SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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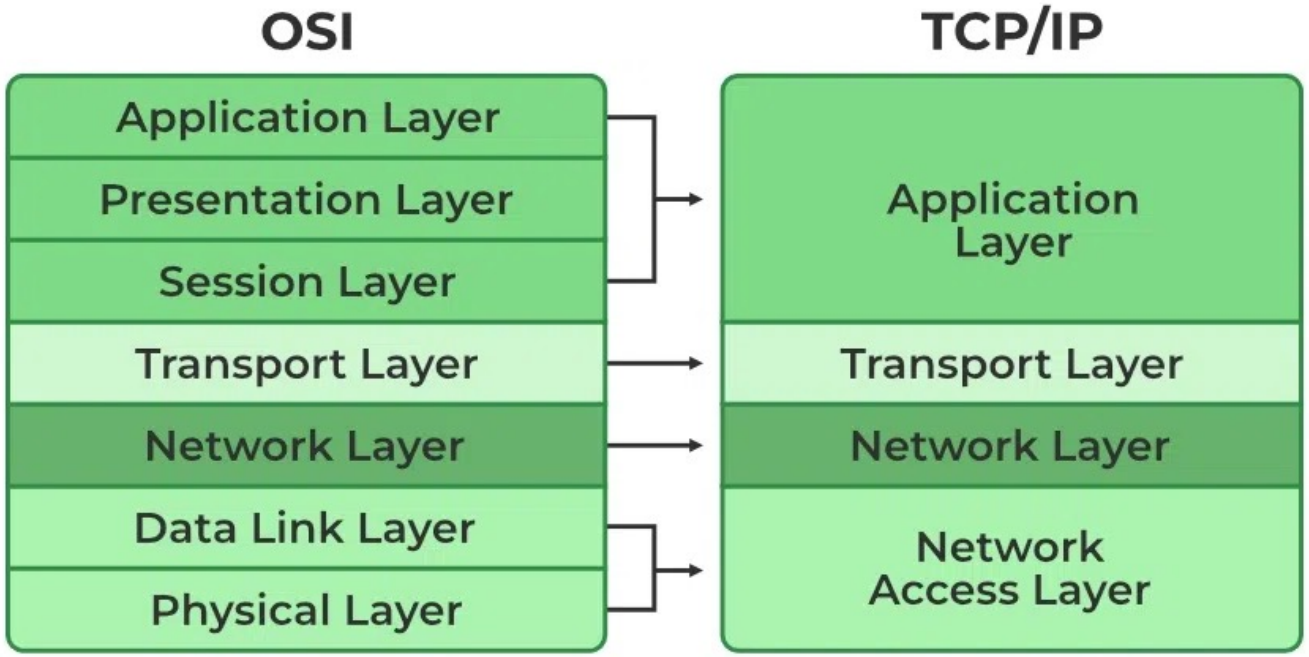
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

19CSB302- COMPUTER NETWORKS

UNIT-1 FUNDAMENTALS AND PHYSICAL LAYER

TCP/IP PROTOCOL SUITE

- TCP/IP is a protocol suite (a set of protocols organised in different layers) used in the internet today
- It is a hierarchical protocol made up of interactive modules each of which provides a specific functionality
- It is a **Five layer model** which breaks down the data into smaller packets that can be shared across a network effectively.
- At the receiver's end, TCP helps to arrange the data packets into a specific order to convey the initial information transferred through the web.
- Each connection will have a specific IP address of the sender and receiver to share data packet.


OSI
TCP/IP
Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer
Application Layer
Transport Layer
Network Layer
Network Access Layer

Horizontal Approach

- The TCP/IP model follows a horizontal approach, This means that the protocols are not tightly coupled, and they can be easily replaced or updated without affecting the other layers which makes the TCP/IP model very flexible and adaptable to different network environments.
- The TCP/IP model does not strictly adhere to the concept of distinct and isolated layers. Instead, it's more flexible and allows for a certain level of overlap and integration between the layers. This is why it's often referred to as a "horizontal" or "flat" approach. The layers of the TCP/IP model work together in a more interconnected manner.
- For example, the HTTP protocol can be used in the application layer with either the TCP or UDP protocol in the transport layer. This means that a web browser can communicate with a web server using either TCP or UDP, depending on the network conditions.
- The horizontal approach of the TCP/IP model is one of the reasons why it has become the standard networking model for the internet. It is a simple and efficient way to ensure that data can be reliably transferred between different devices on a network.

Physical Layer

- It is responsible for carrying individual bits in a frame across the link
- This layer is responsible for generating the data and requesting connections.
- It also includes how bits should optically be signalled by hardware devices which directly interfaces with a network medium, like coaxial, optical, coaxial, fiber, or twisted-pair cables.

Data-link Layer

- Internet is made up of several links connected by routers
- Routers are responsible for choosing the best links for the datagram to travel from source to destination
- The link can be a wired LAN with a link layer switch, wireless LAN, wired WAN or a wireless WAN
- In each case the datalink layer is responsible for moving the packet through the link
- The Data-link layer takes a datagram and encapsulates it in a packet called **FRAMES**
- Provides Error Detection and Error Correction

Network Layer

- This layer is responsible for creating a connection between the source computer and destination computer
- The communication at network layer is host to host and routing the packet through possible routes
- It includes the Internet Protocol(**IP**) address of the source and destination to form it as a **packet or datagram**
- IP is a connectionless Protocol that provides no flow control, no error control and no congestion control services
- It creates **forwarding table** for routers to help them in the routing process

Responsibilities of IP protocol

- **IP addressing** – The IP addressing conventions are part of the IP protocol. IPV4 and IPV6
- **Host-to-host communications** – IP determines the path a packet must take, based on the receiving system's IP address.
- **Packet formatting** – IP assembles packets into units that are known as **datagrams**.
- **Fragmentation** – If a packet is too large for transmission over the network media, IP on the sending system breaks the packet into smaller fragments. IP on the receiving system then reconstructs the fragments into the original packet.

Auxiliary Protocols

Auxiliary Protocols that helps IP in its delivery and routing tasks

ICMP-The Internet Control Message Protocol

Helps IP to report problems when routing packets

IGMP-The Internet Group Management Protocol

Helps IP in multitasking.

DHCP-The Dynamic Host Configuration protocol

Helps IP to get the network-layer address for a host.

ARP- The Address Resolution Protocol

Helps IP to find link layer address of host/router.

Transport Layer

The TCP/IP **transport layer** ensures that packets arrive in sequence and without error, by swapping acknowledgments of data reception, and retransmitting lost packets. This type of communication is known as **end-to-end**.

Transport layer protocols

- Transmission Control Protocol (**TCP**)
- User Datagram Protocol (**UDP**)

TCP: Applications can interact with one another using TCP as though they were physically connected by a circuit. A starting point that establishes the connection, the whole transmission in byte order, and an ending point that closes the connection make up this transmission.

UDP: UDP provides datagram delivery service. UDP does not verify connections between receiving and sending hosts.

Application Layer

- The **application layer** defines standard Internet services and network applications that anyone can use. These services work with the transport layer to send and receive data
- Application-layer helps you to identify communication partners, determining resource availability, and synchronizing communication.
- It allows users to log on to a remote host
- This layer provides various e-mail services
- It consists of **HTTP** (Hypertext Transfer Protocol), **FTP** (File Transfer Protocol), **POP3** (Post Office Protocol 3), **SMTP** (Simple Mail Transfer Protocol), and **SNMP** (Simple Network Management Protocol). It is called the application layer because it consists of application data.

Advantages of TCP/IP

- It helps you to establish/set up a connection between different types of computers.
- It operates independently of the operating system.
- It supports many routing-protocols.
- It enables the internetworking between the organizations.
- TCP/IP model has a highly scalable client-server architecture.
- It can be operated independently.
- Supports several routing protocols.
- It can be used to establish a connection between two computers.

OSI VS TCP/IP

Parameters	OSI Model	TCP/IP Model
Full Form	OSI stands for Open Systems Interconnection.	TCP/IP stands for Transmission Control Protocol/Internet Protocol.
Layers	It has 7 layers.	It has 4 layers.
Usage	It is low in usage.	It is mostly used.
Approach	It is vertically approached.	It is horizontally approached.
Delivery	Delivery of the package is guaranteed in OSI Model.	Delivery of the package is not guaranteed in TCP/IP Model.
Replacement	Replacement of tools and changes can easily be done in this model.	Replacing the tools is not easy .
Reliability	It is less reliable than TCP/IP Model.	It is more reliable than OSI Model.

MCQ

1. OSI stands for

a. open system interconnection
b. operating system interface
c. optical service implementation
d. none of the mentioned

2. The_____ layer lies between the session layer and the application layer.

a. network layer
b. transport layer
c. data link layer
d. presentation layer
Answer: d

3. Segmentation and reassembly is the responsibility of

a. 7th Layer
b. 6th Layer
c. 5th Layer
d. 4th layer

4. Decryption and encryption are the features of

a. transport layer
b. presentation layer
c. session layer

5.Which layer helps to understand data representation in one form on a host to other host in their native representation?

A. Application Layer
B. Presentation Layer
C. Session Layer
D. Transport Layer

6.HTTP is an example of?

a.Session Layer
b. Presentation Layer
c. Data Link Layer
d. Application Layer

7.Which layer helps to uniquely identify hosts beyond the subnets and defines the path which the packets will follow or be routed to reach the destination?

a. Physical Layer
b. Data Link Layer
c. Network Layer
d. Transport Layer

8.The physical layer concerns with

a. bit-by-bit delivery
b. process to process delivery
c. application to application delivery
d. None of the above