



IPv6 On Mikrotik

Mikrotik User Meeting
Armenia Yerevan
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About Me

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Mikrotik

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Fibre to the Home
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RIPE NCC
TRAINING



Agenda

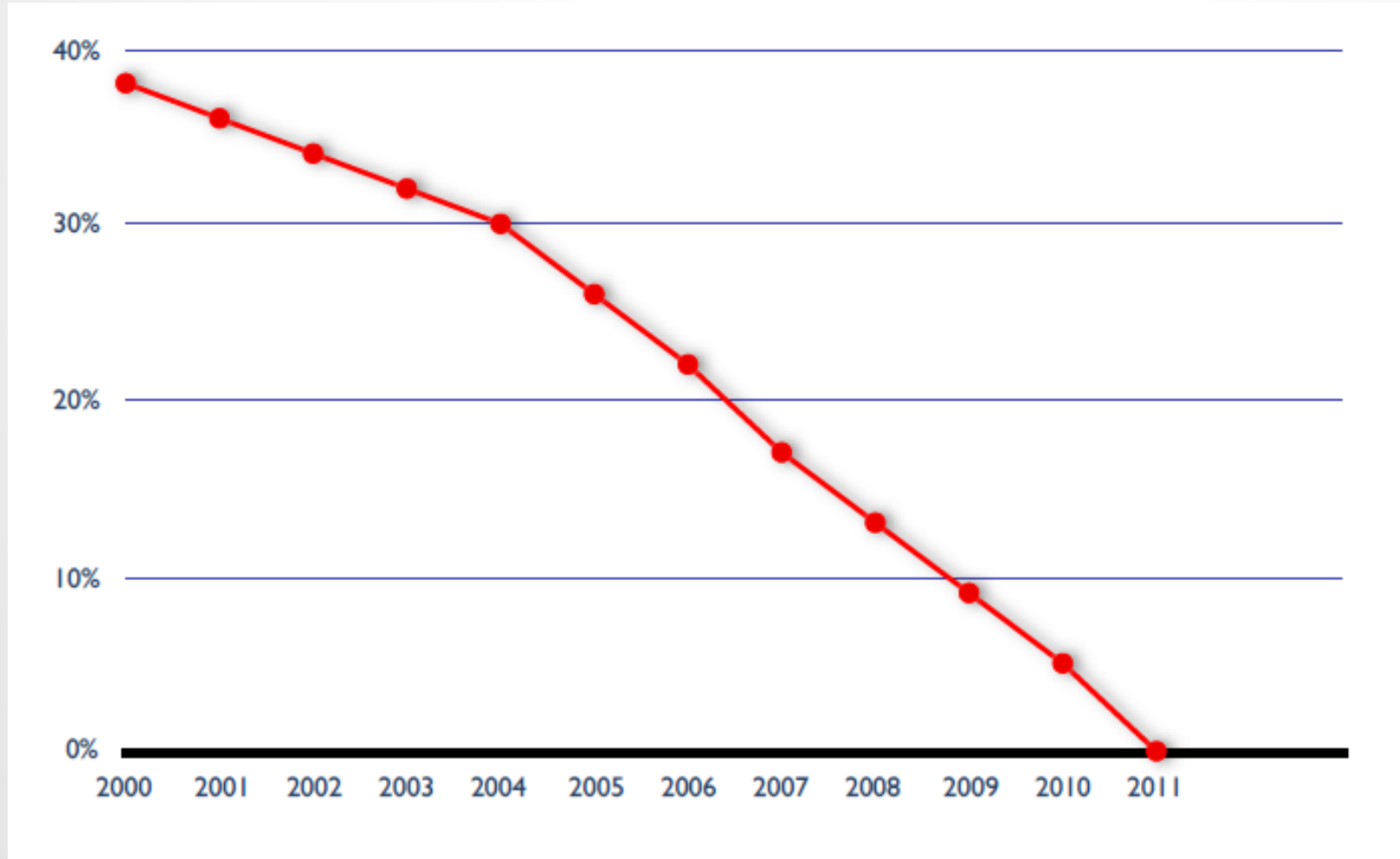
- IPv4?
- IPv6 address Basics
- Getting an IPv6
- Deploying
- Transition mechanisms
- QA
- Demo - IPv6 Address Configuration on ROS
- Demo - Tunnel Broker + Configuration on ROS

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”

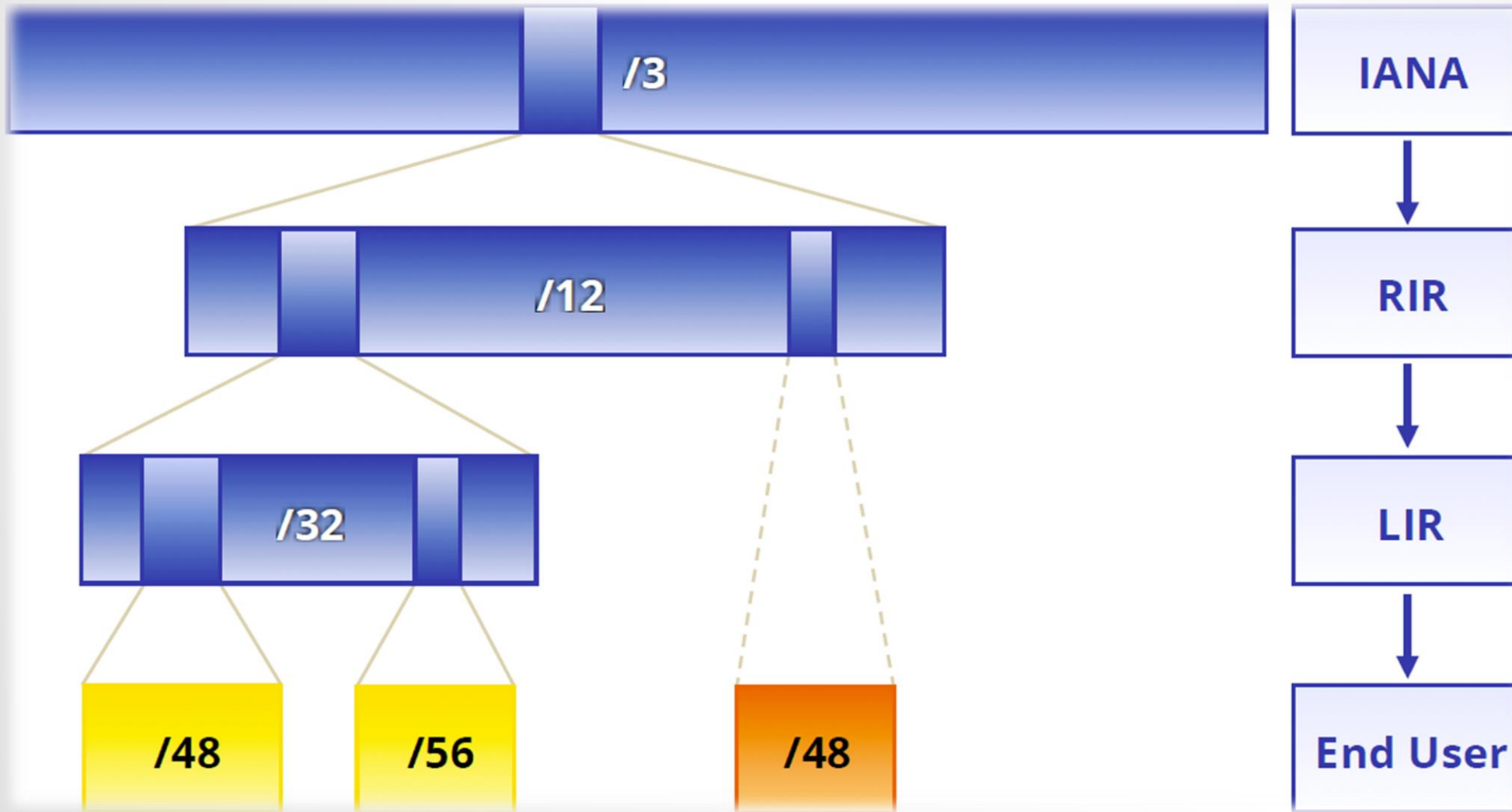


IPv4- Network Address Translation

- 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



IPv6 Address Basics

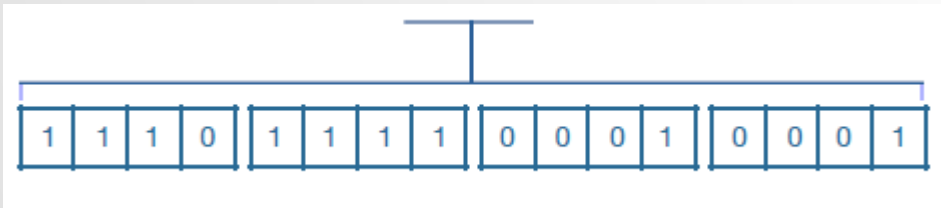
- IPv6 address: 128 bits
 - 32 bits in IPv4
- Every subnet should be a /64
- Customer assignments (sites) between:
 - /64 (1 subnet)
 - /48 (65,536 subnets)
 - Minimum allocation size /32
 - 65,536 /48s
 - 16,777,216 /56s

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

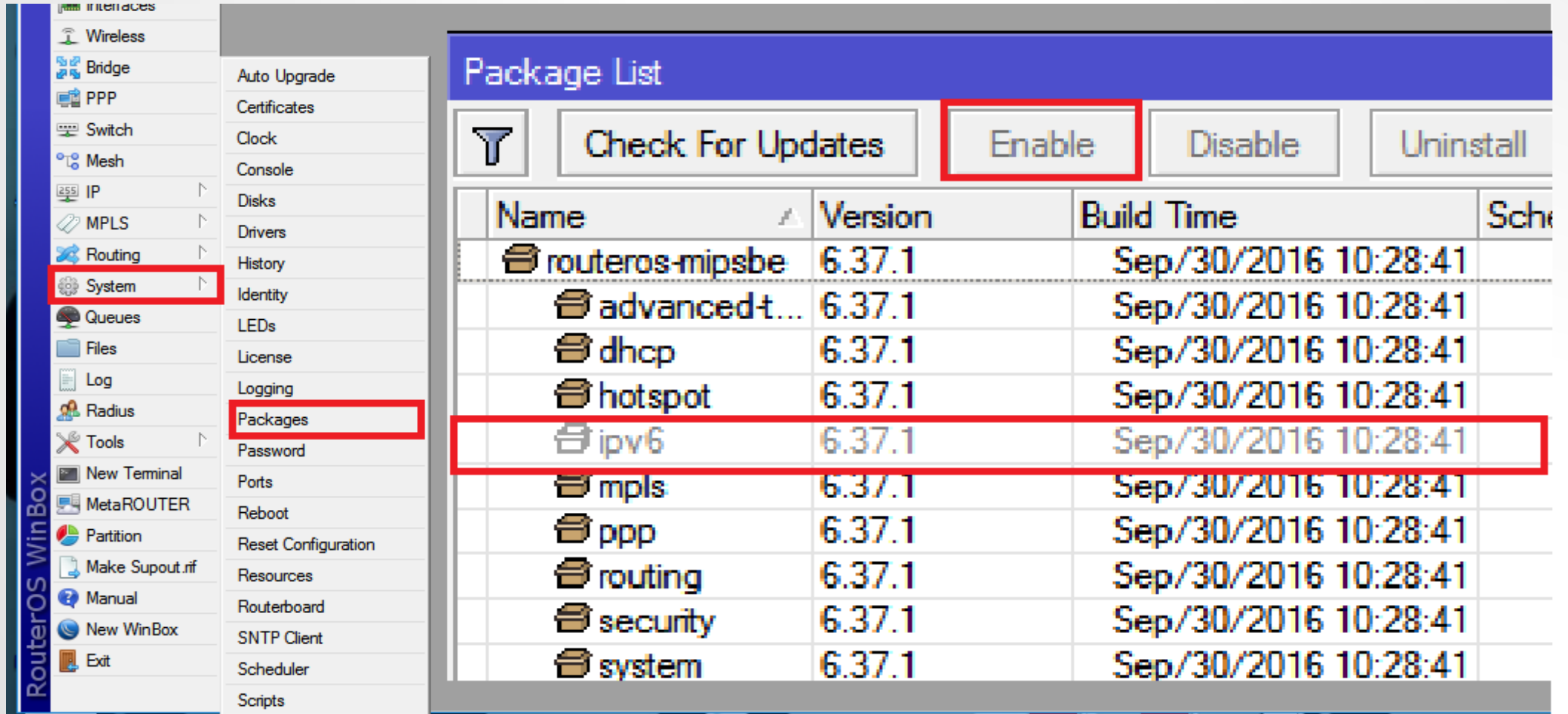


Multiple address types

Addresses	Range	Scope
Unspecified	::/128	n/a
Loopback	::1	Host
IPv4-Embedded	64:ff9b::/96	n/a
Discard-Only	100::/64	n/a
Link Local	fe80::/10	Link
Global Unicast	2000::/3	Global
Unique Local	fc00::/7	Global
Multicast	ff00::/8	variable

Demo- IPv6 address configuration

- IPv6 package is not enabled by default

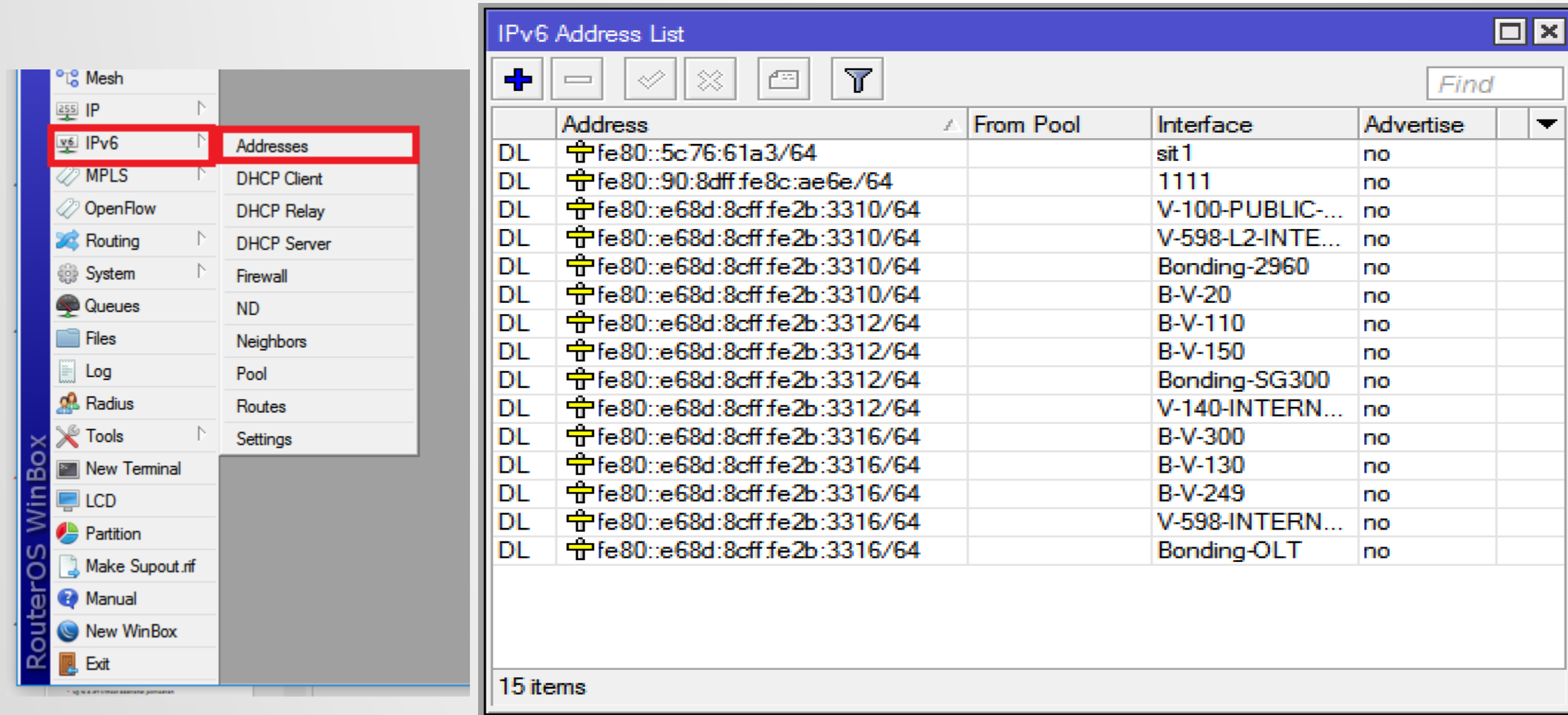


The screenshot displays the Mikrotik WinBox interface. On the left, the 'System' menu item is highlighted in the sidebar, and the 'Packages' sub-menu is also highlighted. The main window shows the 'Package List' dialog. The 'Enable' button is highlighted with a red box. Below the buttons is a table of installed packages. The 'ipv6' package is highlighted with a red box.

Name	Version	Build Time	Sche
routeros-mipsbe	6.37.1	Sep/30/2016 10:28:41	
advancedt...	6.37.1	Sep/30/2016 10:28:41	
dhcp	6.37.1	Sep/30/2016 10:28:41	
hotspot	6.37.1	Sep/30/2016 10:28:41	
ipv6	6.37.1	Sep/30/2016 10:28:41	
mpls	6.37.1	Sep/30/2016 10:28:41	
ppp	6.37.1	Sep/30/2016 10:28:41	
routing	6.37.1	Sep/30/2016 10:28:41	
security	6.37.1	Sep/30/2016 10:28:41	
system	6.37.1	Sep/30/2016 10:28:41	

Demo- IPv6 address configuration

- After RouterOs / Routerboard reboot IPv6 menu appearance in Winbox



The image shows the MikroTik WinBox interface. On the left, the 'RouterOS WinBox' sidebar is visible with the 'IPv6' menu item highlighted in red. The 'IPv6' menu is expanded, showing a list of options: 'Addresses', 'DHCP Client', 'DHCP Relay', 'DHCP Server', 'Firewall', 'ND', 'Neighbors', 'Pool', 'Routes', and 'Settings'. The 'Addresses' option is selected. The main window displays the 'IPv6 Address List' table, which contains 15 items. The table has columns for 'Address', 'From Pool', 'Interface', and 'Advertise'. The 'Address' column shows various IPv6 addresses in the format 'DL fe80::5c76:61a3/64'.

	Address	From Pool	Interface	Advertise
DL	fe80::5c76:61a3/64		sit 1	no
DL	fe80::90:8dff:fe8c:ae6e/64		1111	no
DL	fe80::e68d:8cff:fe2b:3310/64		V-100-PUBLIC-...	no
DL	fe80::e68d:8cff:fe2b:3310/64		V-598-L2-INTE...	no
DL	fe80::e68d:8cff:fe2b:3310/64		Bonding-2960	no
DL	fe80::e68d:8cff:fe2b:3310/64		B-V-20	no
DL	fe80::e68d:8cff:fe2b:3312/64		B-V-110	no
DL	fe80::e68d:8cff:fe2b:3312/64		B-V-150	no
DL	fe80::e68d:8cff:fe2b:3312/64		Bonding-SG300	no
DL	fe80::e68d:8cff:fe2b:3312/64		V-140-INTERN...	no
DL	fe80::e68d:8cff:fe2b:3316/64		B-V-300	no
DL	fe80::e68d:8cff:fe2b:3316/64		B-V-130	no
DL	fe80::e68d:8cff:fe2b:3316/64		B-V-249	no
DL	fe80::e68d:8cff:fe2b:3316/64		V-598-INTERN...	no
DL	fe80::e68d:8cff:fe2b:3316/64		Bonding-OLT	no

15 items

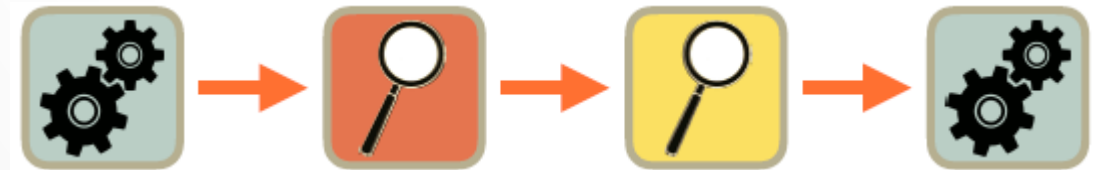
IPv6 Protocol Basics

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>

**HURRICANE ELECTRIC**
INTERNET SERVICES

Account Menu
Main Page
Account Info
Logout

User Functions
Create Regular Tunnel
Create BGP Tunnel
IPv6 Portscan

Hurricane Electric Free IPv6 Tunnel Broker
Name: Hasan Asghari
User ID: v655f5130a510be8.71607251
Tunnel Broker News:
Update - 30 March 2017
[March 30, 2017]
Re: PPTP Tunnel Beta
[May 13, 2016]
This service is no longer offered at this time. No plans to bring it back.
Two-factor Authentication
[January 04, 2016]

HE.NET IPv6 Certified
Sage
asghar170

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Tunnel Details
IPv6 Tunnel
Example Configurations
Advanced
Mikrotik
Copy and paste the following commands into a command window:

```
/interface 6to4 add comment="Hurricane Electric IPv6 Tunnel Broker"  
disabled=no local-address=93.118.97.163 mtu=1280 name=sit1 remote-  
address=74.82.46.6  
/ipv6 route add comment="" disabled=no distance=1 dst-address=2000::/3  
gateway=2001:470:23:74e::1 scope=30 target-scope=10  
/ipv6 address add address=2001:470:23:74e::2/64 advertise=no disabled=no eui-  
64=no interface=sit1
```

NOTE: When behind a firewall appliance that passes protocol 41, use the IPv4 address you get from your appliance's DHCP service instead of the IPv4 endpoint you provided to our broker.
The configurations provided are example configurations and may be different depending on the version of the OS or the tools you are using. If you have any issues getting your tunnel to work please contact us at ipv6@he.net and we will be happy to assist you.

Quick Links
[Certification](#)
[Tunnelbroker](#)
[Free DNS](#)
[BGP Toolkit](#)
[Net Tools App](#)
[Forums](#)
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Description
33::/48 Tunnel 6to4 with Artemis



Demo-Tunnel broker-Mikrotik side

The screenshot displays the Mikrotik WinBox interface. On the left, the 'Interface List' tab is active, showing a table of interfaces. A red box highlights the '+' icon in the 'Interface List' header. A context menu is open, listing various interface types, with '6to4 Tunnel' highlighted by a red box. On the right, the 'Interface <sit1>' configuration window is shown. The 'General' tab is active, and the 'Local Address' and 'Remote Address' fields are highlighted with a red box. The 'Local Address' is set to '93.118.97.163' and the 'Remote Address' is set to '74.82.46.6'. The 'Type' is set to '6to4 Tunnel'. The status bar at the bottom shows 'enabled', 'running', and 'slave'.

Interface List

Interface	Name
R	1111
R	11B-V-2
R	11B-V-1
R	11B-V-1
R	11B-V-1
R	11B-V-2

Quick Set
CAPsMAN
Interfaces
Wireless
Bridge
PPP
Mesh
IP
IPv6
MPLS
OpenFlow
Routing
System
Queues
Files
Log

Interface <sit1>

General Status Traffic

Name: sit1

Type: 6to4 Tunnel

MTU: 1280

Actual MTU: 1280

L2 MTU: 65535

Local Address: 93.118.97.163

Remote Address: 74.82.46.6

IPsec Secret:

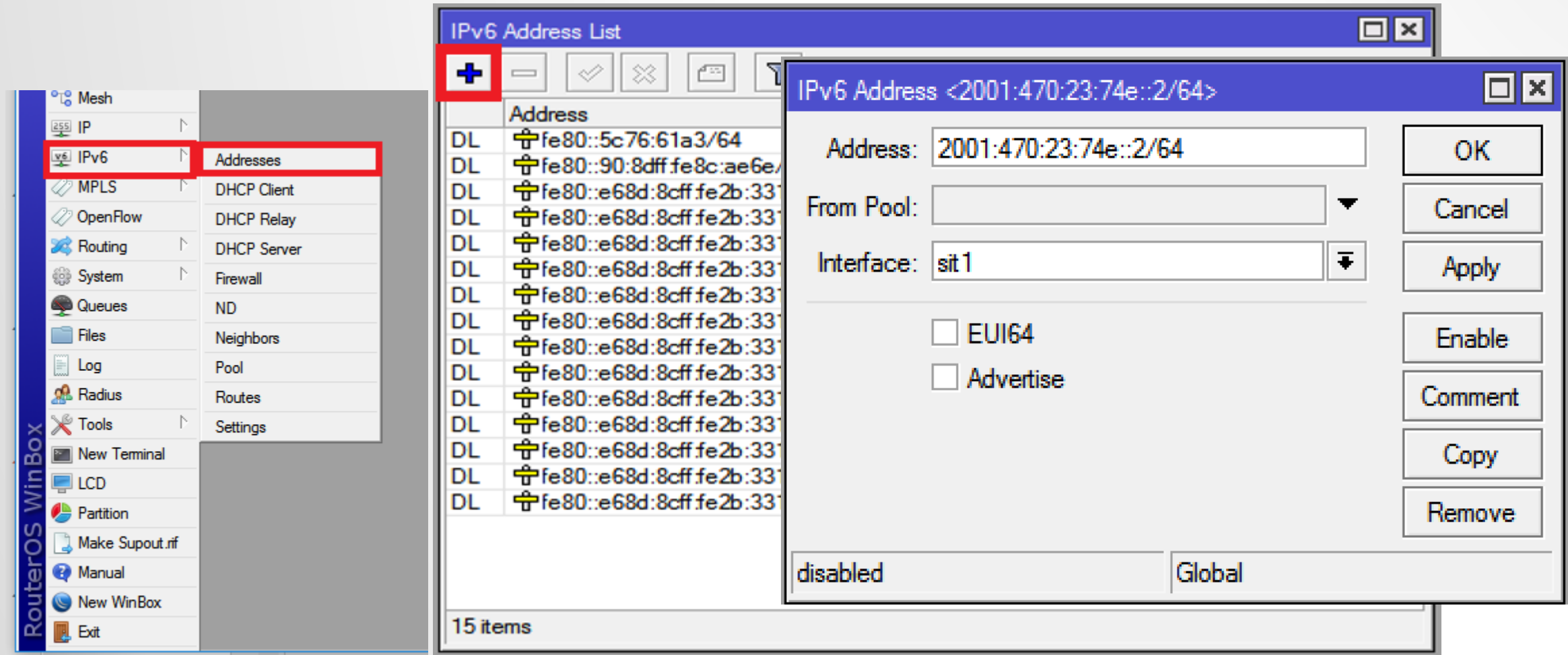
Keepalive:

enabled running slave

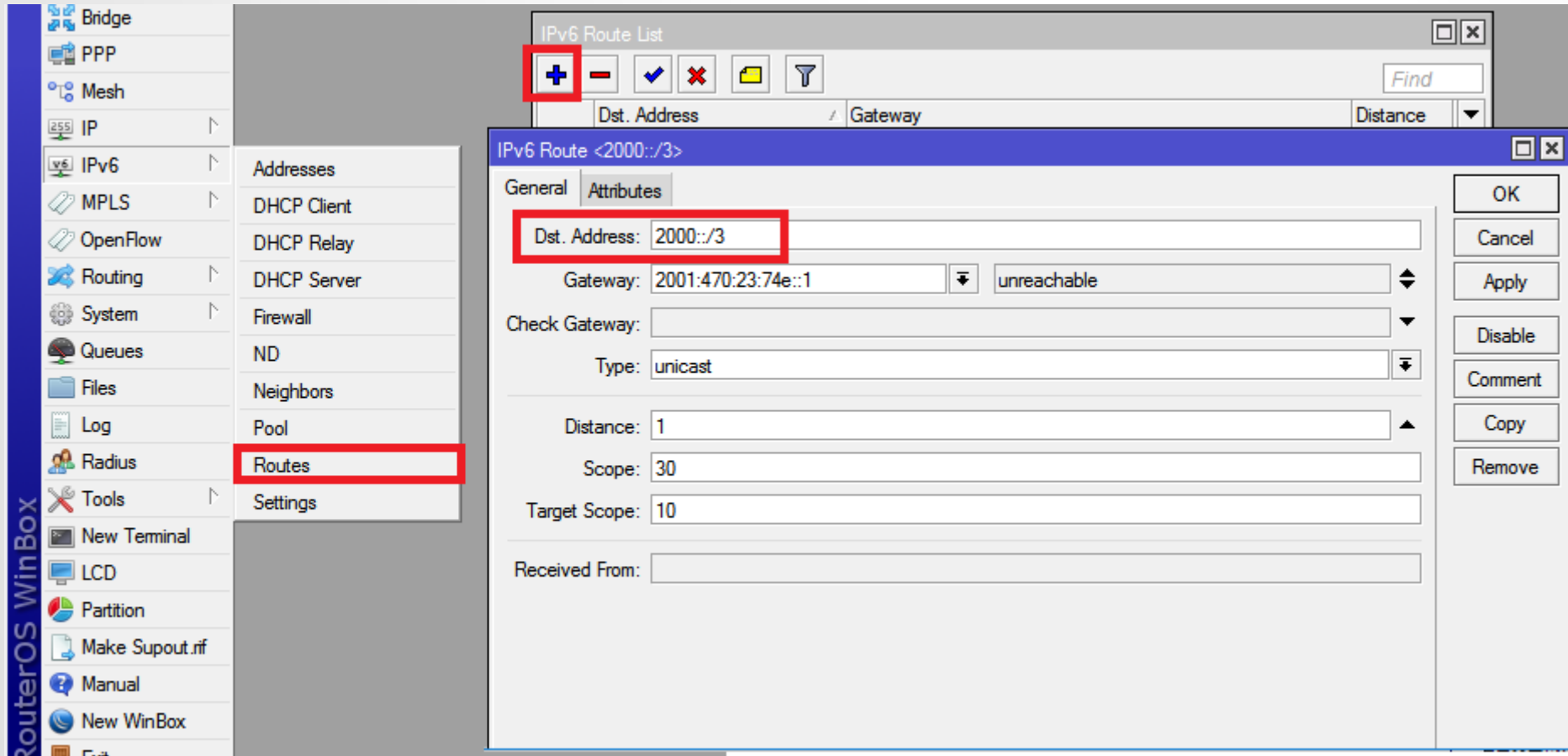
Also you can paste commands in Terminal



Demo-Tunnel broker-Mikrotik side



Demo-Tunnel broker-Mikrotik side



Demo-Tunnel broker-Request More IPv6

Account Menu

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User Functions

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Tunnel Details

IPv6 Tunnel

Example Configurations

Advanced

Tunnel ID: 383573

Creation Date: Jan 16, 2017

Description: Tunnel 6to4 with Artemis

Delete Tunnel

IPv6 Tunnel Endpoints

Server IPv4 Address: 74.82.46.6

Server IPv6 Address: 2001:470:23:74e::1/64

Client IPv4 Address: 93.118.97.163

Client IPv6 Address: 2001:470:23:74e::2/64

Routed IPv6 Prefixes

Routed /64: 2001:470:24:74e::/64

Routed /48: [Assign /48](#)

DNS Resolvers

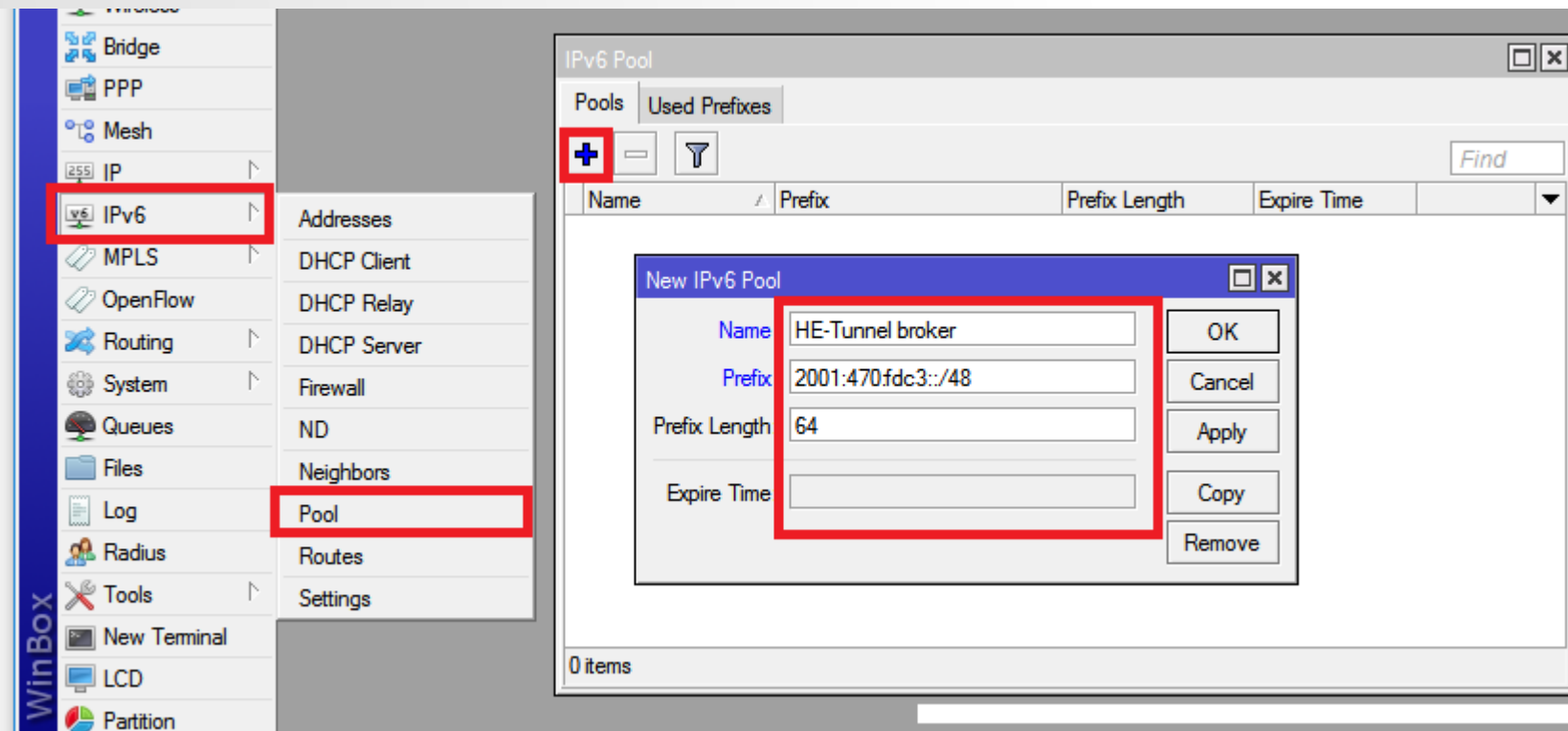
Anycast IPv6 Caching Nameserver: 2001:470:20::2

Anycast IPv4 Caching Nameserver: 74.82.42.42

rDNS Delegations

rDNS Delegated NS1: [Edit](#)

Demo-Tunnel broker-More IPv6 – Mikrotik side



Demo-Tunnel broker-More IPv6 – Mikrotik side

The screenshot displays the Mikrotik WinBox interface. On the left, the 'RouterOS WinBox' sidebar shows the 'IPv6' menu item highlighted in red, with its sub-menu 'Addresses' also highlighted. The main window shows the 'IPv6 Address' list with a '+' button highlighted in red. A 'New IPv6 Address' dialog box is open, with the following fields highlighted in red:

- Address:** `::/64`
- From Pool:** `HE-Tunnel broker`
- Interface:** `sfp1-Cisco-2960`
- ☒ **EUI64**
- ☒ **Advertise**

The dialog box also features buttons for 'OK', 'Cancel', 'Apply', 'Disable', 'Comment', 'Copy', and 'Remove'. At the bottom, the status 'enabled' and 'Global' are visible.

Q/A

Any question ?

