Tutorial No.1

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Discuss different types of operating systems in detail.

1. Batch Operating System

A Batch Operating System (BOS) is a computer system that allows multiple users to use it, without direct communication between them. It achieves this by keeping all users in separate ‘batches’, meaning they can’t interact with each other directly. This makes it ideal for applications where users need to work on separate parts of a project, without getting in the way of each other.

- **Types of Batch Operating System:**
  - Simple Batched System: This type of batch operating system is the most basic and has no direct communication between users.
  - Multiplexed Batch System: This type of batch operating system allows multiple users to use it at the same time.
  - Time-Shared Batch System: This type of batch operating system shares the resources among users, meaning that each user gets a specific amount of time to use the resources.

- **Advantages of Batch Operating System:**
  - There is no direct communication between users, meaning that there is no need for a dedicated communication line.
  - It is easy to use and does not require much maintenance.
  - It is very efficient in terms of resource usage.

- **Disadvantages of Batch Operating System:**
    - It can be slow due to the fact that users need to wait for their turn to use the resources.
    - It can be difficult to manage multiple users.
    - If one user is not done with their work, it can hold up the entire system.

2. Uni programming Operating System

Uniprogramming Operating System implies that only a single task or program is in the main memory at a particular time. It was more common in the initial computers and mobiles where one can run only a single application at a time.

- **Types of Uniprogramming Operating System:**
    - Uni programming allows only one program to be present in memory at a time.
    - The resources are provided to the single program that is present in the memory at that time.
    - Since only one program is loaded the size is small as well.
    - In uni-programming you can have only one program running at any point in time. A single task computer is one that can only run one process at any time as it has only one pipeline...if any.

- **Advantages of Uniprogramming Operating System:**
    - The system of uniprogramming memory can be a small unit so it is easy to design.
    - The Uniprogramming memory management system is moderate without bugs.
    - It additionally executes with minimal overhead.
    - Once an application is stacked, that application is ensured 100% of the processor's time, since no different procedure will intrude on it.
    - Uniprocessing memory management systems are suitable for the embedded system.

- **Disadvantages of Uniprogramming Operating System:**
    - The essential weaknesses are the wasteful utilization of CPU time and the rigidity of employment planning.
    - Compared to fundamental memory, disk memory has a long access time.
    - If the application executes a read from the circle, the CPU will stay inert while trusting that the plate will convey the input information.
    - The time could more readily be utilized executing another client's activity.
    - Users can endure some misuse of CPU time in a microcomputer, yet in computers that cost association hundreds and thousands of dollars clients can't, particularly in a multiuser framework in which different procedures are executing simultaneously.

3. Multiprogramming Operating System

In multiprogramming, numerous programs reside in primary memory (RAM) at once. The operating system which handles numerous projects one after another is known as a multiprogramming working framework. One processor or CPU can just run each procedure in turn. Operating systems use setting exchanging in principle memory for running numerous projects. Setting exchange is to switch programs so all projects are given a reasonable measure of time. The operating system can deal with just a set number of projects. If we run many programs on the computer or mobile then the computer becomes very slow or unresponsive.

- **Types of Multiprogramming Operating System:**

  There are mainly two types of multiprogramming operating systems. These are as follows:

  - Multitasking Operating System
  - Multiuser Operating System

- **Advantages of Multiprogramming Operating System:**
  - High CPU utilization.
  - It creates the impression that numerous programs are designated CPUs simultaneously.

- **Disadvantages of Multiprogramming Operating System:**
  - CPU scheduling is required.
  - To accommodate several jobs in memory, memory management is essential.

4. Multitasking Operating System

In a modern computer system, the word “multitasking” is employed. It’s a logical extension of the multiprogramming system that allows numerous applications to run simultaneously. Multitasking in an OS enables a user to execute multiple computer tasks at the same time. Processes that hold common processing resources, such as a CPU, are known as many tasks. The operating system remembers where you are in these jobs and lets you switch between them without data being lost.

- **Types of Multitasking Operating System:**

  There are mainly two types of multitasking. These are as follows:

  - **Preemptive Multitasking**

    Preemptive multitasking is a special task assigned to a computer operating system. It decides how much time one task spends before assigning another task to use the operating system. Because the operating system controls the entire process, it is referred to as 'preemptive'.

  - **Cooperative Multitasking**

    The term 'Non-Preemptive Multitasking' refers to cooperative multitasking. The main purpose of cooperative multitasking is to run the present task while releasing the CPU to allow another process to run. This task is carried out by using taskYIELD (). When the taskYIELD() function is called, context-switch is executed.

- **Advantages of Multitasking Operating System:**
    - Manage Several Users
    - Virtual Memory
    - Good Reliability
    - Secured Memory
    - Time Shareable
    - Background Processing
    - Optimize the computer resources
    - Use Several Programs

- **Disadvantages of Multitasking Operating System:**
    - Processor Boundation
    - Memory Boundation
    - CPU Heat Up

5. Multiprocessing Operating System

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. The main objective of using a multiprocessor operating system is to increase the execution speed of the system and consume high computing power.

- **Types of Multiprocessing Operating System:**
  - Loosely coupled multiprocessor system
  - Tightly coupled multiprocessor system
  - Homogeneous multiprocessor system
  - Heterogeneous multiprocessor system
  - Shared memory multiprocessor system
  - Distributed memory multiprocessor system
  - Uniform memory access (UMA) system

- **Advantages of Multiprocessing Operating System:**
  - Great Reliability
  - Improve Throughput
  - Cost-Effective System
  - Parallel Processing

- **Disadvantages of Multiprocessing Operating System:**
  - Its massive architecture makes it more price sensitive.
  - If one of the processors fails, the speed can differ.
  - The processor receives the message with a longer delay before acting appropriately.
  - It has significant skew and determinism difficulties.
  - It requires context switching, which could affect how well it performs.

6. Distributed Operating System

These types of operating systems are 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. These system's processors differ in size and function. The major benefit of working with these types of the operating system is that it is always possible that one user can access the files or software which are not actually present on his system but some other system connected within this network i.e., remote access is enabled within the devices connected in that network.

- **Types of Distributed Operating System:**
  - Client-Server System
  - Peer-to-Peer System
  - Middleware
  - Three-tier
  - N-tier

- **Advantages of Distributed Operating System:**
  - Failure of one will not affect the other network communication, as all systems are independent from each other
  - Electronic mail increases the data exchange speed
  - Since resources are being shared, computation is highly fast and durable
  - Load on host computer reduces
  - These systems are easily scalable as many systems can be easily added to the network
  - Delay in data processing reduces

- **Disadvantages of Distributed Operating System:**
    - Failure of the main network will stop the entire communication
    - To establish distributed systems the language which is used are not well defined yet
    - These types of systems are not readily available as they are very expensive. Not only that the underlying software is highly complex and not understood well yet