OPERATING SYSTEMS-UNIT 1

1.Define Operating System and explain the various types of Operating Systems?

Ans-An Operating System performs all the basic tasks like managing files, processes, and memory. Thus operating system acts as the manager of all the resources, i.e. resource manager. Thus, the operating system becomes an interface between user and machine.

1. Batch Operating System –

This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and group them into batches. It is the responsibility of the operator to sort jobs with similar needs.

2. Time-Sharing Operating Systems –

Each task is given some time to execute so that all the tasks work smoothly. Each user gets the time of CPU as they use a single system. These systems are also known as Multitasking Systems. The task can be from a single user or different users also. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to the next task.

3. Distributed Operating System –

These types of the operating system is a recent advancement in the world of computer technology and are being widely accepted all over the world and, that too, with a great pace. Various autonomous interconnected computers communicate with each other using a shared communication network. Independent systems possess their own memory unit and CPU. These are referred to as loosely coupled systems or distributed systems.

4. Network Operating System –

These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions. These types of operating systems allow shared access of files, printers, security, applications, and other networking functions over a small private network.

5. Real-Time Operating System –

These types of OSs serve real-time systems. The time interval required to process and respond to inputs is very small. This time interval is called response time.

Two types of Real-Time Operating System which are as follows:

Hard Real-Time Systems:

These OSs are meant for applications where time constraints are very strict and even the shortest possible delay is not acceptable. These systems are built for saving life like automatic parachutes or airbags which are required to be readily available in case of any accident. Virtual memory is rarely found in these systems.

Soft Real-Time Systems:

These OSs are for applications where for time-constraint is less strict.

2.Explain System Calls with respect to following: definition, types and execution.

Ans-A system call is the programmatic way in which a computer program requests a service from the kernel of the operating system it is executed on. A system call is a way for programs to interact with the operating system. A computer program makes a system call when it makes a request to the operating system's kernel.

Types of System Calls : There are 5 different categories of system calls –

1. Process control: end, abort, create, terminate, allocate and free memory.
2. File management: create, open, close, delete, read file etc.
3. Device management
4. Information maintenance
5. Communication

3.What is file management? Write activities of operating system in regard to file management.

Ans-A file management system is used for file maintenance (or management) operations. It is is a type of software that manages data files in a computer system.

The five major activities of the operating system with regard to file management are:

1. The creation and deletion of files
2. The creation and deletion of directories
3. The support of primitives for manipulating files and directories
4. The mapping of files onto secondary storage
5. The backup of files on stable (nonvolatile) storage media

4.What are advantages and disadvantages of threads?

Ans-

Advantages of threads

1. We can execute multiple tasks of an application at a time.
2. Reduces the complexity of a big applications.
3. Helps to improve the performance of an application drastically.

4. Utilizes the max resources of multiprocessor systems.
5. Better user interface in case of GUI based applications.

Disadvantages of threads

1. Thread synchronization is an extra over head to the developers.
2. Shares the common data across the threads might cause the data inconsistency or thread sync issues.
3. Threads blocking for resources is more common problem.
4. Difficult in managing the code in terms of debugging or writing the code.

5.Discuss Layered Approach in comparison with Kernel based Approach.

Ans-An OS can be broken into pieces and retain much more control on system. In this structure the OS is broken into number of layers (levels). The bottom layer (layer 0) is the hardware and the topmost layer (layer N) is the user interface. These layers are so designed that each layer uses the functions of the lower level layers only. This simplifies the debugging process as if lower level layers are debugged and an error occurs during debugging then the error must be on that layer only as the lower level layers have already been debugged.

The main disadvantage of this structure is that at each layer, the data needs to be modified and passed on which adds overhead to the system. Moreover careful planning of the layers is necessary as a layer can use only lower level layers. UNIX is an example of this structure.

Advantages of Layered structure:

1. Layering makes it easier to enhance the operating system as implementation of a layer can be changed easily without affecting the other layers.
2. It is very easy to perform debugging and system verification.

Disadvantages of Layered structure:

1. In this structure the application performance is degraded as compared to simple structure.
2. It requires careful planning for designing the layers as higher layers use the functionalities of only the lower layers.

6.Explain the term cooperating processes. What are the advantages of the same?

Ans-There are various processes in a computer system, which can be either independent or cooperating processes that operate in the operating system. It is considered independent when any other processes operating on the system may not impact a process. Process-independent

processes don't share any data with other processes. On the other way, a collaborating process may be affected by any other process executing on the system. A cooperating process shares data with another.

Advantages of Cooperating Process in Operating System

1. Information Sharing

2. Modularity

3. Computation Speedup

4. Convenience

7.What are the advantages of peer-to-peer systems over client-server systems?

Ans-The main difference between **peer-to-peer** and **client-server network**, is that, in a peer-to-peer network, ***every node can demand for services and deliver services***, but we if talk about client-server, in client-server, ***the client node can demand for services*** and ***the server node can reply with services***.

8. Distinguish between CPU bounded, I/O bounded processes.

Ans-CPU Bound means the **rate at which process progresses is limited by the speed of the CPU**. A task that performs calculations on a small set of numbers, for example multiplying small matrices, is likely to be CPU bound. I/O Bound means the rate at which a process progresses are limited by the speed of the I/O subsystem.

IO bound process is the one that spends more of its time doing I/o then it spends on doing computation.

CPU bound process need very little I/o but require heavy computation.

9.What is a process? Explain Process Control Block.

Ans-Process Control Block is a data structure that contains information of the process related to it. The process control block is also known as a task control block, entry of the process table, etc.

It is very important for process management as the data structuring for processes is done in terms of the PCB. It also defines the current state of the operating system.

Process Control Block (PCB)

10.State and explain various multithreading models.

Ans-Multi threading-It is a process of multiple threads executes at same time.

Multi threading model are of three types.

1. Many to many model.
2. Many to one model.
3. One to one model.

Many to Many Model

In this model, we have multiple user threads multiplex to same or lesser number of kernel level threads. Number of kernel level threads are specific to the machine, advantage of this model is if a user thread is blocked we can schedule others user thread to other kernel thread.

Many to One Model

In this model, we have multiple user threads mapped to one kernel thread. In this model when a user thread makes a blocking system call entire process blocks. As we have only one kernel thread and only one user thread can access kernel at a time, so multiple threads are not able access multiprocessor at the same time.

One to One Model

In this model, one to one relationship between kernel and user thread. In this model multiple thread can run on multiple processor. Problem with this model is that creating a user thread requires the corresponding kernel thread.

11. Write a note on: Time sharing operating system.

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

Advantages of Timesharing operating systems are −

- It provides the advantage of quick response.
- This type of operating system avoids duplication of software.
- It reduces CPU idle time.

Disadvantages of Time-sharing operating systems are −

- Time sharing has problem of reliability.
- Question of security and integrity of user programs and data can be raised.
- Problem of data communication occurs.

12. Define single and multiprocessor Systems. Write the advantages of multiprocessor systems?

Ans-

Single Processor OS-A single processor system contains only one processor. So only one process can be executed at a time and then the process is selected from the ready queue. Most general purpose computers contain the single processor systems as they are commonly in use.

Multiprocessor OS- Multiprocessor system means, there are more than one processor which work parallel to perform the required operations. It allows the multiple processors, and they are connected with physical memory, computer buses, clocks, and peripheral devices.

Advantages of Multiprocessor Systems

1. More reliable Systems
2. Enhanced Throughput
3. More Economic Systems

13. What is file management? Write activities of operating system in regard to file management.

Ans-SAME AS ANS 3

14. What are advantages and disadvantages of threads?

Ans-Advantages of threads

1. We can execute multiple tasks of an application at a time.
2. Reduces the complexity of a big applications.
3. Helps to improve the performance of an application drastically.
4. Utilizes the max resources of multiprocessor systems.
5. Better user interface in case of GUI based applications.
6. Reduces the development time of an application.
7. All the threads are independent , any unexpected exception happens in any of the thread will not lead to an application exit.

Disadvantages of threads

1. Thread synchronization is an extra over head to the developers.
2. Shares the common data across the threads might cause the data inconsistency or thread sync issues.
3. Threads blocking for resources is more common problem.
4. Difficult in managing the code in terms of debugging or writing the code.

15. Discuss Layered Approach in comparison with Kernel based Approach.

Ans-Layered structure:

An OS can be broken into pieces and retain much more control on system. In this structure the OS is broken into number of layers (levels). The bottom layer (layer 0) is the hardware and the topmost layer (layer N) is the user interface. These layers are so designed that each layer uses the functions of the lower level layers only.

Kernel Approach:

It manages the communication between the software (user level applications) and the hardware (CPU, disk memory, etc). The kernel provides functions like Process management, Device management, Memory management, Interrupt handling, I/O communication, File system, etc.

16. What are Batch systems?

Ans-This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and group them into batches. It is the responsibility of the operator to sort jobs with similar needs.

17. What is an Operating system?

Ans-An operating system (OS) is basically a collection of software that manages computer hardware resources and provides common services for computer programs. Operating system is a crucial component of the system software in a computer system.

18. What is meant by Time-sharing Systems?

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

20. Write a short note on: Process Scheduling.

Ans-The process scheduling is the activity of the process manager that handles the removal of the running process from the CPU and the selection of another process on the basis of a particular strategy.

There are three types of process scheduler.

1. Long Term or job scheduler :

It brings the new process to the 'Ready State'. It controls Degree of Multi-programming, i.e., number of process present in ready state at any point of time. It is important that the long-term scheduler make a careful selection of both I/O and CPU-bound processes.

2. Short term or CPU scheduler :

It is responsible for selecting one process from ready state for scheduling it on the running state. Note: Short-term scheduler only selects the process to schedule it doesn't load the process on running.

3. Medium-term scheduler :

It is responsible for suspending and resuming the process. It mainly does swapping (moving processes from main memory to disk and vice versa). Swapping may be necessary to improve the process mix or because a change in memory requirements has overcommitted available memory, requiring memory to be freed up.

21. What do you mean by inter process communication?

Ans-Interprocess communication (IPC) is a set of programming interfaces that allow a programmer to coordinate activities among different program processes that can run concurrently in an operating system. This allows a program to handle many user requests at the same time. Since even a single user request may result in multiple processes running in the operating system on the user's behalf, the processes need to communicate with each other. The IPC interfaces make this possible. Each IPC method has its own advantages and limitations so it is not unusual for a single program to use all of the IPC methods.

22. Write a note on: operations on processes.

Ans-

1. Creation: This the initial step of process execution activity. Process creation means the construction of a new process for the execution.
2. Scheduling/Dispatching: The event or activity in which the state of the process is changed from ready to running.
3. Blocking: When a process invokes an input-output system call that blocks the process and operating system put in block mode.
4. Preemption: When a timeout occurs that means the process hadn’t been terminated in the allotted time interval and next process is ready to execute, then the operating system preempts the process.
5. Termination: Process termination is the activity of ending the process.