

# **OSI Reference Model**

**CEN 322 – Module I**

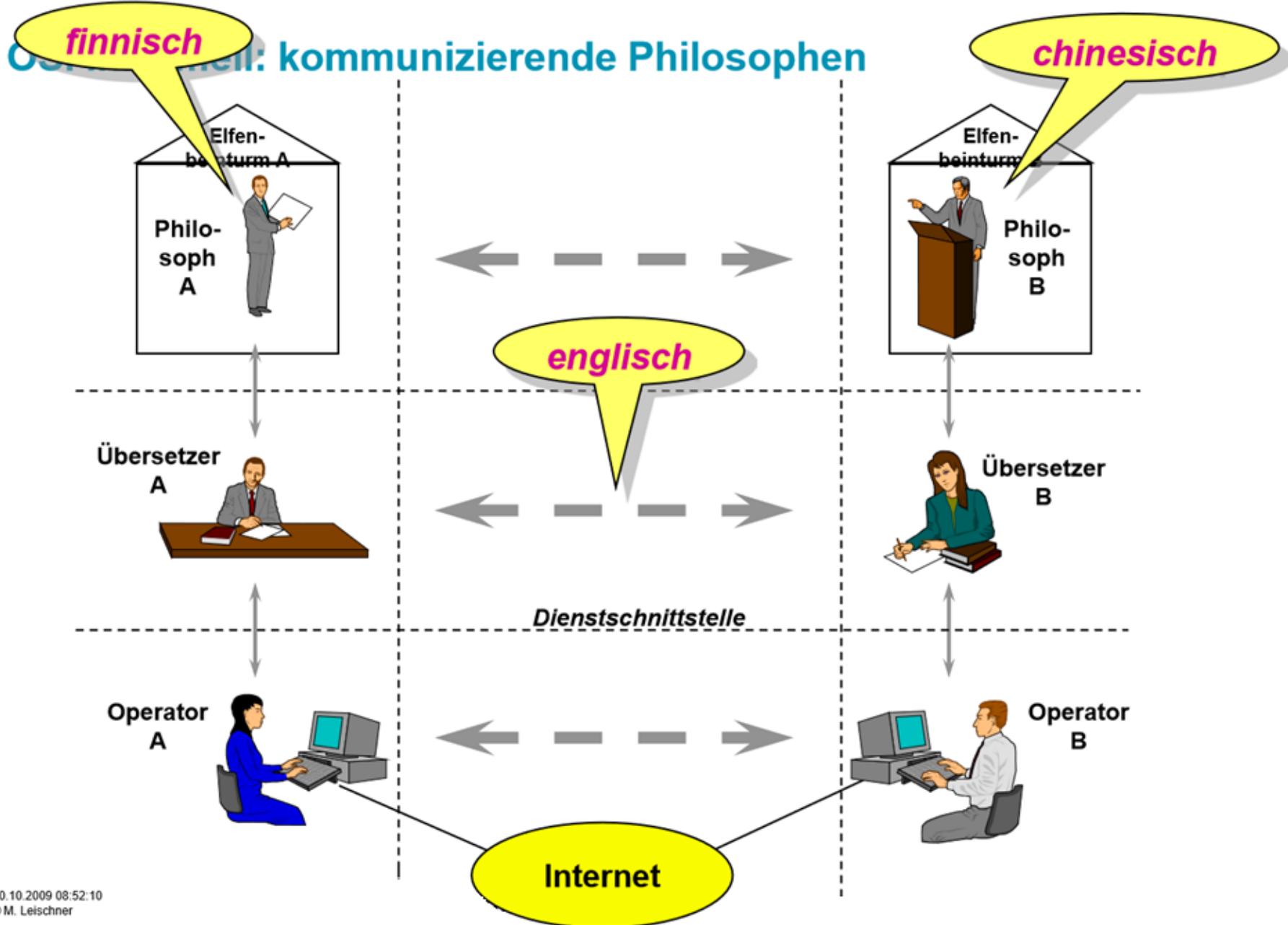
**Internet Communication**

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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.

## OSI-Modell: 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)

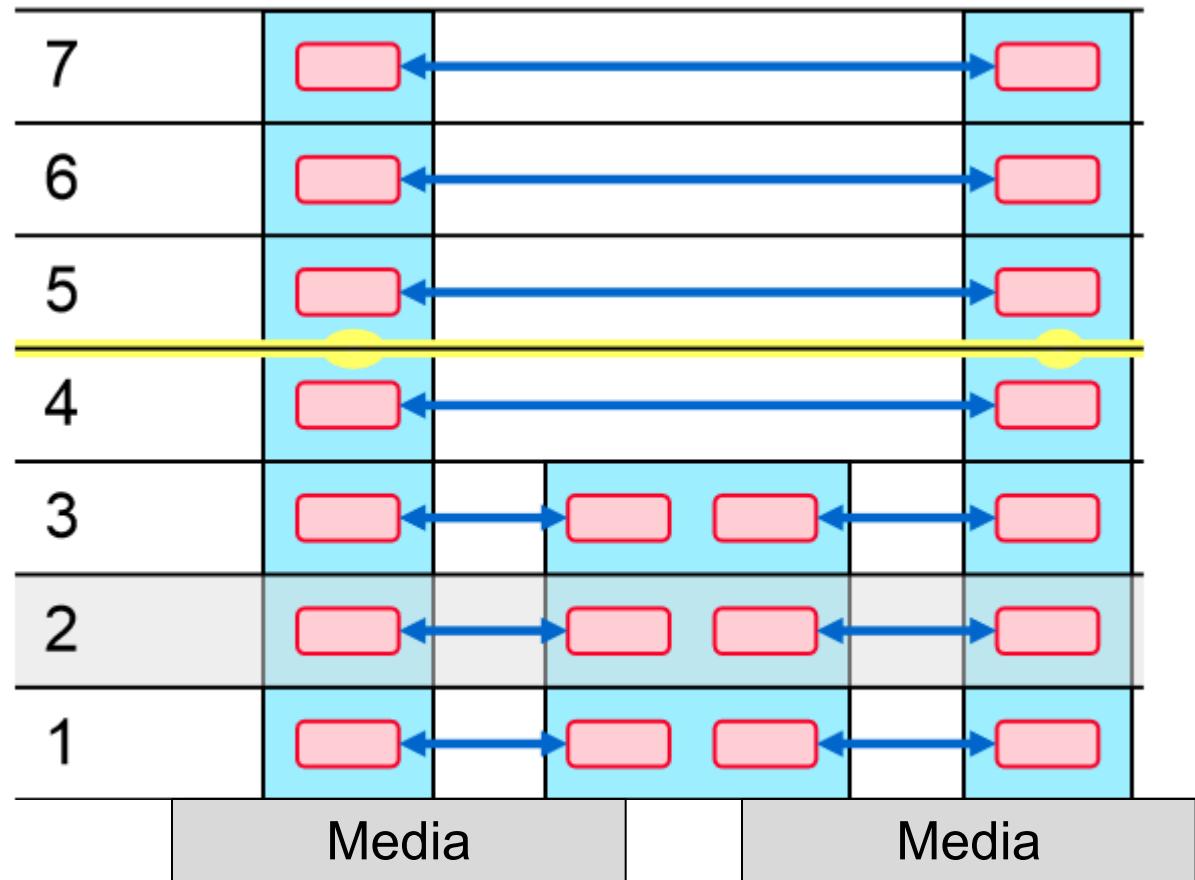
- In 1978, the International Standard Organization (ISO) began to develop its OSI framework architecture.
- OSI has two major components: an abstract model of networking, called the Basic Reference Model or seven-layer model, and a set of specific protocols.

# OSI History (2)

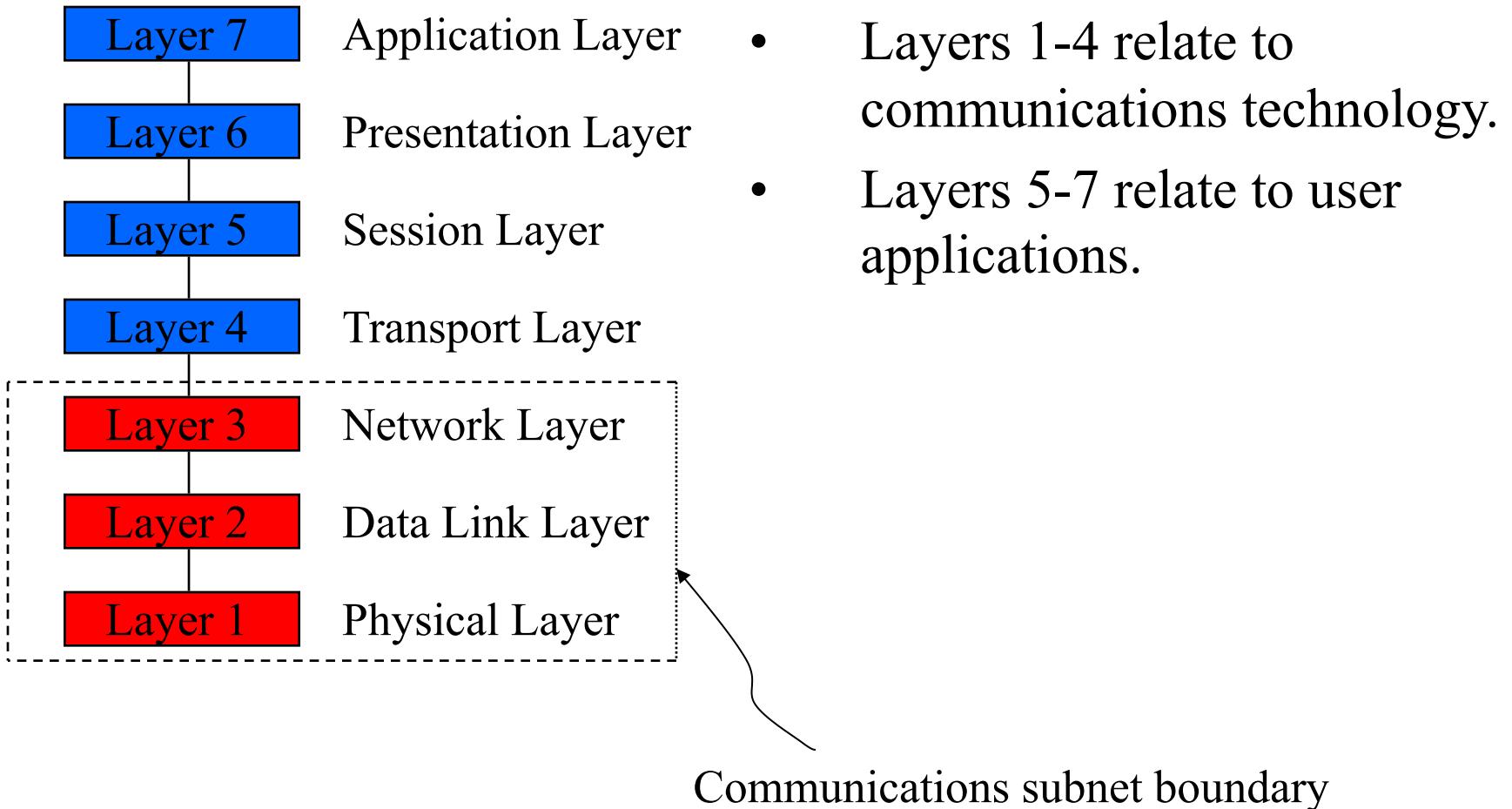
- The concept of a 7 layer model was provided by the work of Charles Bachman, then of Honeywell.
- Various aspects of OSI design evolved from experiences with the Advanced Research Projects Agency Network (ARPANET) and the fledgling Internet.

# Components of OSI-Model

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



# 7-Layer OSI Model



# 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*.

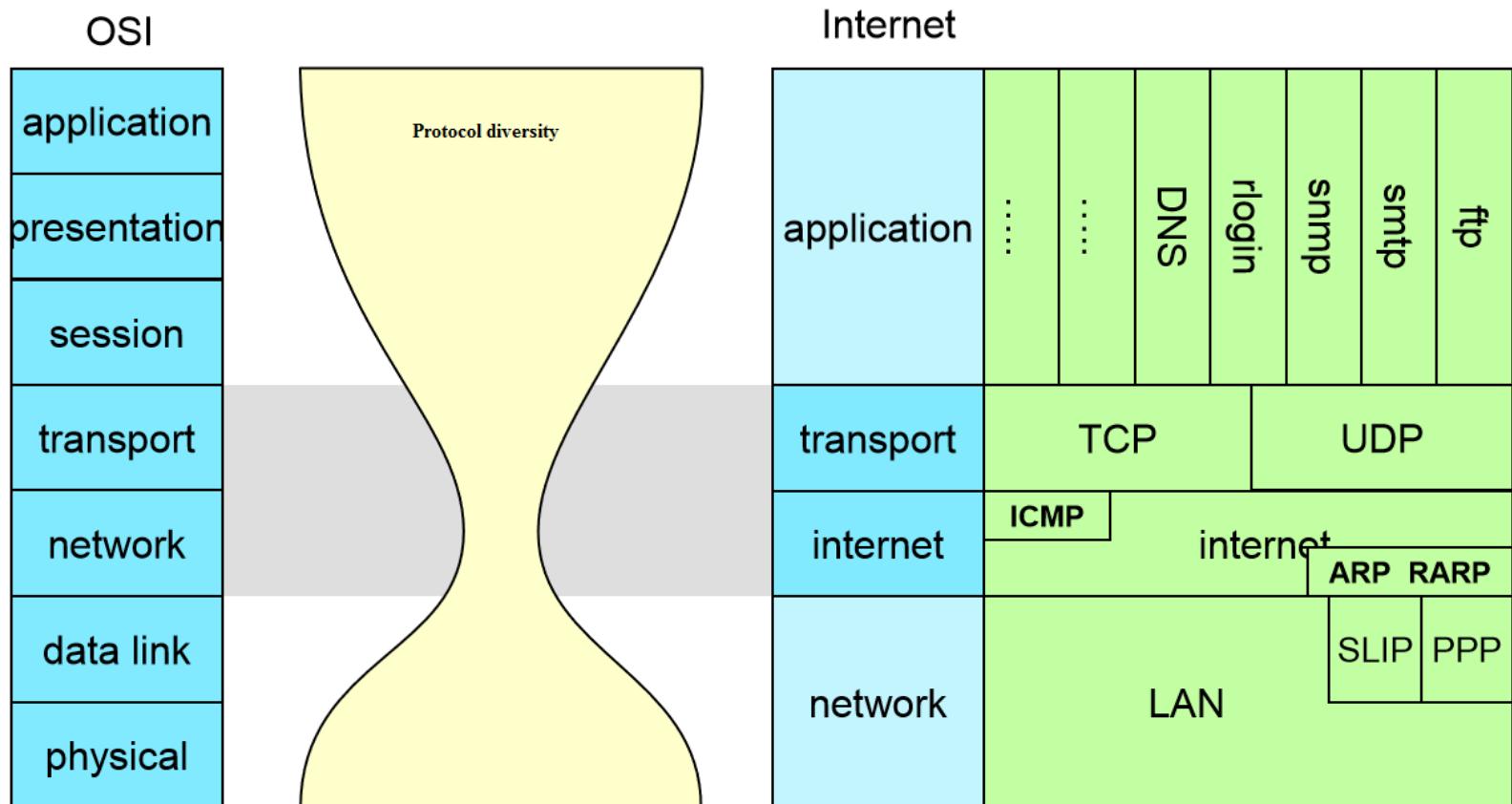
# Layer 6: Presentation Layer

- 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

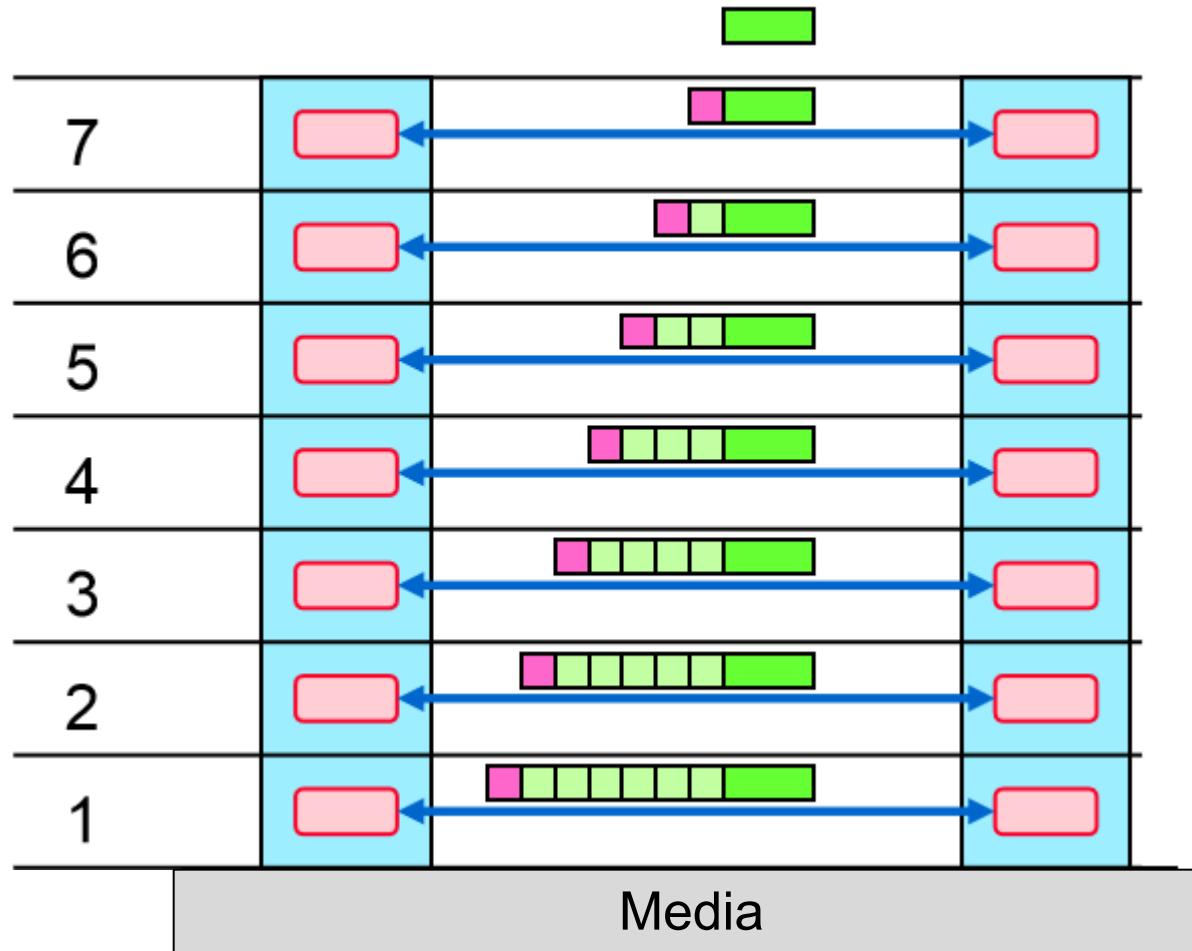


- Explicit Presentation and session layers missing in Internet Protocols
- Data Link and Network Layers redesigned

# 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

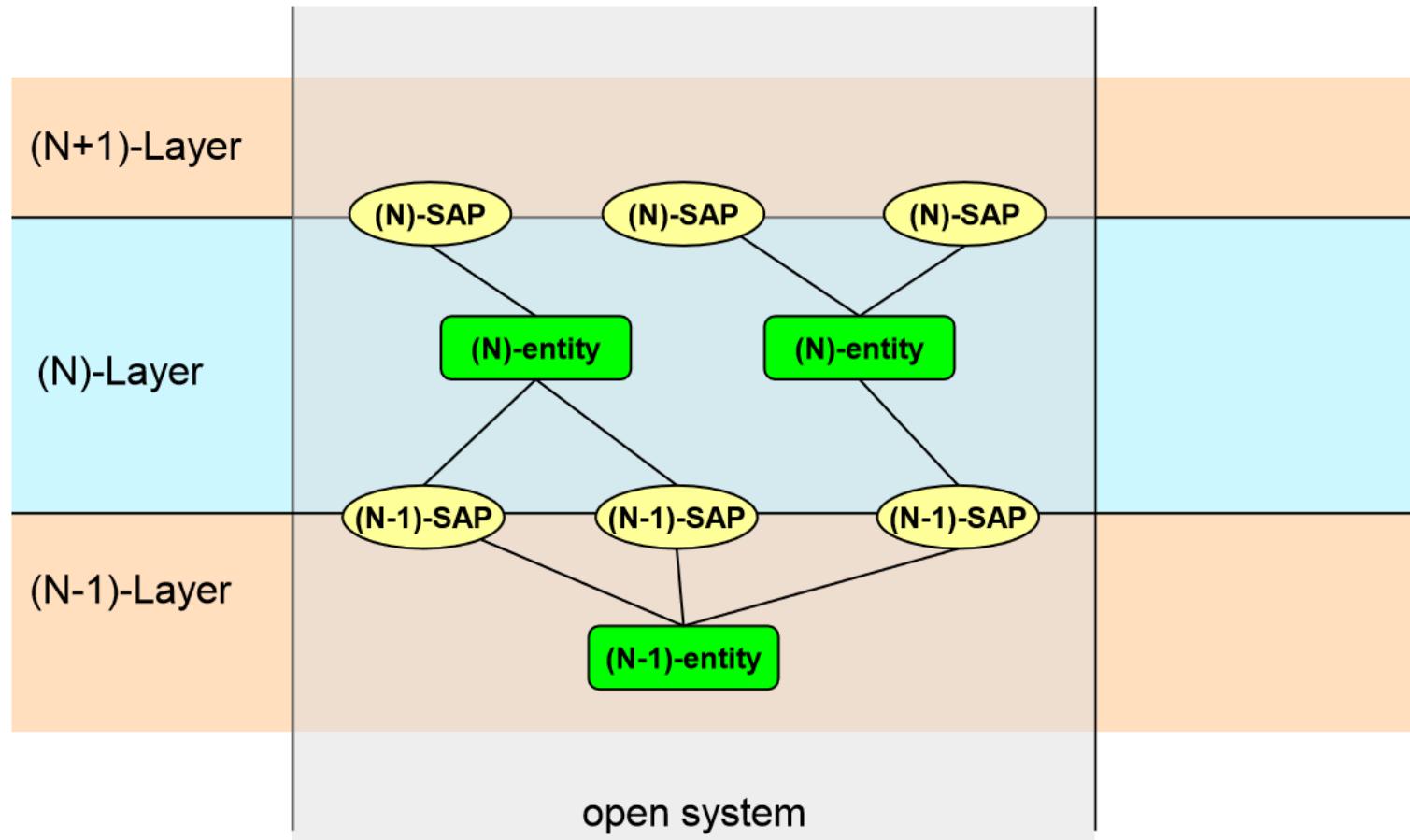
Data-link layer

Link-layer addresses

Bits

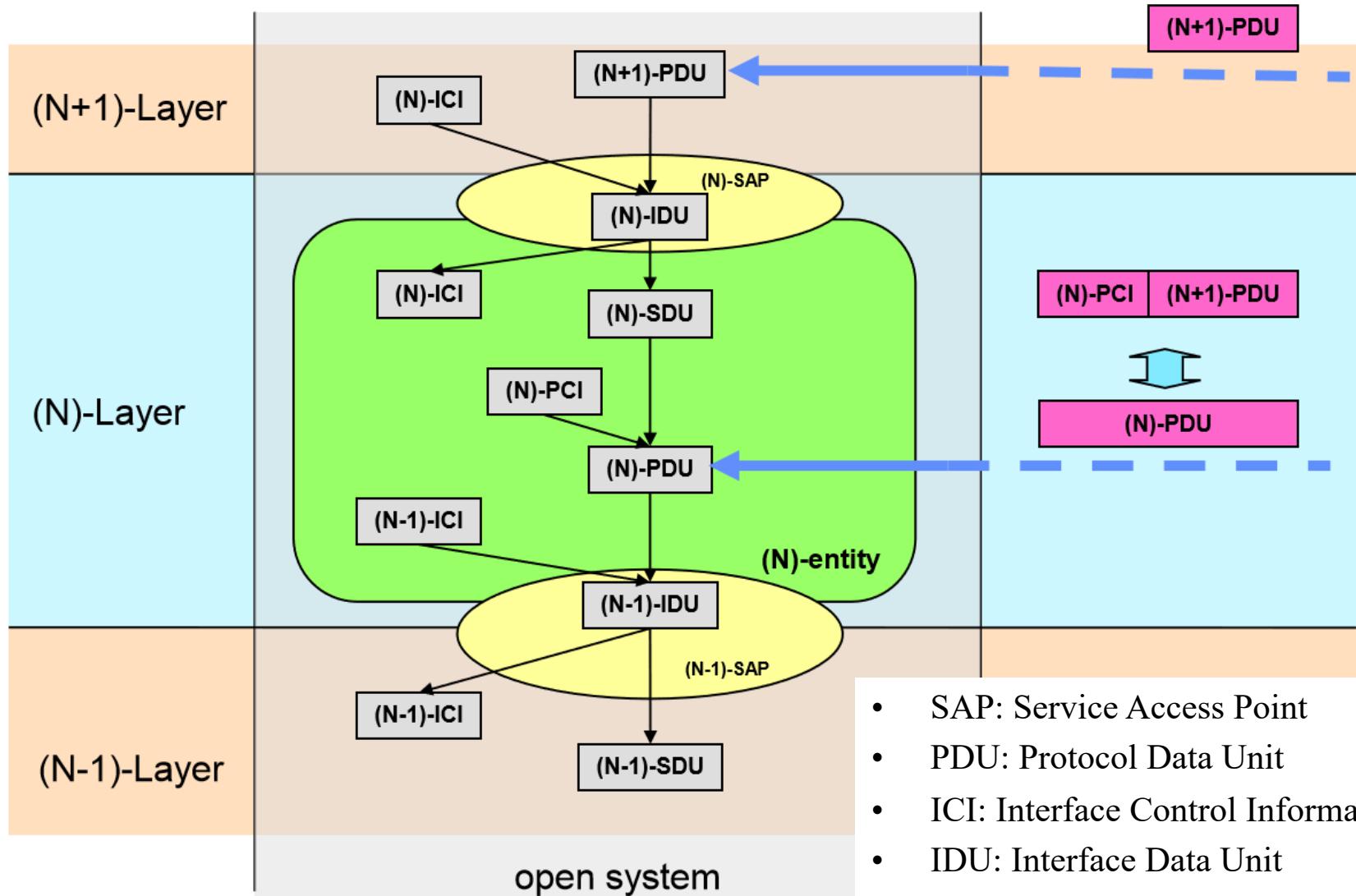
Physical layer

# Layering Principles (1)



- SAP: Service Access Point

# Layering Principles (2)



# 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.