Operating System

BIM IV Semester

Credits: 3
Lecture Hours:48

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Unit–8

Distributed Operating System

Introduction

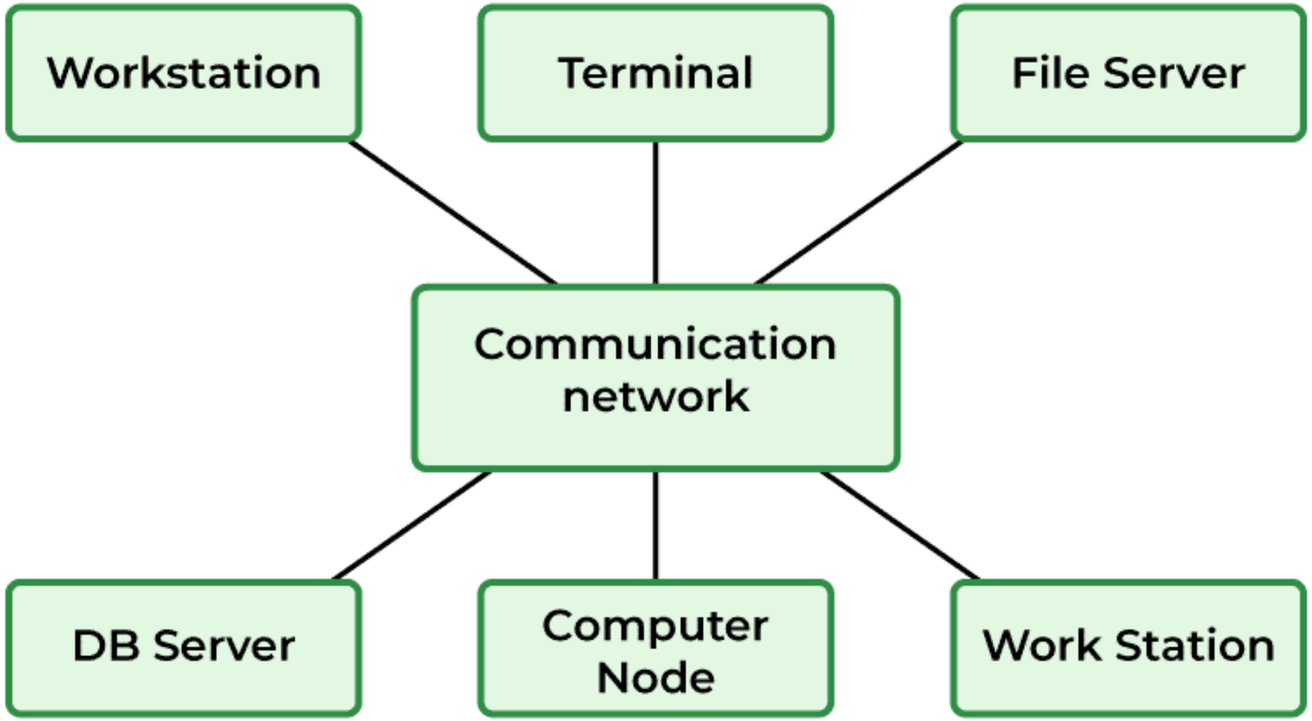
What is Distributed OS?

A Distributed Operating System refers to a model in which applications run on multiple interconnected computers, offering enhanced communication and integration capabilities compared to a network 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.

Introduction

Distributed OS



Types of Distributed OS

1. Client-Server Systems
2. Peer-to-Peer Systems
3. Middleware
4. Three-tier
5. N-tier

1. Client-Server Systems

This strongly connected operating system is appropriate for multiprocessors and homogenous multicomputer. It functions as a centralized server, handling and approving all requests originating from client systems.

Types of Distributed OS

2. Peer-to-Peer Systems

Peer-to-Peer System is loosely coupled system is implemented in computer network applications, consisting of multiple processors without shared memories or clocks. Each processor possesses its own local memory, and communication between processors occurs through high-speed buses or telephone lines.

3. Middleware

Middleware facilitates interoperability (exchange of information) among applications running on different operating systems. By employing these services, applications can exchange data with each other, ensuring distribution transparency.

Types of Distributed OS

4. Three-Tier

Development is made easier because client data is saved in the intermediate tier rather than the client itself. Online applications are where this kind of architecture is most frequently found.

5. N-Tier

N-tier systems are utilized when a server or application has to send requests to other corporate services over a network.

Characteristics of Distributed System

Resource Sharing: It is the ability to use any Hardware, Software, or Data anywhere in the System.

Openness: It is concerned with Extensions and improvements in the system.

Concurrency: Same activity or functionality that can be performed by separate users who are in remote locations.

Scalability: It increases the scale of the system as a number of processors communicate with more users.

Fault tolerance: If there is a failure in Hardware or Software, the system continues to operate properly.

Transparency: It hides the complexity of the Distributed Systems.

Distributed System

Advantages of Distributed System:

- Applications in Distributed Systems are Inherently Distributed Applications.
- Information in Distributed Systems is shared among geographically distributed users.
- Resource Sharing (Autonomous systems can share resources from remote locations).
- It has shorter response time and higher throughput.
- It has higher reliability and availability against component failure.

Distributed System

Applications Area of Distributed System:

Finance and Commerce: Amazon, eBay, Online Banking, E-Commerce websites.

Information Society: Search Engines, Wikipedia, Social Networking, Cloud Computing.

Cloud Technologies: AWS, Salesforce, Microsoft Azure, SAP.

Entertainment: Online Gaming, Music, youtube.

Healthcare: Online patient records, Health Informatics.

Education: E-learning.

Transport and logistics: GPS, Google Maps.

Environment Management: Sensor technologies.

Communication in Distributed System

In a distributed system, each entity may want to share information with other distributed entities.

For example, a temperature sensor may want to share its information with a climate control system. The processes run on different machines and the applications implemented by these processes might include communication between them.

Communication in Distributed System

Two types

1. Unstructured communication

- It involves using memory buffers to pass information between the processes.

-So you might have a shared memory region on a machine.

-Process can read and write to that shared memory region and then some other prcoess can use that information.

2. Structured communication

-Also called as ’message passing’, this uses explicit messages (or interprocess communication mechanisms) over network.

-There is no shared memory in this type of communication.

-The processes can be on same machines or different machines.

Communication model Distributed System

Two types:

1. Open System Interconnection (OSI) Reference Model
2. TCP/IP reference Model

OSI Reference model

All

People

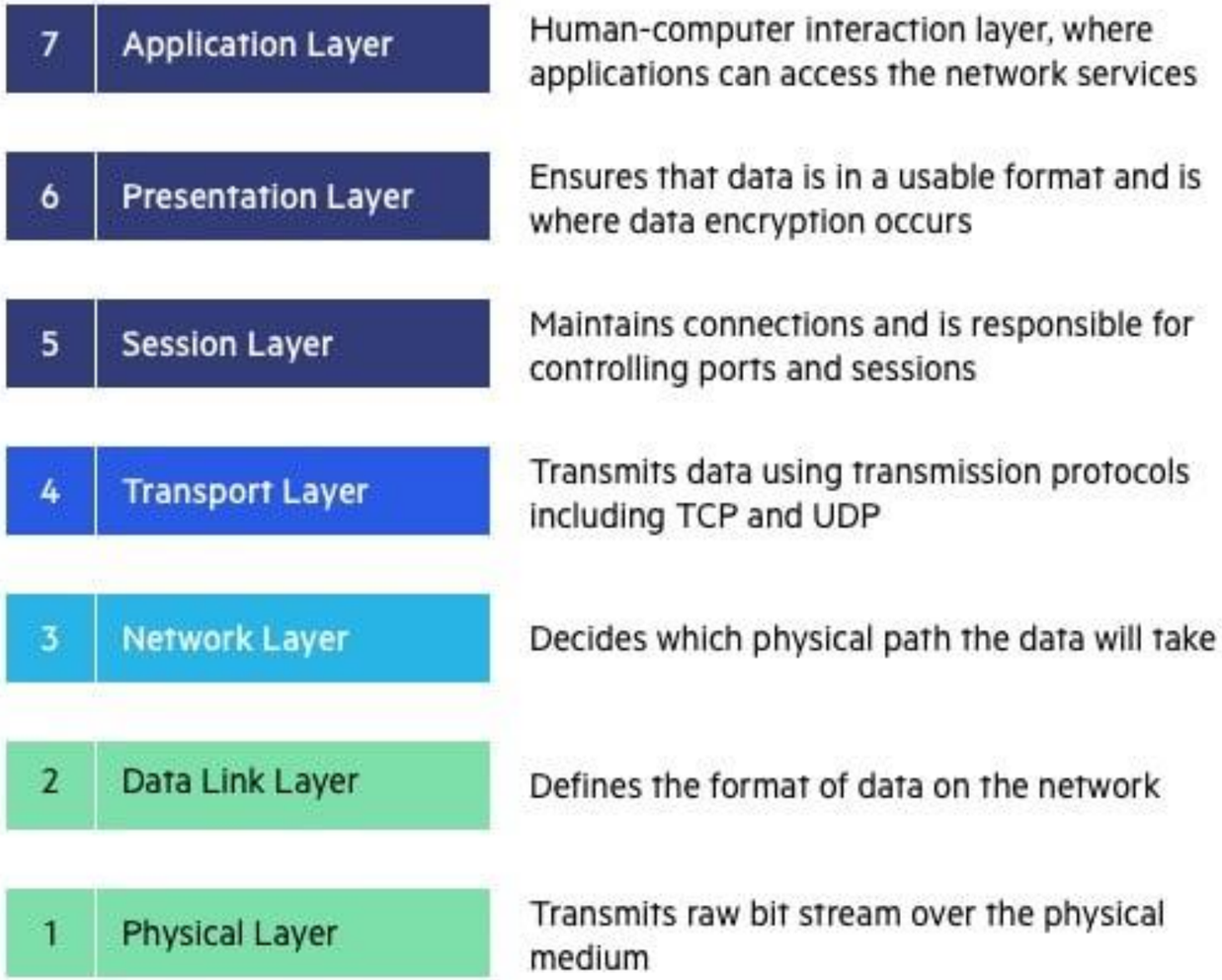
Seems

To

Need

Data

Processing



OSI Reference model

Application Layer:

-Application interface (WhatsApp, browser)

-Protocol: TCP/IP, HTTP, FTP

-It provides high-level APIs (application program interface) to the users.

OSI Reference model

Presentation Layer

-It monitors the syntax and semantics of transmitted information

-Data format

-Encryption /Description for security purposes

-Data Compression

-Translate the data (i.e. if .MP3 file then it opens on vlc, if .docs then it opens in msword.)

OSI Reference model

Session Layer:

-It establishes sessions between users

-If the sender sends information, it establishes a session (connection) to the receiver until data is received.

-If half a portion of the data is sent and a connection is lost in between, then the session layer will start from the point where the connection was lost rather than establishing from starting.

Example: email sent successfully or email fail

OSI Reference model

Transport Layer:

-Divide data into segment

-TCP and UDP protocol

-if TCP establishes connection first and sends data, receive Ack.

-if UDP sends data without a prior connection, no Ack.

OSI Reference model

Network Layer:

-Divide data into the packets (add to and from address in segment)

-Stores IP address of sender and receiver

-Ensure where to send data, where data comes from

-Router exists here

OSI Reference model

Datalink Layer:

-Divide data into the frames

-Check if the data contains any errors.

-Maintains flow control (data speed between sender and receiver)

-Node to Node delivery

Physical Layer

-Converts into bit format (010110)

-Cable and connectors

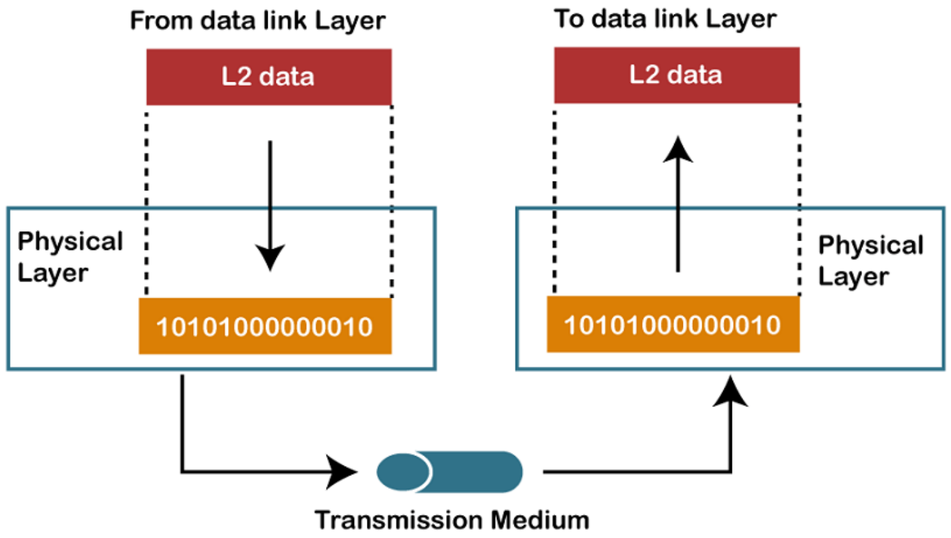
-Topology

-Hardware (repeaters, HUB)

-Transmission mode (Simplex, Half Duplex, Full Duplex)

-Encoding

-Multiplexing (divide channel)



Message Passing in distributing system

-Message passing in distributed systems refers to the communication medium used by nodes (computers or processes) to commute information and coordinate their actions

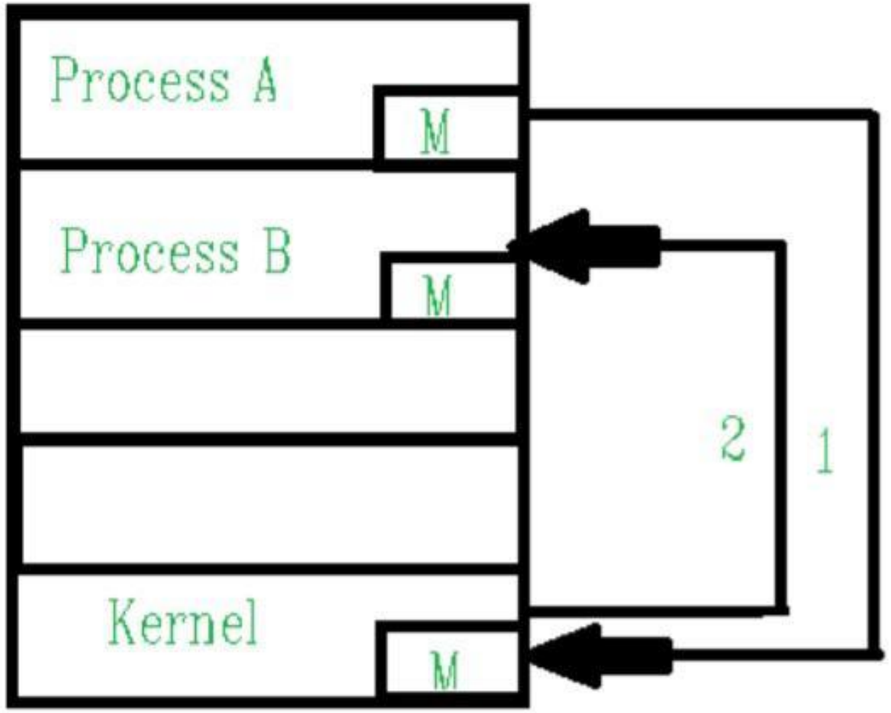
-It involves transferring and entering messages between nodes to achieve various goals such as coordination, synchronization, and data sharing.

Message passing is a flexible and scalable method for inter-node communication in distributed systems. It enables nodes to exchange information, coordinate activities, and share data without relying on shared memory or direct method invocations.

Message Passing in distributing system

Types of Message Passing

1. Synchronous message passing
2. Asynchronous message passing
3. Hybrids



Message Passing System

Remote file access

Files can be shared across the network via variety of methods –
Using FTP i.e., file transfer protocol is used to transfer file from one computer to other.
Using distributed file system (DFS) in which remote directories are visible from local machine.
Using Remote File System (RFS) in which the arrival of networks has allowed communication between remote computer. These networks allows various hardware and software resources to be shared throughout the world.

Remote file access

To implement remote file system we use client-server model. It was one of the basic application of Remote File System.

-Client-Server Model in RFS : RFS allows a computer to support one or more file systems from one or more remote machines.

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