

Layer 1: Physical Layer

This layer doesn't have protocols as it deals with the physical transmission of bits over a medium. Instead, it defines hardware standards for things like electrical signals, cabling, and connectors.

Layer 2: Data Link Layer

1. Ethernet (IEEE 802.3)

Action: Provides a method for devices in the same network to communicate using MAC addresses. Frames data for transmission and handles error detection.

Example: When your computer connects to a local area network (LAN), Ethernet is used to transmit frames between your computer and the network switch.

2. ARP (Address Resolution Protocol)

Action: Resolves IP addresses to MAC addresses so that data can be sent on a local network.

Example: When you send data to another device on the same network, ARP maps the device's IP address to its physical MAC address so it can receive the data.

3. PPP (Point-to-Point Protocol)

Action: Used for direct communication between two network nodes, often in WAN links. Handles authentication, encryption, and compression.

Example: Dial-up internet connections use PPP to communicate between a modem and an Internet Service Provider (ISP).

Layer 3: Network Layer

1. IP (Internet Protocol)

Action: Routes packets across different networks. It assigns IP addresses and determines the best path for data.

Example: When you access a website, IP routes your request from your computer to the server hosting the website, often across multiple networks.

2. ICMP (Internet Control Message Protocol)

Action: Sends error messages and operational information (e.g., whether a service is reachable).

Example: When you use the `ping` command to check if a server is reachable, ICMP is used to send echo requests and replies.

3. OSPF (Open Shortest Path First)

Action: A routing protocol that determines the best path for data based on the shortest path.

Example: In large enterprise networks, OSPF is used to ensure that data takes the most efficient route between routers.

4. RIP (Routing Information Protocol)

Action: A simple routing protocol that routes data by hop count.

Example: RIP might be used in a small network to route data between different subnets, though it's less common today due to its simplicity and limitations.

5. BGP (Border Gateway Protocol)

Action: Routes data between autonomous systems (different networks, typically used by ISPs) on the Internet.

Example: BGP is what allows data to travel between different internet providers across the world, making global connectivity possible.

Layer 4: Transport Layer

1. TCP (Transmission Control Protocol)

Action: Ensures reliable, ordered, and error-checked delivery of data between applications.

Example: When you load a webpage, TCP breaks the data into segments, ensures all segments arrive at the destination in order, and retransmits any lost segments.

2. UDP (User Datagram Protocol)

Action: Provides a connectionless, lightweight transport with no guarantee of delivery, suitable for fast data transmission where reliability is less important.

Example: Used for streaming video or VoIP calls where speed is more important than ensuring every single packet arrives.

3. **SCTP (Stream Control Transmission Protocol)**

Action: Combines features of TCP and UDP, ensuring reliable and ordered delivery of data, while also supporting multiple streams.

Example: SCTP is used in applications like telecommunication signaling (SS7) and by some newer VoIP systems.

Layer 5: Session Layer

1. **NetBIOS (Network Basic Input/Output System)**

Action: Manages sessions between computers, allowing applications on different computers to communicate over a network.

Example: Windows systems use NetBIOS for file sharing and printer sharing within the same local network.

2. **PPTP (Point-to-Point Tunneling Protocol)**

Action: Used to establish virtual private network (VPN) connections.

Example: PPTP is used to set up a VPN tunnel between your computer and a remote server, often for secure access to a corporate network.

3. **SMB (Server Message Block)**

Action: Provides shared access to files, printers, and other resources on a network.

Example: When you access shared files on another computer in your office, SMB allows for the file sharing functionality.

4. **RPC (Remote Procedure Call)**

Action: Enables a program to execute a procedure on a remote server as if it were local.

Example: Used in distributed systems, where an application needs to interact with a remote service, like client-server applications.

Layer 6: Presentation Layer

1. **SSL/TLS (Secure Sockets Layer / Transport Layer Security)**

Action: Encrypts data to secure communication between two systems.

Example: When you access a website using HTTPS, TLS encrypts the data to ensure security during the transmission of sensitive information like login credentials.

2. JPEG, GIF, PNG (Image Formats)

Action: Formats data for display as an image. These protocols compress and standardize image data.

Example: When you view images on the web, JPEG, PNG, or GIF files are sent and rendered by your browser.

3. ASCII, EBCDIC (Character Encoding)

Action: Translates data into a readable format by defining how characters are represented in binary.

Example: ASCII encoding is used to convert text files into binary format for transmission over networks.

4. MPEG, MP3 (Multimedia Encoding)

Action: Compresses audio and video for storage and transmission.

Example: When you stream a video on YouTube, the video is compressed using MPEG to minimize bandwidth use.

Layer 7: Application Layer

1. HTTP/HTTPS (Hypertext Transfer Protocol / Secure)

Action: Facilitates the transfer of web pages and resources over the Internet. HTTPS includes encryption for security.

Example: When you browse the web, HTTP/HTTPS is used to request and receive web pages from servers.

2. FTP (File Transfer Protocol)

Action: Used for transferring files between a client and a server over a network.

Example: FTP is commonly used for uploading files to a web server or downloading files from a remote server.

3. SMTP (Simple Mail Transfer Protocol)

Action: Transfers emails between mail servers.

Example: When you send an email, SMTP transfers the email from your mail server to the recipient's mail server.

4. DNS (Domain Name System)

Action: Translates domain names (e.g., google.com) into IP addresses that computers can

understand.

Example: When you type "google.com" into your browser, DNS resolves the domain to the IP address of Google's servers.

5. **Telnet**

Action: Provides remote command-line access to servers over a network.

Example: Telnet can be used to remotely log into a server and execute commands, though it is rarely used today due to its lack of security.

6. **DHCP (Dynamic Host Configuration Protocol)**

Action: Automatically assigns IP addresses and other network configurations to devices on a network.

Example: When you connect to a Wi-Fi network, DHCP assigns your device an IP address so it can communicate on the network.

7. **POP3, IMAP (Email Retrieval Protocols)**

Action: POP3 downloads emails from a mail server to a client, while IMAP synchronizes email across multiple devices.

Example: When you check your email on your phone, IMAP synchronizes the mail between your phone and the mail server.

8. **SNMP (Simple Network Management Protocol)**

Action: Monitors and manages network devices.

Example: SNMP is used by network administrators to monitor the health and status of network devices like routers and switches