

## UNIT 2

**Computer Hardware** is defined as the physical part or component of a computer system which can be felt, seen, and touched.

A printer which we use to Produce outputs, a computer memory which is used to store data or programs all are the types of hardware used in computer system for better functionality of computers.

### **Types of Hardware Component Used in Computer & Their Differences**

- Cabinet Case
- Motherboard
- Ram
- Hard Disk
- CPU
- SMPS (Switching Mode Power Supply)
- Keyboard
- Mouse
- Monitors
- Printers
- Speaker etc

These are the most used and common hardware devices here mentioned above some of the devices are used for better functionality or used for additional features. Like Speaker and Printers.

They are not used in the boot process of PC as when found missing PC cannot start or boot on its own. They are not responsible for booting computers.

But some of the devices mentioned above are responsible for the booting process of PC, for example, **power supply, CPU, and Computer Memory [RAM]** are essential hardware devices that are solely responsible for the booting of PC and their better computer functionality.

### **Cabinet Case**

Cabinet case comes in various shapes and sizes but commonly used case is a tower case whose height ranges from 15 to 25 inches.

They enable different types of hardware devices to be fit in themselves to make it a whole and all the devices are connected to the case using screws.

The Commonly attached hardware devices to the PC case are **Power supply, Motherboard CPU, Ram, Hard disk, DVD-RW** etc.

### **Motherboard**

The **Computer Motherboard or mainboard** is nothing but a piece of PCB (printed circuit board) where all the other devices are connected to it using cables & wires.

Motherboard generally distributes all the voltages and power received from SMPS or power supply to other parts of the hardware devices attached to the PC.

### **RAM**

**RAM [Random Access Memory]** is an essential part of the computer system which is used for storing data or program temporarily.

It is a volatile memory that tends to lose data when power is missing from a power supply.

When RAM is found missing motherboard gives a sound, and no display is found on monitors.

### **Hard Disk Drive**

Computer Hard disk drives are used to store the data permanently.

It is a type of non-volatile memory that does not lose data or programs when there is no power.

Nowadays huge volume of data can be stored in a hard disk.

Which are also called as **secondary storage hardware devices**?

The hard disk capacity is measured in **MB-MEGABYTES, GB-GIGABYTES & TB-TERABYTES**

### **CPU [Central Processing Unit]**

CPU stands for **Central Processing Unit** which is responsible for almost all the operation computer system performs.

CPU performs Arithmetical and logical operation which includes addition, subtraction, division, and multiplication, and logical operations include comparison, less and greater values.

Every input which is sent by input devices is first collected in primary memory and later transferred to the CPU for further processing.

### **SMPS (Power Supply)**

SMPS is known as **Switching Mode Power Supply**. Which is responsible to give power to the motherboard later this power is distributed among the other hardware devices for better functionality.

### **Keyboard**

The keyboard is an input device that is primarily used for entering text as input to the CPU.

### **Mouse**

The mouse is a Pointing device that is used for selecting, pointing, and drag icons, files, and folders from one location to another in hard drives.

### **Monitors**

Monitors are display units or commonly called as **VDU** which stands for [**visual display unit**] they are used to display information received from computers on their screen.

They are also called as **SOFTCOPY** Terminals.

### **Printers**

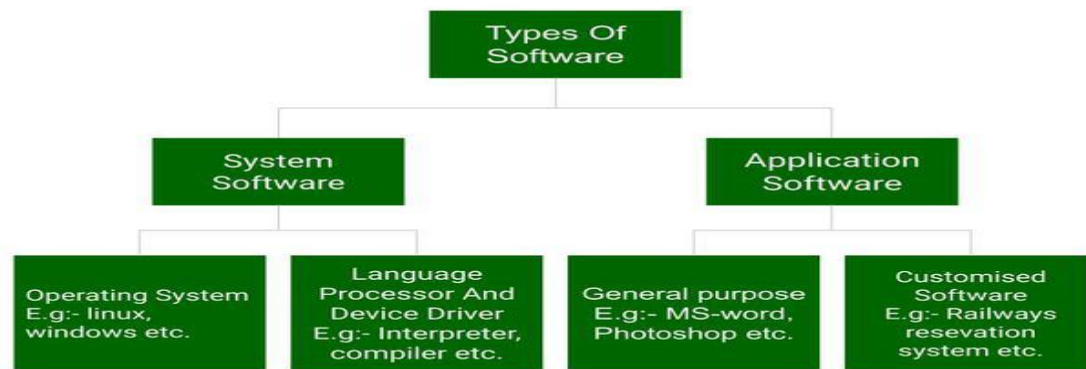
Printers are hardware component of the computer which is often used for producing outputs on papers as a **HARDCOPY**.

### **Speaker**

Speakers are used to output digital signals. You can use a speaker for hearing sound, videos and playing games.

## Software

In a computer system, the software is basically a set of instructions or commands that tells a computer what to do. Or in other words, the software is a computer program that provides a set of instructions to execute a user's commands and tell the computer what to do. For example like MS-Word, MS-Excel, PowerPoint, etc.



### System Software

System software basically controls a computer's internal functioning and also controls hardware devices such as monitors, printers, and storage devices, etc. It is like an interface between hardware and user applications, it helps them to communicate with each other because hardware understands machine language(i.e. 1 or 0) whereas user applications are work in human-readable languages like English, Hindi, German, etc. so system software converts the human-readable language into machine language and vice versa.

#### Features of system software:

1. System Software is closer to the computer system.
2. System Software is written in a low-level language in general.
3. System software is difficult to design and understand.
4. System software is fast in speed (working speed).
5. System software is less interactive for the users in comparison to application software.

#### Types of system software:

It has two subtypes which are:

1. **Operating System:** It is the main program of a computer system. When the computer system ON it is the first software that loads into the computer's memory. Basically, it manages all the resources such as memory, CPU, printer, hard disk, etc., and provides an interface to the user, which helps the user to interact with the computer system. Examples of operating systems are Linux, Apple mac OS, Microsoft Windows, etc.
2. **Language Processor:** As we know that system software converts the human-readable language into a machine language and vice versa. So, the conversion is done by the language processor. It converts programs written in high-level programming languages like Java, C, C++, Python, etc (known as source code), into sets of instructions that are easily readable by machines (known as object code or machine code).
3. **Device Driver:** A device driver is a program or software that controls a device and helps that device to perform its functions. Every device like a printer, mouse, modem, etc. needs a driver to connect with the computer system. So, when you connect a new

device with your computer system, first you need to install the driver of that device so that your operating system knows how to control or manage that device.

## Application Software

Application software is designed to perform a specific task for end-users. It is a product or a program that is designed only to fulfill end-users' requirements. It includes word processors, spreadsheets, database management, inventory, payroll programs, etc.

### Features of application software:

1. An important feature of application software is it performs more specialized tasks like word processing, spreadsheets, email, etc.
2. Mostly, the size of the software is big, so it requires more storage space.
3. Application software is more interactive for the users, so it is easy to use and design.
4. The application software is easy to design and understand.
5. Application software is written in a high-level language in general.

### Types of application software:

There are different types of application software and those are:

1. **General Purpose Software:** This type of application software is used for a variety of tasks and it is not limited to performing a specific task only. For example, MS-Word, MS-Excel, PowerPoint, etc.
2. **Customized Software:** This type of application software is used or designed to perform specific tasks or functions or designed for specific organizations. For example, railway reservation system, airline reservation system, invoices management system, etc.
3. **Utility Software:** Utility Program-Usually utility software installed during the installation of OS. Utility program helps in analyze, configure, secure, optimize and maintain the system and take care of its requirements as well. For example, antivirus, disk fragmentary, memory tester, disk repair, disk cleaners, registry cleaners, disk space analyzer, disk backup etc.

System Software	Application Software
It is designed to manage the resources of the computer system, like memory and process management, etc.	It is designed to fulfill the requirements of the user for performing specific tasks.
Written in a low-level language	Written in a high-level language
Less interactive for the users	More interactive for the users
System software plays vital role for the effective functioning of a system.	Application software is not so important for the functioning of the system, as it is task specific.
It is independent of the application software to run.	It needs system software to run.

### What is a Firmware?

Firmware refers to software that has been permanently installed in a machine, device, or microchip, usually by the manufacturer. Without it, the electronic device will not work. Unlike standard software, firmware is meant to control, operate, or maintain the hardware in the background, and not interact with human users. It usually requires special equipment to embed firmware into a device, and you normally will not be able to alter or erase it without the manufacturer's help. Because it is planted into the hardware, firmware is also called "embedded software" or "embedded system."

**Firmware is software** that's embedded in a piece of hardware.

### Differences between Hardware and Software

Hardware	Software
Hardware is further divided into four main categories: <ul style="list-style-type: none"><li>• Input Devices</li><li>• Output Devices</li><li>• Secondary Storage Devices</li><li>• Internal Components</li></ul>	Software is further divided into two main categories: <ul style="list-style-type: none"><li>• Application Software</li><li>• System Software</li></ul>
Developed using electronic and other materials	Developed writing using instructions using a programming language
When damaged, it can be replaced with a new component	When damaged it can be installed once more using a backup copy
Hardware is physical in nature and hence one can touch and see hardware	The software cannot be physically touched but still can be used and seen
Hardware cannot be infected by Viruses	The software can be infected by Viruses
An example of Hardware is hard drives, monitors, CPU, scanners, printers etc.	An example of software is Windows 10, Adobe Photoshop etc.

### Computer language

- A language is the main medium of communicating between the Computer systems and the most common are the programming languages.

- As we know a Computer only understands binary numbers that is 0 and 1 to perform various operations but the languages are developed for different types of work on a Computer.
- A language consists of all the instructions to make a request to the system for processing a task.
- A language consists of all the instructions to make a request to the system for processing a task.

### **Computer Language**

A Computer language includes various languages that are used to communicate with a Computer machine.

Some of the languages like programming language which is a set of codes or instructions used for communicating the machine.

Machine code is also considered as a computer language that can be used for programming. But all the languages that are now available are categorized into two basic types of languages including.

- **Low-level language and**
- **High level language.**

### **Low Level Language**

Low level languages are the machine codes in which the instructions are given in machine language in the form of 0 and 1 to a Computer system.

It is mainly designed to operate and handle all the hardware and instructions set architecture of a Computer.

The main function of the Low level language is to operate, manage and manipulate the hardware and system components.

There are various programs and applications written in low level languages that are directly executable without any interpretation or translation.

The most famous and the base of all programming languages “C” and “C++” are mostly used Low level languages till today.

**Low level language is also divided into two parts are**

- **Machine language**
- **Assembly language.**

### **Machine Language**

- The first generation language developed for communicating with a Computer.
- It is written in machine code which represents 0 and 1 binary digits inside the Computer string which makes it easy to understand and perform the operations.
  - As we know a Computer system can recognize electric signals so here 0 stands for turning off electric pulse and 1 stands for turning on electric pulse.
- It is very easy to understand by the Computer and also increases the processing speed.

**Advantage:–**

No need of a translator or interpreter to translate the code, as the Computer can directly can understand.

**Disadvantage:–**

Remember the operation codes, memory address every time you write a program and also hard to find errors in a written program.

### Typical Machine language Instruction format

1. **OPCODE** (Operation code) OPCODE tells the computer which operation to perform from the instruction set of the computer.
2. **OPERAND** (Address/Location) OPERAND tells the address of the data on which the operation is to be performed.

### Assembly Language

- The second generation programming language that has almost similar structure and set of commands as Machine language.
- Here we use words or names in English forms and also symbols (Mnemonics).
- The programs that have been written using words, names and symbols in assembly language are converted to machine language using an Assembler.
- Because a Computer only understands machine code languages that's why we need an Assembler that can convert the Assembly level language to Machine language so the Computer gets the instruction and responds quickly.

### Assembler

It is computer programmes which converts or translate assembly language into machine language. It assembles the machine language program in the main memory of the computer and makes it ready for execution.

Assembly language program **INPUT** → ASSAMBLER **OUTPUT** → Machine lang. program

### Advantages

- Machine language programs can be replaced by mnemonics that are easier to remember.
- It allows complex jobs to run in a simpler way.
- It is memory efficient, as it requires less memory.
- It is not necessary to keep track of memory locations.
- The speed is faster.
- Easy to insert and delete data.

### Disadvantage:–

- It is written only for a single type of CPU and does not run on any other CPU.
- Machine-dependent.
- Lengthy code.
- On small-sized computers, such programs cannot be executed.
- Coding or writing the program takes a lot of time, as it is more complex.
- The syntax is difficult to remember.

### High Level Language:

The high level languages are the most used and also more considered programming languages that helps a programmer to read, write and maintain. It is also the third generation



language that is used and also running till now by many programmers. They are less independent to a particular type of Computer and also require a translator that can convert the high level language to machine language. The translator may be an interpreter and Compiler that helps to convert into binary code for a Computer to understand. There is various high level programming languages like C, FORTRAN or Pascal that are less independent and also enables the programmer to write a program.

The Compiler plays an important role on the Computer as it can convert to machine language and also checks for errors if any before executing. There are several high level languages that were used earlier and also now like COBOL, FORTRAN, BASIC, C, C++, PASCAL, LISP, Ada, Algol, Prolog and Java. It is user-friendly as the programs are written in English using words, symbols, characters, numbers that needs to be converted to machine code for processing.

### **Advantages of High level language**

1. High level languages are programmer friendly. They are easy to write, debug and maintain.
2. It provides higher level of abstraction from machine languages.
3. It is machine independent language.
4. Easy to learn.
5. Less error prone, easy to find and debug errors.
6. High level programming results in better programming productivity.

### **Disadvantages of High level language**

1. It takes additional translation times to translate the source to machine code.
2. High level programs are comparatively slower than low level programs.
3. Compared to low level programs, they are generally less memory efficient.
4. Cannot communicate directly with the hardware.

### **Translator**

A translator is a programming language processor that converts a computer program from one language to another. It takes a program written in source code and converts it into machine code. It discovers and identifies the error during translation.

### **Purpose of Translator**

It translates a high-level language program into a machine language program that the central processing unit (CPU) can understand. It also detects errors in the program.

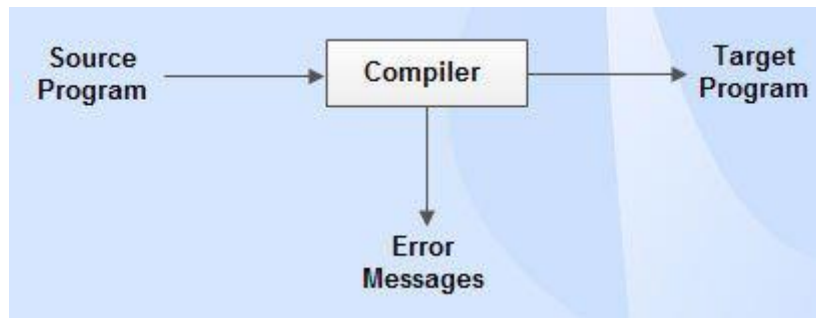
### **Different Types of Translators**

There are 3 different types of translators as follows:

#### **1. Compiler**

A compiler is a translator used to convert high-level programming language to low-level programming language. It converts the whole program in one session and reports errors detected after the conversion. The compiler takes time to do its work as it translates high-level code to lower-level code all at once and then saves it to memory.





### Advantages of the Compiler:

- The whole program is validated so there are no system errors.
- The executable file is enhanced by the compiler, so it runs faster.
- User do not have to run the program on the same machine it was created.

### Disadvantages of the Compiler:

- It is slow to execute as you have to finish the whole program.
- It is not easy to debug as errors are shown at the end of the execution.

## 2. Interpreter

Just like a compiler, is a translator used to convert high-level programming language to low-level programming language. It converts the program one at a time and reports errors detected at once while doing the conversion. With this, it is easier to detect errors than in a compiler. An interpreter is faster than a compiler as it immediately executes the code upon reading the code.

It is often used as a debugging tool for software development as it can execute a single line of code at a time.



### Advantages of the Interpreter:

- Program can be run before it is completed so you get partial results immediately.
- You can work on small parts of the program and link them later into a whole program.

### Disadvantages of the Interpreter:

- There's a possibility of syntax errors on unverified scripts.
- It may be slow because of the interpretation in every execution.

## 3. Assembler

An assembler is a translator used to translate assembly language to machine language. It is like a compiler for the assembly language but interactive like an interpreter. Assembly language is difficult to understand as it is a low-level programming language.

### Advantages of the Assembler:

- The symbolic programming is easier to understand thus time-saving for the programmer.
- It is easier to fix errors and alter program instructions.

#### Disadvantages of the Assembler:

- It is machine dependent, cannot be used in other architecture.
- A small change in design can invalidate the whole program.
- It is difficult to maintain.

#### Differences between compiler and interpreter

S.No	Compiler	Interpreter
1	Performs the translation of a program as a whole.	Performs statement by statement translation.
2	Execution is faster.	Execution is slower.
3	Debugging is hard as the error messages are generated after scanning the entire program only.	It stops translation when the first error is met. Hence, debugging is easy.
4	Programming languages like C, C++ uses compilers.	Programming languages like <u>Python</u> , BASIC, and Ruby uses interpreters.

- **Linker** – Linker is a computer program that connects and combines multiple object files to create an executable file. All these files might have been compiled by a separate assembler. The function of a linker is to inspect and find referenced module/routines in a program and to decide the memory location where these codes will be loaded creating the program instruction have an absolute reference.
- **Loader** – The loader is an element of the operating framework and is liable for loading executable files into memory and implement them. It can compute the size of a program (instructions and data) and generate memory space for it. It can initialize several registers to start execution.

#### What is an Operating System?

It is software that works as an interface between a user and the computer hardware. The primary objective of an *operating system* is to make computer system convenient to use and to utilize computer hardware in an efficient manner. The operating system performs the basic tasks such as receiving input from the keyboard, processing instructions and sending output to the screen.

Operating system is software that is required in order to run application programs and utilities. It works as a bridge to perform better interaction between application programs and hardware of the computer. **Examples of operating system are UNIX, MS-DOS, MS-Windows – 98/XP/Vista, Windows-NT/2000, OS/2 and Mac OS.**

### **Functions of Operating System**

- **Processor Management:** An operating system manages the processor's work by allocating various jobs to it and ensuring that each process receives enough time from the processor to function properly.
- **Memory Management:** An operating system manages the allocation and deallocation of the memory to various processes and ensures that the other process does not consume the memory allocated to one process.
- **Device Management:** There are various input and output devices. An OS controls the working of these input-output devices. It receives the requests from these devices, performs a specific task, and communicates back to the requesting process.
- **File Management:** An operating system keeps track of information regarding the creation, deletion, transfer, copy, and storage of files in an organized way. It also maintains the integrity of the data stored in these files, including the file directory structure, by protecting against unauthorized access.
- **Security:** The operating system provides various techniques which assure the integrity and confidentiality of user data. Following security measures are used to protect user data:
  - Protection against unauthorized access through login.
  - Protection against intrusion by keeping Firefall active.
  - Protecting the system memory against malicious access.
  - Displaying messages related to system vulnerabilities.
- **Error Detection:** From time to time, the operating system checks the system for any external threat or malicious software activity. It also checks the hardware for any type of damage. This process displays several alerts to the user so that the appropriate action can be taken against any damage caused to the system.
- **Job Scheduling:** In a multitasking OS where multiple programs run simultaneously, the operating system determines which applications should run in which order and how time should be allocated to each application.

### **Features of Operating Systems**

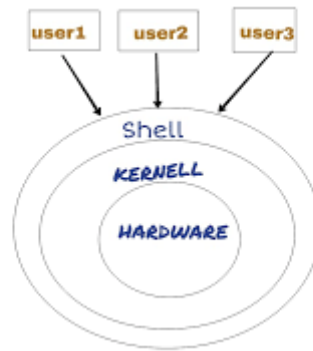
Here is a list of some important features of operating systems:

1. Provides a platform for running applications
2. Handles memory management and CPU scheduling
3. Provides file system abstraction
4. Provides networking support
5. Provides security features
6. Provides user interface
7. Provides utilities and system services
8. Supports application development

### **Characteristics of Operating System**

- 1) Operating System is a Collection of Programs those are Responsible for the Execution of other Programs.
- 2) Operating System is that which Responsible is for Controlling all the Input and Output Devices those are connected to the System.
- 3) Operating System is that which Responsible is for Running all the Application Software's.
- 4) Operating System is that which Provides Scheduling to the Various Processes Means Allocates the Memory to various Process those Wants to Execute.
- 5) Operating System is that which provides the Communication between the user and the System.
- 6) Operating System is Stored into the BIOS Means in the Basic Input and Output System means when a user Starts his System then this will Read all the instructions those are Necessary for Executing the System Means for Running the Operating System, Operating System Must be Loaded into the Computer For this, this will use the Floppy or Hard Disks Which Stores the Operating System.

### **Components of Operating System**



The operating system has two components:

- Shell
- Kernel

Both the **Shell and the Kernel** are the Parts of this Operating System. These Both Parts are used for performing any Operation on the System. When a user gives his Command for Performing Any Operation, then the Request Will goes to the Shell Parts, The Shell Parts is also called as the Interpreter which translate the Human Program into the Machine Language and then the Request will be transferred to the Kernel. So that Shell is just called as the interpreter of the Commands which Converts the Request of the User into the Machine Language.

Kernel is also called as the **heart of the Operating System** and the Every **Operation is performed by using the Kernel**, When the Kernel Receives the Request from the Shell then this will Process the Request and Display the Results on the Screen. The various Types of Operations those are Performed by the Kernel are as followings:-

1) It Controls the State the Process Means it checks whether the **Process is running or Process is Waiting** for the Request of the user.

2) **Provides the Memory for the Processes those are Running on the System** Means Kernel Runs the Allocation and De-allocation Process , First When we Request for the service then the Kernel will Provides the Memory to the Process and after that he also Release the Memory which is Given to a Process.

3) The Kernel also Maintains a **Time table for all the Processes** those are Running Means the Kernel also **Prepare the Schedule Time means this will Provide the Time to various Process of the CPU** and the Kernel also Puts the Waiting and Suspended Jobs into the different Memory Area.

4) **Kernel also maintains all the files those are Stored into the Computer System and the Kernel Also Stores all the Files into the System as no one can read or Write the Files without any Permissions.** So that the Kernel System also Provides us the Facility to use the Passwords and also all the Files are Stored into the Particular Manner.

## Types of Operating System

## Batch OS

Batch OS is the first operating system for second-generation computers. This OS does not directly interact with the computer. Instead, an operator takes up similar jobs and groups them together into a batch, and then these batches are executed one by one based on the first-come, first, serve principle.

### Advantages of Batch OS

- Execution time taken for similar jobs is higher.
- Multiple users can share batch systems.
- Managing large works becomes easy in batch systems.
- The idle time for a single batch is very less.

### Disadvantages of OS

- It is hard to debug batch systems.
- If a job fails, then the other jobs have to wait for an unknown time till the issue is resolved.
- Batch systems are sometimes costly.

**Examples of Batch OS:** payroll system, bank statements, data entry, etc.

## Multitasking OS

The multitasking OS is also known as the time-sharing operating system as each task is given some time so that all the tasks work efficiently. This system provides access to a large number of users, and each user gets the time of CPU as they get in a single system. The tasks performed are given by a single user or by different users. The time allotted to execute one task is called a quantum, and as soon as the time to execute one task is completed, the system switches over to another task.

### Advantages of Multitasking OS

- Each task gets equal time for execution.
- The idle time for the CPU will be the lowest.
- There are very few chances for the duplication of the software.

### Disadvantages of Multitasking OS

- Processes with higher priority cannot be executed first as equal priority is given to each process or task.
- Various user data is needed to be taken care of from unauthorized access.
- Sometimes there is a data communication problem.

**Examples of Multitasking OS:** UNIX, etc.

## Real-Time OS

Real-Time operating systems serve real-time systems. These operating systems are useful when many events occur in a short time or within certain deadlines, such as real-time simulations.

Types of the real-time OS are:

- **Hard real-time OS**

The hard real-time OS is the operating system for mainly the applications in which the slightest delay is also unacceptable. The time constraints of such applications are very strict. Such systems are built for life-saving equipment like parachutes and airbags, which immediately need to be in action if an accident happens.

- **Soft real-time OS**

The soft real-time OS is the operating system for applications where time constraint is not very strict.

In a soft real-time system, an important task is prioritized over less important tasks, and this priority remains active until the completion of the task. Furthermore, a time limit is always set for a specific job, enabling short time delays for future tasks, which is acceptable. For Example, virtual reality, reservation systems, etc.

### **Advantages of Real-Time OS**

- It provides more output from all the resources as there is maximum utilization of systems.
- It provides the best management of memory allocation.
- These systems are always error-free.
- These operating systems focus more on running applications than those in the queue.
- Shifting from one task to another takes very little time.

### **Disadvantages of Real-Time OS**

- System resources are extremely expensive and are not so good.
- The algorithms used are very complex.
- Only limited tasks can run at a single time.
- In such systems, we cannot set thread priority as these systems cannot switch tasks easily.

**Examples of Real-Time OS:** Medical imaging systems, robots, etc.

### **Network OS**

Network operating systems are the systems that run on a server and manage all the networking functions. They allow sharing of various files, applications, printers, security, and



other networking functions over a small network of computers like LAN or any other private network. In the network OS, all the users are aware of the configurations of every other user within the network, which is why network operating systems are also known as tightly coupled systems.

### **Advantages of Network OS**

- New technologies and hardware can easily upgrade the systems.
- Security of the system is managed over servers.
- Servers can be accessed remotely from different locations and systems.
- The centralized servers are stable.

### **Disadvantages of Network OS**

- Server costs are high.
- Regular updates and maintenance are required.
- Users are dependent on the central location for the maximum number of operations.

**Examples of Network OS:** Microsoft Windows server 2008, LINUX, etc.

### **Distributed OS**

A distributed OS is a recent advancement in the field of computer technology and is utilized all over the world that too with great pace. In a distributed OS, various computers are connected through a single communication channel. These independent computers have their memory unit and CPU and are known as loosely coupled systems. The system processes can be of different sizes and can perform different functions. The major benefit of such a type of operating system is that a user can access files that are not present on his system but in another connected system. In addition, remote access is available to the systems connected to this network.

### **Advantages of Distributed OS**

- Failure of one system will not affect the other systems because all the computers are independent of each other.
- The load on the host system is reduced.
- The size of the network is easily scalable as many computers can be added to the network.
- As the workload and resources are shared therefore the calculations are performed at a higher speed.
- Data exchange speed is increased with the help of electronic mail.

### **Disadvantages of Distributed OS**

- The setup cost is high.

- Software used for such systems is highly complex.
- Failure of the main network will lead to the failure of the whole system.

**Examples of Distributed OS:** LOCUS, etc.

### **Single-User/Single-Tasking OS**

An operating system that allows a single user to perform only one task at a time is called a Single-User Single-Tasking Operating System. Functions like printing a document, downloading images, etc., can be performed only one at a time. Examples include MS-DOS, Palm OS, etc.

Advantages

- This operating system occupies less space in memory.

Disadvantages

- It can perform only a single task at a time.

### **Single-User/Multitasking OS**

An operating system that allows a single user to perform more than one task at a time is called Single-User Multitasking Operating System. Examples include Microsoft Windows and Macintosh OS.

Advantages

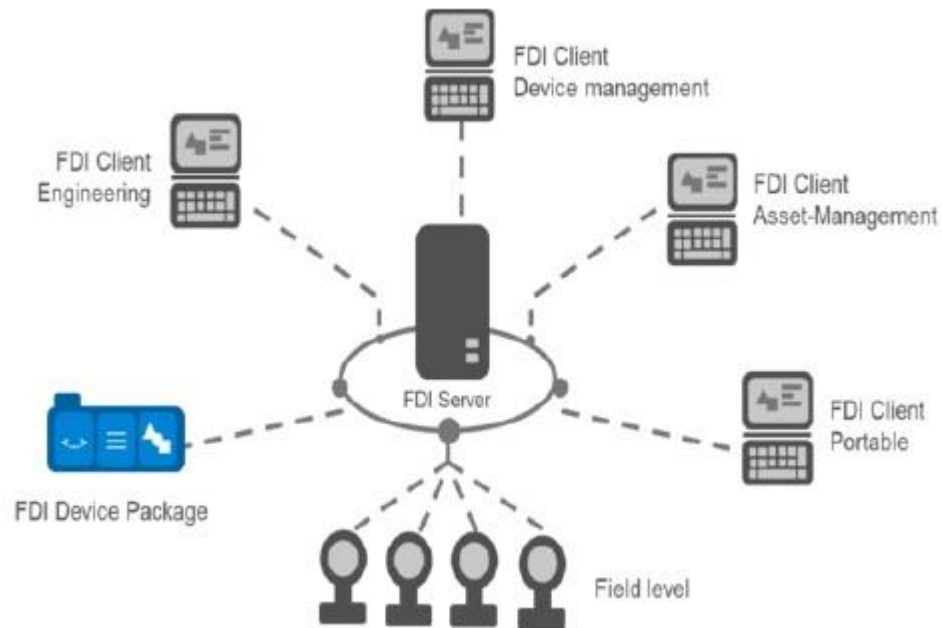
- It is time saving as it performs multiple tasks at a time yielding high productivity.

Disadvantages

- This operating system is highly complex and occupies more space.

### **Multiuser/Multitasking OS**

It is an operating system that permits several users to utilize the programs that are concurrently running on a single network server. The single network server is termed as "Terminal server". "Terminal client" is a software that supports user sessions. Examples include UNIX, MVS, etc.



#### Advantages

- It is highly productive as it performs multiple tasks at a time.
- It is time saving as we don't have to make changes in many desktops, instead can make changes only to the server.

#### Disadvantages

- If the connection to the server is broken, user cannot perform any task on the client as it is connected to that server.

## Computer virus

A computer virus is a program which can harm our device and files and infect them for no further use. When a virus program is executed, it replicates itself by modifying other computer programs and instead enters its own coding. This code infects a file or program and if it spreads massively, it may ultimately result in crashing of the device.

The computer virus only hits the programming of the device, it is not visible. But there are certain indications which can help you analyse that a device is virus-hit. Given below are such signs which may help you identify computer viruses:

- **Speed of the System** – In case a virus is completely executed into your device, the time taken to open applications may become longer and the entire system processing may start working slowly
- **Pop-up Windows** – One may start getting too many pop up windows on their screen which may be virus affected and harm the device even more
- **Self Execution of Programs** – Files or applications may start opening in the background of the system by themselves and you may not even know about them
- **Log out from Accounts** – In case of a virus attack, the probability of accounts getting hacked increase and password protected sites may also get hacked and you might get logged out from all of them
- **Crashing of the Device** – In most cases, if the virus spreads in maximum files and programs, there are chances that the entire device may crash and stop working

## What is malware?

Malware is short for **malicious software**. There are several types of malware and each of them has a unique way of infiltrating your computer which may include attempts at gaining unauthorized control of your computer systems, stealing your personal information, encrypting your important files, or causing other harm to your computers. Sometimes the damage can be irrevocable.

## Where does malware come from?

Some of the most common sources of malware are email attachments, malicious websites, torrents, and shared networks.

- **Phishing** – Emails can be disguised to be coming from a fraudulent company for the sole purpose of getting you to reveal personal information. “Phishing” is a scam where thieves attempt to steal personal or financial account information by sending deceptive electronic messages that trick unsuspecting consumers into disclosing personal information.

- **Malicious Websites** – Some websites may attempt to install malware onto your computer, usually through popups or malicious links
- **Shared Networks** – A malware-infected computer on the same shared network may spread malware onto your computer

### 1. Trojans

A Trojan (or Trojan horse) disguises itself as legitimate software with the purpose of tricking you into executing malicious software on your computer.

### 2. Spyware

Spyware invades your computer and attempts to steal your personal information such as credit card or banking information, web browsing data, and passwords to various accounts.

### 3. Adware

Adware is unwanted software that displays advertisements on your screen. Adware collects personal information from you to serve you with more personalized ads.

### 4. Rootkits

Rootkits enable unauthorized users to gain access to your computer without being detected.

### 6. Worms

A worm replicates itself by infecting other computers that are on the same network. They're designed to consume bandwidth and interrupt networks.

### What is Antivirus Software?

Antivirus software is a program(s) that is created to search, detect, prevent and remove software viruses from your system that can harm your system. Other harmful software such as worms, adware, and other threats can also be detected and removed via antivirus. This software is designed to be used as a proactive approach to cyber security, preventing threats from entering your computer and causing issues. Most antivirus software operates in the background once installed, providing real-time protection against virus attacks.

### Examples of Antivirus:

The antivirus software is available in 2 types:

- (i) **Free:** Free anti-virus software provides basic virus protection
- (ii) **Paid:** commercial anti-virus software provides more extensive protection.

The following are some commonly used antivirus software:

**1. Bitdefender:** Bitdefender Total Security is a comprehensive security suite that protects against viruses and dangerous malware of all varieties. This user-friendly antivirus software is compatible with all four major operating systems and smart homes, and it also includes a free VPN with a daily limit of 200MB, parental controls, camera protection, a password manager, etc. This security suite is reasonably priced and will protect up to five devices 24 hours a day, seven days a week.

**2. AVAST:** This is a free antivirus available. All you have to do to obtain top-notch protection on your computer, emails, downloads, and instant messages in the free version is

register (for free) once a year. It includes a sophisticated heuristics engine that enables it to detect viruses.

**3. Panda:** It can detect viruses, trojans, spyware, adware, worms, and malware at the same level as other antiviruses do. It is different from others because using this software, when you scan your computer, it doesn't consume any of your computer's resources; instead, it runs in the cloud, allowing your machine to continue to function normally.

#### **Advantages of Antivirus:**

- **Spam and advertisements are blocked:** Viruses exploit pop-up advertising and spam websites as one of the most common ways to infect your computer and destroy your files. Antivirus acts against harmful virus-infected adverts and websites by denying them direct access to your computer network.
- **Virus protection and transmission prevention:** It identifies any possible infection and then attempts to eliminate it.
- **Hackers and data thieves are thwarted:** Antivirus do regular checks to see if there are any hackers or hacking-related apps on the network. As a result, antivirus offers complete security against hackers.
- **Protected against devices that can be detached:** Antivirus scans all removable devices for potential viruses, ensuring that no viruses are transferred.
- **To improve security from web, restrict website access:** Antivirus restricts your online access in order to prevent you from accessing unauthorized networks. This is done to ensure that you only visit websites that are safe and non-harmful to your computer.
- **Password Protection:** Using antivirus, you should consider using a password manager for added security.

#### **Disadvantages of Antivirus:**

- **Slows down system's speed:** When you use antivirus programs, you're using a lot of resources like your RAM and hard drive. As a result, the computer's overall speed may be significantly slowed.
- **Popping up of Advertisements:** Apart from commercial antivirus applications, free antivirus must make money in some way. One approach to attaining these is through advertising. Many times these advertisements degrade the user experience by popping up every time.
- **Security Holes:** When security flaws exist in the operating system or networking software, the virus will be able to defeat antivirus protection. The antivirus software will be ineffective unless the user takes steps to keep it updated.
- **No customer care service:** There will be no customer service provided unless you pay for the premium version. If an issue arises, the only method to solve it is to use forums and knowledge resources.