TCP/IP

Section B

History of TCP/IP

- The ARPANET was a research network sponsored by the DOD (U.S. Dept. of Defense). It eventually connected hundreds of universities and govt. institutes using leased telephone lines.
- When satellite & radio networks were added later, the existing protocols had trouble internetworking with them, so a new reference architecture was needed. Thus the ability to connect multiple networks together in a seamless way was one of the major design goals from the very beginning.
- This architecture later became known as the TCP/IP Reference Model, after its 2 primary protocols.

TCP/IP Reference Model

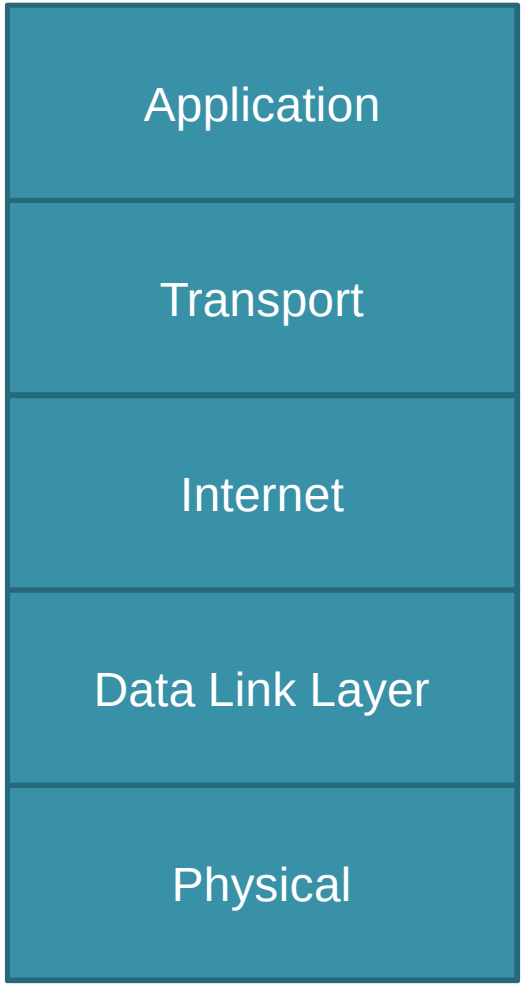
- The TCP/IP Reference model is a reference model used in the grandparent of all the computer networks, the ARPANET, & its successors, the world wide internet.

- The ability to connect multiple networks together in a seamless way was one of the major design goals of the TCP/IP Reference model.

What is TCP/IP?

- **TCP/IP is a set of protocols developed to allow cooperating computers to share resources across a network**
- **TCP stands for "Transmission Control Protocol"**
- **IP stands for "Internet Protocol"**
- **They are Transport layer and Network layer protocols respectively of the protocol suite**
- **The most well known network that adopted TCP/IP is Internet – the biggest WAN in the world**

TCP / IP



TCP/IP Reference Model

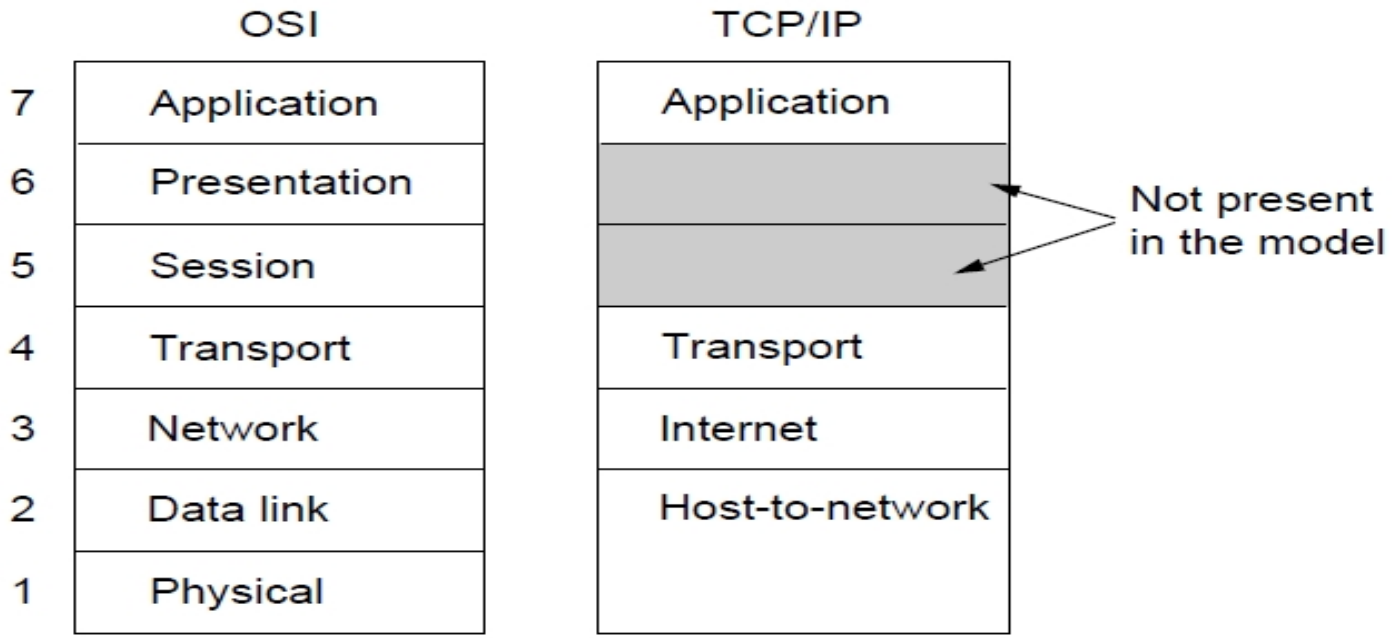


Fig. 1-21. The TCP/IP reference model.

What is a protocol?

- A protocol is a collection of rules and procedures for two computers to exchange information
- Protocol also defines the format of data that is being exchanged

The Internet Layer

- The job of the internet layer is to permit hosts to inject packets into any network and have them travel independently to the destination.
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- It provides only connectionless services between hosts.
- It defines an official packet format & protocol called Internet Protocol.
- The job of the internet layer is to deliver IP packets where they are supposed to go.
- Packet routing is a major issue another is Avoiding Congestion
- TCP/IP internet layer is very similar in functionality to the OSI network layer.
- TCP/IP supports the internetworking protocol (IP). IP in turn uses 4 supporting protocols: ARP, RARP, ICMP, IGMP.
- Internet layer ensure that every packet originated at the host will reach the destination.

•(ICMP)Internet Control Message Protocol :used to exchange error messages and (traffic) control messages

• (IGMP) Internet Group Management : used to administrate subscriptions , host groups and exchanging membership information with multicast routers

•(ARP) Address Resolution Protocol and its counterpart Reverse ARP (RARP) provide the conversion functions from IP to LAN address and vise versa respectively

The Transport Layer

- Transport layer is designed to allow peer entities on the source & destination hosts to carry on a conversation.
- 2 Protocols defined on this are:

  TCP

  UDP

Transport Layer (contd…)

TCP (Transmission Control Protocol)	UDP (User Datagram Protocol)
A reliable connection-oriented protocol that allows a byte stream on one machine to be delivered without any error on to other machine.	It is unreliable connectionless protocol for application that don't want packet sequencing or flow control & wish to provide their own.
It fragments incoming byte stream into discrete messages & passes each one on to the internet layer.	It is useful for client server type request reply queries & application in which prompt delivery is more important than accurate delivery like speech, video.
At the destination, receiving TCP process reassembles the received messages into the output stream.	
TCP also handles flow control to make sure that a fast sender can't swamp a slow receiver with more messages than it can handle.	

Transport Layer (contd…)

- **Protocols :**

1. TCP
2. UDP
3. SCTP (stream control transmission protocol)

SCTP : Provides some of the same service features of both (TCP &UDP), ensuring reliable, in-sequence transport of messages with congestion control.

The Application Layer

- It contains all the higher-level protocols.
- They include:

1. Virtual terminal (TELNET)- allows a user on one machine to log into a distant machine & work there.
2. File Transfer (FTP)- provides a way to move data efficiently from one machine to another.
3. Electronic Mail (SMTP)
4. Domain Name Service (DNS)- used for mapping host names onto their network addresses.
5. HTTP- used for moving new articles around
6. NNTP- used for fetching pages on the www.

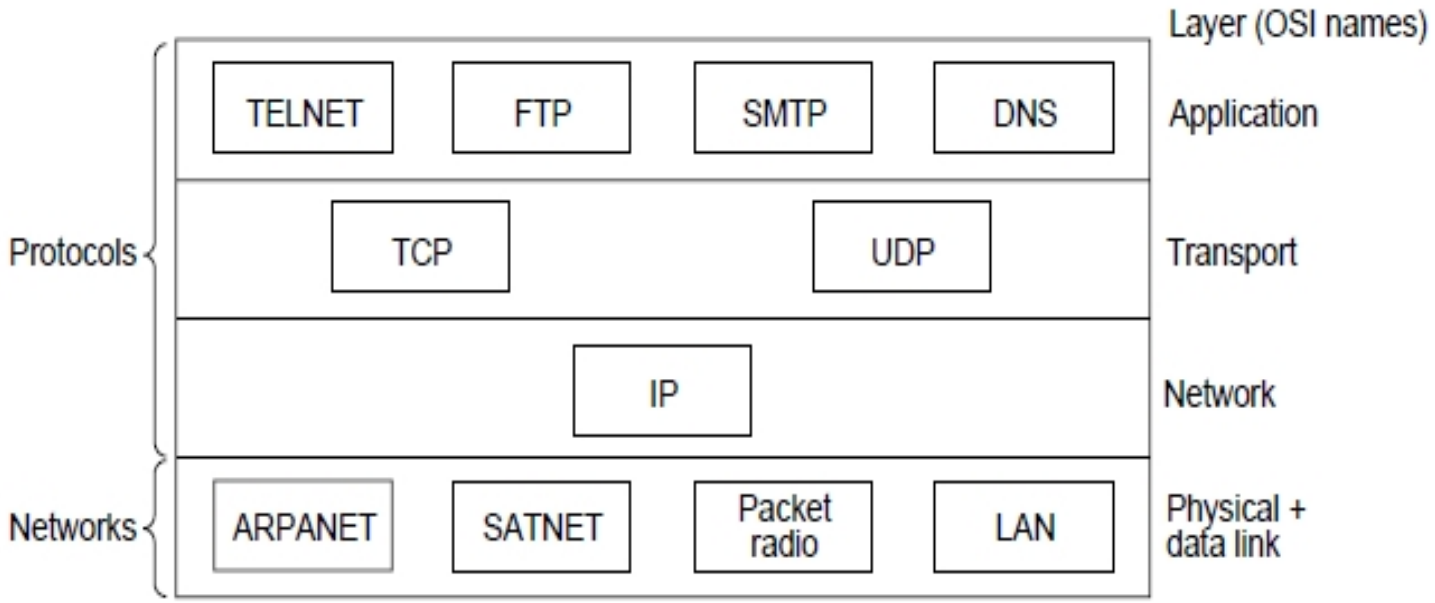

Fig. 1-22. Protocols and networks in the TCP/IP model initially.

The Host-to-Network Layer (Physical + Data link Layers)

- In this, the host has to connect to the network using some protocol, so it can send IP packets over it.
- This protocol isn't defined & varies from host to host & network to network.
- It doesn't define nay specific protocol. It supports all the standard & proprietary protocols.

Difference between OSI & TCP/IP

TCP/IP	OSI
It is a basic communication language or protocol of the internet developed by U.S. Dept. of Defense, ARPANET for 'transporting application data over local and wide area networks'.	It is a standard developed by the ISO for 'how messages should be transmitted b/w any 2 points in a telecommunication n/w.
It doesn't clearly distinguish b/w service, interface & protocol.	It distinguish the service, interface and protocols at different layers.
The protocols aren't hidden	Protocols are better hidden than in TCP/IP model and can be changed/replaced as the technology changes.
These are specific models where protocol come first and model is just a description of the existing protocol.	It was designed before the protocol were invented. This means the model was biased towards any specific protocol or a set of protocols.
TCP/IP model has 4 layers	OSI model has 7 layers.
TCP/IP model has only one mode in the network layer (connectionless), but supports both modes in the transport layer, giving the users a choice.	OSI model supports both connectionless and connection oriented communication in the network layer, but only connection oriented communication in the transport layer, where it counts.

Application

- TCP/IP model is the practically used model for data communication over networks
- TCP/IP model is also applicable in wireless networks
- Latest IP protocol IPv6 is having such a strength that it can connect all the electronics devices supporting TCP/IP over network not only mobile , laptops, desktops or PDA's. A number of different devices can now support TCP/IP communication.

Scope of Research

- Mobility support in TCP/IP
- Adhoc networks
- Security in IPv6