol style="list-style-type: none"> 1) Opera (Web Browser) 2) Microsoft Word (Word Processing) 3) Microsoft Excel (Spreadsheet software) 4) MySQL (Database Software) 5) Microsoft PowerPoint (Presentation Software) 6) Adobe Photoshop (Graphics Software)
Interaction:	Generally, users do not interact with system software as it works in the background.	Users always interact with application software while doing different activities.
Dependency:	System software can run independently of the application software.	Application software cannot run without the presence of the system software.

■ Units of Measurements

- Storage measurements: The basic unit used in computer data storage is called a bit (binary digit). Computers use these little bits, which are composed of ones and zeros, to do things and talk to other computers. All your files, for instance, are kept in the computer as binary files and translated into words and pictures by the software (which is also ones and zeros). This two number system, is called a "binary number system" since it has only two numbers in it. The decimal number system in contrast has ten unique digits, zero through nine.



Unit	Abbreviation	Information
Bit		Smallest unit of data (either 1 or 0)
Byte		1 byte = 8 bits
Kilobyte	KB	1 KB = 2 ¹⁰ bytes = 1024 bytes
Megabyte	MB	1 MB = 2 ¹⁰ Kilobytes = 1024 Kilobytes
Gigabyte	GB	1 GB = 2 ¹⁰ Megabytes = 1024 Megabytes
Terabyte	TB	1 TB = 2 ¹⁰ Gigabytes = 1024 Gigabytes

Size example

- 1 bit - answer to an yes/no question
 - 1 byte - a number from 0 to 255.
 - 90 bytes: enough to store a typical line of text from a book.
 - 4 KB: about one page of text.
 - 120 KB: the text of a typical pocket book.
 - 3 MB - a three minute song (128k bitrate)
 - 650-900 MB - a CD-ROM
 - 1 GB -114 minutes of uncompressed CD-quality audio at 1.4 Mbit/s
 - 8-16 GB - size of a normal flash drive
- Speed measurements: The speed of Central Processing Unit (CPU) is measured by Hertz (Hz), Which represent a CPU cycle. The speed of CPU is known as Computer Speed.

CPU Speed Measures	
1 hertz or Hz	1 cycle per second
1 MHz	1 million cycles per second
1 GHz	1 billion cycles per second or 1000 MHz