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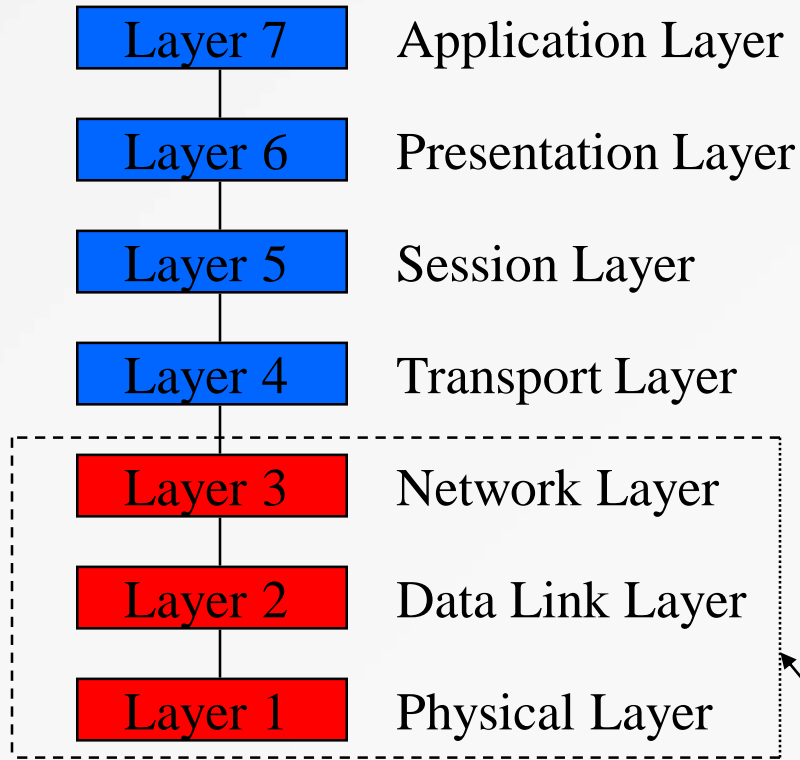
OSI Model

Computer Networks

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

Layer 7	Application Layer
Layer 6	Presentation Layer
Layer 5	Session Layer
Layer 4	Transport Layer
Layer 3	Network Layer
Layer 2	Data Link Layer
Layer 1	Physical Layer

- 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

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?

Internet Protocols vs OSI

Application	Application
Presentation	
Session	
Transport	TCP
Network	IP
Data Link	Network Interface
Physical	Hardware

- 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
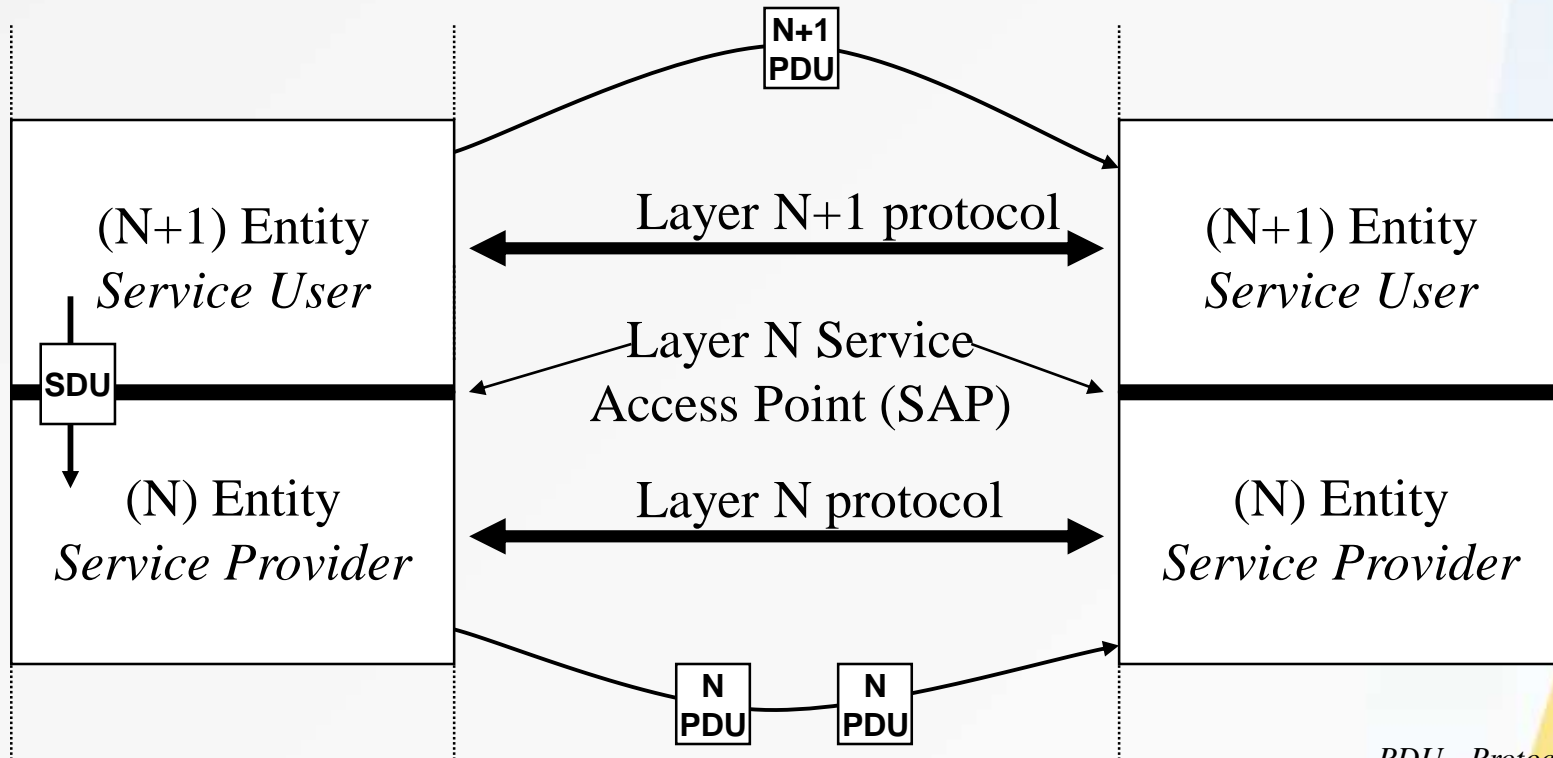
- Layer N provides service to layer N+1

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.