

MikroTik & IPv6

MikroTik & IPv6

Course objectives:

- Overcoming fear of IPv6 networking
- Becoming familiar with IPv6 addresses

- The course provides **basic knowledge of IPv6**
- The course is **NOT** for IPv6 advanced users

Overview

- IPv6 addressing format
- Assigning an IPv6 address to interface
- Static routes
- IPv6 vs IPv4
- Stateless Autoconfiguration, EUI-64
- OSPFv3
- Bonus: IPv6 from DNS records AAAA
- Bonus: link-local addresses

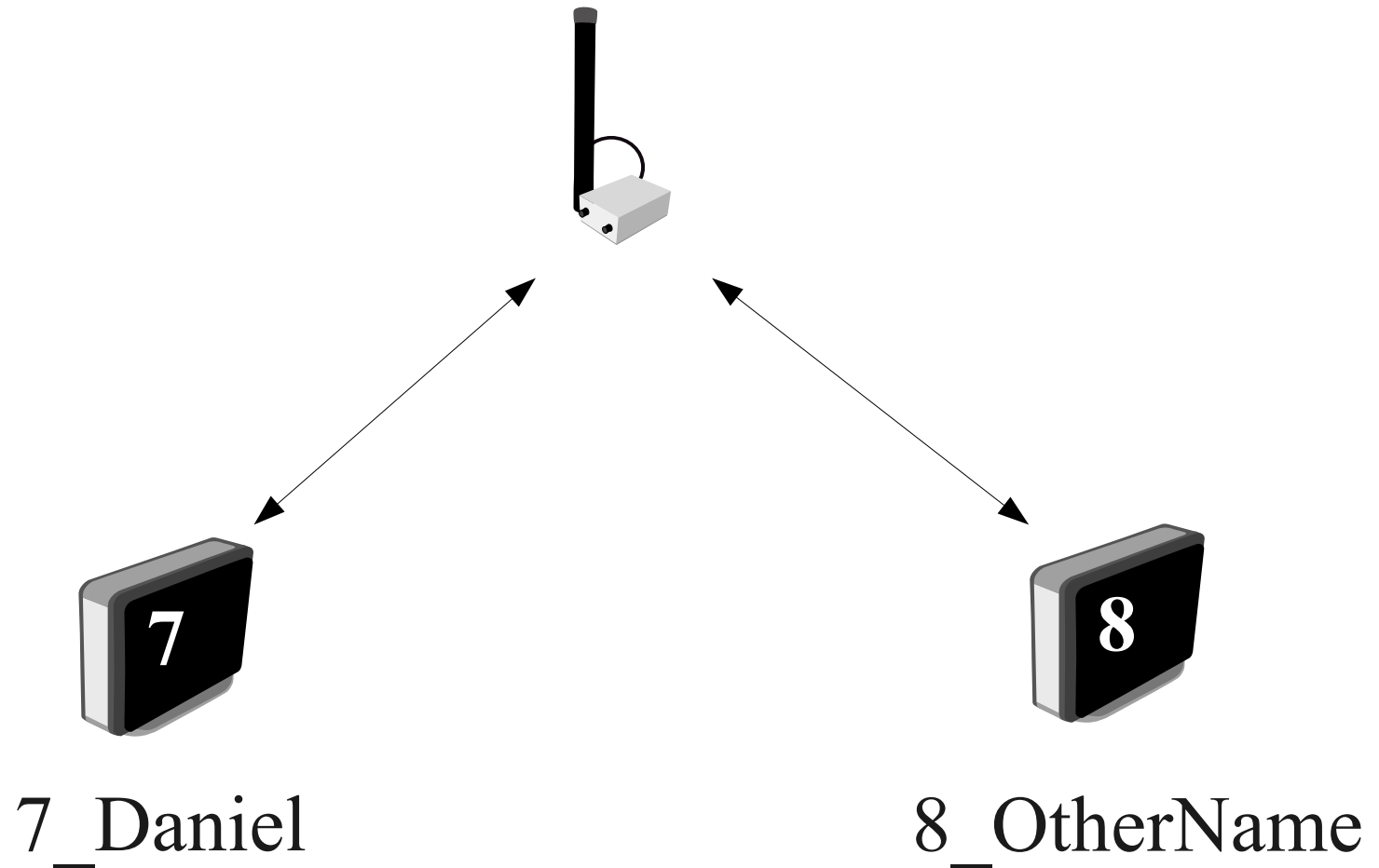
LAB: preparation

- Enable IPv6 package

The screenshot shows the Mikrotik WinBox interface. The 'System' menu is highlighted in the left sidebar, and the 'Packages' option is selected. A 'Package List' window is open, displaying a table of installed packages. The 'ipv6' package is highlighted, and the 'Enable' button is also highlighted. The table contains the following data:

| Name | Version | Build Time | Scheduled |
|-----------------|---------|----------------------|-----------|
| routeros-mipsbe | 4.17 | mar/02/2011 10:58:07 | |
| advanced-... | 4.17 | mar/02/2011 10:54:34 | |
| dhcp | 4.17 | mar/02/2011 10:54:42 | |
| hotspot | 4.17 | mar/02/2011 10:55:06 | |
| X ipv6 | 4.17 | mar/02/2011 10:55:02 | |
| X mpls | 4.17 | mar/02/2011 10:54:56 | |
| ppp | 4.17 | mar/02/2011 10:54:49 | |
| routerboard | 4.17 | mar/02/2011 10:57:03 | |
| routing | 4.17 | mar/02/2011 10:54:51 | |
| security | 4.17 | mar/02/2011 10:54:41 | |
| system | 4.17 | mar/02/2011 10:54:29 | |
| wireless | 4.17 | mar/02/2011 10:55:15 | |
| X wireless-nv2 | 4.17 | mar/02/2011 10:56:53 | |

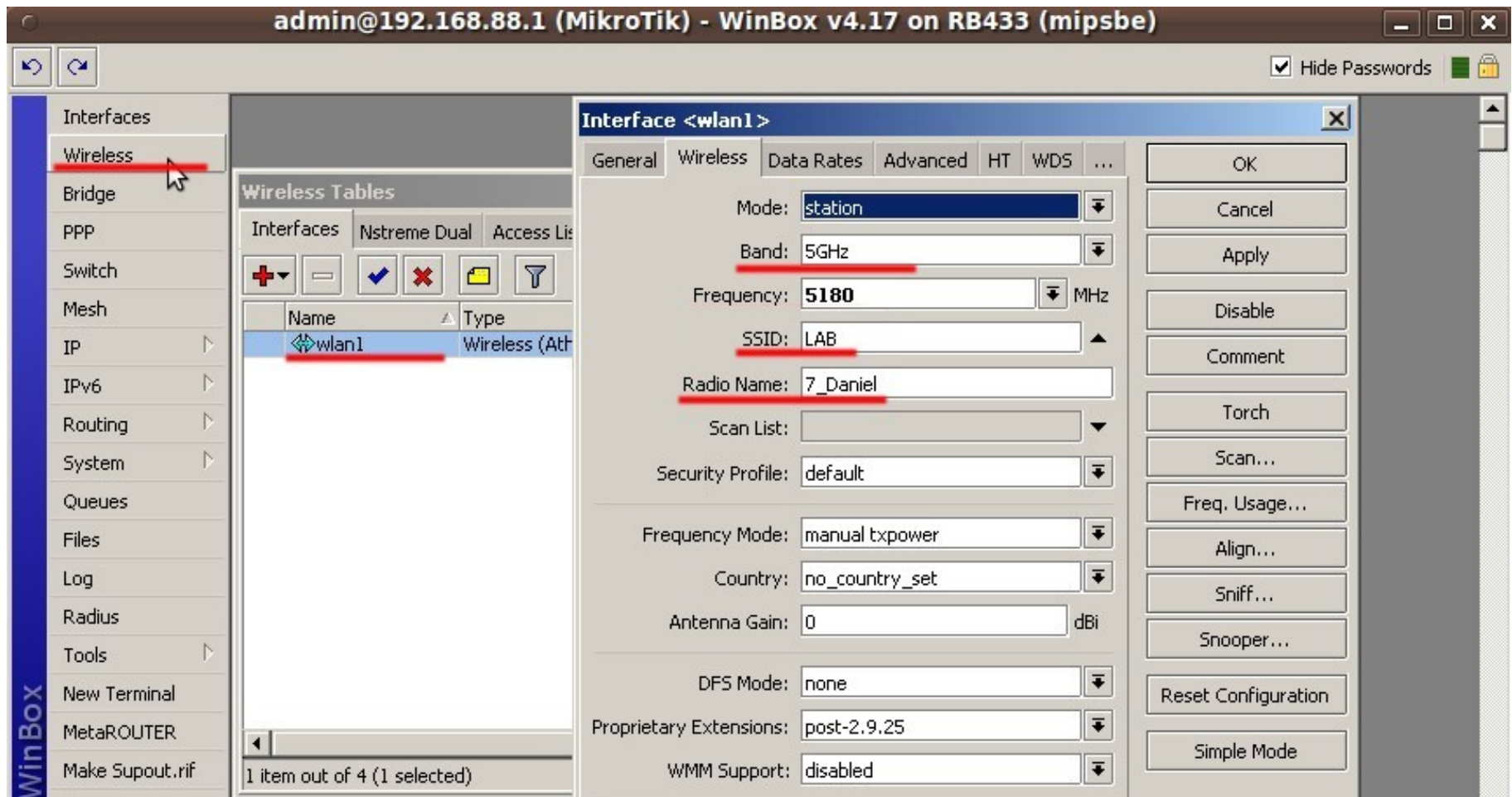
LAB: preparation



LAB: preparation

- Reset router configuration
- Make wireless connection:
- Band: **5GHz**
- SSID: **LAB**
- Radio Name: **X_YourName**
- X – hex number from 1 to F, ex. 7_Daniel

LAB: preparation



- Radio Name: **X_YourName**

IPv6 address format

1122:3344:5566:7788:99aa:bbcc:ddee:ffee

subnet

host

1122:3344:5566:7788:99aa:bbcc:ddee:ffee

1122:3344:5566:7788:0000:0000:0000:0000/64

1122:3344:5566:0000:0000:0000:0000:0000/48

1122:3344:0000:0000:0000:0000:0000:0000/32

1122:0000:0000:0000:0000:0000:0000:0000/16

IPv6 address notation

2001:0468:bb20:0040:0000:0000:0000:01a0

leading 0's:

2001:**0**468:bb20:**00**40:**0000**:**0000**:**0000**:**0**1a0

2001:468:bb20:40:0:0:0:1a0

0's group:

2001:468:bb20:40:**0:0:0**:1a0

2001:468:bb20:40::1a0

IPv6 address notation

2001:0468:bb20:0040:0000:0000:0000:01a0

=

2001:468:bb20:40::1a0

IPv6 example

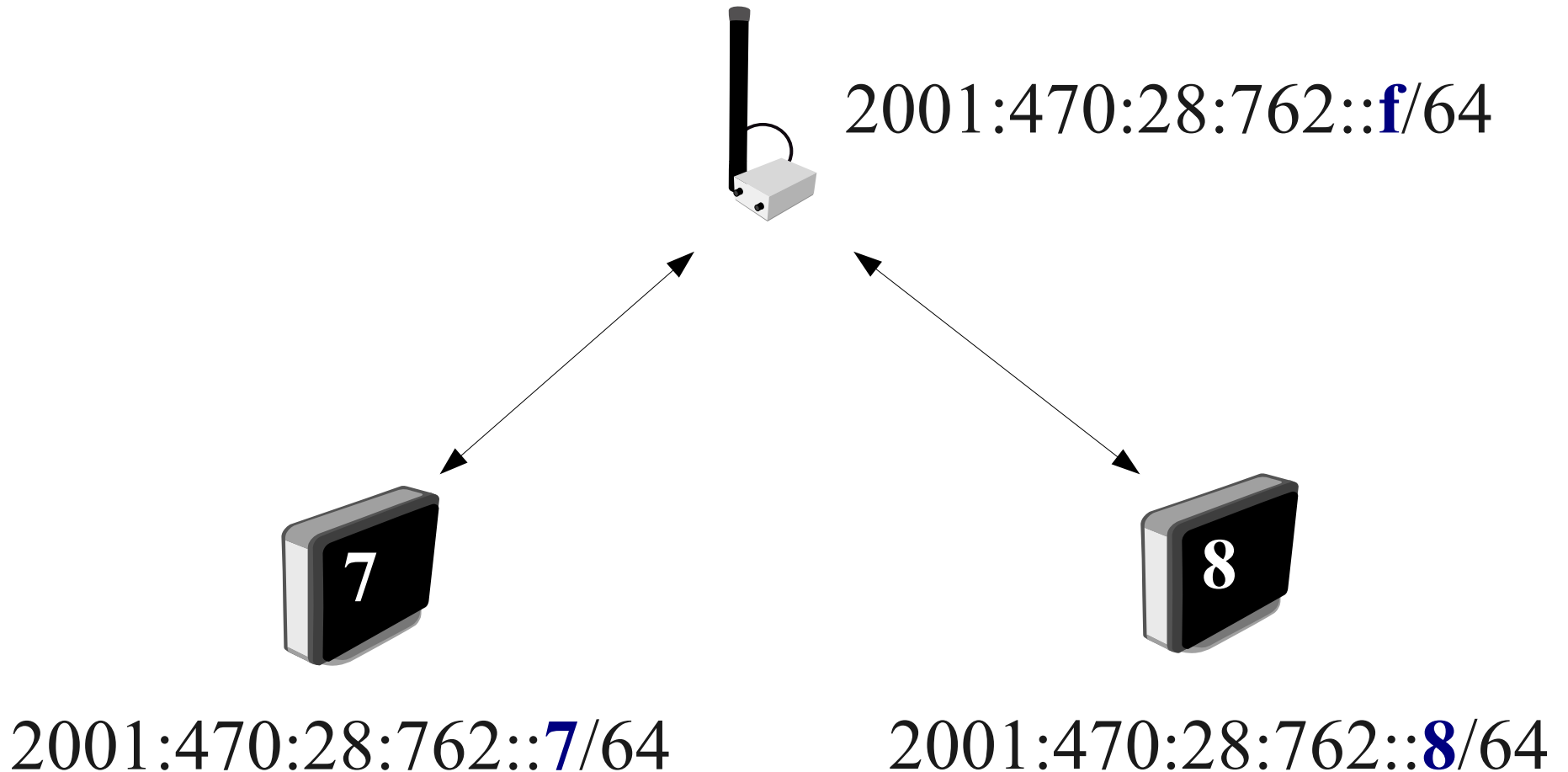
2001:468:0:40::1a0

- good!

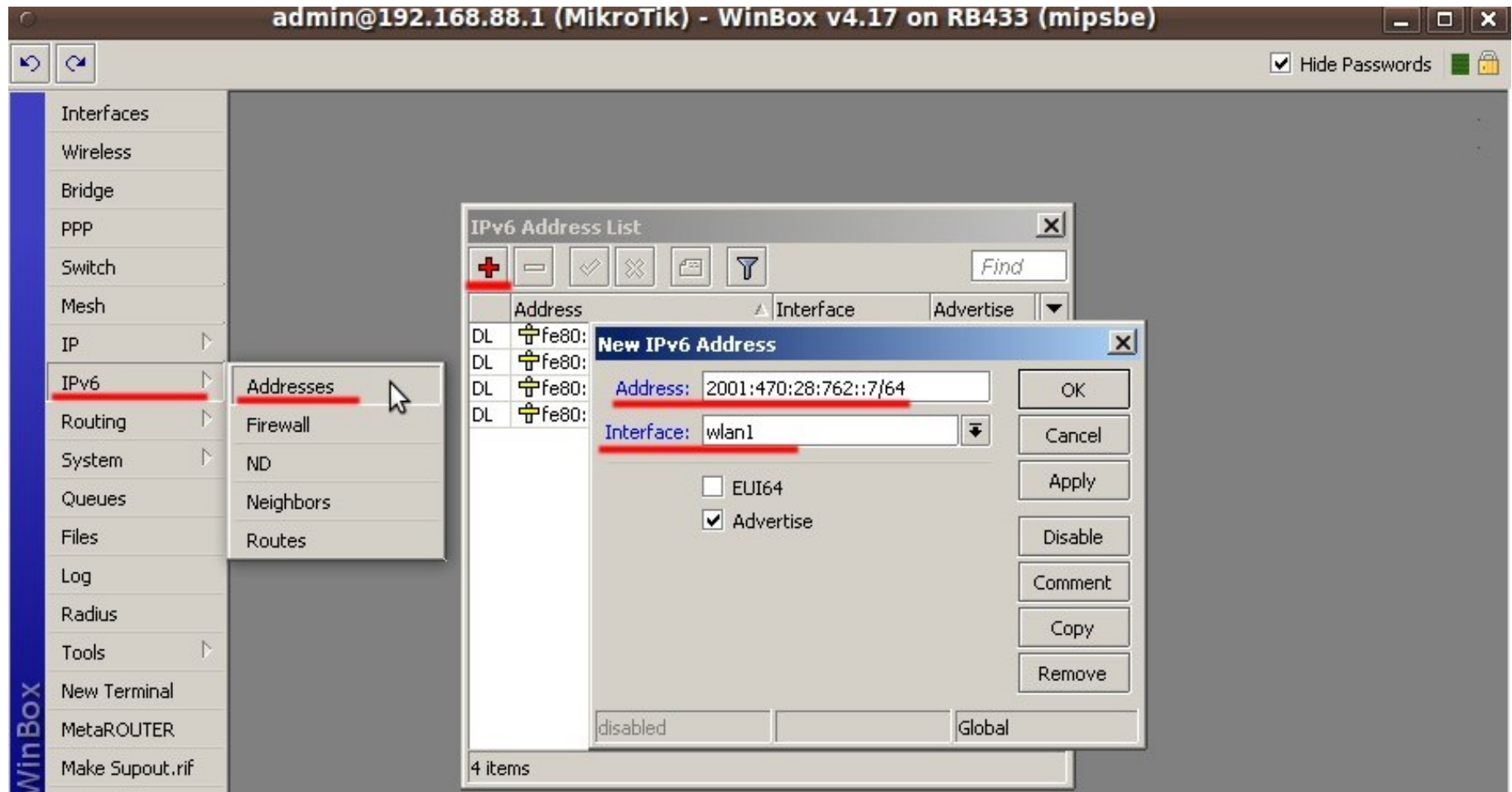
2001:468::40::1a0

- wrong! (why?)

LAB: assigning IPv6 address

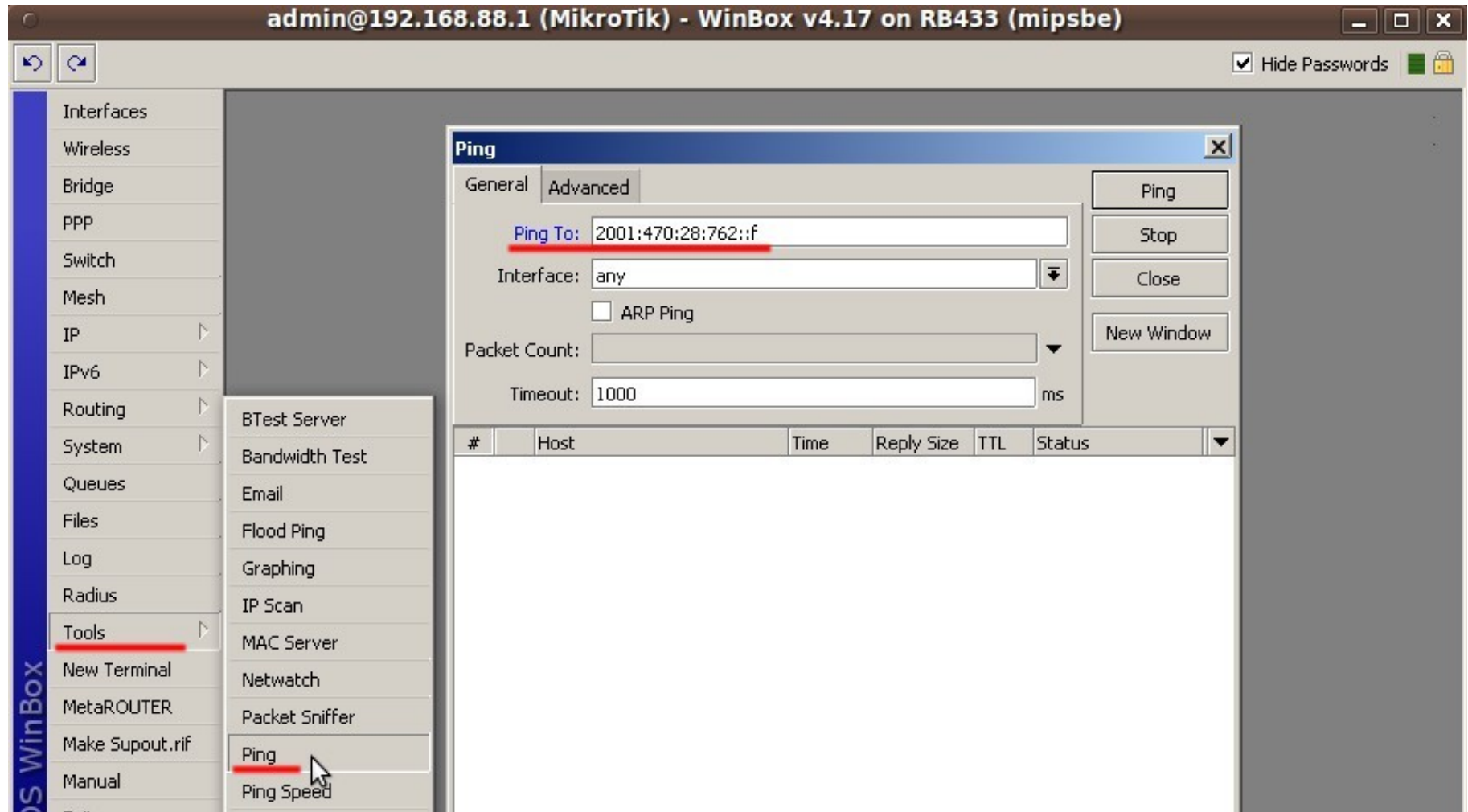


LAB: assigning IPv6 address



- Configure IPv6 address 2001:470:28:762::**N**/64

LAB: checking IPv6 connection



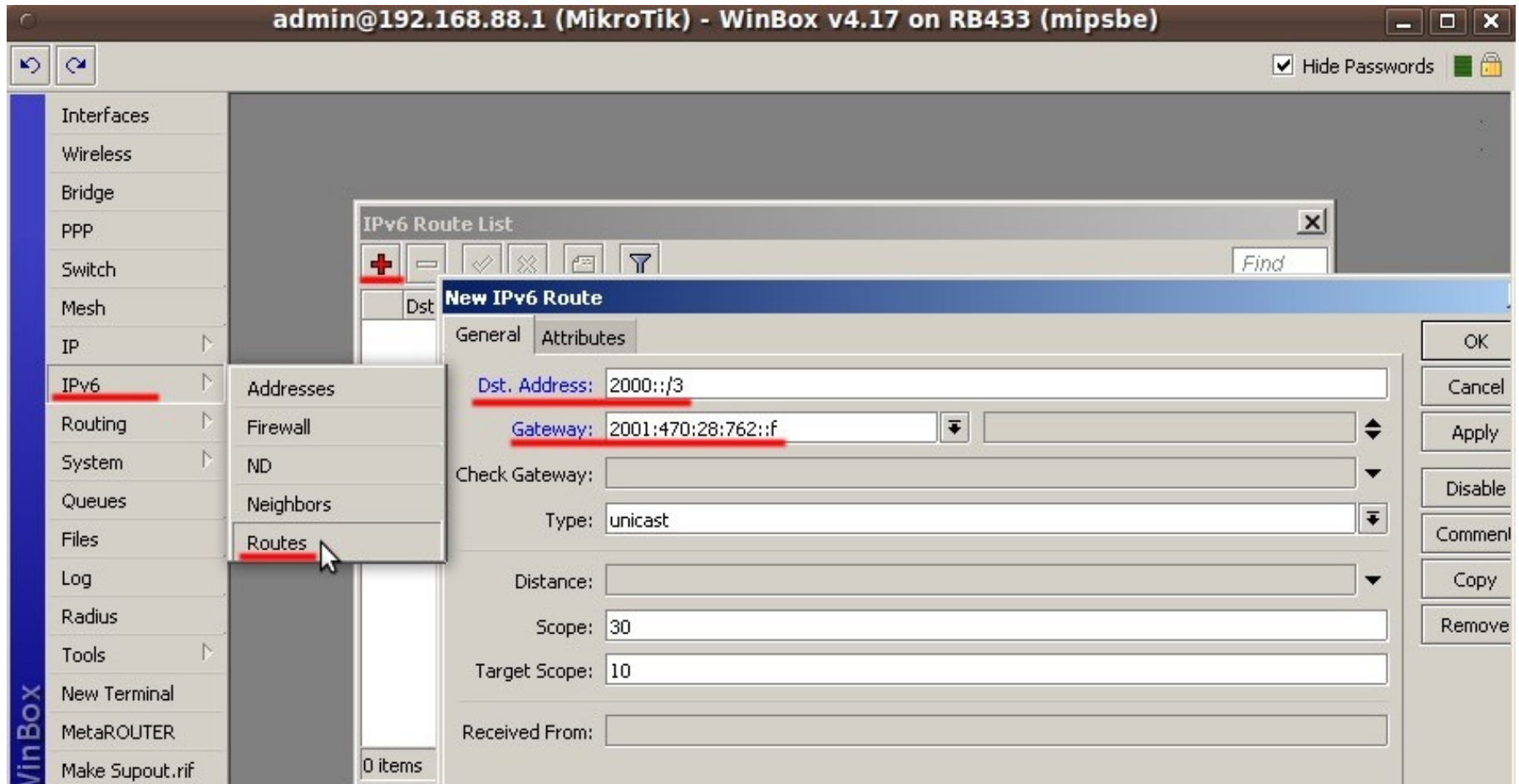
- Ping gateway: **2001:470:28:762::f**

IPv6 ranges

| IPv6 Prefix | Allocation | Reference | Note |
|-------------|----------------------|-----------|-----------|
| 0000::/8 | Reserved by IETF | [RFC4291] | [1][5][6] |
| 0100::/8 | Reserved by IETF | [RFC4291] | |
| 0200::/7 | Reserved by IETF | [RFC4048] | [2] |
| 0400::/6 | Reserved by IETF | [RFC4291] | |
| 0800::/5 | Reserved by IETF | [RFC4291] | |
| 1000::/4 | Reserved by IETF | [RFC4291] | |
| 2000::/3 | Global Unicast | [RFC4291] | [3] |
| 4000::/3 | Reserved by IETF | [RFC4291] | |
| 6000::/3 | Reserved by IETF | [RFC4291] | |
| 8000::/3 | Reserved by IETF | [RFC4291] | |
| A000::/3 | Reserved by IETF | [RFC4291] | |
| C000::/3 | Reserved by IETF | [RFC4291] | |
| E000::/4 | Reserved by IETF | [RFC4291] | |
| F000::/5 | Reserved by IETF | [RFC4291] | |
| F800::/6 | Reserved by IETF | [RFC4291] | |
| FC00::/7 | Unique Local Unicast | [RFC4193] | |
| FE00::/9 | Reserved by IETF | [RFC4291] | |
| FE80::/10 | Link Local Unicast | [RFC4291] | |
| FEC0::/10 | Reserved by IETF | [RFC3879] | [4] |
| FF00::/8 | Multicast | [RFC4291] | |

<http://www.iana.org/assignments/ipv6-address-space/ipv6-address-space.xml>

LAB: adding default route



- Add route to **2000::/3**, gw: **2001:470:28:762::f**

LAB: checking IPv6 route operation

The screenshot shows the Mikrotik WinBox interface. The 'Tools' menu is open, and 'Traceroute' is selected. The Traceroute dialog box is displayed with the following configuration:

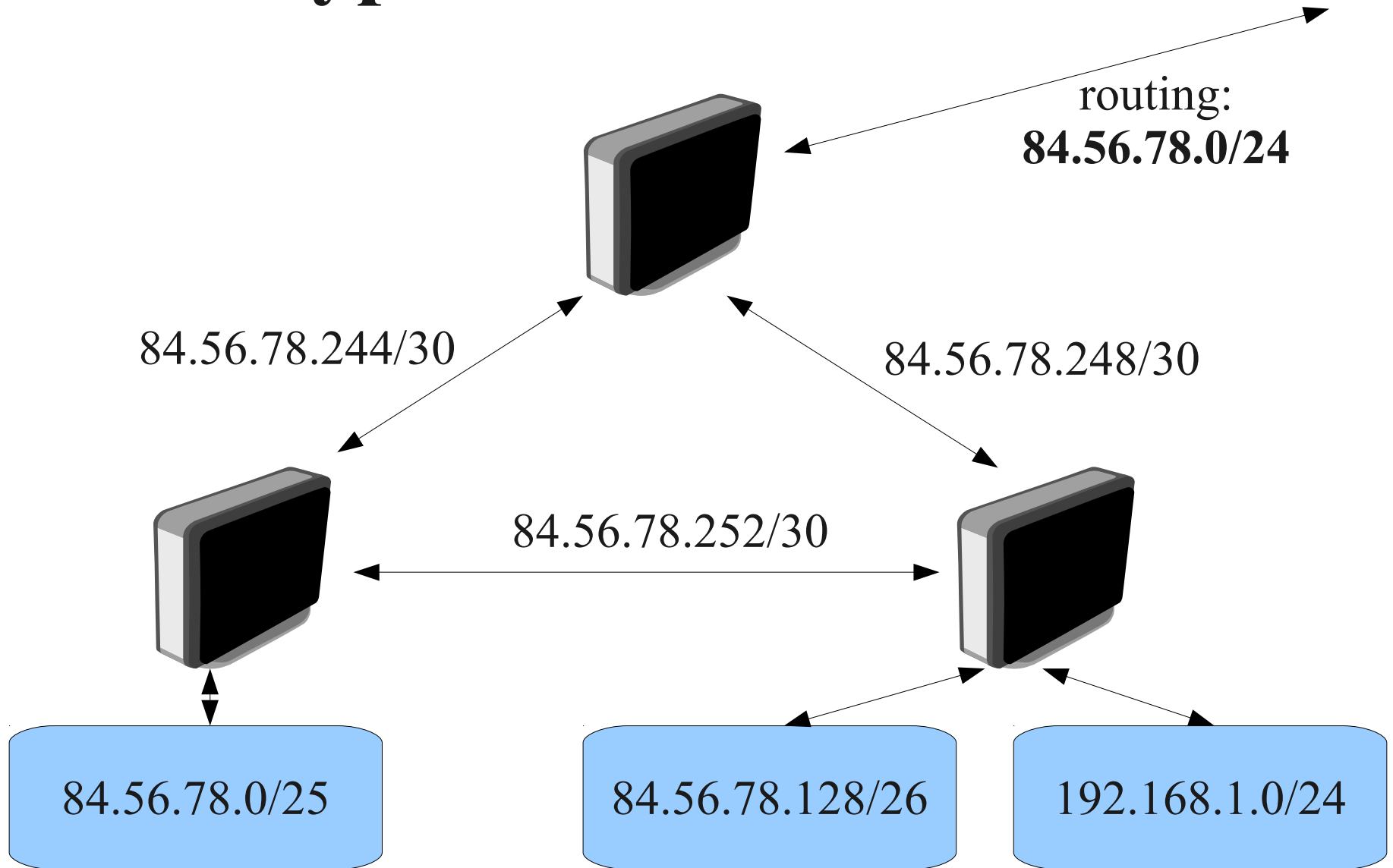
- Traceroute To: 2a00:1450:8003::93
- Packet Size: 56
- Timeout: 1 s
- Protocol: icmp
- Port: 68
- Src. Address: (empty)
- Interface: (empty)
- DSCP: (empty)
- Routing Table: (empty)

The Traceroute results table is as follows:

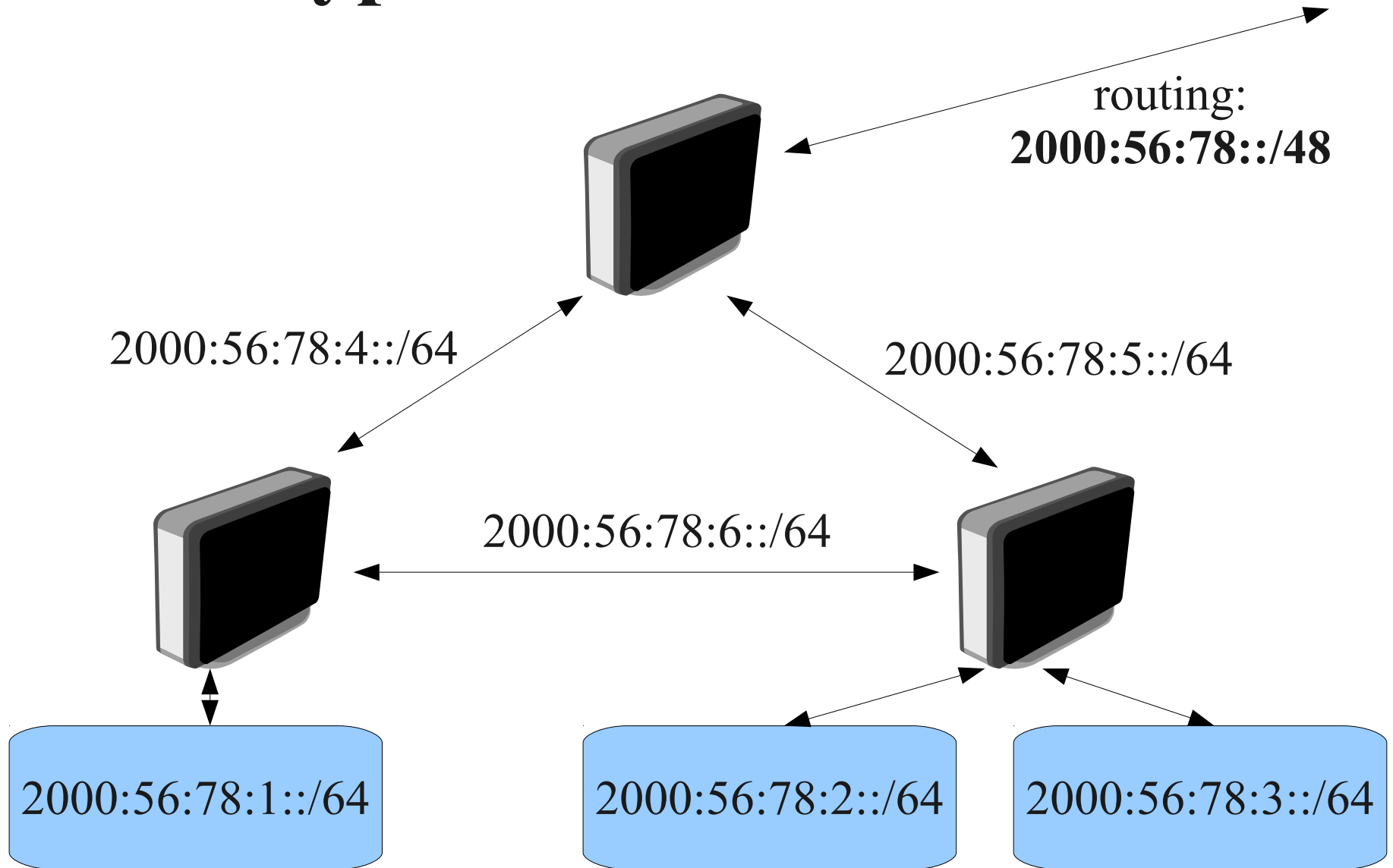
| # | Host | Time 1 | Time 2 | Time 3 |
|---|-----------------------|--------|--------|--------|
| 0 | 2001:470:26:532::f | 4ms | 4ms | 4ms |
| 1 | 2001:470:25:532::1 | 60ms | 64ms | 60ms |
| 2 | 2001:470::11d:0:0:0:1 | 57ms | 59ms | 60ms |
| 3 | 2001:470::10d:0:0:0:1 | 74ms | 64ms | 83ms |
| 4 | 2001:7f8::3b41:0:2 | 67ms | 65ms | 67ms |
| 5 | 2001:4860::1:0:11 | 131ms | 74ms | 85ms |
| 6 | 2001:4860::1:0:4b3 | 72ms | 74ms | 77ms |
| 7 | 2001:4860::2:0:66f | 76ms | 101ms | 80ms |
| 8 | 2001:4860::1:0:0:0:2b | 86ms | 88ms | 90ms |
| 9 | 2a00:1450:8003::93 | 78ms | 79ms | 84ms |

- Ping 2a00:1450:8003::93 - ipv6.google.com

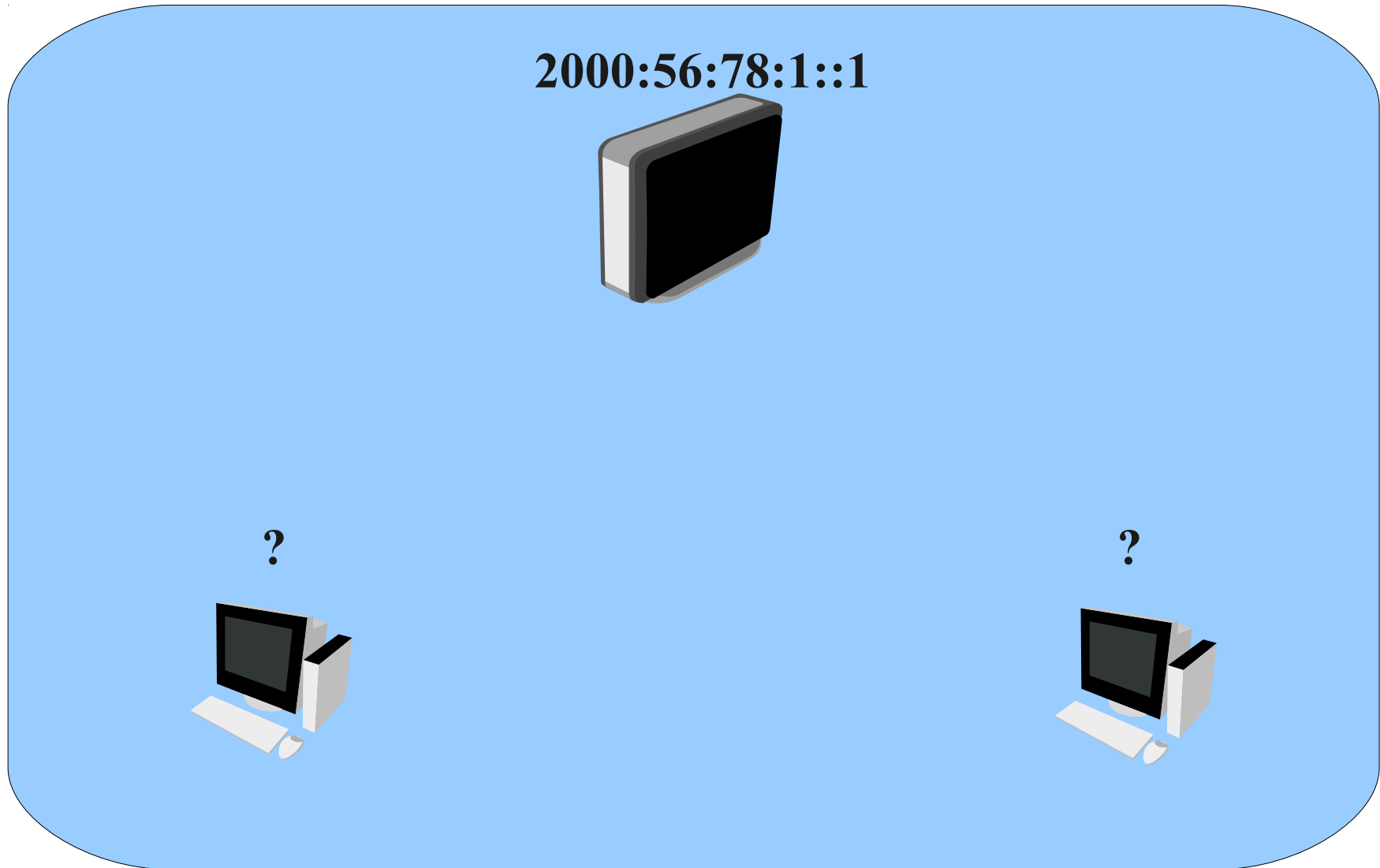
Typical IPv4 network



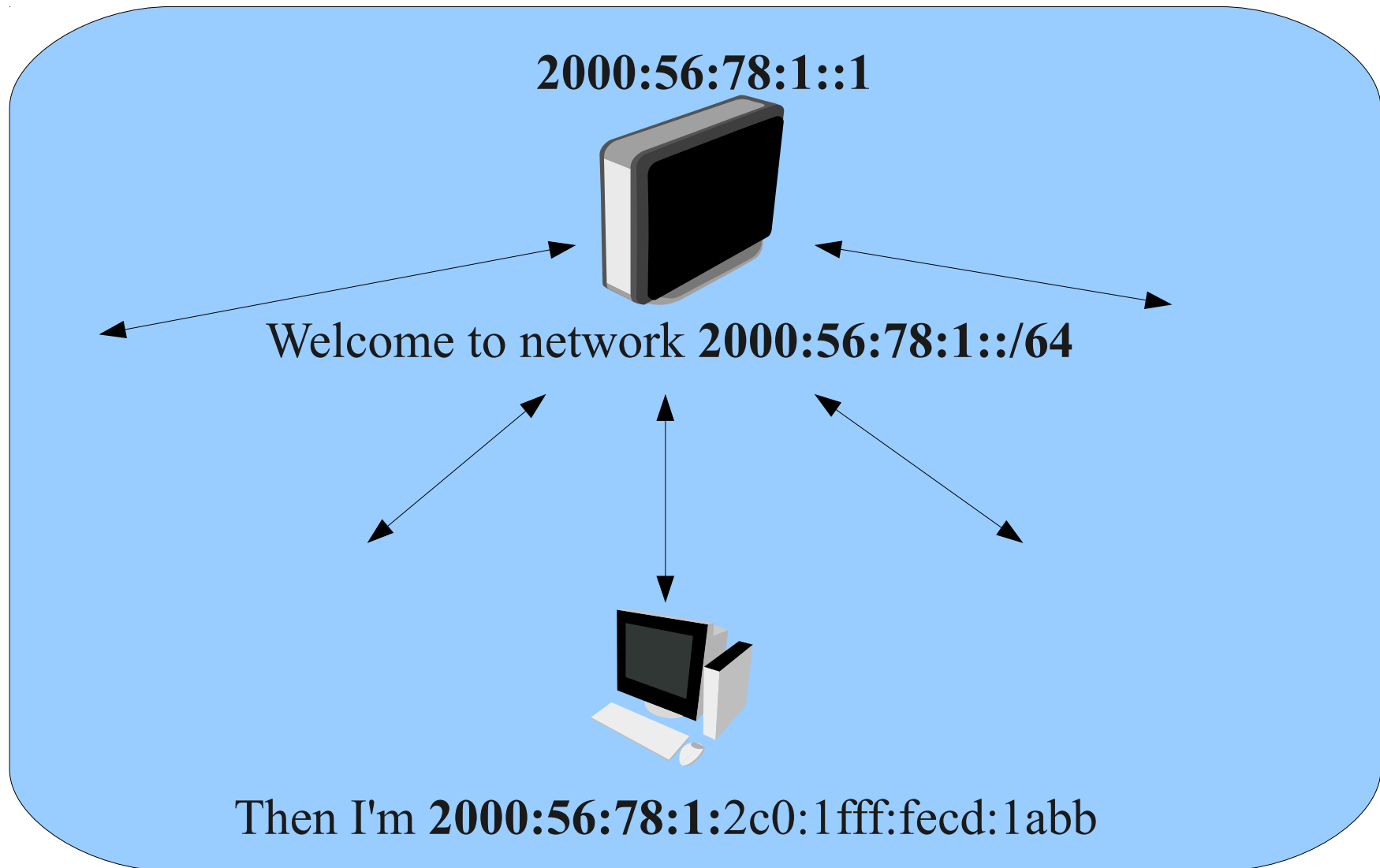
Typical IPv6 network



Stateless Autoconfiguration



Stateless Autoconfiguration



Stateless Autoconfiguration

Subnet:

2000:56:78:1::/64

Router:

2000:56:78:1::1/64

Host:

2000:56:78:1:2c0:1fff:fece:1abb

(and fe80::2c0:1fff:fece:1abb)

EUI-64

Extended Unique Identifier

MAC:

00:c0:1f:cd:1a:bb

EUI-64:

02c0:1ff:fecd**:1abb**

(changed 7th bit)

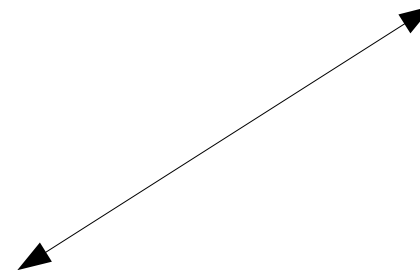
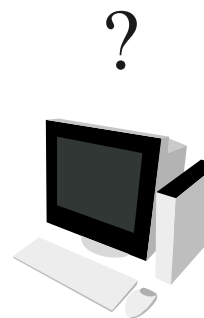
LAB: advanced setup

2001:470:28:762::**f**/64

2001:470:28:762::**7**/64



2001:470:de32:**7**::1/64



LAB: advanced setup

- Assign IPv6 address to ether1:
2001:470:de32:N::1/64
- Enable IPv6 on your computer's ethernet interface
- Check your IPv6 address (ipconfig / ifconfig)

LAB: dynamic routing

Why did the IP packed die in the network??

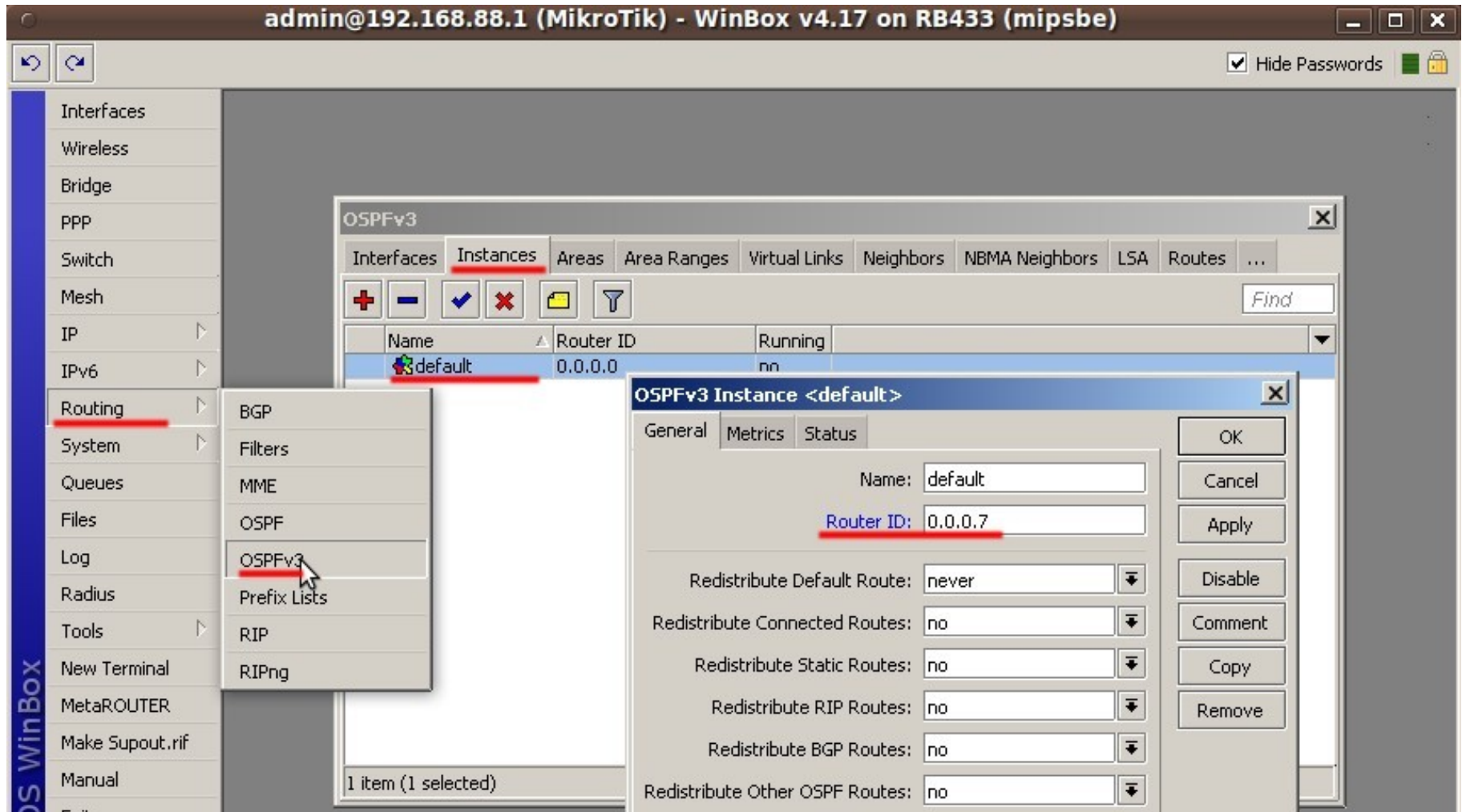
LAB: dynamic routing

Why did the IP packed die in the network??

Because there was RIP...

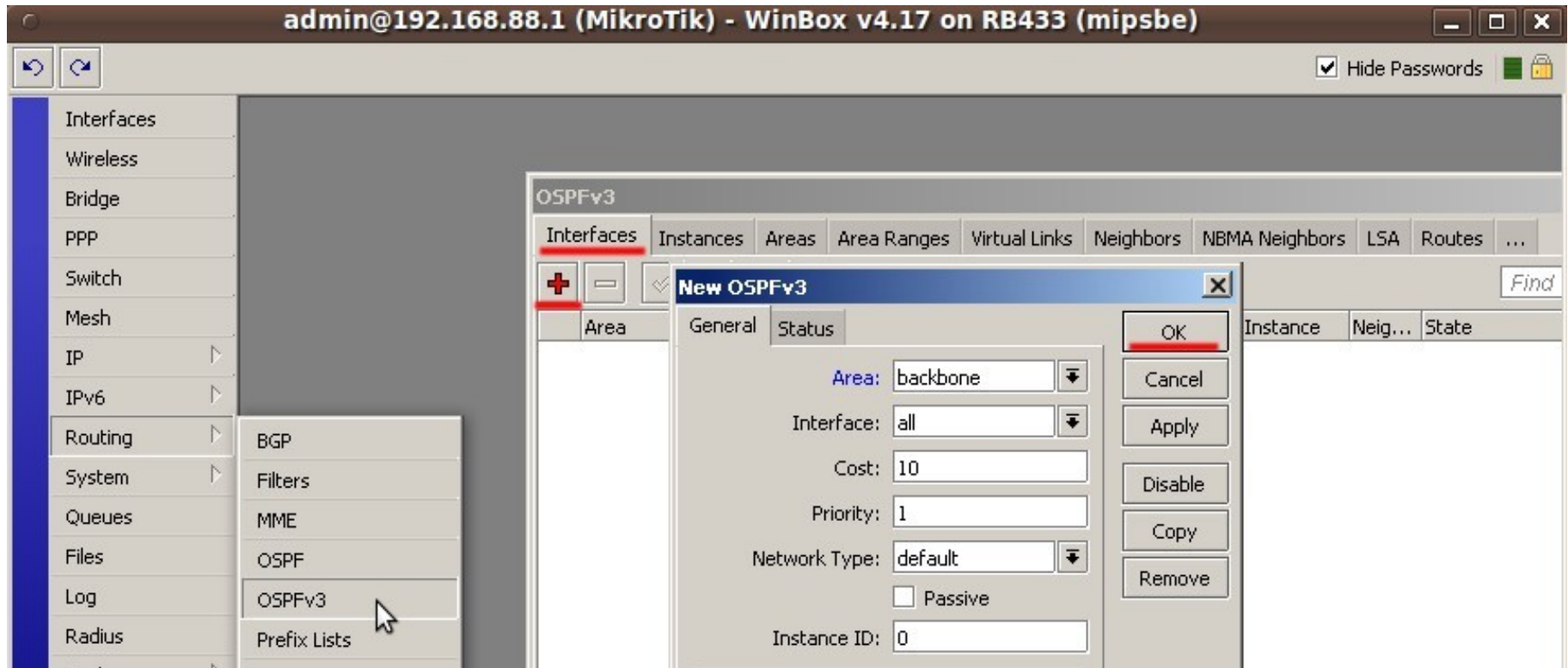


LAB: OSPFv3



- Set Router ID to: **0.0.0.N** (N is decimal here)

LAB: OSPFv3



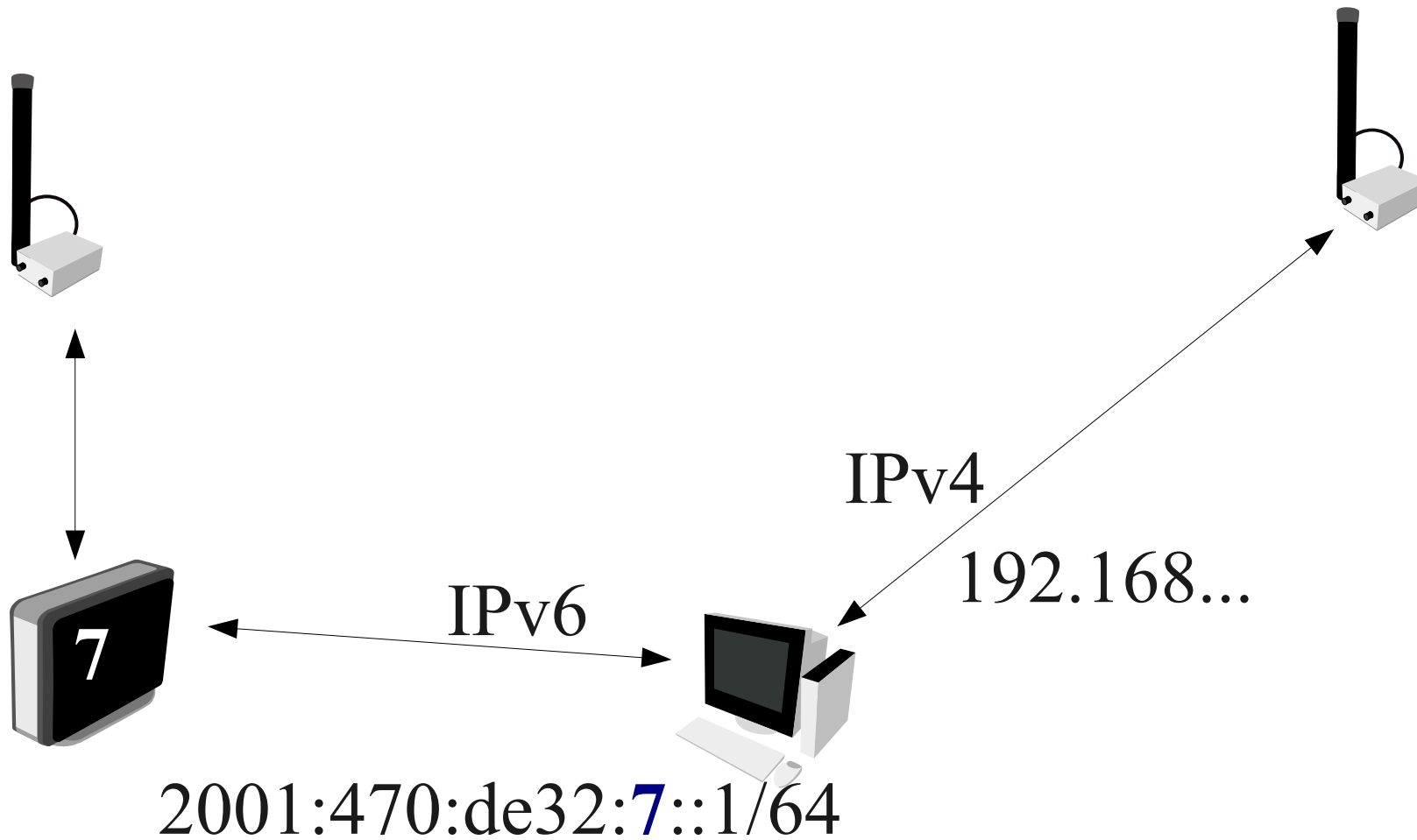
- Enable OSPFv3 on all interfaces

LAB: IPv6 internet connection

- Check your IPv6 internet connection:

<http://whatismyipv6.net>

LAB: advanced setup

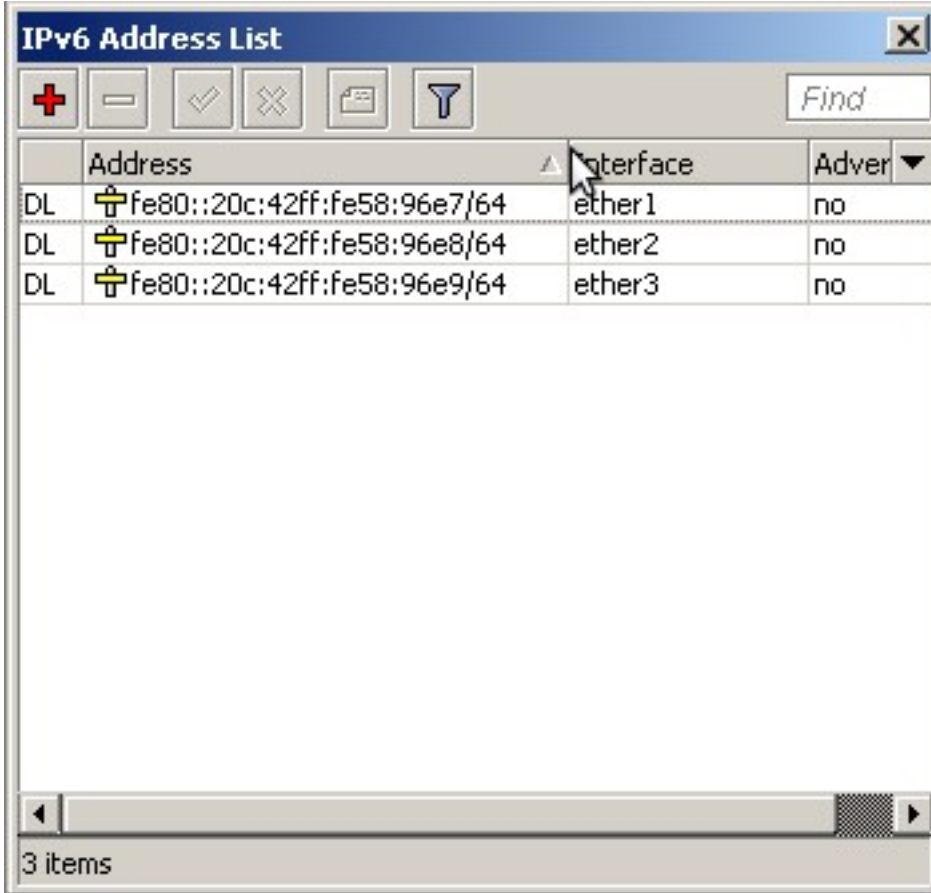


Bonus: IPv6 from DNS

- `nslookup mikrotik.com`
- `nslookup -type=AAAA mikrotik.com`
- `nslookup ipv6.google.com`
- `nslookup -type=AAAA ipv6.google.com`
- `nslookup microsoft.com`
- `nslookup -type=AAAA microsoft.com`
- DNS can resolve IPv6 names!
- but... usually can only use IPv4 to operate (UDP 53)

Bonus: link-local addresses

- The link-local addresses can be used to communicate!



The screenshot shows a window titled "IPv6 Address List" with a toolbar containing icons for adding, deleting, checking, unchecking, refreshing, and filtering, along with a "Find" search box. The main area displays a table with three rows of link-local addresses. Each row has a "DL" status, a plus icon, and a cross icon. The status bar at the bottom indicates "3 items".

| | Address | Interface | Adver |
|----|-----------------------------|-----------|-------|
| DL | fe80::20c:42ff:fe58:96e7/64 | ether1 | no |
| DL | fe80::20c:42ff:fe58:96e8/64 | ether2 | no |
| DL | fe80::20c:42ff:fe58:96e9/64 | ether3 | no |

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- OSPFv3
- Bonus: IPv6 from DNS records AAAA
- Bonus: link-local addresses

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Questions?

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Thank you!