

Types of Operating System

- **Batch Operating System**
- **Multiprogramming OS.**
- **Time-sharing or multitasking operating systems**
- **Distributed operating System**
- **Network operating System**
- **Real Time operating System**
 - **Hard real--time systems**
 - **Soft real--time systems**

Batch operating system

- This type of operating system does not interact with the computer directly.
- Batch processing is a technique in which an Operating System collects the programs and data together in a batch before processing starts.
- Each user prepares his job on an offline 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.

Batch operating system

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.

Multiprogramming OS

- In such type of operating system, multiple jobs can sit simultaneously in the memory.
- For it, memory is considered as a partitioned device, so that each job can reside in a partition.
- Multiprogramming increases CPU utilization by organizing jobs so that the CPU always has one to execute.

Multiprogramming OS

The following figure shows the memory layout for a multiprogramming system.



Multiprogramming OS

- It takes one job from the memory and starts its execution.
- During execution eventually, the job requires some I/O operation so the job waits until I/O operation is complete.
- In non multiprogramming environment, during this time CPU sits idle. But in multiprogramming, the operating system switches to present job and executes another job.
- When that job waits for some task, CPU is switched to another job and so on.
- When first job finishes waiting, the CPU again starts its execution. So here the CPU time is fully utilized.

Multiprogramming OS

Advantages:

- Increase CPU utilization by eliminating idle time of CPU.
- Multiple jobs can execute simultaneously.

Disadvantage:

- User cannot interact with his program during execution, i.e., it does not support interactivity.

Functions of Operating System in Multiprogramming

- (a) Job Scheduling
- (b) CPU scheduling
- (c) Memory Management

(a) Job Scheduling- Since several jobs are ready in job pool to enter in the memory and if memory has not enough space to keep all the jobs, then it is necessary to choose some jobs out of all the jobs of job pool on some basis. This process of selecting jobs to enter in memory from the job pool is called job scheduling.

Functions of Operating System in Multiprogramming

- (b) CPU Scheduling- If several jobs are ready in memory to run at the same time then it is necessary to choose a job to run. This Process of selecting job for execution out of all ready to run jobs in memory is called CPU scheduling.
- © Memory Management- Since several jobs are loaded into memory simultaneously for execution, for this, memory management is required.

Time-sharing or Multitasking

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.

Time-sharing or Multitasking

operating systems

- 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.
- 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.

Time-sharing or Multitasking operating systems

Advantages of Timesharing operating systems are as follows –

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

Time-sharing or Multitasking operating systems

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 busses 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.

Distributed operating System

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, user's, groups, security, applications, and other networking functions.
- The primary purpose of the network operating system is to allow shared file and printers 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.

Network operating System

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 in to the system.
- Remote access to servers is possible from different locations and types of systems.

Network operating System

- The disadvantages of networks 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.

Mainframe OS

- The mainframe OS are designed to handle large amount of disk space and large number of I/O devices.
- Heavily oriented toward processing many jobs at once.
- They typically provides three sort of services batch, transaction processing, and time sharing.
- The file protection is necessary, since many users handle these types of computers.
- These OS are used for high-end Web servers, for business-to-business transaction etc.
- Example-OS/390, OS/360 descendant etc.

Personal Computer Operating Systems

- Designed to handle small amount of disk space and small number of I/O devices.
- Some personal computer operating system handle only one job at a time, like MS-DOS.
- They typically provide a good interface to a single user.
- The file protection is not necessary in some personal computer but if these PCs are used on network then file protection becomes a necessary feature for such operating systems.
- These operating systems are used for personal computer those perform computer those perform word processing, prepare spreadsheets, and access internet.
- Example- DOS, Windows., Macintosh, Linux, etc.

Multiprocessor OS

- The multiprocessors system need special types of operating systems.
- The main feature of such operating system is that they allow many processes to run simultaneously without a significant lack of performance.
- These also provide a better way to ensure, that in I/O operation data is coming and reaching to the appropriate CPU.
- Example – Windows NT, Solaris, Linux etc.

References

1. Book: Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley Publication.
2. www.google.com

THANKS