

OSI Model

The **OSI Model** (Open Systems Interconnection Model) is a conceptual framework used to understand and standardize how different networking protocols interact and communicate over a network. It divides network communication into **seven layers**, each with a specific function. This model helps ensure interoperability and defines how data moves across a network.

The 7 Layers of the OSI Model (from top to bottom)

1. Application Layer (Layer 7):

- **Function:** This layer is the closest to the user and interacts directly with software applications. It provides services like email, file transfer, and network management.
- **Example Protocols:** HTTP (web browsing), FTP (file transfer), SMTP (email).
- **Main Role:** Facilitates user interaction with the network.

2. Presentation Layer (Layer 6):

- **Function:** This layer ensures that data is in a usable format and translates between the application and network formats. It handles data encryption, compression, and translation (e.g., converting text from one character set to another).
- **Example:** Encryption (e.g., SSL/TLS), data format conversions like ASCII to EBCDIC.
- **Main Role:** Data translation, encryption, and compression.

3. Session Layer (Layer 5):

- **Function:** Manages sessions (connections) between applications. It establishes, maintains, and terminates connections.
- **Example:** Managing multiple web browser tabs independently.
- **Main Role:** Establishing, maintaining, and ending communication sessions.

4. Transport Layer (Layer 4):

- **Function:** Ensures reliable data transfer between two devices. It handles error correction, data flow control, and segmentation of data into smaller packets.
- **Example Protocols:** TCP (Transmission Control Protocol) for reliable communication, UDP (User Datagram Protocol) for faster, but less reliable communication.
- **Main Role:** Reliable data transfer, error handling, and data flow control.

5. Network Layer (Layer 3):

- **Function:** Responsible for routing packets of data from the source to the destination. It uses logical addressing (IP addresses) to determine paths.
- **Example Protocols:** IP (Internet Protocol), ICMP (Internet Control Message Protocol).
- **Main Role:** Routing and logical addressing (IP addresses).

6. Data Link Layer (Layer 2):

- **Function:** Provides error detection and correction for data packets. It packages bits into frames and ensures correct delivery by using MAC (Media Access Control) addresses.
- **Sub-Layers:**
 - **Logical Link Control (LLC):** Manages communication links.
 - **Media Access Control (MAC):** Handles access to the physical network medium.
- **Example Protocols:** Ethernet, Wi-Fi (802.11).
- **Main Role:** Physical addressing and reliable transmission over a single link.

7. Physical Layer (Layer 1):

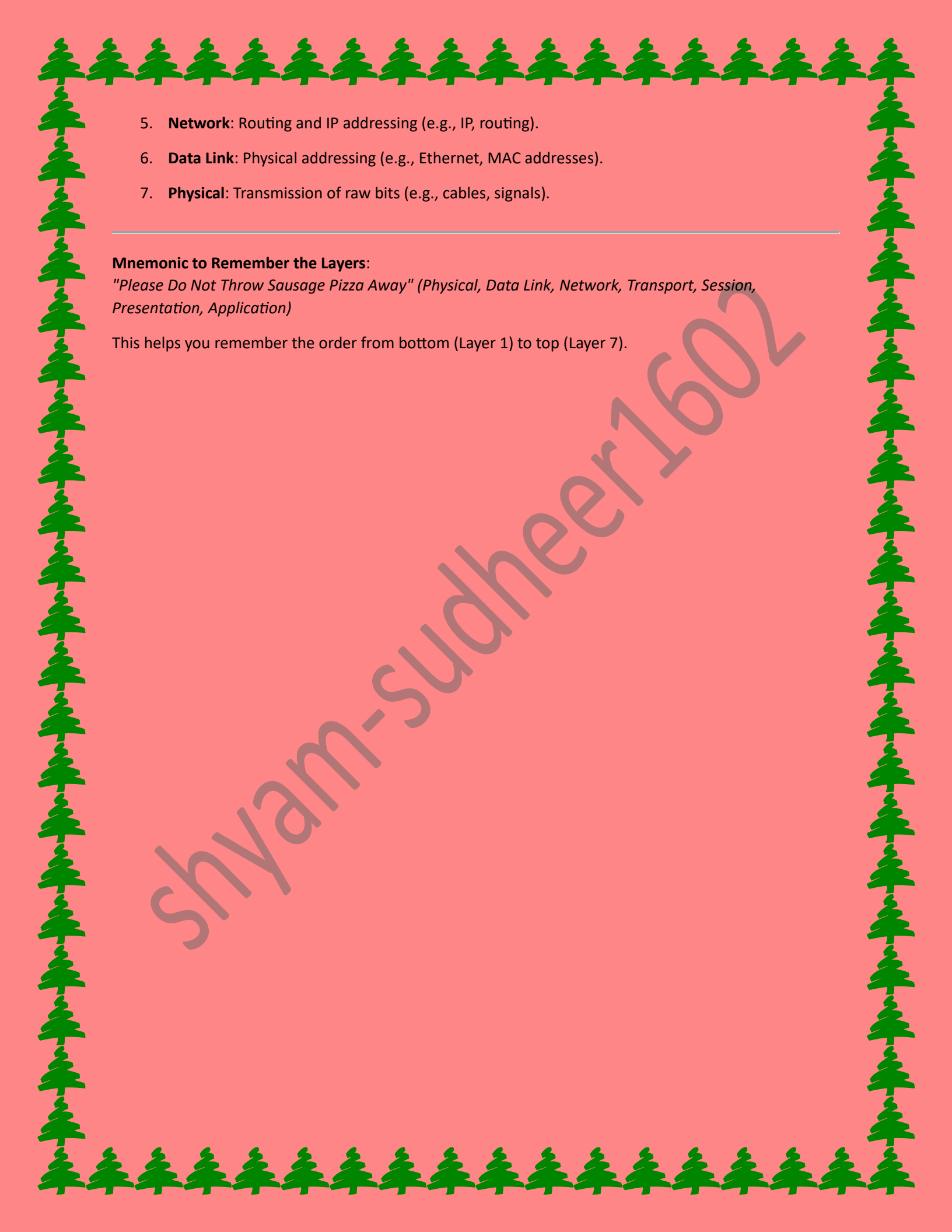
- **Function:** Deals with the physical connection between devices and the transmission and reception of raw bits over a physical medium (cables, radio waves, etc.).
- **Example:** Cables (Ethernet cables, fiber optics), signals (electrical or optical).
- **Main Role:** Transmission of raw data bits over the physical network medium.

Why the OSI Model Matters

- **Standardization:** Provides a standardized approach for networking protocols to interact.
 - **Interoperability:** Ensures different systems and devices can communicate regardless of their manufacturer.
 - **Troubleshooting:** Simplifies network troubleshooting by isolating issues to a specific layer.
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Summary of the Layers

1. **Application:** User interface and services (e.g., web browsing, email).
2. **Presentation:** Data format and encryption (e.g., data conversion, encryption).
3. **Session:** Managing sessions (e.g., connection establishment).
4. **Transport:** Reliable data transfer (e.g., TCP, UDP).

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5. **Network:** Routing and IP addressing (e.g., IP, routing).
 6. **Data Link:** Physical addressing (e.g., Ethernet, MAC addresses).
 7. **Physical:** Transmission of raw bits (e.g., cables, signals).
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Mnemonic to Remember the Layers:

"Please Do Not Throw Sausage Pizza Away" (Physical, Data Link, Network, Transport, Session, Presentation, Application)

This helps you remember the order from bottom (Layer 1) to top (Layer 7).

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