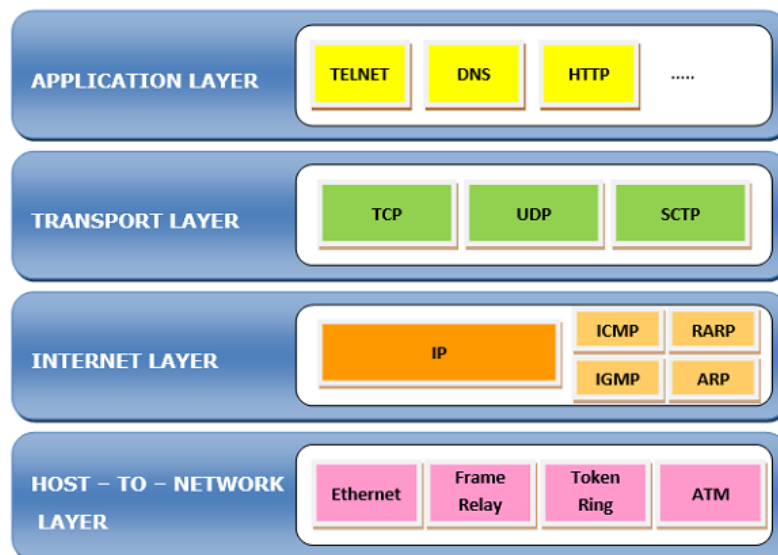
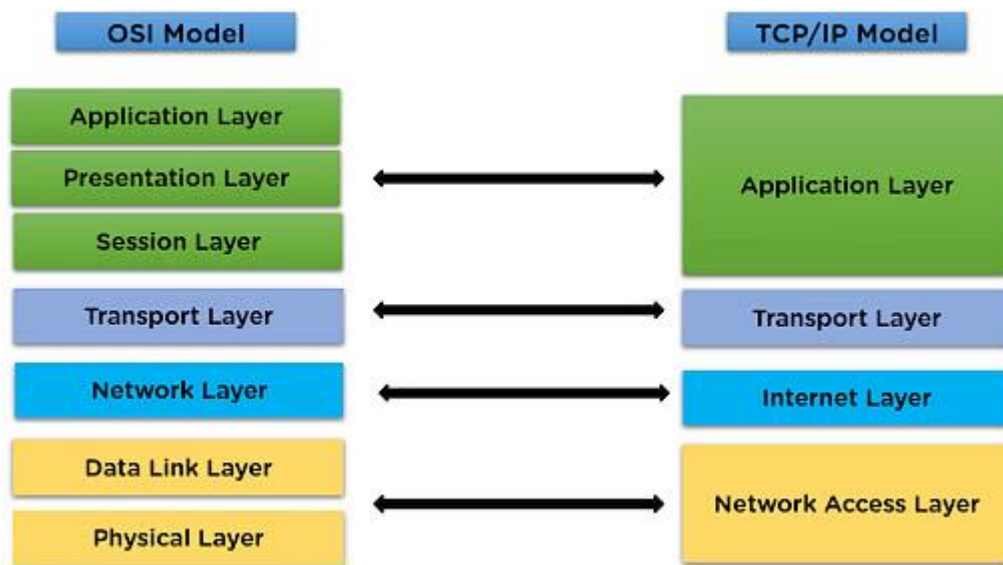


# TCP / IP Reference Model

The Defence Advanced Research Projects Agency, the research branch of the U.S. Department of defence, created the TCP/IP model in the 1970s for use in ARPANET, a wide area network that preceded the internet.

- ✓ The TCP/IP model was developed prior to the OSI model and its not exactly similar to the OSI model.
- ✓ The TCP/IP model consists of four layers: the application layer, transport layer, Internet layer, Network Access Layer (Host To Network layer).
- ✓ TCP/IP is a hierarchical protocol made up of interactive modules, and each of them provides specific functionality.



## 1. Network Access Layer (Host To Network Layer)

- A network layer is the lowest layer of the TCP/IP model and 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 and responsible for the transmission of the data between two devices on the same network.

- The functions carried out by this layer are encapsulating the IP datagram into frames transmitted by the network and mapping of IP addresses into physical addresses.
- The protocols used by this layer are ethernet, token ring, FDDI, X.25, frame relay.

## 2. Internet Layer

- An internet layer is the second layer of the TCP/IP model and also known as the network 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.

**Following are the protocols used in this layer are:**

### 2.1 IP Protocol:

- **IP Addressing:** This protocol implements logical host addresses known as IP addresses. The IP addresses are used by the internet and higher layers to identify the device and to provide internetwork routing.
- **Host-to-host communication:** It determines the path through which the data is to be transmitted.
- **Data Encapsulation and Formatting:** An IP protocol accepts the data from the transport layer protocol. An IP protocol ensures that the data is sent and received securely, it encapsulates the data into message known as IP datagram.
- **Fragmentation and Reassembly:** The limit imposed on the size of the IP datagram by data link layer protocol is known as Maximum Transmission unit (MTU). If the size of IP datagram is greater than the MTU unit, then the IP protocol splits the datagram into smaller units so that they can travel over the local network. Fragmentation can be done by the sender or intermediate router. At the receiver side, all the fragments are reassembled to form an original message.
- **Routing:** When IP datagram is sent over the same local network such as LAN, MAN, WAN, it is known as direct delivery. When source and destination are on the distant network, then the IP datagram is sent indirectly. This can be accomplished by routing the IP datagram through various devices such as routers.

### 2.2 ARP Protocol

ARP stands for **Address Resolution Protocol** and used to find the physical address from the IP address.

### 2.3 ICMP Protocol

**ICMP** stands for Internet Control Message Protocol and used by the hosts or routers to send notifications regarding datagram problems back to the sender.

### 3. Transport Layer

The transport layer is responsible for the reliability, flow control, and correction of data which is being sent over the network. This layer is similar to the transport layer of the OSI model.

The main protocols of this layer are:

**TCP** - It stands for Transmission Control Protocol. It is a connection-oriented protocol and provides reliable communication and error-free delivery of data from the source to the destination host. It is optimized for accurate delivery than timely delivery. It is used by many internet applications including World Wide Web(WWW), email.

**UDP** - It stands for User Datagram Protocol. It provides simple, cost-effective but unreliable service. It prioritizes speed over the accuracy of delivery.

### 4. Application Layer

An application layer is the topmost layer in the TCP/IP model and responsible for handling high-level protocols, issues of representation. This layer allows the user to interact with the application.

Following are the main protocols used in the application layer:

- **HTTP:** HTTP stands for Hypertext transfer protocol. This protocol allows us to access the data over the world wide web. It transfers the data in the form of plain text, audio, video.
- **SNMP:** SNMP stands for Simple Network Management Protocol. It is a framework used for managing the devices on the internet by using the TCP/IP protocol suite.
- **SMTP:** SMTP stands for Simple mail transfer protocol.
- **DNS:** DNS stands for Domain Name System. An IP address is used to identify the connection of a host to the internet uniquely. But, people prefer to use the names instead of addresses. Therefore, the system that maps the name to the address is known as Domain Name System.
- **TELNET:** It is an abbreviation for Terminal Network. It establishes the connection between the local computer and remote computer in such a way that the local terminal appears to be a terminal at the remote system.
- **FTP:** FTP stands for File Transfer Protocol. FTP is a standard internet protocol used for transmitting the files from one computer to another computer.