IPv6 On Mikrotik

Mikrotik User Meeting
Armenia Yerevan
October 10, 2017
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Agenda

- IPv4?
- IPv6 address Basics
- Getting an IPv6
- Deploying
- Transition mechanisms
- QA

- Demo - IPv6 Address Configuration on ROS
- Demo - Tunnel Broker + Configuration on ROS
IPv4?
IPv4- Reaching the next billion

- Around 3.675 billion Internet users now.
  - around 50.1% of all people in the world
- Mobile phones are Internet devices
- The Internet of Things
  - How will the Internet look like in 5 - 10 years?
IPv4- IANA IPv4 Pool
IPv4- Exhaustion

“On 14 September 2012, the RIPE NCC ran out of their regular pool of IPv4”
IPv4- Network Address Translation

- Extends the capacity of the IPv4 address space by sharing an IPv4 address between clients
- Fairly common technology, used everywhere
- Breaks the end to end connectivity model
- It doesn’t allow communication with IPv6!
- You are probably going to need it in some form
IPv6 Address Basics
IP Address Distribution

/3

/12

/32

/48

/56

/48

IANA

RIR

LIR

End User
IPv6 Address Basics

- IPv6 address: 128 bits
  - 32 bits in IPv4
- Every subnet should be a /64
- Customer assignments (sites) between:
  - /64 (1 subnet)
  - /48 (65,536 subnets)
  - Minimum allocation size /32
    - 65,536 /48s
    - 16,777,216 /56s
Address Notation

2001:0db8:003e:ef11:0000:0000:c100:004d
2001:0db8:003e:ef11:0000:0000:c100:004d
2001:db8:3e:ef11:0:0:c100:4d
## Multiple address types

<table>
<thead>
<tr>
<th>Addresses</th>
<th>Range</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unspecified</td>
<td>::/128</td>
<td>n/a</td>
</tr>
<tr>
<td>Loopback</td>
<td>::1</td>
<td>Host</td>
</tr>
<tr>
<td>IPv4-Embedded</td>
<td>64:ff9b::/96</td>
<td>n/a</td>
</tr>
<tr>
<td>Discard-Only</td>
<td>100::/64</td>
<td>n/a</td>
</tr>
<tr>
<td>Link Local</td>
<td>fe80::/10</td>
<td>Link</td>
</tr>
<tr>
<td>Global Unicast</td>
<td>2000::/3</td>
<td>Global</td>
</tr>
<tr>
<td>Unique Local</td>
<td>fc00::/7</td>
<td>Global</td>
</tr>
<tr>
<td>Multicast</td>
<td>ff00::/8</td>
<td>variable</td>
</tr>
</tbody>
</table>
Demo- IPv6 address configuration

- IPv6 package is not enabled by default

<table>
<thead>
<tr>
<th>Name</th>
<th>Version</th>
<th>Build Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>routeros-mipsbe</td>
<td>6.37.1</td>
<td>Sep/30/2016 10:28:41</td>
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<tr>
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<td>Sep/30/2016 10:28:41</td>
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<td>Sep/30/2016 10:28:41</td>
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<tr>
<td>hotspot</td>
<td>6.37.1</td>
<td>Sep/30/2016 10:28:41</td>
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<td>ipv6</td>
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<td>Sep/30/2016 10:28:41</td>
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<td>Sep/30/2016 10:28:41</td>
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<td>Sep/30/2016 10:28:41</td>
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<td>Sep/30/2016 10:28:41</td>
</tr>
<tr>
<td>system</td>
<td>6.37.1</td>
<td>Sep/30/2016 10:28:41</td>
</tr>
</tbody>
</table>
Demo - IPv6 address configuration
- After RouterOs / Routerboard reboot IPv6 menu appearance in Winbox
IPv6 Protocol Basics
IPv6 Protocol Functions

- Address Auto configuration
  - Supported by Neighbor Discovery
  - Stateless - with SLAAC
  - Stateful - with DHCPv6
- Neighbor Discovery Protocol
- Replaces ARP from IPv4
  - Uses ICMPv6 and Multicast
  - Finds the other IPv6 devices on the link
  - Keeps track of reachability
The Auto configuration Process

1. Make a Link-Local address
2. Check for duplicates on the link
3. Search for a router
4. Make a Global Unicast address
Deploying IPv6
IPv6 Address Management

- Your spreadsheet might not scale
  - There are 65,536 /64s in a /48
  - There are 65,536 /48s in a /32
  - There are 524,288 /48s in a /29
  - There are 16,777,216 /56s in a /32
  - There are 134,217,728 /56s in a /29
- Find a suitable IPAM solution
Transition Mechanisms
Transitioning: Solving Two Problems

- Maintaining connectivity to IPv4 hosts by sharing IPv4 addresses between clients
  - Extending the address space with NAT/CGN/LSN
  - Translating between IPv6 and IPv4
  - Provide a mechanism to connect to the emerging IPv6-only networks
  - Tunneling IPv6 packets over IPv4-only networks
Transitioning

- 6to4
- 6RD
- DS-Lite
- 6in4
- Teredo
- NAT64
- Dual Stack
Demo-Tunnel broker

- https://tunnelbroker.net
Demo-Tunnel broker - Mikrotik side

Also you can paste commands in Terminal
Demo-Tunnel broker-Mikrotik side

IPv6 Address List

Address: 2001:470:23:74e::2/64
From Pool: 
Interface: sit1

- EUI64
- Advertise

disabled Global

15 items
Demo-Tunnel broker-Mikrotik side
Demo-Tunnel broker-Request More IPv6
Demo - Tunnel broker - More IPv6 – Mikrotik side
Demo - Tunnel broker - More IPv6 – Mikrotik side
Any question?