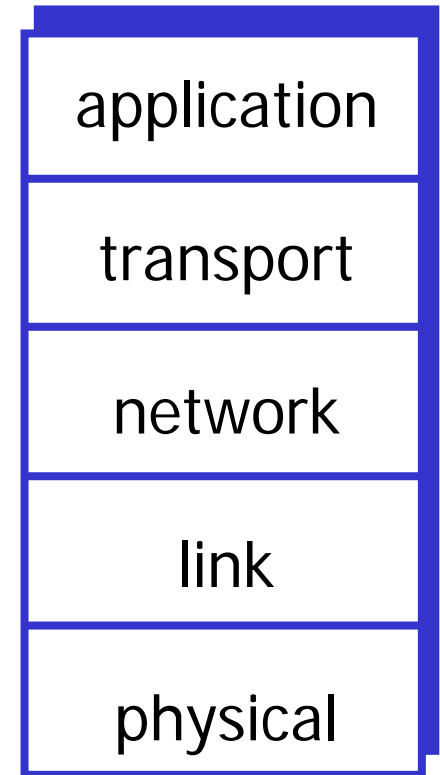


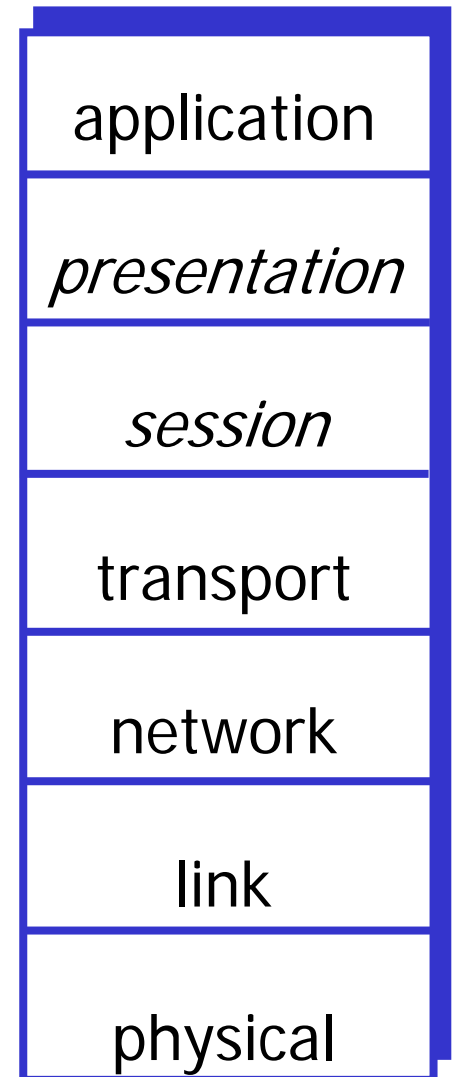
# TCP/IP - protocol stack

- ❑ **application:** supports network applications
  - ftp, smtp, http, ssh, telnet, DHCP (Dynamic Host Configuration Protocol)...
- ❑ **transport:** data transfer from end system to end system
  - TCP, UDP, SPX...
- ❑ **network:** finding the way through the network from machine to machine
  - IP (IPv4, IPv6), ICMP, IPX
- ❑ (data) **link:** data transfer between two neighbours in the network
  - ppp, ethernet, ATM, ISDN, 802.11 (WLAN)
- ❑ **physical:** bits “on the wire”



# OSI - model

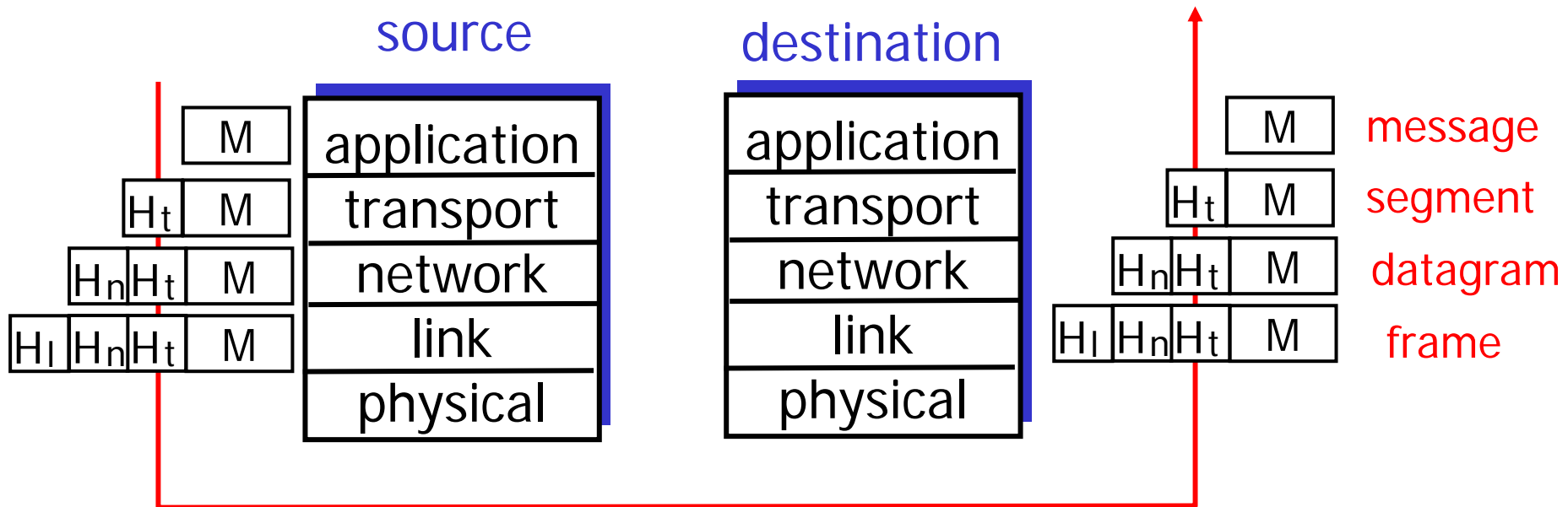
- ❑ A standard for layering of communication protocols
  - Open Systems Interconnection
  - by the ISO – International Standardization Institute
- ❑ Two additional layers to those of the Internet stack
- ❑ **presentation**: translates between different formats
  - XML, XDR
  - provides platform independence
- ❑ **session**: manages connection, control and disconnection of communication sessions
  - RTP



# Protocol layer and data

Each layer takes data from next higher layer

- ❑ Adds header information to create a new data unit (message, segment, frame, packet ...)
- ❑ Send the new data unit to next lower layer



# Physical layer

- ❑ Provides services to the link layer.
- ❑ Transmitting raw bits
- ❑ No packet headers or tails
- ❑ Simplex – Only one direction (Television broadcast, radio)
- ❑ Half duplex - One direction at a time (walkie-talkie)
- ❑ Full duplex (Telephone)

## Data Link layer

Provides services to the network layer.

Uses MAC addressing

Hubs, bridges, switches work on this layer

□ Some possible services:

- Error detection and correction
- Flow control

# Network layer

- ❑ Provides services to the transport layer.
- ❑ Uses IP addressing
- ❑ Some switches work on this layer.
- ❑ Getting data (packets of data) all the way from the source to the destination.
- ❑ Congestion control
- ❑ Routing
- ❑ Fairness

# Transport layer

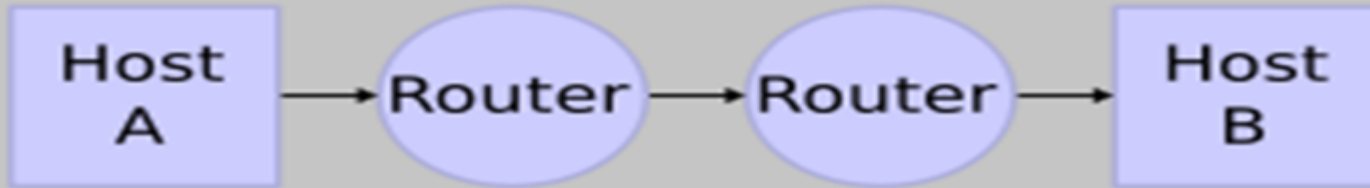
- ❑ Provides services to the application layer.
- ❑ TCP and UDP work on this layer.
- ❑ Source and destination port numbers in the header of each transport layer data packet.
- ❑ Some possible services:
  - Virtual circuits (TCP).
  - Flow Control

# Application layer

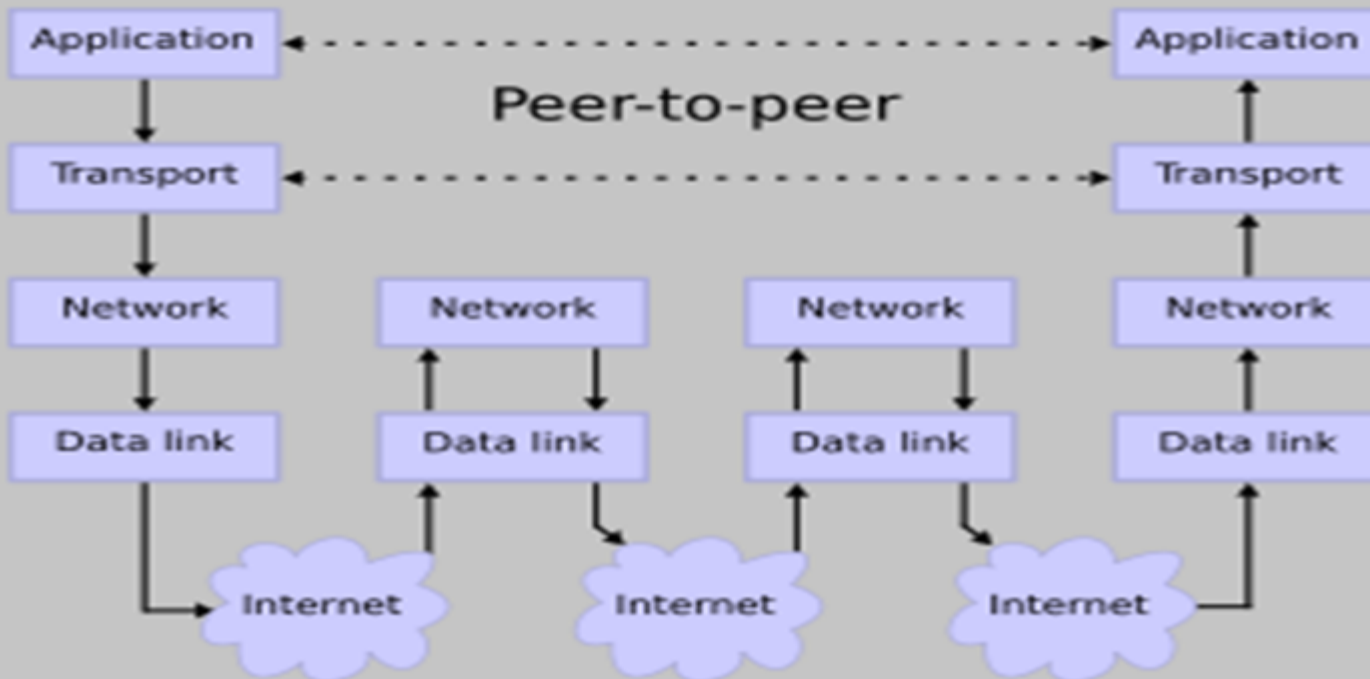
- ❑ Provides a way for the user application to gain access to OSI.
- ❑ Makes sure that necessary communication resources exist (for example, is there a modem in the sender's computer?)
- ❑ The application layer is concerned with the user's view of the network.
- ❑ Domain Name System (DNS)
- ❑ As the “top of the stack” layer, the application layer is the only one that does not provide any services to the layer above it in the stack—there isn't one! Instead, it provides services to programs that want to use the network, and to you, the user.
- ❑ IRC (Internet Relay Chat)



# Network Connections



# Stack Connections



# Protocols

- ❑ Ethernet
- ❑ IP (Internet Protocol)
- ❑ UDP (User Datagram Protocol)
- ❑ TCP (Transmission Control Protocol)
- ❑ DHCP (Dynamic Host Configuration Protocol)
- ❑ HTTP (Hypertext Transfer Protocol)
- ❑ FTP (File Transfer Protocol)
- ❑ Telnet (Telnet Remote Protocol)
- ❑ SSH (Secure Shell Remote Protocol)
- ❑ POP3 (Post Office Protocol 3)
- ❑ SMTP (Simple Mail Transfer Protocol)
- ❑ IMAP (Internet Message Access Protocol)