IPv6-Addresses in brief

„My subnet is bigger than your Internet!"

- **There are 2^{128} ≈ 3.4*10^{35} IPv6 addresses!!**
- **It's about 6.6*10^{18} addresses per m² Earth**
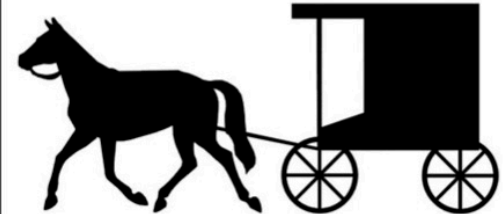- **started 1999 → It's now 20 years old!!!!**

Why IPv6?

- Bigger address-space
- You are not the owner of your IP-address!
- Optmization of the old IPv4 packets
  - Mobile IP
  - Security and encryption
  - Broadcasts are replaced by multicasts
  - Auto-configuration / Privacy extension
  - QoS as a part of protocol
  - Header optimized
  - HEX not Decimal-Numbers
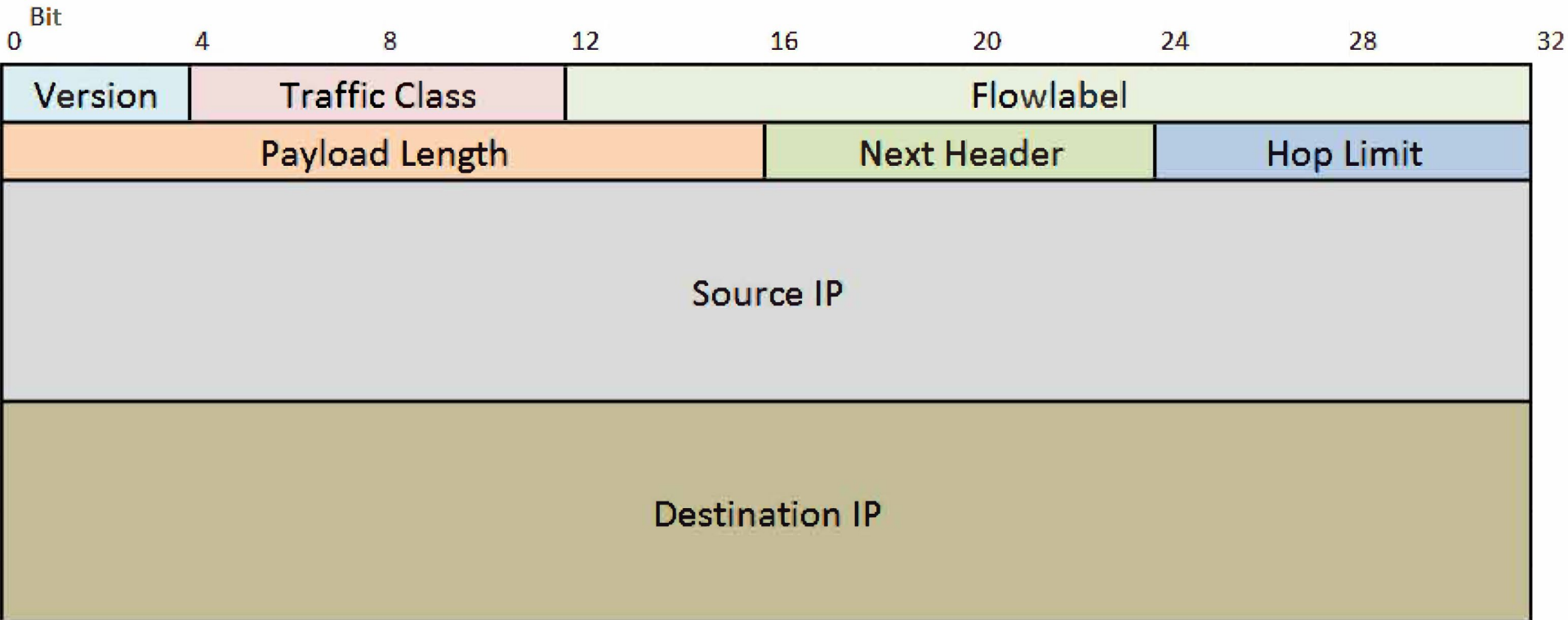 - No address-wasting (e.g. local-host)

⚠ **CAUTION**

Legacy IP Only

This product does not support the current generation of the Internet Protocol, IPv6.

IPv6-Header

Bit								
0	4	8	12	16	20	24	28	32

Version	Traffic Class	Flowlabel		
Payload Length		Next Header		Hop Limit

Source IP

Destination IP

Version	4Bit	1P-Version-Number
Traffic Class	8Bit	Qual ity of Service (QoS): Priority Value
Flow Label	20Bit	also a QoS-Value for time-critical and real-time transmissions
Payload Next	16Bit	Length of Payload-field in Byte
Header Hop	8Bit	Identifier of Header in Payload-Field e.g. TCP (6) / UDP {17}
Limit	8Bit	Identical as Time to Live (TTL) in IPv4.
Src/Dest Address	128Bit	Address of Source / Destination

IPv6-Addresses in detail

- not longer 32 Bit – now 128 Bit length
- Prefix and Identifier (Net-part and Host-part)
- 8 Blocks, seperated by ":"
- each with 4 Hexadecimal digits = 16 Bits
- Mask is always written as /0..128 (decimal)

FC00:0000:0000:0001:0000:0000:0000:0001/64

Let's make it shorter

FC00:0000:0000:0001:0000:0000:0000:0001/64
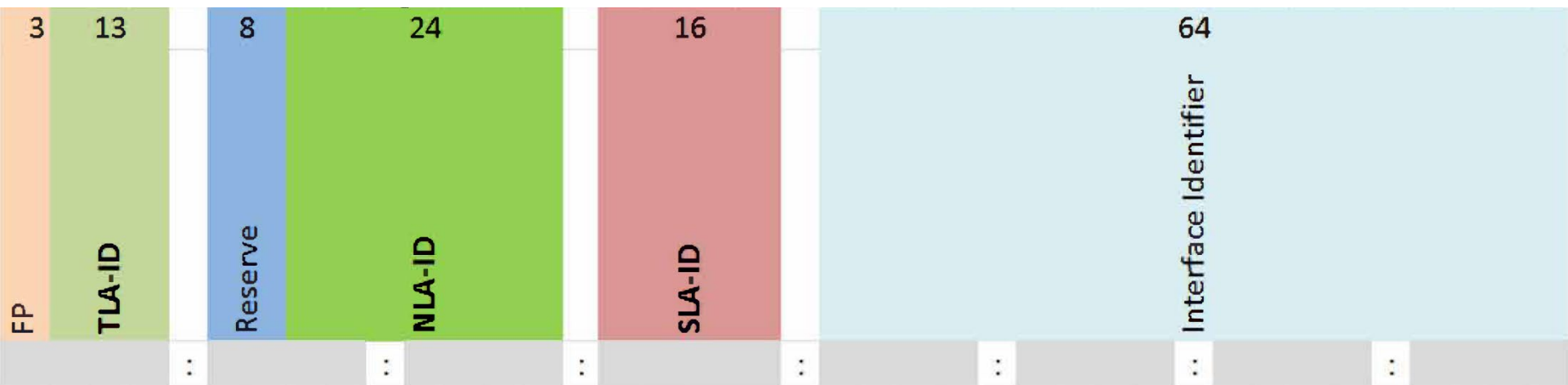
beginning Zeros in a block can be deleted:

FC00:0:0:1:0:0:0:1/64

multiple Zero-blocks can be **replaced** by "::" ONCE

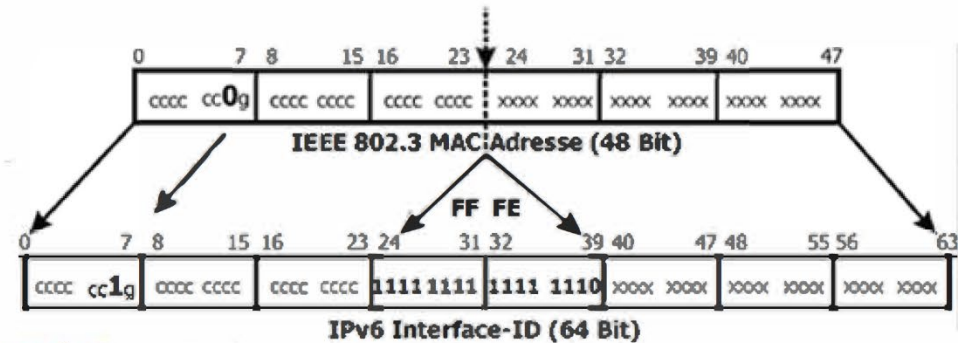FC00:0:0:1::1/64

Address-structure

„must-know" addresses

- Not defined = *   `::`

- Loopback (localhost)   `::1`

- IPv4   (e.g. 192.168.1.2)   `::FFFF:C0A8:0102`

- Global public IP   `2000:: - 3FFF::`

- Unique Local Unicast private IP   `FC00:: - FDFF::`

- Linklocal / auto-configuration APIPA   `FE80:: - FEBF::`

- Multicast   `FF00:: - FFFF::`

IPv4-names in blue

IPv6-Multicast

Multicast	FF00 - FFFF::
all devices (broadcast)	FF01::1, FF02::1
all routers in segment	FF01::2, FF02::2, FF05::2

F	F	0	0	:		:		:		:		:		:		:

Flag	
0	Permanently defined well-known multicast-addresses (assignend by IANA)
1	(T-Bit set) Transient (temporaitlly), or dynamically assigned multicast-addresses
3	(P-Bit set, forces the T-Bit) *Unicast-Prefix-based m*ulticast-addresses
7	(R-Bit set, forces P- and T-Bit} multicast-addresses, which contains the address of *Rendezvous Point*

Valid	
1	Interface-local, the packets never pass the NIC. (Loopback: Computer internally / Operating-system)
2	Link-local, will never forwarded by routers. Cannot leave own subnet.
4	Admin-local, block or passing must be configured manually on routers
5	Site-local, will be forwarded by intern routers but not by border-routers (never passing the firewall)
8	Organization-local, can also pass the firewall (border-routers) but will never leave „the Company" e.g. VPN
e	Global Multicast, no limitation
0,3,f	Reserved
Rest	unused