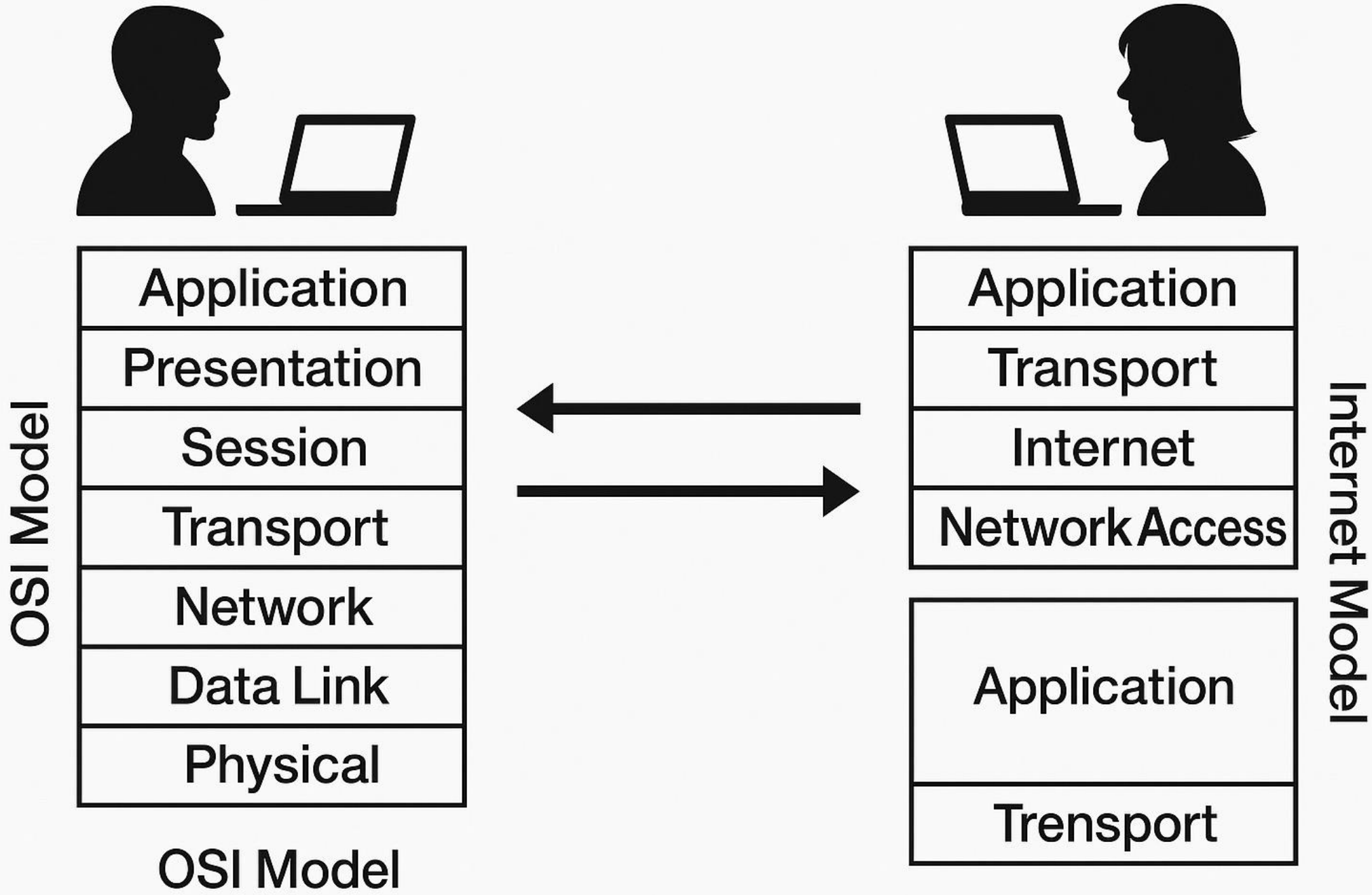
Application
Presentation
Session
Transport
Network
Data Link
Physical
OSI Model
OSI Model
Application
Transport
Internet
Network Access
Application
Trensport
Internet Model

OSI (Open System Interconnection)

- OSI was Developed by the International Organization For Standardization (ISO) and introduced in 1984.
- It is a layered architecture.
- Each layers define a set of functions which takes part in data communication.
- Based upon OSI model Physical, Datalink, and network are called network support layer (Here we are creating physical topology).
- Session , Presentation, and Application layer are called user support layer (where logical topology comes into picture).
- Network support layer technically called underlay connectivity and user support layer is called overlay connectivity.

Application Layer

- It is responsible for providing a user interface for the users to interact with applications or networking services.

Or

- The Application Layer provides support to user systems by allowing them to access network resources.
  For example, it enables services like email, remote file access and transfer, and shared database management.

Application Layer Protocol are:

Services		Port No
FTP	→	20, 21
TFTP	→	69
TELNET	→	23
HTTP	→	80
SMTP	→	25
POP3	→	110(us), 995(SSL/TLS)
IMAP4	→	143, 993
NNTP	→	119, 563
IRC	→	194, 6697

Presentation Layer

- It is responsible for defining the standard format to the data.
- The major functions described at this layers are:-

Translation (Encoding and Decoding) (text to ASCII or UNICODE, Video/autdio – Stream Data)

Encryption – Decryption (plain text – Cipher text)

Compression –Decompression (big file to gzip)

P: Translation (Encoding and Decoding)

📤 **When sending data:**

- The Presentation Layer **encodes** the data into a common format so it can travel across the network.
- Example: Converting characters to ASCII or Unicode, or formatting video/audio into a streamable format.

📥 **When receiving data:**

- The Presentation Layer **decodes** the incoming data back into a format the application can understand.
- Example: Turning binary or encoded video/audio back into something viewable or readable.

P: Encryption and Decryption

❑The **Presentation Layer** is responsible for applying **encryption** before sending data and **decryption** when receiving it — if security is required.

📥 **When Sending Data:**

1.Data comes from the **Application Layer** (e.g., email content).

2.The Presentation Layer uses an **encryption algorithm** (like AES or DES).

3.It converts the readable data (plaintext) into **ciphertext**.

4.Ciphertext is passed down the stack to be sent over the network.

📥 **When Receiving Data:**

1.Ciphertext is received from the lower layers.

2.The Presentation Layer **decrypts** it using the correct **key** and algorithm.

3.It turns the data back into **plaintext** for the Application Layer to use.

P: Compression and Decompression

📦 What is Compression?

Compression means making data **smaller in size** so it can be sent **faster** over the network.

❑It reduces the number of bits used to represent the data.

❑This helps **save bandwidth** and speeds up transmission.

🔄 What is Decompression?

Decompression means **restoring** the original data from the compressed version **after it is received**.

❑It ensures the receiving system gets the **exact same data** that was originally sent.

Presentation Layer Protocols

🔑 1. MIME (Multipurpose Internet Mail Extensions)

- Used to format multimedia content in email and web communications.
- Helps email clients understand how to handle images, audio, video, etc.

🔐 2. SSL/TLS (Secure Sockets Layer / Transport Layer Security)

- Provides **encryption and data integrity** between two communicating applications.
- While it's often implemented between Presentation and Session layers, its **encryption function** is a Presentation Layer responsibility.

📄 3. XDR (External Data Representation)

- Used in Remote Procedure Call (RPC) systems to ensure platform-independent data formatting.

Presentation Layer Protocols

📊 4. ASN.1 (Abstract Syntax Notation One)

❑A standard interface used in **SNMP, LDAP, and telecom protocols** to describe data structures for cross-platform communication.

💾 5. JPEG, MPEG, GIF, PNG

❑These are **data format standards** for images and video compression handled at the Presentation Layer.

📦 6. GZIP, DEFLATE

❑Compression algorithms used in HTTP and other protocols for efficient data transmission.

Session Layer

It Establishes, Manages and Terminate the Connections between the Local and Remote Application. It Provides Full-Duplex, Half-Duplex, Simplex Operation and Establishes Procedures which is to check pointing, Suspending, Restarting and Terminating Session.

- When an application wants to communicate, it requests a **session** from the Session Layer.
- Example: When you log into a website, a session is created to manage your connection during your interaction.

Session Layer Protocols

Protocol / Service	Description
RPC (Remote Procedure Call)	Allows a program to execute a procedure on another system as if it were local.
NetBIOS (Network Basic Input/Output System)	Used in Windows systems for session-level communication between networked computers.
PPTP (Point-to-Point Tunneling Protocol)	Creates VPN sessions and encapsulates PPP frames.
SQL (Structured Query Language)	While primarily an application protocol, SQL session management occurs at this layer.
NFS (Network File System)	Uses session management to allow file access across networks.
ASP (AppleTalk Session Protocol)	Manages sessions in Apple's legacy AppleTalk protocol suite.
Session Initiation Protocol (SIP)	Used in VoIP and video calls to establish, manage, and terminate sessions.

Transport Layer

The **Transport Layer** is responsible for **delivering** data between two applications.

The Major functions described at this layer are:-

- ❑Reliable Data Transfer
- ❑Identifying a service
- ❑Multiplexing & Demultiplexing
- ❑Segmentation
- ❑Sequencing & Reassembling
- ❑Error Correction
- ❑Flow Control (💡 Solution: **Sliding Window Protocol: minBW (Client & Server), for 3 segments one ack**)

Transport Layer Protocols

Protocol	Type	Description
TCP (Transmission Control Protocol)	**Connection-oriented**	Ensures reliable, ordered, and error-checked delivery of data (e.g., web, email, file transfer).
UDP (User Datagram Protocol)	**Connectionless**	Fast, lightweight, but unreliable — no guarantee of delivery (used in streaming, DNS, VoIP).
SCTP (Stream Control Transmission Protocol)	**Hybrid**	Supports multiple streams in a single connection, used in telecom (like VoLTE).
DCCP (Datagram Congestion Control Protocol)	**Connection-oriented** but **unreliable**	Designed for real-time apps (e.g., media streaming) that need congestion control but not guaranteed delivery.

Network Layer

- It provides the logical addressing and path determination.
- This Layer Applies Policies on User Traffic and Filter Request according to Topology.
- Router and layer-3 Firewalls works on Network Layer.
- It can **filter traffic** based on IP addresses and routing rules.

Network Layer Protocols

The protocols that works in this layer are:-

i. Routed protcols

- ❑ It carries actual user data from host to host.
- ❑Ex:- Ip, Ipx, Appletalk, Ipsec

ii. Routing Protocols

- ❑ It is used to find the best path from source to destination.
- ❑Ex:- Rip, Eigrp, Ospf, Bgp

Datalink Layer

- Its main job is to manage how data is sent and received between devices on the same local network (like between your computer and a router).
- This Layer is Responsible to Convert Physical Layer Functionality into Reliable Link.
- It Detects and Correct Errors which occur in the Physical Layer.
- This Layer has divided Into Two Sub Parts. **MAC** and **Logical Link Control (LLC).**
- LLC is used to controls the Synchronization, Flow Control and Error-Checking. Based upon the Function there are Three Types of Switches works on Data Link Layer. These are-> Cut-Through, Fragment-Free, Store & Forward.
- LLC: provides communication with network layer
- MAC: provides a reliable transmission of the data across a physical link. (Ethernet and Token ring)

Datalink Layer Protocols

- **HDLC: p**rotocol used for **synchronous, point-to-point and multipoint communication** over serial links
- **SDLC → Old IBM protocol for mainframes.**
- **PPP → Dial-up & direct connections (with login).**
- **Frame Relay → Fast WAN connections (like leased lines).**
- **ATM → High-speed fixed-size cell transfers (for voice/video).**
- **MACSec → A security protocol for Layer 2 that provides encryption and integrity for Ethernet frames.**
- **VXLAN → It creates layer2 overlay**
- **SPB (Shortest Path Bridging) → Replace older spanning-tree protocols with better convergence and support for larger networks**

Physical Layer

- The **Physical Layer** is responsible for **transmitting raw bits (0s and 1s)** over a physical medium — such as copper wire, fiber optics, or radio waves.
- Or
- It defines the electrical, mechanical and functional specifications for communication between the network devices.
- The Major functions described at this layer are:-

  Encoding – Decoding (converting binary data into signals based on the type of media).

  Copper media: electrical signals for different voltages

  Fiber media: Light pulses for different wavelength

  Wireless media: Radio Frequency waves

- Components: Physical Layer components are Ethernet, Bluetooth, USB Standards.