

OSI Model

Networking and Computer Security

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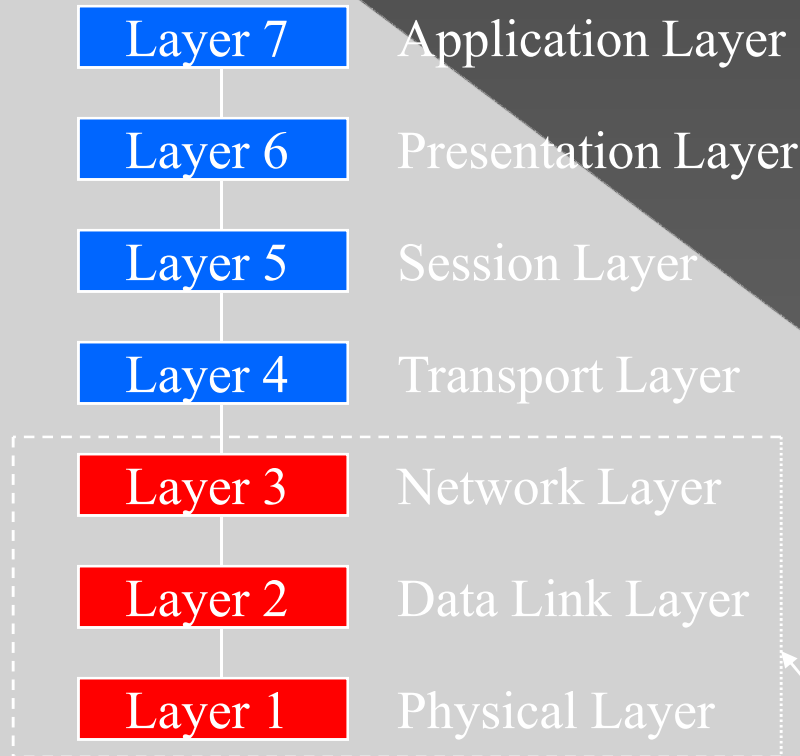
Topics

- The OSI reference model
- Services in the OSI model

OSI Reference Model

- OSI Reference Model - internationally standardised network architecture.
- OSI = *Open Systems Interconnection*: deals with *open systems*, i.e. systems open for communications with other systems.
- Specified in ISO 7498.
- Model has 7 layers.

7-Layer OSI Model



- Layers 1-4 relate to communications technology.
- Layers 5-7 relate to user applications.

Communications subnet boundary

Layer 7: Application Layer

- ⦿ Level at which applications access network services.
 - > Represents services that directly support software applications for file transfers, database access, and electronic mail etc.

Layer 6: Presentation Layer

- ⦿ Related to representation of transmitted data
 - > Translates different data representations from the Application layer into uniform standard format
- ⦿ Providing services for secure efficient data transmission
 - > e.g. data encryption, and data compression.

Layer 5: Session Layer

- ⊙ Allows two applications on different computers to establish, use, and end a session.
 - > e.g. file transfer, remote login
- ⊙ Establishes dialog control
 - > Regulates which side transmits, plus when and how long it transmits.
- ⊙ Performs *token management* and *synchronization*.

Layer 4: Transport Layer

- ◎ Manages transmission packets
 - > Repackages long messages when necessary into small packets for transmission
 - > Reassembles packets in correct order to get the original message.
- ◎ Handles error recognition and recovery.
 - > Transport layer at receiving acknowledges packet delivery.
 - > Resends missing packets

Layer 3: Network Layer

- ⦿ Manages addressing/routing of data within the subnet
 - > Addresses messages and translates logical addresses and names into physical addresses.
 - > Determines the route from the source to the destination computer
 - > Manages traffic problems, such as switching, routing, and controlling the congestion of data packets.
- ⦿ Routing can be:
 - > Based on static tables
 - > determined at start of each session
 - > Individually determined for each packet, reflecting the current network load.

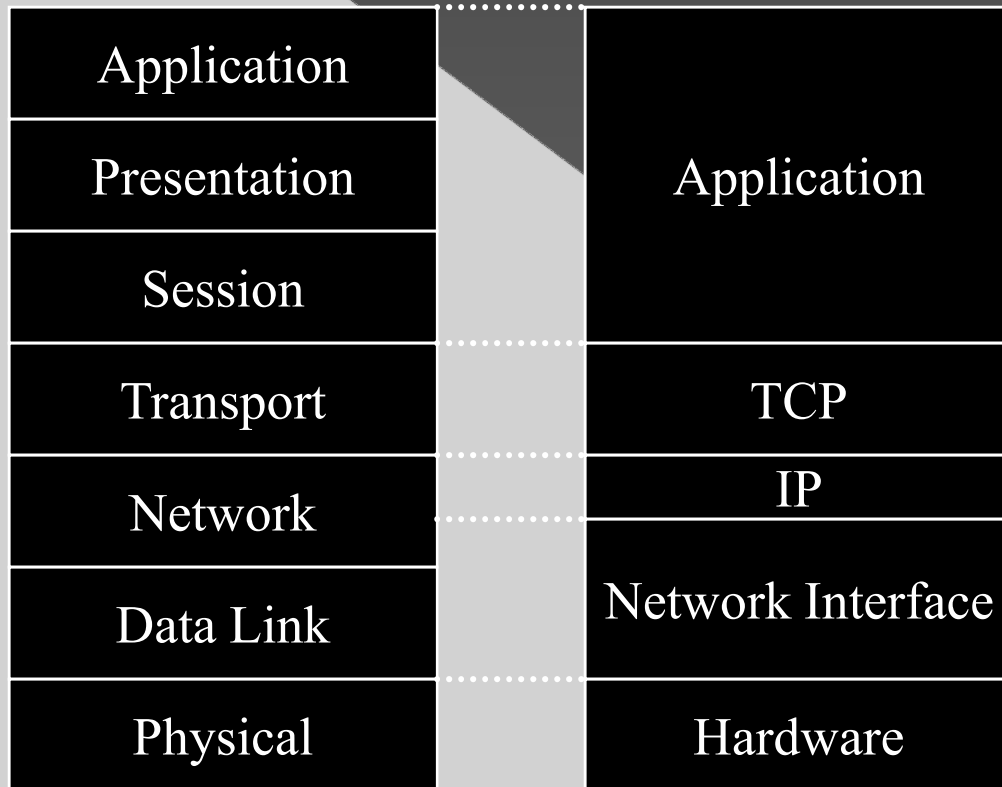
Layer 2: Data Link Layer

- Packages raw bits from the Physical layer into frames (logical, structured packets for data).
- Provides reliable transmission of frames
 - It waits for an acknowledgment from the receiving computer.
 - Retransmits frames for which acknowledgement not received

Layer 1: Physical Layer

- ⦿ Transmits bits from one computer to another
- ⦿ Regulates the transmission of a stream of bits over a physical medium.
- ⦿ Defines how the cable is attached to the network adapter and what transmission technique is used to send data over the cable. Deals with issues like
 - > The definition of 0 and 1, e.g. how many volts represents a 1, and how long a bit lasts?
 - > Whether the channel is simplex or duplex?
 - > How many pins a connector has, and what the function of each pin is?

Internet Protocols vs OSI

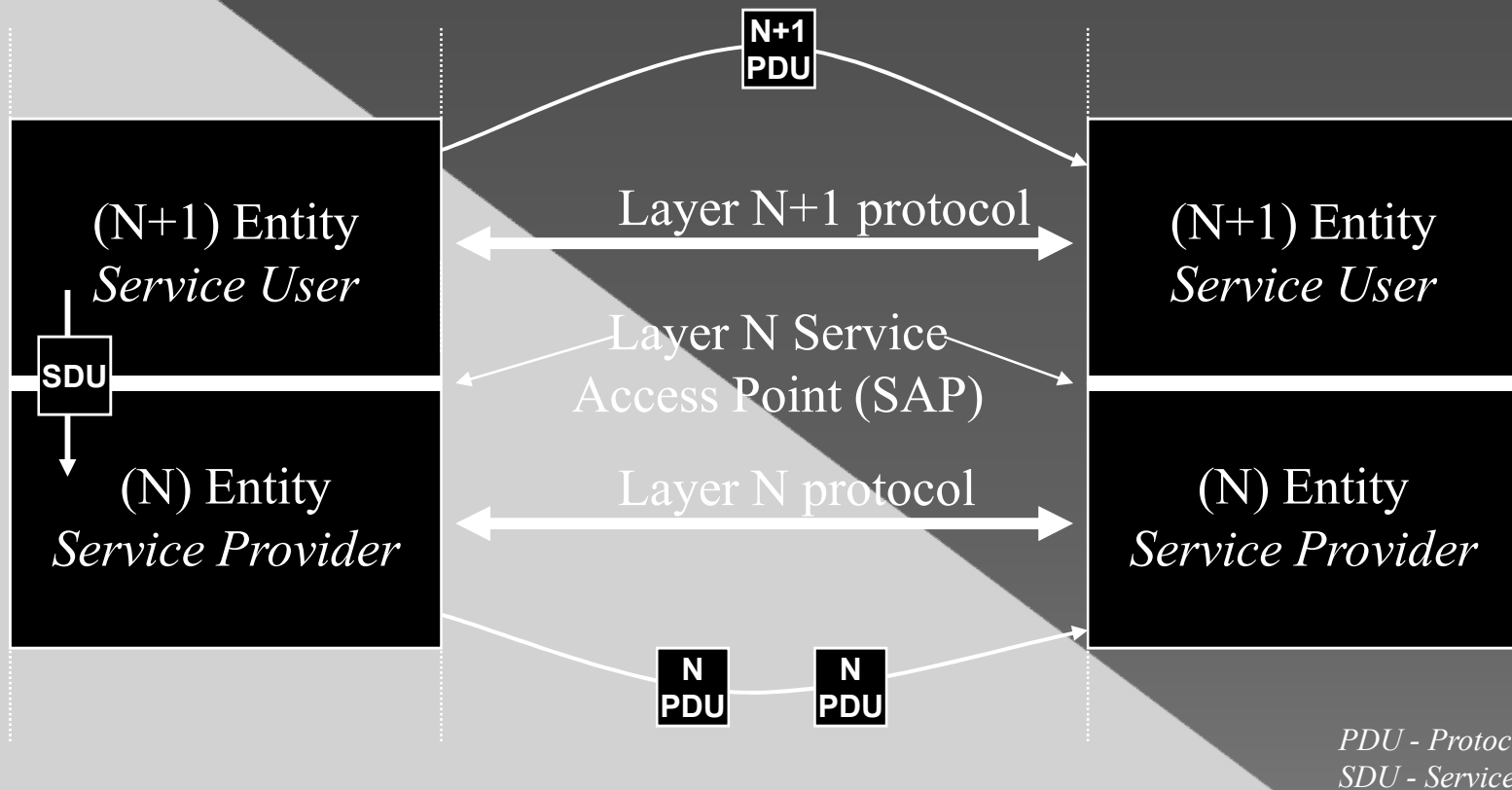


- Explicit Presentation and session layers missing in Internet Protocols
- Data Link and Network Layers redesigned

Services in the OSI Model

- In OSI model, each layer provide services to layer above, and 'consumes' services provided by layer below.
- Active elements in a layer called *entities*.
- Entities in same layer in different machines called *peer entities*.

Layering Principles



- ⊙ Layer N provides service to layer N+1

Connections

- Layers can offer *connection-oriented* or *connectionless* services.
- Connection-oriented like telephone system.
- Connectionless like postal system.
- Each service has an associated *Quality-of-service* (e.g. reliable or unreliable).

Reliability

- Reliable services never lose/corrupt data.
- Reliable service costs more.
- Typical application for reliable service is file transfer.
- Typical application not needing reliable service is voice traffic.
- Not all applications need connections.

Topics

- Service = set of primitives provided by one layer to layer above.
- Service defines what layer can do (but not how it does it).
- Protocol = set of rules governing data communication between peer entities, i.e. format and meaning of frames/packets.
- Service/protocol decoupling very important.

THANK YOU