

## 8 Network Layer

### 8.1 Network Layer Characteristics

- Network Layer Operations
  - Addressing end devices
  - Encapsulation (Quelle packt Layer 4-Segment in IP-Packet ein)
  - Routing (host to host): Router, Layer3-Switches
  - De-encapsulation (Empfänger packt Layer-4-Segment aus)
- Characteristics of IP
  - Connectionless (wie Brief)
  - Best Effort
  - Media Independent (Kupferkabel, Glasfaser, Funk)
    - \* Jedes Medium hat eigenes MTU (maximum transmission unit) → evtl. Fragmentation (nur IPv4, nicht IPv6)

### 8.2 IPv4 Packet

- [rfc-editor.org/rfc/rfc791](http://rfc-editor.org/rfc/rfc791)
- Wireshark: sniffer IPv4 Header

### 8.3 IPv6 Packet

- Grund für IPv6: IPv4 address depletion, NAT
- IPv6 Eigenschaften
  - 128 bit Adressen → mehr Adressen
  - Einfacherer IP Header
  - Braucht kein NAT mehr
- Vergleich: IPv4-Header vs. IPv6-Header
- Wireshark: sniffer IPv6 Header

### 8.4 How a Host Routes

- Host Forward Decision
  - Itself: loopback, 127.0.0.1, ::1
  - Local host
  - Remote host → Default gateway
- Default Gateway
  - Local IP-Address in same address range
  - Routes date from local network to other networks
- Host routing tables
  - `netstat -r`: interface list, IPv4 Routing Table, IPv6 Routing table

## 8.5 Introduction to Routing

- Router Packet Forwarding Decision
- Routing Table: Route (Netz) - Next Hop / Exit Interface
  - Directly-connected networks
  - Remote networks
  - Default route
- Wie kommen Einträge in die Routing Table?
  - Manually: Static routes
  - Dynamically: Routing Protocol
- Static routes
  - R1(config)# ip route 10.1.1.0 255.255.255.0 209.165.200.226
- Dynamic routing
  - OSPF
  - EIGRP
- IPv4 Routing Table
  - Show ip route
  - L, C, S, O, D