



IPv6 On Mikrotik

Mikrotik **U**ser **M**eeting
Armenia Yerevan
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About Me

Hasan Asghari

Mikrotik

- ✓ Mikrotik Certified Trainer
- ✓ Mikrotik Certified Academy Trainer
- ✓ Mikrotik Consultant

RIPE NCC

- ✓ RIPE NCC IPv6 Trainer

Cisco

- ✓ Cisco Certified Network Associate (CCNA R/S)
- ✓ Cisco Certified Network Professional (CCNP R/S)



Mikrotikuniversity.net



Hasan.Asghari@Hotmail.com



00989027770800
0037495912777



RIPE NCC
TRAINING



Prefix	/48s	/56s	/64s	Bits
/24	16M	4G	1T	104
/25	8M	2G	512G	103
/26	4M	1G	256G	102
/27	2M	512M	128G	101
/28	1M	256M	64G	100
/29	512K	128M	32G	99
/30	256K	64M	16G	98
/31	128K	32M	8G	97
/32	64K	16M	4G	96
/33	32K	8M	2G	95
/34	16K	4M	1G	94
/35	8K	2M	512M	93
/36	4K	1M	256M	92
/37	2K	512K	128M	91
/38	1K	256K	64M	90
/39	512	128K	32M	89
/40	256	64K	16M	88
/41	128	32K	8M	87
/42	64	16K	4M	86
/43	32	8K	2M	85
/44	16	4K	1M	84
/45	8	2K	512K	83
/46	4	1K	256K	82
/47	2	512	128K	81
/48	1	256	64K	80
/49	1	128	32K	79
/50	1	64	16K	78
/51	1	32	8K	77
/52	1	16	4K	76
/53	1	8	2K	75
/54	1	4	1K	74
/55	1	2	512	73
/56	1	1	256	72
/57	1	1	128	71
/58	1	1	64	70
/59	1	1	32	69
/60	1	1	16	68
/61	1	1	8	67
/62	1	1	4	66
/63	1	1	2	65
/64	1	1	1	64

Agenda

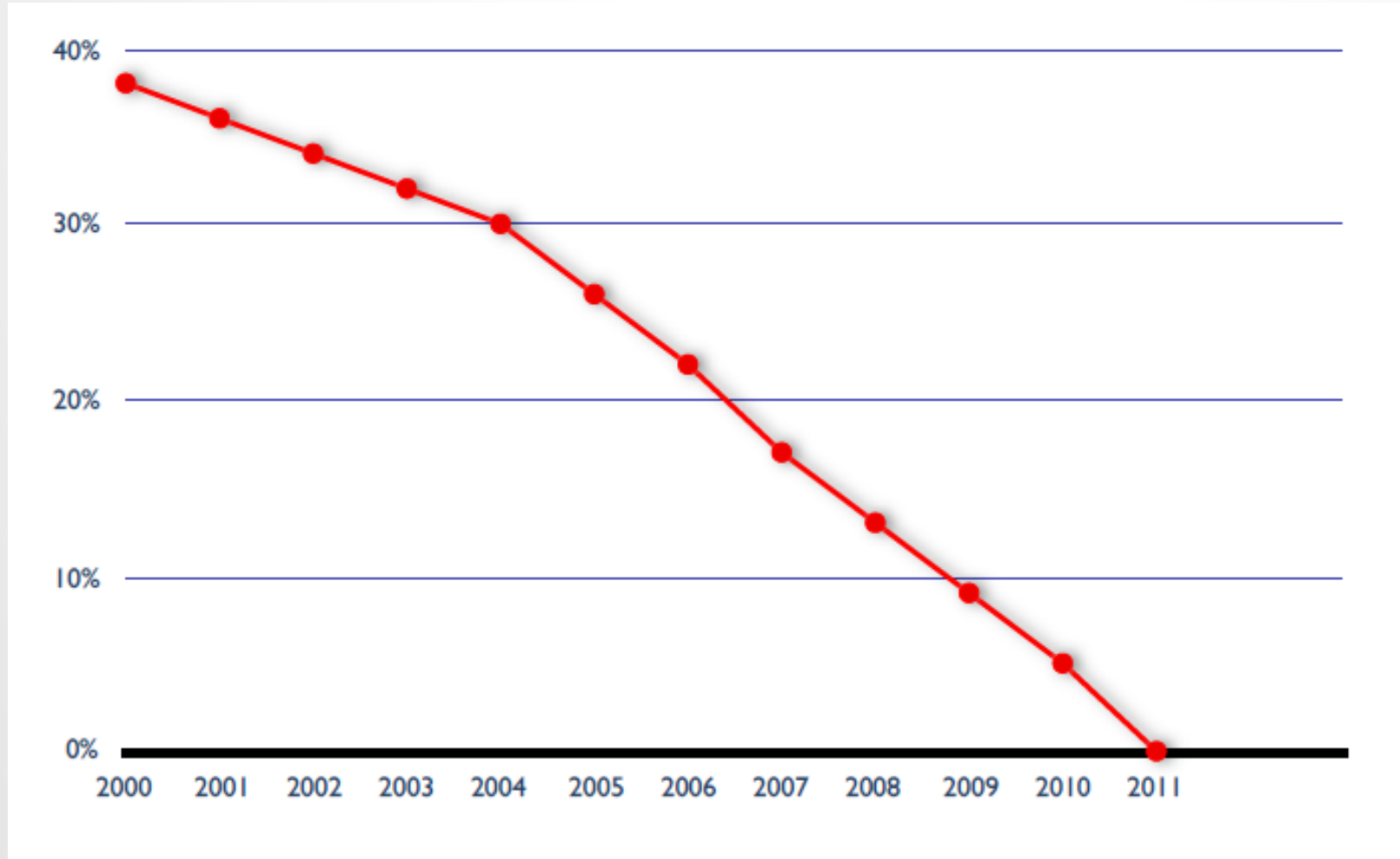
- IPv4?
- IPv6 address Basics
- Getting an IPv6
- Deploying
- Transition mechanisms
- QA
- Demo - IPv6 Address Configuration on ROS
- Demo - Tunnel Broker + Configuration on ROS

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”

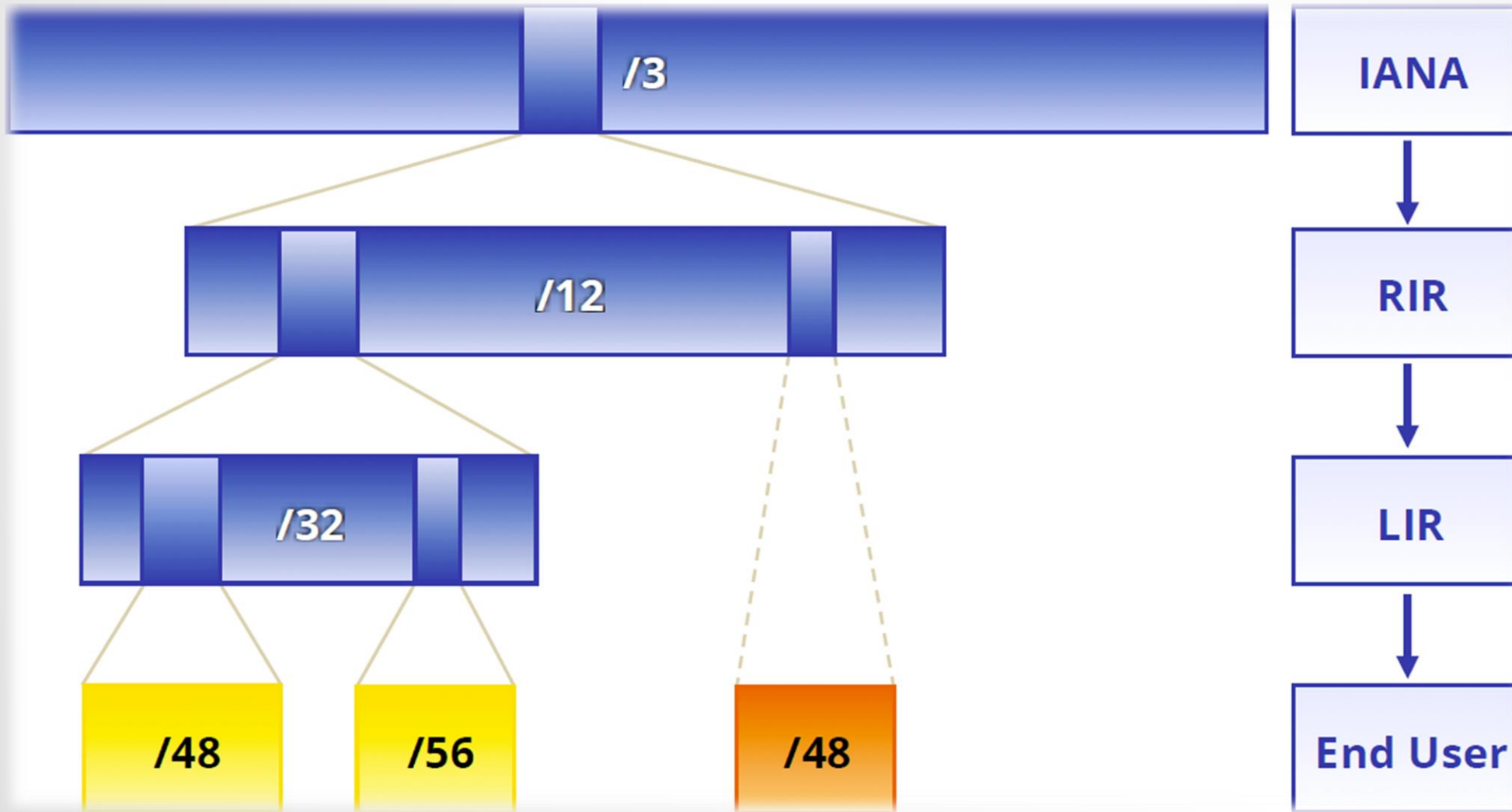


IPv4- Network Address Translation

- 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

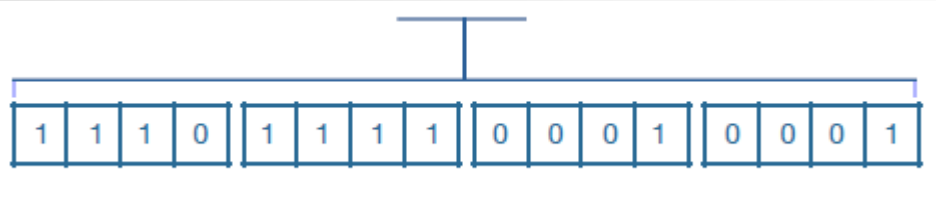
- IPv6 address: 128 bits
 - 32 bits in IPv4
- Every subnet should be a /64
- Customer assignments (sites) between:
 - /64 (1 subnet)
 - /48 (65,536 subnets)
 - Minimum allocation size /32
 - 65,536 /48s
 - 16,777,216 /56s

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 shows the Mikrotik WinBox interface. On the left, the 'System' menu item is highlighted with a red box. Below it, the 'Packages' option is also highlighted with a red box. In the main window, the 'Package List' window is open, showing a table of installed packages. The 'Enable' button is highlighted with a red box. The 'ipv6' package is highlighted with a red box in the table.

Name	Version	Build Time	Sche
routeros-mipsbe	6.37.1	Sep/30/2016 10:28:41	
advanced-t...	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 'Addresses' as the selected option. To the right, the 'IPv6 Address List' window is open, displaying a table of 15 IPv6 addresses. The table has columns for 'Address', 'From Pool', 'Interface', and 'Advertise'. The status of each address is 'DL' (Down). The 'Advertise' column shows 'no' for all entries. The bottom of the window indicates '15 items'.

	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

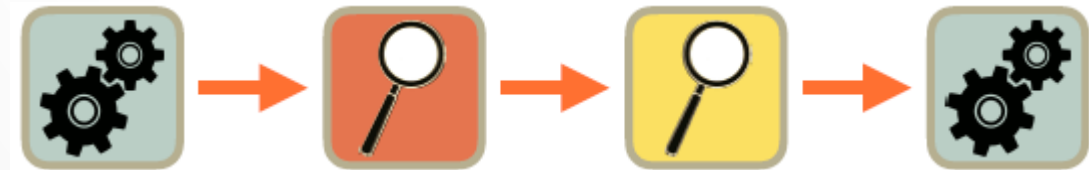
IPv6 Protocol Basics

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>

Account Menu Main Page Account Info Logout	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]	Quick Links Certification Tunnelbroker Free DNS BGP Toolkit Net Tools App Forums FAQ Video Presentations Usage Statistics Tunnel Server Status Network Map Looking Glass (v4/v6) Route Server (telnet) Global IPv6 Report
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Account Menu Main Page Account Info Logout	Tunnel Details IPv6 Tunnel Example Configurations Advanced Mikrotik Copy and paste the following commands into a command window: <pre>/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</pre> <p>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.</p> <p>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.</p>	Quick Links Certification Tunnelbroker Free DNS BGP Toolkit Net Tools App Forums FAQ Video Presentations Usage Statistics Tunnel Server Status Network Map Looking Glass (v4/v6) Route Server (telnet) Global IPv6 Report
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HE.NET
IPv6
Certified
Sage
asghar170

Description
:3::/48 Tunnel 6to4 with Artemis

Services
Transit
Colocation
Dedicated Servers

v4 Exhaustion
IPv4 & IPv6 Statistics



Demo-Tunnel broker-Mikrotik side

The screenshot displays the Mikrotik WinBox interface. On the left, a sidebar menu lists various configuration categories, with 'Routing' expanded to show '6to4 Tunnel' highlighted in red. The main window shows the 'Interface List' table with a '+' button in the top-left corner also highlighted in red. A context menu is open over the 'Interface List', with '6to4 Tunnel' selected and highlighted in red. To the right, the 'Interface <sit1>' configuration window is shown, with the 'Local Address' field set to '93.118.97.163' and the 'Remote Address' field set to '74.82.46.6', both fields highlighted in red. The status bar at the bottom of the configuration window shows 'enabled', 'running', and 'slave'.

Also you can paste commands in Terminal

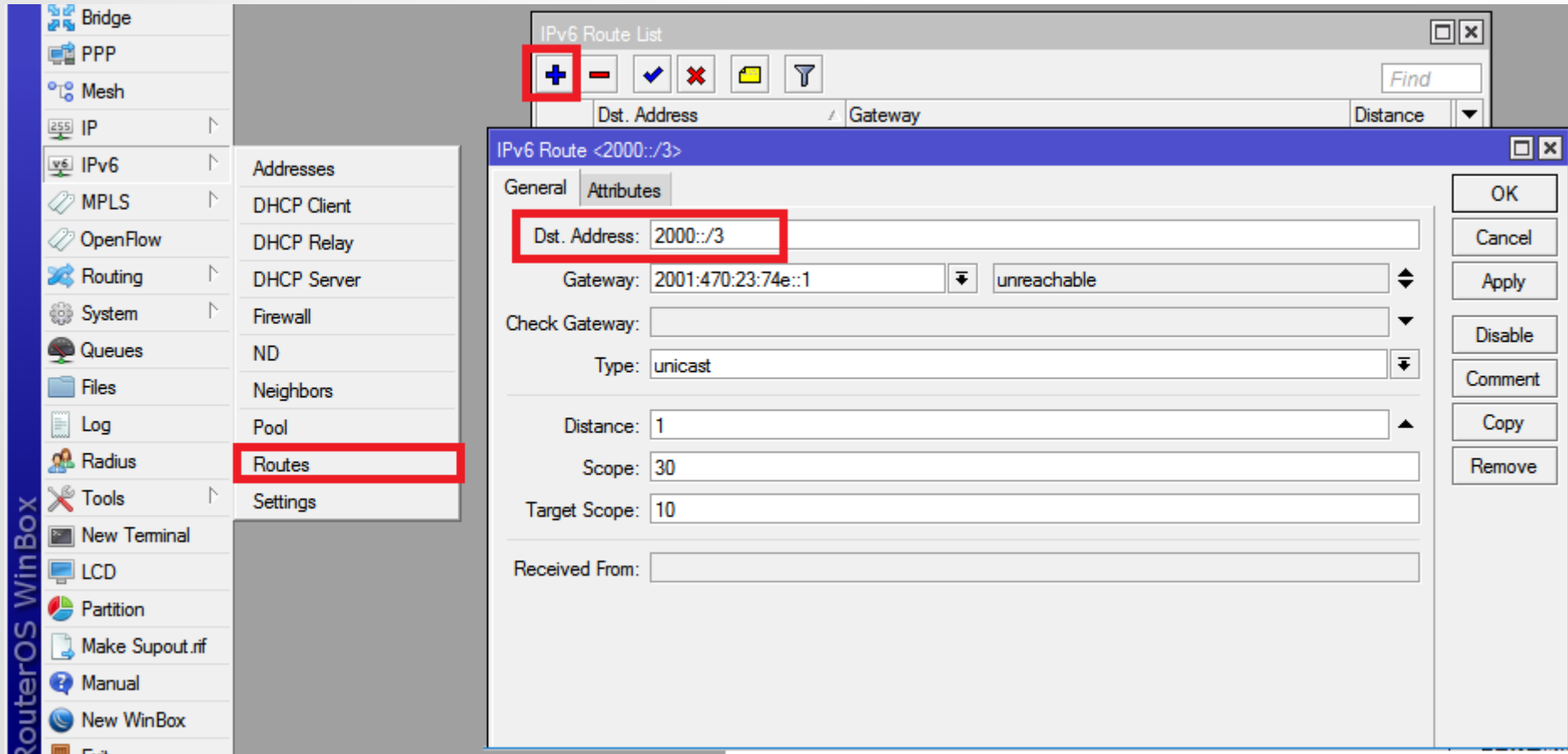


Demo-Tunnel broker-Mikrotik side

The image shows the Mikrotik WinBox interface. On the left, the 'RouterOS WinBox' sidebar is visible with 'IPv6' selected under the 'IP' category, and the 'Addresses' sub-menu is open. The main window displays the 'IPv6 Address List' table with 15 items. A red box highlights the '+' icon in the toolbar. An 'IPv6 Address' configuration dialog is open, showing the address '2001:470:23:74e::2/64' and interface 'sit 1'. The dialog also includes checkboxes for 'EUI64' and 'Advertise', and buttons for 'OK', 'Cancel', 'Apply', 'Enable', 'Comment', 'Copy', and 'Remove'. The status bar at the bottom of the dialog shows 'disabled' and 'Global'.

DL	Address
DL	fe80::5c76:61a3/64
DL	fe80::90:8dff:fe8c:ae6e/
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33
DL	fe80::e68d:8cff:fe2b:33

Demo-Tunnel broker-Mikrotik side



Demo-Tunnel broker-Request More IPv6

Account Menu
Main Page
Account Info
Logout

User Functions
Create Regular Tunnel
Create BGP Tunnel
IPv6 Portscan

Tunnel Details
IPv6 Tunnel | Example Configurations | Advanced

IPv6 Tunnel

Tunnel ID: 383573 Delete Tunnel
Creation Date: Jan 16, 2017
Description: Tunnel 6to4 with Artemis

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 Edit

rDNS Delegated NS1:

Demo-Tunnel broker-More IPv6 – Mikrotik side

The screenshot shows the Mikrotik WinBox interface. On the left, the 'WinBox' sidebar is visible with the 'IPv6' menu item highlighted in red. The 'Pool' option under the IPv6 menu is also highlighted in red. The main window displays the 'IPv6 Pool' configuration screen. The 'Pools' tab is active, and a red box highlights the '+' button used to add a new pool. A 'New IPv6 Pool' dialog box is open, with a red box around its input fields. The dialog contains the following information:

Name	Prefix	Prefix Length	Expire Time
HE-Tunnel broker	2001:470fdc3::/48	64	

Buttons for 'OK', 'Cancel', 'Apply', 'Copy', and 'Remove' are visible on the right side of the dialog. The main window also shows a table with columns for Name, Prefix, Prefix Length, and Expire Time, and a 'Find' search box. The status bar at the bottom indicates '0 items'.

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 expanded to 'Addresses'. The main window shows the 'IPv6 Address' table with a '+' button highlighted. A 'New IPv6 Address' dialog box is open, showing the following configuration:

- Address:
- From Pool:
- Interface:
- EUI64
- Advertise

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

Q/A

Any question ?

