IPv6

Protocol Header

Version (4 bits) · Always set to 6

Traffic Class (8 bits) · A DSCP value for QoS

Flow Label (20 bits) · Identifies unique flows (optional)

Payload Length (16 bits) · Length of the payload in bytes

Next Header (8 bits) · Header or protocol which follows

Hop Limit (8 bits) · Functions as IPv4's time to live field

Source Address (128 bits) · Source IP address

Destination Address (128 bits) · Destination IP address

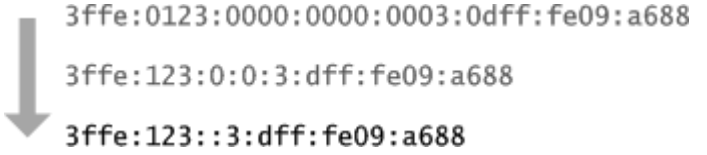
Address Types

Unicast · One-to-one communication

Multicast · One-to-many communication

Anycast · An address configured in multiple locations

Address Notation



Step 1 · Eliminate all leading zeros

Step 2 · Replace up to one set of consecutive zeros with a double-colon

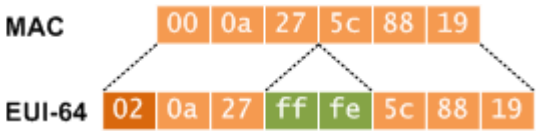
Address Formats

Global unicast

Link-local unicast

Multicast

EUI-64 Formation



Step 1 · Insert 0xfffe between the two halves of the MAC

Step 2 · Flip the seventh bit (universal/local flag) to 1

Special-Use Ranges

`::/0`	Default route
`::/128`	Unspecified
`::1/128`	Loopback
`::/96`	IPv4-compatible*
`::FFFF:0:0/96`	IPv4-mapped
`2001::/32`	Teredo
`2001:DB8::/32`	Documentation
`2002::/16`	6to4
`FC00::/7`	Unique local
`FE80::/10`	Link-local unicast
`FEC0::/10`	Site-local unicast*
`FF00::/8`	Multicast

* Deprecated

Extension Headers

Hop-by-hop Options (0) · Carries additional information which must be examined by every router in the path

Routing (43) · Provides source routing functionality

Fragment (44) · Included when a packet has been fragmented by its source

Encapsulating Security Payload (50) · Provides payload encryption (IPsec)

Authentication Header (51) · Provides packet authentication (IPsec)

Destination Options (60) · Carries additional information which pertains only to the recipient

Transition Methods

Dual Stack · Running IPv4 and IPv6 on all devices simultaneously

Tunneling · IPv6 packets are encapsulated into IPv4 using IPv6-in-IP, UDP (Teredo), or Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)

Translation · Stateless IP/ICMP Translation (SIIT) translates IP header fields and NAT Protocol Translation (NAT-PT) maps between IPv6 and IPv4 addresses