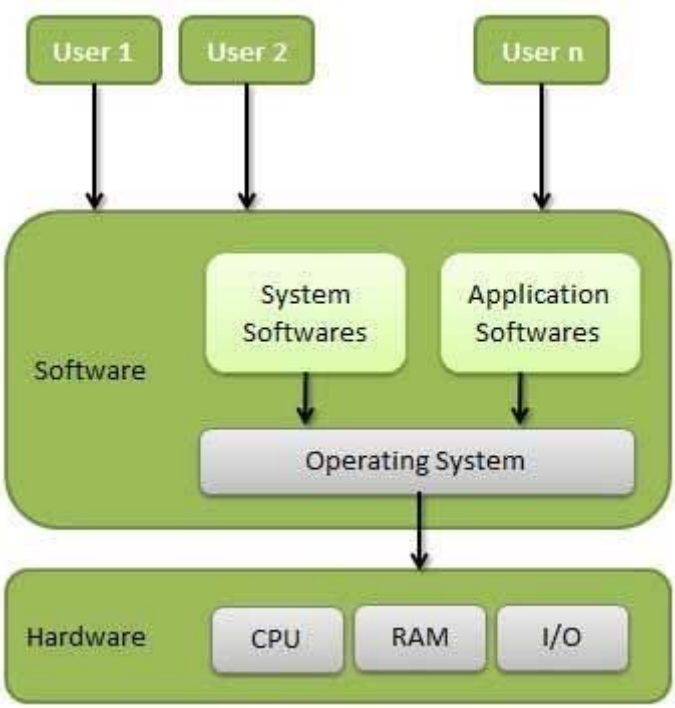
UNIT 1

INTRODUCTION

- An operating system is a program that controls the execution of application programs and acts as an interface between the user of a computer and the computer hardware.
- It is the one program running at all times on the computer.
- It is concerned with the allocation of resources and services, such as memory, processors, devices, and information. The operating system correspondingly includes programs to manage these resources, such as a traffic controller, a scheduler, a memory management module, I/O programs, and a file system.

OS Provides -

1. **Convenience:** it makes a computer more convenient to use.
2. **Efficiency:** it allows the computer system resources to be used efficiently.
3. **Ability to Evolve:** it should be constructed in such a way as to permit the effective development, testing, and introduction of new system functions at the same time without interfering with service.



"The services of OS is invoked through system calls. We as users interact with system through applications but in backend OS works to connect ourselves with hardware".

"OS works as a higher authority within system."

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. Main memory is a large array of words or bytes where each word or byte has its own address.

Main memory provides a fast storage that can be accessed directly by the CPU. For a program to be executed, it must in the main memory.

An Operating System does the following activities for memory management −

1. Keeps tracks of primary memory, i.e., what part of it are in use by whom, what part are not in use.
2. In multiprogramming, the OS decides which process will get memory when and how much.
3. Allocates the memory when a process requests it to do so.
4. De-allocates the memory when a process no longer needs it or has been terminated.

Processor Management

In multiprogramming environment, the OS decides which process gets the processor when and for how much time. This function is called process scheduling.

An Operating System does the following activities for processor management −

1. Keeps tracks of processor and status of process. The program responsible for this task is known as traffic controller.
2. Allocates the processor (CPU) to a process.
3. De-allocates processor when a process is no longer required.

Device Management

An Operating System manages device communication via their respective drivers. It does the following activities for device management −

1. Keeps tracks of all devices. Program responsible for this task is known as the I/O controller.
2. Decides which process gets the device when and for how much time.
3. Allocates the device in the efficient way.
4. 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.

An Operating System does the following activities for file management −

1. Keeps track of information, location, uses, status etc. The collective facilities are often known as file system.
2. Decides who gets the resources.

3. Allocates the resources.
4. De-allocates the resources.

Security

By means of password and similar other techniques, it prevents 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.

Advantage of using Operating System

1. Allows you to hide details of hardware by creating an abstraction
2. Easy to use with a GUI
3. Offers an environment in which a user may execute programs/applications
4. The operating system must make sure that the computer system convenient to use
5. Operating System acts as an intermediary among applications and the hardware components
6. It provides the computer system resources with easy to use format

Disadvantages of using Operating System

1. If any issue occurs in OS, you may lose all the contents which have been stored in your system
2. Operating system's software is quite expensive for small size organization which adds burden on them. Example Windows
3. It is never entirely secure as a threat can occur at any time

Common services provided by an operating system

- Program execution
- I/O operations
- File System manipulation

- Communication
- Error Detection
- Resource Allocation
- Protection

Program execution

Operating systems handle many kinds of activities from user programs to system programs like printer spooler, name servers, file server, etc. Each of these activities is encapsulated as a process.

A process includes the complete execution context (code to execute, data to manipulate, registers, OS resources in use).

Following are the major activities of an operating system with respect to program management −

1. Loads a program into memory.
2. Executes the program.
3. Handles program's execution.
4. Provides a mechanism for process synchronization.
5. Provides a mechanism for process communication.
6. Provides a mechanism for deadlock handling.

I/O Operation

An I/O subsystem comprises of I/O devices and their corresponding driver software. Drivers hide the peculiarities of specific hardware devices from the users.

An Operating System manages the communication between user and device drivers.

1. I/O operation means read or write operation with any file or any specific I/O device.
2. Operating system provides the access to the required I/O device when required.

File system manipulation

A file represents a collection of related information. Computers can store files on the disk (secondary storage), for long-term storage purpose.

A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions.

Following are the major activities of an operating system with respect to file management −

1. Program needs to read a file or write a file.
2. The operating system gives the permission to the program for operation on file.
3. Permission varies from read-only, read-write, denied and so on.
4. Operating System provides an interface to the user to create/delete files.
5. Operating System provides an interface to the user to create/delete directories.

6. Operating System provides an interface to create the backup of file system.

Communication

The operating system manages communications between all the processes. Multiple processes communicate with one another for their execution.

Following are the major activities of an operating system with respect to communication −

1. Two processes often require data to be transferred between them
2. Both the processes can be on one computer or on different computers, but are connected through a computer network.
3. Communication may be implemented by two methods, either by Shared Memory or by Message Passing.

Error handling

Errors can occur anytime and anywhere. An error may occur in CPU, in I/O devices or in the memory hardware.

Following are the major activities of an operating system with respect to error handling −

1. The OS constantly checks for possible errors.
2. The OS takes an appropriate action to ensure correct and consistent computing.

Resource Management

In case of multi-user or multi-tasking environment, resources such as main memory, CPU cycles and files storage are to be allocated to each user or job.

Following are the major activities of an operating system with respect to resource management −

1. The OS manages all kinds of resources using schedulers.
2. CPU scheduling algorithms are used for better utilization of CPU.

Protection

Considering a computer system having multiple users and concurrent execution of multiple processes, the various processes must be protected from each other's activities.

Protection refers to a mechanism or a way to control the access of programs, processes, or users to the resources defined by a computer system.

Following are the major activities of an operating system with respect to protection −

1. The OS ensures that all access to system resources is controlled.
2. The OS ensures that external I/O devices are protected from invalid access attempts.
3. The OS provides authentication features for each user by means of passwords.

Components of OS

File Management

A file is a set of related information which is should define by its creator. It commonly represents programs, both source and object forms, and data. Data files can be numeric, alphabetic, or alphanumeric.

Function of file management in OS:

1. File and directory creation and deletion.
2. For manipulating files and directories.
3. Mapping files onto secondary storage.
4. Backup files on stable storage media.

Process Management

The process management component is a procedure for managing the many processes that are running simultaneously on the operating system. Every software application program has one or more processes associated with them when they are running.

All processes should be managed by process management, which keeps processes for running efficiently. It also uses memory allocated to them and shutting them down when needed.

The execution of a process must be sequential so, at least one instruction should be executed on behalf of the process.

Functions of process management in OS:

1. Process creation and deletion.
2. Suspension and resumption.
3. Synchronization process
4. Communication process

I/O Device Management

One of the important use of an operating system that helps you to hide the variations of specific hardware devices from the user.

Functions of I/O management in OS:

1. It offers buffer caching system
2. It provides general device driver code
3. It provides drivers for particular hardware devices.
4. I/O helps you to know the individualities of a specific device.

Network Management

Network management is the process of administering and managing computer networks. It includes performance management, fault analysis, provisioning of networks, and maintaining the quality of service.

A distributed system is a collection of computers/processors that never share their own memory or a clock. In this type of system, all the processors have their local Memory, and the processors communicate with each other using different communication lines, like fiber optics or telephone lines.

The computers in the network are connected through a communication network, which can be configured in a number of different ways. With the help of network management, the network can be fully or partially connected, which helps users to design routing and connection strategies that overcome connection and security issues.

Functions of Network management:

1. Distributed systems help you to various computing resources in size and function. They may involve microprocessors, minicomputers, and many general-purpose computer systems.
2. A distributed system also offers the user access to the various resources the network shares.
3. It helps to access shared resources that help computation to speed-up or offers data availability and reliability.

Main Memory management

Main Memory is a large array of storage or bytes, which has an address. The memory management process is conducted by using a sequence of reads or writes of specific memory addresses.

In order to execute a program , it should be loaded inside the Memory. Main Memory offers fast storage that can be accessed directly by the CPU. It is costly and hence has a lower storage capacity.

Functions of Memory management in OS:

1. It helps you to keep track of primary memory.
2. Determine what part of it are in use by whom, what part is not in use.
3. In a multiprogramming system, the OS takes a decision about which process will get Memory and how much.
4. Allocates the memory when a process requests
5. It also de-allocates the Memory when a process no longer requires or has been terminated.

Secondary-Storage Management

The most important task of a computer system is to execute programs. These programs, along with the data, helps you to access, which is in the main memory during execution.

This Memory of the computer is very small to store all data and programs permanently. The computer system offers secondary storage to back up the main Memory. Today modern computers use hard drives/SSD as the primary storage of both programs and data. However, the secondary storage management also works with storage devices, like a USB flash drive, and CD/DVD drives.

Programs like assemblers, compilers, stored on the disk until it is loaded into memory, and then use the disk as a source and destination for processing.

Functions of Secondary storage management in OS:

1. Storage allocation
2. Free space management
3. Disk scheduling

Security Management

The various processes in an operating system need to be secured from each other's activities. For that purpose, various mechanisms can be used to ensure that those processes which want to operate files, memory, CPU, and other hardware resources should have proper authorization from the operating system.

For example, Memory addressing hardware helps you to confirm that a process can be executed within its own address space. The time ensures that no process has control of the CPU without renouncing it.

Lastly, no process is allowed to do its own I/O, to protect, which helps you to keep the integrity of the various peripheral devices.

Other Important Activities

Here, are some other important activities of OS:

- The user's program can't execute I/O operations directly. The operating system should provide some medium to perform this.
- OS checks the capability of the program to read, write, create, and delete files.
- OS facilitates an exchange of information between processes executing on the same or different systems.
- OS components help you to makes sure that you get the correct computing by detecting errors in the CPU and memory hardware.

Layered Operating System (Structure of Operating System)

Layered Structure is a type of system structure in which the different services of the operating system are split into various layers, where each layer has a specific well-defined task to perform.

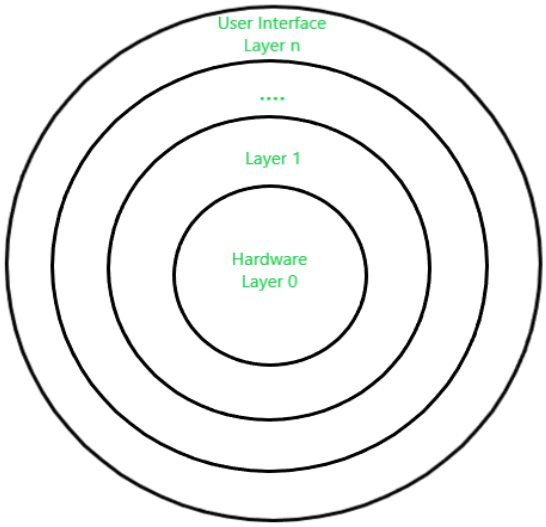
Example – The Windows NT operating system uses this layered approach as a part of it.

Design Analysis:

The whole Operating System is separated into several layers (from 0 to n).Each of the layers must have its own specific function to perform. There are some rules in the implementation of the layers as follows.

1. The outermost layer must be the User Interface layer.
2. The innermost layer must be the Hardware layer.
3. A particular layer can access all the layers present below it but it cannot access the layers present above it. That is layer n-1 can access all the layers from n-2 to 0 but it cannot access the nth layer.

Thus if the user layer wants to interact with the hardware layer, the response will be travelled through all the layers from n-1 to 1. Each layer must be designed and implemented such that it will need only the services provided by the layers below it.



Layered OS Design

Advantages

1. **Modularity:**
   This design promotes modularity as each layer performs only the tasks it is scheduled to perform.
2. **Easy debugging:**
   As the layers are discrete so it is very easy to debug. Suppose an error occurs in the CPU scheduling layer, so the developer can only search that particular layer to debug.
3. **Easy update:**
   A modification made in a particular layer will not affect the other layers.
4. **No direct access to hardware:**
   The hardware layer is the innermost layer present in the design. So a user can use the services of hardware but cannot directly modify or access it, unlike the Simple system in which the user had direct access to the hardware.

5. **Abstraction:**
   Every layer is concerned with its own functions. So the functions and implementations of the other layers are abstract to it.

Disadvantages

1. **Complex and careful implementation:**
   As a layer can access the services of the layers below it, so the arrangement of the layers must be done carefully. For example, the backing storage layer uses the services of the memory management layer. So it must be kept below the memory management layer. Thus with great modularity comes complex implementation.
2. **Slower in execution:**
   If a layer wants to interact with another layer, it sends a request that has to travel through all the layers present in between the two interacting layers. Thus it increases response time, unlike the Monolithic system which is faster than this. Thus an increase in the number of layers may lead to a very inefficient design.

Kernel in Operating System

A Kernel is a computer program that is the heart and core of an Operating System. It is a place where all the services are kept.

Since the Operating System has control over the system so, the Kernel also has control over everything in the system. It is the most important part of an Operating System.

Whenever a system starts, the Kernel is the first program that is loaded after the bootloader because the Kernel has to handle the rest of the thing of the system for the Operating System.

The Kernel remains in the memory until the Operating System is shut-down.
The Kernel is responsible for low-level tasks such as disk management, memory management, task management, etc. It provides an interface between the user and the hardware components of the system.

When a process makes a request to the Kernel, then it is called System Call.

Functions of a Kernel

1. **Access Computer resource:** A Kernel can access various computer resources like the CPU, I/O devices and other resources. It acts as a bridge between the user and the resources of the system.
2. **Resource Management:** It is the duty of a Kernel to share the resources between various processes in such a way that there is uniform access to the resources by every process.

3. **Memory Management:** Every process needs some memory space. So, memory must be allocated and deallocated for its execution. All these memory management is done by a Kernel.
4. **Device Management:** The peripheral devices connected in the system are used by the processes. So, the allocation of these devices is managed by the Kernel.

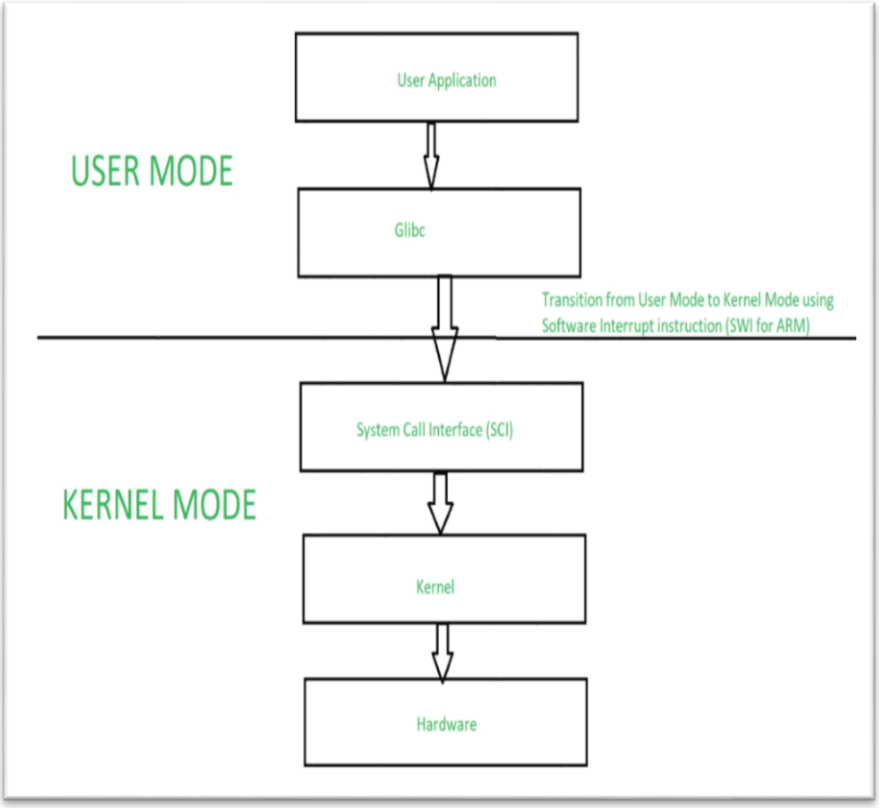
User space and Kernel Space

1. **Kernel Space -**A Kernel is provided with a protected Kernel Space which is a separate area of memory and this area is not accessible by other application programs. So, the code of the Kernel is loaded into this protected Kernel Space**.**
2. **User Space** - the memory used by other applications is called the User Space

Kernel Mode and User Mode

1. **User Mode -** the CPU executes the processes that are given by the user (or user application) in the User Space.

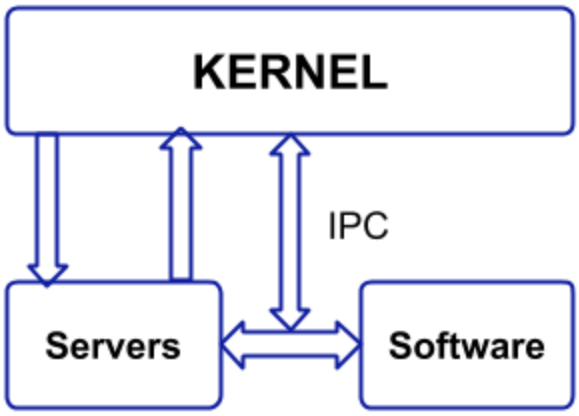
2. **Kernel Mode -**There are certain instructions that need to be executed by Kernel only. So, the CPU executes these instructions in the Kernel Mode only. For example, memory management should be done in Kernel-Mode only.



3. In its life span a process executes in user mode and kernel mode (CPU switch between user mode and kernel mode).

4. The **User mode** is normal mode where the process has limited access. While the **Kernel mode** is the privileged mode where the process has unrestricted access to system resources like hardware, memory, etc.

5. A process in Kernel mode get power to access any device and memory, and same time any crash in kernel mode brings down the whole system. But any crash in user mode brings down the faulty process only.
6. The kernel provides System Call Interface (**SCI**), which are the entry points for kernel. System Calls are the only way through which a process can go into kernel mode from user mode.



Monolithic Kernels

Monolithic Kernels are those Kernels where the user services and the kernel services are implemented in the same memory space i.e. different memory for user services and kernel services are not used in this case.

By doing so, the size of the Kernel is increased and this, in turn, increases the size of the Operating System.

As there is no separate User Space and Kernel Space, so the execution of the process will be faster in Monolithic Kernels.

Advantages:

- It provides CPU scheduling, memory scheduling, file management through System calls only.
- Execution of the process is fast because there is no separate memory space for user and kernel.

Disadvantages:

- If any service fails, then it leads to system failure.
- If new services are to be added then the entire Operating System needs to be modified.

Microkernel

A Microkernel is different from Monolithic kernel because in a Microkernel, the user services and kernel services are implemented into different spaces i.e. we use User Space and Kernel Space in case of Microkernels.

As we are using User Space and Kernel Space separately, so it reduces the size of the Kernel and this, in turn, reduces the size of Operating System. As we are using different spaces for user services and kernel service, so the communication between application and

services is done with the help of message passing and this, in turn, reduces the speed of execution.

Advantages:

- If new services are to be added then it can be easily added.

Disadvantages:

- Since we are using User Space and Kernel Space separately, so the communication between these can reduce the overall execution time.

Reentrant Kernels

Reentrant kernel is the one which allows multiple processes to be executing in the kernel mode at any given point of time and that too without causing any consistency problems among the kernel data structures.

A re-entrant kernel enables a process (and its threads) to give away the CPU while in kernel mode. They do not hinder other processes from also entering kernel mode. This behaviour allows CPU to be shared among multiple processes.

Types of Operating system

Batch System

The First operating system of the second-generation computer is the batch operating system.

The users of a 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. The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches.

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.

Interactive Operating System

In Interactive Operating System there is a direct interaction between the user and the computer. Mostly all the Personal Computers are Interactive Operating System. In this kind of Operating system, the user input some command in the system and the system works according to it.

Multiprogramming operating system

It has ability to execute multiple programs with using of only one processor machine**.** Multiple programs may loads in memory for their execution in ready queue.

In multiprogramming operating system**,** if single program gets to wait for I/O transfer, then other programs are always ready to CPU utilization. Due to this, multiple jobs can share time of its CPU. But, CPU executes a program at a time, it switches between programs for their execution. The concurrent executions of programs help to improve performance of system resources utilization as well as improve system throughput than to serial and batch processing system**.**

Advantages of Multiprogramming Operating System

1. Increase **CPU** utilization and it never gets idle.
2. Resources are utilized smartly.
3. Less response time
4. Short time jobs are done fastest compare to long time jobs.
5. Multiple users can use multiprogramming system at once.
6. It can help to execute multiple tasks in single application at same time duration.
7. Multiprogramming system helps to optimize total job throughput of computer.

Disadvantages of Multiprogramming System

1. **CPU** scheduling is needed.
2. Memory management is required because all types of jobs are stored in the main memory**.**
3. Harder task is to manage of all processes and jobs.
4. It is highly complex and sophisticated.

Multiprocessor Operating System

Multiprocessor operating system allows the multiple processors, and these processors are connected with physical memory, computer buses, clocks, and peripheral devices. Main objective of using multiprocessor operating system is to consume high computing power and increase the execution speed of system.

Components of Multiprocessor Operating System

1. CPU
2. Input/Output Processor
3. Input/Output Devices
4. Memory Unit

CPU – CPU is capable to access memories as well as controlling the entire I/O tasks.

I/O Processor – I/O processor can access direct memories, and every I/O processors have to responsible for controlling all input and output tasks.

Input/Output Devices – These devices are used for inserting the input commands, and producing output after processing.

Memory Unit – Multiprocessor system uses the two types of memory modules such as shared memory and distributed shared memory.

Characteristics of Multiprocessor Operating System

1. The Multiprocessor system allows making communication in between multiple CPUs with their share memory and input/output devices.
2. Multiprocessor system can use different types of processor as per own need, such as central processing unit (CPU) or an input- output processor (IOP).
3. Multiprocessors are split into multiple instruction stream multiple data stream (MIMD) systems.
4. Entire multiprocessor system is managed by operating system, and it allows the communication between all processors and I/O devices as well.
5. Multiprocessor has a better reliability.
6. If, any processor gets fails due to any reason, then other processor can handle all function of faulty processor.
7. Multiprocessor organization provides many benefits for enhancing the system performance.
8. Multiprocessing system has a optimize architecture due to implement parallel processing.
9. In multiprocessor use different compiler, those are able to identify the parallelism in a user's program in automation mode.
10. Main objective of using the compilers is to determine the all data dependency in the entire program.
11. If, any program totally depends upon the data, which are created by other programs, then that data is executed firstly without getting any delay.
12. Multiprocessors are categorized with their memory management such as shared memory or tightly coupled multiprocessor.

Advantages of Multiprocessor Operating System

1. Great Reliability

If due to any reason, any one processor gets fails then do not worry because, entire system will do work properly. For example – if multiprocessor has 6 processors and any one processor does not perform properly, at this stage rest of them processors have to responsibilities for handling this system.

2. Improve Throughput

Enhancing the throughput of system, entire system is improved, if couples of processors work with getting collaboration.

3. Cost Effective System

Multiprocessor systems are cost effective compare to single processor system in long life because this system is capable to share all input/output devices, power supplies system, and data storage centre. In multiprocessor, do not need to connect all peripheral terminals separately with each processor.

4. Parallel Processing

Multiprocessor O/S gets high performance due to parallel processing. In this system, single job is divided into various same small jobs, and execute them like as Parallel nature.

Disadvantages of Multiprocessor Operating System

1. Multiprocessor has complicated nature in both form such as H/W and S/W.
2. It is more expensive due to its large architecture.
3. Multiprocessor operating system has a daunting task for scheduling processes due to its shareable nature.
4. Multiprocessor system needs large memory due to sharing its memory with other resources.
5. Its speed can get degrade due to fail any one processor.
6. It has more time delay when processor receives message and take appropriate action.

Multi user Operating System

A multi user operating system allows to permission of multiple users for accessing the single machine at a time. All different users can access that system running operating system with the help of several terminals, which are connected in networking form.

Main objective of designing of Multi user OS is used to time sharing and batch processing on mainframe system. Now these days, this multi user operating system is used in the large organization, government sector, educational system such as large scale university, and mostly used in the servers side like as Ubunto Server or Windows Server. These servers grant the permission of multiple users to accessing the operating system, kernel, and hardware simultaneously.

Features and Characteristics of Multi User Operating System

1. **Multi -Tasking** – Multi user O/S is capable to perform couple of tasks at concurrently, and multiple programs can be run on this operating system at a same time.
2. **Resource Sharing** – In the multi user operating system, several peripheral can be shared such as printers, fax m/c, plotters, and hard drives etc. Due to this feature, users can share own documents. In this system, tiny time slice of CPU time is allotted to all users.3
3. **Background Processing** – In which, if given instructions are not processed, and then they perform their tasks in the background as well as other programs are interacting with system in the current time.

Advantages of Multi User OS

1. Multi user operating system is very useful in offices or library, because it can be handled printing jobs with effective manner.
2. Multiple users can access same copy of document on one computer system. For example, if some PPT file is stored in the one computer, then other user can watch this PPT on other terminals.
3. Multi user O/S is used in the ticket reservation system and in Airlines.
4. Entire system does not get halt, if one computer gets fails in own network system.

Disadvantage of Multi User OS

1. If, virus attacks on one computer, then this virus spreads on entire network system simultaneously, and finally all computer system can get fails.
2. All information of computer is shared publicly, so your private data is shared on the entire network.

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. 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 Systems and Time-Sharing Systems is that in case of Multiprogrammed systems, the objective is to maximize processor use, whereas in Time-Sharing Systems, the objective is to minimize response time.

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. When the user submits the command, the response time is in few seconds at most.

Advantages of Timesharing operating systems

1. Provides the advantage of quick response.
2. Avoids duplication of software.
3. Reduces CPU idle time.

Disadvantages of Time-sharing operating systems

1. Problem of reliability.
2. Question of security and integrity of user programs and data.
3. Problem of data communication.

Real Time Operating System

Real time operating systems are used in environments where a large number of events, mostly external to the computer system, must be accepted and processed in a short time or within certain deadlines. Such applications are industrial control, telephone switching equipment, flight control, and real time simulations.

The real time operating systems can be of 2 types

1. **Hard Real Time operating system:**

These operating systems guarantee that critical tasks be completed within a range of time.

For example - a robot is hired to weld a car body, if robot welds too early or too late, the car cannot be sold, so it is a hard real time system that require to complete car welding by robot hardly on the time.

2. **Soft real time operating system:**

This operating systems provides some relaxation in time limit.

For example – Multimedia systems, digital audio system etc.

"Multitasking operation is accomplished by scheduling processes for execution independently of each other. Each process is assigned a certain level of priority that corresponds to the relative importance of the event that it services. The processor is allocated to the highest priority processes. This type of scheduling, called, priority based preemptive scheduling is used by real time systems".

Advantages of real time operating system

1. Maximum consumption –Maximum utilization of devices and system. Thus more output from all the resources.
2. Task Shifting –Time assigned for shifting tasks in these systems are very less. For example in older systems it takes about 10 micro seconds. In shifting one task to another and in latest systems it takes 3 micro seconds.
3. Focus On Application –Focus on running applications and less importance to applications which are in queue.
4. Real Time Operating System In Embedded System –Since size of programs are small, RTOS can also be embedded systems like in transport and others.
5. Error Free –These types of systems are error free.
6. Memory Allocation –Memory allocation is best managed in these type of systems.

Disadvantages of real time operating system

1. Limited Tasks –Very few task run at the same time and their concentration is very less on few applications to avoid errors.
2. Use Heavy System Resources –Sometimes the system resources are not so good and they are expensive as well.

3. Complex Algorithms –The algorithms are very complex and difficult for the designer to write on.
4. Device Driver And Interrupt signals –It needs specific device drivers and interrupt signals to response earliest to interrupts.