Computer Hardware and Software :

 Hardware represents the physical and tangible components of a computer, i.e. the components that can be seen and touched.

Examples of Hardware are the following −

- **Input devices** − keyboard, mouse, etc.

- **Output devices** − printer, monitor, etc.

- **Secondary storage devices** − Hard disk, CD, DVD, etc.

- **Internal components** − CPU, motherboard, RAM, etc.

Relationship between Hardware and Software

- Hardware and software are mutually dependent on each other. Both of them must work together to make a computer produce a useful output.

- Software cannot be utilized without supporting hardware.

- Hardware without a set of programs to operate upon cannot be utilized and is useless.

- To get a particular job done on the computer, relevant software should be loaded into the hardware.

- Hardware is a one-time expense.

- Software development is very expensive and is a continuing expense.

- Different software applications can be loaded on a hardware to run different jobs.

- A software acts as an interface between the user and the hardware.

- If the hardware is the 'heart' of a computer system, then the software is its 'soul'. Both are complementary to each other.

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software −

- System Software
- Application Software

System Software

The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software is generally prepared by the computer manufacturers. These software products comprise of programs written in low-level languages, which interact with the hardware at a very basic level. System software serves as the interface between the hardware and the end users.

Some examples of system software are Operating System, Compilers, Interpreter, Assemblers, etc.

Here is a list of some of the most prominent features of a system software −

- Close to the system
- Fast in speed
- Difficult to design
- Difficult to understand
- Less interactive
- Smaller in size
- Difficult to manipulate
- Generally written in low-level language

Application Software

Application software products are designed to satisfy a particular need of a particular environment. All software applications prepared in the computer lab can come under the category of Application software.

Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are the following −

- Payroll Software
- Student Record Software
- Inventory Management Software
- Income Tax Software
- Railways Reservation Software
- Microsoft Office Suite Software
- Microsoft Word
- Microsoft Excel
- Microsoft PowerPoint

Features of application software are as follows −

- Close to the user
- Easy to design
- More interactive
- Slow in speed
- Generally written in high-level language
- Easy to understand
- Easy to manipulate and use
- Bigger in size and requires large storage space

Operating System :

The Operating System is a program with the following features −

- An operating system is a program that acts as an interface between the software and the computer hardware.
- It is an integrated set of specialized programs used to manage overall resources and operations of the computer.
- It is a specialized software that controls and monitors the execution of all other programs that reside in the computer, including application programs and other system software.

Objectives of Operating System

The objectives of the operating system are −

- To make the computer system convenient to use in an efficient manner.

- To hide the details of the hardware resources from the users.

- To provide users a convenient interface to use the computer system.

- To act as an intermediary between the hardware and its users, making it easier for the users to access and use other resources.

- To manage the resources of a computer system.

- To keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users.

- To provide efficient and fair sharing of resources among users and programs.

Characteristics of Operating System

Here is a list of some of the most prominent characteristic features of Operating Systems −

- **Memory Management** − Keeps track of the primary memory, i.e. what part of it is in use by whom, what part is not in use, etc. and allocates the memory when a process or program requests it.

- **Processor Management** − Allocates the processor (CPU) to a process and deallocates the processor when it is no longer required.

- **Device Management** − Keeps track of all the devices. This is also called I/O controller that decides which process gets the device, when, and for how much time.

- **File Management** − Allocates and de-allocates the resources and decides who gets the resources.

- **Security** − Prevents unauthorized access to programs and data by means of passwords and other similar techniques.

- **Job Accounting** − Keeps track of time and resources used by various jobs and/or users.

- **Control Over System Performance** − Records delays between the request for a service and from the system.

- **Interaction with the Operators** − Interaction may take place via the console of the computer in the form of instructions. The Operating System

acknowledges the same, does the corresponding action, and informs the operation by a display screen.

- **Error-detecting Aids** − Production of dumps, traces, error messages, and other debugging and error-detecting methods.

- **Coordination Between Other Software and Users** − Coordination and assignment of compilers, interpreters, assemblers, and other software to the various users of the computer systems.

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.

Data is represented with the help of characters such as alphabets (A-Z, a-z), digits (0-9) or special characters (+,-,/,*,<,>,= etc.)

What is Information?

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.

For the decision to be meaningful, the processed data must qualify for the following characteristics −

- **Timely** − Information should be available when required.

- **Accuracy** − Information should be accurate.

- **Completeness** − Information should be complete.

Data Processing Cycle

Data processing is the 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.

- **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.

Computer Network :

A **computer network** is a system in which multiple computers are connected to each other to share information and resources.

Characteristics of a Computer Network

- Share resources from one computer to another.

- Create files and store them in one computer, access those files from the other computer(s) connected over the network.

- Connect a printer, scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over the network.

Following is the list of hardware's required to set up a computer network.

- Network Cables
- Distributors
- Routers
- Internal Network Cards
- External Network Cards

Network Cables

Network cables are used to connect computers. The most commonly used cable is Category 5 cable RJ-45.

Distributors

A computer can be connected to another one via a serial port but if we need to connect many computers to produce a network, this serial connection will not work.

The solution is to use a central body to which other computers, printers, scanners, etc. can be connected and then this body will manage or distribute network traffic.

Router

A router is a type of device which acts as the central point among computers and other devices that are a part of the network. It is equipped with holes called ports. Computers and other devices are connected to a router using network cables. Now-a-days router comes in wireless modes using which computers can be connected without any physical cable.

Network Card

Network card is a necessary component of a computer without which a computer cannot be connected over a network. It is also known as the network adapter or Network Interface Card (NIC). Most branded computers have network card pre-installed. Network cards are of two types: Internal and External Network Cards.

Internal Network Cards

Motherboard has a slot for internal network card where it is to be inserted. Internal network cards are of two types in which the first type uses Peripheral Component Interconnect (PCI) connection, while the second type uses Industry Standard Architecture (ISA). Network cables are required to provide network access.

External Network Cards

External network cards are of two types: Wireless and USB based. Wireless network card needs to be inserted into the motherboard, however no network cable is required to connect to the network.

Universal Serial Bus (USB)

USB card is easy to use and connects via USB port. Computers automatically detect USB card and can install the drivers required to support the USB network card automatically.

Internet

It is a worldwide/global system of interconnected computer networks. It uses the standard Internet Protocol (TCP/IP). Every computer in Internet is identified by a unique IP address. IP Address is a unique set of numbers (such as 110.22.33.114) which identifies a computer's location.

A special computer DNS (Domain Name Server) is used to provide a name to the IP Address so that the user can locate a computer by a name. For example, a DNS server will resolve a name https://www.tutorialspoint.com to a particular IP address to uniquely identify the computer on which this website is hosted.

Internet is accessible to every user all over the world.

Intranet

Intranet is the system in which multiple PCs are connected to each other. PCs in intranet are not available to the world outside the intranet. Usually each organization has its own Intranet network and members/employees of that organization can access the computers in their intranet.

Each computer in Intranet is also identified by an IP Address which is unique among the computers in that Intranet.

Similarities between Internet and Intranet

- Intranet uses the internet protocols such as TCP/IP and FTP.

- Intranet sites are accessible via the web browser in a similar way as websites in the internet. However, only members of Intranet network can access intranet hosted sites.

- In Intranet, own instant messengers can be used as similar to yahoo messenger/gtalk over the internet.

Differences between Internet and Intranet

- Internet is general to PCs all over the world whereas Intranet is specific to few PCs.

- Internet provides a wider and better access to websites to a large population, whereas Intranet is restricted.

- Internet is not as safe as Intranet. Intranet can be safely privatized as per the need.