OSI model layers with their respective Protocols

1. Physical Layer

- **Function**: Transmits raw binary data over physical mediums (e.g., cables, wireless).
- **Protocols/Standards**:
    - Ethernet (Physical signaling standards)
    - USB (Universal Serial Bus)
    - Bluetooth
    - IEEE 802.11 (Wi-Fi physical standards)
    - RS-232, RS-485 (Serial communication)

---

2. Data Link Layer

    - **Function**: Ensures reliable transmission of data across a physical network; handles error detection and framing.
    - **Protocols/Standards**:
    - Ethernet (MAC/LLC)
    - IEEE 802.11 (Wi-Fi MAC)
    - PPP (Point-to-Point Protocol)
    - HDLC (High-Level Data Link Control)
    - Frame Relay
    - ATM (Asynchronous Transfer Mode, at lower layers)
    - ARP (Address Resolution Protocol)

---

3. Network Layer

- **Function**: Handles logical addressing, routing, and forwarding of data.
- **Protocols/Standards**:
    - IP (Internet Protocol) - IPv4 and IPv6
    - ICMP (Internet Control Message Protocol)
    - IGMP (Internet Group Management Protocol)
    - OSPF (Open Shortest Path First)
    - RIP (Routing Information Protocol)
    - BGP (Border Gateway Protocol)
    - MPLS (Multi-Protocol Label Switching)

---

4. Transport Layer

- **Function**: Ensures reliable data transfer, error correction, and flow control between devices.
- **Protocols**:
    - TCP (Transmission Control Protocol)

- UDP (User Datagram Protocol)
- SCTP (Stream Control Transmission Protocol)
- DCCP (Datagram Congestion Control Protocol)

---

5. Session Layer

- **Function**: Manages sessions (connections) between applications; handles setup, maintenance, and termination.
- **Protocols**:
  - NetBIOS
  - RPC (Remote Procedure Call)
  - PPTP (Point-to-Point Tunneling Protocol)
  - SMB (Session Message Block)

---

6. Presentation Layer

- **Function**: Translates data between the application layer and the network, handling encryption, compression, and formatting.
- **Protocols/Standards**:
  - TLS/SSL (Transport Layer Security / Secure Sockets Layer)
  - ASCII, EBCDIC (Character encoding)
  - JPEG, PNG, GIF (Image formats)
  - MPEG, MP3 (Media formats)

---

7. Application Layer

- **Function**: Provides network services directly to end-users or applications.
- **Protocols**:
  - HTTP, HTTPS (HyperText Transfer Protocol)
  - FTP, SFTP (File Transfer Protocols)
  - SMTP (Simple Mail Transfer Protocol)
  - IMAP, POP3 (Email retrieval protocols)
  - DNS (Domain Name System)
  - SNMP (Simple Network Management Protocol)
  - Telnet, SSH (Remote access protocols)

Layer Number	Layer Name	Example Protocols
1	Physical	Ethernet (Physical), USB, Bluetooth
2	Data Link	Ethernet (MAC), Wi-Fi (802.11), ARP, PPP
3	Network	IP, ICMP, OSPF, RIP, BGP
4	Transport	TCP, UDP, SCTP
5	Session	NetBIOS, RPC, PPTP
6	Presentation	TLS/SSL, ASCII, JPEG, MPEG
7	Application	HTTP, FTP, SMTP, DNS, SNMP, Telnet, SSH

OSI model layers with their respective Networking and Internetworking devices

1. Physical Layer

- **Function**: Responsible for the transmission of raw binary data over physical mediums.
- **Devices**:
  - Hubs (Passive and Active)
  - Repeaters
  - Network Interface Cards (NICs, at the hardware signaling level)
  - Cables (Coaxial, Fiber Optic, Twisted Pair)
  - Connectors (RJ45, RJ11)
  - Modems (at the physical signal conversion level)

---

2. Data Link Layer

- **Function**: Handles data framing, error detection, and MAC addressing for communication within a local network.
- **Devices**:
  - Switches (Layer 2)
  - Bridges
  - Network Interface Cards (NICs, at the MAC level)
  - Wireless Access Points (WAPs) (for MAC-level communication)

---

3. Network Layer

- **Function**: Responsible for logical addressing, routing, and forwarding of data between networks.
- **Devices**:
  - Routers
  - Layer 3 Switches (switches with routing capabilities)
  - Firewalls (at the IP-level filtering stage)
  - Gateways (when protocol conversions are required)

---

4. Transport Layer

- **Function**: Manages end-to-end communication, ensuring reliable data delivery and flow control.
- **Devices**:
  - Firewalls (at transport-layer filtering, e.g., TCP/UDP port-based rules)
  - Load Balancers (managing transport-layer connections)

---

5. Session Layer

- **Function**: Manages and controls sessions (establishing, maintaining, and terminating connections).
- **Devices**:
  - Session Gateways (e.g., in VoIP for session establishment)
  - Firewalls (session tracking in stateful inspection)

---

6. Presentation Layer

- **Function**: Handles data translation, encryption, and compression between the application and network layers.
- **Devices**:
  - Encryption/Decryption Devices (e.g., SSL/TLS accelerators)
  - Application Gateways (e.g., for protocol conversions, like email servers performing encoding/decoding)

---

7. Application Layer

- **Function**: Provides interfaces for applications to access network services.
- **Devices**:
  - Proxy Servers (for caching, filtering, and access control)
  - Application Firewalls (e.g., Web Application Firewalls, WAF)

- Servers (Web servers, Mail servers, DNS servers, etc.)
- End-User Devices (e.g., computers, smartphones, IoT devices)

Layer Number	OSI Layer	Associated Devices
1	Physical	Hubs, Repeaters, Cables, Connectors, Modems
2	Data Link	Switches, Bridges, WAPs, NICs
3	Network	Routers, Layer 3 Switches, Firewalls, Gateways
4	Transport	Firewalls, Load Balancers
5	Session	Session Gateways, Stateful Firewalls
6	Presentation	SSL/TLS Accelerators, Encryption Devices
7	Application	Proxy Servers, Application Firewalls, Servers, End Devices

OSI model layers with their respective Functions

1. Physical Layer

- **Function**:
  - Transmits raw binary data over the physical medium.
  - Converts digital data into electrical, optical, or radio signals and vice versa.
  - Defines hardware specifications such as cables, connectors, and transmission modes.
  - Manages data rates, signal types, and synchronization.
- **Key Responsibilities**:
  - Bit-by-bit data transmission.
  - Media and signal definition.

---

2. Data Link Layer

- **Function**:
  - Provides reliable node-to-node data transfer.
  - Packages data into frames for physical transmission.
  - Handles error detection and correction.
  - Manages MAC (Media Access Control) addressing for communication between devices.
- **Key Responsibilities**:
  - Framing, addressing, and error handling.
  - Flow control between nodes.

---

3. Network Layer

- **Function**:
  - Manages logical addressing (IP addresses).
  - Handles data routing and forwarding across networks.
  - Provides inter-network communication by determining the best path for data delivery.
- **Key Responsibilities**:
  - Routing, forwarding, and addressing.
  - Congestion control and fragmentation.

---

4. Transport Layer

- **Function**:
  - Ensures reliable end-to-end communication between devices.
  - Manages segmentation, sequencing, and reassembly of data packets.
  - Provides error detection, correction, and flow control for reliable delivery.
- **Key Responsibilities**:
  - Connection establishment, maintenance, and termination.
  - Error recovery and flow control.

---

5. Session Layer

- **Function**:
  - Manages sessions or connections between applications.
  - Establishes, maintains, and terminates communication sessions.
  - Coordinates dialogues and ensures orderly data exchange.
- **Key Responsibilities**:
  - Session setup, synchronization, and teardown.
  - Session management in multi-tasking environments.

---

6. Presentation Layer

- **Function**:
  - Translates data into a format usable by the application layer.
  - Handles data encryption, decryption, compression, and formatting.
  - Ensures interoperability between different data formats.
- **Key Responsibilities**:
  - Data translation, compression, and encryption.
  - Formatting for display or transmission.

---

7. Application Layer

- **Function**:
  - Provides network services directly to end-users and applications.
  - Handles high-level protocols for communication, data sharing, and resource access.
  - Acts as an interface between the user and the network.
- **Key Responsibilities**:
  - File transfer, email, remote login, and web browsing.
  - High-level application-specific services.

Layer Number	Layer Name	Key Functions
1	Physical	Bit-level transmission, signal conversion, hardware specs.
2	Data Link	Framing, MAC addressing, error detection, flow control.
3	Network	Logical addressing, routing, forwarding, path determination.
4	Transport	Reliable delivery, segmentation, sequencing, error control.
5	Session	Session setup, synchronization, dialogue control.
6	Presentation	Data translation, encryption, compression, formatting.
7	Application	End-user services, resource access, high-level communication.