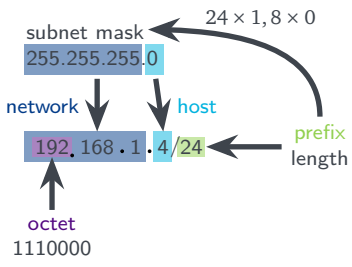
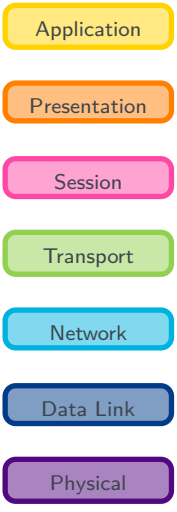
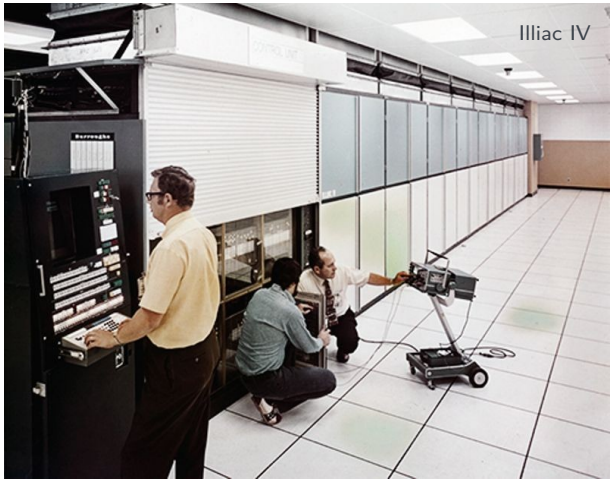
Switch

Networks, OSI & IP
– Jan Lotze –





(Inter)Networks: Why?



https://www.computerhistory.org/timeline/1966/

- Situation: Computers revolutionize research
- Problem: Computers are too large

↪ Solution: Connect Computer(Network)s

(Inter)Networks: Components & End devices

Router

Bridge

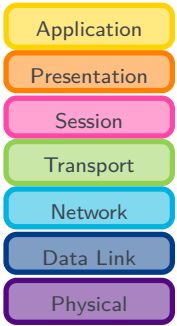
Switch

Repeater

Modem

Server

OSI reference model: Uploading a picture



Application Data

Encapsulation & De-encapsulation

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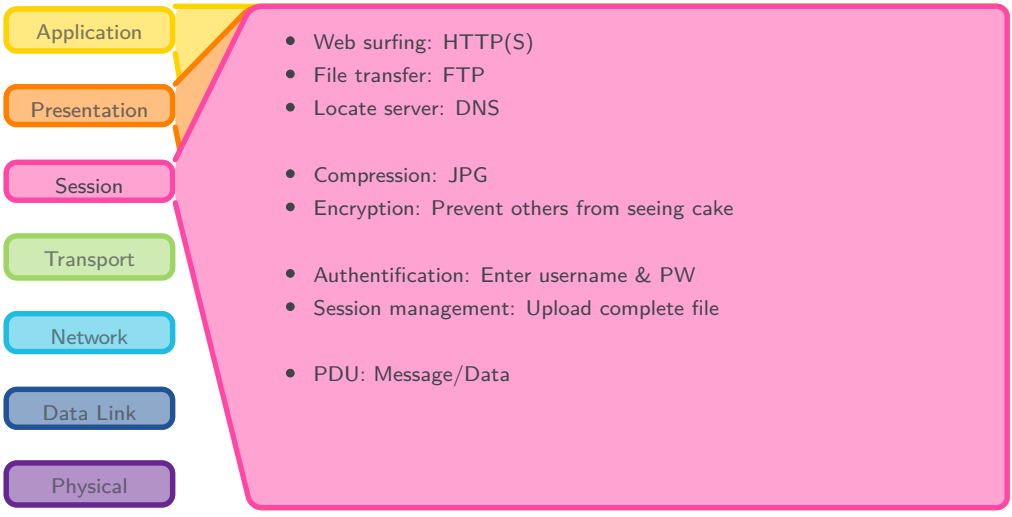
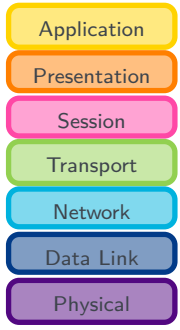


OSI reference model: Uploading a picture

Application Data

Segments



Encapsulation & De-encapsulation

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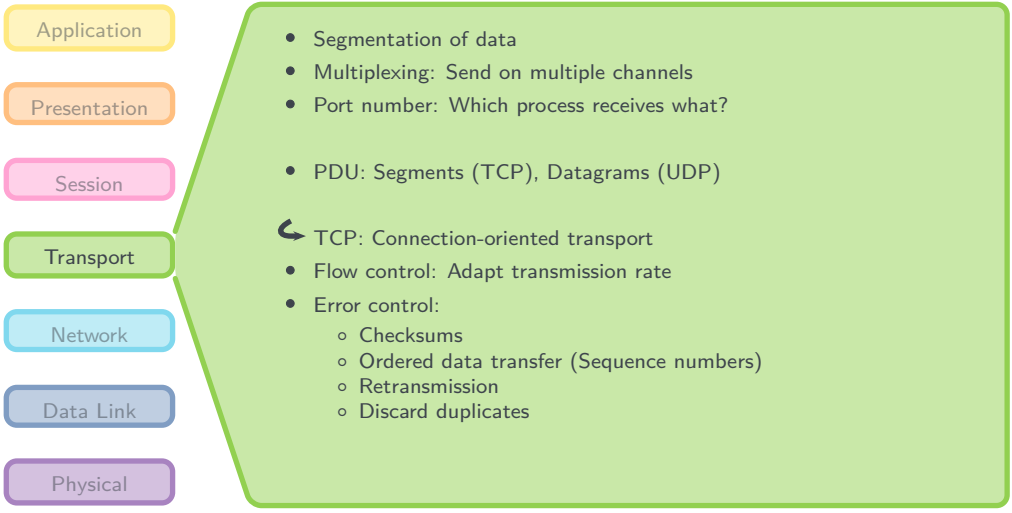

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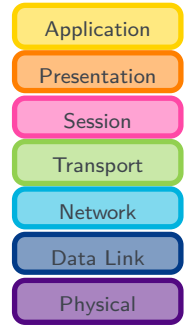
Application Data

Segments

Packet



Encapsulation & De-encapsulation

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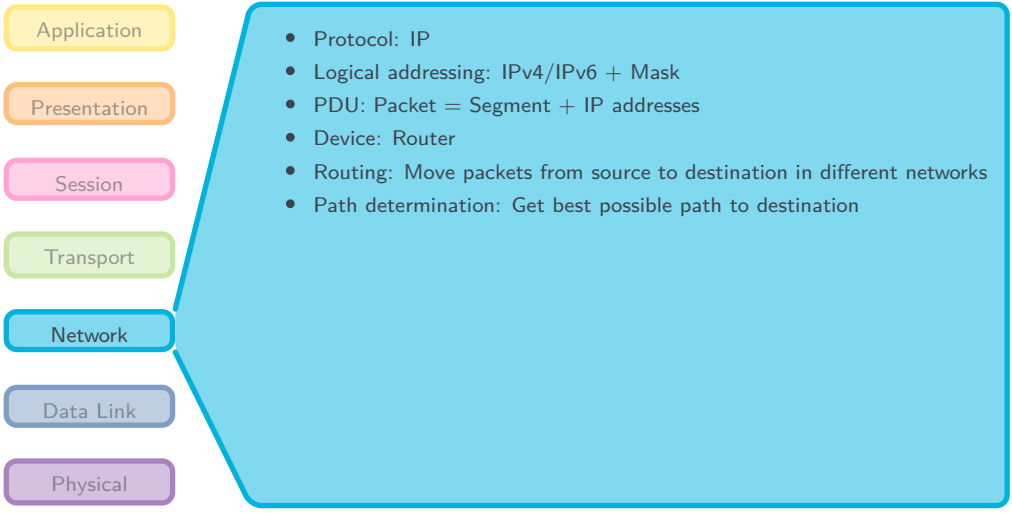

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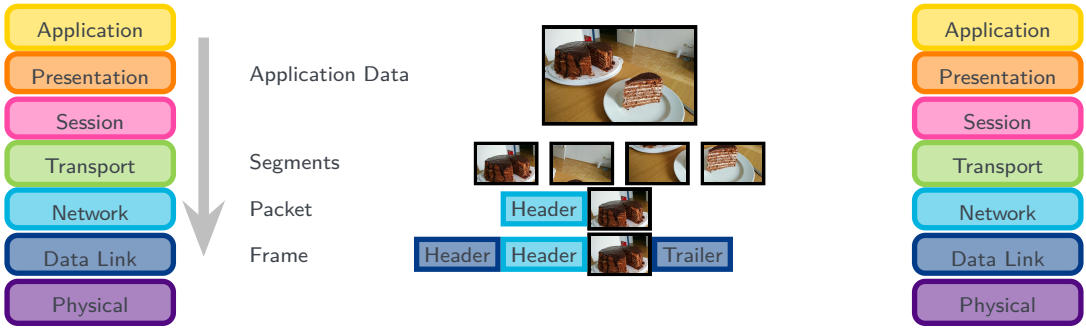

Encapsulation & De-encapsulation

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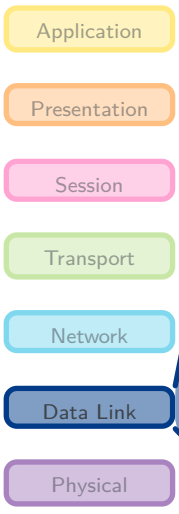
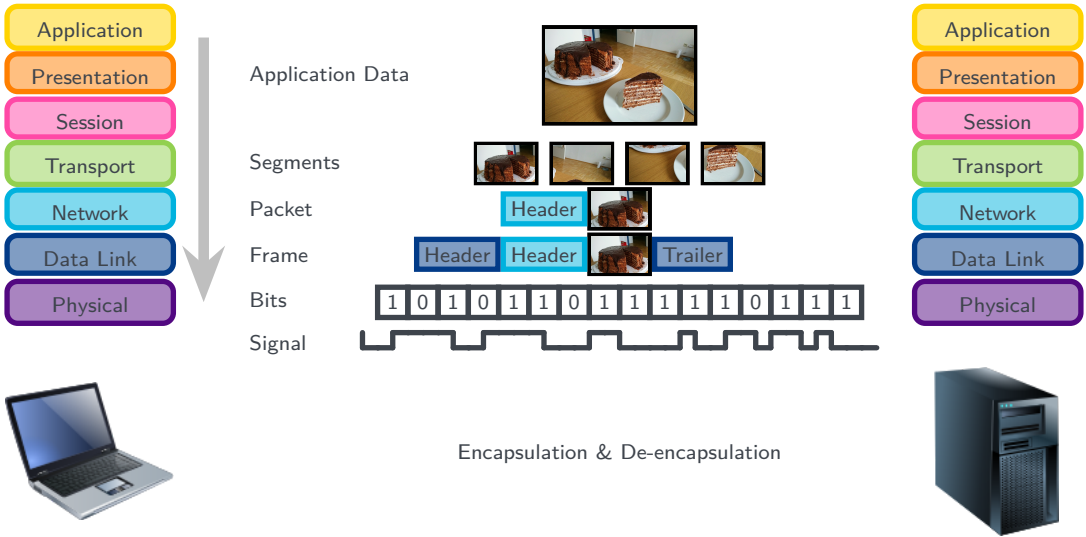


- MAC sublayer:
  - Physical addressing: MAC address in NIC
  - Transport data between computers via local media
  - Access media: CSMA/CD
  - Problems: Data collisions
- LLC sublayer: (Usually bypassed, see Transport layer)
  - Flow control: Adapt transmission rate
  - Error control: Checksums, Retransmission
  - Resize packets to fit into frames
- Device: Switch
- PDU: Frame = Packet + MAC addresses + Trailer
- Logical topology of network: Data flow

OSI reference model: Uploading a picture



Encapsulation & De-encapsulation

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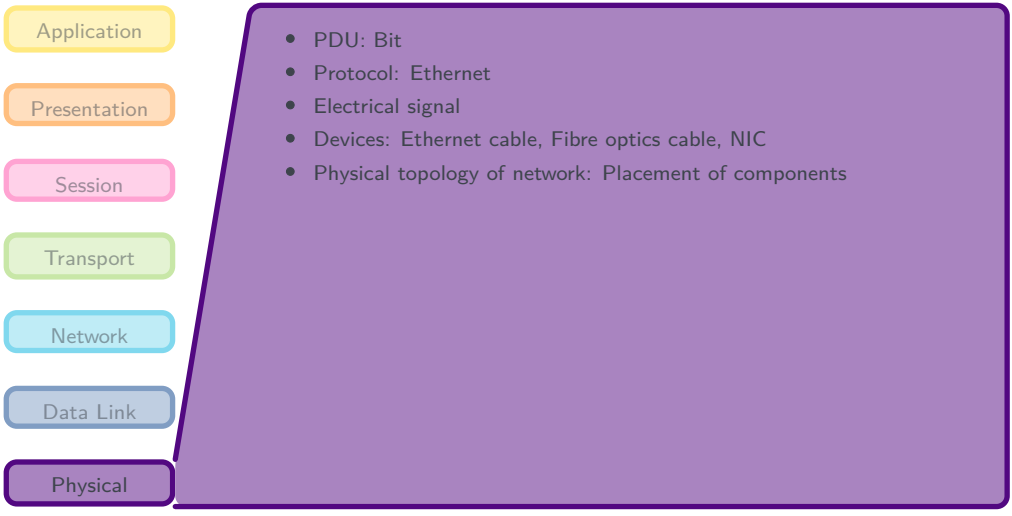

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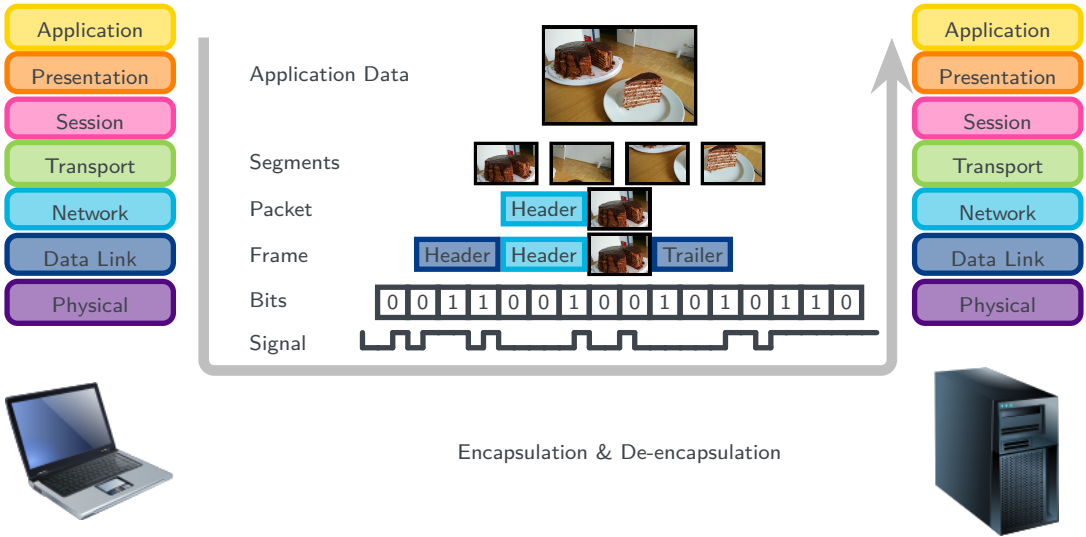
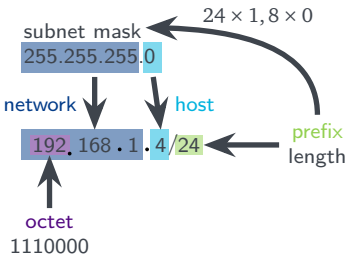
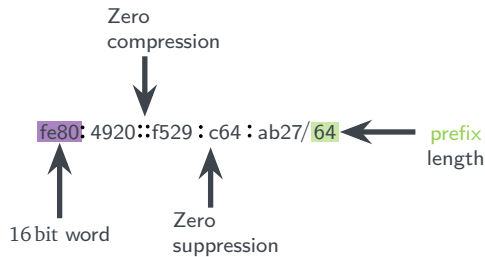


Anatomy of IPv4 & IPv6

- IPv4:
  - Length: 32 bit
  - Dotted decimal notation

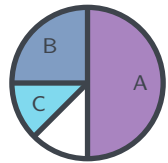


- IPv6:
  - Length: 128 bit
  - Colon hexadecimal notation

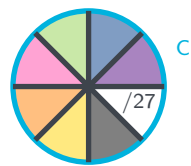


Subnetting: Why & How?

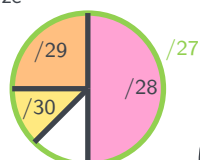
- "Classful" IP addressing: Network-ID comes in fixed sizes
  - ↪ Important classes:
    - A: 8 bit ⟶ 2^{24} hosts
    - B: 16 bit ⟶ 2^{16} hosts
    - C: 24 bit ⟶ 2^{8} hosts
- Problem: Insufficient granularity ⟶ Waste of IP addresses



- Single-Level Subnetting: Split Host-ID into Subnet-ID and smaller Host-ID at any bit
  - ↪ More granularity inside classes
- Problem: All subnets have the same size



- VLSM: Subnet the subnets
- Problem: Only subdivides Host-ID



- Classless IP addressing: Subnet the original network