COMPUTER FUNDAMENTALS & INFORMATION TECHNOLOGY
UNIT – 5

What is Operating System :

- A modern computer consists of: One or more processors , Main memory, Disks , Printers , Various input/output devices. Managing all these varied components requires a layer of software – the OS .

- An OS is a program which acts as an interface between computer system users and the computer hardware.

- It provides a user-friendly environment in which a user may easily develop and execute programs.

- Otherwise, hardware knowledge would be mandatory for computer programming.

- So, it can be said that an OS hides the complexity of hardware from uninterested users.

- Services provided by an OS:

  - Facilities for program creation - editors, compilers, linkers, debuggers, etc.

  - Program execution - loading in memory, I/O and file initialization.

  - Access to I/O and files - deals with the specifics of I/O and file formats.

  - System access - resolves conflicts for resource contention. protection in access to resources and data.

Functionalities of OS :

•   Boot Disk:A boot drive is the drive from which your personal computer boots (starts). C drive is most common boot drive. The process of starting or restarting a computer is called booting.

•   Providing a user Interface: A user interface controls how you enter data and instructions & how information is displayed on the screen. There are two types of user interface : Command-line interface Graphical interface .

•   Managing Programs: Some operating system only support a single user program at a time while others run multiple programs at a time. When a computer is running multipe windows at a time, the program that is active is on the foreground while others are in the background.

•   Managing Memory: The purpose of memory management is to optimize the use of Random Access Memory(RAM).

•   Scheduling Jobs: A job is an operation that processor manages. Operat ing system determines the order in which jobs are processed. Jobs include receiving data from an input device, processing instructions, sending information to any output device & transferring items form storage to memory and form memory to storage.

•   Configuring Devices: Each devices connected to computer(i.e. mouse, keyboard, etc.) requires its own specialized set of commands & thus requires its own specific driver.

•   Monitoring Performance: A performance monitor is a program accesses & reports information about various computer resources & devices.

•   Providing File Management & Other Utilities: managing files, searching for files, viewing images, securing a computer from unauthorized access, uninstalling programs, scanning disks, defragmenting disks, diagnosing problems, backing up files & disks, etc.

•   Controlling a Network: Some operating systems have built-in network features. In other cases, the network OS is a set of programs separate from operating systems in the client computers that access the network.

•   Administrating Security: Network administrator uses the network to establish permissions to resources. Network administrator establishes a user account which enables a user to access / log on to a computer or a network.

## Characteristics of Operating System :

- **Memory Management** — It keeps tracks of primary memory i.e what part of it are in use by whom, what part are not in use etc. Allocates the memory when the process or program request it.

- **Processor Management** — Allocate the processor(CPU) to a process. Deallocate processor when processor is no longer required.

- **Device Management** — Keep tracks of all devices. This is also called I/O controller. Decides which process gets the device when and for how much time.

- **File Management** — Allocates the resources. De-allocates the resource. Decides who gets the resources.

- **Security** — By means of passwords & similar other techniques, preventing unauthorized access to programs & data.

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

Advantage of using Operating System :

- User Friendly
- Help to Run Programs
- Additional System Software
- Managing Computer Resources
- Controls Hardware and Software

- Cheap to Buy
- It is Versatile
- Makes Computer Useful
- Compatible Play Games
- Easily Upgraded or Replaced
- Correct Hard Disk Errors and Others

Types of Software :

- System software
- Application Software
- Utility Software
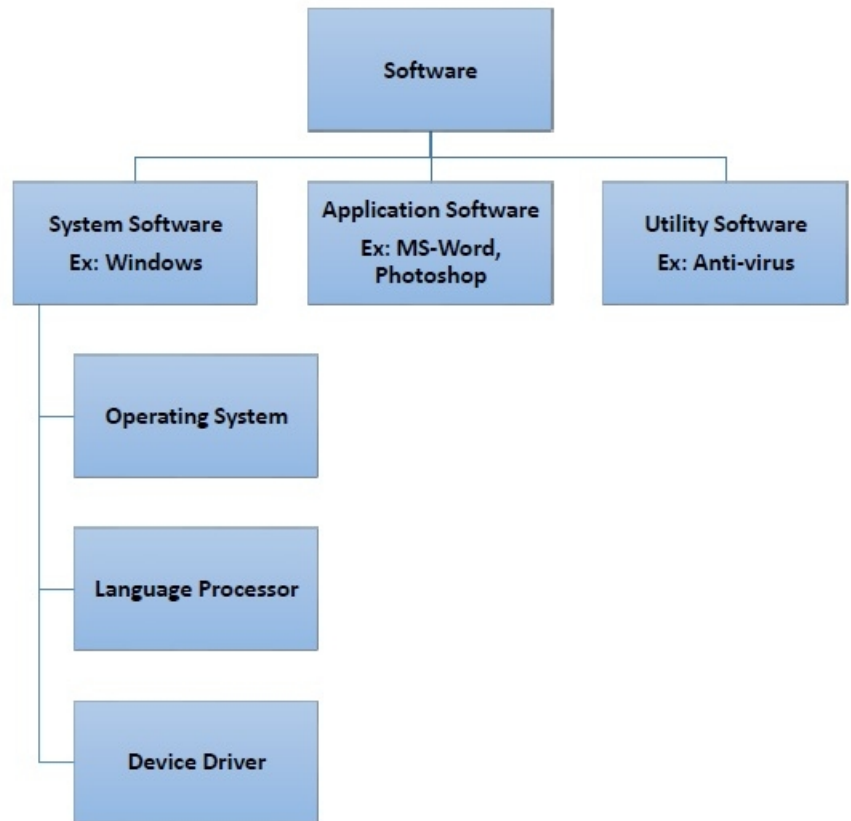
1. System Software

- Software required to run the hardware parts of the computer and other application software are called system software.

- System software acts as interface between hardware and user applications.

- An interface is needed because hardware devices or machines and humans speak in different languages.

- Machines understand only binary language i.e. 0 (absence of electric signal) and 1 (presence of electric signal) while humans speak in English, French, German, Tamil, Hindi and many other languages.

- English is the pre-dominant language of interacting with computers. Software is required to convert all human instructions into machine understandable instructions.

- And this is exactly what system software does.

2. Application Software

- A software that performs a single task and nothing else is called application software.

- Application software are very specialized in their function and approach to solving a problem.

- So a spreadsheet software can only do operations with numbers and nothing else.

- A hospital management software will manage hospital activities and nothing else.

- Here are some commonly used application software −

    - Word processing

    - Spreadsheet

    - Presentation

    - Database management

    - Multimedia tools

3. Utility Software

- Application software that assist system software in doing their work is called utility software.

- Thus utility software is actually a cross between system software and application software.

- Examples of utility software include −

    - Antivirus software

    - Disk management tools

    - File management tools

    - Compression tools

    - Backup tools

Drivers, Compilers and Interpreters

What are Computer Drivers?

- For your computer to work efficiently, it needs frequent maintenance and updates. One component that may need attention is a driver.

- How do computer drivers work? What is the best way to update them? Get the details on how these essentials keep you productive, along with how to check for driver updates and perform them manually when needed.

- A driver, or device driver, is a set of files that tells a piece of hardware how to function by communicating with a computer's operating system. All pieces of hardware require a driver, from your internal computer components, such as your graphics card, to your external peripherals, like a printer.

- The driver files are designed to work seamlessly with the specific operating system you have on your PC, so the operating system typically keeps them updated and running through automatic updates.

- Updates are additional downloaded files that can install on their own to keep everything functioning correctly.

What is Compiler?

- **Compiler**, computer software that translates (compiles) source code written in a high-level language (e.g., C++) into a set of machine-language instructions that can be understood by a digital computer's CPU.

- Compilers are very large programs, with error-checking and other abilities. Some compilers translate high-level language into an intermediate assembly language, which is then translated (assembled) into machine code by an assembly program or assembler.

- Other compilers generate machine language directly. The term *compiler* was coined by American computer scientist Grace Hopper, who designed one of the first compilers in the early 1950s.

What is Interpreter?

- An **Interpreter** directly executes instructions written in a programming or scripting language without previously converting them to an object code or machine code.

- Examples of interpreted languages are Perl, Python and Matlab.

Following are some interesting facts about interpreters and compilers.

- Both compilers and interpreters convert source code (text files) into tokens, both may generate a parse tree, and both may generate immediate instructions. The basic difference is that a compiler system, including a (built in or separate) linker, generates a stand alone machine code program, while an interpreter system instead performs the actions described by the high level program.

- Once a program is compiled, its source code is not useful for running the code. For interpreted programs, the source code is needed to run the program every time.

- In general, interpreted programs run slower than the compiled programs.

- Java programs are first compiled to an intermediate form, then interpreted by the interpreter.
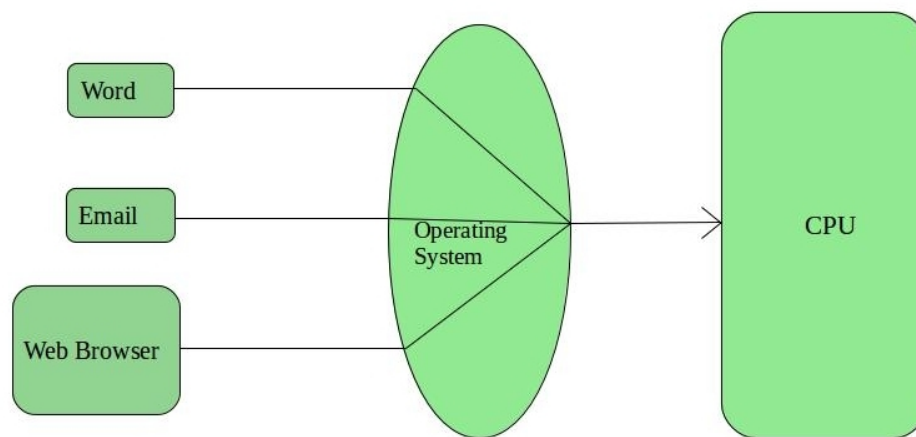
Types of Operating Systems

1. Batch Operating System

- This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and group them into batches.

- It is the responsibility of the operator to sort jobs with similar needs.
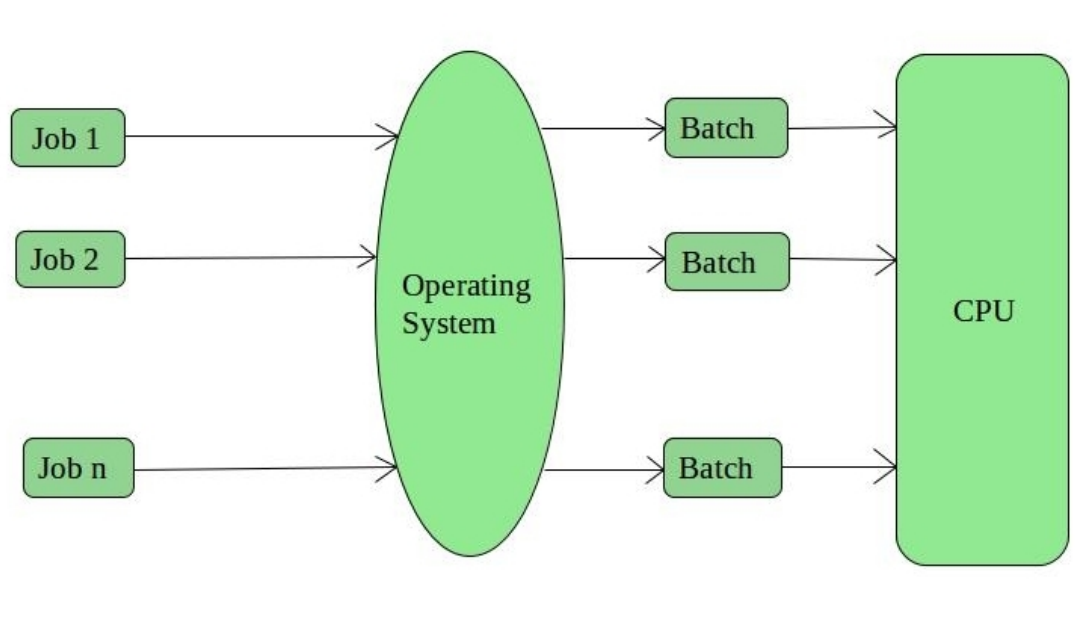
2. Time-Sharing Operating System

- Each task is given some time to execute so that all the tasks work smoothly. Each user gets the time of CPU as they use a single system.

- These systems are also known as Multitasking Systems.

- The task can be from a single user or different users also. The time that each task gets to execute is called quantum.

- After this time interval is over OS switches over to the next task.

3. Distributed Operating System

- These types of the operating system is a recent advancement in the world of computer technology and are being widely accepted all over the world and, that too, with a great pace.

- Various autonomous interconnected computers communicate with each other using a shared communication network.

- Independent systems possess their own memory unit and CPU.

- These are referred to as **loosely coupled systems** or distributed systems.
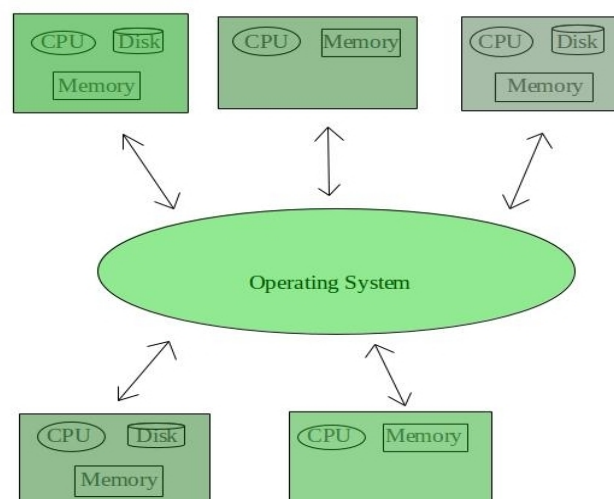
4. Network Operating System

- These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions.

- These types of operating systems allow shared access of files, printers, security, applications, and other networking functions over a small private network.
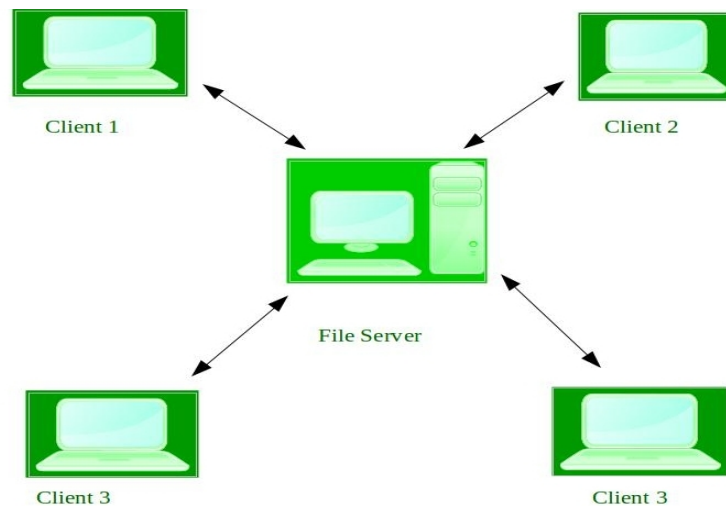
5. Real-Time Operating System

- These types of OSs serve real-time systems. The time interval required to process and respond to inputs is very small. This time interval is called response time.

- Real-time systems are used when there are time requirements that are very strict like missile systems, air traffic control systems, robots, etc.