# OPERATING-SYSTEM

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Unit-I

Operating System : An operating system is a software that acts as an intermediary/interface between computer hardware components and the user. it manages resources and provides an enviornment for software applications to execute. Essentially it ensures efficient utilization of the computer's resources and simplifies user interaction with the hardware.

Functions of an OS :-

1) Process management :- it handles the creation, scheduling and termination of processes. it ensures that multiple processes can run concurrently without conflicts.

2) Memory management :- the OS manages system memory, allocates it to processes, ensures efficient utilization of memory while avoiding memory leaks.

3) File system management :- it organizes and manages data storage on devices, allowing for the creation, modification and retrieval of files.

4) Device Management :- The OS manages peripheral devices like printers, disk and keyboards, providing a seamless interface for interaction

5) Security and Access control :- it protects system resource against unauthorized access and ensures data integrity.

6) User Interface :- Modern OS provide user interface such as GUI (Graphical user interface) and CLI (command line interfaces) to enhance usability.

★ Types of OS

1) Batch OS :- Some computer process are lengthy and time-consuming. To speed the same process, a job with similar type of needs are batched together and run as a group. The user of a batch operating system never directly interacts with the computer. In this type of OS, every user prepares his or her job on an offline device like a punch cards and submit it to the computer operator.

Advantages :

1) Multiple user can share batch system
2) Managing large works becomes easy in batch system.
3) the idle time for single batch is very less.

Disadvantages :

1) it is hard to debug batch system
2) if a job fails, then the other jobs have to wait for an unknown time till the issue is resolved.
3) Batch system are sometimes costly.

Examples :- payroll system, bank statements, data entry etc.

2) Multiprogram: A multiprogramming OS may run many programs on a single processor computer. In a multiprogramming OS, if one program must wait for an input/output transfer, the other programs are ready to use the CPU. As a result, different jobs may have to split CPU time. However, their jobs are not scheduled to be completed at the same time.

Advantages:

1) CPU utilization is high because the CPU never goes to idle state.
2) Memory utilization is efficient.
3) CPU throughput is high and also supports multiple interactive user terminals.

Disadvantages:

1) CPU scheduling is compulsory because lots of jobs are ready to run on CPU simultaneously.
2) User is not able to interact with jobs when it is executing.
3) Programmers cannot modify a program that is being executed.

Eg - User can use MS-Excel, download apps, transfer data from one point to another point.

3) Time Sharing:

Time-sharing operating system enables people located at a different terminal (shell) to use a single computer system at the same time. The processor time (CPU) which is shared among multiple users is termed as time-sharing. 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 task performed are given by a single user or by different users. The time alloted 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:

1) Each task gets equal time for execution.
2) the idle time for the CPU will be the lowest.
3) there are very few chances for the duplication of the software.

Disadvantages:

1) Processes with high priority cannot be executed first as equal priority is given to each process.
2) Various user data is needed to be taken care of from a unauthorized access.
3) Sometimes there is a data communication problem.

Example-UNIX etc

4) Personal: it is a single user operating that is in which one user works on one interface. In these systems no other operating system is interrupting with the processing. single user operating systems work on processing that requires less resources.

Advantages:

1) support one user at a time
2) easy to maintain
3) less chance to damage
4) concentrates on one task

Disadvantage:

1) tasks take longer time to complete
2) idle time is higher.

Eg- desktop computers, laptops, tablets and mobile etc.

5) Parallel: parallel operating system are designed to speed up the execution of programs by dividing the programs into multiple fragments and processing these fragments at the same time.

Advantages:

1) cost
2) Scalability
3) Diversity

Disadvantage:

1) Power consumption
2) Configuration
3) Administration

Eg- VMwware, Microsoft Hyper-V, Red-hat enterprise etc.

6) Distributed : 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 operating system type is that user can access file that are not present in his system but in another connected system. In addition, remote access is available to the systems connected to this network.

Advantages:

1) Falivre of one computer/system will not affect the other systems because all comp are independent of each other
2) the load on the host system is reduced.
3) Size of Network is easily scalable.
4) Data exchange speed is increased with the help of electronic mail.

Disadvantage:

1) the set up cost is high
2) Software used for such system is highly complex
3) Falivre of the main network will lead to falivre of the whole Network.

Ex- LOCUS etc

7) Real time : A Real time OS time internal to process and respond to inputs is very small. The time internal is called response time. real-time systems are used when there are time requirements that are very strict like missile system. Examples :- Military Software Systems, Space Software Systems are the Real time OS example.

types of Real time OS :-

1) Hard real time OS - the chard real-time OS is the operating system for mainly the applications in which the slightest delay is also unacceptable. the time constraint of such applications are very strict. such system are built for life-saving equipments like parachutes and airbags.

2) Soft real time OS - it is for application where time constraint is not very strict. In Soft RTOS an impt task is prioritized over less impt task and this priority remains active until the completion of task.

Advantage :

1) Provides more output from all the resources as there is maximum utilization of systems.
2) These system are always error-free.
3) Shifting from one task to another take very little time.

Disadvantages :

1) System resources are extremly expensive and are not so good
2) The algorithm are very complex
3) Only limited task can run at a single time.

Examples - Medical imaging system, Robots etc.

## Introduction to LINUX

Linux is an open-source, Unix-like operating system kernel initially developed by Linus Torvalds in 1991. It serves as the foundation for various distributions, such as Ubuntu, Fedora, and CentOS. Linux is known for its stability, security and flexibility, and it has become a dominant force in the world of computing, powering everything from servers and supercomputers to embedded devices and smartphones.

## Linux Architecture:

1) **Hardware layer** : the hardware layer represent the physical computer hardware, including the CPU, memory, storage devices, I/O device and networking interfaces. it plays a vital role in managing all the hardware components. The Kernel directly interacts with the hardware using device drivers ensuring efficient resource management.

2) Kernel: At the core of the Linux operating system is the Kernel. The Kernel is responsible for interacting with the hardware and managing system resources. it provides essential services such as process management, device management and file system access

3) System libraries: on top of the Kernel, there is a layer of system libraries. these libraries are pre-written, reusable code libraries that provide essential functions for software development and system operations. it also Provide Standard APIs for developers to interact with the System eg glibc. (GNU C library).

4) System Utilities: this layer contains essential command-line utilities and system management tools that helps users and administrator interact with the OS. These utilities enhances user productivity and simplify the management of linux system.

5) Shell: the shell is a CLI that allows user to interact with the system by typing text commands. The shell interprets user commands and communicates with the Kernel to execute them. Popular shell includes Bash, Zsh, Fish.

DATE
PAGE

# VI Editor

Vi is a widely used text editor in Unix-like OS known for its powerful editing capabilities and efficiency. It operates entirely in the terminal making it a popular choice for programmers, system administrators and experienced users

Vi consist of three modes each with distinct functionalities:-

## 1) Normal mode (Command mode):

- Default Mode: when you launch Vi, you start in Normal mode.
- Functionality: In Normal mode, you can navigate through the document, issue commands and perform various text manipulation tasks without entering or modifying the text content.
- Keybindings: Normal mode uses keybindings for commands and navigation

=> "h" (left), "J" (down), "K" (up), "L" (Right) for cursor movement.

=> "x" is used to delete a character
=> "dd" to delete a line
=> "yy" to yank (copy) a line
=> "p" to paste.
=> "w" to save changes
=> "q" to quit
=> "wq" to save and quit.

- Changing Modes: you can enter insert mode by pressing
'i' to insert text before the cursor
'I' to insert text at the beginning of the line
'a' to append text after the cursor.
'A' to append text at the end of the line.

- to return to Normal mode from Insert Mode press the "Esc" key.

2) Insert mode:

- Functionality: In Insert mode, you can insert and edit text within the document as you would in typical text editor. This is where you input and modify content.
- Keybindings: The keybindings in insert mode are similar to those in other text editors. You can type and edit text freely.
- to exit and Return to Normal press "esc".

3) Visual Mode:

- Functionality: Visual mode allows you to select text in the document for copying, cutting and other manipulation. It's mode for highlighting and working with text.
- Keybindings: Visual mode provides various keybindings for selecting text.
  - => "v" to start charachter-wise selection.
  - => "V" to start line-wise selection
  - => "ctrl+v" to start block-wise (column) selection.
- After selecting text, you can use commands like "x" (cut), "y" to copy, "d" to delete the selected content.