

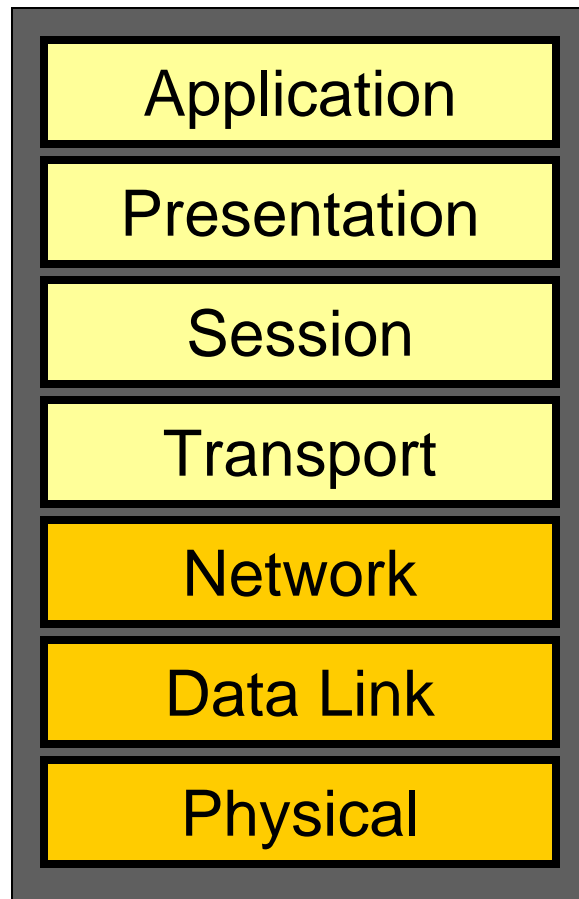


Industrial Ethernet Training

OSI Model

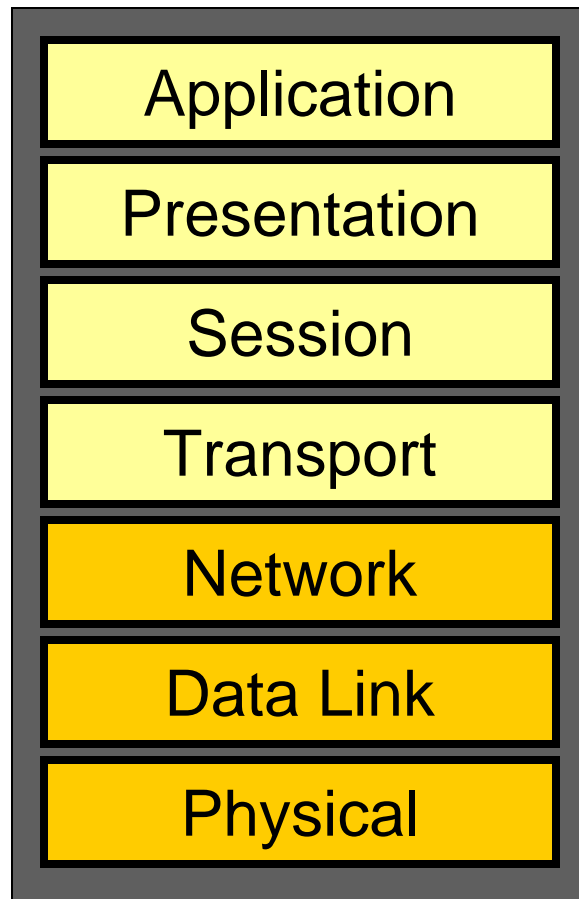
FLEXIBLE. RELIABLE. POWERFUL.

- **Open Systems Interconnection Reference Model**
- **Developed in 1984 by the International Standards Organization (ISO)**
- **It is a way of sub-dividing a communications system into smaller parts called layers.**
- **A layer is a collection of conceptually similar functions that provide services to the layer above it and receives services from the layer below it.**
- **Provides a set of design standards for equipment manufacturers so they can communicate with each other**
- **Basic guideline for protocol development**



- **Seven Layer Model**
- **Each layer provides a set of functions to the layer above and relies on function of the layer below**
- **Each layer communicates with its peer layer on another node by sending messages back and forth**

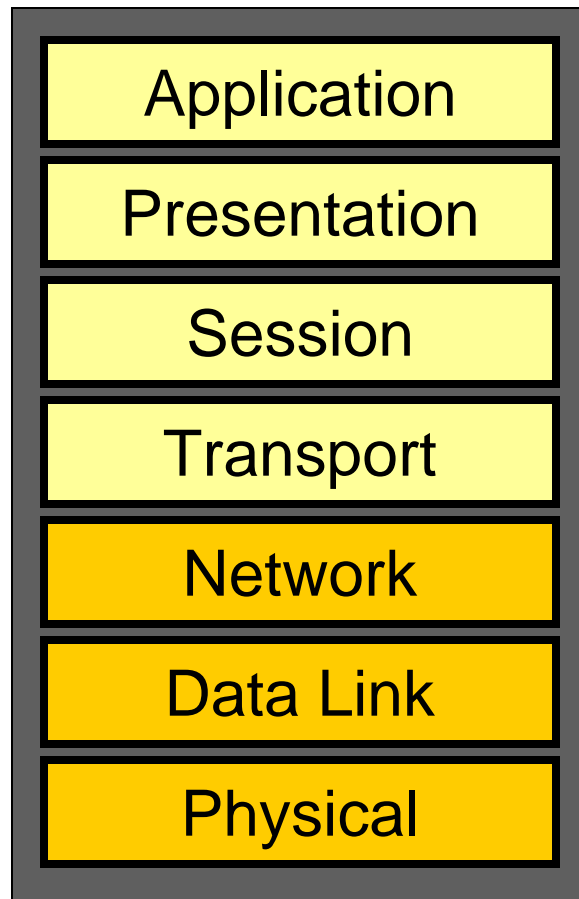
OSI Model



Host Layers: Used whenever a message passes from or to a user

Media Layers: Used whenever any message passes through the host device

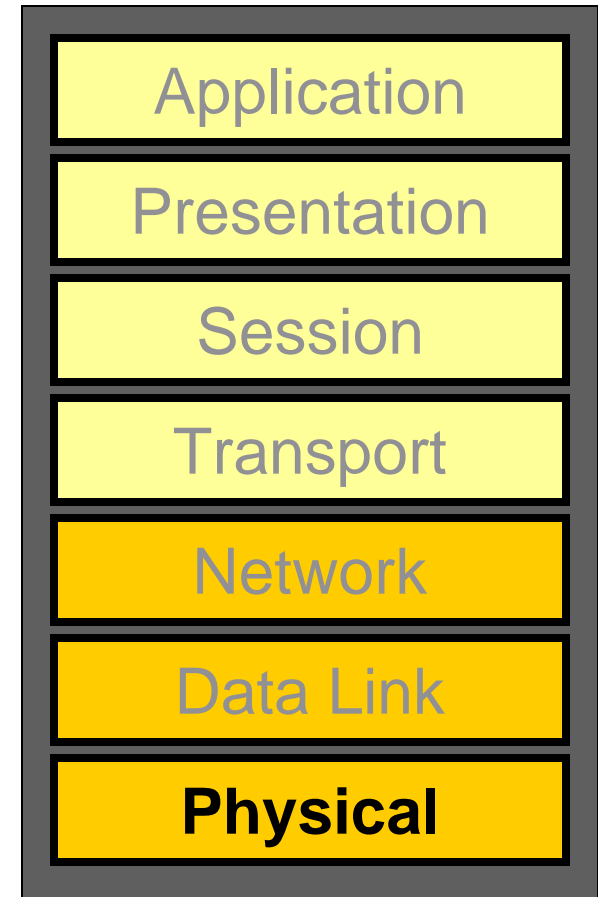
OSI Model



- 7 Network Process for Applications
- 6 Data Formatting & Encryption
- 5 Inter-host communication
- 4 Provides End to End Delivery
- 3 Routing & Addressing
- 2 Physical Addressing
- 1 Binary TRx on Physical Media

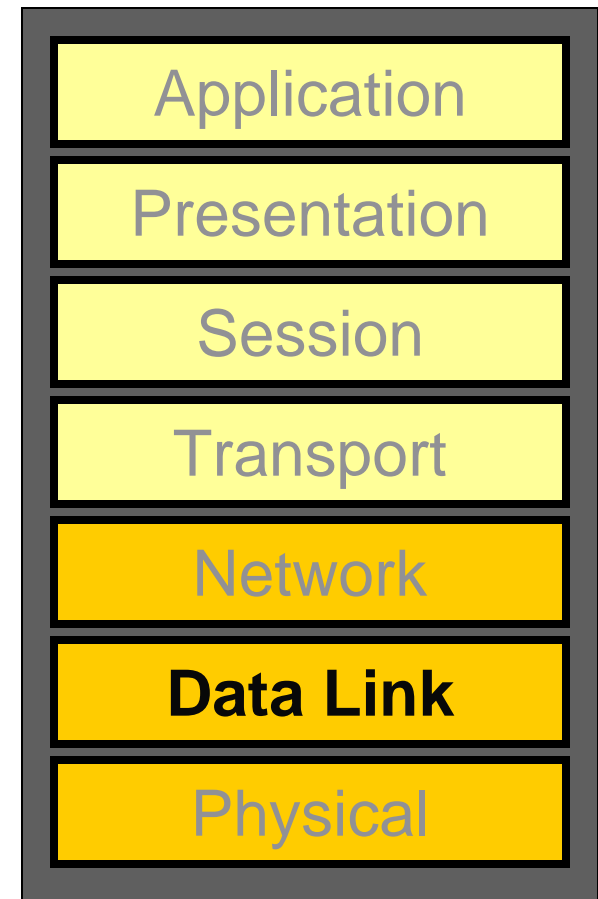
1: Physical Layer

- Conveys the bit stream through the network at the electrical and mechanical level
- Defines physical means of moving data over network devices
- Interfaces between network medium and devices
- Defines optical, electric and mechanical characteristics: voltage levels, timing of voltage changes, physical data rates, transmission distances and physical connections



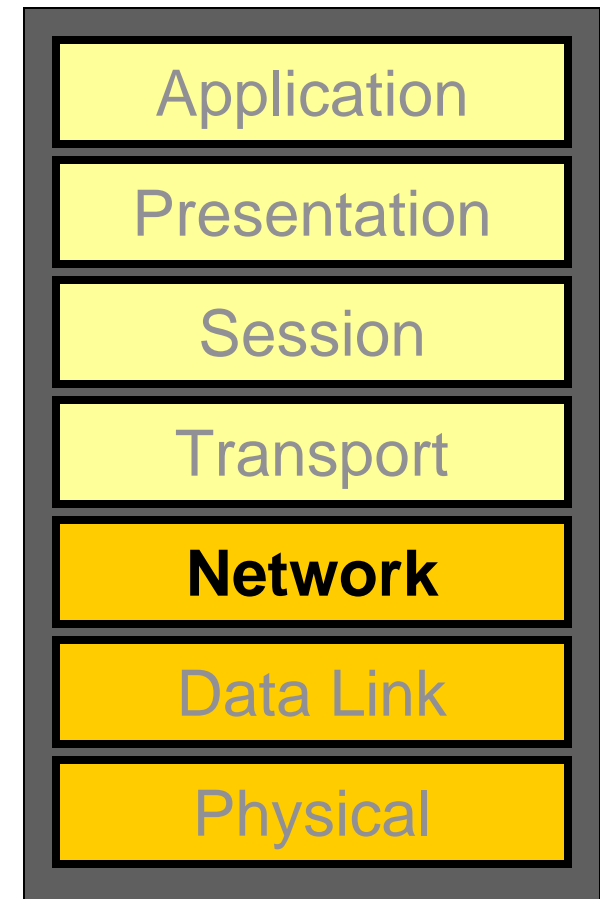
2: Data Link Layer

- Takes a string of bits and delivers it across a link
- Conveys the bit stream through the network at the electrical and mechanical level (i.e., Layer 1)
- Turns packets into raw bits and bits into packets
- **Framing & Error Detection**
 - Break the bit stream up into frames
 - Compute an error-detection code
 - Transmit each frame separately



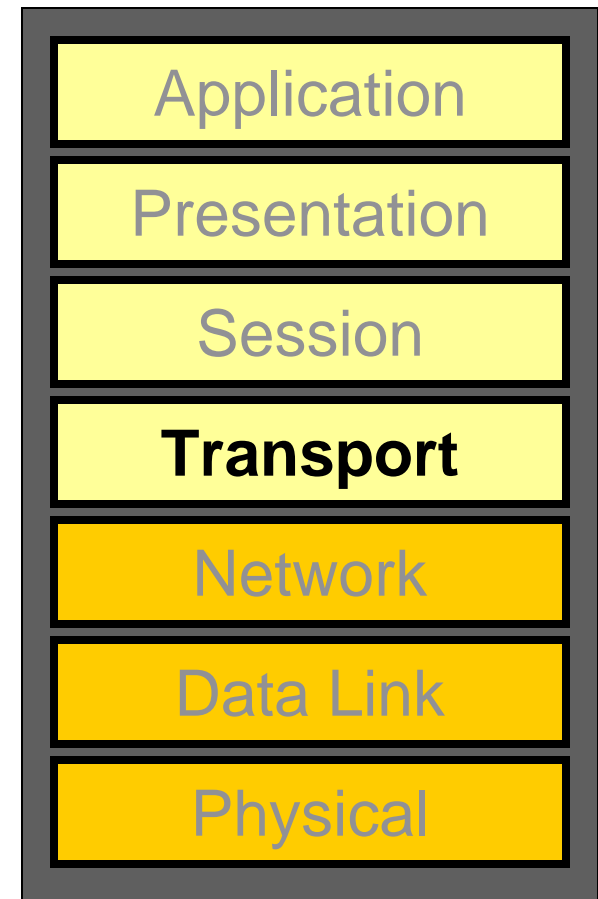
3: Network Layer

- Translates logical network address and names to their physical address (e.g., Device name to MAC address)
- Responsible for
 - Addressing
 - Determining routes for sending
 - Managing network problems such as packet switching, data congestion and routing
- Breaks the data into smaller unit and assembles data
- Shields higher layers from details of how the data gets to its destination



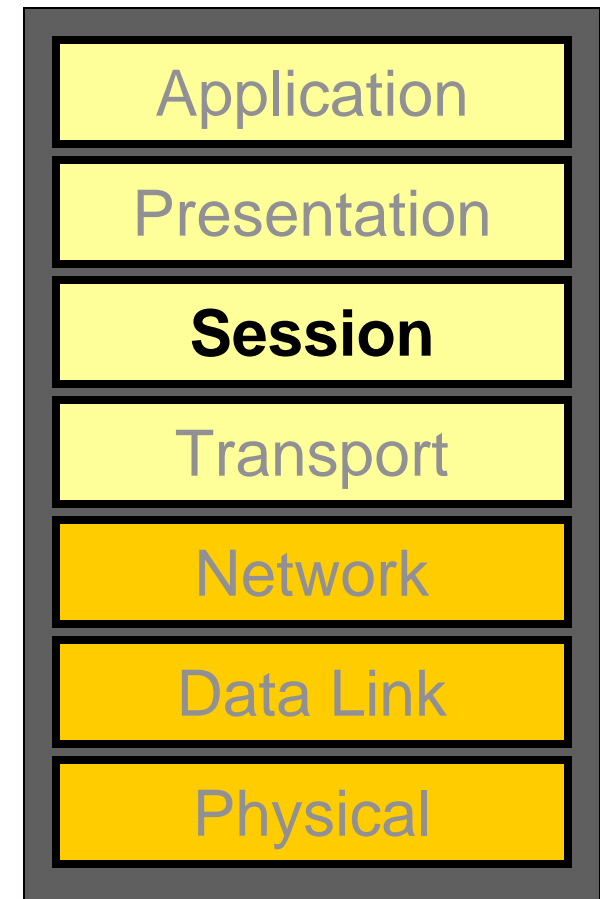
4: Transport Layer

- Divides streams of data into chunks or packets
- Reassembles the message from packets
- Provide error-checking to guarantee error-free data delivery, with no losses or duplications
- Provides acknowledgment of successful transmissions
- Requests retransmission if some packets don't arrive error-free
- Provides flow control and error-handling



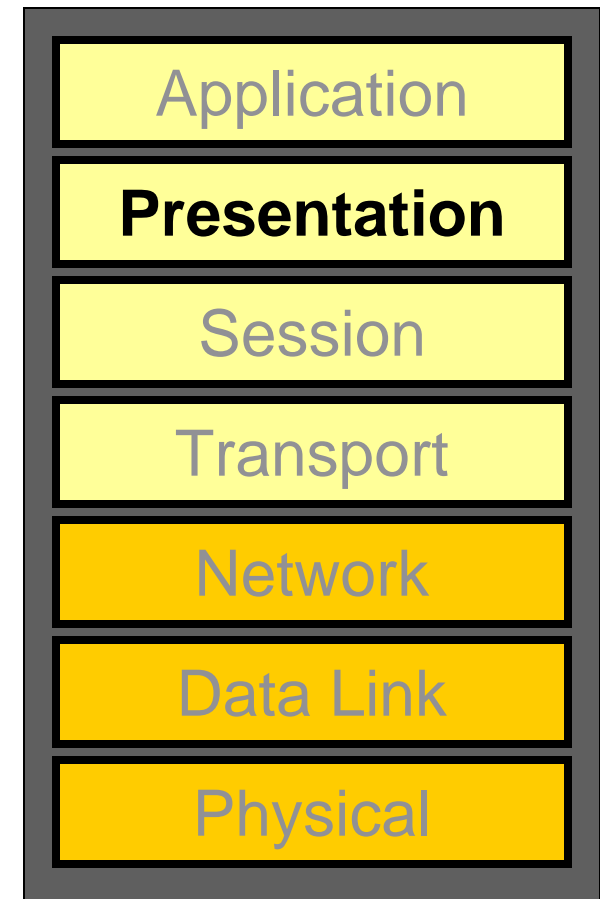
5: Session Layer

- Establishes, maintains and ends sessions across the network
- Responsible for name recognition (identification) so only the designated parties can participate in the session
- Provides synchronization services by planning check points in the data stream
- If session fails, only data after the most recent checkpoint need be transmitted
- Manages who can transmit data at a certain time and for how long



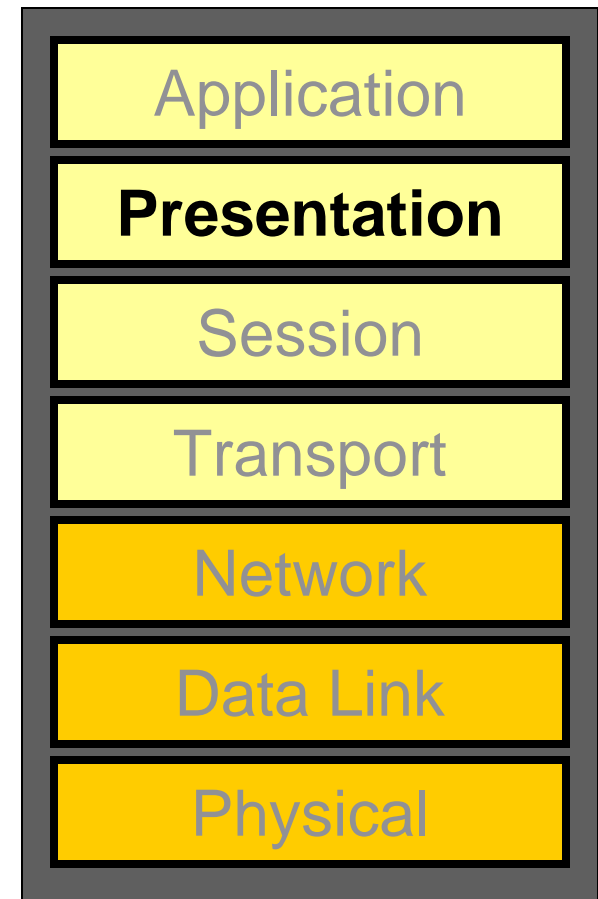
6: Presentation

- Translates from application to network format and vice-versa
- All different formats from all sources are made into a common uniform format that the rest of the OSI can understand
- Responsible for protocol conversion, character conversions, data encryption / decryption, expanding graphics commands and data compression
- Sets standards for different systems to provide seamless communication from multiple protocol stacks



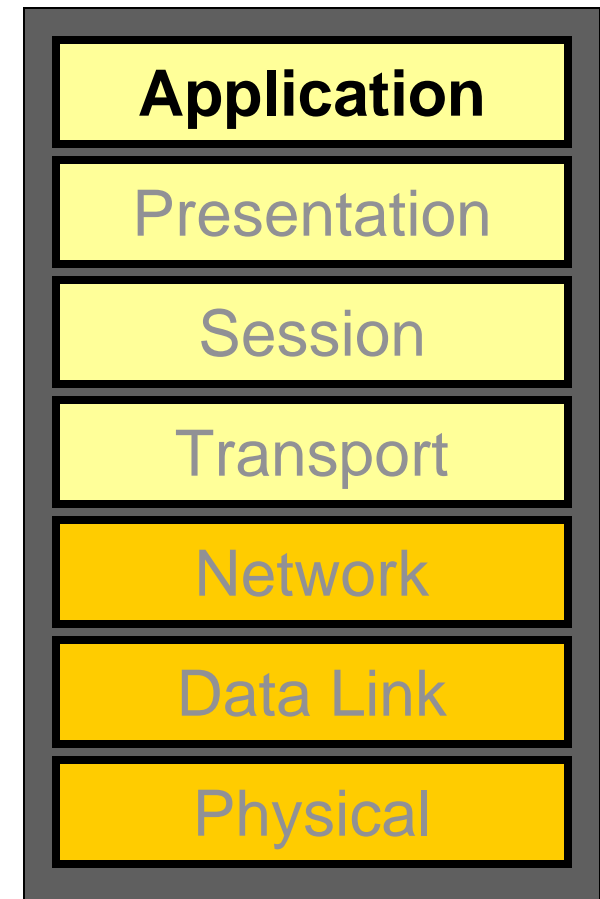
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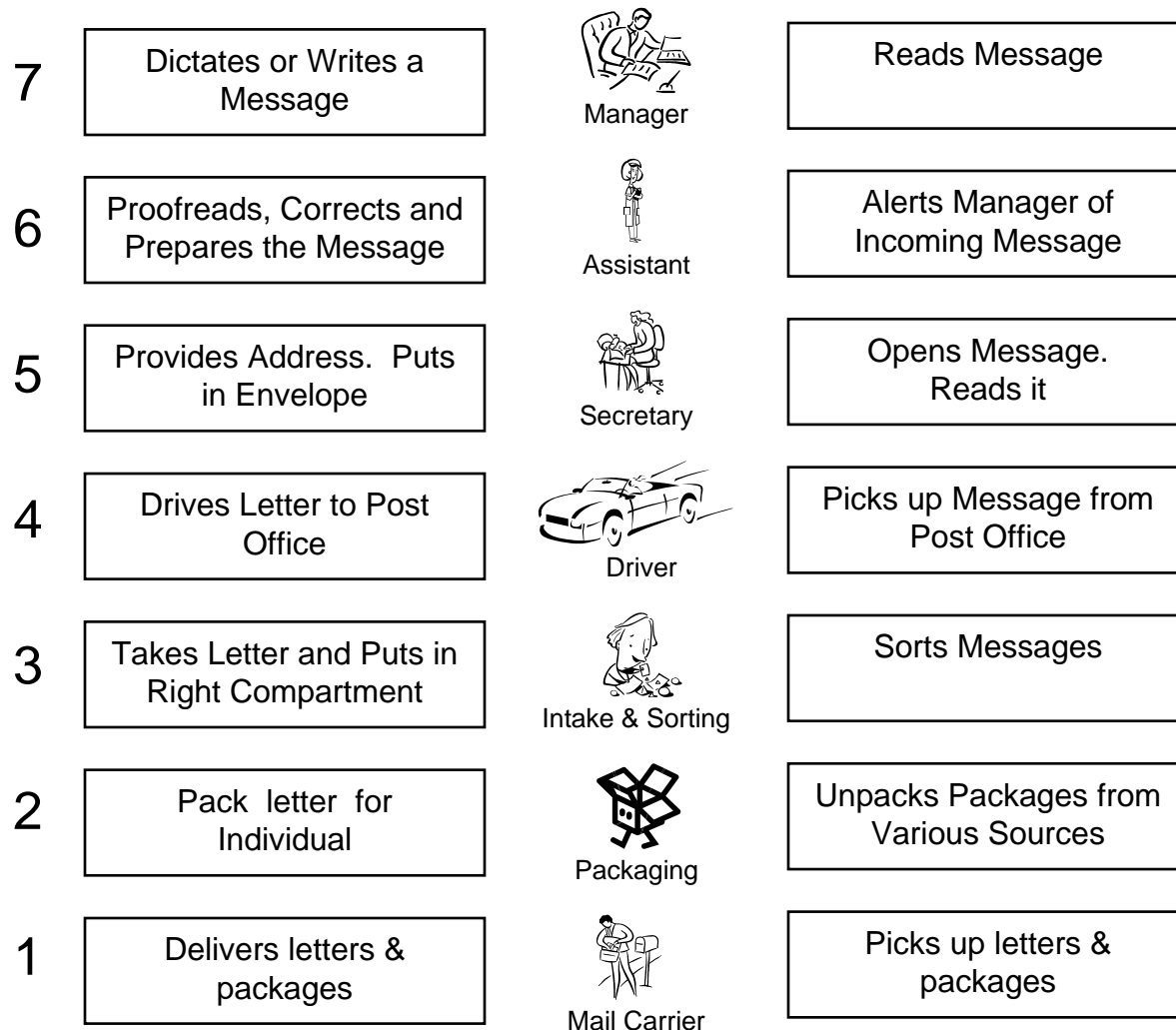
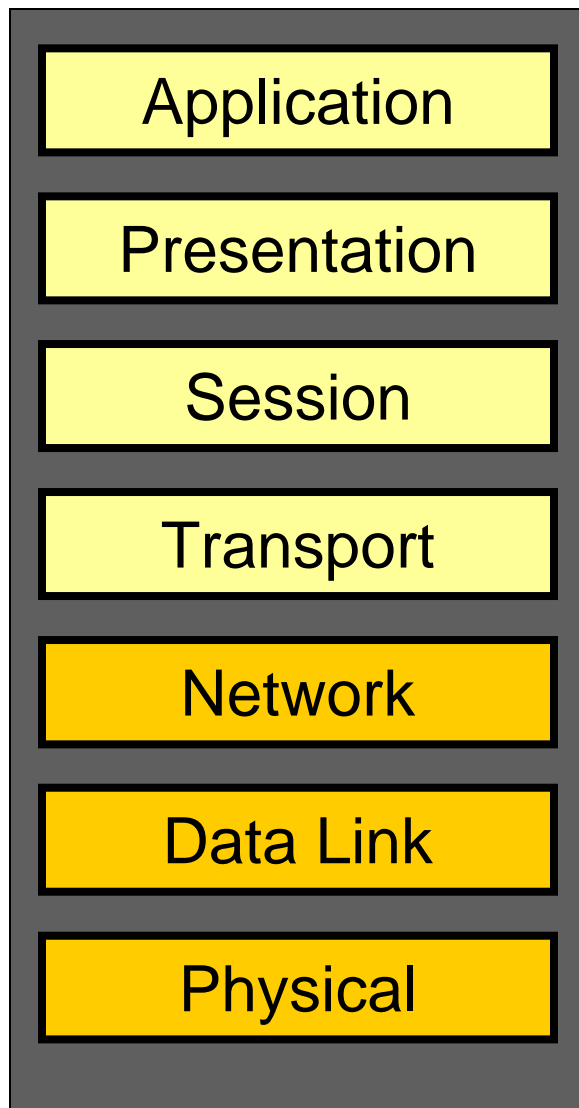


7: Application Layer

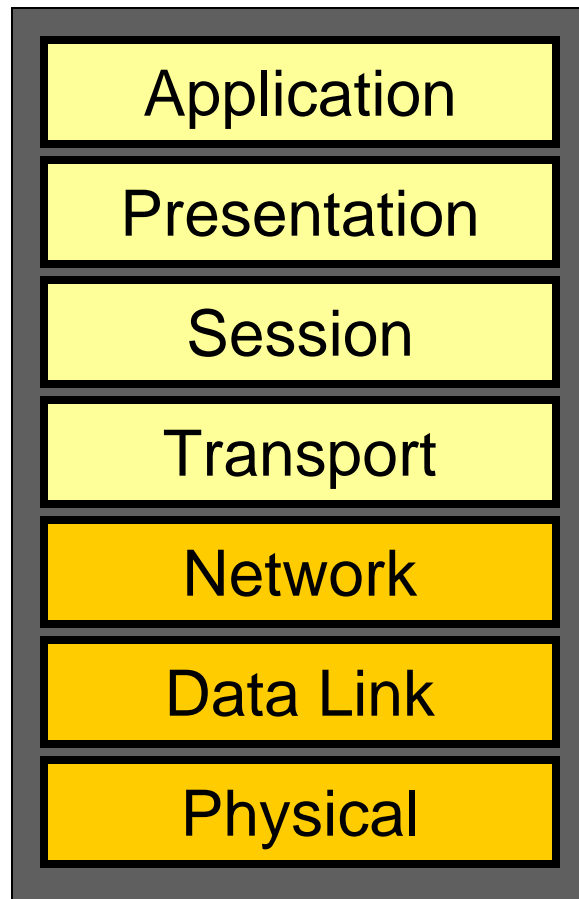
- Used for applications specially written to run over the network
- Allows access to network services that support applications
- Directly represents the services that directly support user applications (e.g., file transfer and email)
- What the user sees or does



OSI Model



Network Components

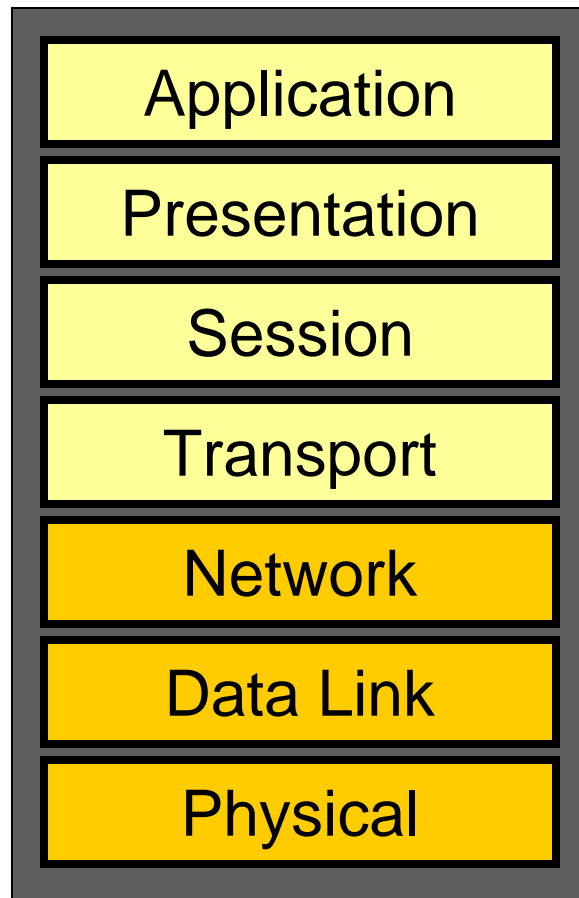


Routers, Layer 3 switches

Switches, Bridges

NICs, Cables, Hubs, Repeaters

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