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Subject Name

Operating System

Unit-5

Topic: Network, Distributed and Multiprocessor Operating System

As Per

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

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New Scheme Based on AICTE Flexible Curricula

Computer Science and Engineering

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Network Operating System

Network Operating System (NOS) is one of the important type of operating system. A network operating system provides services for computers connected to a network. Examples include shared file access, shared applications, and printing capabilities. Some popular examples of network operating systems are Windows NT/XP/2000, Sun Solaris, Novell Netware, UNIX, Linux, and IBM OS/2.
A NOS may either be a peer-to-peer (P2P) OS, which is installed on each computer, or a client-server model, where one machine is the server and others have client software installed.

Prominent features of NOS

- It supports basic functions such as protocol and processor support, hardware recognition and multiprocessing of applications.
- It allows multiple systems to connect, so that they can share files, data, and hardware devices.
- It provides security features like restrictions, authorizations, authentication, and access control.
- It offers file, web service, printing, and back-up services.
- It provides name and directory services management.
- It offers basic network administration utilities with provisions for remote access and system management.
- It has inter-networking features like routing, WAN ports, and clustering capabilities

Basic tasks associated with Network Operating Systems

- System maintenance activities such as back-up services
- Basic network administration utilities
- Tasks associated with file management
- Security monitoring on all resources in the network
- Setting priority to print jobs in the network.

Advantages

- Centralized servers are highly stable.
- Security is server managed.
- Upgradation of new technologies and hardware can be easily integrated into the system.
- It is possible to remote access to servers from different locations and types of systems.

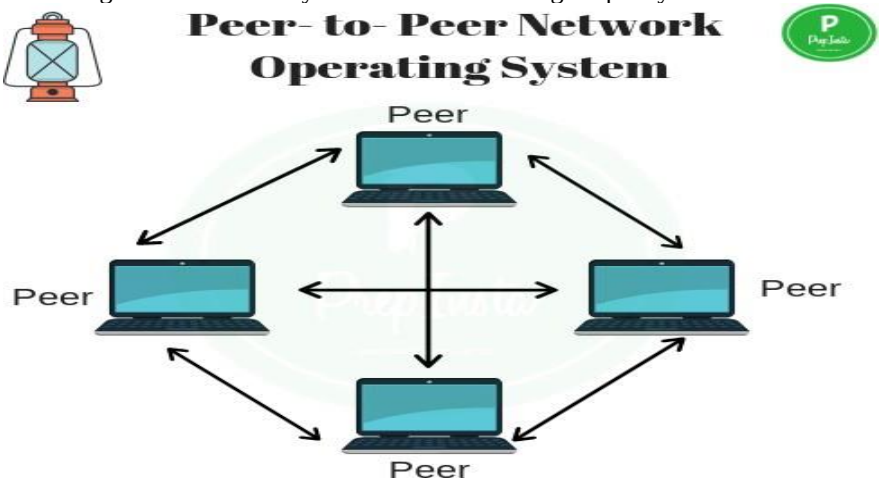
Disadvantages

- High cost of buying and running a server.
- Dependency on a central location for most operations.
- Regular maintenance and updates are required.

Types of Network operating system

1.Peer-to-Peer: -

Peer-to-peer network operating systems allow users to share resources and files located on their computers and to access shared resources found on other computers. The requirement of hardware is less. Also, no server is needed to establish the connection. Its setup process is natural. However, this type of system is less secured and provides no central location for storage. It means each system has its own storage capacity.



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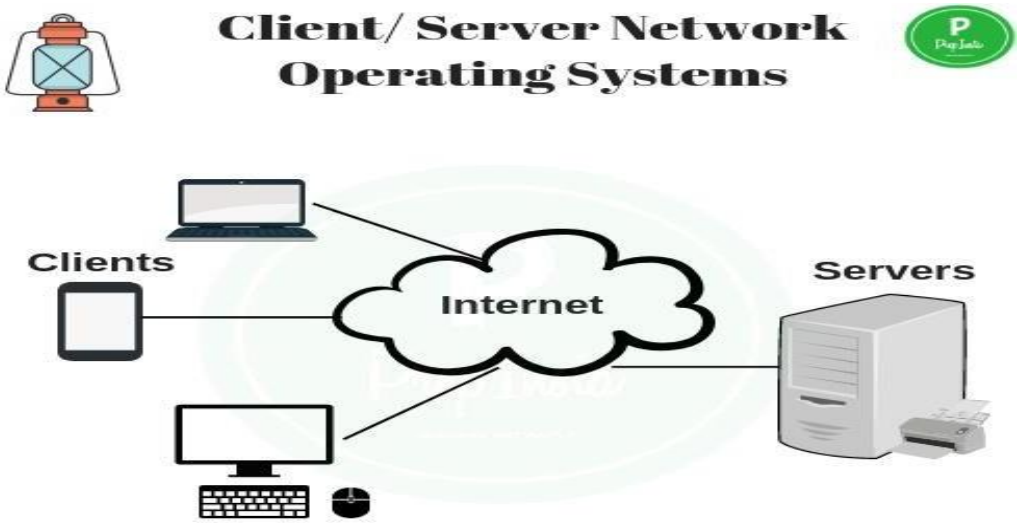
2.Client/Server: -

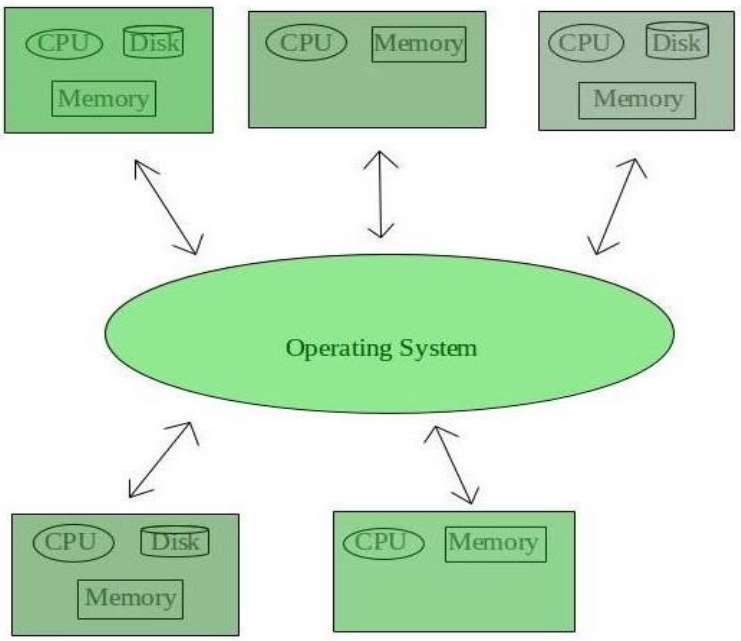
Client/server network operating systems allow the network to centralize functions and applications in one or more dedicated file servers. The clients run programs and access data that are stored on the server. Examples of servers include web servers, mail servers, and file servers. With these examples, it becomes easy to integrate new technology into the system. In this system, machines can remotely access the server from different locations. However, this system is costly and requires regular maintenance. The data is stored on a centralized server.



In a nutshell, the Peer-to-Peer network model focuses on connectivity to the remote computers, whereas, the Client-Server network model focuses on information sharing.

Distributed Operating System

These types of 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 each other using a shared communication network. Independent systems possess their own memory unit and CPU. These are referred 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 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 on some other system connected within this network i.e., remote access is enabled within the devices connected in that network.



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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 are 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.

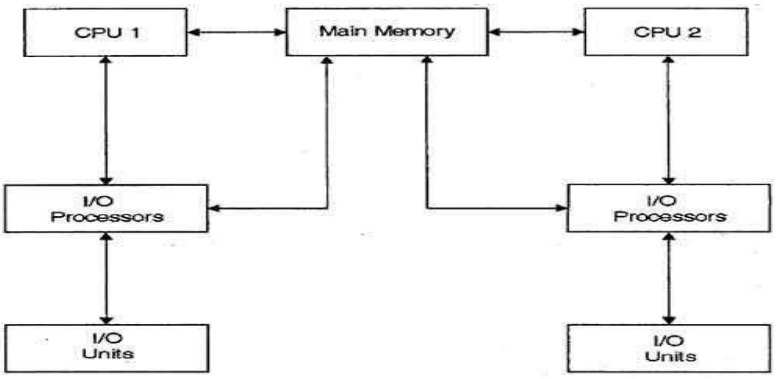
Examples of Distributed Operating System are- LOCUS etc.

Multiprocessor Operating System

Definition – 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-There are four major components, which are used in the Multiprocessor Operating System.

(i) CPU
(ii) Input/output Devices
(iii) Input/output Processor
(iv)Memory Unit



CPU – CPU is capable to access memories as well as controlling the entire I/O tasks.
IOP – I/P processor can access direct memories, and every I/O processor 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.

Types of Multiprocessor Operating System-Here, we will explain different types of multiprocessor operating system, and classification of its list is done into six types.

1 Symmetric Multiprocessor
2 Asymmetric Multiprocessor
3 Shared Memory Multiprocessor
4 Distributed Memory Multiprocessor
5 UMA Multiprocessor
6 NUMA Multiprocessor

1. **Symmetric Multiprocessor**-In this system, every processor has own identically copy of operating system, and they can make communication in between each other. In which all processors are connected each other with peer to peer relationship nature, it means no master & slave relation.

2. **Asymmetric Multiprocessor-**In this system, every processor is allotted predefined tasks, and master processor has power for controlling entire system. In which, It use the master- slave relationship.

3. **Shared Memory Multiprocessor-**In this system, each CPU contains sharable common memory.

4. **Distributed Memory Multiprocessor-**In this system, every processor consists own private memory.

5. **UMA Multiprocessor-**UMA Multiprocessor stands for **"Uniform Memory Access Multiprocessor"**. In which, it allows to access all memory at the uniform speed rate for all processors.

6. **NUMA Multiprocessor-**NUMA Multiprocessor stands for **"Non-Uniform Memory Access Multiprocessor"**. In this system, it involves some areas of the memory for accessing at the faster rate, and left parts of memory are utilized for other tasks.

Advantages of Multiprocessor Operating System-There are list of several advantages of Multiprocessor operating system such as

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 center. 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.
7 It has big challenge related to skew and determinism.
8 It needs context switching which can be impacted its performance.

Characteristics of Multiprocessor Operating System-

1. The Multi-processor system allows making communication in between multiple CPUs with their share memory and **input/output devices**.
2. Multi-processor 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 multi-processor system is managed by operating system, and it allows the communication between all processors and I/O devices as well.
5. If, any processor gets fails due to any reason, then other processor can handle all function of faulty processor.
6. Multiprocessor organization provides many benefits for enhancing the system performance.
7. Multiprocessing system has a optimize architecture due to implement parallel processing.
8. In multiprocessor use different compiler, those are able to identify the parallelism in a user's program in automation mode.
9. Main objective of using the compilers is to determine the all data dependency in the entire program.
10. If, any program totally depends upon the data, which are created by other programs, then that data is executed firstly without getting any delay.
11. If, any data is executed in concurrently, then other parts of the programs can use them.

Examples of Multiprocessor Operating System

Examples for Symmetric Multiprocessor – Windows NT, Solaris, Digital UNIX, OS/2 & Linux.
Examples for Asymmetric Multiprocessor – SunOS Version 4, IOS

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