

Operating Systems 2 Types of Operating Systems

Batch processing operating system

- Batch processing is the processing of transactions in a group or batch.
- No user interaction is required once batch processing is underway. This differentiates batch processing from transaction processing, which involves processing transactions one at a time and requires user interaction.
- It can operate in-the-background meaning that when a system closes down from transaction processing then the batch processing jobs (programs) are done. Also, they can be executed when the transaction processing load eases.
- Batch processing helps in handling tasks like:
 - Payroll
 - Report generation
 - Calculating bills for utilities
- Advantages:
 - Fast – the system does not have to stop for inputs etc.
 - Cost – it is cheap when compared with doing the work manually.
 - Can be run anytime even during the night
 - Hands-off approach – manager does not need to constantly supervise the process. Alerts are sent if there are ever any problems.
- Disadvantages:
 - Training of personnel to run the system.
 - For some businesses the cost may be unfeasible.

Real-time operating system

- Immediate replies (time-limit set between input and output)
- Deals with events occurring concurrently
- Processes and produces a response within a guaranteed specific time interval
- They are built with hardware redundancy
- Two types:
 - Hard real-time (critical): time limit has to be respected e.g.
 - Aircraft control systems
 - Nuclear power stations
 - Missile guidance systems
 - Anti-missile attack systems

- Remote medical operation
- Soft real-time (non-critical): time limit can be eased e.g.
 - Airline reservations
 - Automated email replies

Time-sharing operating system

- Allows users on different terminals to use a computer system at the same time.
- Also called multi-tasking or on-line operating system.
- Multiple jobs are executed by the CPU by switching between them, but the switches occur so frequently that the user is not aware of this.
- The operating system uses CPU scheduling i.e. a policy of how the CPU will be assigned to programs. One scheduling policy can be Round Robin i.e. programs get the processor for a quantum of time each one after the other. Another policy might include priority programs that use the processor until they are finished while all the other programs have to wait.
- Advantages of time-sharing systems:
 - Allows more than one interactive program to be executed.
 - Allows more than one user to use the system concurrently.
 - Reduces CPU idle time.
- Disadvantages of time-sharing systems:
 - System is complex
 - Security

Single-user operating system

- Can be split into two types:
 - Single user, single application operating systems e.g. mobile phone
 - Single user, multi-tasking operating systems e.g. personal computer

Multi-user operating system

- More than one user is logged on and can use the computer at the same time.
- Each user runs more than one application at a time, so it needs to be multi-tasking as well.
- Also called multi-access.

Networked operating system

- It includes special functions for connecting computers and devices.
- Some features:
 - It allows multiple computers to connect so that they can share data, files and hardware devices.
 - Supports multi-processing of applications.
 - Provides communication protocols.
 - Provides security features such as authentication, logon restrictions and access control.
 - Provides file, print, web services and back-up services.
 - Supports Internetworking such as routing and WAN ports.
 - Supports auditing tools with graphical interfaces.
- Types of NOSs
 - Peer-to-peer (P2P):
 - Allows users to share resources and files located on their computers and to access shared resources found on other computers.
 - In P2P all computers are considered equal; they all have the same privileges to use the resources available on the network.
 - Are designed primarily for small to medium local area networks.
 - Windows for Workgroups is an example of the program that can function as peer-to-peer network operating systems.
 - Client/server network:
 - Most computers are Clients i.e. asking for a service and some computers are Servers i.e. providing the service.
 - Examples of servers are File Server, Database server etc.
 - Novell Netware and Windows 2000 Server are examples of client/server network operating systems.

Single-program operating system

- Allows only one program to run at a time.
 - If you are working on an email and want to play a song, you must shut down the email application and open up a media player. This is annoying!
- Some hand-held devices like tablets and mobile phones may still use this type of operating system.

- Devices like programmable thermostats and home security systems have single-program operating systems.

Multiprogramming operating system

- A number of programs share the processor.
- Two or more programs reside in memory at the same time.
- Multiprogramming increases CPU utilization by organizing jobs so that the CPU always has one to execute (unless there are no programs to execute).

Exercise

1. Name two applications programs that are best executed by means of batch processing.
2.
 - a. Name one application that requires a critical real-time operating system to operate.
 - b. Name one application that can run in a non-critical real-time operating system.
3. Name one advantage and one disadvantage of a time-sharing system as compared to a batch processing operating system.
4. Name two features of a networked operating system.