Internet Protocol Version 6

Reading: Chapter 23

IPv6

- Longer IP address
  - 128 bits

- Simplified header format
- Extension headers
- Flow labeling
- Authentication and data protection

Address

- 128 bits
  - Colon separated hexadecimal
    - FEDC:B408:7654:3210
    - F8:5::12
  - Mixed IPv6 and IPv4 format
    - :FFFF:129.13.64.5

- Some special address:
  - Unspecified, all 0
  - Loopback ::1
  - Link-local addresses: FE80::/64
  - Site-local addresses: FE00::/64

Packet header format (40 bytes)

<table>
<thead>
<tr>
<th>0</th>
<th>3</th>
<th>11</th>
<th>15</th>
<th>23</th>
<th>31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>Traffic class</td>
<td>Flow label</td>
<td>Payload length</td>
<td>Next header</td>
<td>Hop limit</td>
</tr>
</tbody>
</table>

Source address

Destination address
Packet header extensions

• Hop-by-hop options
• Routing packet header extension
• Fragment packet header extension
• Destination options
• Authentication header
• Encapsulating security payload

IPv6 implementation: incoming

• ipv6_rcv()
  – Accepting packets from lower layer (DLL)
  – Some sanity checking
  – Processing extension headers if present
  – Passing on to ip6_rcv_finish()
    • ip6_input()
    • ip6_mc_input()
    • ip6_forward()

Forwarding packets

• ip6_forward()
  – For packets need to be forwarded
  – If we can forward packets (router?)
  – Hop limit OK?
    • If not, drop packet, send ICMPv6 error message
    • If packet too big?
    – If so, dropping packet, sending ICMPv6 message
  – ip6_forward_finish()
    • ip6_output()

Packets delivered locally

• ip6_input()
  – Passing on to ip6_input_finish()
    • Processing extension headers
      (ip6_parse_exheaders())
    • Passing to higher protocols (TCP/UDP)
Transport layer packets

- ip6_xmit(), ip6_output()

  - ip6_xmit()
    - Allocating extra header space if necessary
    - Setting header values
    - Passing to ip6_maybe_reroute()
    - Passing to ip6_output()

ip6_output()

- Passing on to ip6_output_finish()
  - Figuring out next hop (Neighbor Discovery)
  - Passing to lower layer