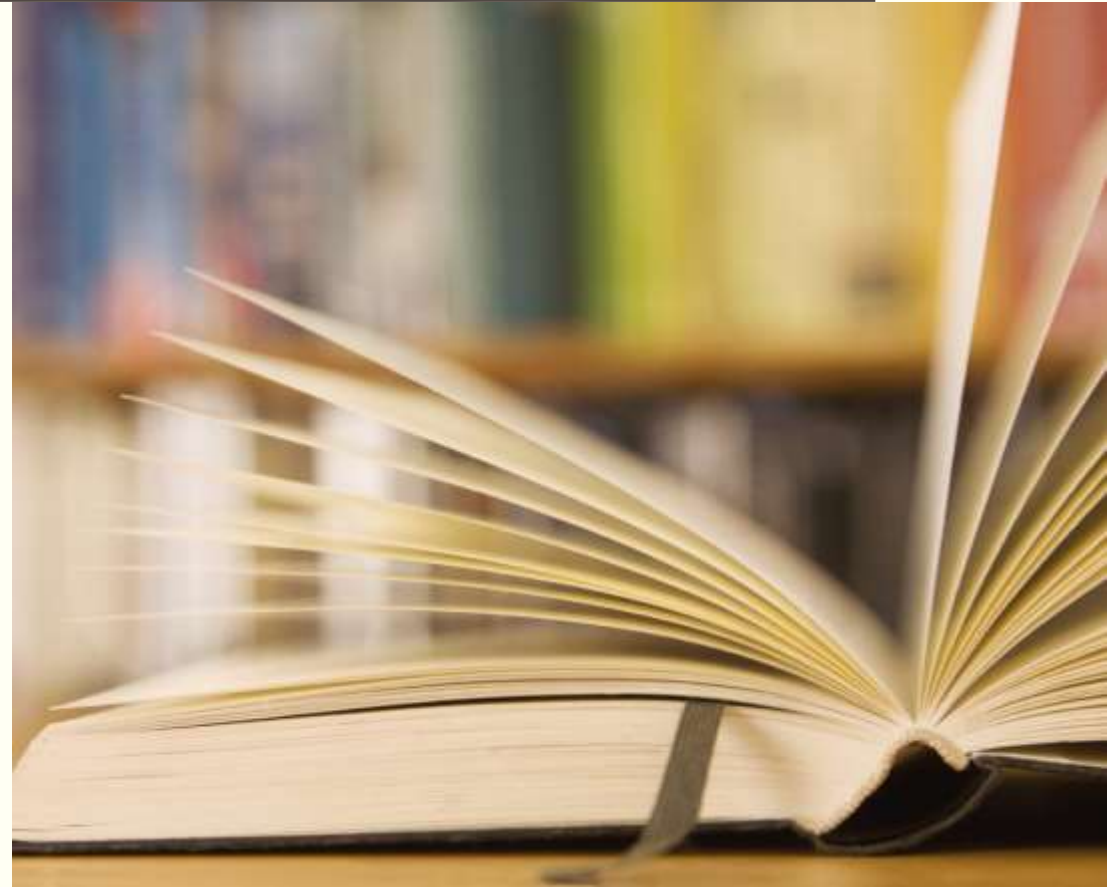# PROTOCOLS AND THE TCP/IP PROTOCOL SUITE

Made by Atharva Deshmukh

# CONTENT

1. History
2. TCP/IP Suite Layer
   a} Network Interface
   b} Internet Layer
   c} Transport Layer
   d} Application Layer
3.Comparison of OSI and IP

History Of TCP/IP Suite

- The **Transmission Control Protocol/ Internet Protocol** suite of protocol form the basis of the internet. It is TCP/IP that creates a virtual network when multiple computer networks are connected together. The TCP/IP networks was earlier known as ARPANET, but is now known as internet.
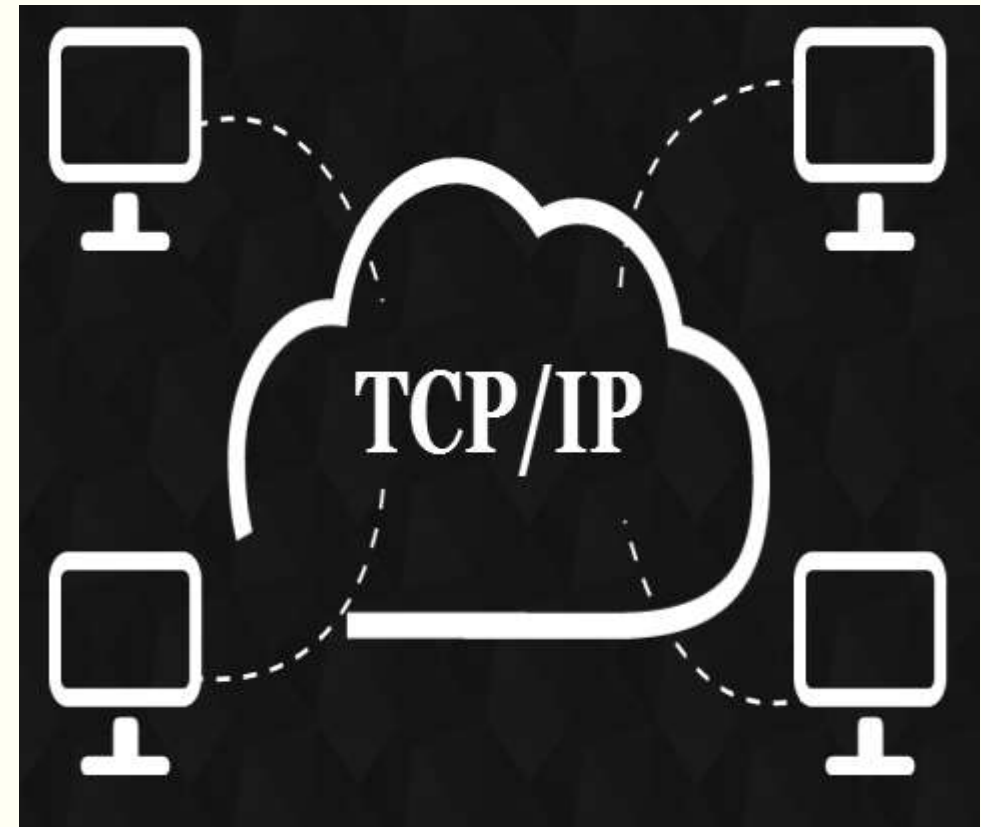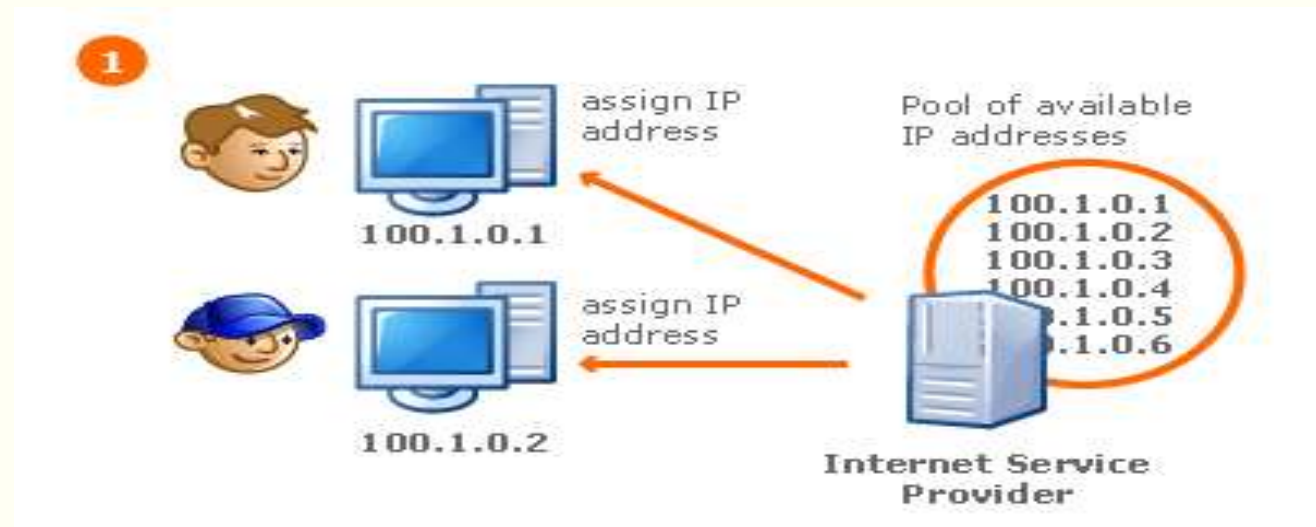
What is IP, Protocol?

Protocol: -
In information technology, a **protocol** is the special set of rules that end points in a telecommunication connection use when they communicate. Protocols specify interactions between the communicating entities.
IP: -
An Internet Protocol address (**IP** address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication.
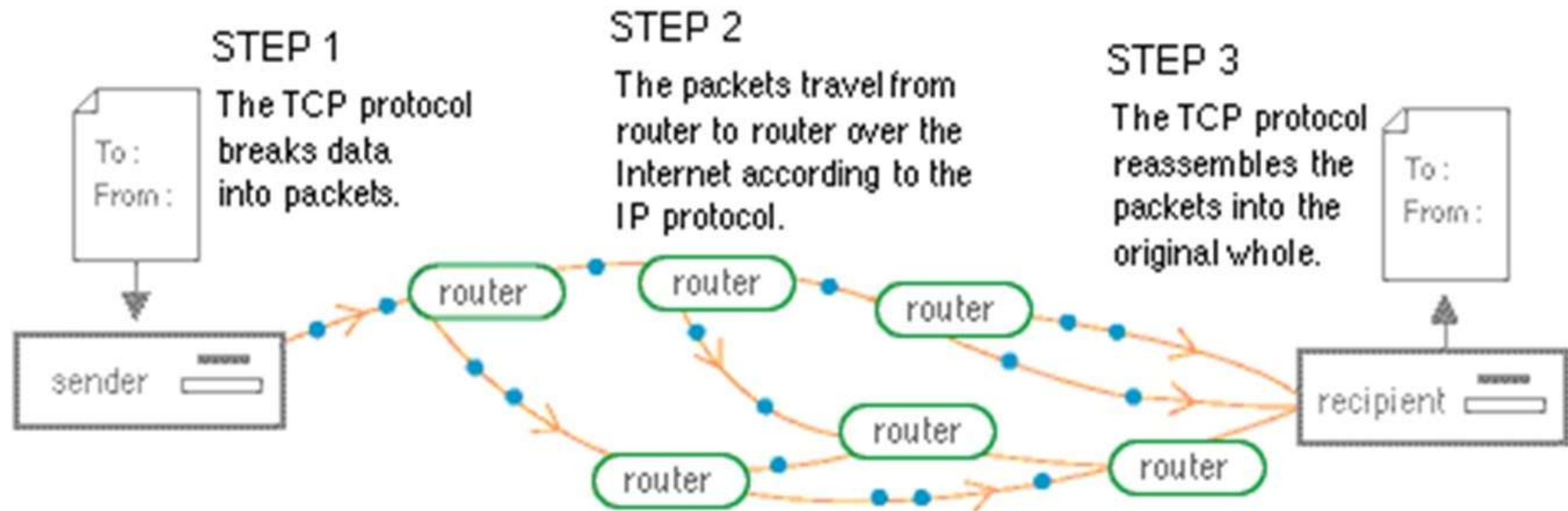
Working Of TCP/IP

How TCP/IP Works

STEP 1
The TCP protocol breaks data into packets.

STEP 2
The packets travel from router to router over the Internet according to the IP protocol.

STEP 3
The TCP protocol reassembles the packets into the original whole.

To :
From :

sender

router   router   router   router   router   router

recipient

To :
From :

Figure 2. How data travels over the Net.

TCP/IP Suite layer

## TCP/IP Suite consists of Four layer

Network Interface: - It include the function of physical layer and data link layer.

TCP/IP protocol suite includes Host-to-network layer protocols such as Serial Line internet protocol and point to point protocol

Internet Layer: - The internet layer is exactly same to the network layer of OSI model.

IP is the primary protocol operating at this layer and it provides data encapsulation routing, addressing and fragmentation services to the protocols at the transport layer above it.
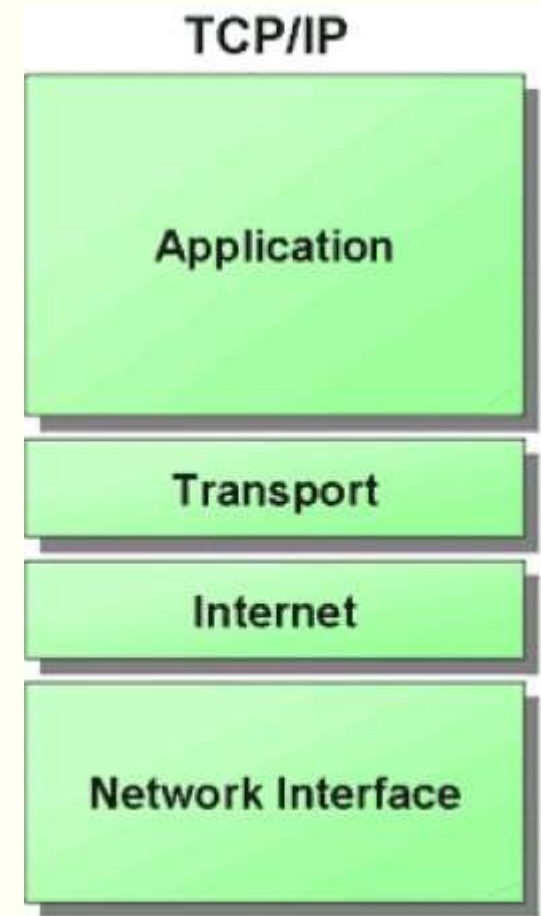
TCP/IP

| Application |
| Transport |
| Internet |
| Network Interface |
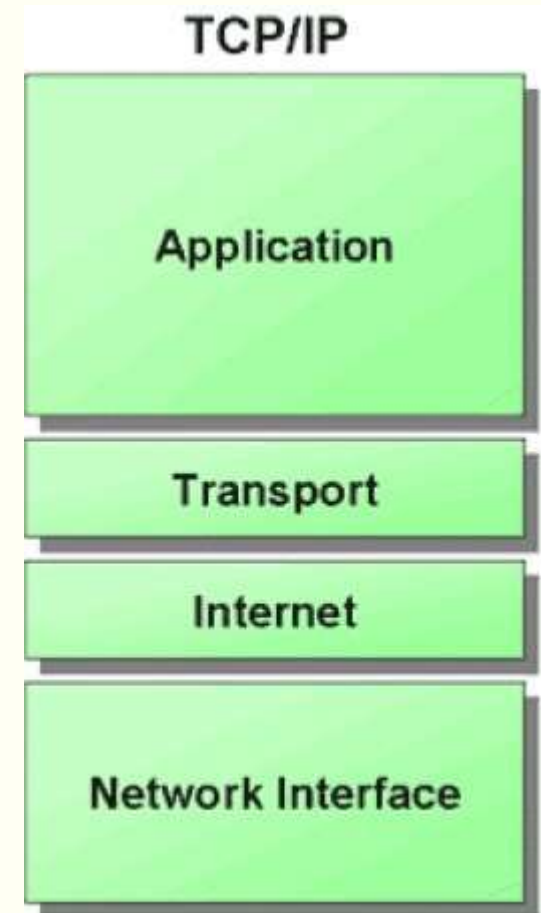
TCP/IP Suite layer

Transport Layer: - TCP/IP Suite includes two protocol at this layer, the transmission control protocol and the user datagram protocol
These protocol provides connection or connectionless data transfer services.

Application layer: - The TCP/IP protocol at the application layer can take different forms of Protocols, such as the File Transfer Protocol, Hypertext Transfer Protocol.

TCP/IP

| Application |
| Transport |
| Internet |
| Network Interface |

Network Interface Layer

- It is the bottom layer of TCP/IP Model lies below the Internet Layer.
- It is also known as Host To Network Layer
- Function of this layer is to connect the Host To Network & inform the upper layers so that they could start sending the data packets.
- This layer varies from network to network.
- Host To Network Layer protocols
  - SLIP(Serial Line IP)
 - PPP(Point To Point Protocol)

three important functions:
- *path determination*: route taken by packets from source to dest. (*Routing Algorithms*)
- *forwarding*: move packets from router's input to appropriate router output
- *call setup*: some network architectures require router call setup along path before data flows

Serial Line Internet Protocol

❖ Serial line Internet protocol is very simple and used to connect the workstation to internet over dial-up line using a modem.

❖ SLIP(Serial line Internet protocol) is not a standard protocol for carrying IP Packets over the a serial line between a home user and The ISP server. But , it has become popular because of its simplicity .

❖ The role of SLIP begins only when there is a proper connection between the two modem.
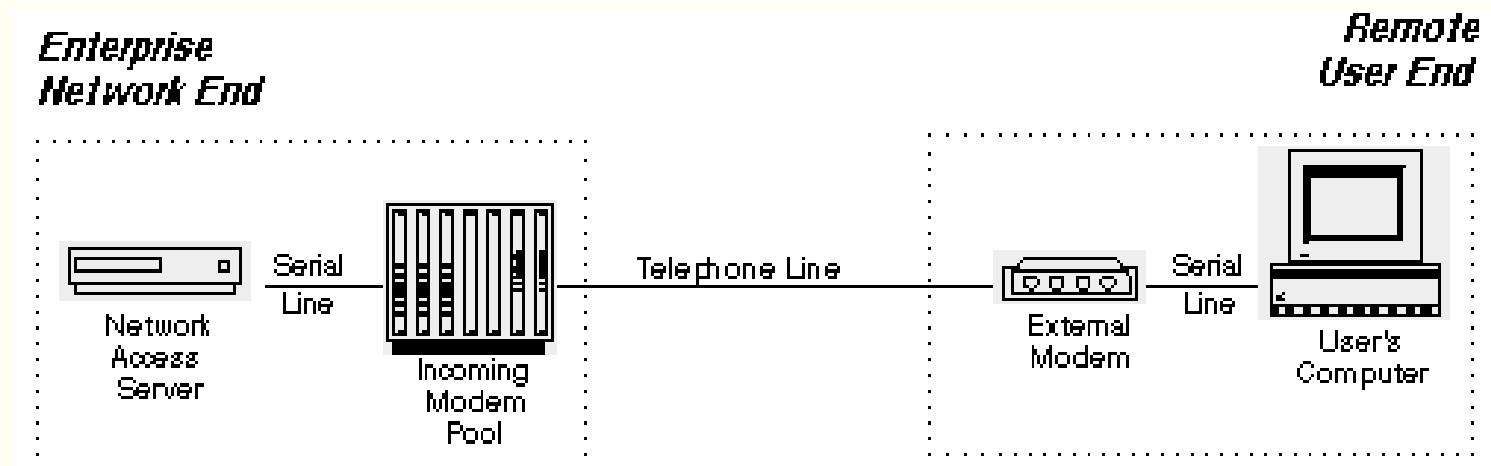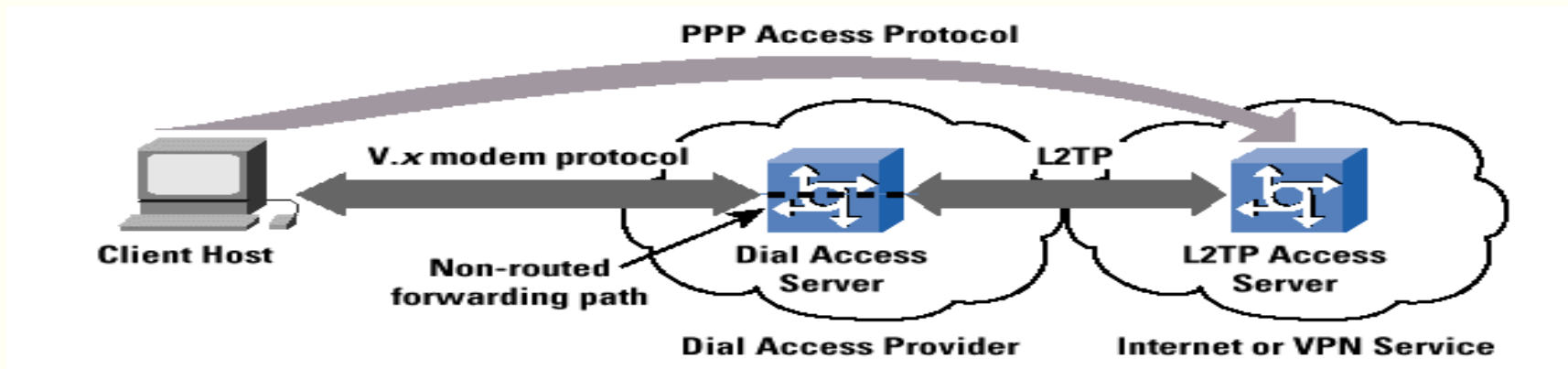
Problem with SLIP Protocol

- It is not an approved internet standard.
- It does not provide any authentication.
- SLIP provides no way for the two devices to communicate control information between them to manage the link.
- SLIP doesn't provide any way of detecting or correcting errors in transmissions.
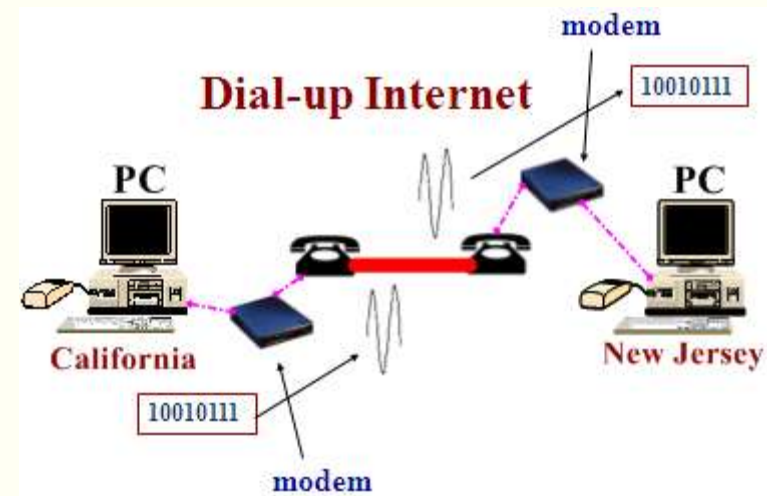
Point to Point Protocol (PPP)

❖ Point to Point Protocol is a data link layer Protocol.
❖ PPP is another examples of the evolving the nature of internet.
❖ It has become standard internet protocol for remote access, using dial-up connection.
❖ The basic Functionality of PPP is similar to the SLIP.
❖ It passes the and other packets in the form of frames between a client and ISP Server.
❖ PPP is more complex than SLIP.

PPP Access Protocol

V.x modem protocol   L2TP

Client Host

Non-routed forwarding path

Dial Access Server

L2TP Access Server

Dial Access Provider   Internet or VPN Service

PPP Set of Protocol Are as given below:

- Line control Protocol(LCP): - The Line control protocol is responsible for establishing , maintaining the connection between the Two end (Home User and the ISP)
- Password Authentication Protocol(PAP) : - password authentication protocol is used.
- Here the user must establish a proof of identity , so that he can connect to ISP.
- Network Control protocol (NCP): - Once the Authentication is done, PPP on the client side sends out a NCP packet. This packet tells the ISP server what kind of traffic is to be passed over this PPP link.
- IP Control Protocol (IPCP) : - the IP Control Protocol takes over. Here , actual IP packet are now exchanged. IPCP establishes the connection between the Host user and ISP.

Comparison between The SLIP And PPP

- Serial Line Internet Protocol
  - Older protocol
  - Require no addressing
  - No authentication
  - No error checking
  - Supports only IP
  - No compression is supported in original Version

- Point-to-Point Protocol
  - New protocol
  - Supports dynamic IP address assignment
  - LCP
  - Error checking
  - NCP , Carries multiple protocols: IP, IPX, AppleTalk, NetBIOS
 - Inherently supports compression

Internet Layer

The fives network layer protocol are as follows:-
1. ARP
2. RARP
3. IP
4. ICMP
5. IGMP

IP is an Important protocol in this layer.

ARP (Address resolution protocol)
✓ Every machine on internet has one address, these address cannot actually be used for sending packets data because data link layer does not understand the internet address.
✓ ARP Provides an essential services when TCP/IP is running in LAN.

IP Address

ARP
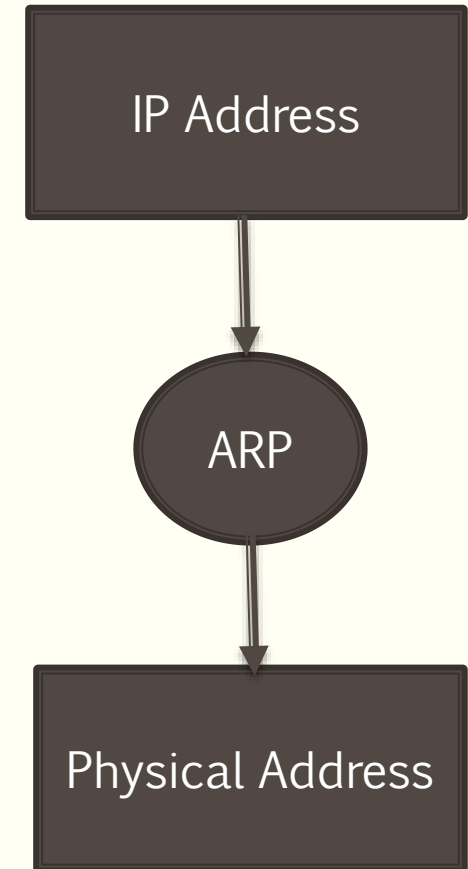
Physical Address

RARP (Reverse Address Resolution Protocol)

❖ The Reverse Address Resolution Protocol is used to obtain the IP address of a Host based on Its physical address. That is , it preform a job that is exactly opposite to that of ARP.

❖ RARP works in a very similar way to ARP. but in the exactly opposite direction , as shown in the side figure.

Note: - IP Address is a universally unique address and inter-networked address.

MAC Address is local address. It is unique locally but not universally.

Physical Address

RARP

IP Address
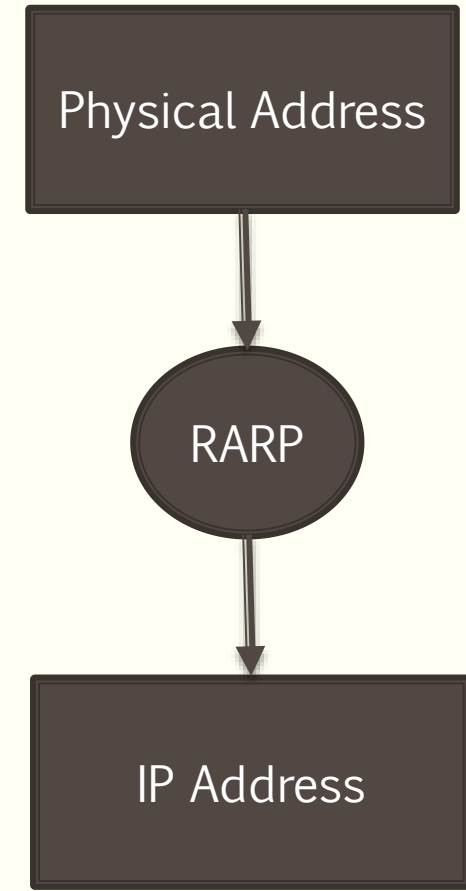
Internet Protocol (IP)

- Internet Protocol is very important protocol present in this network layer.
- IP is the protocol responsible for carrying data, generated by nearly all the other TCP/IP protocol, from the source system to its destination .

IP Features : -

    i.   Unreliable

               IP is unreliable , it means that it does not provide a guarantee that a datagram send from a source computer definitely will arrive at the destination.

    i.   Connectionless

               IP services is similar to the postal service. It is possible that the order in which the message are sent and the order in which they are received is different.
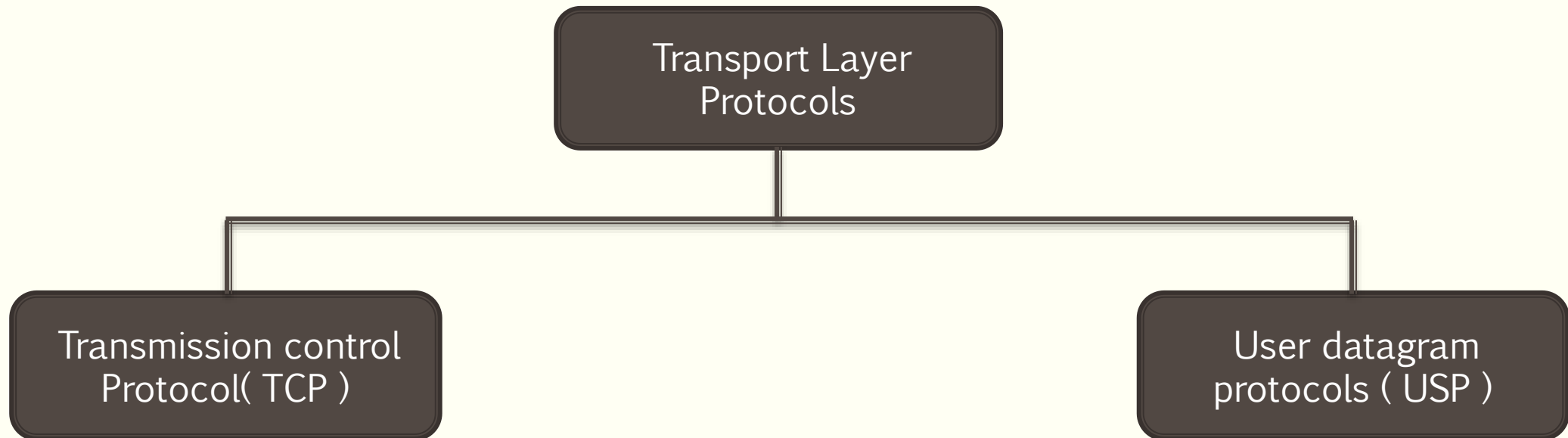
Difference Between IPv4 And IPv6

IPv4

IPv6

IPv4	IPv6
The Adress Space is 32 bits.	The space is 128 bits.
The length of header is 20 bytes	The length of header is 40
4 bytes for each adress in the header	16 bytes for each adressin the header
The number of Header field 12	The number of header field 8
Checksum field, used to measure error in the header,required	Chicksum field eliminated from header as error in the IP header are ot very crucial
Internet Protocol Security (IPSec) with repect to network security is optional	Internet Protocol Secuirty (IPSec) With respect to net work secuirty is mandatory
No identification to the packet flow (Lack of QoS handing).	The flow level field on the header portion identifies the packet flow and directs to router (Efficient QoS handling)
The Fargmentation is done both by sending host and routers	The framentation is done both by sending hoost; there is no role of the routers.
No identification to the packet flow (Lack of QoS handing).	The flow level field on the header portion identifies the packet flow and directs to router (Efficient QoS handling)
Clients have approach Dynamic Host Configuration server (DHCS) whenever they connect to an network.	Clients do not have to approach any such server as they are given permanent adresses.

Transport Layer (TCP and UDP)

➤ The transport layer runs on the top of internet layer and is mainly concerned with transport of packets from the source to the destination.

➤ The main function of transport layer is to deliver packets between the end points.

➤ In TCP/IP, the transport layer include to protocols : TCP and UDP.

```
                    ┌──────────────────────┐
                    │   Transport Layer     │
                    │     Protocols         │
                    └──────────┬───────────┘
              ┌────────────────┴────────────────┐
    ┌──────────────────────┐         ┌──────────────────────┐
    │ Transmission control │         │   User datagram       │
    │    Protocol( TCP )    │         │  protocols ( USP )    │
    └──────────────────────┘         └──────────────────────┘
```

Comparison between TCP And UDP

Parameter	UDP	TCP
Data Transfer	Data is sent in discrete packages by the application.	Data is sent by the application with no particular structure.
Transmission speed	Very High	High but not as high s UDP
Protocol connection setup	Connectionless	Connection oriented
Used	UDP is useful when speed of delivery is critical	TCP is useful for transmission of data without error.

Application Layer

❑ The TCP/IP Model Does Not have Session or presentation layer on the top of the transport layer.

❑ It is just has the application layer. It contains all higher level protocols.

❑ Higher Level Protocols Used in application layer are as Follows:

| Application	Description
DHCP	Dynamic Host Configuration Protocol assigns IP addresses
DNS	Domain Name System translates website names to IP addresses
HTTP	Hypertext Transfer Protocol used to transfer web pages
Telnet	Bi-directional text communication via a terminal application
SMTP	Simple Mail Transfer Protocol sends email messages

Types Of Protocol In application Layer

TELNET: - the virtual terminal protocol allows a user on one machine to log onto a distant machine and work there.

FTP: - File Transfer protocol provides a way to move data efficiently from one machine to another.

SMTP: - Simple mail transfer protocol developed for email transfer.

DNS: -Domain Name System Protocol is used for mapping the host names onto their network address.

HTTP: -hyper Text transfer Protocol is used for fetching pages on the world wide web (WWW) and many others.
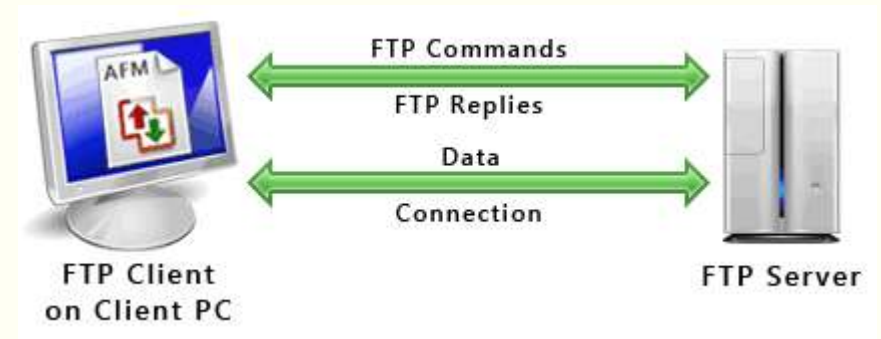
TCP/IP Reference Model

TCP/IP Layers	TCP/IP Prototocols				
Application Layer	HTTP	FTP	Telnet	SMTP	DNS
Transport Layer	TCP			UDP	
Network Layer	IP		ARP	ICMP	IGMP
Network Interface Layer	Ethernet		Token Ring		Other Link-Layer Protocols

Comparison Of OSI and TCP/IP

OSI	TCP/IP
Its has seven Layer	Its has four layer
Application Presentation Session Transport Network Data link Physical	Application Transport Internet Network Interface
It Supports both connection oriented and connectionless communication.	Its support only connectionless communication.
Transport layer provides connection oriented communication.	Transport layer provides connection oriented communication and connectionless.
Transport layer guarantees delivery of packets	Transport layer does not guarantees delivery of packets

END OF CHAPTER

Thank You