

Hello Everyone in this video you will learn about TCP/IP Protocol Suite.

TCP/IP is de-facto network reference model made up of interactive layers, each of which provides a specific functionality. It contains independent protocols that can be mixed and matched depending on the needs of the system.

TCP/IP protocol suite is defined using five layers Physical, Data Link, Network, Transport and Application Layer. Let's understand these layers and their functions one by one.

**Physical Layer.** Physical Layer is the first layer of the TCP/IP model. It deals with data in the form of bits. This layer mainly handles the host to host communication in the network. It defines the encoding techniques, transmission medium and mode of communication between two devices.

**Data-Link Layer.** Data Link Layer is the second layer of the TCP/IP protocol suite. It deals with data in the form of data frames. It performs physical addressing of the data packets by adding the source and the destination address known as MAC addresses to it. The data-link layer facilitates the delivery of frames within the same network

Data Link layer also provides **Flow Control** to prevent the faster sending node on one side of the link from

overwhelming the slow receiving node on another side of the link with large amount of data, more than its capacity. Error control in data link layer is the process of detecting and correcting data frames that have been corrupted or lost during transmission. In case of lost or corrupted frames, the receiver does not receive the correct data-frame and sender is ignorant about the loss, in absence of error control mechanism.

**Network Layer.** Network Layer is responsible for the transmission of the data between two devices on the different networks. It supports IP (Internet Protocol) for identifying the devices uniquely among the networks, which in turn uses 4 supporting protocols: ARP, DHCP, ICMP and IGMP. **Address Resolution Protocol (ARP)** is used to associate an IP address with the physical address, **Dynamic Host Configuration Protocol (DHCP)** , a network management protocol is used to dynamically assign the IP address and other information to each host on the network , **Internet Control Message Protocol (ICMP)** is used by hosts and gateways to send notification of communication problems back to the sender. And **Internet Group Message Protocol (IGMP)** is used to facilitate the simultaneous transmission of a message to a group of recipients Network layer also provides addressing, congestion control and routing services to the packets.

**Let's learn about IP address or** Internet Protocol addresses. These addresses are 32-bit number used to identify computing devices on a network. These addresses allow the devices to connect to each other and transfer data on a local network or over the internet. Each address is represented as a string of decimal numbers separated by dots. There are four numbers in total and each number can range between 0 and 255. An example of an IP address would be: 17.172.224.47.

Currently there are 2 versions of IP addresses, in use i.e. IPV4 and IPV6. **IPV4 (Internet Protocol Version 4) as discussed,** is the first version of Internet Protocol address. The address size of IPV4 is 32-bit number. There are 4,294,967,296 number of address still we are seeing a shortage in network addresses as the use of network & virtual devices are increasing rapidly. **IPV6 (Internet Protocol Version 6):** is the recent version of Internet Protocol address. The address size of IPV6 is 128-bit number It allows  $3.4 \times 10^{38}$  unique IP addresses which seems to be more than sufficient to support trillions of internet devices present now or coming in future.

Apart from addressing, Network layer also provides Congestion Control, a mechanism that controls the entry of data packets into the network, enabling a better use of a shared network infrastructure and avoiding congestive data losses. Routing is another very important function of network layer. In a network, there are multiple routes available from a source to a destination and one of them is

to be chosen. The network layer decides the optimal route to be taken. This is called as routing.

**Transport Layer.** The Transport layer is the fourth layer of the TCP/IP model. It deals with data in the form of data segments and is responsible for transporting data and setting up communication between the application layer and the lower layers. This layer facilitates the end-to-end communication and error-free delivery of the data. It also facilitates flow control between communicating processes, by specifying data rates. The transport layer also provides congestion control.

There are mainly two protocols used on transport layer. Transmission Control Protocol, TCP and User Datagram Protocol UDP. TCP provides reliable, ordered delivery of a stream of bytes from a program on one computer to another program on another computer and is used by many Internet applications such as the World Wide Web, email, remote administration and file transfer. It guarantees delivery of a data stream sent from one host to another without duplication or losing data.

**Another protocol User Datagram Protocol (UDP)** is a message-oriented protocol that provides a simple and unreliable, connectionless, unacknowledged service. It is suitable for applications that do not require TCP's sequencing, error control or flow control. It is used for transmitting a small amount of data where the speed of delivery is more important than the accuracy of delivery like the online video conferencing applications.

Application Layer is the top most layer of the TCP/IP model. This single layer performs all the operations of a session layer, presentation layer, and application layer of the OSI model. If the user wants to communicate with various networking systems, this layer combines the functions of interfacing with various applications like, data encoding, data translation etc. The important protocols working on this layer are DNS, FTP, HTTP, Telnet etc.

**Domain Name System (DNS)** is a hierarchical distributed naming system for computers, services, or any resource connected to the Internet or a private network. It translates domain names meaningful to humans into the numerical identifiers associated with networking equipment for the purpose of locating and addressing these devices worldwide.

Analogy to explain the Domain Name System is that it serves as the phone book for the Internet by translating human-friendly computer hostnames into IP addresses. For example, the domain name `www.example.com` may translates to the addresses `182.0.43.0` (IPv4) and `2620:0:2d0:200::10` (IPv6).

**Another protocol File Transfer Protocol (FTP)** is a standard network protocol used to transfer files from one host to another host over a TCP-based network, such as the Internet. It is often used to upload web pages and other documents from a private development machine to a public web-hosting server. FTP is built on a client-server architecture and uses separate control and data connections between the client and the server. **Telnet** is a

network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communications facility using a virtual terminal connection.

**Simple Mail Transfer Protocol (SMTP)** is an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (IP) networks. And **Simple Network Management Protocol (SNMP)** is an Internet-standard protocol for managing devices on IP networks. Devices that typically support SNMP include routers, switches, servers, workstations, printers, modem racks, and more.

The **Hypertext Transfer Protocol (HTTP)** is an application protocol used for accessing web pages. HTTP functions as a request-response protocol in the client-server computing model. The client submits an HTTP request message to the server while accessing a web page and the server, which stores content, or provides resources, such as HTML files, or performs other functions on behalf of the client, returns a response message to the client. A response contains completion status information about the request and may contain any content requested by the client in its message body.

Thank You.