

TCP/IP model

The TCP/IP model is a conceptual framework used to understand and implement network protocols and communications over the Internet and other networks. It stands for Transmission Control Protocol/Internet Protocol, and it is often compared to the OSI model, which has a more detailed seven-layer structure. The TCP/IP model, however, is more streamlined and practical for real-world networking. It consists of four layers, each serving specific functions:

1. Link Layer (Network Interface Layer)

- **Function:** This layer handles the physical and data link aspects of network communication. It is responsible for defining how data is formatted for transmission and how devices on the same network segment communicate with each other.
- **Key Protocols:**
 - **Ethernet:** Used in local area networks (LANs) for wired connections.
 - **Wi-Fi:** Used for wireless local area networks.
 - **ARP (Address Resolution Protocol):** Maps IP addresses to MAC addresses.

2. Internet Layer

- **Function:** This layer is responsible for addressing, routing, and packaging data for delivery across network boundaries. It manages the movement of packets from the source to the destination across different networks.
- **Key Protocols:**
 - **IP (Internet Protocol):** Handles addressing and

routing. Includes IPv4 and IPv6.

- **ICMP (Internet Control Message Protocol):** Used for error reporting and diagnostic functions, such as the «ping» command.
- **IGMP (Internet Group Management Protocol):** Manages multicast group memberships.

3. Transport Layer

- **Function:** This layer provides end-to-end communication services for applications. It ensures data is transferred reliably and in the correct order, or in some cases, it provides a connectionless service.
- **Key Protocols:**
 - **TCP (Transmission Control Protocol):** Provides reliable, connection-oriented communication with error checking and flow control.
 - **UDP (User Datagram Protocol):** Provides connectionless communication with minimal overhead, suitable for applications where speed is crucial and occasional data loss is acceptable, such as video streaming and online gaming.

4. Application Layer

- **Function:** This layer provides network services directly to end-user applications. It defines the protocols and standards used by applications to communicate over the network.
- **Key Protocols:**
 - **HTTP (Hypertext Transfer Protocol):** Used for transferring web pages and web resources.

- **FTP (File Transfer Protocol):** Used for transferring files between client and server.
- **SMTP (Simple Mail Transfer Protocol):** Used for sending emails.
- **DNS (Domain Name System):** Resolves domain names to IP addresses.
- **POP3/IMAP (Post Office Protocol 3/Internet Message Access Protocol):** Used for retrieving emails from a server.

Key Differences from the OSI Model:

- **Layer Count:** The TCP/IP model has four layers, whereas the OSI model has seven.
- **Combining Layers:** The TCP/IP model combines the functionalities of several OSI layers into a single layer. For instance, the Link layer in TCP/IP includes the functionalities of both the Data Link and Physical layers in OSI.
- **Practical Orientation:** The TCP/IP model is more closely aligned with practical implementations and is the basis for most modern networking protocols and the Internet.