**Operating System Concepts**

Course Code:

Credit Hours: 3

Pre requisites: Introduction to Computer System

Basic Computer Architecture

**CHAPTER1**

•Overview

•Definition

•functions of an operating System

•Memory Management

•Processor Management

•Device Management

•File Management

•Other Important Activities

•Security

•Control over system performance

•Job accounting

•Error detecting aids

•Coordination between other software and users

What is an Operating System?

• An operating system is a program that acts as an intermediary between a user of a computer and the computer hardware.

• The purpose of an operating system is to provide an environment in which a user can execute programs.

The primary goal of an operating system is thus to make the computer system convenient to use.

• A secondary goal is to use the computer hardware in an efficient manner

• In brief, an operating system is the set of programs that controls a computer. Some examples of operating systems are UNIX, Mach, MS-DOS, MS Windows, Windows/NT, OS/2 and Mac OS.

• An operating system is an important part of almost every computer system.

• A computer system can be divided roughly into four components: the hardware, the operating system, the application programs and the users.



Functions of an 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.

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, OS decides which process will get memory when and how much.

•Allocates the memory when the process requests it to do so.

•De-allocates the memory when the process no longer needs it or has been terminated.

Processor Management

Operating System does the following activities for processor management.

•Keeps tracks of processor and status of process. Program responsible for this task is known as traffic controller.

•Allocates the processor (CPU) to a process.

•De-allocates processor when processor is no longer required.

Device Management

OS manages device communication via their respective drivers.

Operating System 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.

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 Operating System does.

**Security --**By means of password and similar other techniques, preventing 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 software and users --**Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

Types of Operating Systems

**Batch operating system**

•The users of 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.

•Thus, the programmers left their programs with the operator.

•The operator then sorts programs into batches with similar requirements.

**The problems with Batch Systems are following:**

•Lack of interaction between the user and job.

•CPU is often idle, because the speeds of the mechanical I/O devices are slower than 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.

•Processor's time which is shared among multiple users simultaneously is termed as time-sharing.

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

•Multiple jobs are executed by the CPU by switching between them.

**Advantages of Timesharing operating systems are following**

•Provide advantage of quick response.

•Avoids duplication of software.

•Reduces CPU idle time.

**Disadvantages of Timesharing operating systems are following.**

•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 application and multiple users.

•Data processing jobs are distributed among the processors accordingly to which one can perform each job most efficiently.

•The processors communicate with one another through various communication lines (such as high-speed buses or telephone lines).

•Processors in a distributed system may vary in size and function.

•These processors are referred as sites, nodes, and computers and so on.

**The advantages of distributed systems are following.**

•With resource sharing facility 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**

•Network Operating System runs on a server and provides 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), and a private network or to other networks.

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

**The advantages of network operating systems are following.**

•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 following.**

•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**

•Real time system is defines 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 response time.

•So in this method response time is very less as compared to the online processing.

•Real-time operating system has well-defined, fixed time constraints otherwise system will fail.

•For example Scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, and home-appliance controllers, Air traffic control system etc.