EXP NO : 1   **STUDY OF OPERATING SYSTEMS**   **DATE: –07–2024**
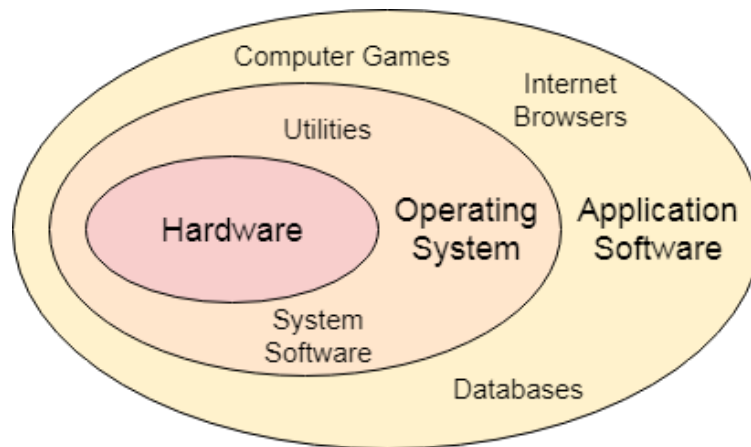
AIM : To study concept of an operating system and different type of operating system

Theory :

1. Operating System

An **Operating System** can be defined as an **interface between user and hardware**. It is responsible for the execution of all the processes, Resource Allocation, CPU management, File Management and many other tasks.

The purpose of an operating system is to provide an environment in which a user can execute programs in a convenient and efficient manner.

2. Differences between Linux Operating system and Windows Operating System.

Parameter	Linux	Windows
Access	Users can access the source code of the kernel in Linux and can alter the kernel according to need.	Usually, users cannot access the source code. However, members of some groups can have access to it.
Variety	Linux has several distributions that are highly customizable.	Windows have fewer options to customize.
Command–line	The command line usually referred to as Terminal	Windows also have a command line, but it is not such effective as a comparison to the Linux terminal.

Written in	Linux is written in assembly language and C.	Windows is written in C++ and assembly language.
Reliability	Linux is highly reliable and secure.	Windows is not as much reliable as Linux.
Security	Linux OS is more secure than Windows. It is hard for the hackers and attackers to find a loophole in it.	Windows is less secure than Linux.
License	Linux is distributed under the **GPL** license.	Windows is distributed under a **Proprietary commercial software license.**

3. Different operating systems with their advantages, disadvantages and some examples.

    i.   **Batch Operating system**
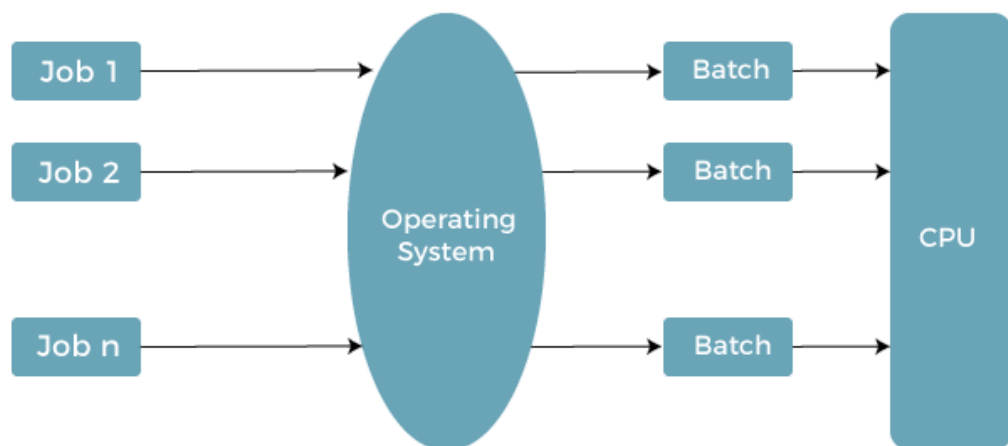
   The jobs were executed in batches. People used to have a single computer known as a **mainframe**. Users using batch operating systems do not interact directly with the computer. Each user prepares their job using an offline device like a punch card and submitting it to the computer operator. Jobs with similar requirements are grouped and executed as a group to speed up processing. Once the programmers have left their programs with the operator, they sort the programs with similar needs into batches.

Advantages

1. It isn't easy to forecast how long it will take to complete a job; only batch system processors know how long it will take to finish the job in line.
2. This system can easily manage large jobs again and again.
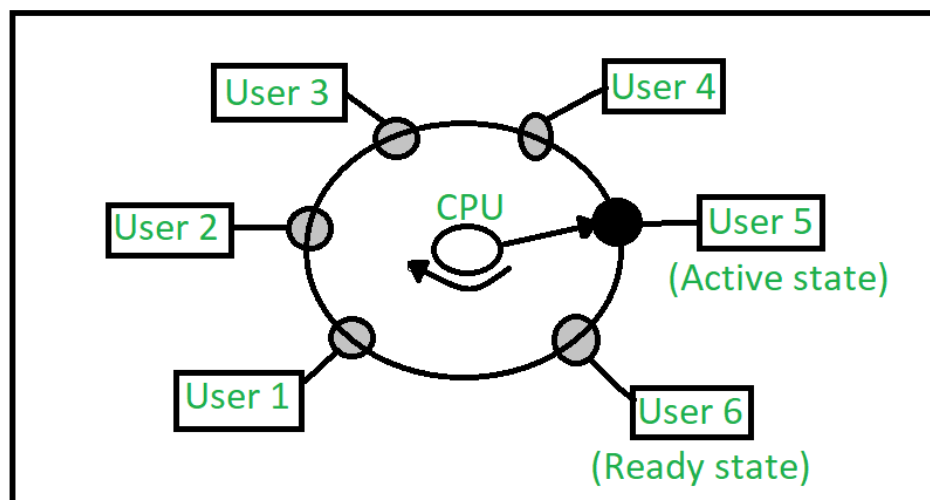
Disadvantages

1. When a job fails once, it must be scheduled to be completed, and it may take a long time to complete the task.
2. Computer operators must have full knowledge of batch systems.
3. The batch system is quite difficult to debug.

Examples

Examples of batch operating systems include **IBM's OS/360** and **Unisys' MCP**

ii. Time sharing Operating system

A time-sharing operating system allows multiple users to share system resources simultaneously by rapidly switching between them. This provides the illusion that each user has their own dedicated system, ensuring efficient CPU utilization and interactive response times. The CPU executes multiple jobs by switching between them so frequently that users can interact with each program while it is running. This type of system enhances productivity by allowing multiple users to work on a single machine at the same time.

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

Disadvantages

1. Reliability problem.
2. One must have to take of the security and integrity of user programs and data.
3. Data communication problem

Examples

1. **Unix**: A widely used operating system known for its robustness and flexibility.
2. **Linux**: An open-source operating system based on Unix principles.
3. **Windows Server**: Microsoft's server operating system that supports multiple users.

iii. Distributed Operating system

In a Distributed Operating System, multiple CPUs are utilized, but for end-users, it appears as a typical centralized operating system. It enables the sharing of various resources such as CPUs, disks, network interfaces, nodes, and computers across different sites, thereby expanding the available data within the entire system.

Advantages

1. It can increase data availability throughout the system by sharing all resources (CPU, disk, network interface, nodes, computers, and so on) between sites.

2. Because all data is replicated across all sites, it reduces the probability of data corruption because users can access data from another operating site in the event that one site fails.
3. Data transfer from one site to another is accelerated by it.

Disadvantages

1. Comparing a DOS-connected database to a single-user system, the latter is easier to maintain and less complex.
2. Compared to other systems, the underlying software is incredibly sophisticated and poorly understood.

Examples

1. **AIX**: Developed for IBM RS/6000 computers.
2. **Solaris**: Designed for SUN multiprocessor workstations.
3. **Mach/OS**: A multitasking and multithreading UNIX-compatible operating system.

iv. **Network operating system**

Network Operating Systems
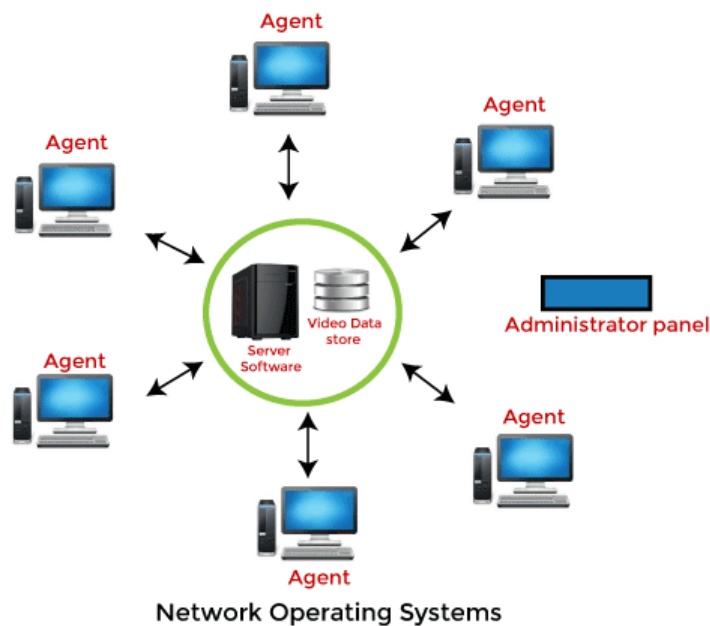
A network operating system (NOS) is software that enables multiple computers to communicate, share resources, and work together over a network. It provides essential services like file sharing, printer access, and network security, allowing individual devices to interact seamlessly. The NOS resides on a server and manages network resources, ensuring efficient data exchange and coordinated operations among connected devices, typically facilitating administration and user collaboration in a networked environment.

1. This type of system is less expensive to set up and maintain.
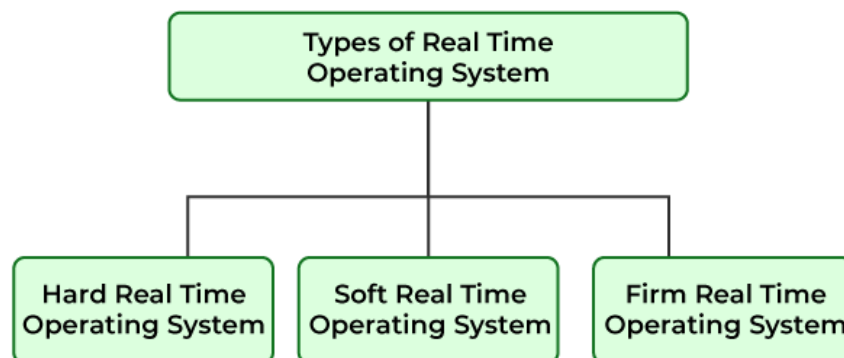2. In this, dedicated hardware is not required.

1. This failure of any node in a system affects the whole system.
2. Its performance degrades as the Network grows.

Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, BSD, etc.

v. **Realtime Operating system**

Real-time **operating systems (RTOS)** 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. With an RTOS, the processing time is measured in tenths of seconds. This system is time-bound and has a fixed deadline. The processing in this type of system must occur within the specified constraints. Otherwise, This will lead to system failure.

a) **Hard Real-Time Operating System:** These operating systems guarantee that critical tasks are completed within a range of time.

For example, a robot is hired to weld a car body. If the robot welds too early or too late, the car cannot be sold, so it is a hard real-time system that requires complete car welding by the robot hardly on time., scientific experiments, medical imaging systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

b) **Soft real-time operating system:** This operating system provides some relaxation in the time limit. For example – Multimedia systems, digital audio systems, etc. Explicit, programmer-defined, and controlled processes are encountered in real-time systems. A separate process is changed by handling a single external event. The process is activated upon the occurrence of the related event signaled by an interrupt.

Advantages

1. **Focus On Application:** Focus on running applications and less importance to applications that are in the queue.

2. **Real-Time Operating System In Embedded System:** Since the size of programs is small, RTOS can also be embedded systems like in transport and others.

Disadvantages

1. **Limited Tasks:** Very few tasks run simultaneously, 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.

Examples

1. **Airline Traffic Control Systems**: RTOS ensures precise and timely communication between air traffic controllers and aircraft.
2. **Command Control Systems**: Used in military and defence applications for real-time decision-making.
3. **Airline Reservation Systems**: RTOS handles reservations, ticketing, and seat allocation in real time.
4. **Heart Pacemakers**: RTOS ensures accurate timing for pacemaker functions.

Conclusion : Different types of operating systems, their advantages, disadvantages, and examples were studied comprehensively, along with the basic concepts of an operating system and the differences between Linux and Windows operating systems.