Computer - Data and Information

Data can be defined as a representation of facts, concepts, or instructions in a formalized manner, which should be suitable for communication, interpretation, or processing by human or electronic machine.

Information is organized or classified data, which has some meaningful values for the receiver. Information is the processed data on which decisions and actions are based.

Data Processing

"the collection and manipulation of items of data to produce meaningful information."

Data Processing Cycle

Re-structuring or re-ordering of data by people or machine to increase their usefulness and add values for a particular purpose. Data processing consists of the following basic steps - input, processing, and output. These three steps constitute the data processing cycle.

Data Processing Cycle

- **Input** − In this step, the input data is prepared in some convenient form for processing. The form will depend on the processing machine. For example, when electronic computers are used, the input data can be recorded on any one of the several types of input medium, such as magnetic disks, tapes, and so on.

- **Processing** − In this step, the input data is changed to produce data in a more useful form. For example, pay-checks can be calculated from the time cards, or a summary of sales for the month can be calculated from the sales orders.

- **Output** − At this stage, the result of the proceeding processing step is collected. The particular form of the output data depends on the use of the data. For example, output data may be pay-checks for employees.

History

Manual data processing

Data processing functions have been performed manually for millennia. For example, bookkeeping involves functions such as posting transactions and producing reports like the balance sheet and the cash flow statement. Completely manual methods were augmented by the application of mechanical or electronic calculators. A person whose job was to perform calculations manually or using a calculator was called a "computer."

The 1890 United States Census schedule was the first to gather data by individual rather than household. A number of questions could be answered by making a check in the appropriate box on the form. From 1850 through 1880 the Census Bureau employed "a system of tallying, which, by reason of the increasing number of combinations of classifications required, became increasingly

complex. Only a limited number of combinations could be recorded in one tally, so it was necessary to handle the schedules 5 or 6 times, for as many independent tallies."[4] "It took over 7 years to publish the results of the 1880 census"[5] using manual processing methods.

Automatic data processing[edit]

The term *automatic data processing* was applied to operations performed by means of unit record equipment, such as Herman Hollerith's application of punched card equipment for the 1890 United States Census. "Using Hollerith's punchcard equipment, the Census Office was able to complete tabulating most of the 1890 census data in 2 to 3 years, compared with 7 to 8 years for the 1880 census.... It is estimated that using Hollerith's system saved some $5 million in processing costs"[5] in 1890 dollars even though there were twice as many questions as in 1880.

Electronic data processing[edit]

Computerized data processing, or Electronic data processing represents a later development, with a computer used instead of several independent pieces of equipment. The Census Bureau first made limited use of electronic computers for the 1950 United States Census, using a UNIVAC I system,[4] delivered in 1952..

Other developments[edit]

The term *data processing* has mostly been subsumed by the more general term *information technology* (IT).[6] The older term "data processing" is suggestive of older technologies. For example, in 1996 the *Data Processing Management Association* (DPMA) changed its name to the *Association of Information Technology Professionals*. Nevertheless, the terms are approximately synonymous.

Computer - Types

Computers can be broadly classified by their speed and computing power.

S.No.	Type	Specifications
1	PC (Personal Computer)	It is a single user computer system having moderately powerful microprocessor
2	Workstation	It is also a single user computer system, similar to personal computer however has a more powerful microprocessor.
3	Mini Computer	It is a multi-user computer system, capable of supporting hundreds of users simultaneously.
4	Main Frame	It is a multi-user computer system, capable of supporting hundreds of users simultaneously. Software technology is different from minicomputer.
5	Supercomputer	It is an extremely fast computer, which can execute hundreds of millions of

		instructions per second.

PC (Personal Computer)

A PC can be defined as a small, relatively inexpensive computer designed for an individual user. PCs are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip. Businesses use personal computers for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications. At home, the most popular use for personal computers is playing games and surfing the Internet.

Although personal computers are designed as single-user systems, these systems are normally linked together to form a network. In terms of power, now-a-days high-end models of the Macintosh and PC offer the same computing power and graphics capability as low-end workstations by Sun Microsystems, Hewlett-Packard, and Dell.

Workstation

Workstation is a computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other such types of applications which require a moderate amount of computing power and relatively high quality graphics capabilities.

Workstations generally come with a large, high-resolution graphics screen, large amount of RAM, inbuilt network support, and a graphical user interface. Most workstations also have mass storage device such as a disk drive, but a special type of workstation, called diskless workstation, comes without a disk drive.

Common operating systems for workstations are UNIX and Windows NT. Like PC, workstations are also single-user computers like PC but are typically linked together to form a local-area network, although they can also be used as stand-alone systems.

Minicomputer

It is a midsize multi-processing system capable of supporting up to 250 users simultaneously.

Mainframe

Mainframe is very large in size and is an expensive computer capable of supporting hundreds or even thousands of users simultaneously. Mainframe executes many programs concurrently and supports many simultaneous execution of programs.

Supercomputer

Supercomputers are one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require immense amount of mathematical calculations (number crunching).

 For example, weather forecasting, scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting).

Computer – Components

All types of computers follow the same basic logical structure and perform the following five basic operations for converting raw input data into information useful to their users.

S.No.	Operation	Description
1	Take Input	The process of entering data and instructions into the computer system.
2	Store Data	Saving data and instructions so that they are available for processing as and when required.
3	Processing Data	Performing arithmetic, and logical operations on data in order to convert them into useful information.
4	Output Information	The process of producing useful information or results for the user, such as a printed report or visual display.

5	Control the workflow	Directs the manner and sequence in which all of the above operations are performed.
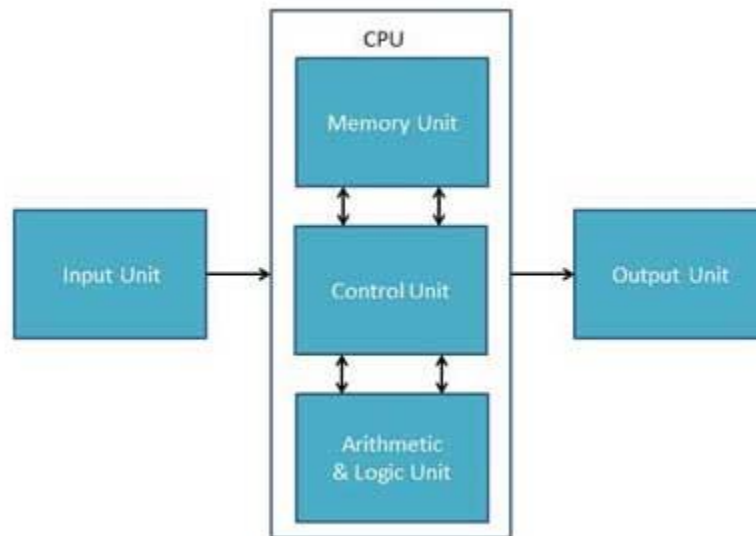
Input Unit

This unit contains devices with the help of which we enter data into the computer. This unit creates a link between the user and the computer. The input devices translate the information into a form understandable by the computer.

CPU (Central Processing Unit)

CPU is considered as the brain of the computer. CPU performs all types of data processing operations. It stores data, intermediate results, and instructions (program). It controls the operation of all parts of the computer.

CPU itself has the following three components −

1. ALU (Arithmetic Logic Unit)

This unit consists of two subsections namely,

- Arithmetic Section
- Logic Section

Arithmetic Section

Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division. All complex operations are done by making repetitive use of the above operations.

Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

2. Memory or Storage Unit

This unit can store instructions, data, and intermediate results. This unit supplies information to other units of the computer when needed. It is also known as internal storage unit or the main memory or the primary storage or Random Access Memory (RAM).

Its size affects speed, power, and capability. Primary memory and secondary memory are two types of memories in the computer. Functions of the memory unit are −

- It stores all the data and the instructions required for processing.
- It stores intermediate results of processing.
- It stores the final results of processing before these results are released to an output device.
- All inputs and outputs are transmitted through the main memory.

3. Control Unit

This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations.

Functions of this unit are −

- It is responsible for controlling the transfer of data and instructions among other units of a computer.
- It manages and coordinates all the units of the computer.
- It obtains the instructions from the memory, interprets them, and directs the operation of the computer.
- It communicates with Input/Output devices for transfer of data or results from storage.
- It does not process or store data.

Output Unit

The output unit consists of devices with the help of which we get the information from the computer. This unit is a link between the computer and the users. Output devices translate the computer's output into a form understandable by the users.

Memory Unit

This is unit in which data and instructions given to computer as well as results given by computer are stored. Unit of memory is "Byte".

1 Byte = 8 Bits

Business computer systems

Business computer systems are available as: Desktops, consisting of a base unit, monitor, keyboard and mouse. They are designed to be set up and used in one place. ... Laptops, portable **computers** that can be used on the move.

Computer - Memory

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

Memory is primarily of three types −

- Cache Memory
- Primary Memory/Main Memory
- Secondary Memory

Cache Memory

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

Advantages

The advantages of cache memory are as follows −

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

Disadvantages

The disadvantages of cache memory are as follows −

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

Primary Memory (Main Memory)

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

Characteristics of Main Memory

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

• RAM (Random Access Memory)	• ROM(Read Only Memory)

- emory.

RAM	ROM
1. Temporary Storage.	1. Permanent storage.
2. Store data in MBs.	2. Store data in GBs.
3. Volatile.	3. Non-volatile.
4.Used in normal operations.	4. Used for startup process of computer.
5. Writing data is faster.	5. Writing data is slower.

Difference between RAM and ROM

Secondary Memory

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

Characteristics of Secondary Memory

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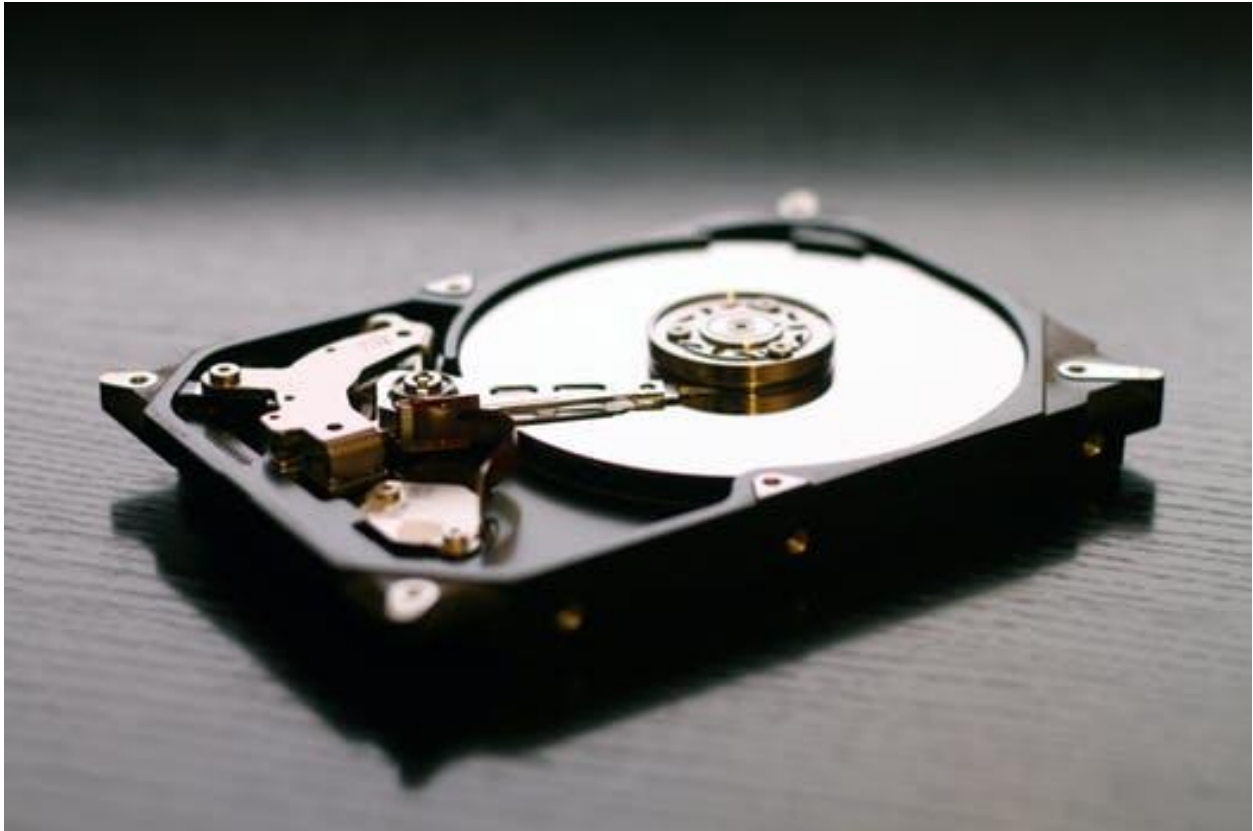- Computer may run without the secondary memory.

- Slower than primary memories.

Secondary Storage types

The different types of secondary storage devices are:

Hard Disk

Hard disks are the most famously used secondary storage devices. They are round, flat pieces of metal covered with magnetic oxide. They are available in many sizes ranging from 1 to 14 inch diameter.


Floppy Disk

They are flexible plastic discs which can bend, coated with magnetic oxide and are covered with a plastic cover to provide protection. Floppy disks are also known as floppies and diskettes.

Memory Card

This has similar functionality to a flash drive but is in a card shape. It can easily plug into a port and removed after its work is done. A memory card is available in various sizes such as 8MB, 16MB, 64MB, 128MB, 256MB etc.
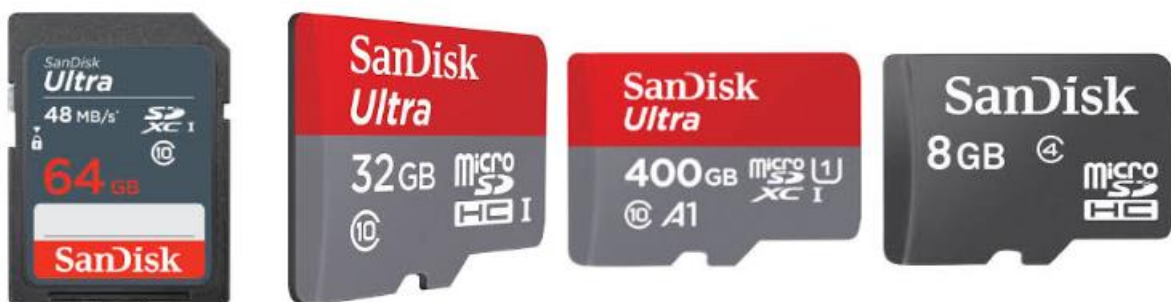
Flash Drive

This is also known as a pen drive. It helps in easy transportation of data from one system to another. A pen drive is quite compact and comes with various features and designs.

CD-ROM

This is short for compact disk - read only memory. A CD is a shiny metal disk of silver colour. It is already pre recorded and the data on it cannot be altered. It usually has a storage capacity of 700 MB.

Computer - Memory Units

Memory unit is the amount of data that can be stored in the storage unit. This storage capacity is expressed in terms of Bytes.

The following table explains the main memory storage units −

S.No.	Unit & Description
1	**Bit (Binary Digit)** A binary digit is logical 0 and 1 representing a passive or an active state of a component in an electric circuit.
2	**Nibble** A group of 4 bits is called nibble.
3	**Byte** A group of 8 bits is called byte. A byte is the smallest unit, which can represent a data item or a

S.No.	Unit & Description

character.

4	**Word** A computer word, like a byte, is a group of fixed number of bits processed as a unit, which varies from computer to computer but is fixed for each computer. The length of a computer word is called word-size or word length. It may be as small as 8 bits or may be as long as 96 bits. A computer stores the information in the form of computer words.

The following table lists some higher storage units −

S.No.	Unit & Description
1	**Kilobyte (KB)** 1 KB = 1024 Bytes
2	**Megabyte (MB)** 1 MB = 1024 KB
3	**GigaByte (GB)** 1 GB = 1024 MB
4	**TeraByte (TB)** 1 TB = 1024 GB
5	**PetaByte (PB)** 1 PB = 1024 TB

Basics of Computer Science - Virus

A computer virus is a malicious software program loaded onto a user's computer without the user's knowledge and performs malicious actions. ... It can self-replicate, inserting itself onto other programs or files, infecting them in the process. Not all computer viruses are destructive though.

Infected computer programs may include data files, or even the "boot" sector of the hard drive.

Types of Virus

Following are the major types of computer virus −

Worms

This is a computer program that replicates itself at a swift pace. Unlike a computer virus, it is self-contained and hence does not need to be part of another program to propagate itself.

Trojan Horse

A Trojan Horse is also a sort of destructive program that remains disguised in a normal software program. It is not exactly a virus, as it cannot replicate itself. However, there is possibility that virus program may remain concealed in the Trojan Horse.

Bombs

It is similar to Trojan Horse, but Logic bombs have some specialty; these include a timing device and hence it will go off only at a particular date and time.

How Does Virus Affect?

Let us discuss in what ways a virus can affect your computer system. The ways are mentioned below −

- By downloading files from the Internet.
- During the removable of media or drives.
- Through pen drive.
- Through e-mail attachments.
- Through unpatched software & services.
- Through unprotected or poor administrator passwords.

Impact of Virus

Let us now see the impact of virus on your computer system −

- Disrupts the normal functionality of respective computer system.
- Disrupts system network use.
- Modifies configuration setting of the system.
- Destructs data.
- Disrupts computer network resources.
- Destructs of confidential data.

Virus Detection

The most fundamental method of detection of virus is to check the functionality of your computer system; a virus affected computer does not take command properly.

However, if there is antivirus software in your computer system, then it can easily check programs and files on a system for virus signatures.

Virus Preventive Measures

Let us now see the different virus preventive measures. A computer system can be protected from virus through the following −

- Installation of an effective antivirus software.
- Patching up the operating system.
- Patching up the client software.
- Putting highly secured Passwords.
- Use of Firewalls.

Most Effective Antivirus

Following are the most popular and effective antivirus from which you can choose one for your personal computer −

- McAfee Antivirus Plus
- Symantec Norton Antivirus
- Avast Pro Antivirus
- Bitdefender Antivirus Plus
- Kaspersky Anti-Virus
- Avira Antivirus
- Webroot Secure Anywhere Antivirus
- Emsisoft Anti-Malware
- Quick Heal Antivirus
- ESET NOD32 Antivirus