

# 12 IPv6 Addressing

## 12.1 IPv4 Issues

- Need for IPv6
  - NAT / Private IPv4
  - Mobile Devices
  - IoT
- IPv4 and IPv6 Coexistence
  - Dual Stack
  - Tunneling
  - Translation

## 12.2 IPv6 Address Representation

- 16-bit Segments
- Rule 1: Omit Leading Zeros
- Rule 2: Double Colon
- Activity 12.2.4 IPv6 Address Representation

## 12.3 IPv6 Address Types

- IPv6 Address Types
  - Unicast, Multicast, Anycast (nearest device having that address)
  - IPv6 Prefix Length
- Types of IPv6 Unicast Addresses
  - Global Unicast
  - Link-local
  - Loopback ::1/128
  - Unspecified Address ::
  - Unique Local fc00::/7 (-fdff::) (vgl. Private IPv4)
- IPv6 GUA
  - vgl. Public IPv4
  - ICANN allocates blocks to five RIRs
  - 2000::/3 (001..) (-3fff:ff..)
  - 2001:db8::/32 reserved documentation purposes in examples
  - Global Routing Prefix, Subnet ID, Interface ID
- IPv6 LLA
  - communicate on the same link (subnet)
  - fe80::/10 (-febf:ff..)
  - statically / dynamically

## 12.4 GUA and LLA Static Configuration

- IPv6 GUA Configuration

- Cisco Router

```
R1(config)# interface gigabitethernet 0/0/0
R1(config-if)# ipv6 address 2001:db8:acad:1::1/64
R1(config-if)# no shutdown
```

- Windows Host

- Static Configuration of a Link-Local Unicast Address

```
R1(config)# interface gigabitethernet 0/0/0
R1(config-if)# ipv6 address fe80::1:1 link-local
R1(config-if)# exit
```

## 12.5 Dynamic Addressing for IPv6 GUAs

- ICMPv6 RS (Router Solicitation)

- ICMPv6 RA (Router Advertisement) every 200s

- Method 1: SLAAC

- Prefix from RA
- Interface ID: EUI-64
- Gateway: router LLA

- Method 2: SLAAC with stateless DHCPv6 server

- Prefix from RA
- Interface ID: EUI-64
- Gateway: router LLA
- DNS-Server, ...: from DHCPv6 server

- Method 3: Stateful DHCPv6 (no SLAAC)

- Prefix from RA
- Gateway: router LLA
- Interface ID, DNS-Server, ...: from DHCPv6 server

- EUI-64

- Interface ID anhand der MAC-Adresse bestimmen
- MAC: 11:22:33:44:55:66
- 11:22:33:FF:FE:44:55:66
- 7.bit umdrehen: 13:22:33:FF:FE:44:55:66
- siehe RFC 5342

- Windows: Random 64-Bit generated Interface ID with DAD (Duplicate Address Detection)

## 12.6 Dynamic Addressing for IPv6 LLAs

- fe80:: + Interface ID (EUI-64 or Random)
- Cisco Router: EUI-64
- Cisco-Befehle
  - show ipv6 interface brief
  - show ipv6 route
  - ping

## 12.7 IPv6 Multicast Addresses

- Well-Known
  - ff02::1 All-nodes
  - ff02::2 All-routers
- Solicited-Node: Mit Multicast MAC

## 12.8 Subnet an IPv6 Network

Bsp:

- 2001:db8:acad:0::/64
- 2001:db8:acad:1::/64
- 2001:db8:acad:2::/64
- ..
- 2001:db8:acad:fff::/64