### Protocol Header

<table>
<thead>
<tr>
<th>Field</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>4</td>
</tr>
<tr>
<td>Traffic Class</td>
<td>8</td>
</tr>
<tr>
<td>Flow Label</td>
<td>20</td>
</tr>
<tr>
<td>Payload Length</td>
<td>16</td>
</tr>
<tr>
<td>Next Header</td>
<td>8</td>
</tr>
<tr>
<td>Hop Limit</td>
<td>8</td>
</tr>
<tr>
<td>Source Address</td>
<td>128</td>
</tr>
<tr>
<td>Destination Address</td>
<td>128</td>
</tr>
</tbody>
</table>

#### Address Notation

- 3ffe:0123:0000:0000:0003:0ff:fe09:a688
- 3ffe:123:0:0:3:0ff:fe09:a688
- 3ffe:123:0:0:3:0ff:fe09:a688

**Step 1** · Eliminate all leading zeros

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

#### Address Formats

**Global unicast**

- Global Prefix: 48
- Subnet: 16
- Interface ID: 64

**Link-local unicast**

- FE80::/64
- Interface ID: 64

**Multicast**

- FF
- Flag
- Scope
- Group ID: 112

#### EUI-64 Formation

- MAC: 00 0a 27 5c 88 19
- EUI-64: 02 0a 27 ff fe 5c 88 19

**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
- ::/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