

Computer Networking – Part 2



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- Network Devices used and their basic functions
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What is a ?

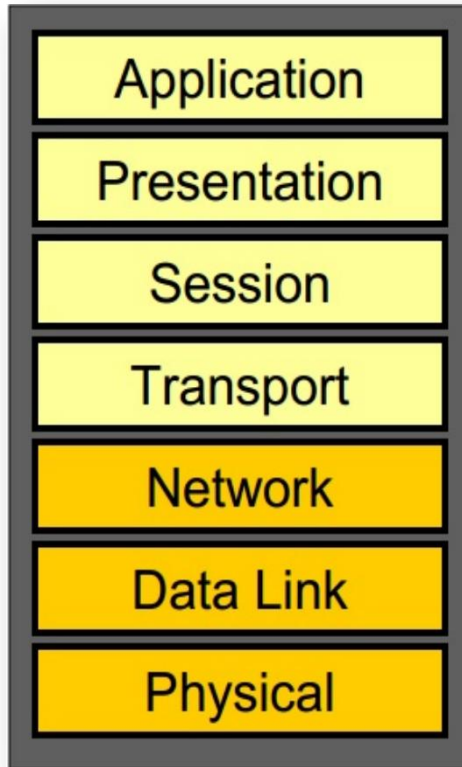
OSI (Open Source Interconnection) 7 Layer Model

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	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 Routers IP/IPX/ICMP	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		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	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 Land Based Layers	

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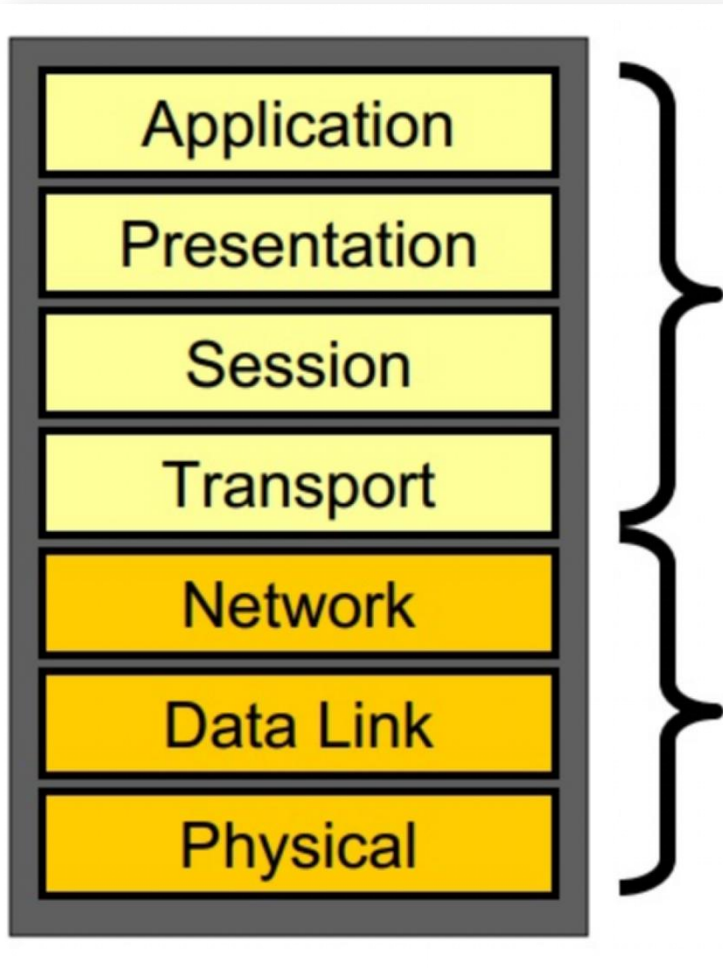
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What is an OSI Model ?



- OSI model is a reference tool for understanding data communications between any two networked systems
- It divides the communications processes into seven layers
- Each layer both performs specific functions to support the layers above it and offers services to the layers below it

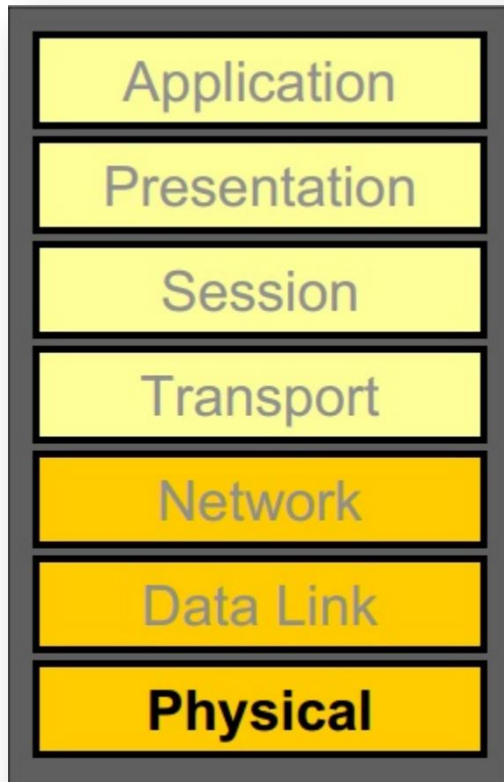
What is an OSI Model? Cont.



- Host Layers : Used whenever a message passes from or to a user
- \
- Media Layers : Used whenever any message passes through the host device

Basic Functions of each layer

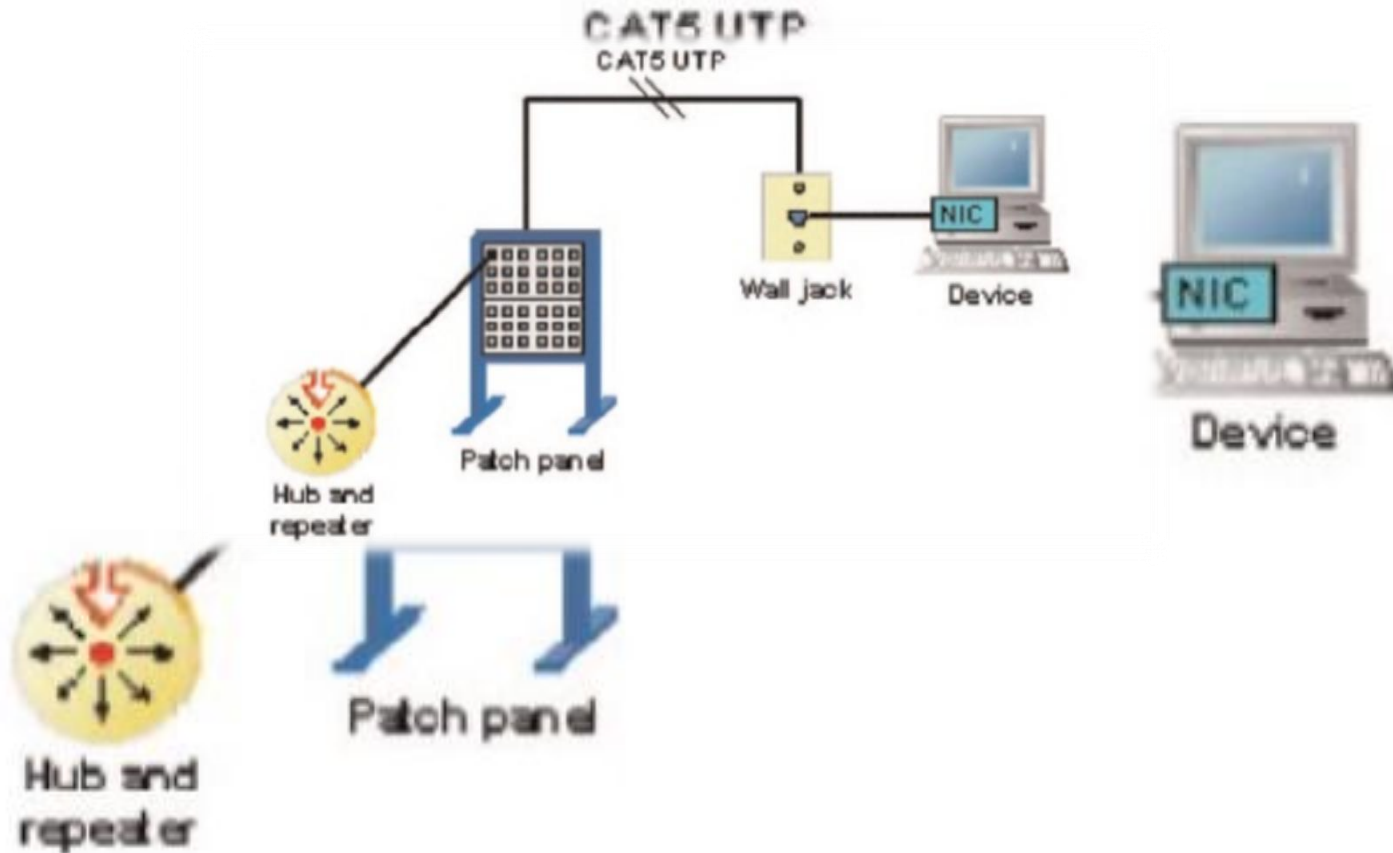
1. Physical Layer



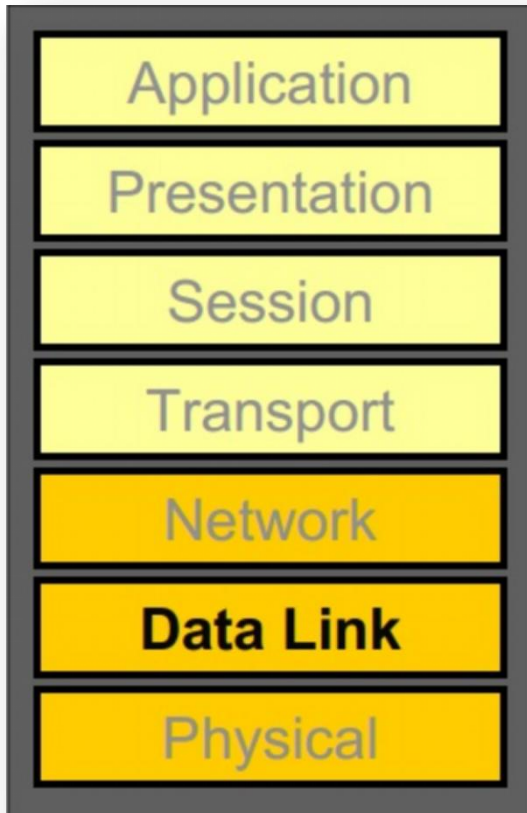
- This layer conveys the bit stream - electrical impulse, light or radio signal - through the network at the electrical and mechanical level.
- It provides the hardware means of sending and receiving data on a carrier, including defining cables, cards and physical aspects.

1. Physical Layer Cont.

- Defines the physical interfaces between devices



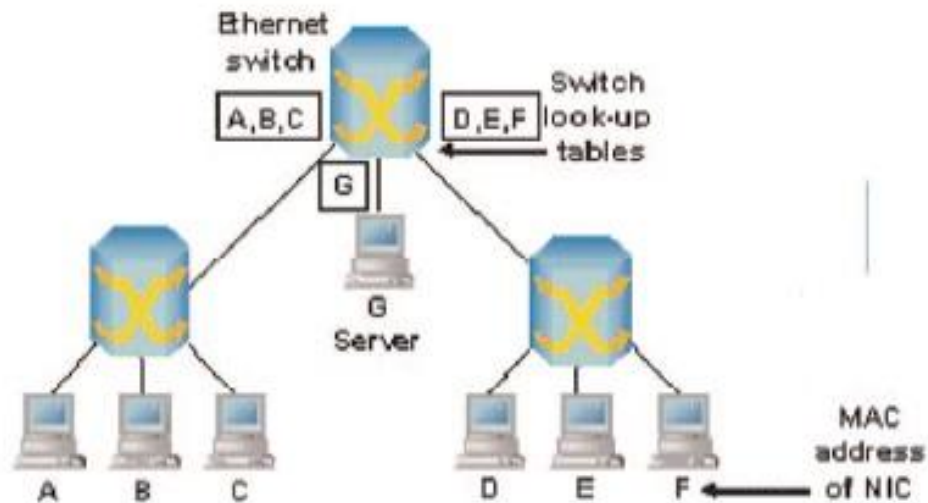
2. Data Link Layer



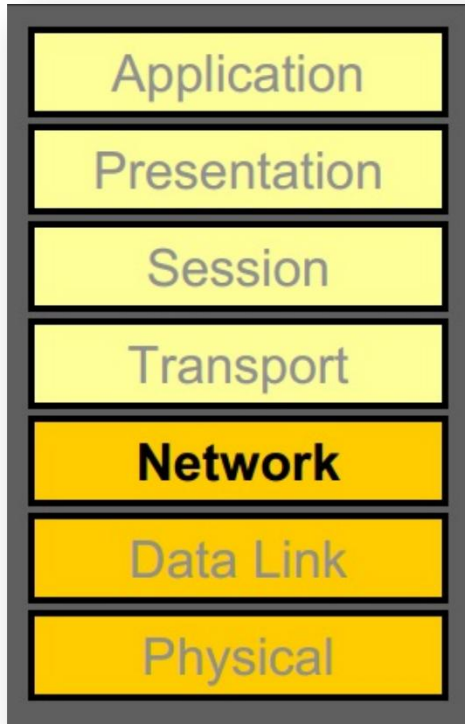
- At this layer, data packets are encoded and decoded into bits. It furnishes transmission protocol knowledge and management and handles errors in the physical layer, flowcontrol and frame synchronization.

2. Data Link Layer Contd.

- Physical link reliability and controls the access to media



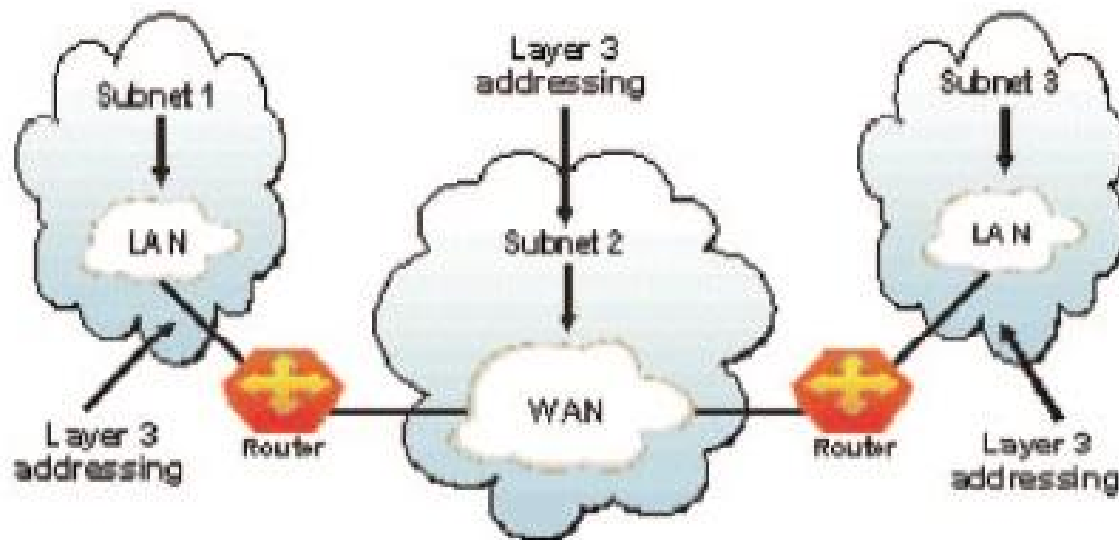
Network Layer



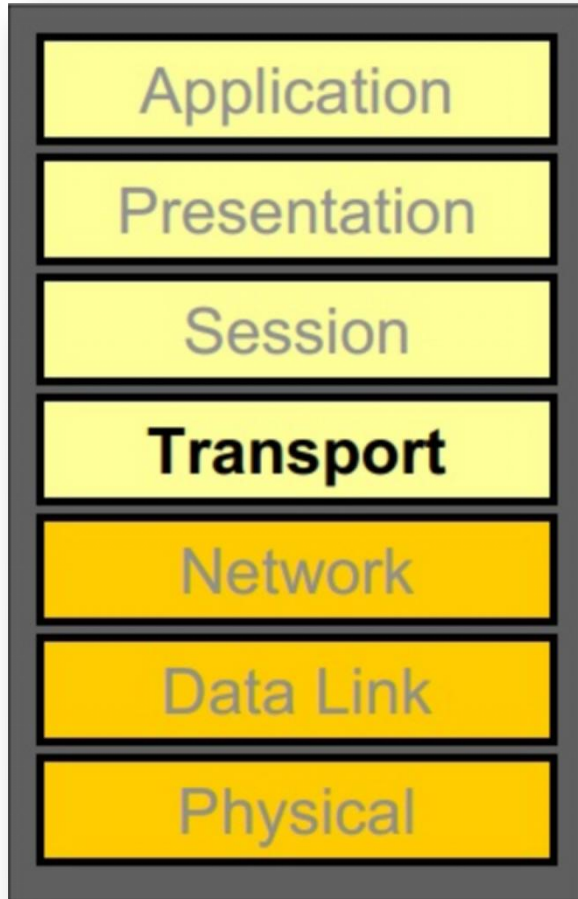
- This layer provides switching and routing technologies, creating logical paths, known as virtual circuits, for transmitting data from node to node.
- Routing and forwarding are functions of this layer, as well as addressing, internetworking, error handling, congestion control and packet sequencing.

3. Network Layer Cont.

- Translates logical network address and names to their physical address



4. Transport Layer



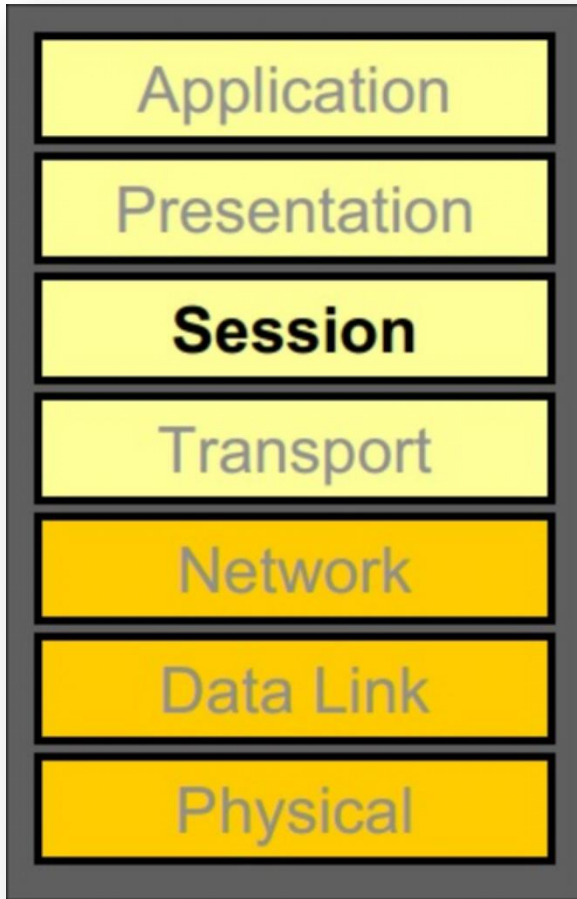
- This layer provides transparent transfer of data between end systems, or hosts, and is responsible for end-to-end error recovery and flow control. It ensures complete data transfer.

4. Transport Layer Cont.

- Transport layer of the OSI model, offers end-to-end communication between end devices through a network.



5. Session Layer



- This layer establishes, manages and terminates connections between applications.
- The session layer sets up, coordinates, and terminates conversations, exchanges, and dialogues between the applications at each end.

5. Session Layer Cont.

- Session layer, provides various services, including tracking the number of bytes that each end of the session has acknowledged receiving from the other end of the session

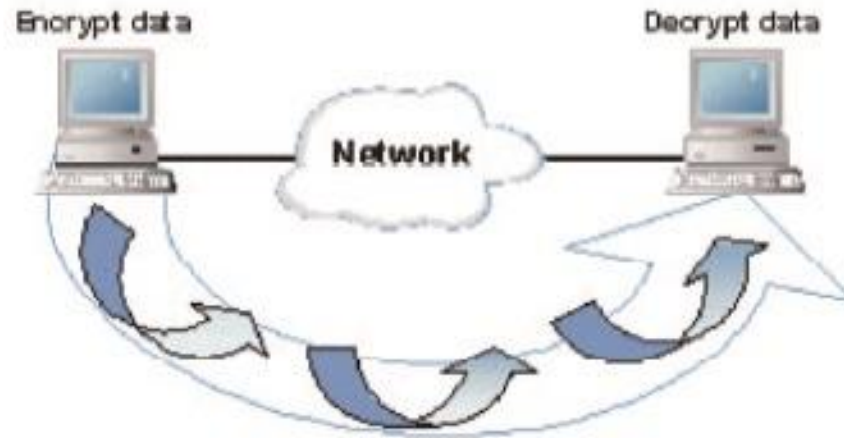
6. Presentation Layer



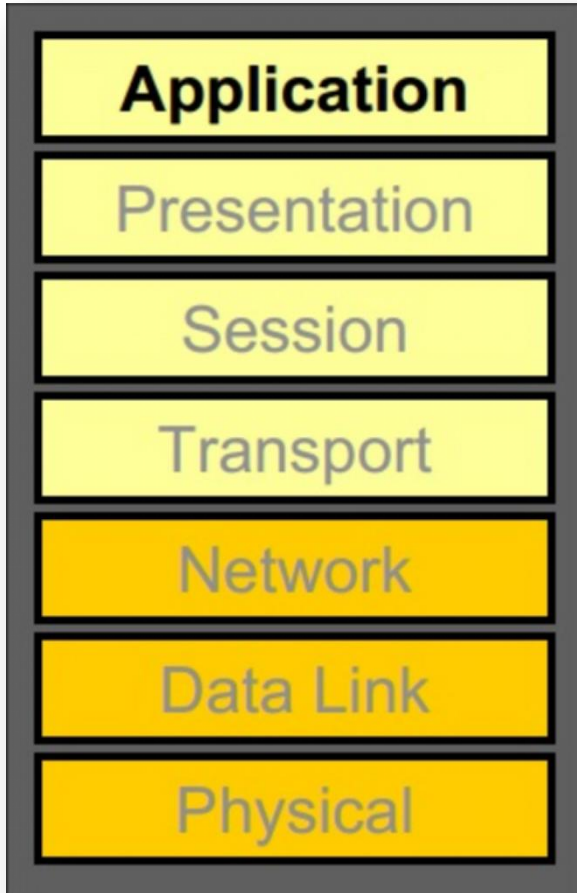
- This layer provides independence from differences in data representation (e.g., encryption) by translating from application to network format, and vice versa.
- This layer formats and encrypts data to be sent across a network, providing freedom from compatibility problems

6. Presentation Layer Cont.

- Presentation layer, is responsible for how an application formats the data to be sent out onto the network.



7. Application Layer



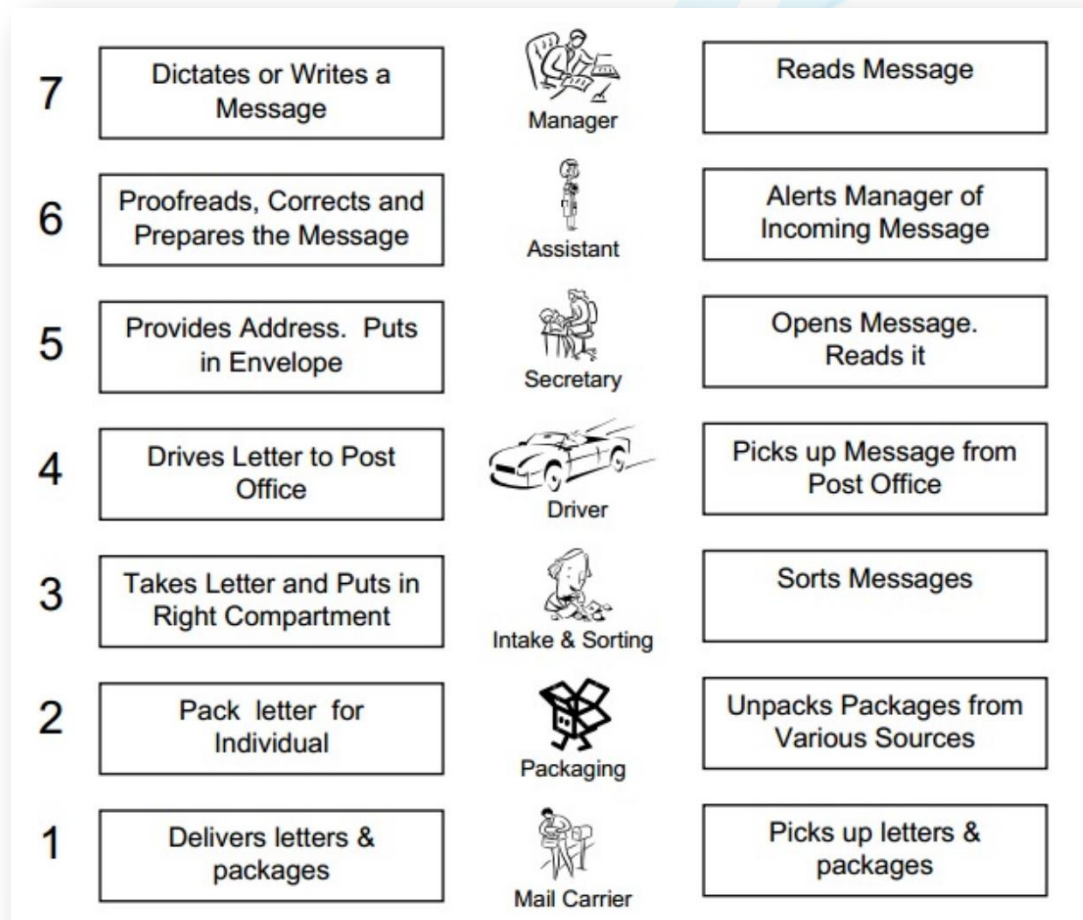
- This layer supports application and end-user processes.
- Communication partners are identified, quality of service is identified, user authentication and privacy are considered, and any constraints on data syntax are identified.

7. Application Layer Cont.

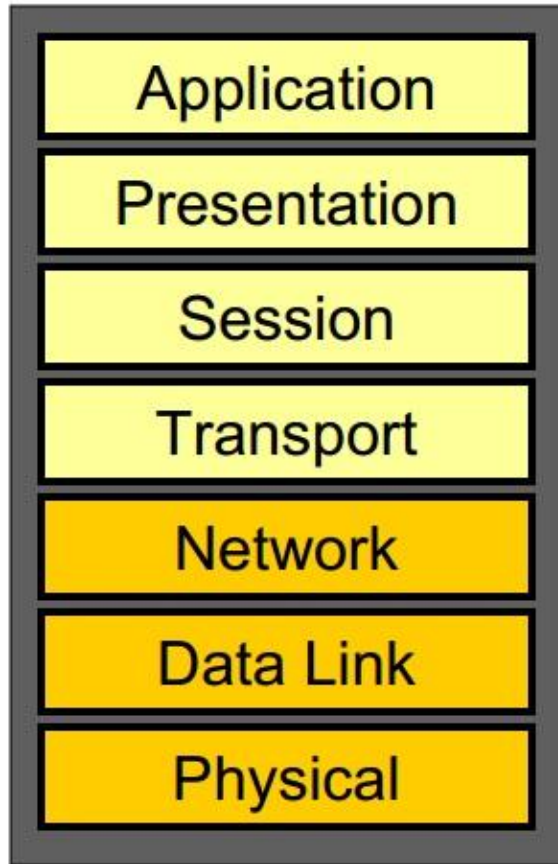
- Application layer, provides an interface for the end user operating a device connected to a network.



With an example



Network Devices used

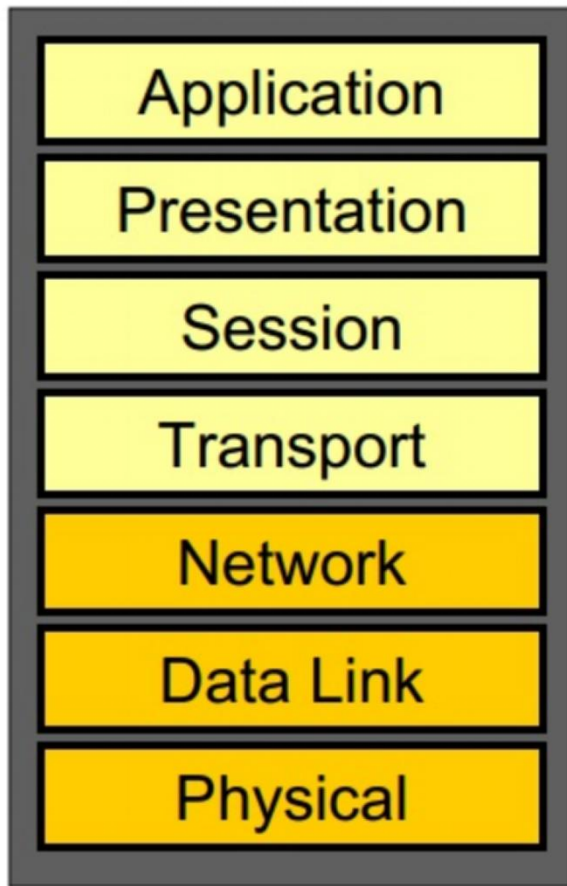


Routers, Layer 3 switches

Switches, Bridges

NICs, Cables, Hubs, Repeaters

Basic Protocols



NNTP, SIP, SSI, DNS, FTP, Gopher, HTTP, NFS, NTP, SMPP, SMTP, DHCP, SNMP, Telnet, Netconf

MIME, XDR, TLS, SSL

Named Pipes, NetBIOS, SAP, SIP, L2TP, PPTP

TCP, UDP, SCTP, DCCP

IP (IPv4, IPv6), ICMP, IPsec, IGMP, IPX, AppleTalk

ATM, SDLC, HDLC, ARP, CSLIP, SLIP, PLIP, IEEE 802.3, Frame Relay, ITU-T G.hn DLL, PPP, X.25

EIA/TIA-232, EIA/TIA-449, ITU-T V-Series, I.430, I.431, POTS, PDH, SONET/SDH, PON, OTN, DSL, IEEE 802.3, IEEE 802.11, IEEE 802.15, IEEE 802.16, IEEE 1394, ITU-T G.hn PHY, USB, Bluetooth

The Main Benefits of the OSI model

- Helps users understand the big picture of networking
- Helps users understand how hardware and software elements function together
- Makes troubleshooting easier by separating networks into manageable pieces

The Main Benefits of the OSI model

- Defines terms that networking professionals can use to compare basic functional relationships on different Networks
- Helps users understand new technologies as they are developed
- Aids in interpreting vendor explanations of product functionality



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