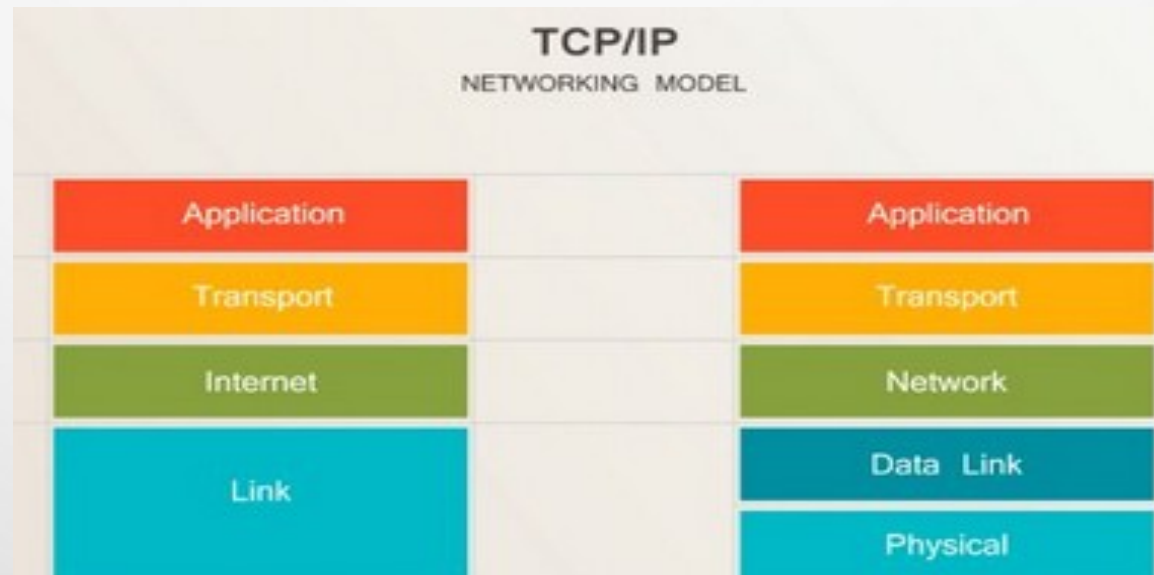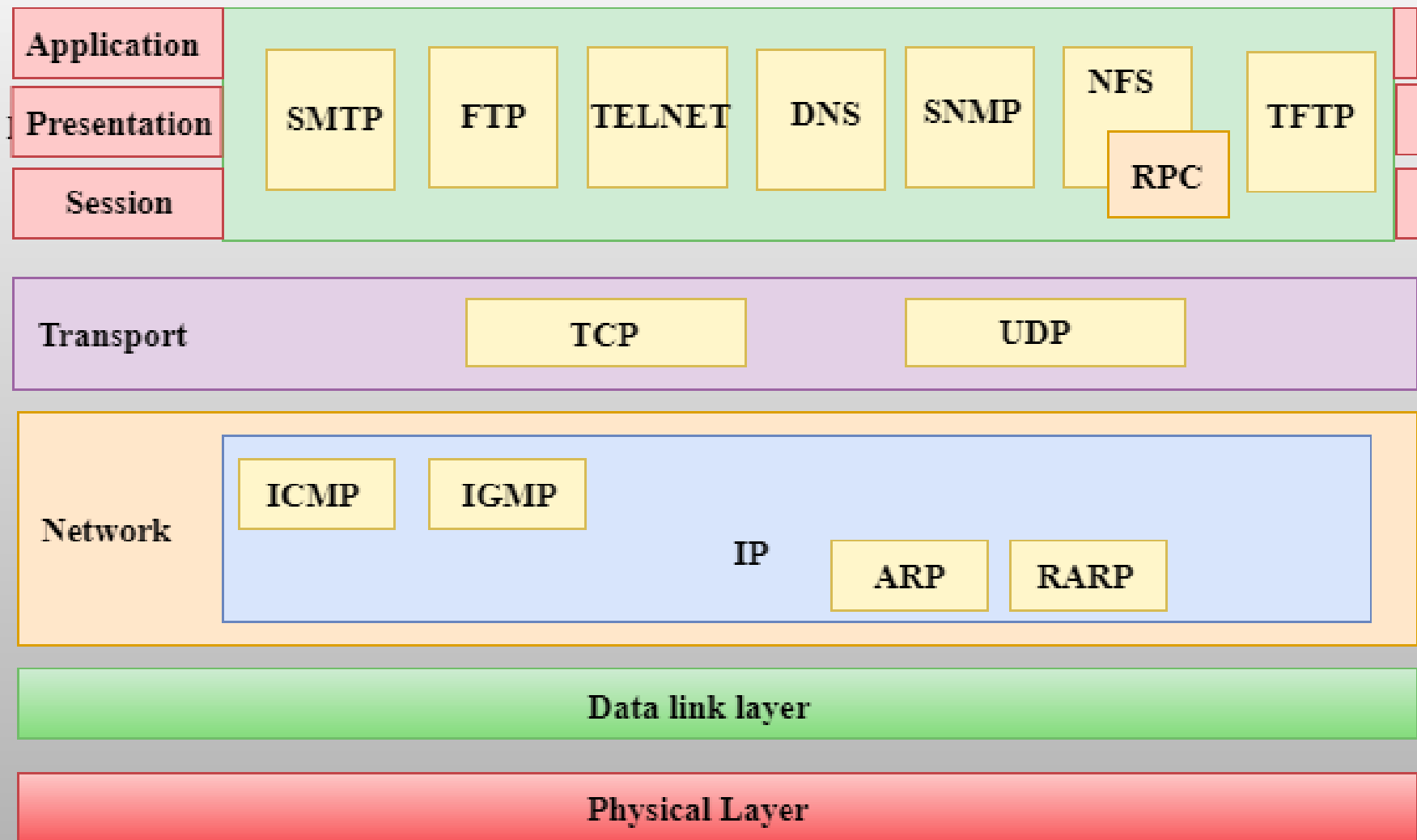# TCP/IP

- Designed and developed by Department of Defense (DoD) in 1960s and is based on standard protocols.
- **Transmission Control Protocol/Internet Protocol.**
- The TCP/IP model was developed prior to the OSI model.
- The TCP/IP model is not exactly similar to the OSI model.
- The TCP/IP model consists of five layers: **the application layer, transport layer, network layer, link layer(data link layer and physical layer).**

TCP/IP
NETWORKING MODEL

Application		Application
Transport		Transport
Internet		Network
Link		Data Link
		Physical

TCP/IP

| Application / Presentation / Session | SMTP | FTP | TELNET | DNS | SNMP | NFS RPC | TFTP |

Transport: TCP, UDP

Network: ICMP, IGMP, IP, ARP, RARP

Data link layer

Physical Layer

Application Layer

Application Layer protocol:-
 1. TELNET:
- Telnet stands for the TELecomunications NETwork.
- It helps in terminal emulation.
- It allows Telnet client to access the resources of the Telnet server.
- It is used for managing the files on the internet.
- It is used for initial set up of devices like switches.
- The telnet command is a command that uses the Telnet protocol to communicate with a remote device or system.
- Port number of telnet is 23.

Application Layer

Application Layer protocol:-
2. SMTP
- It stands for Simple Mail Transfer Protocol.
- It is a part of the TCP/IP protocol.
- Using a process called "store and forward," SMTP moves your email on and across networks.
- It works closely with something called the Mail Transfer Agent (MTA) to send your communication to the right computer and email inbox.
- Port number for SMTP is 25.

Application Layer

Application Layer protocol:-

3. FTP
- FTP stands for file transfer protocol.
- It is the protocol that actually lets us transfer files.
- It can facilitate this between any two machines using it.
- But FTP is not just a protocol but it is also a program.
- FTP promotes sharing of files via remote computers with reliable and efficient data transfer.
- Port number for FTP is 20 for data and 21 for control.

Application Layer

- Application Layer protocol:-
4. HTTP

- HTTP is a protocol used mainly to access data on the www.
- The Hypertext Transfer Protocol (HTTP) the Web's main application-layer protocol although current browsers can access other types of servers
- A respository of information spread all over the world and linked together.
- The HTIP protocol transfer data in the form of plain text, hyper text, audio, video and so on.
- HTTP utilizes TCP connections to send client requests and server replies.
- it is a synchronous protocol which works by making both persistent and non persistent connections.

Application Layer

- Application Layer protocol:-
5. TFTP

- The Trivial File Transfer Protocol (TFTP) is the stripped-down, stock version of FTP, but it's the protocol of choice if you know exactly what you want and where to find it.
- It's a technology for transferring files between network devices and is a simplified version of FTP

Application Layer

- Application Layer protocol:-
6. IP-RTP

- The Real-time Transport Protocol is a network protocol for delivering audio and video over IP networks.
- RTP is used in communication and entertainment systems that involve streaming media, such as telephony, video teleconference applications including WebRTC, television services and web-based push-to-talk features

Transport Layer

- Layer 3 or the Network layer uses IP or Internet Protocol which being a connection less protocol treats every packet individually and separately leading to lack of reliability during a transmission.
- For example, when data is sent from one host to another, each packet may take a different path even if it belongs to the same session.
- This means the packets may/may not arrive in the right order.
- Therefore, IP relies on the higher layer protocols to provide reliability.

Transport Layer

- Transport Layer Protocols :

1) TCP (Transmission Control Protocol):

- TCP is a layer 4 protocol which provides acknowledgement of the received packets and is also reliable as it resends the lost packets.
- It is better than UDP but due to these features it has an additional overhead. It is used by application protocols like HTTP and FTP.

2) UDP (User Datagram Protocol):

- UDP is also a layer 4 protocol but unlike TCP it doesn't provide acknowledgement of the sent packets.
- Therefore, it isn't reliable and depends on the higher layer protocols for the same.
- But on the other hand it is simple, scalable and comes with lesser overhead as compared to TCP.
- It is used in video and voice streaming.

TCP/IP – Network / Internet layer

- **Network/Internet Layer:**
- The main responsibility of the internet layer is to send the packets from any network, and they arrive at the destination irrespective of the route they take.
- This layer is concerned with the format of datagrams as defined in the **Internet Protocol(IP).**
- **This layer is responsible for actual routing of datagrams.**
- The **IP** portion of the **TCP/IP suite** deals with this layer.
- It routes and forward a datagrams to the next node but it is not resposible for the accurate and timely delivery of all the datagrams to the destination in a proper sequence.
- Some other protocols in this layer **ARP(Address Resolution Protocol), RARP(Reverse Address Resolution Protocol) and ICMP(Internet Control Message Protocol).**

TCP/IP
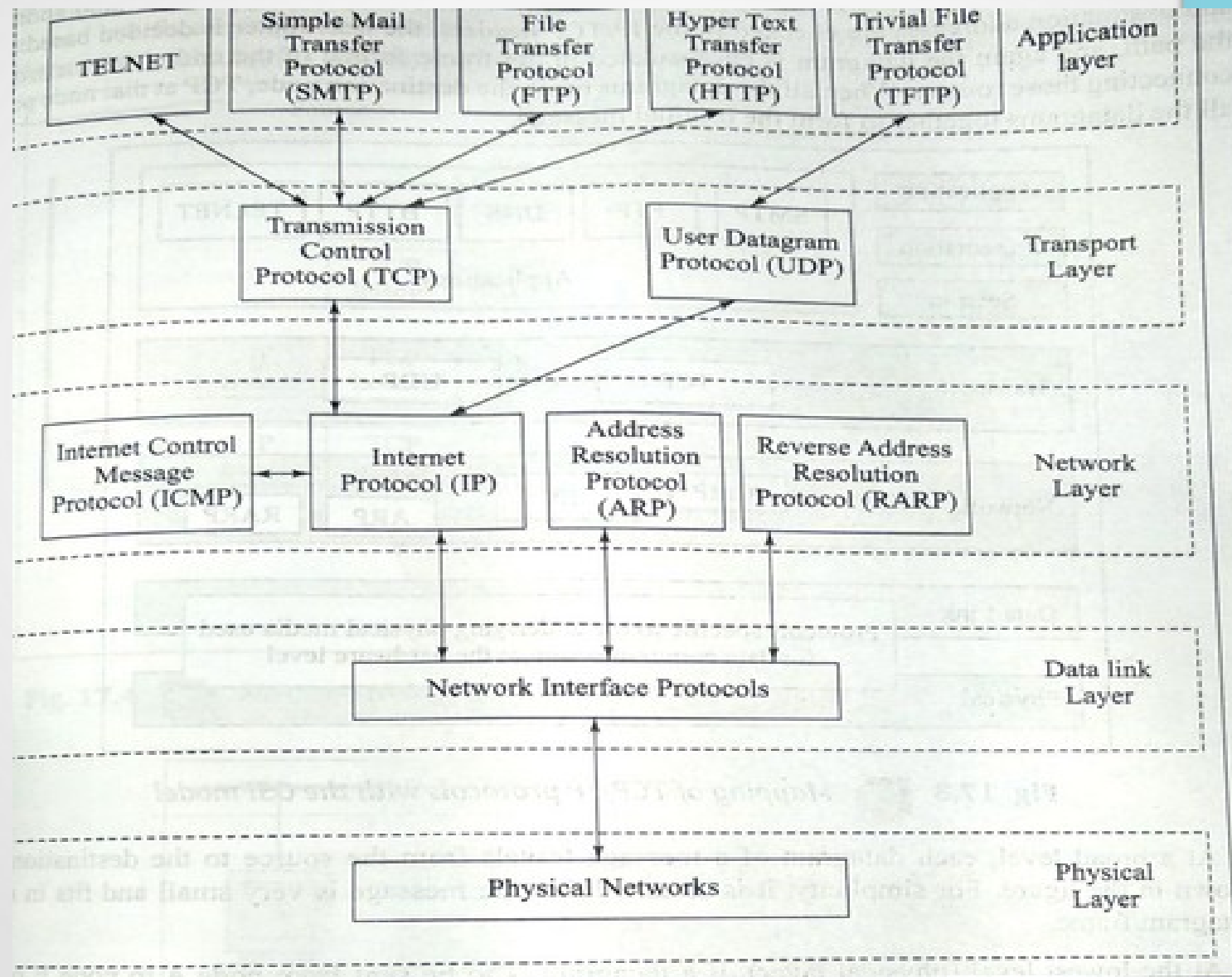
TCP/IP – Protocol Suite

- **Internetworking Protocol (IP)**
  - The Internetworking Protocol (IP) is the transmission mechanism used by the TCP/IP protocols.
  - It is an unreliable and connectionless protocol-a best-effort delivery service.
  - IP transports data in packets called datagrams.
- **Address Resolution Protocol**
 - The Address Resolution Protocol (ARP) is used to associate a logical address with a physical address
- **Reverse Address Resolution Protocol**
  - The Reverse Address Resolution Protocol (RARP) allows a host to discover its Internet address when it knows only its physical address
- **Internet Control Message Protocol**
  - The Internet Control Message Protocol (ICMP) is a mechanism used by hosts and gateways to send notification of datagram problems back to the sender.
  - ICMP sends query and error reporting messages.

TCP/IP – Protocol Suite
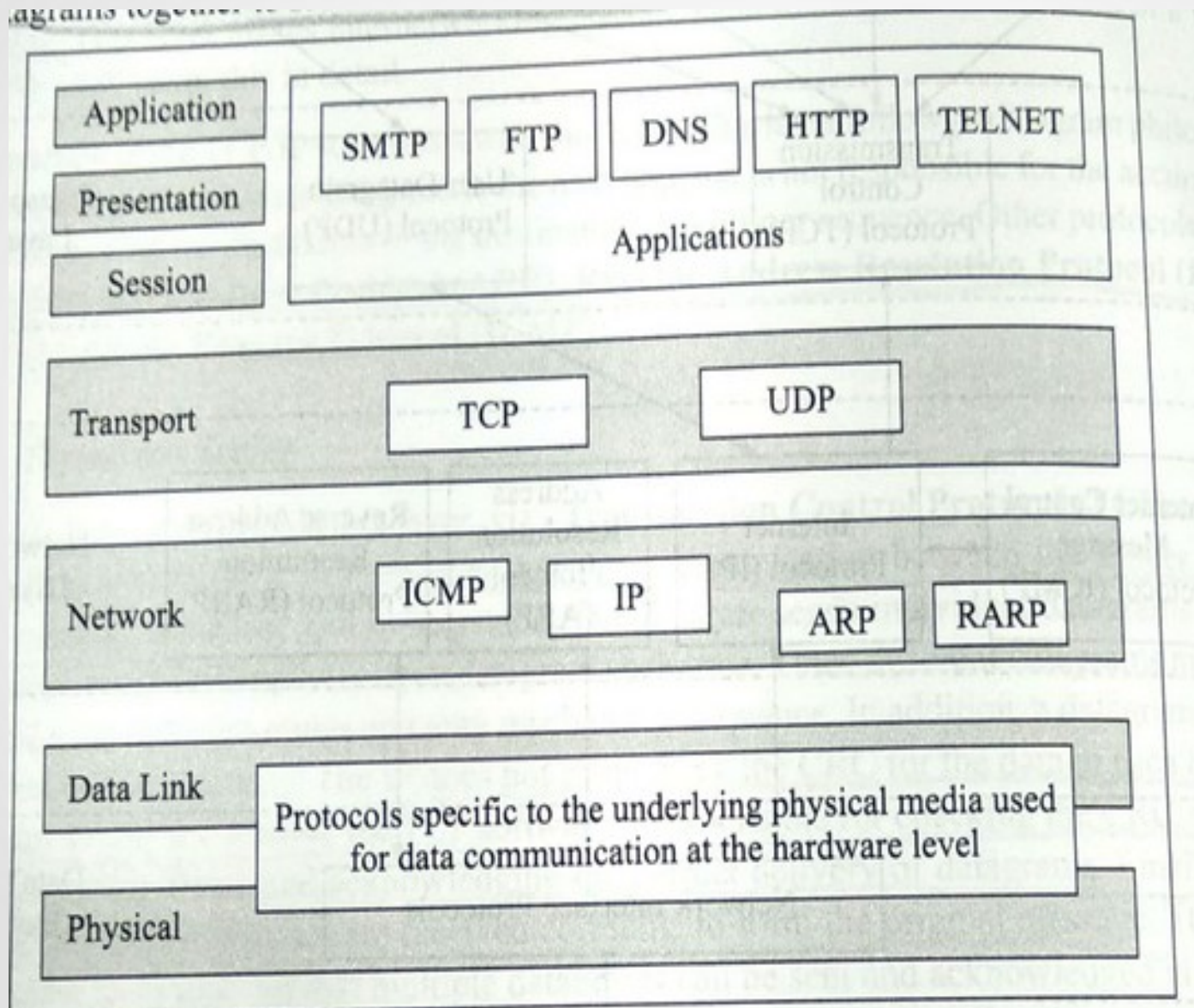
TCP/IP – Link layer

- **Link Layer:(Physical layer/ Datalink layer)**
  - A network layer is the lowest layer of the TCP/IP model.
  - A network layer is the combination of the Physical layer and Data Link layer defined in the OSI reference model.
  - It defines how the data should be sent physically through the network.
  - This layer is mainly responsible for the transmission of the data between two devices on the same network.
  - It covers MAC(Media Access Control) i.e. who can send data and when, etc.
  - The protocols used by this layer are ethernet, token ring, FDDI, X.25, frame relay.