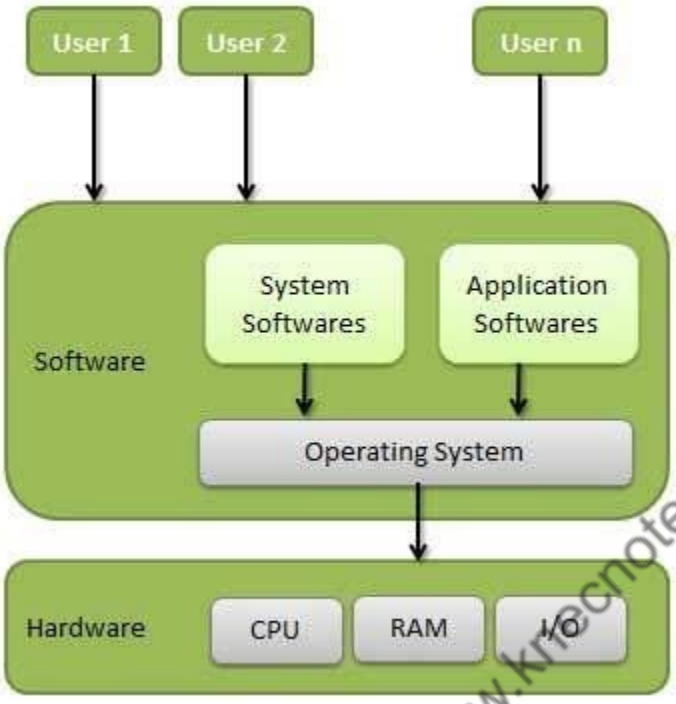
CHAPTER 2: INTRODUCTION TO OPERATING SYSTEM ENVIRONMENT

Introduction to OS

An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.



Function of Operating system

Following are some of important functions of an operating System.

- Memory Management
- Processor Management
- Device Management
- File Management
- Security
- Control over system performance
- Job accounting
- Error detecting aids
- Coordination between other software and users

Memory Management

Memory management refers to management of Primary Memory or Main Memory. Main memory is a large array of words or bytes where each word or byte has its own address.

Main memory provides a fast storage that can be accessed directly by the CPU. For a program to be executed, it must in the main memory. An Operating System does the following activities for memory management −

- Keeps tracks of primary memory, i.e., what part of it are in use by whom, what part are not in use.
- In multiprogramming, the OS decides which process will get memory when and how much.
- Allocates the memory when a process requests it to do so.
- De-allocates the memory when a process no longer needs it or has been terminated.

Processor Management

In multiprogramming environment, the OS decides which process gets the processor when and for how much time. This function is called **process scheduling**. An Operating System does the following activities for processor management −

- Keeps tracks of processor and status of process. The program responsible for this task is known as **traffic controller**.
- Allocates the processor (CPU) to a process.
- De-allocates processor when a process is no longer required.

Device Management

An Operating System manages device communication via their respective drivers. It does the following activities for device management −

- Keeps tracks of all devices. Program responsible for this task is known as the **I/O controller**.
- Decides which process gets the device when and for how much time.
- Allocates the device in the efficient way.
- De-allocates devices.

File Management

A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions.
An Operating System does the following activities for file management −

- Keeps track of information, location, uses, status etc. The collective facilities are often known as **file system**.
- Decides who gets the resources.
- Allocates the resources.
- De-allocates the resources.

Other Important Activities

Following are some of the important activities that an Operating System performs −

- **Security** − By means of password and similar other techniques, it prevents unauthorized access to programs and data.
- **Control over system performance** − Recording delays between request for a service and response from the system.
- **Job accounting** − Keeping track of time and resources used by various jobs and users.
- **Error detecting aids** − Production of dumps, traces, error messages, and other debugging and error detecting aids.
- **Coordination between other softwares and users** − Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

Types of Operating System

Operating systems are there from the very first computer generation and they keep evolving with time. In this chapter, we will discuss some of the important types of operating systems which are most commonly used.

Batch operating system

The users of a batch operating system do not interact with the computer directly. Each user prepares his job on an off-line device like punch cards and submits it to the computer operator. To speed up processing, jobs with similar needs are batched together and run as a group. The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches.

The problems with Batch Systems are as follows −

- Lack of interaction between the user and the job.
- CPU is often idle, because the speed of the mechanical I/O devices is slower than the CPU.
- Difficult to provide the desired priority.

Time-sharing operating systems

Time-sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time. Time-sharing or multitasking is a logical extension of multiprogramming. Processor's time which is shared among multiple users simultaneously is termed as time-sharing.

The main difference between Multiprogrammed Batch Systems and Time-Sharing Systems is that in case of Multiprogrammed batch systems, the objective is to maximize processor use, whereas in Time-Sharing Systems, the objective is to minimize response time.

Multiple jobs are executed by the CPU by switching between them, but the switches occur so frequently. Thus, the user can receive an immediate response. For example, in a transaction processing, the processor executes each user program in a short burst or quantum of

computation. That is, if **n** users are present, then each user can get a time quantum. When the user submits the command, the response time is in few seconds at most.

The operating system uses CPU scheduling and multiprogramming to provide each user with a small portion of a time. Computer systems that were designed primarily as batch systems have been modified to time-sharing systems.

Advantages of Timesharing operating systems are as follows −

- Provides the advantage of quick response.
- Avoids duplication of software.
- Reduces CPU idle time.

Disadvantages of Time-sharing operating systems are as follows −

- Problem of reliability.
- Question of security and integrity of user programs and data.
- Problem of data communication.

Distributed operating System

Distributed systems use multiple central processors to serve multiple real-time applications and multiple users. Data processing jobs are distributed among the processors accordingly.

The processors communicate with one another through various communication lines (such as high-speed buses or telephone lines). These are referred as **loosely coupled systems** or distributed systems. Processors in a distributed system may vary in size and function. These processors are referred as sites, nodes, computers, and so on.

The advantages of distributed systems are as follows −

- With resource sharing facility, a user at one site may be able to use the resources available at another.
- Speedup the exchange of data with one another via electronic mail.
- If one site fails in a distributed system, the remaining sites can potentially continue operating.
- Better service to the customers.
- Reduction of the load on the host computer.
- Reduction of delays in data processing.

Network operating System

A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions. The primary purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network or to other networks.

Examples of network operating systems include Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.

The advantages of network operating systems are as follows −

- Centralized servers are highly stable.
- Security is server managed.
- Upgrades to new technologies and hardware can be easily integrated into the system.
- Remote access to servers is possible from different locations and types of systems.

The disadvantages of network operating systems are as follows −

- High cost of buying and running a server.
- Dependency on a central location for most operations.
- Regular maintenance and updates are required.

Real Time operating System

A real-time system is defined as a data processing system in which the time interval required to process and respond to inputs is so small that it controls the environment. The time taken by the system to respond to an input and display of required updated information is termed as the **response time**. So in this method, the response time is very less as compared to online processing.

Real-time systems are used when there are rigid time requirements on the operation of a processor or the flow of data and real-time systems can be used as a control device in a dedicated application. A real-time operating system must have well-defined, fixed time constraints, otherwise the system will fail. For example, Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

There are two types of real-time operating systems.

Hard real-time systems

Hard real-time systems guarantee that critical tasks complete on time. In hard real-time systems, secondary storage is limited or missing and the data is stored in ROM. In these systems, virtual memory is almost never found.

Soft real-time systems

Soft real-time systems are less restrictive. A critical real-time task gets priority over other tasks and retains the priority until it completes. Soft real-time systems have limited utility than hard real-time systems. For example, multimedia, virtual reality, Advanced Scientific Projects like undersea exploration and planetary rovers, etc.

Use of operating systems command

There are many different operating systems. Each do the same thing: they control all input, processing and output. Click on the links to see examples of the desktop for the operating systems listed. These examples open in their own window. Click the **X** in the upper-right corner of the window to return to this page.

- **DOS -** Disk Operating System - one of the first operating systems for the personal computer. When you turned the computer on all you saw was the command prompt which looked like **c:** >. You had to type all commands at the command prompt which might look like **c:\>wp\wp.exe**. This is called a **command-line interface**.
  It was not very "user friendly"
- **Windows** - The Windows operating system, a product of Microsoft, is a **GUI** (graphical user interface) operating system. This type of "user friendly" operating system is said to have **WIMP** features:
  - **W**indows
  - **I**cons
  - **M**enus
  - **P**ointing device (mouse)
- **MacOS -** Macintosh, a product of Apple, has its own operating system with a GUI and WIMP features.
- **Unix - Linux** (the PC version of Unix) - Unix and Linux were originally created with a command-line interface, but recently have added GUI enhancements.

*__user-friendly__ is a relative term. The current GUI interfaces provided by Windows and Mac operating systems are more friendly than the previous DOS systems, but still require us to conform to their specifications (use of a keyboard or mouse instead of voice and/or hand-writing recognition).

Operating Systems - MS-DOS - Commands

DOS commands are the commands available in MS-DOS that are used to interact with the operating system and other command line based software.

Accessing DOS interface: on start button, type CMD(short for Command) to open the DOS command interface

Command	Description
dir	lists the contents of a folder
cd	changes folder
cd ..	parent folder
md or mkdir	creates a new folder
deltree	deletes a folder and all sub-folders
copy, xcopy	copies a file
move	moves a file
del	deletes a file
type	displays the contents of a file
type |more	displays file contents page by page, pausing after each page

help	help for the given command
print	prints the given file
attrib (-/+r, -/+a, -/+s, -/+h)	changes a file's attributes (- deactivates, + activates, r: read-only, a: archive, s: systeme, h: hidden file)
format	formats the given drive
label	assigns a drive name to a drive
ver	gives the version number

DOS Internal and External Commands

Command is an instruction written in a computer acceptable language that user types on the dos prompt. It will execute and do the appropriate action. There are mainly two types of dos command.

- ✓ Internal commands
- ✓ External commands

1. Internal commands: The internal commands are those commands that are automatically loaded in the memory. Some commonly used DOS internal commands are

1 Cls	6. Copycon	11.CD
2. Dir	7. Type	12. RD
3. Date	8. Ren	13. Copy
4. Time	9. Del	
5. Ver	10. MD	

1) Cls :- The purpose of this command is to clear the display screen and redisplay the Dos prompt at the top left corner of the screen.

Syntax:- C : / > Cls

2) Dir:- It displays the list of directories and files on the screen.

Syntax:- C : / > dir.

a. C : / > dir/p – It displays the list of directories or files page wise

b. C: / > dir/w- It displays the list of directories or files width wise