OS Assignment-2: TYPES OF OPERATING SYSTEMS

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1. Batch Operating System

In a Batch Operating System, the similar jobs are grouped together into batches with the help of some operator and these batches are executed one by one.

1. For example, let us assume that we have 10 programs that need to be executed. Some programs are written in C++, some in C and rest in Java.
2. Now, every time when we run these programmes individually then we will have to load the compiler of that particular language and then execute the code.
3. But what if we make a batch of these 10 programmes. The benefit with this approach is that, for the C++ batch, you need to load the compiler only once.
4. Similarly, for Java and C, the compiler needs to be loaded only once and the whole batch gets executed.

Advantages

- Batch processing system consumes less time for executing all jobs.
- Sharing of the batch system for multiple users is possible.
- The idle time of the batch system is very less.

Disadvantages

- Batch processing system's online sensors are often not available.
- Time-varying process characteristics.
- If anyone's job halts, then increase the workload for predicting time.
- Due to any mistake, any job can enter into an infinite loop.

Examples

- Bank Invoice System
- Transactions Process
- Billing System

2. Time-Sharing Operating System

In a Multi-tasking Operating System, more than one processes are being executed at a particular time with the help of the time-sharing concept.

1. So, in the time-sharing environment, we decide a time that is called time quantum and
2. when the process starts its execution then the execution continues for only that amount of time and after that, other processes will be given chance for that amount of time only.
3. In the next cycle, the first process will again come for its execution and it will be executed for that time quantum only and again next process will come.

Advantages

- Each task gets an equal opportunity.
- Fewer chances of duplication of software.
- CPU idle time can be reduced.

Disadvantages

- Reliability problem.
- One must have to take of security and integrity of user programs and data.
- Data communication problem.

Examples

- Windows 2000 server
- Windows NT server
- Unix
- Linux

3. Distributed Operating System

In a Distributed Operating System, we have various systems and all these systems **have their own CPU**, main memory, secondary memory, and resources. These systems are connected to each other using a **shared communication network**. The best part about these Distributed Operating System is **remote**

access i.e., one user can access the data of the other system and can work accordingly.

Advantages

- A distributed operating system may share all resources from one site to another, increasing data availability across the entire system.
- It reduces the probability of data corruption because all data is replicated across all sites.

Disadvantages

- The system must decide which jobs must be executed when they must be executed, and where they must be executed. A scheduler has limitations, which can lead to underutilized hardware and unpredictable runtimes.
- It is hard to implement adequate security in a distributed operating system since the nodes and connections must be secured.

Examples

- Solaris
- OSF/1
- Micros

4. Embedded Operating System

An Embedded Operating System is designed to perform a specific task for a particular device which is not a computer. For example, the software used in elevators is dedicated to the working of elevators only and nothing else. So, this can be an example of Embedded Operating System. The Embedded Operating System allows the access of device hardware to the software that is running on the top of the Operating System.

Advantages

- The OS is often low-cost.
- The OS tends to use few resources, including minimal power.
- The performance is generally trouble-free.

Disadvantages

- The OS can usually only run a single or very few applications.

- It is difficult to modify the OS once you establish a framework and build it into the device.
- Trouble-shooting the OS when there are issues can be difficult.

Examples

- Windows Mobile/CE (handheld Personal Data Assistants)
- Symbian (cell phones)
- Linux-based OSes.

5. Real-time Operating System

The Real-time Operating Systems are used in the situation where we are dealing with some real-time data. So, as soon as the data comes, the execution of the process should be done and there should be **no delay** i.e., **no buffer** delays should be there. Real-time OS is a time-sharing system that is based on the **concept of clock interrupt.**

For example, the details of the temperature of the petroleum industry are very crucial and this should be done in real-time and in a very short period of time. A small delay can result in a life-death situation.

Advantages

- Priority-Based Scheduling.
- Abstracting Timing Information.
- Maintainability/Extensibility.
- Modularity.

Disadvantages

- Limited Tasks.
- Use Heavy System resources.
- Complex Algorithms.
- Device driver and interrupt signals.
- Thread Priority.

Examples

- Airline traffic control systems.
- Command Control Systems.
- Airlines reservation system.

6. Multiprogramming Operating System

A multiprogramming operating system runs multiple programs on a single processor computer. If a program waits for an I/O transfer, the other programs are ready to use the CPU. As a result, various jobs may share CPU time. However, the execution of their jobs is not defined to be in the same period. A multiprogramming OS is of the following two types:

1. **Multitasking OS**: Enables execution of multiple programs at the same time. The operating system accomplishes this by swapping each program in and out of memory one at a time. When a program is switched out of memory, it is temporarily saved on disk until it is required again.
2. **Multiuser Operating System**: This allows many users to share processing time on a powerful central computer from different terminals. The operating system accomplishes this by rapidly switching between terminals, each of which receives a limited amount of processor time on the central computer.

Advantages

- It may help to run various jobs in a single application simultaneously.
- It helps to optimize the total job throughput of the computer.
- Various users may use the multiprogramming system at once.
- Short-time jobs are done quickly in comparison to long-time jobs.
- It may help to improve turnaround time for short-time tasks.
- It helps in improving CPU utilization and never gets idle.
- The resources are utilized smartly.

Disadvantages

- It is highly complicated and sophisticated.
- The CPU scheduling is required.
- Memory management is needed in the operating system because all types of tasks are stored in the main memory.
- The harder task is to handle all processes and tasks.
- If it has a large number of jobs, then long-term jobs will require a long wait.

Examples

- Apps like office, chrome, etc.
- Microcomputers like MP/M, XENIX, and ESQview.
- Windows O/S
- UNIX O/S

5. Multiprocessor Operating System

Multiprocessor operating system utilizes multiple processors, which are connected with physical memory, computer buses, clocks, and peripheral devices (touchpad, joystick, etc). The main objective of using a multiprocessor OS is to consume high computing power and increase the execution speed of the system.

Following are four major components, used in the Multiprocessor Operating System:

1. **CPU** – capable to access memories as well as controlling the entire I/O tasks.
2. **Input Output Processor** – I/P processor can access direct memories, and every I/O processors have to be responsible for controlling all input and output tasks.
3. **Input/Output Devices** – These devices are used for inserting the input commands, and producing output after processing.
4. **Memory Unit** – Multiprocessor system uses the two types of memory modules - shared memory and distributed shared memory.

Advantages

- Great Reliability.
- Improve Throughput.
- Cost-Effective System.
- Parallel Processing.

Disadvantages

- It is more expensive due to its large architecture.
- Its speed can get degraded due to failing any one processor.
- It has more time delay when the processor receives the message and takes appropriate action.
- It has big challenges related to skew and determinism.
- It needs context switching which can be impacted its performance.