## Operating System

## What is an Operating System?

An Operating System (OS) is a software that acts as an interface between computer hardware components and the user. Every computer system must have at least one operating system to run other programs. Applications like Browsers, MS Office, Notepad Games, etc., The OS helps you to communicate with the computer without knowing how to speak the computer's language.

**2. TYPES OF OPERATING SYSTEM:**

### Real time OS

A real time operating system time interval to process and respond to inputs is very small. Examples: Military Software Systems, Space Software Systems are the Real time OS example.

### Distributed Operating System

Distributed systems use many processors located in different machines to provide very fast computation to its users.

### Network Operating System

Network Operating System runs on a server. It provides the capability to serve to manage data, user, groups, security, application, and other networking functions.

**3. What are its main functions?**

**The main functions of an OS are:**  
  
 **a. Process management**:- Process management helps OS to create and delete processes. It also provides mechanisms for synchronization and communication among processes.

**b.Memory management:-** Memory management module performs the task of allocation and de-allocation of memory space to programs in need of this resources.

1. **I/O System Management:** One of the main objects of any OS is to hide the peculiarities of that hardware devices from the user.
2. **File management**:- It manages all the file-related activities such as organization storage, retrieval, naming, sharing, and protection of files.

**4. What is a Kernel?**

Kernel is the part of OS which handles all details of sharing resources and device handling

Its purpose is to handle the communication between software and hardware  
Its services are used through system calls.  
A layer of software called shell wraps around the Kernel.

**5. What are the different types of Kernel?**

**Kernels are basically of two types:**  
  
a. **Monolithic Kernels** - In this architecture of kernel, all the system services were packaged into a single system module which lead to poor maintainability and huge size of kernel.  
b. **Microkernels** - They follow the modular approach of architecture. Maintainability became easier with this model as only the concerned module is to be altered and loaded for every function. This model also keeps a tab on the ever growing code size of the kernel.

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| **6. What is a deadlock?**  - It is a condition where a group of two or more waiting for the resources currently in use by other processes of the same group. - In this situation every process is waiting for an event to be triggered by another process of the group. - Since no thread can free up the resource a deadlock occurs and the application hangs. |
| **7. What are the necessary conditions for deadlock to occur?**   1. At least one resource should be occupied in a non-sharable condition. b. A process holding at least one resource is waiting for more resources currently in use by other processes. c. It is not possible to pre-empt the resource. d. There exists a circular wait for processes. |

**8. Non-Preemptive algorithms**: In this type of scheduling once a CPU has been allocated to a process it would not release the CPU till a request for termination or switching to waiting state occurs.  
  
**9. Preemptive algorithms**: In this type of scheduling a process maybe interrupted during execution and the CPU maybe allocated to another process.

**10. For a deadlock to occur what are the necessary conditions**

**In order for deadlocks to occur there are four necessary conditions:**  
  
- **Mutual Exclusion:** The resources available are not sharable. This implies that the resources used must be mutually exclusive.  
  
- **Hold and Wait:** Any process requires some resources in order to be executed. In case of insufficient availability of resources a process can take the available resources, hold them and wait for more resources to be available.  
  
- **No Preemption:** The resources that a process has on hold can only be released by the process itself voluntarily. This resource cannot be preempted by the system.  
  
- **Circular Waiting:** A special type of waiting in which one process is waiting for the resources held by a second process. The second process is in turn waiting for the resources held by the first process.

**11.What are sockets?**

- A socket is defined as endpoint for communication, a pair of sockets is used by the pair of processes.  
- It is made of IP address chained with a port number.  
- They use the client server architecture.  
- Server waits for incoming client requests by listening to specified port.  
- On reception of request, server accepts connection from client socket to complete the connection

**12. What is process scheduling?**

Process scheduling is an OS task that schedules processes of different states like ready, waiting, and running.

Process scheduling allows OS to allocate a time interval of CPU execution for each process.

Another important reason for using a process scheduling system is that it keeps the CPU busy all the time.

**13. Types of process scheduling?**

First Come First Serve (FCFS)

1. Shortest-Job-First (SJF) Scheduling
2. Shortest Remaining Time
3. Priority Scheduling
4. Round Robin Scheduling
5. Multilevel Queue Scheduling

## First Come First Serve

First Come First Serve is the full form of FCFS. It is the easiest and most simple CPU scheduling algorithm. In this type of algorithm, the process which requests the CPU gets the CPU allocation first. This scheduling method can be managed with a FIFO queue.

## Shortest Remaining Time

The full form of SRT is Shortest remaining time. It is also known as SJF preemptive scheduling. In this method, the process will be allocated to the task, which is closest to its completion. This method prevents a newer ready state process from holding the completion of an older process.

## Priority Based Scheduling

Priority scheduling is a method of scheduling processes based on priority. In this method, the scheduler selects the tasks to work as per the priority.

Priority scheduling also helps OS to involve priority assignments. The processes with higher priority should be carried out first, whereas jobs with equal priorities are carried out on a round-robin or FCFS basis. Priority can be decided based on memory requirements, time requirements, etc.

## Round-Robin Scheduling

Round robin is the oldest, simplest scheduling algorithm. The name of this algorithm comes from the round-robin principle, where each person gets an equal share of something in turn. It is mostly used for scheduling algorithms in multitasking. This algorithm method helps for starvation free execution of processes.