Internet Lab (iLab1)

Basics

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Lab 1 – SoSe 2024

Outline

Internet protocol architecture

MAC addresses

Internet protocol

L3 address resolution

Next Steps

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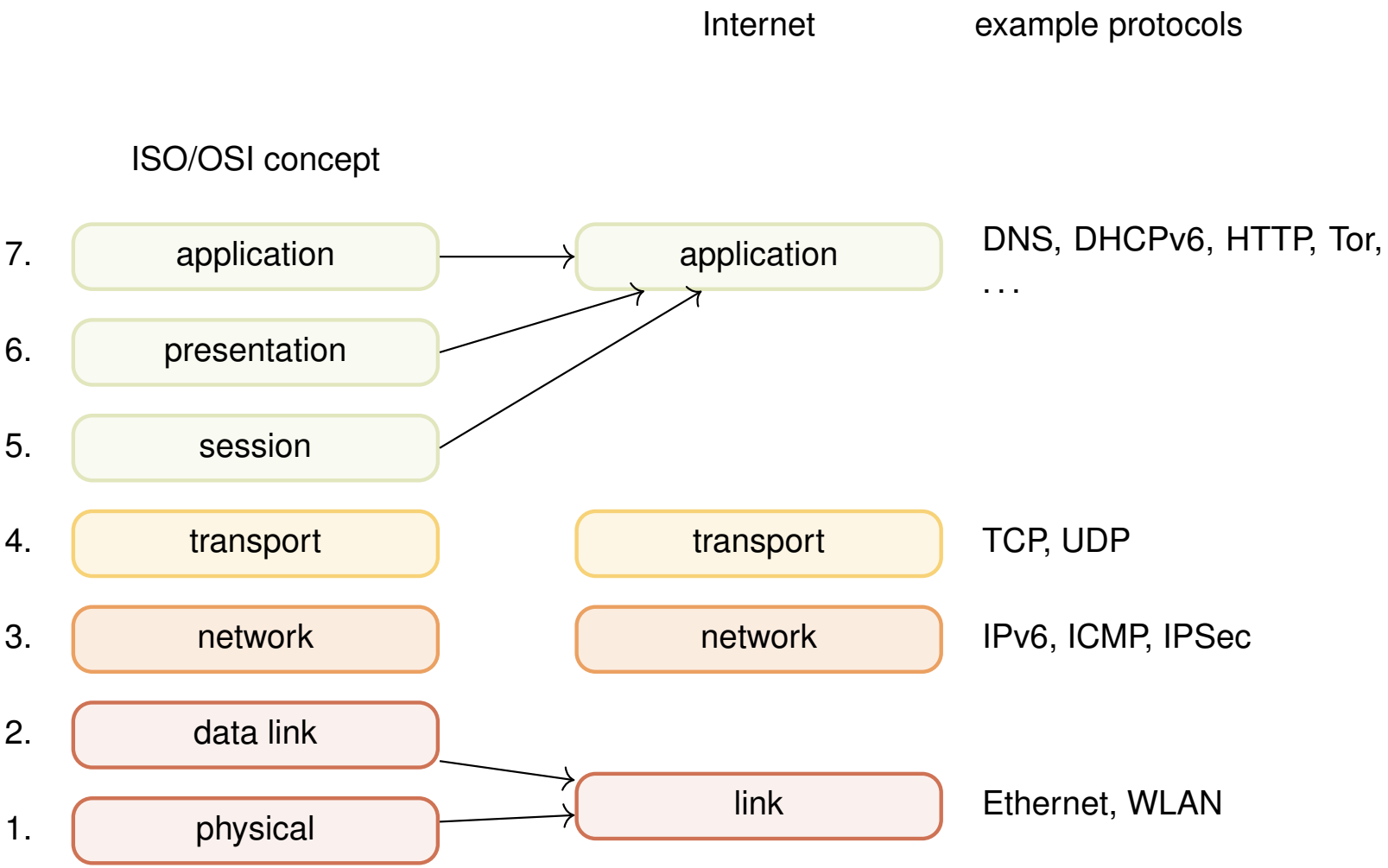
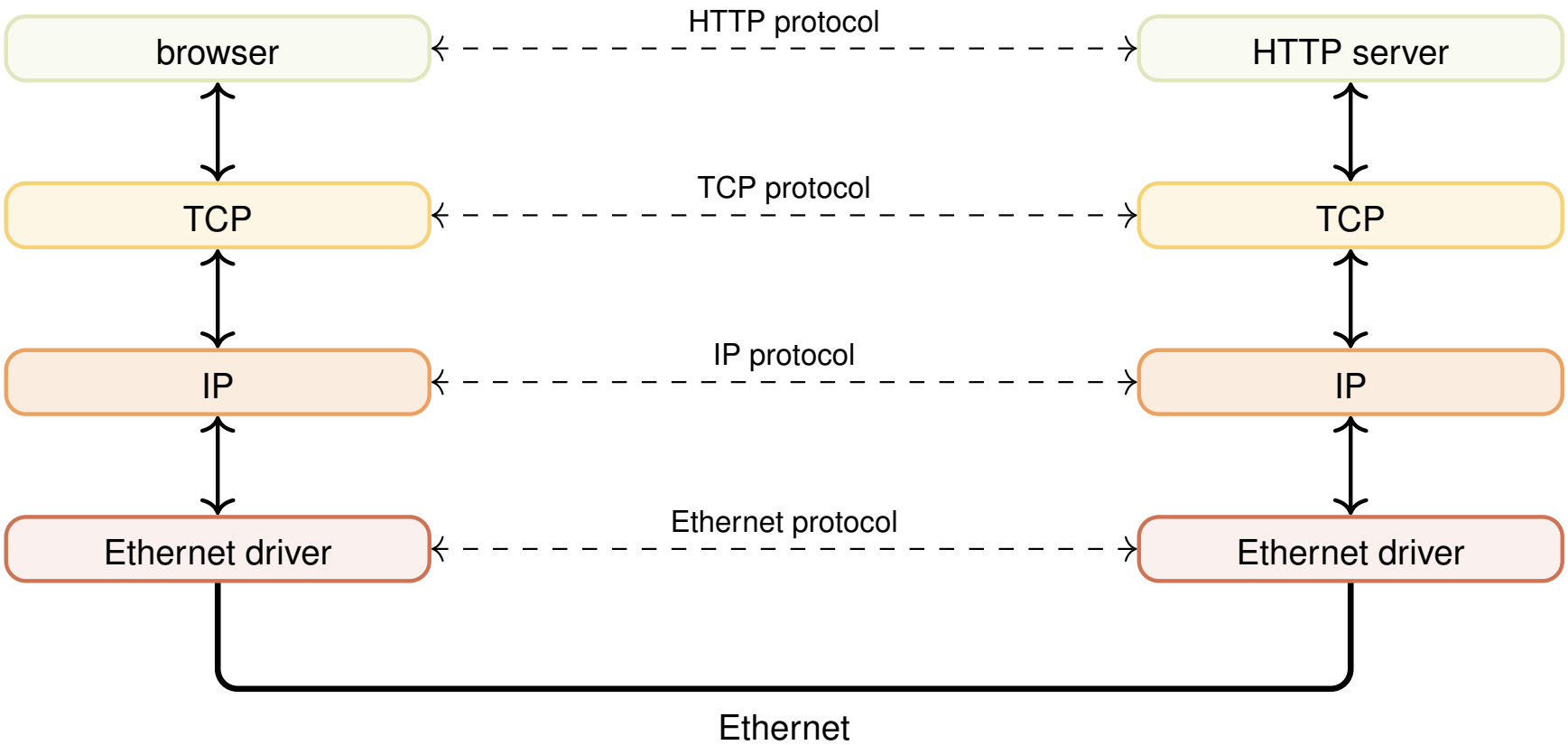
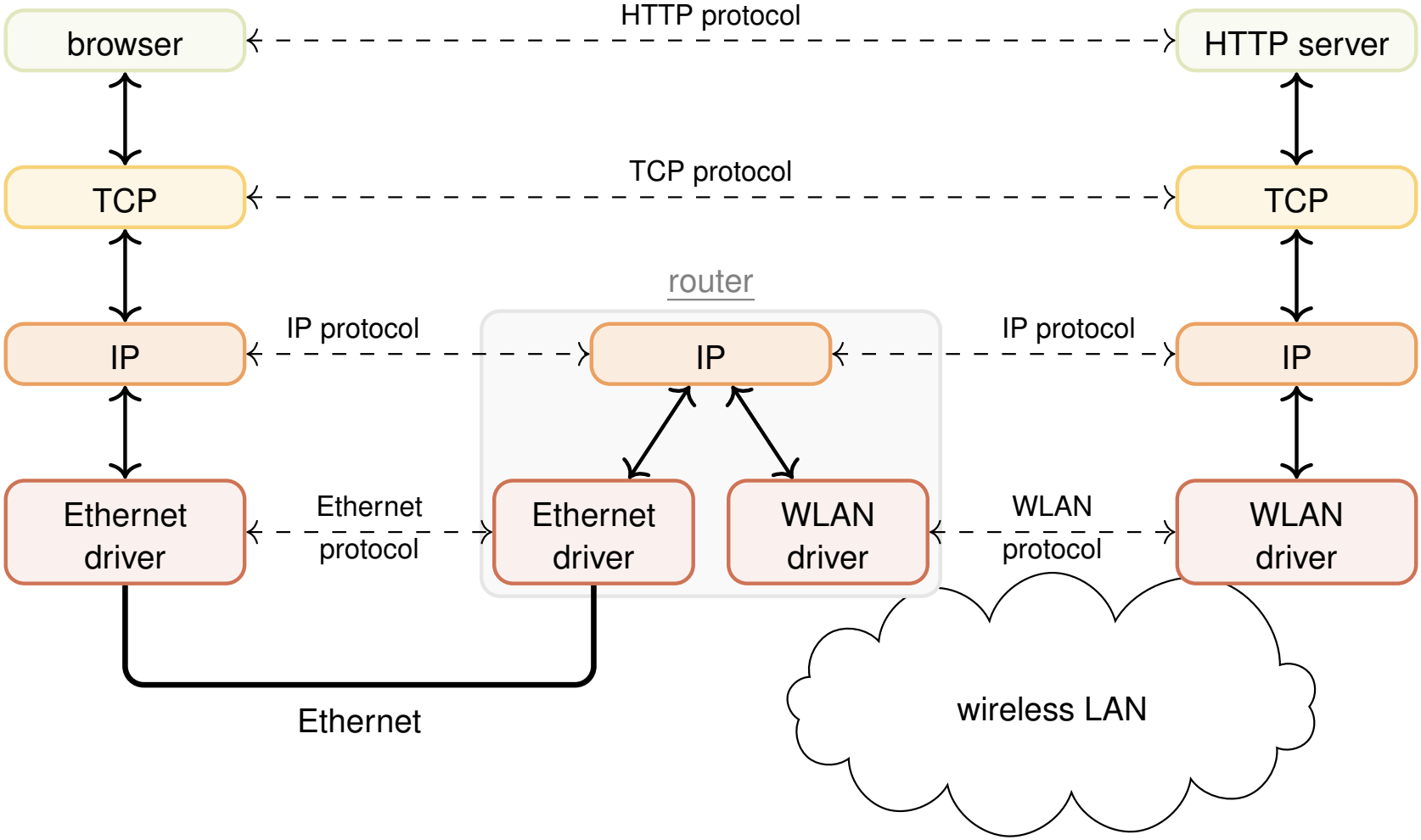
Layer model


Internet
example protocols
ISO/OSI concept
7.
application
application
DNS, DHCPv6, HTTP, Tor,
...
6.
presentation
5.
session
4.
transport
transport
TCP, UDP
3.
network
network
IPv6, ICMP, IPSec
2.
data link
link
Ethernet, WLAN
1.
physical

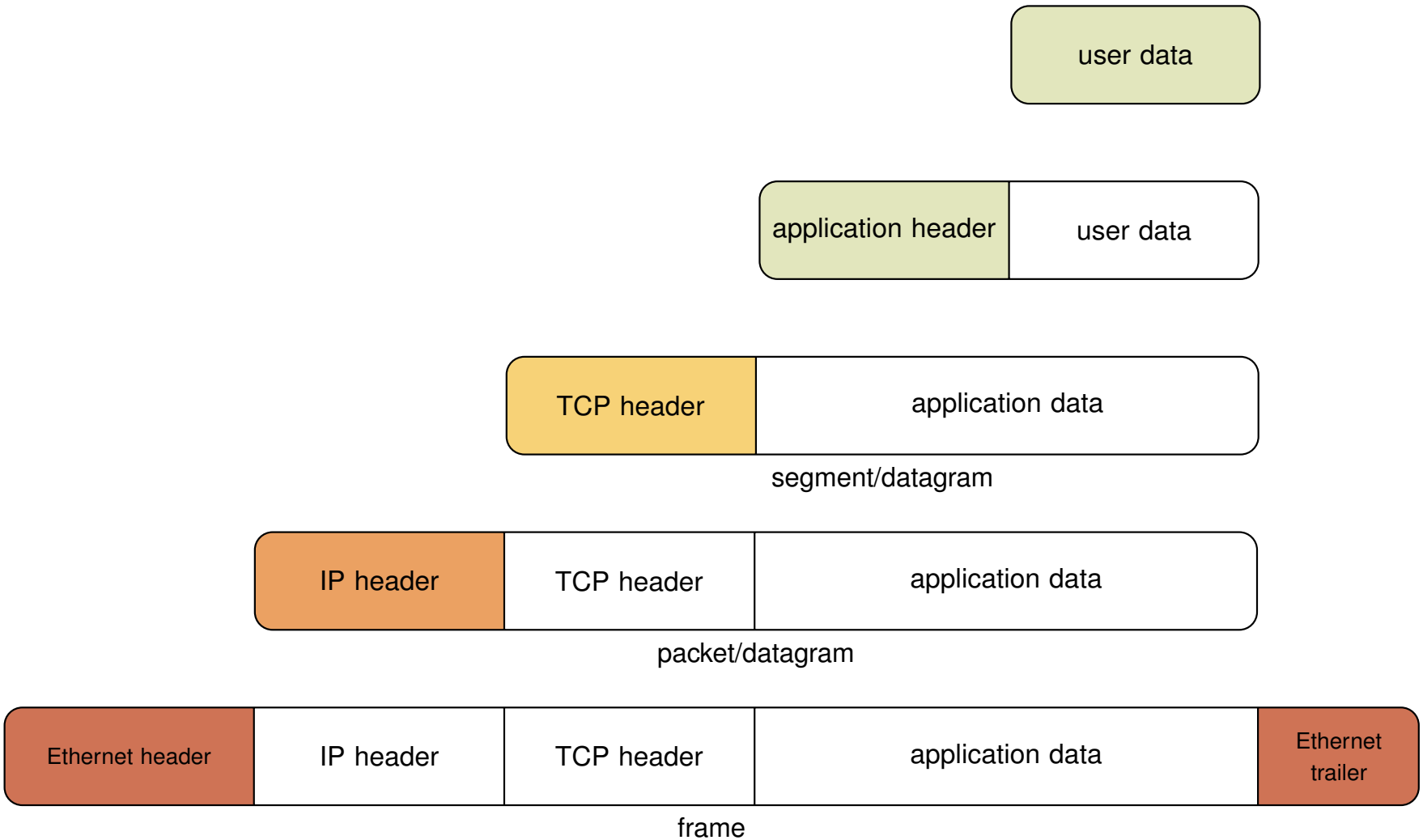
Example: HTTP communication in a local area network



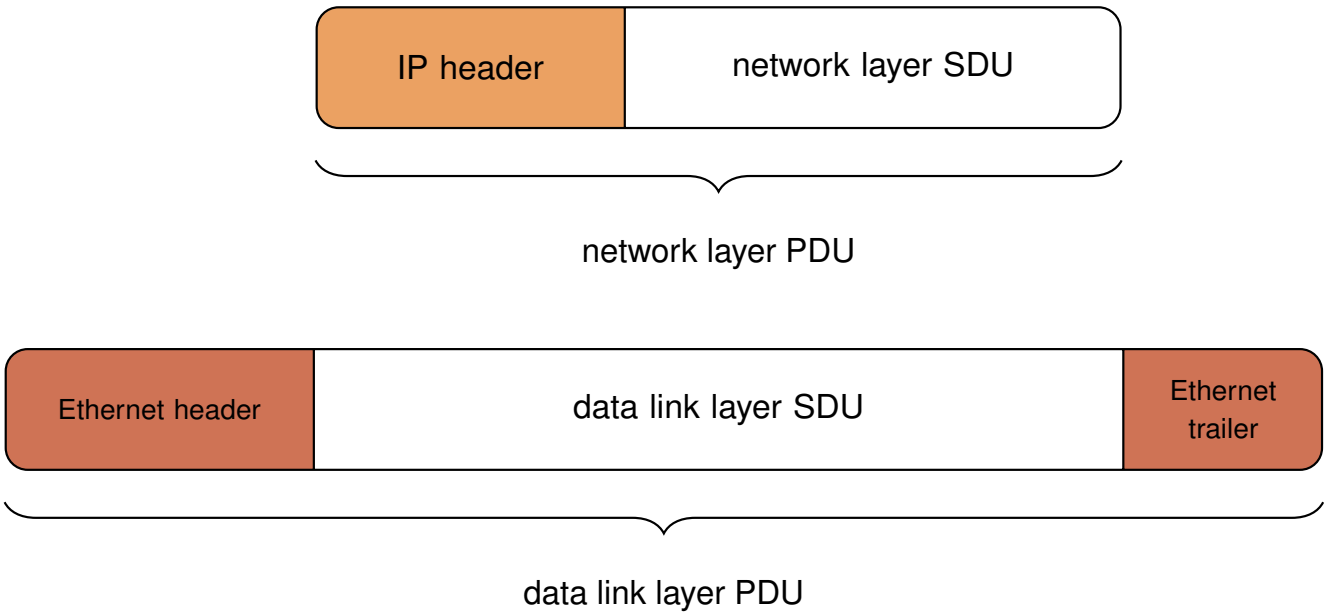
Example: two networks connected with a router



Encapsulation of data in the protocol stack



Terminology



- Protocol Data Unit
- Service Data Unit
- Interface: service access point (SAP)

Design decisions

- no state between sender and destination
- end-to-end principle
- separation of packet forwarding and routing

Destinations

- unicast
- broadcast
- multicast

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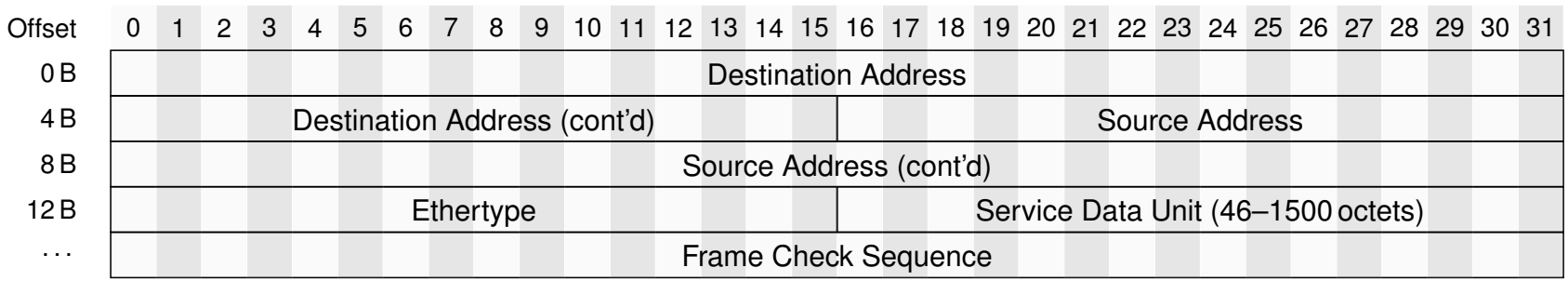
Layer 2 addresses/frame

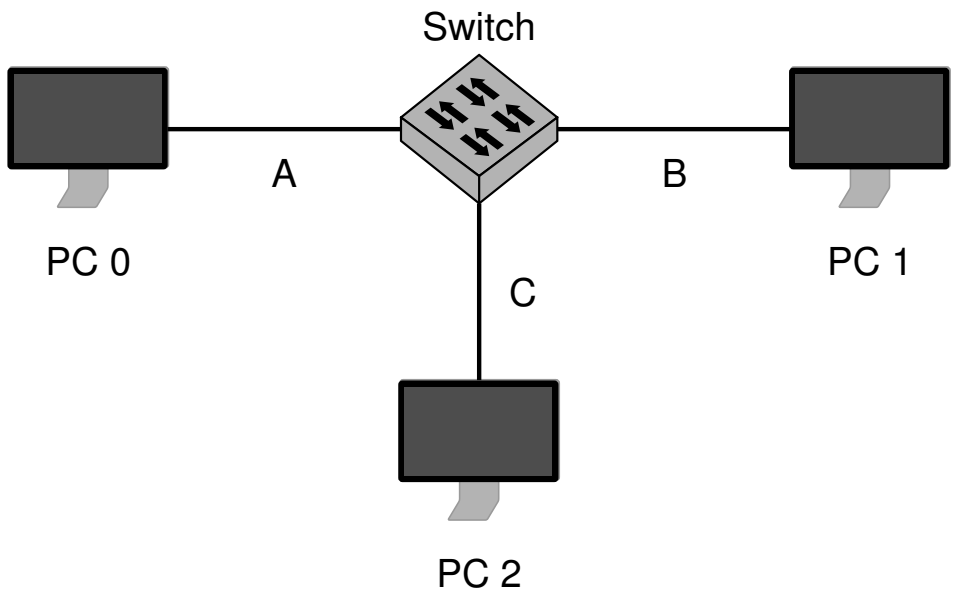
- MAC addresses, “physical address”
- specific for medium
- Ethernet/WLAN: 48 bit
  - 1 bit invividual/group (multicast or broadcast)
  - 1 bit globally (factory default)/locally administered
  - vendor and product information
- not hierarchical

Why are MAC addresses not used for addressing devices on the Internet?

Ethernet layer 2



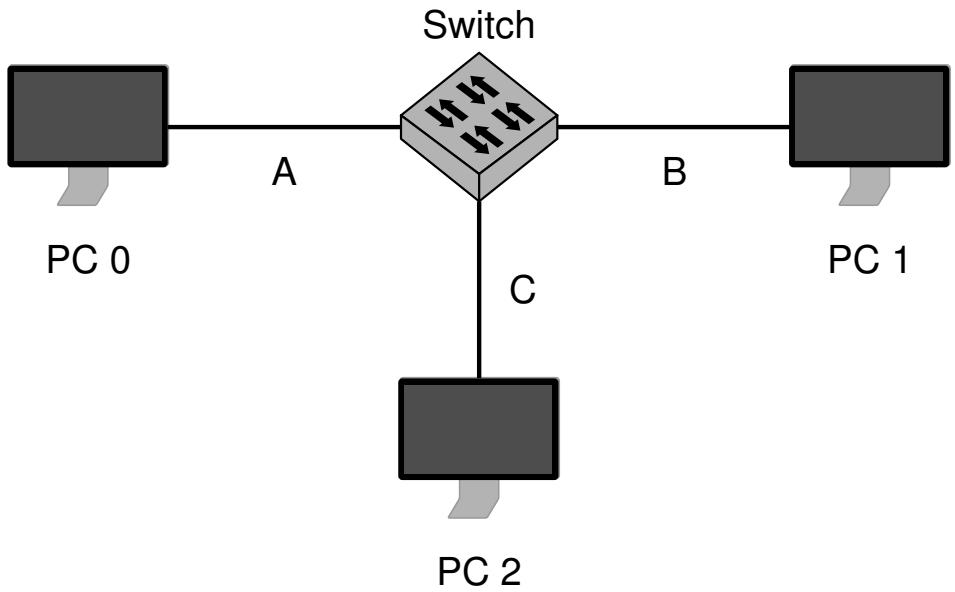
Layer 2 traffic



PC 0 transmits:

1. destination MAC PC 1
2. destination MAC FF:FF:FF:FF:FF:FF

Layer 2 traffic



switch table:

port	address
A	MAC PC 0

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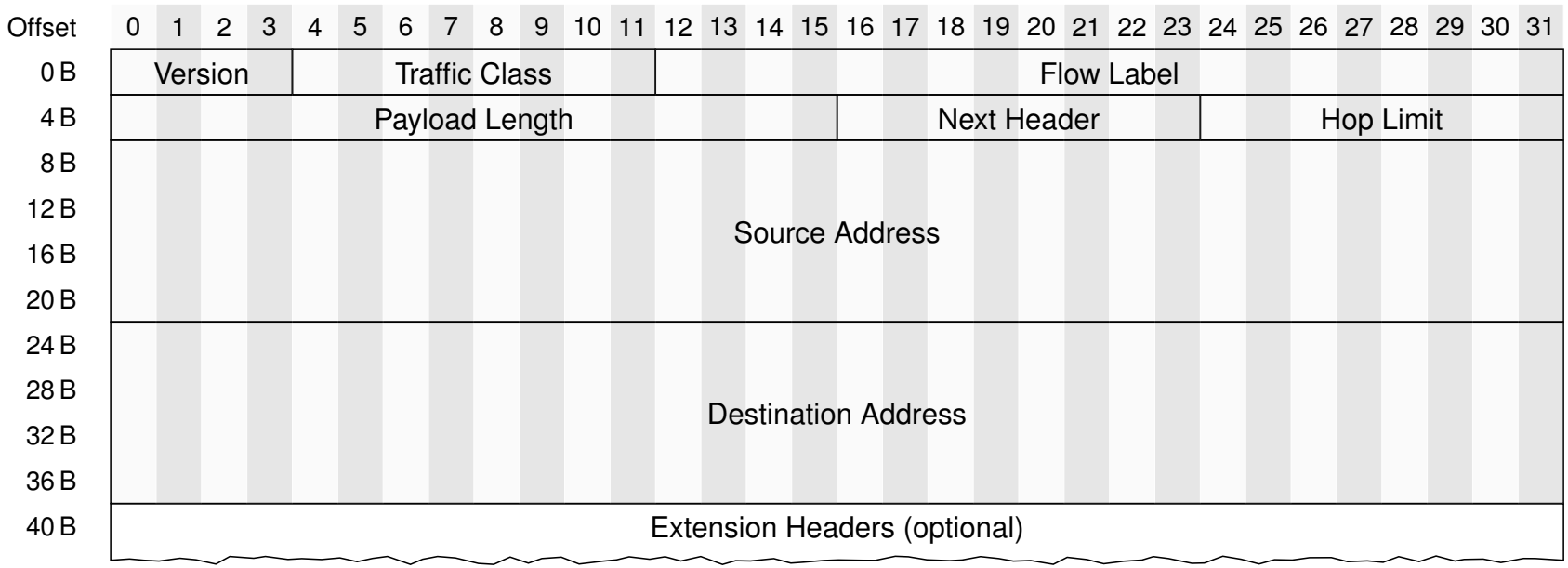
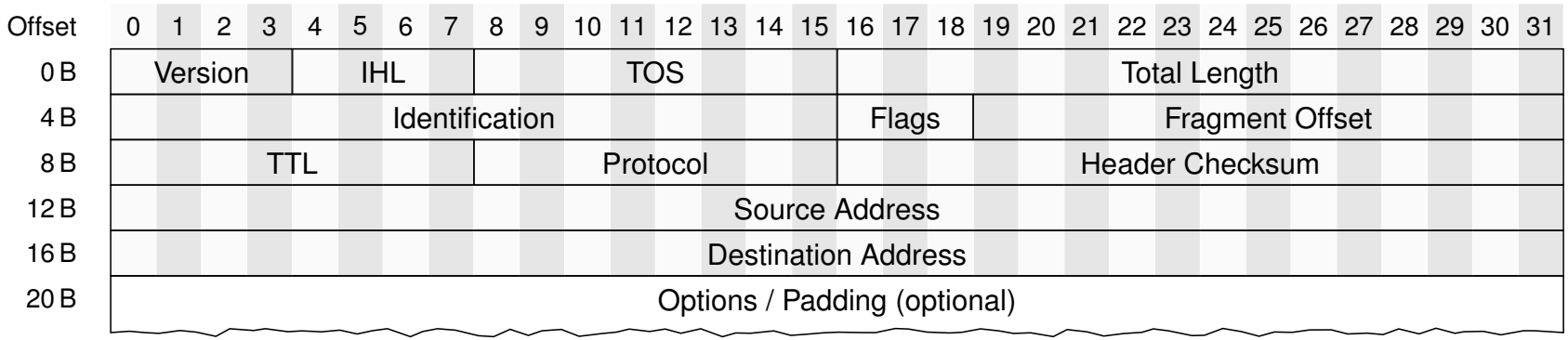
Internet Protocol

- packet switched
- best effort
- connectionless
- unreliable
- no flow control

IPv6 header

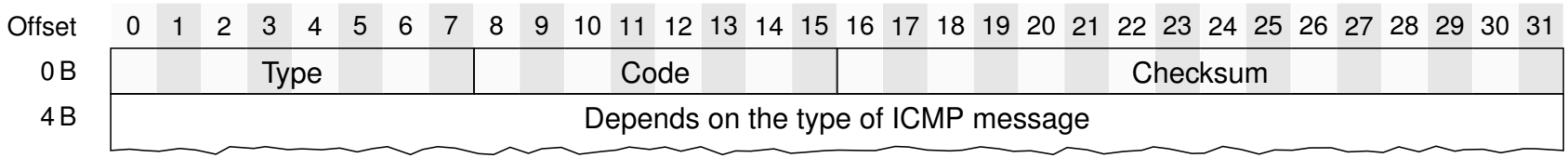

Offset
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
0 B
4 B
8 B
12 B
16 B
20 B
24 B
28 B
32 B
36 B
40 B
Version
Traffic Class
Flow Label
Payload Length
Next Header
Hop Limit
Source Address
Destination Address
Extension Headers (optional)

IPv4 header



- Flags are used for packet fragmentation
- Minimum length is 20 B

Internet control message protocol



- IPv6 next header: 58
- IPv4 protocol: 1
- similarities between ICMPv6 and ICMPv4
- kind of on L3

purpose, e.g.,

- destination unreachable
- time to live exceeded
- neighbor discovery

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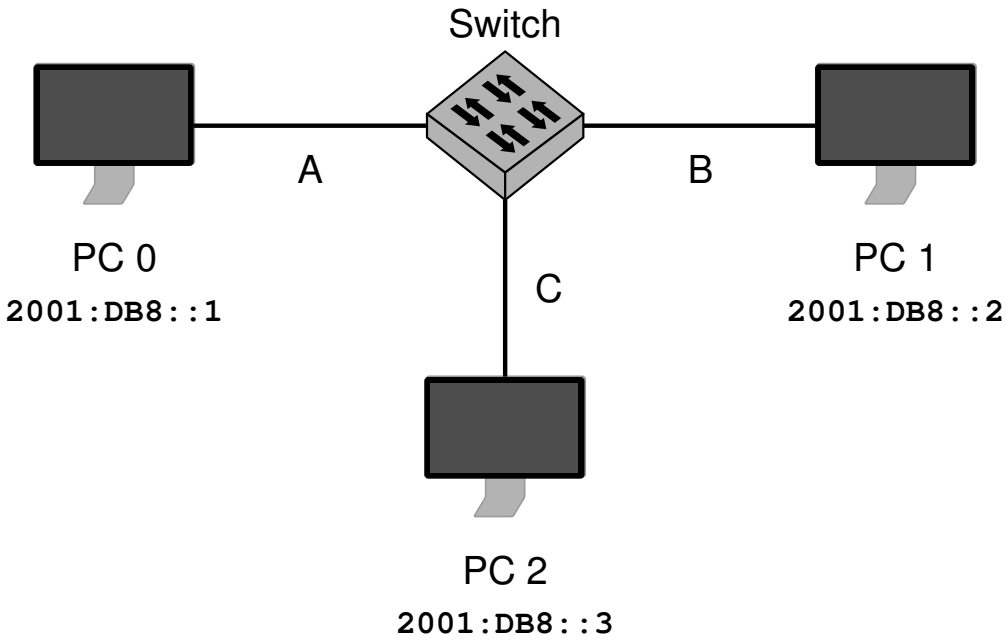
Neighbor Discovery Protocol



Request/response protocol flow

- Neighbor Solicitation (NS): What is the MAC of 2001:DB8::2?
- Neighbor Advertisement (NA): MAC of 2001:DB8::2 is MAC_{PC1}.

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Next steps

- You should already have access to the Basics lab
- You should receive a mail about lab slot and isle preference
- Enter your preference until Thursday 18th of April 2024 23:59 CEST
- Results will be published after the deadline has passed