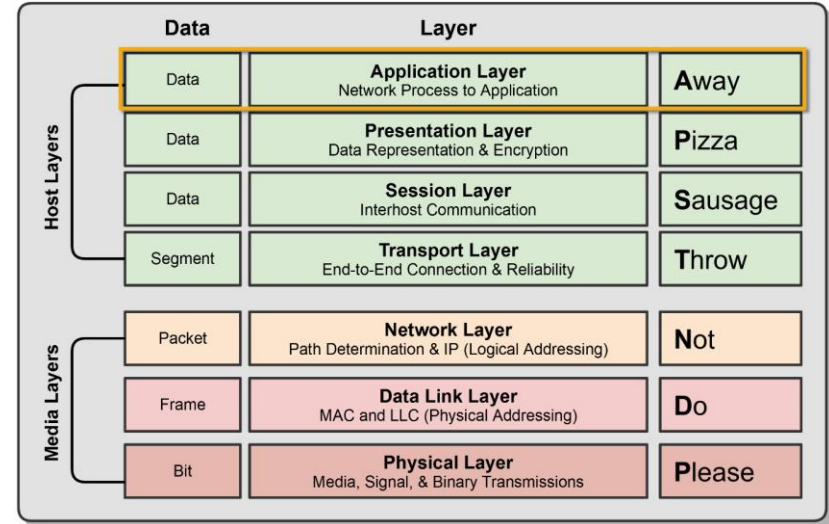


# *OSI Layer 7 - The Application Layer*

# Layer 7 – Application Layer

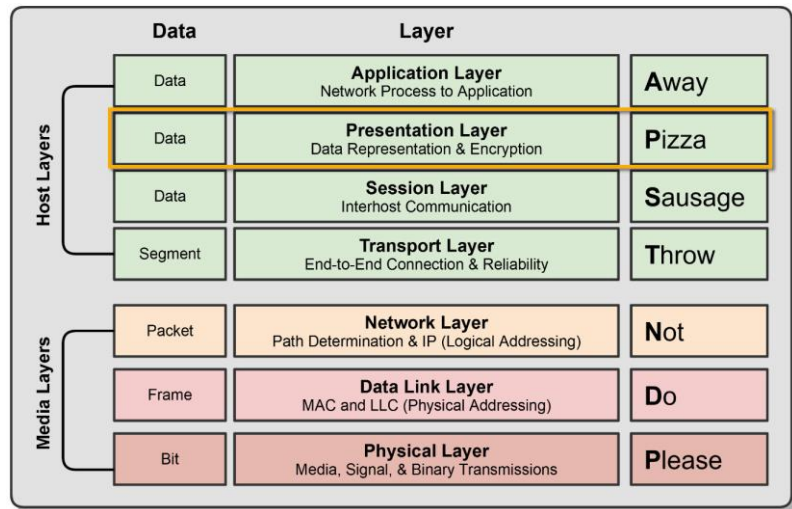
- Where users interact with the computer.
- Acts as an interface between an application and end-user protocols.
- Provides an interface to communicate with the network (Outlook, Chrome, etc.).
- Applications don't reside in the application layer but instead interfaces with application-layer protocols.
- Example Application Layer Protocols:
  - **E-Mail:** IMAP4, POP3, SMTP
  - **Web Browsers:** HTTP, HTTPS
  - **Remote Access:** SSH, Telnet



# *OSI Layer 6 - The Presentation Layer*

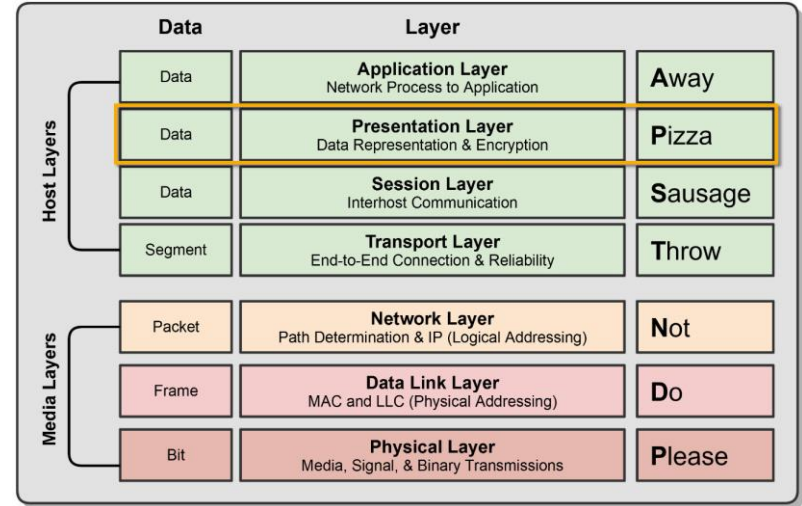
# Layer 6 – Presentation Layer

- Ensures that data transferred from one system's Application Layer can be read by the Application Layer on another one.
- Provides character code conversion, data compression, and data encryption/decryption.
- Example:** Google Chrome HTML converted to ASCII Format.



# Layer 6 – Presentation Layer

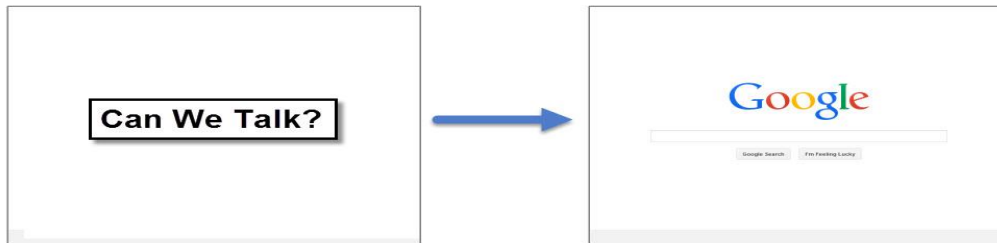
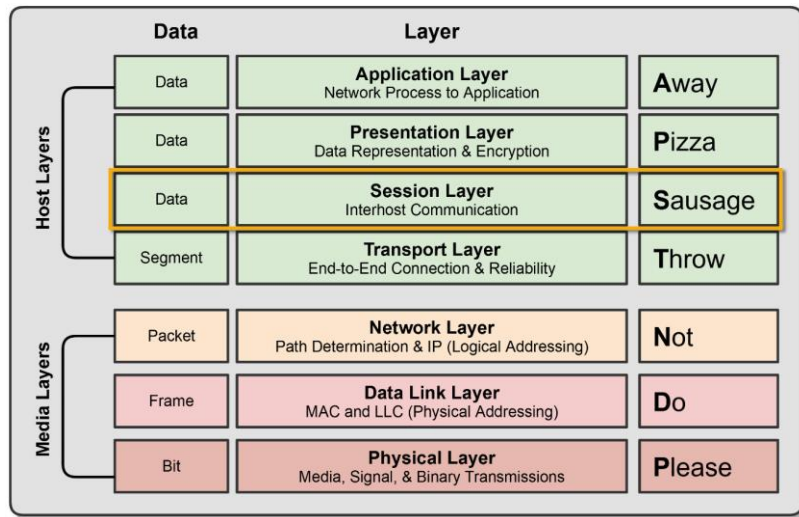
- Example Layer 6 File Formats:
  - **Web Browser:** HTML, XML, JavaScript
  - **Graphics Files:** JPEG, GIF, PNG
  - **Audio/Video:** MPEG, MP3
  - **Encryption:** TLS, SSL
  - **Text/Data:** ASCII, EBCDIC



# *OSI Layer 5 - The Session Layer*

# Layer 5 - Session Layer

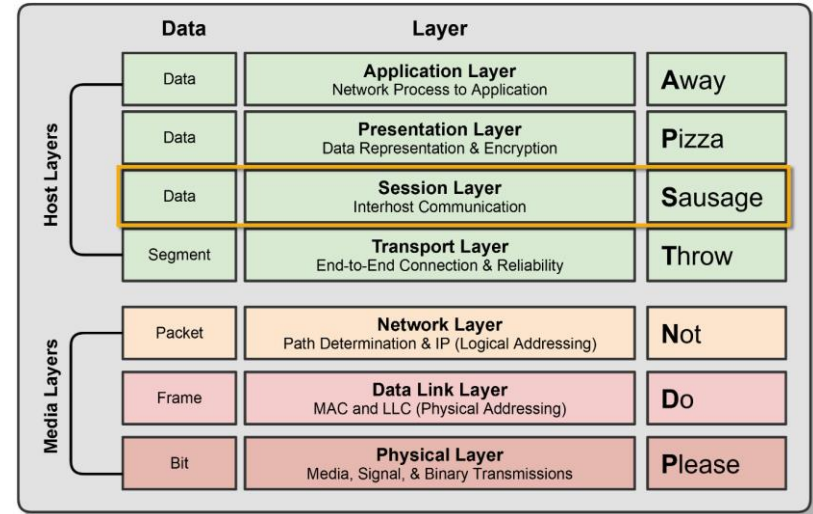
- Responsible for setting up, managing, and then tearing down sessions between network devices.
- Ensures data from different application sessions are kept separate.
- Utilizes Application Program Interfaces (APIs) to communicate with TCP/IP protocols.
- Coordinates communication between systems.
  - Start, Stop, Restart



# Layer 5 - Session Layer

Can provide three different methods of communication between devices:

- **Simplex:** One-way communication between two devices, like listening to a radio station.
- **Half Duplex:** Two-way communication between two devices, but only one device can communicate at a time.
- **Full Duplex:** Two-way communication between two devices, where both sides can communicate at the same time.

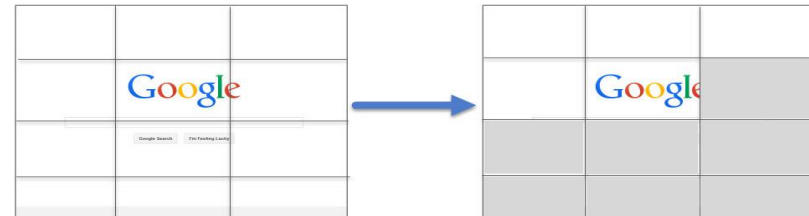
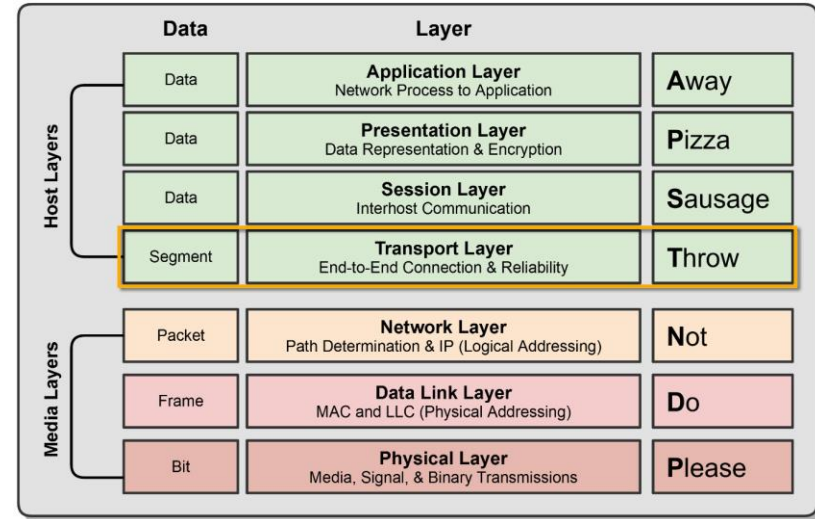




# *OSI Layer 4 - The Transport Layer*

# Layer 4 - Transport Layer

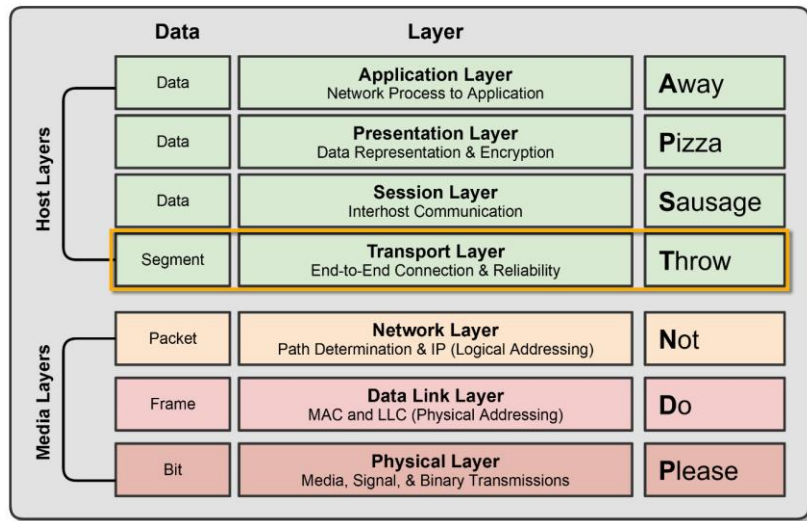
- Ensures data is delivered error-free and in sequence.
- Segments data and reassembles correctly.
- Can be connection-oriented or connectionless.
- Considered the “Post Office” Layer
  - TCP** (Transmission Control Protocol)
  - UDP** (User Datagram Protocol)
  - Covered in detail in the next section.



# Layer 4 - Transport Layer

Responsible for two data flow control measures:

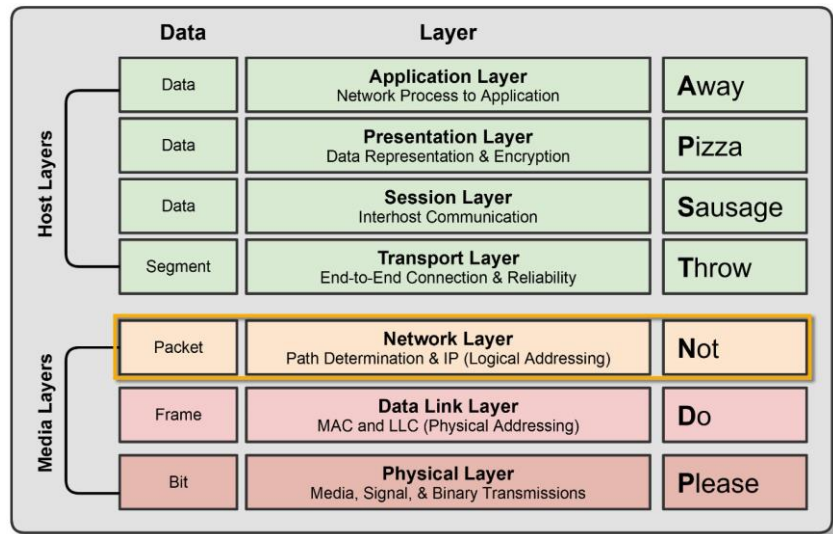
- **Buffering**
  - Stores data in memory buffers until destination device is available.
- **Windowing**
  - Allows devices in session to determine the “window” size of data segments sent.



# *OSI Layer 3 - The Network Layer*

# Layer 3 - Network Layer

- The “Routing” Layer
- Provides logical addressing (IP Addressing) and routing services.
- Places two IP addresses into a packet:
  - Source Address & Destination IP Address
- Internet Protocol (IP)
  - The primary network protocol used on the Internet, IPv4, IPv6 Logical Addresses



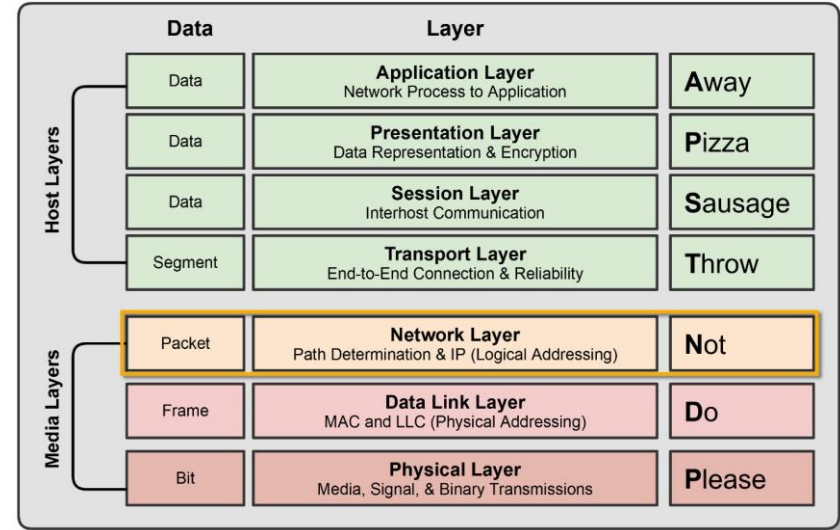
# Layer 3 - Network Layer

Types of Packets at Network Layer:

- **Data Packets**
  - Routed Internet Protocol (IP) data packets.
    - IPv4 & IPv6
- **Route-Update Packets**
  - Routing protocols designed to update neighboring routers with router information for path determination.
    - RIP, OSPF, EIGRP, etc.

## Layer 3 Devices & Protocols:

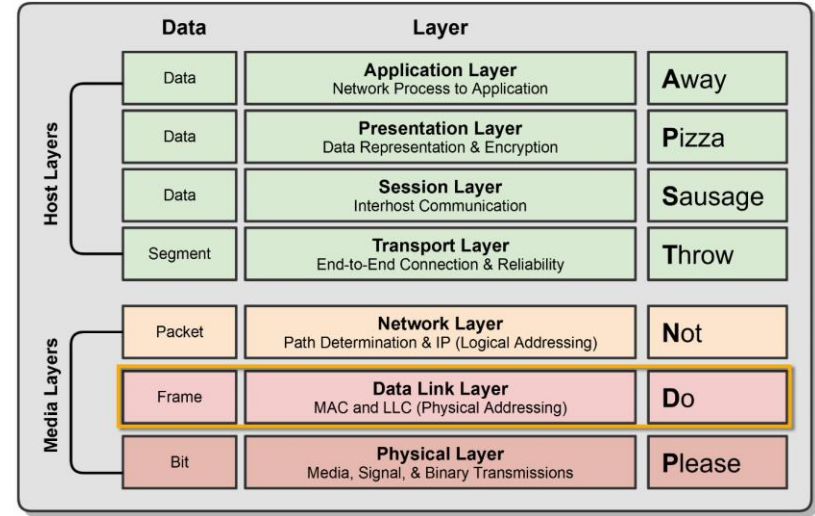
- Routers & Multi-Layer Switches
- IPv4 & IPv6
- Internet Control Message Protocol (ICMP), i.e., Ping



# *OSI Layer 2 - The Data Link Layer*

# Layer 2 – Data Link Layer

- The “Switching” Layer
- Ensures that messages are delivered to the proper device on a LAN using hardware addresses.
  - MAC (Media Access Control) Address
  - Only concerned with the local delivery of frames on the same network.
- Responsible for packaging the data into frames for the physical layer.
- Translates messages from the Network layer into bits for the Physical layer.

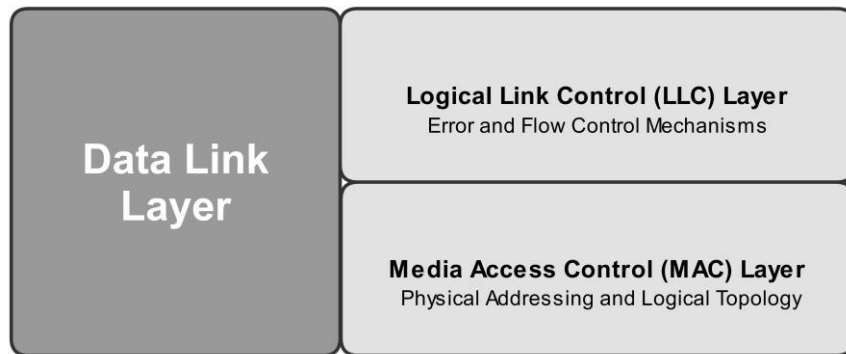




# Layer 2 – Data Link Layer

Has two Sub-Layers

- **Logical Link Control (LLC) Layer**
  - Error Control and Flow Control
    - Detect and correct corrupted data frames.
    - Limits amount of data sent so devices aren't overwhelmed.
- **Media Access Control (MAC) Layer**
  - Physical Addressing (MAC Address)
    - 48-Bit MAC Address burned on NIC.
  - Logical Topology and Media Access
    - Ethernet, Token Ring, etc.
    - CSMA/CD & CSMA/CA



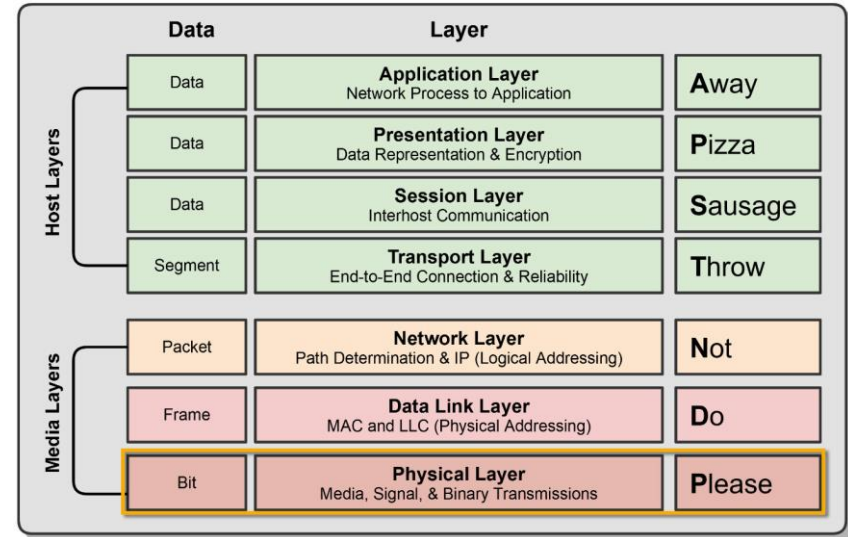
# *OSI Layer 1 - The Physical Layer*

# Layer 1 – Physical Layer

Defines the physical and electrical medium for network communication:

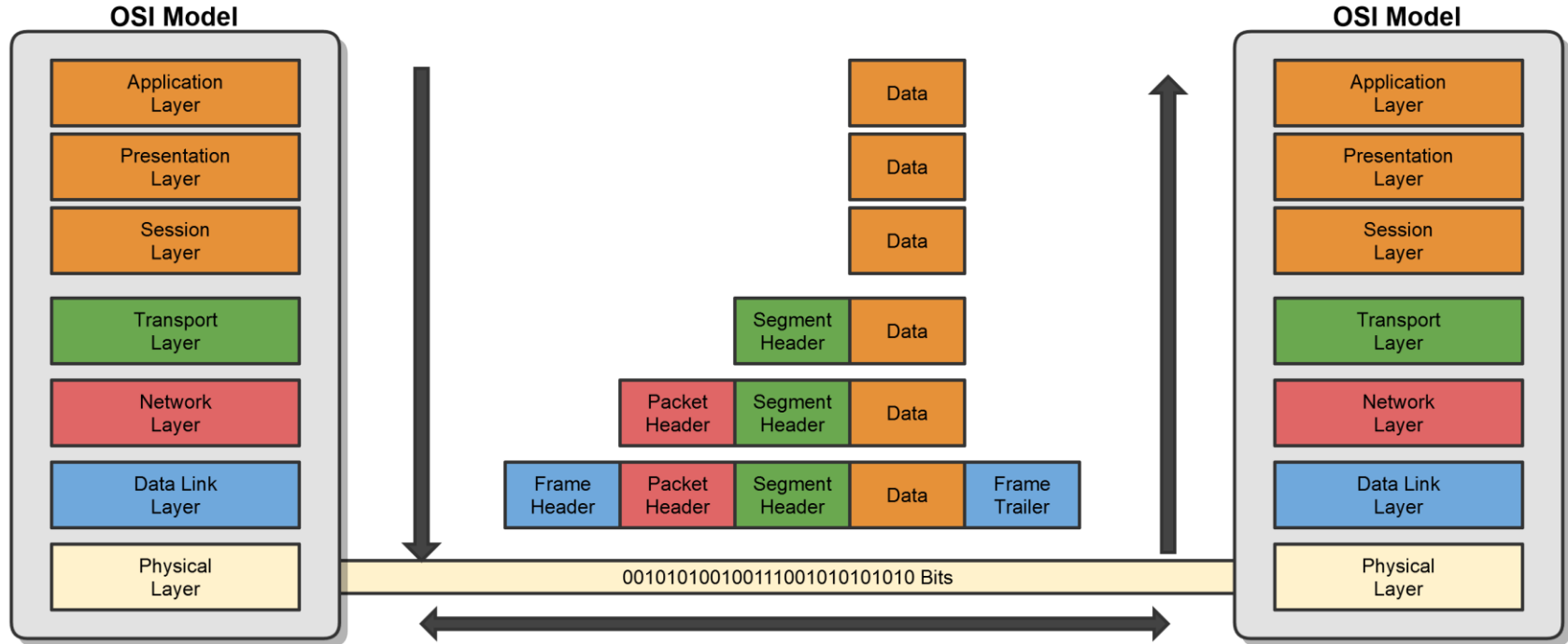
- Sending and receiving bits (1 or 0)
- Encoding Signal Types
  - Electricity, radio waves, light
- Network Cabling, Jacks, Patch Panels, etc.
  - Copper or Fiber
- Physical Network Topology
  - Star, Mesh, Ring, etc.
- Ethernet IEEE 802.3 Standard
- Layer 1 Equipment
  - Hubs, Media Converters, Modems

It's responsible for the network hardware and physical topology.



# *OSI Model Data Encapsulation and De-Encapsulation*

# OSI Encapsulation & De-Encapsulation



# OSI Encapsulation & De-Encapsulation

