1. **Objective**:

- ✓ To explore the structure and functionality of the OSI and TCP/IP reference models, understand how data flows across different layers in a network, and identify their real-world applications.

- ✓ To study and compare the OSI and TCP/IP models in terms of architecture, layer functionalities, and protocol usage in order to gain a deeper understanding of modern network communication systems.

- ✓ To conduct research on the layered approach to networking, analyze the significance of each layer in both OSI and TCP/IP models, and apply this knowledge to real-world network design and troubleshooting scenarios

2. Introduction

A network is a group of connected, communicating devices such as computers and printers. An internet is two or more networks that can communicate with each other. The most notable internet is called the “Internet” which is composed of hundreds of thousands of interconnected networks.

Protocols – A protocol is a set of rules that governs communication. For example, in a face-to-face communication between two persons, there is a set of implicit rules in each culture that define how two persons should start the communication, how to continue the communication, and how to end the communication.

3. TCP/IP Model

The TCP/IP protocol suite was developed prior to the OSI model. TCP/IP is a two-layer program. The higher layer, Transmission Control Protocol, manages the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer that reassembles the packets into the original message. The lower layer, Internet Protocol, handles the address part of each packet so that it gets to the right destination. Each gateway computer on the network checks this address to see where to forward the message.

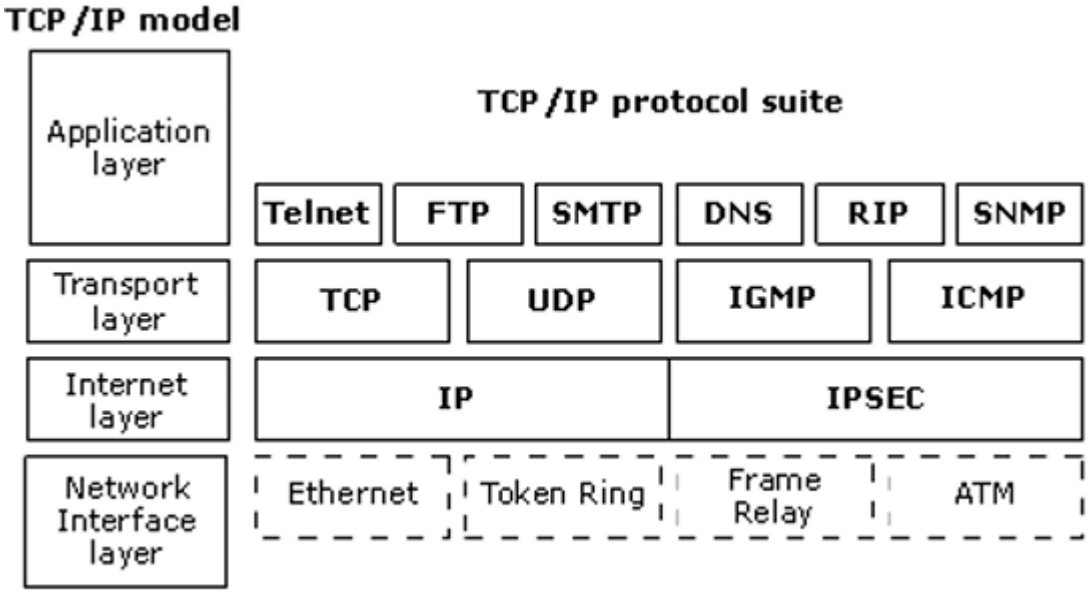

Figure 1: TCP-IP Protocol Suite.

Layer: 4 – Application Layer

The Application layer is the scope within which applications create user data and communicate this data to other applications on another or the same host. The applications, or processes, make use of the services provided by the underlying, lower layers, especially the Transport Layer which provides reliable or unreliable pipes to other processes.

Layer: 3 – Transport Layer

The Transport Layer performs host-to-host communications on either the same or different hosts and on either the local network or remote networks separated by routers. It provides a channel for the communication needs of applications. UDP is the basic transport layer protocol, providing an unreliable datagram service. The Transmission Control Protocol provides flow-control, connection establishment, and reliable transmission of data.

Layer: 2 – Network Layer / Internet Layer

The Internet layer has the task of exchanging datagrams across network boundaries. It provides a uniform networking interface that hides the actual topology (layout) of the underlying network connections. It is therefore also referred to as the layer that establishes internetworking, indeed, it defines and establishes the Internet. This layer defines the addressing and routing structures used for the TCP/IP protocol suite.

Layer: 1 – Link Layer

The Link layer defines the networking methods within the scope of the local network link on which hosts communicate without intervening routers. This layer includes the protocols used to describe the local network topology and the interfaces needed to effect transmission of Internet layer datagrams to next neighbour hosts.

Comparison b/w OSI Model and TCP/IP model:

Parameter	OSI Model	TCP/IP Model
Full form	OSI stands for Open Systems Interconnection.	TCP/IP stands for Transmission Control Protocol/Internet Protocol
Definition	It is a generic, protocol independent standard that serves as a communication gateway between the network and the end-user.	This is a protocol-dependent model that allows the connection of hosts over a network.
Number of layers	It has seven layers: 1. Physical 2. Data Link 3. Network 4. Transport 5. Session 6. Presentation 7. Application	It has four layers: 1. Network Access 2. Internet 3. Transport 4. Application
Reliability	It is less reliable.	TCP/IP is more reliable.
Protocol replacement	Protocols are easy to replace.	Protocols are not easy to replace.
Function	It offers standardization to different hardware devices, such as routers and switches.	It provides a connection between various computers but does not provide standardization to hardware devices.
Approach type	Follows a vertical approach.	Follows a horizontal approach.
Data link and physical layer	The data link layer and physical are separate.	The data link and physical layers are combined as a single host-to-network layer.
Service type	In the OSI model, the network layer provides connection-oriented and connectionless services.	In this model, the network layer provides only connectionless service.
Assurance	The transport layer provides a guarantee for the delivery of packets.	The transport layer in this model does not provide assurance delivery of packets.
Session and presentation layer	The session and presentation layers are separate.	The session and presentation layers are not segregated and are included in the application layer.
Minimum header size	The minimum header size is 5 bytes.	The minimum header size is 20 bytes.

4. Conclusion

The TCP/IP model is the backbone of real-world networking and the Internet. It is more practical and implementation-driven compared to the OSI model. With fewer layers and defined protocols like TCP, IP, HTTP, and FTP, it efficiently handles everything from data transmission to end-to-end communication. Its simplicity and effectiveness make it the go-to model in modern networking systems.

5. References

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