

OSI Reference Model

CEN 322 – Module I

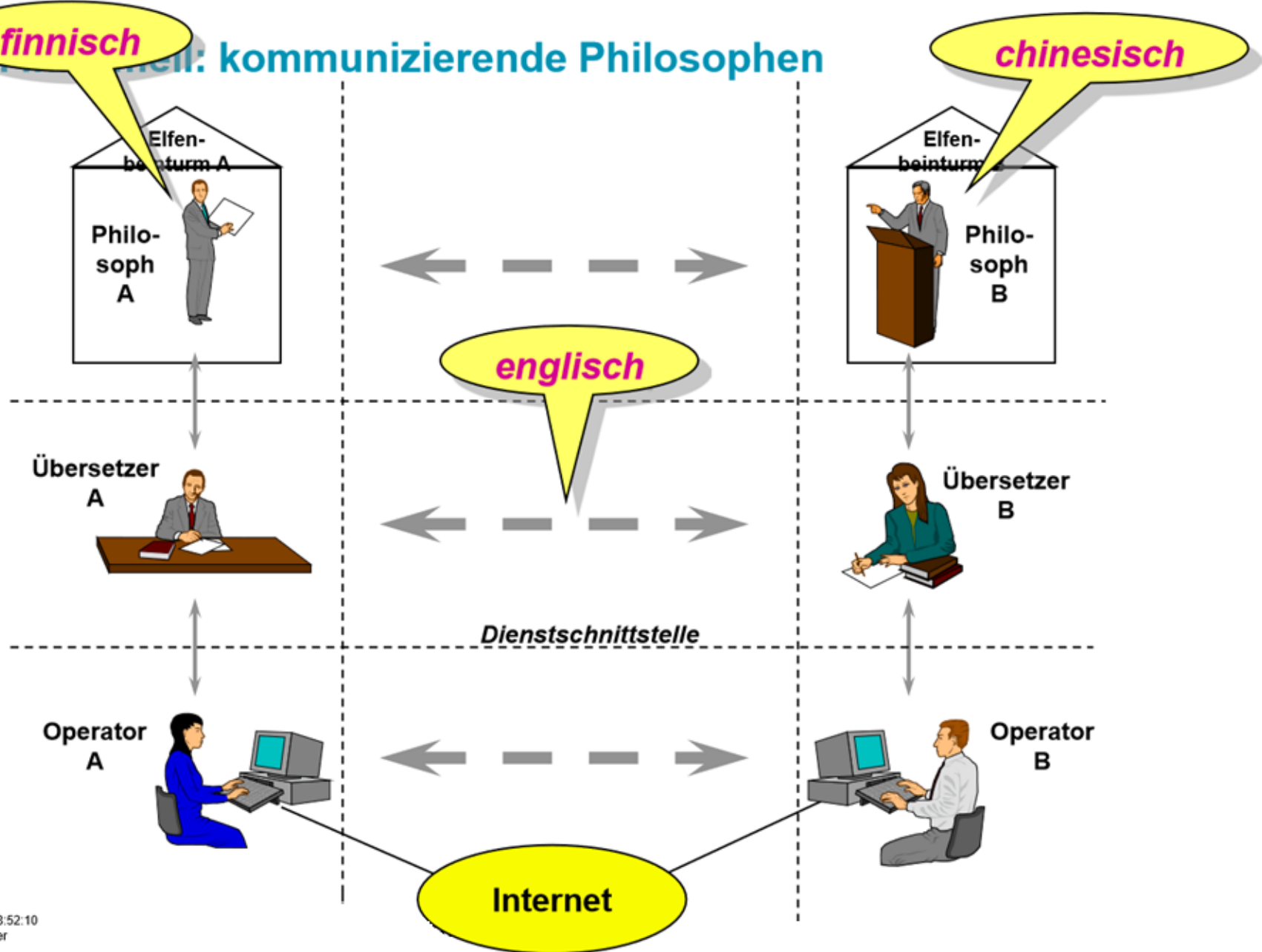
Internet Communication

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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.

Übersetzung: kommunizierende Philosophen



OSI Feature

- Open system standards over the world
- Rigorously defined structured, hierarchical network model
- Complete description of the function
- Provide standard test procedures

OSI History (1)

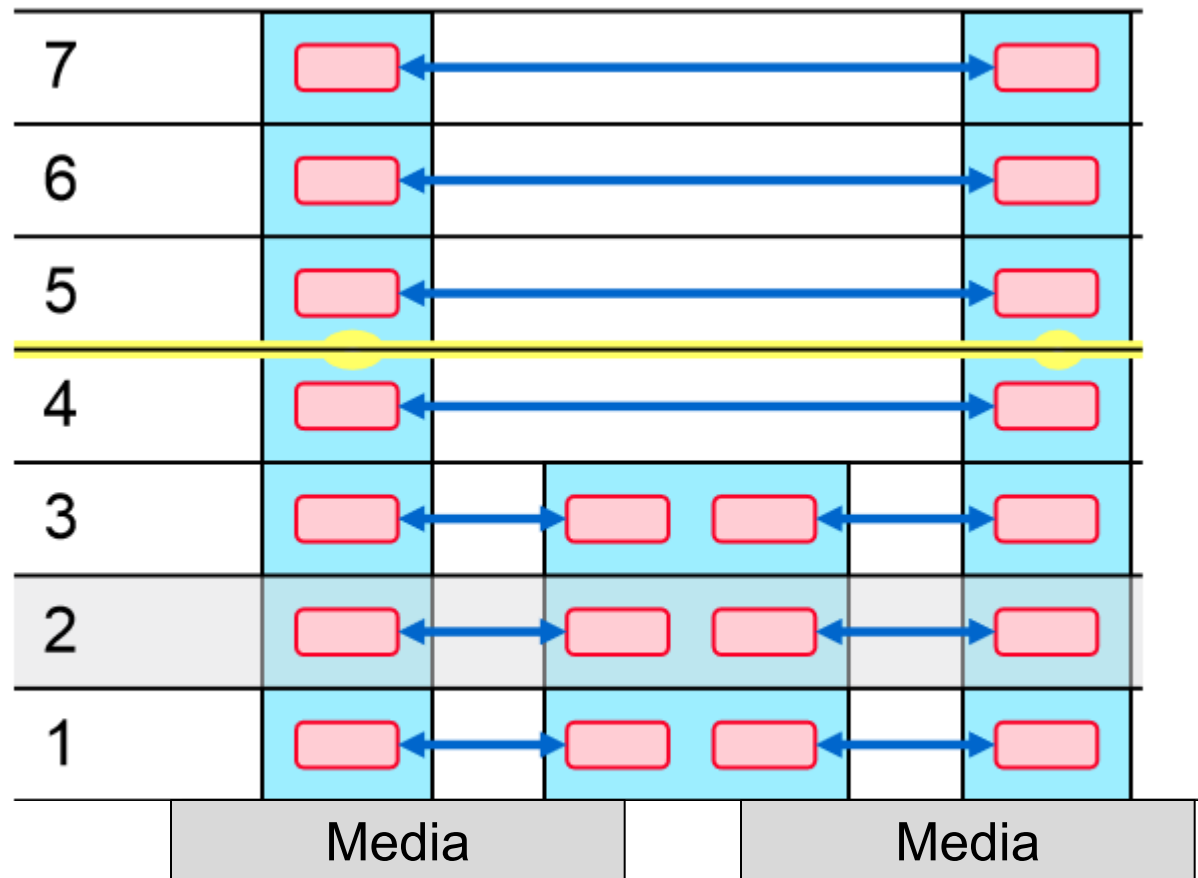
- In 1978, the International Standard Organization (ISO) began to develop its OSI framework architecture.
- OSI has two major components: an abstract model of networking, called the Basic Reference Model or seven-layer model, and a set of specific protocols.

OSI History (2)

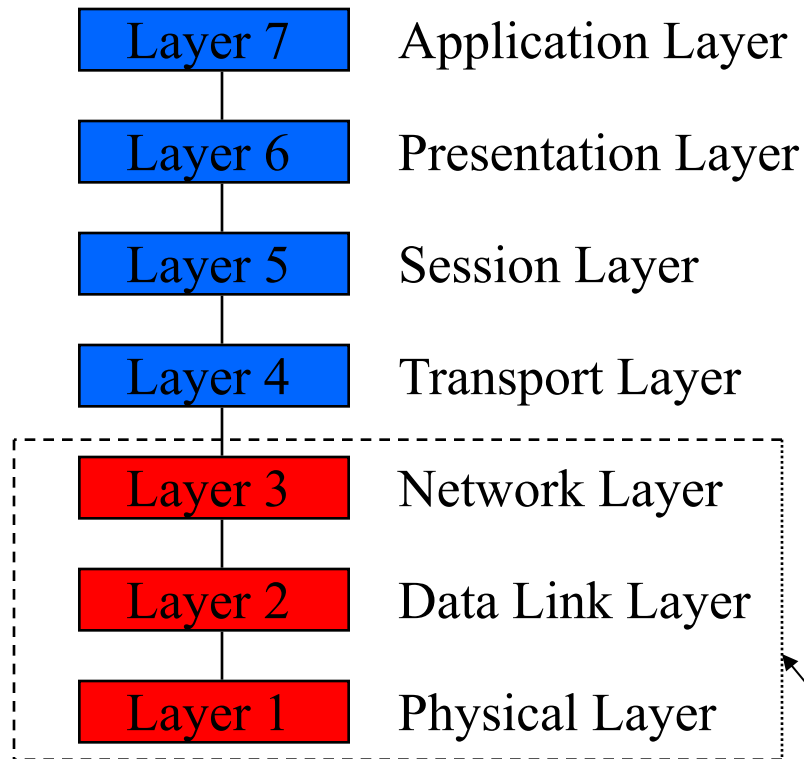
- The concept of a 7 layer model was provided by the work of Charles Bachman, then of Honeywell.
- Various aspects of OSI design evolved from experiences with the Advanced Research Projects Agency Network (ARPANET) and the fledgling Internet.

Components of OSI-Model

- Layers
- Systems
- Media
- Services
- Entities
- Protocols



7-Layer OSI Model



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

Communications subnet boundary

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?

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 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 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 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*.

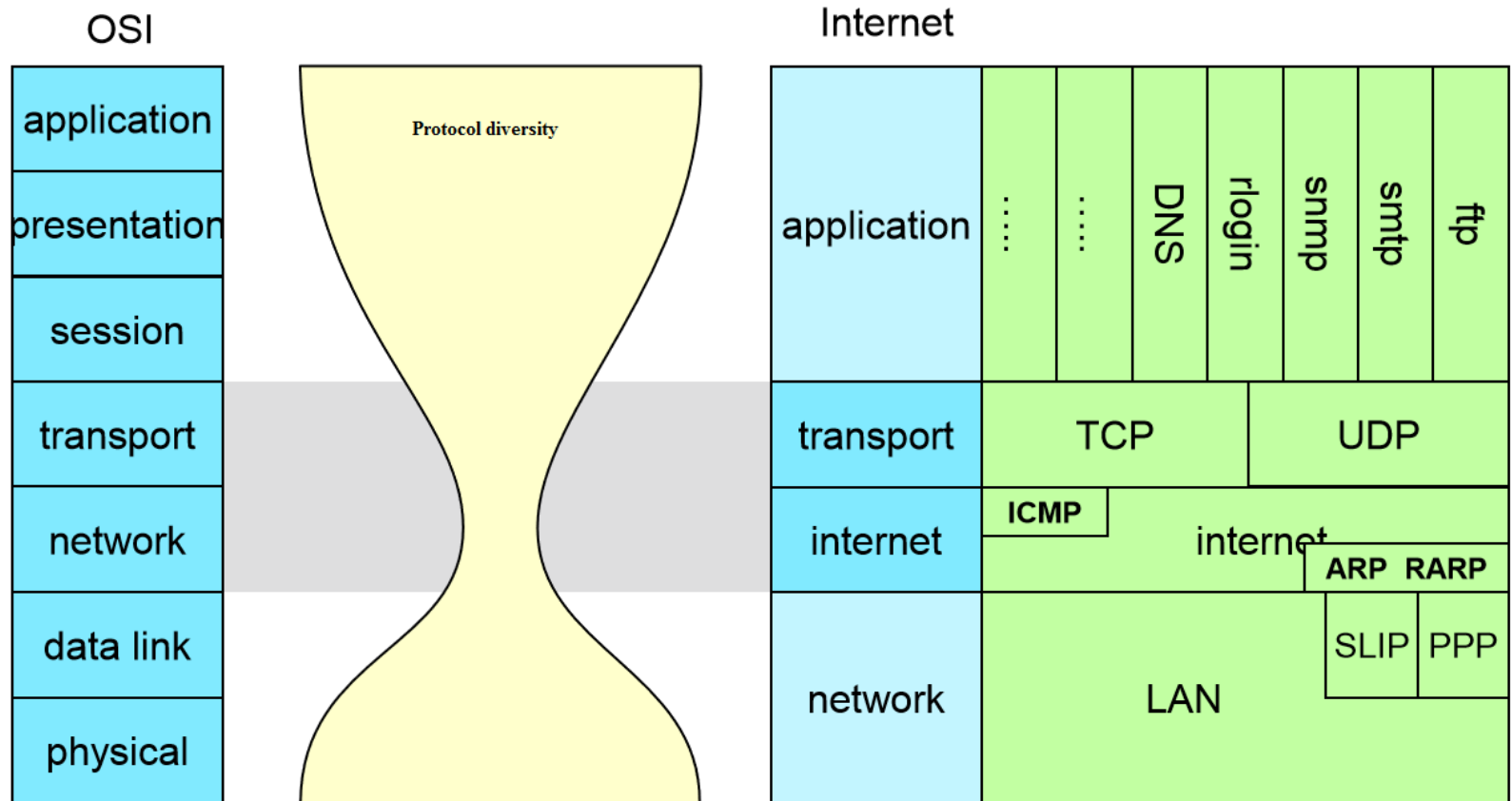
Layer 6: Presentation Layer

- 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 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.

Internet Protocols vs OSI

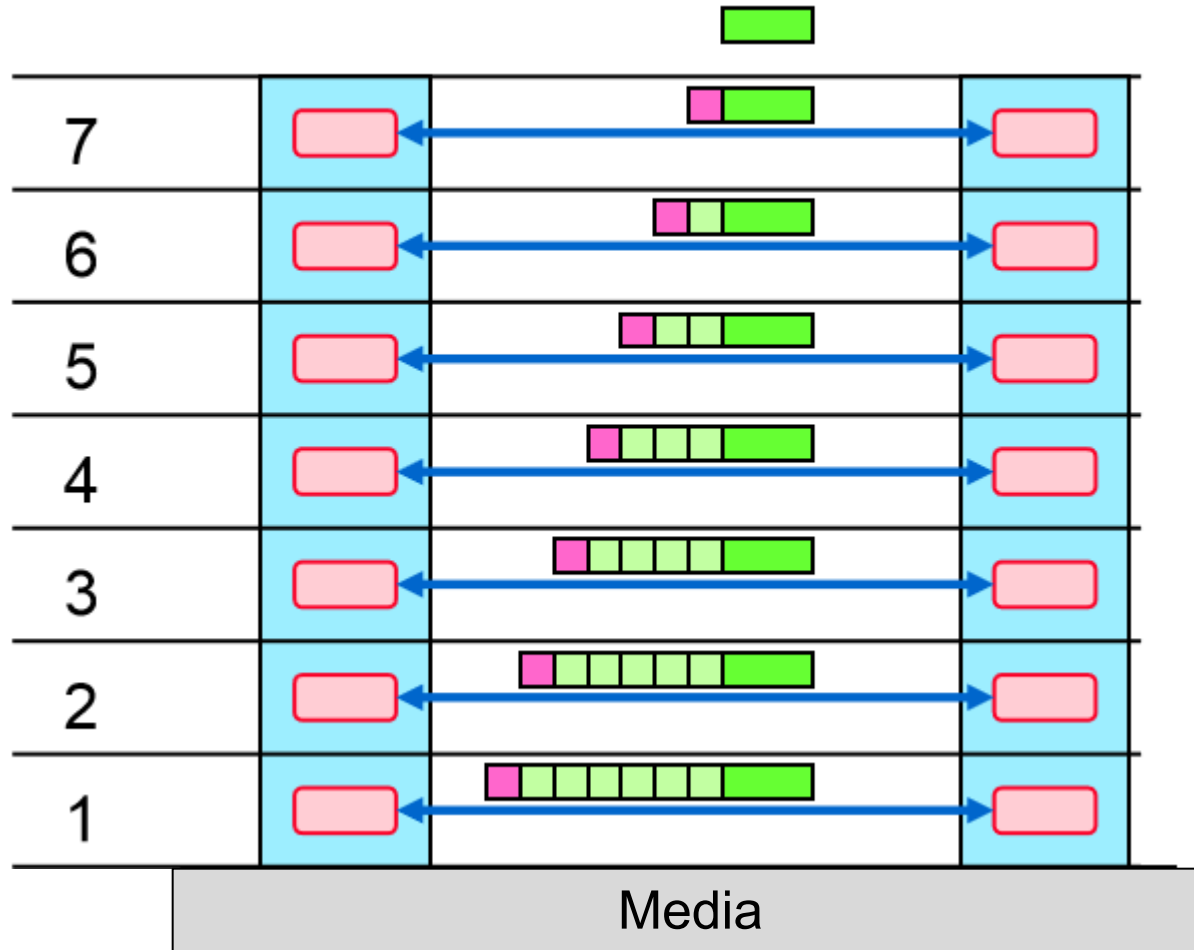


- Explicit Presentation and session layers missing in Internet Protocols
- Data Link and Network Layers redesigned

Encapsulation and Decapsulation (1)

- As the message passes through each layer, an information header (and or trailer) is added to the message.
- The information header is used to assist in any of these tasks: routing of the object, flow control, error detection, error correction, etc.
- (see next slide)

Encapsulation and Decapsulation (2)



Addressing in the TCP/IP protocol suite

Packet names

Layers

Addresses

Message

Application layer

Names

Segment / User datagram

Transport layer

Port numbers

Datagram

Network layer

Logical addresses

Frame

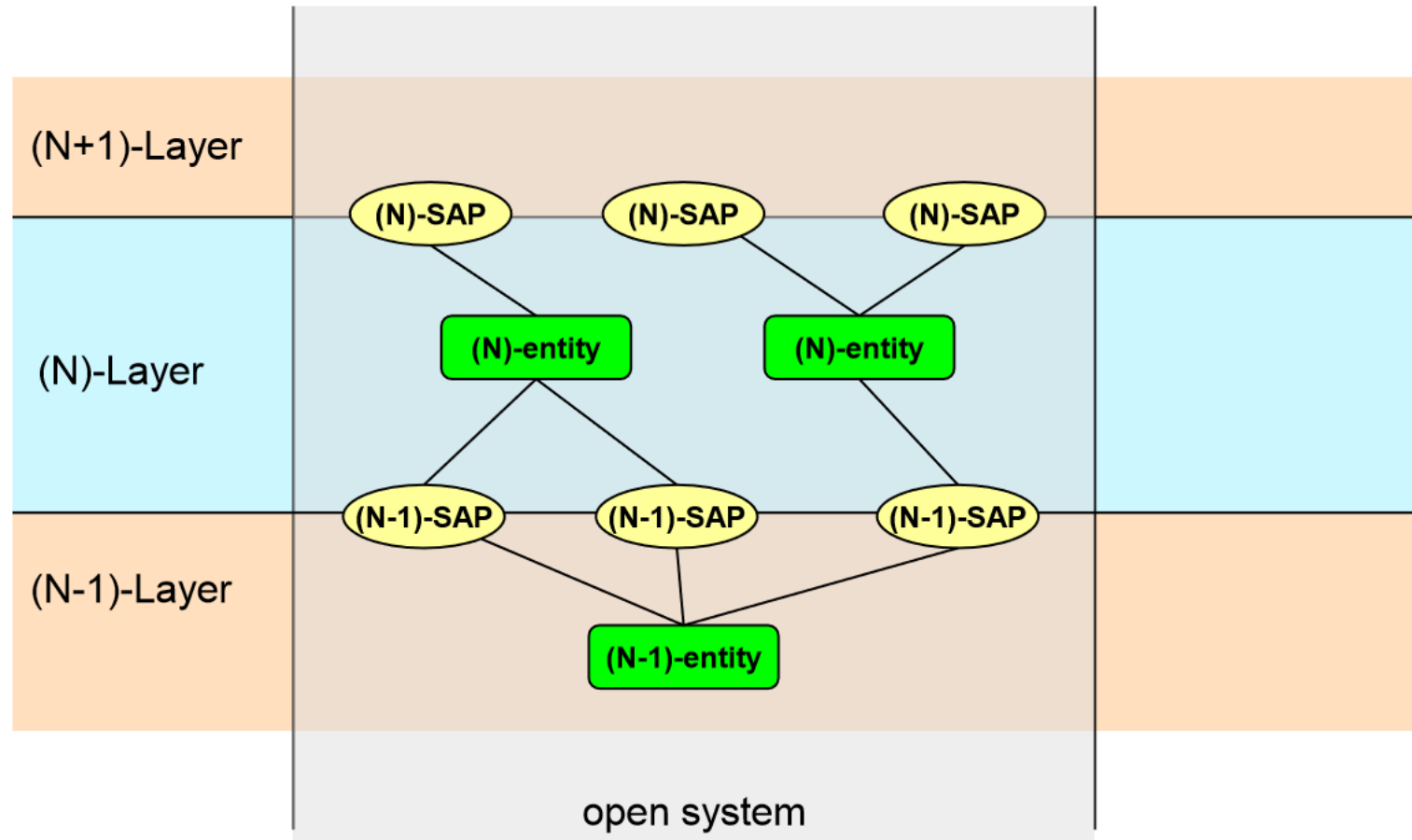
Data-link layer

Link-layer addresses

Bits

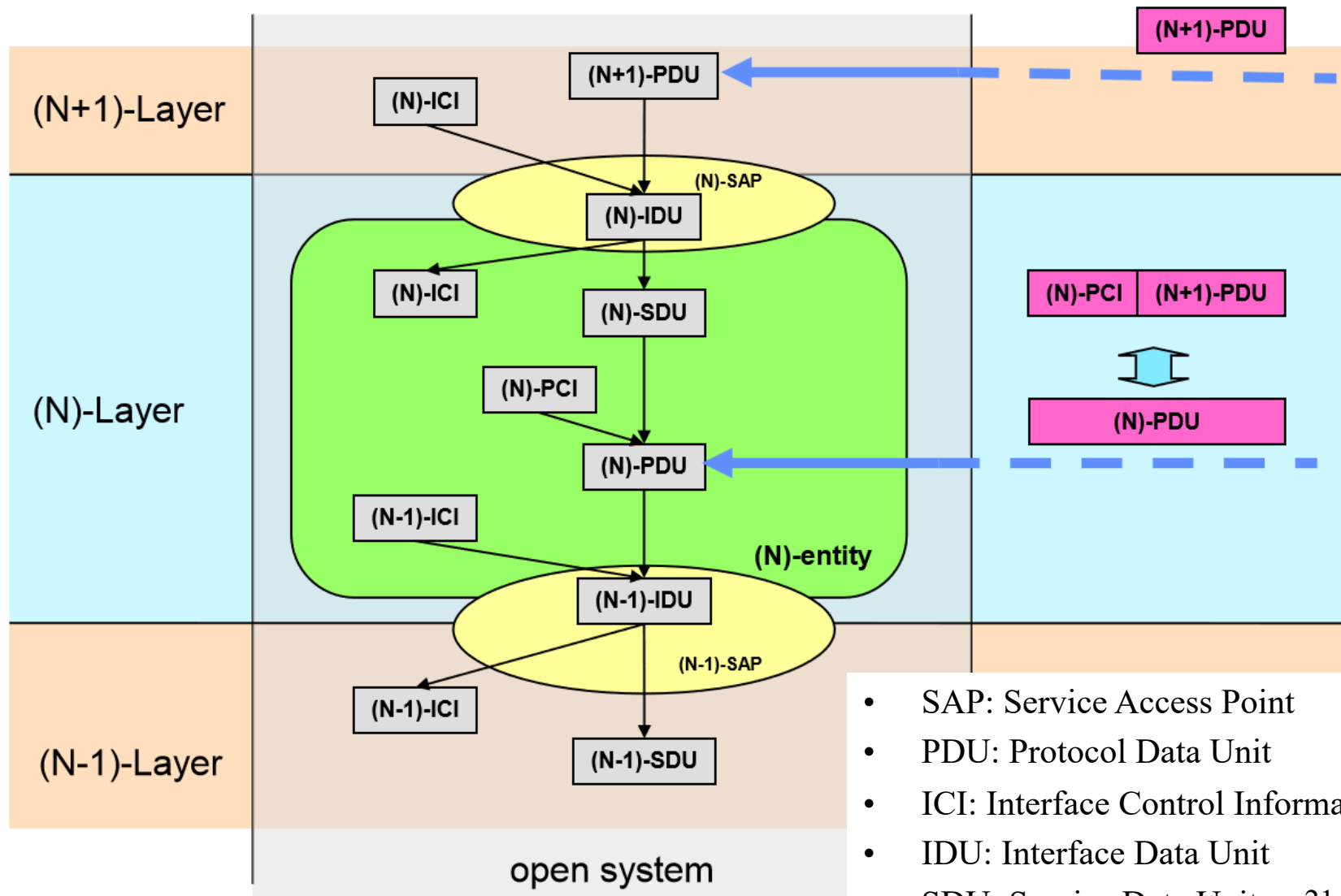
Physical layer

Layering Principles (1)



- SAP: Service Access Point

Layering Principles (2)



- SAP: Service Access Point
- PDU: Protocol Data Unit
- ICI: Interface Control Information
- IDU: Interface Data Unit
- SDU: Service Data Unit
- PCI: Protocol Control Information

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*.

Service vs. Protocol

- 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.