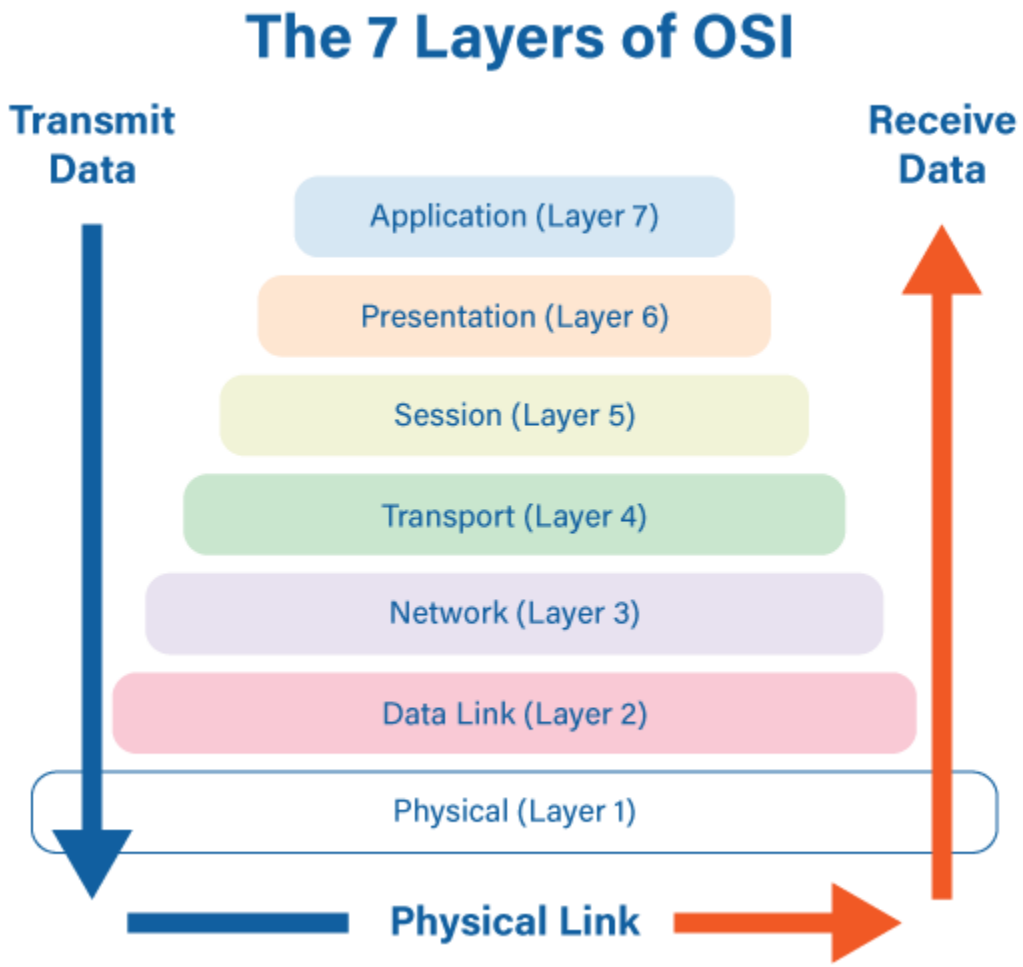
OSI Model (Open Systems Interconnection Model)

The OSI model is a conceptual framework that divides the functions of a communication system into seven separate layers. Developed by the International Organization for Standardization (ISO) in the 1980s, its purpose is to assist product developers in creating network systems that can effectively communicate with each other. The model consists of seven layers:

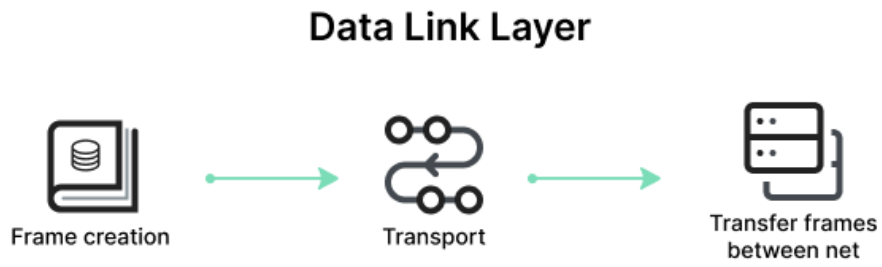


1. Physical Layer

- **Purpose**: The physical layer is responsible for the transmission and reception of raw data bits over a physical medium, such as cables or radio waves. It defines electrical, mechanical, and procedural aspects of communication.
- **Devices**: Network cables, switches, hubs, and network interface cards (NICs).
- **Key Functions**: Bit transmission, modulation, and signal encoding.

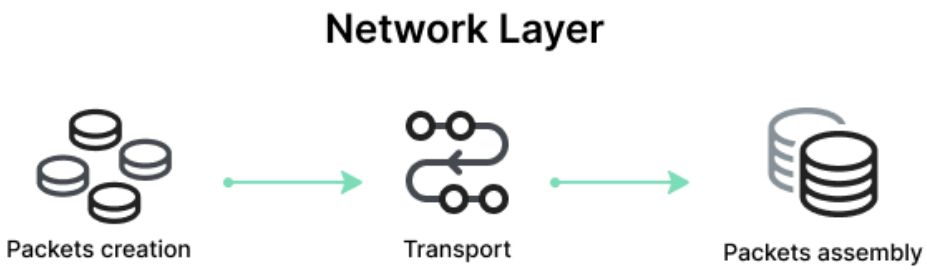
2. Data Link Layer

- **Purpose**: This layer provides error-free transfer of data frames between nodes on the network. It ensures that data is correctly framed and manages the flow of data to prevent collisions.
- **Devices**: Network interface cards (NICs), bridges, and switches.
- **Key Functions**: Framing, error detection/correction, and flow control.



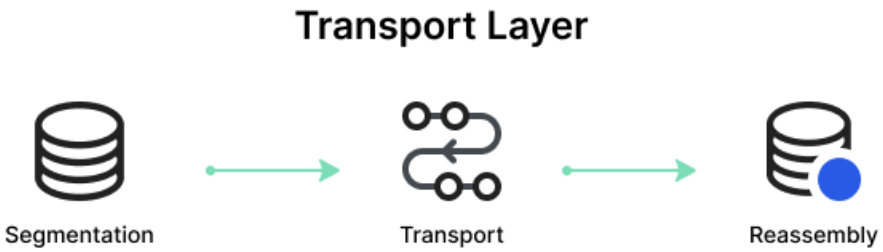
3. Network Layer

- **Purpose**: Responsible for determining the best path to route data from the source to the destination across multiple networks. It handles logical addressing and routing.
- **Devices**: Routers.
- **Key Functions**: Logical addressing (IP addresses), routing, packet forwarding, and fragmentation.



4. Transport Layer

- **Purpose**: Provides end-to-end communication and error recovery between hosts. It ensures reliable data transfer with error detection and correction.
- **Protocols**: TCP (Transmission Control Protocol), UDP (User Datagram Protocol).
- **Key Functions**: Segmentation, flow control, error control, and establishing connections.

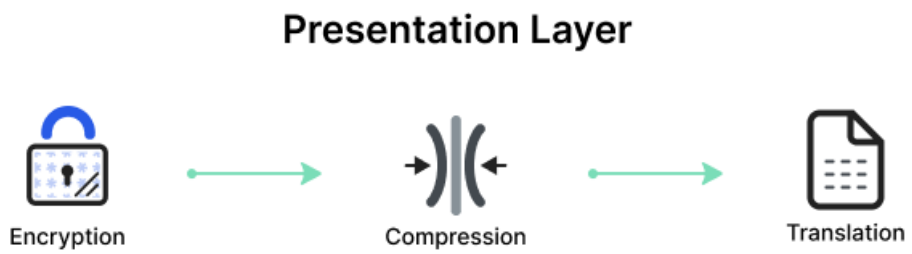


5. Session Layer

- **Purpose**: Manages sessions or connections between applications. It controls the dialogues (connections) between computers and ensures that data is properly synchronized.
- **Key Functions**: Session establishment, maintenance, and termination.

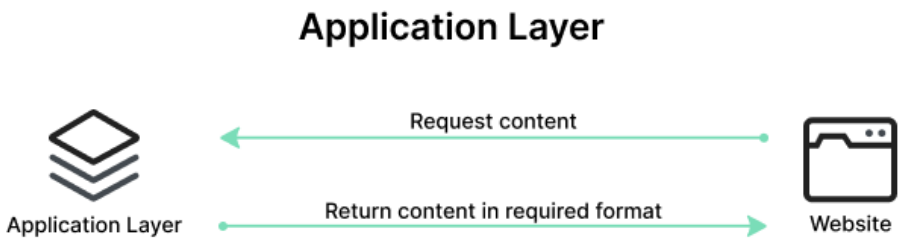
6. Presentation Layer

- **Purpose**: Translates, encrypts, and compresses data to ensure that it is readable by the application layer. It defines how data is presented.
- **Key Functions**: Data translation, data encryption/decryption, data compression.



7. Application Layer

- **Purpose**: This is the layer closest to the end user. It provides network services directly to the applications (e.g., web browsers, email clients).
- **Protocols**: HTTP, FTP, SMTP, DNS, POP3.
- **Key Functions**: User interface, application services, and protocol communication between applications.

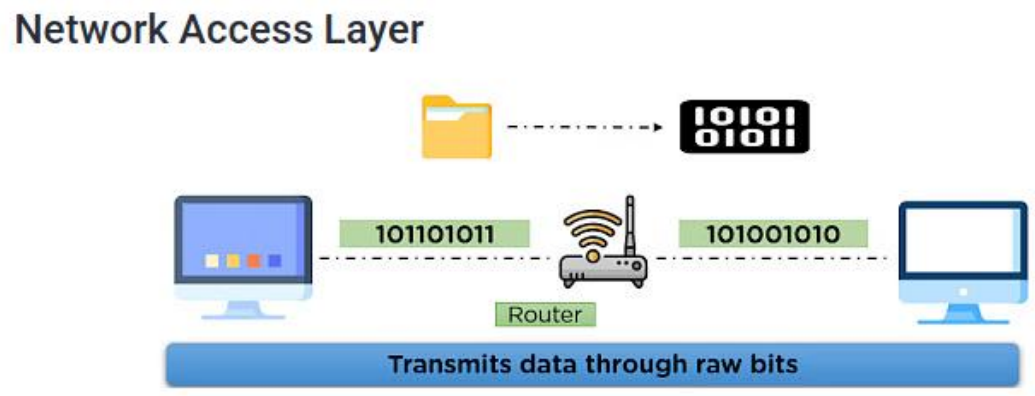


TCP/IP Model (Transmission Control Protocol/Internet Protocol Model)

The TCP/IP model is a simplified, more practical model used for network communication. Developed in the 1970s by the Department of Defense, it became the basis for the modern Internet. The TCP/IP model consists of four layers:

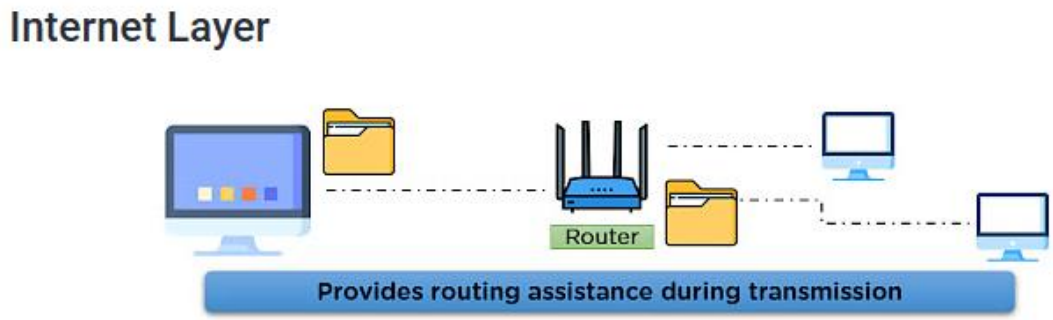
1. Network Interface Layer (Link Layer)

- **Purpose**: This layer combines the OSI model's physical and data link layers. It manages how data is physically transmitted over the network and how devices on the same local network communicate.
- **Devices**: Network interface cards, switches, routers.
- **Key Functions**: Frame encapsulation, addressing, and data link control.



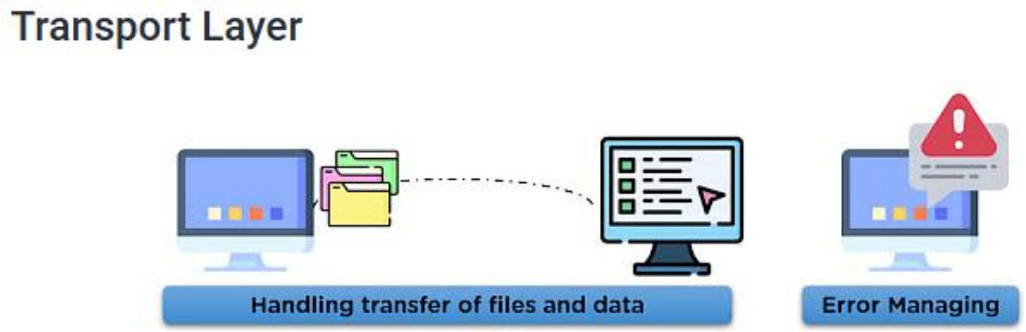
2. Internet Layer

- **Purpose**: Responsible for logical addressing and routing data across networks. The primary protocol used in this layer is IP (Internet Protocol).
- **Protocols**: IP, ICMP, ARP, IGMP.
- **Key Functions**: Routing, addressing (IP addressing), packet forwarding, and fragmentation.



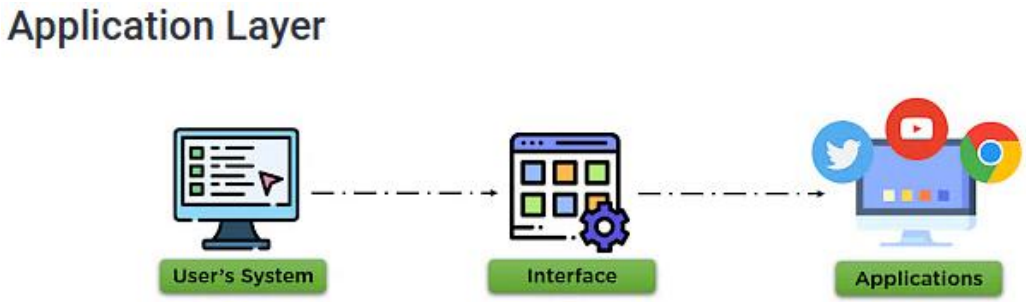
3.Transport Layer

- **Purpose**: Provides end-to-end communication between hosts. It ensures reliable data transfer with error correction and flow control mechanisms. TCP and UDP are the two most common protocols used in this layer.
- **Protocols**: TCP, UDP.
- **Key Functions**: Flow control, error control, reliable data transfer (TCP), and connectionless communication (UDP).

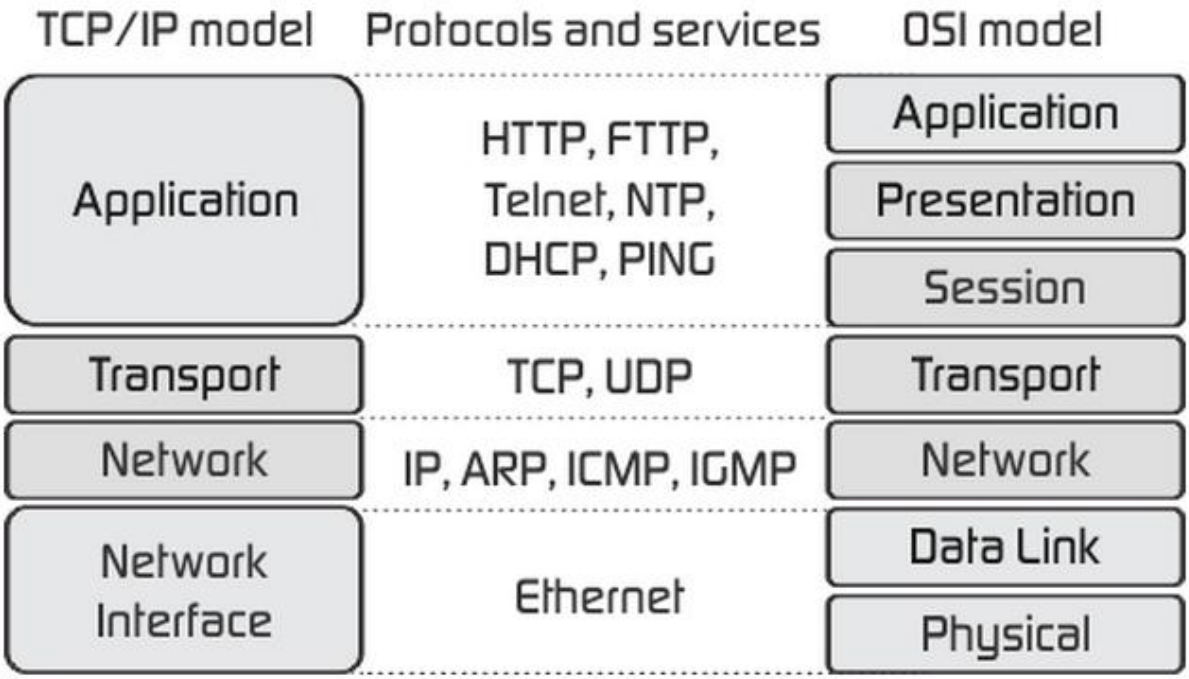


4.Application Layer

- **Purpose**: The highest layer in the TCP/IP model, it defines protocols that allow software applications to communicate over the network.
- **Protocols**: HTTP, FTP, DNS, SMTP, SNMP.
- **Key Functions**: Data exchange between applications, network services like file transfer, email, and web browsing.



Comparison: TCP/IP Models vs. OSI



Conclusion

The OSI and TCP/IP models are both crucial for grasping the fundamentals of network communication. The OSI model is a conceptual framework that separates networking tasks into individual layers, while the TCP/IP model is more practical and commonly applied in real-world network structures. Familiarity with both models offers important insights into how data flows through networks and the various protocols at each layer.
