Open Systems Interconnection

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OSI

- Open Systems Interconnect (OSI)
  - Conceptual framework that standardizes the functions of a telecommunication or computing systems
  - 7 distinct layers
  - Each layer is responsible for specific tasks
  - Work together to facilitate communication between devices in a network.

  - Developed by the International Organization for Standardization (ISO)

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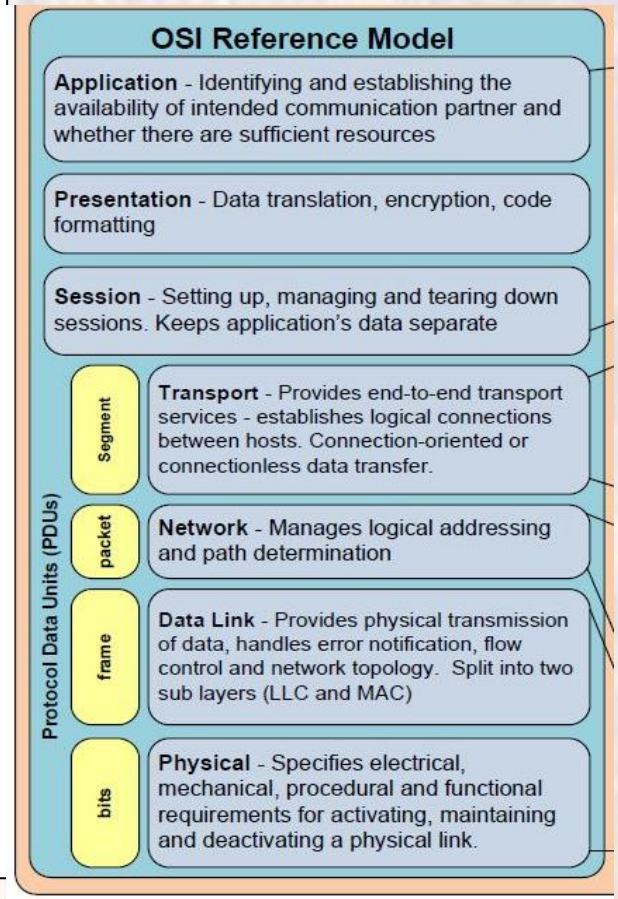
OSI (Open Source Interconnection) 7 Layer Model

Layer	Application/Example		Central Device/ Protocols			DOD4 Model
Application (7) Serves as the window for users and application processes to access the network services.	**End User layer** Program that opens what was sent or creates what is to be sent Resource sharing • Remote file access • Remote printer access • Directory services • Network management		**User Applications** SMTP		GATEWAY Can be used on all layers	Process
Presentation (6) Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.	**Syntax layer** encrypt & decrypt (if needed) Character code translation • Data conversion • Data compression • Data encryption • **Character Set Translation**		JPEG/ASCII EBDIC/TIFF/GIF PICT			
Session (5) Allows session establishment between processes running on different stations.	**Synch & send to ports** (logical ports) Session establishment, maintenance and termination • Session support - perform security, name recognition, logging, etc.		**Logical Ports** RPC/SQL/NFS NetBIOS names			
Transport (4) Ensures that messages are delivered error-free, in sequence, and with no losses or duplications.	**TCP** Host to Host, Flow Control Message segmentation • Message acknowledgement • Message traffic control • Session multiplexing	PACKET FILTERING	TCP/SPX/UDP			Host to Host
Network (3) Controls the operations of the subnet, deciding which physical path the data takes.	**Packets** ("letter", contains IP address) Routing • Subnet traffic control • Frame fragmentation • Logical-physical address mapping • Subnet usage accounting		**Routers** IP/IPX/ICMP			Internet
Data Link (2) Provides error-free transfer of data frames from one node to another over the Physical layer.	**Frames** ("envelopes", contains MAC address) [NIC card — Switch — NIC card] (end to end) Establishes & terminates the logical link between nodes • Frame traffic control • Frame sequencing • Frame acknowledgment • Frame delimiting • Frame error checking • Media access control		**Switch Bridge WAP** PPP/SLIP	Land Based Layers		Network
Physical (1) Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.	**Physical structure** Cables, hubs, etc. Data Encoding • Physical medium attachment • Transmission technique - Baseband or Broadband • Physical medium transmission Bits & Volts		**Hub**			



src: vWannabe

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- Example – send an email via Gmail
  - Application Layer:
    - You interact with the email service through a user interface (e.g., web browser or email client).
    - Compose the email, attach files if necessary, and hit the send button.
    - The email application (in this case, Gmail) uses application-layer protocols like SMTP (Simple Mail Transfer Protocol) to transmit your email data to the email server.
  - Presentation Layer:
    - Data encryption (e.g., using SSL/TLS to secure the connection between your device and the email server)
    - Data compression (if applicable).
  - Session Layer:
    - Manage the establishment, maintenance, and termination of the session between your device and the email server.
    - Manage authentication

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  - Transport Layer:
    - This layer ensures reliable data transfer and error checking for your email.
    - Gmail's server might use TCP (Transmission Control Protocol) to break down the email into smaller packets and manage their flow
      - Ensures all packets arrive in the correct order and that any missing packets are resent
  - Network Layer:
    - At the network layer, IP (Internet Protocol) handles routing the email data from your device through multiple networks to Gmail's server.
    - IP addresses are used for routing.
    - Email packets travel across multiple networks
    - Using routers and switches, until they reach the destination server.
    - Ensures the correct addressing and routing of the packets.
  - Data Link Layer:
    - Data is organized into frames
    - Ethernet addresses (MAC addresses) are used for communication between your device and the local network infrastructure (e.g., router, switch).
    - The frames containing your email data are sent over the local network to reach the network layer.

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  - Physical Layer:
    - The email data is transmitted as electrical or optical signals over physical mediums such as Ethernet cables, Wi-Fi signals, or cellular networks.
    - The physical layer deals with the hardware and infrastructure, such as cables, network interface cards, and wireless access points, that enable data transmission