

MikroTik lifehacking

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About me

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- MikroTik user since 2008
- MikroTik trainer since 2011
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What is lifehacking

MikroTik lifehacking
≠
MikroTik live hacking

Disclaimer: No RouterBOARDS were harmed in the making of this presentation

OK, so what lifehacking is?



Source: <http://www.hometheatrequipment.com/general-discussion-10/lifehacking-5772/>

Really, what is lifehacking about?



source: <http://wonderfulengineering.com/100-clever-life-improving-ideas-that-you-can-use-in-everyday-life/>

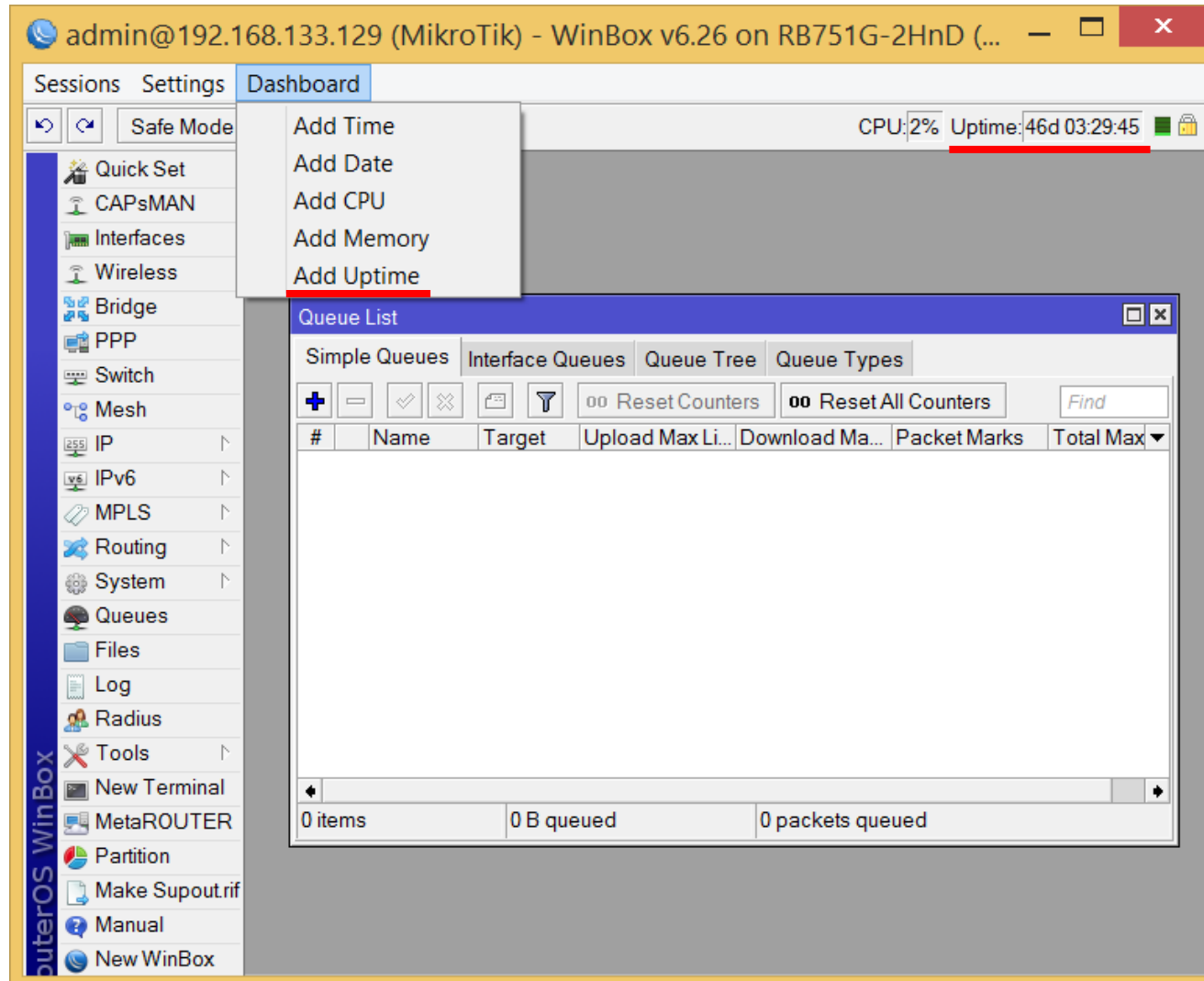
MikroTik lifehacking – why, for whom?

- The presentation target is to INSPIRE, not to teach 😊
- Some examples of my private MikroTik lifehacks, which – after I started using – made my life easier
- You may be using some of them already

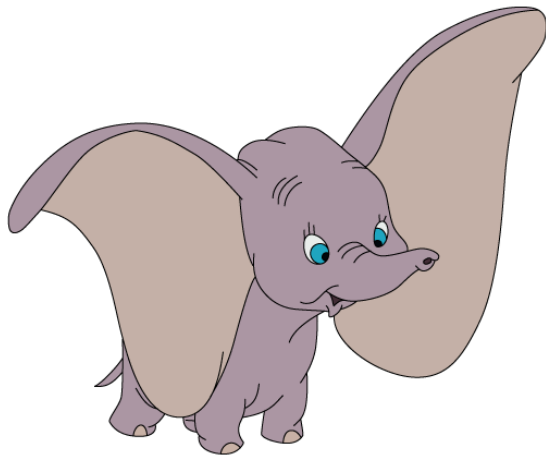
Problem example – **WinBox** connection frozen

- Sometimes, when loosing connectivity to MikroTik router, WinBox disconnects after time (~20 seconds)
- Before the time – **no sign** of connectivity problems
- Empty lists of items (IP addresses, etc.) in WinBox can be caused by temporary connection loss
- **SOLUTION:** always keep **uptime** shown in WinBox window! 😊

Problem example – WinBox connection frozen



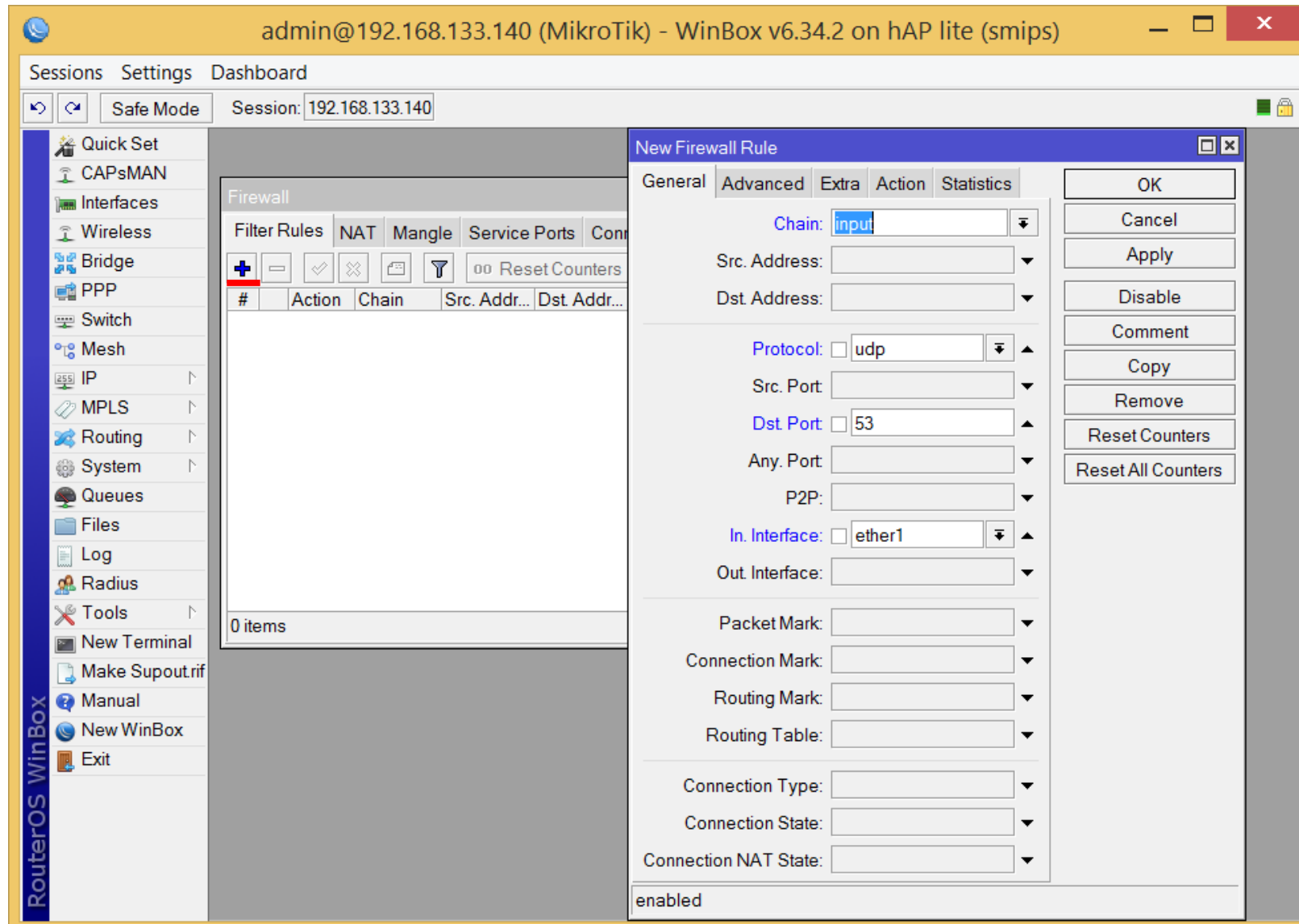
And now for something
completely different



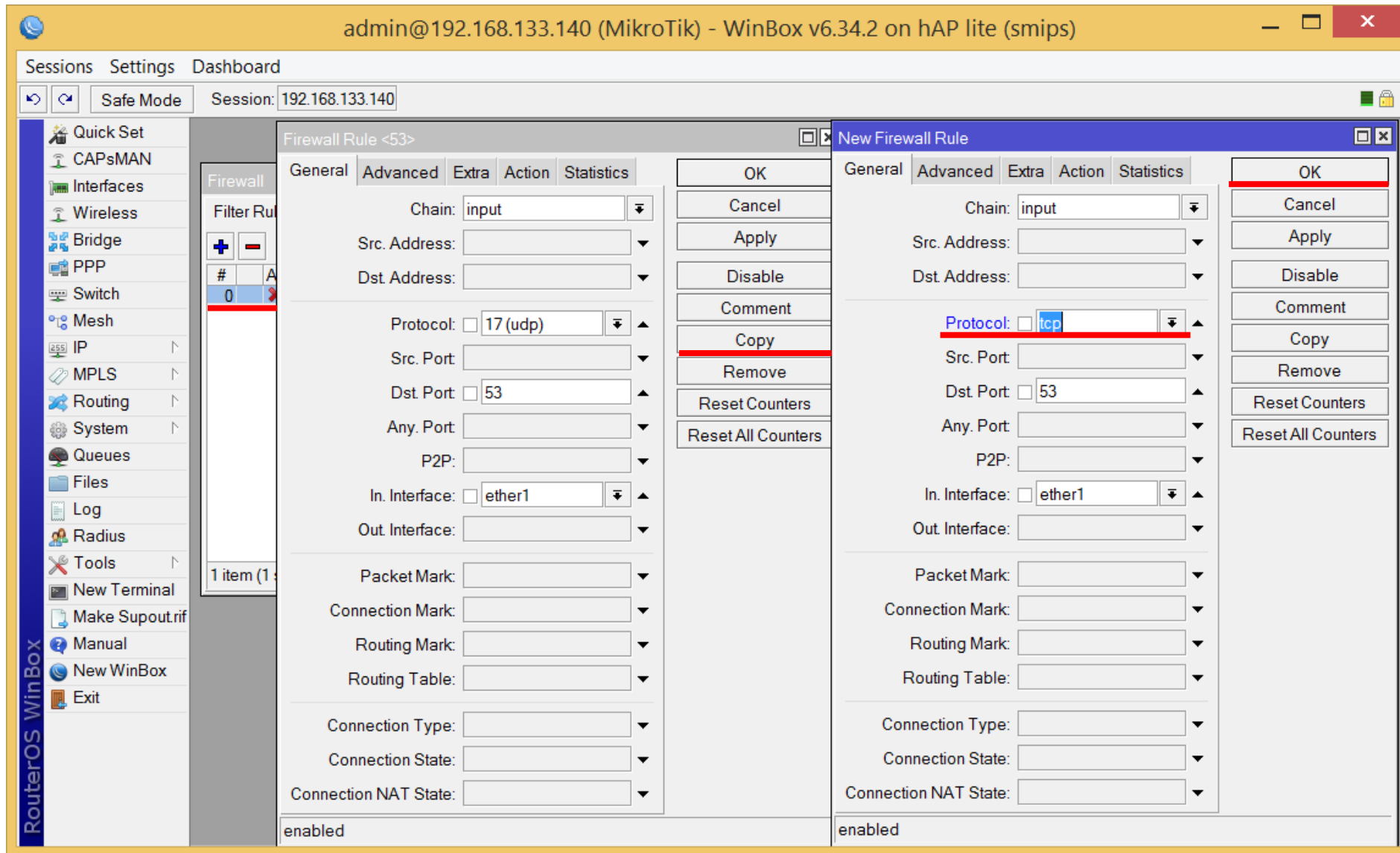
Copy – not a “hack”, but often forgotten

- WinBox has a “**Copy**” button, that speeds things up!
- Example – create rules blocking DNS connection from not trusted addresses
- Chain=input, protocol=udp, port=53, src-address-list, action...
- I said “rules”, DNS can also use TCP...
- How will you do this one? Add new one, or copy the existing? 😊

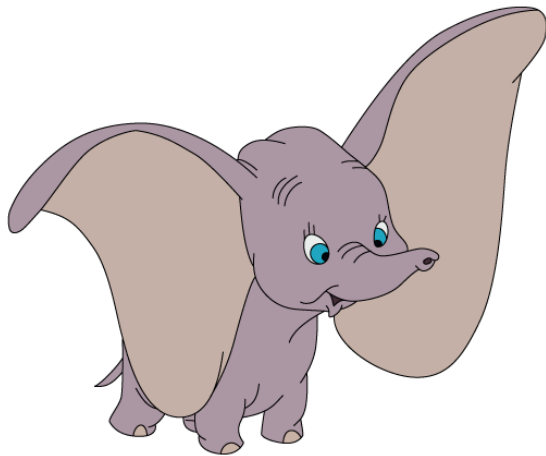
Copy – not a “hack”, but often forgotten



Copy – not a “hack”, but often forgotten



And now for something
completely different



Learn how to use CLI, it's not difficult!

- CLI can often speed things up – learn, how to use it 😊
- It's not difficult – just configure something in WinBox, then go to New Terminal and see, how it was configured
- Find the right section in terminal
- Use **print** to see, what is configured there
- Use **export** to see, how it is configured
- Use **<TAB>** and **?** to see available options

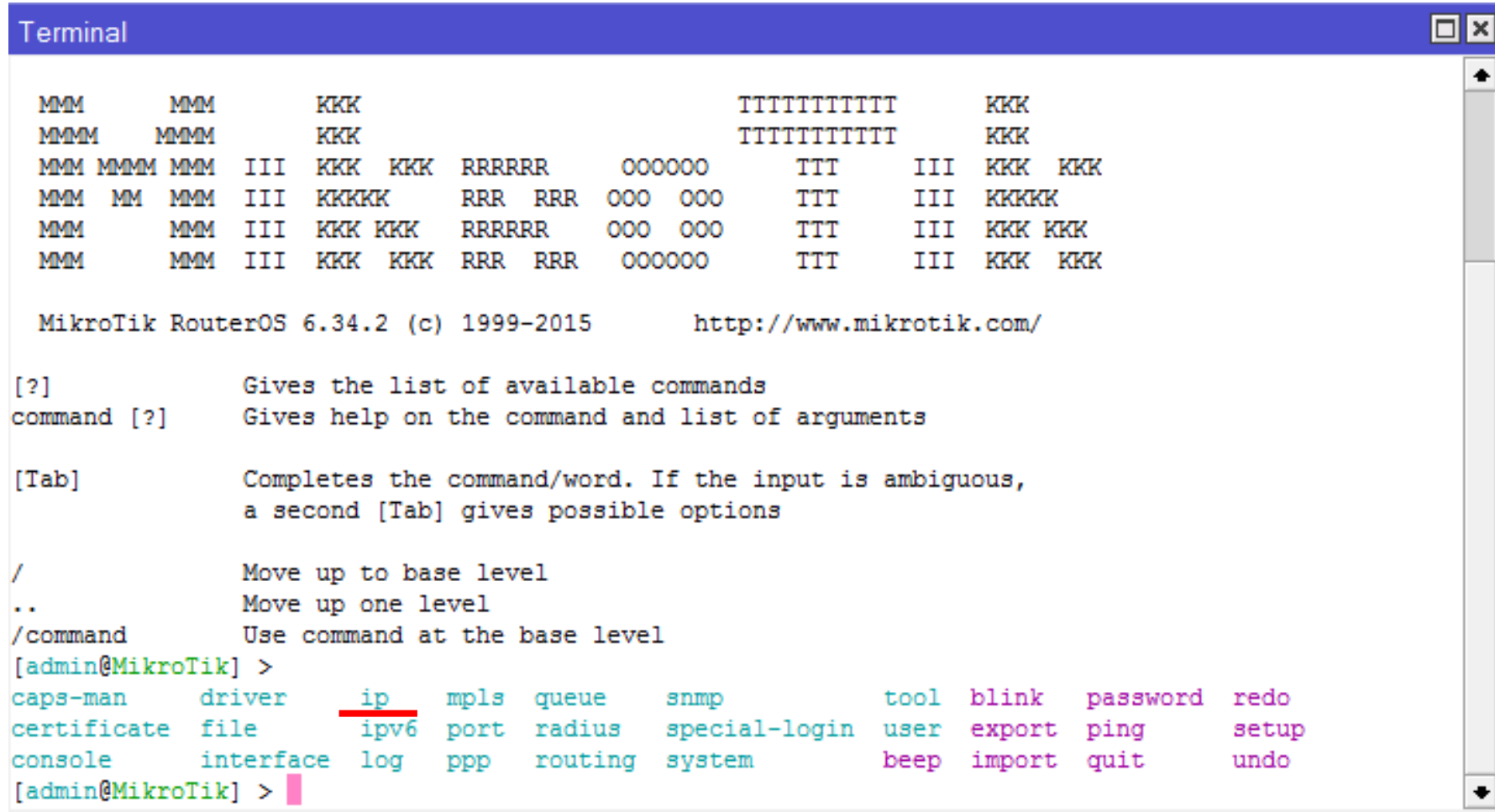
CLI – example with IP addresses

The screenshot shows the MikroTik WinBox v6.34.2 interface. The title bar indicates the user is 'admin@192.168.1.1 (MikroTik)' and the session is '192.168.1.1'. The left sidebar contains a menu with 'IP' highlighted. The main area displays the 'Address List' configuration window, which shows a table of IP addresses. The table has columns for 'Address', 'Network', and 'Interface'. Two entries are listed: '172.29.13.161/30' on 'ether1' and '192.168.1.1/24' on 'LAN'. The '192.168.1.1/24' entry is highlighted with a red line. The status bar at the bottom of the window indicates '2 items'.

	Address	Network	Interface
D	172.29.13.161/30	172.29.13.160	ether1
	192.168.1.1/24	192.168.1.0	LAN

CLI – example with IP addresses

- Using <TAB>



```
Terminal

MMM      MMM      KKK                      TTTTTTTTTTT      KKK
MMMM     MMMM     KKK                      TTTTTTTTTTT      KKK
MMM MMMM MMM III KKK KKK RRRRRR      OOOOOO      TTT      III KKK KKK
MMM MM  MMM III KKKKK RRR RRR OOO OOO      TTT      III KKKKK
MMM      MMM III KKK KKK RRRRRR      OOO OOO      TTT      III KKK KKK
MMM      MMM III KKK KKK RRR RRR OOOOOO      TTT      III KKK KKK

MikroTik RouterOS 6.34.2 (c) 1999-2015      http://www.mikrotik.com/

[?]          Gives the list of available commands
command [?]  Gives help on the command and list of arguments

[Tab]        Completes the command/word. If the input is ambiguous,
              a second [Tab] gives possible options

/            Move up to base level
..          Move up one level
/command     Use command at the base level
[admin@MikroTik] >
caps-man    driver    ip    mpls    queue    snmp      tool    blink    password    redo
certificate file      ipv6    port    radius    special-login    user    export    ping      setup
console     interface log    ppp     routing  system      beep    import    quit      undo
[admin@MikroTik] >
```


CLI – example with IP addresses

- Typing “ip” and using <TAB> again

```
Terminal
MMM MM MMM III KKKKK RRR RRR OOO OOO TTT III KKKKK
MMM   MMM III KKK KKK RRRRRR OOO OOO TTT III KKK KKK
MMM   MMM III KKK KKK RRR RRR OOOOOO TTT III KKK KKK

MikroTik RouterOS 6.34.2 (c) 1999-2015      http://www.mikrotik.com/

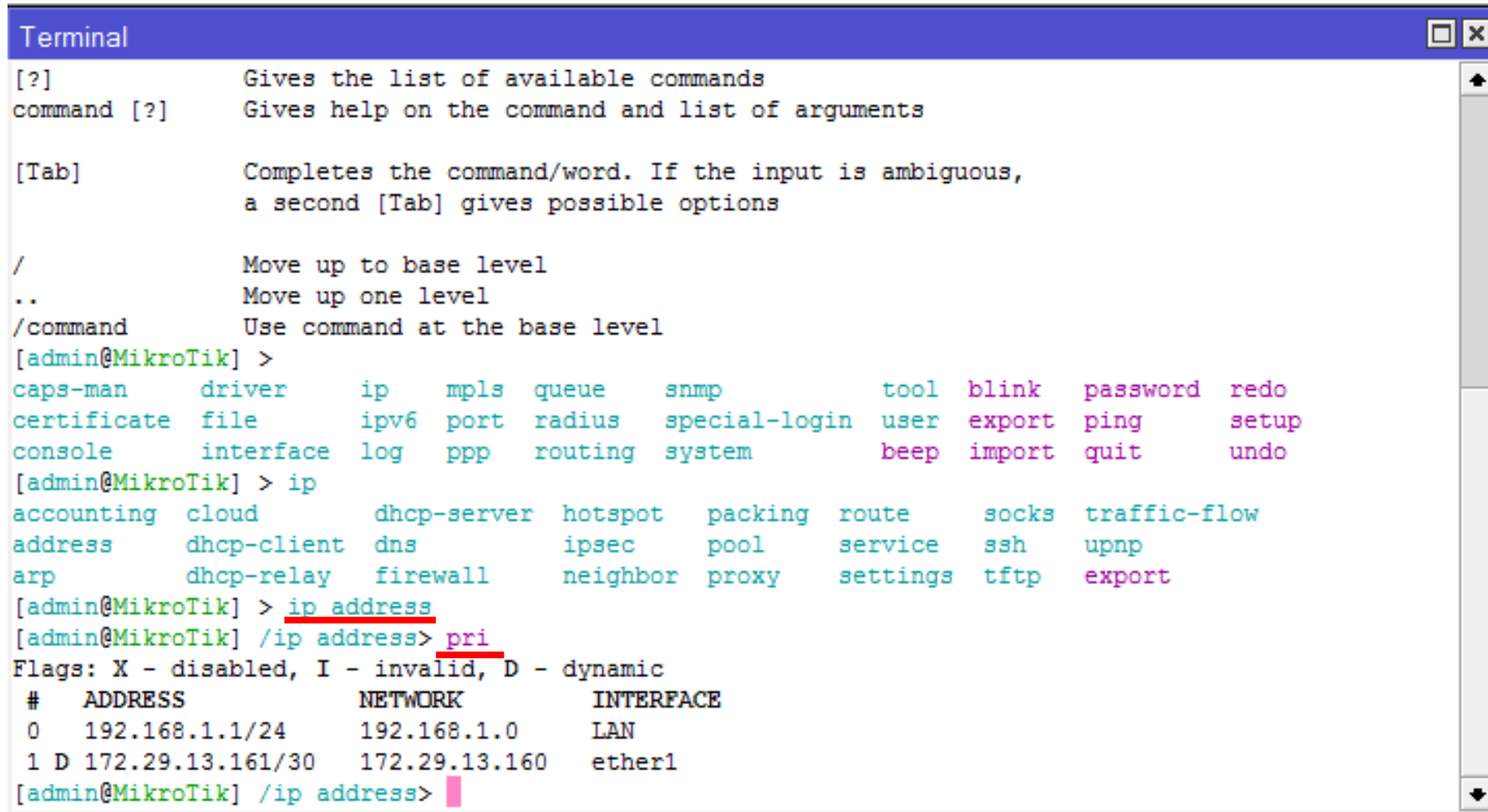
[?]                Gives the list of available commands
command [?]        Gives help on the command and list of arguments

[Tab]              Completes the command/word. If the input is ambiguous,
                    a second [Tab] gives possible options

/                  Move up to base level
..                 Move up one level
/command           Use command at the base level
[admin@MikroTik] >
caps-man          driver      ip      mpls  queue  snmp          tool  blink  password  redo
certificate       file        ipv6   port  radius special-login  user  export  ping      setup
console           interface  log    ppp   routing system        beep  import  quit      undo
[admin@MikroTik] > ip
accounting         cloud          dhcp-server  hotspot   packing  route  socks  traffic-flow
address            dhcp-client   dns           ipsec     pool     service ssh    upnp
arp                dhcp-relay    firewall     neighbor  proxy    settings tftp   export
[admin@MikroTik] > ip
```

CLI – example with IP addresses

- Using **print** in /ip address



```
Terminal
[?] Gives the list of available commands
command [?] Gives help on the command and list of arguments

[Tab] Completes the command/word. If the input is ambiguous,
a second [Tab] gives possible options

/ Move up to base level
.. Move up one level
/command Use command at the base level
[admin@MikroTik] >
caps-man driver ip mpls queue snmp tool blink password redo
certificate file ipv6 port radius special-login user export ping setup
console interface log ppp routing system beep import quit undo
[admin@MikroTik] > ip
accounting cloud dhcp-server hotspot packing route socks traffic-flow
address dhcp-client dns ipsec pool service ssh upnp
arp dhcp-relay firewall neighbor proxy settings tftp export
[admin@MikroTik] > ip address
[admin@MikroTik] /ip address> pri
Flags: X - disabled, I - invalid, D - dynamic
# ADDRESS NETWORK INTERFACE
0 192.168.1.1/24 192.168.1.0 LAN
1 D 172.29.13.161/30 172.29.13.160 ether1
[admin@MikroTik] /ip address>
```

CLI – example with IP addresses

- Using **export** in /ip address

```
Terminal
/          Move up to base level
..         Move up one level
/command   Use command at the base level
[admin@MikroTik] >
caps-man   driver   ip   mpls   queue   snmp           tool   blink   password   redo
certificate file    ipv6 port   radius  special-login  user   export   ping       setup
console    interface log   ppp    routing  system        beep   import   quit       undo
[admin@MikroTik] > ip
accounting cloud      dhcp-server hotspot  packing route    socks  traffic-flow
address     dhcp-client dns          ipsec   pool    service ssh    upnp
arp         dhcp-relay  firewall  neighbor proxy    settings tftp   export
[admin@MikroTik] > ip address
[admin@MikroTik] /ip address> pri
Flags: X - disabled, I - invalid, D - dynamic
# ADDRESS NETWORK INTERFACE
0 192.168.1.1/24 192.168.1.0 LAN
1 D 172.29.13.161/30 172.29.13.160 ether1
[admin@MikroTik] /ip address> export
# feb/24/2016 23:37:32 by RouterOS 6.34.2
# software id = 1VWV-4NDH
#
/ip address
add address=192.168.1.1/24 interface=LAN network=192.168.1.0
[admin@MikroTik] /ip address>
```

Learn how to use CLI, really!

- Most sections are easy to find
- **IP -> Firewall -> Filter Rules** can be found in **/ip firewall filter**
- Sometimes small differences
- **Wireless** in WinBox, but **/interface wireless** in CLI
- **System -> Users** in WinBox, but **/user** in CLI
- Or just type **/export** to analyse whole configuration

Prepare CLI rules for “massive” configuration

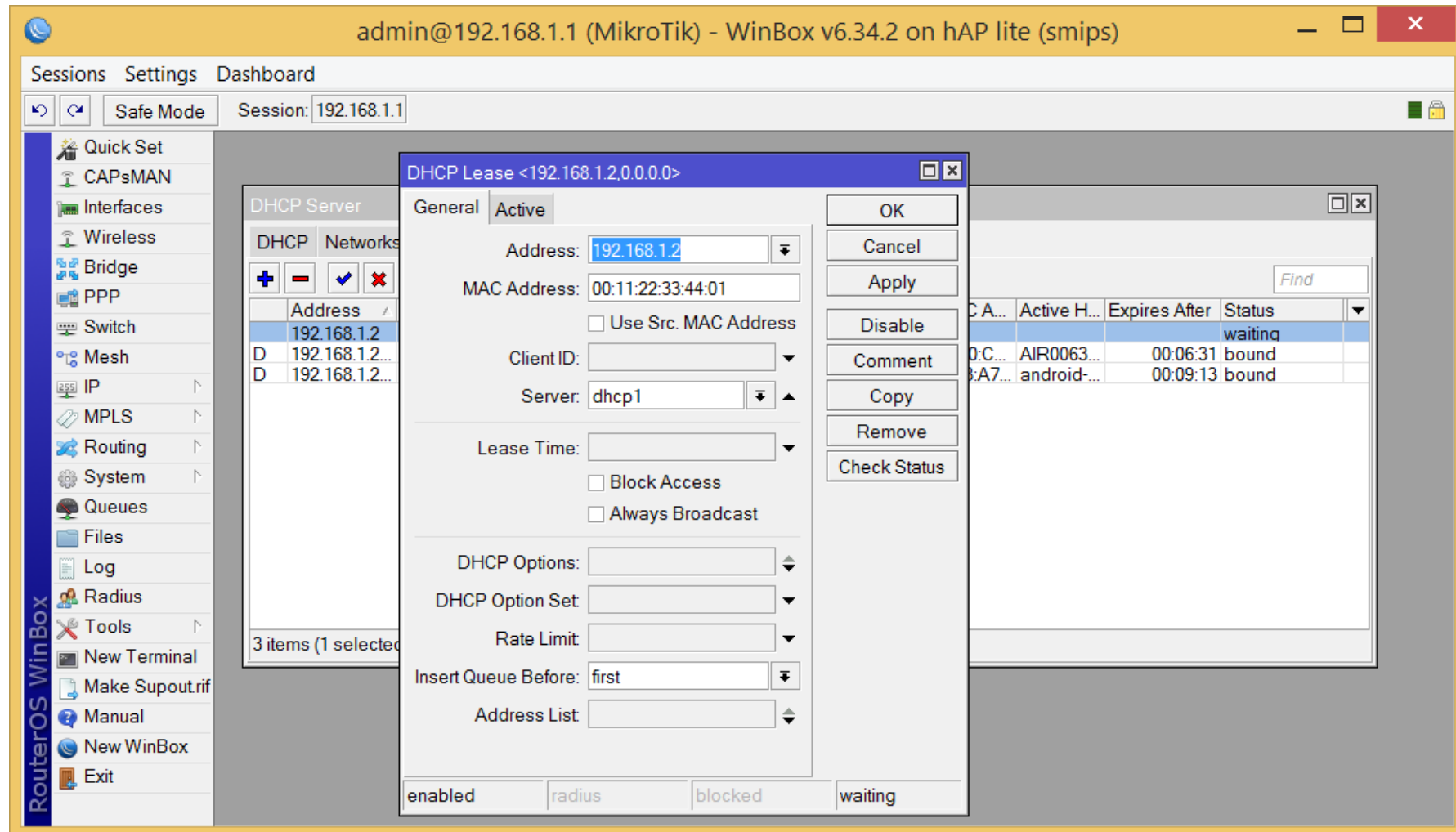
- Imagine, that your MikroTik router is running DHCP server
- You get a spreadsheet with a list of 200 IP and MAC addresses of the devices that need to be added statically to the DHCP server
- Will you click “+”, copy-paste them, and click “**OK**” 200 times? 😊

Prepare CLI rules for “massive” configuration

B3		:	  	192.168.1.4		
	A	B	C	D	E	F
37		192.168.1.38	00:11:22:33:44:37			
38		192.168.1.39	00:11:22:33:44:38			
39		192.168.1.40	00:11:22:33:44:39			
40		192.168.1.41	00:11:22:33:44:40			
41		192.168.1.42	00:11:22:33:44:41			
42		192.168.1.43	00:11:22:33:44:42			
43		192.168.1.44	00:11:22:33:44:43			
44		192.168.1.45	00:11:22:33:44:44			
45		192.168.1.46	00:11:22:33:44:45			
46		192.168.1.47	00:11:22:33:44:46			
47		192.168.1.48	00:11:22:33:44:47			
48		192.168.1.49	00:11:22:33:44:48			
49		192.168.1.50	00:11:22:33:44:49			
50		192.168.1.51	00:11:22:33:44:50			
51		192.168.1.52	00:11:22:33:44:51			

Prepare CLI rules for “massive” configuration

- Add the first line with WinBox, if you’re not sure



Prepare CLI rules for “massive” configuration

- Check the syntax in CLI

```
Terminal
MMM MMMM MMM III KKK KKK RRRRRR OOOOOO TTT III KKK KKK
MMM MM MMM III KKKKK RRR RRR OOO OOO TTT III KKKKK
MMM MMM III KKK KKK RRRRRR OOO OOO TTT III KKK KKK
MMM MMM III KKK KKK RRR RRR OOOOOO TTT III KKK KKK

MikroTik RouterOS 6.34.2 (c) 1999-2015 http://www.mikrotik.com/

[?] Gives the list of available commands
command [?] Gives help on the command and list of arguments

[Tab] Completes the command/word. If the input is ambiguous,
a second [Tab] gives possible options

/ Move up to base level
.. Move up one level
/command Use command at the base level
[admin@MikroTik] > ip dhcp-server lease
[admin@MikroTik] /ip dhcp-server lease> export
# feb/24/2016 23:24:25 by RouterOS 6.34.2
# software id = 1VWV-4NDH
#
/ip dhcp-server lease
add address=192.168.1.2 mac-address=00:11:22:33:44:01 server=dhcp1
[admin@MikroTik] /ip dhcp-server lease>
```

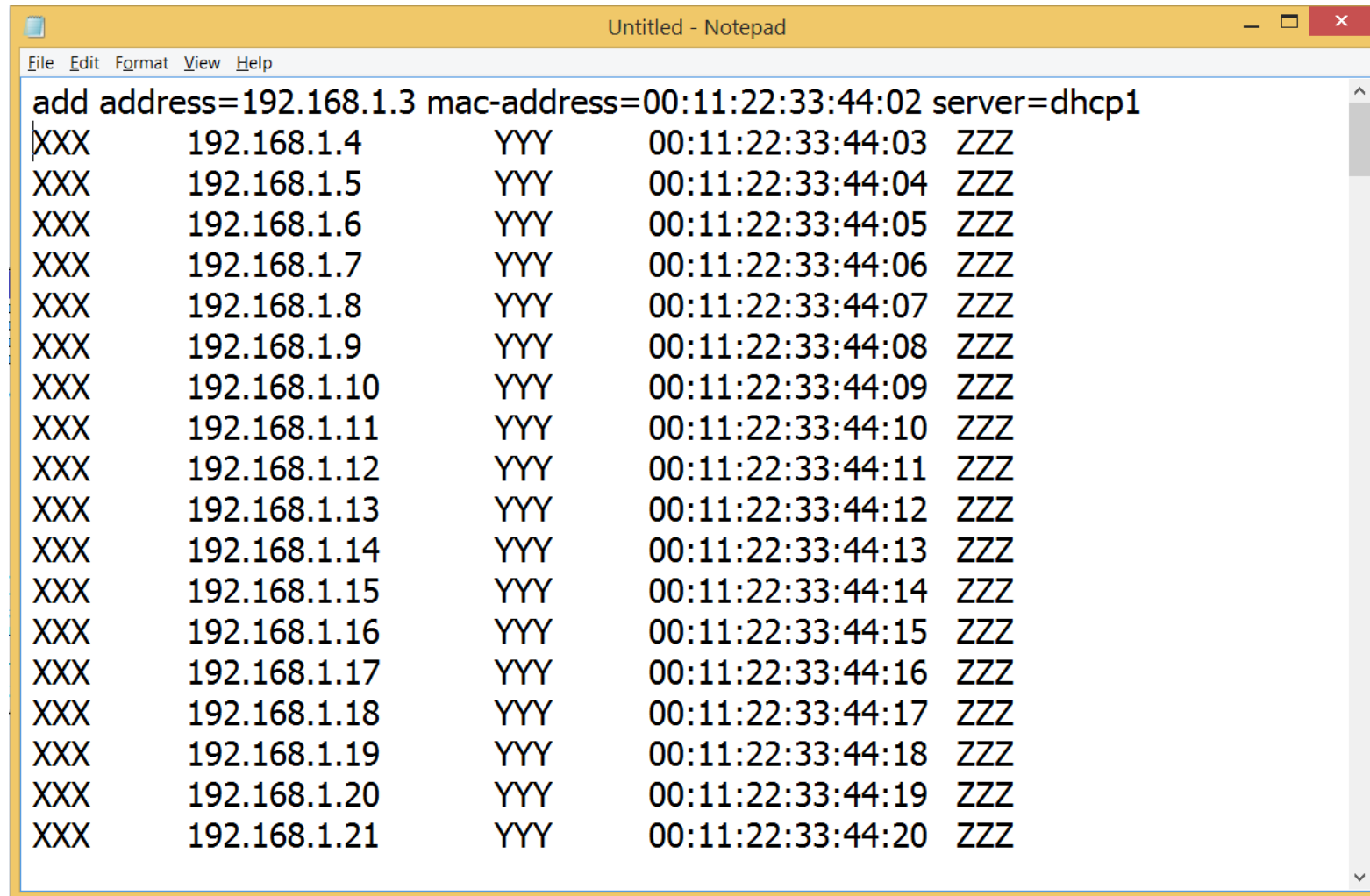

Prepare CLI rules for “massive” configuration

- Create “dummy” columns with unique values

B6		✕ ✓ <i>fx</i>		192.168.1.7			
	A	B	C	D	E	F	
37	XXX	192.168.1.38	YYY	00:11:22:33:44:37	ZZZ		
38	XXX	192.168.1.39	YYY	00:11:22:33:44:38	ZZZ		
39	XXX	192.168.1.40	YYY	00:11:22:33:44:39	ZZZ		
40	XXX	192.168.1.41	YYY	00:11:22:33:44:40	ZZZ		
41	XXX	192.168.1.42	YYY	00:11:22:33:44:41	ZZZ		
42	XXX	192.168.1.43	YYY	00:11:22:33:44:42	ZZZ		
43	XXX	192.168.1.44	YYY	00:11:22:33:44:43	ZZZ		
44	XXX	192.168.1.45	YYY	00:11:22:33:44:44	ZZZ		
45	XXX	192.168.1.46	YYY	00:11:22:33:44:45	ZZZ		
46	XXX	192.168.1.47	YYY	00:11:22:33:44:46	ZZZ		
47	XXX	192.168.1.48	YYY	00:11:22:33:44:47	ZZZ		
48	XXX	192.168.1.49	YYY	00:11:22:33:44:48	ZZZ		
49	XXX	192.168.1.50	YYY	00:11:22:33:44:49	ZZZ		
50	XXX	192.168.1.51	YYY	00:11:22:33:44:50	ZZZ		
51	XXX	192.168.1.52	YYY	00:11:22:33:44:51	ZZZ		

Prepare CLI rules for “massive” configuration

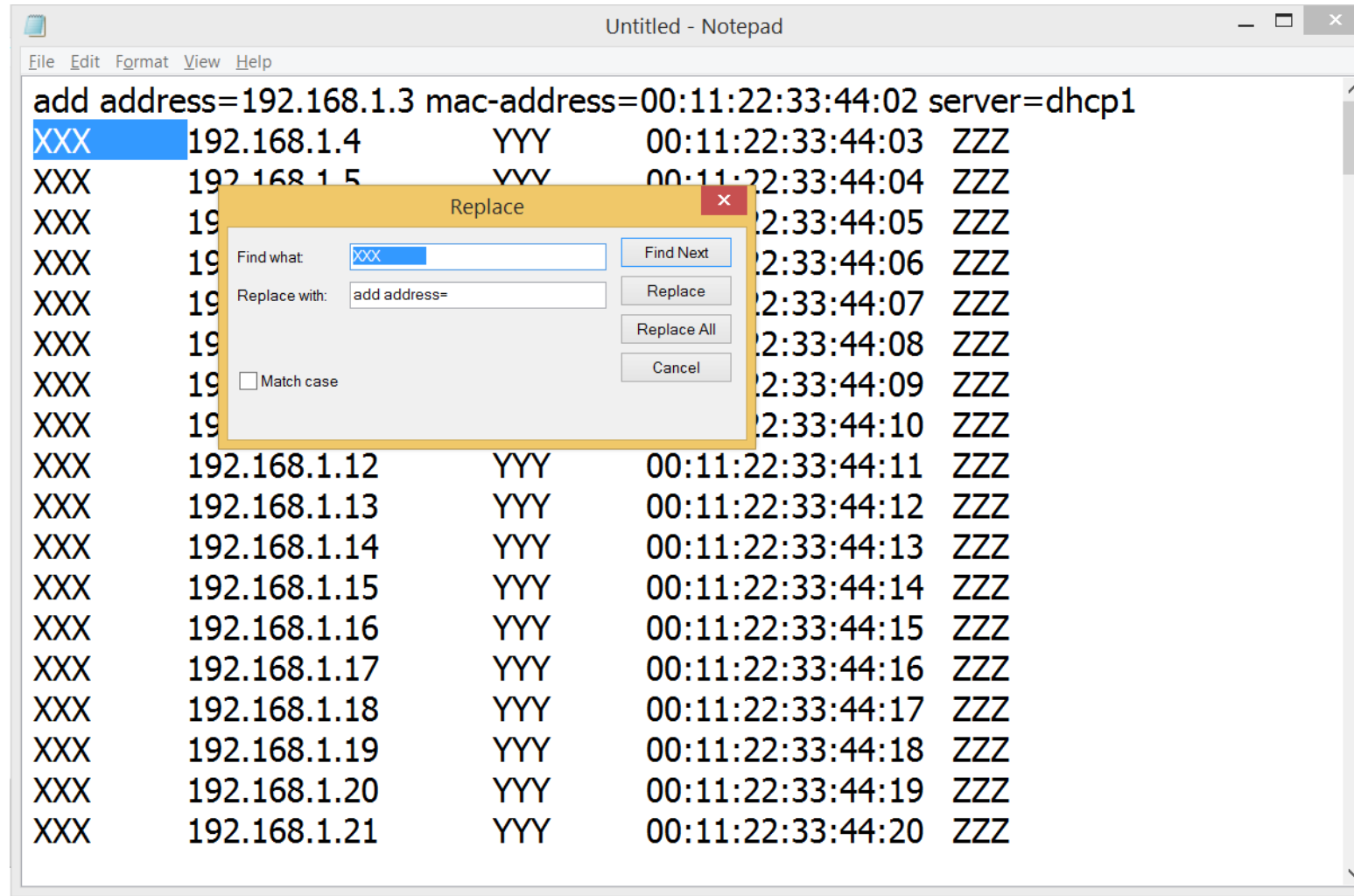
- Copy the spreadsheet to the notepad, prepare the first line



```
add address=192.168.1.3 mac-address=00:11:22:33:44:02 server=dhcp1
XXX      192.168.1.4      YYY      00:11:22:33:44:03      ZZZ
XXX      192.168.1.5      YYY      00:11:22:33:44:04      ZZZ
XXX      192.168.1.6      YYY      00:11:22:33:44:05      ZZZ
XXX      192.168.1.7      YYY      00:11:22:33:44:06      ZZZ
XXX      192.168.1.8      YYY      00:11:22:33:44:07      ZZZ
XXX      192.168.1.9      YYY      00:11:22:33:44:08      ZZZ
XXX      192.168.1.10     YYY      00:11:22:33:44:09      ZZZ
XXX      192.168.1.11     YYY      00:11:22:33:44:10      ZZZ
XXX      192.168.1.12     YYY      00:11:22:33:44:11      ZZZ
XXX      192.168.1.13     YYY      00:11:22:33:44:12      ZZZ
XXX      192.168.1.14     YYY      00:11:22:33:44:13      ZZZ
XXX      192.168.1.15     YYY      00:11:22:33:44:14      ZZZ
XXX      192.168.1.16     YYY      00:11:22:33:44:15      ZZZ
XXX      192.168.1.17     YYY      00:11:22:33:44:16      ZZZ
XXX      192.168.1.18     YYY      00:11:22:33:44:17      ZZZ
XXX      192.168.1.19     YYY      00:11:22:33:44:18      ZZZ
XXX      192.168.1.20     YYY      00:11:22:33:44:19      ZZZ
XXX      192.168.1.21     YYY      00:11:22:33:44:20      ZZZ
```

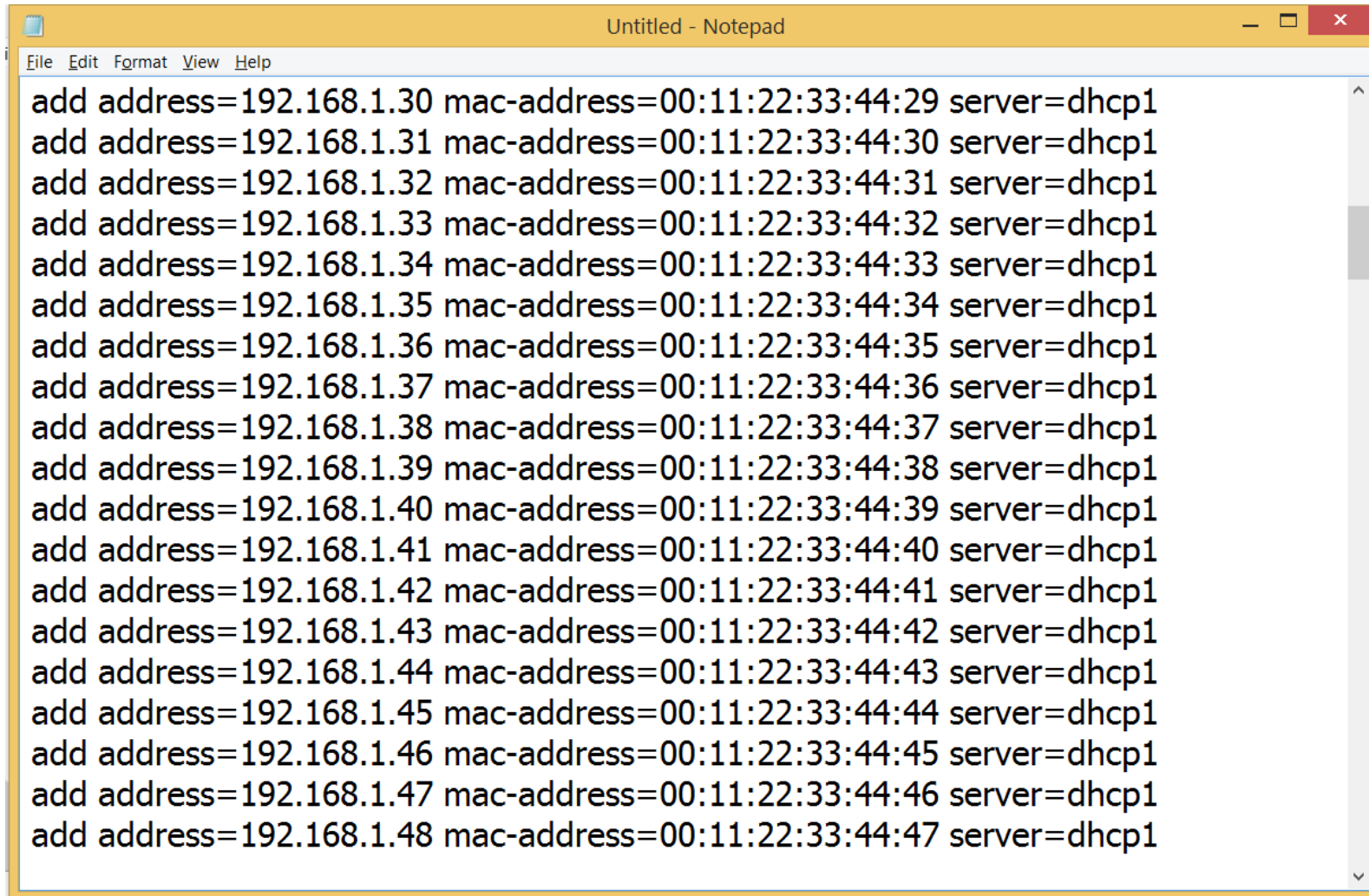
Prepare CLI rules for “massive” configuration

- Use “Replace” function



Prepare CLI rules for “massive” configuration

- Voila!



```
add address=192.168.1.30 mac-address=00:11:22:33:44:29 server=dhcp1
add address=192.168.1.31 mac-address=00:11:22:33:44:30 server=dhcp1
add address=192.168.1.32 mac-address=00:11:22:33:44:31 server=dhcp1
add address=192.168.1.33 mac-address=00:11:22:33:44:32 server=dhcp1
add address=192.168.1.34 mac-address=00:11:22:33:44:33 server=dhcp1
add address=192.168.1.35 mac-address=00:11:22:33:44:34 server=dhcp1
add address=192.168.1.36 mac-address=00:11:22:33:44:35 server=dhcp1
add address=192.168.1.37 mac-address=00:11:22:33:44:36 server=dhcp1
add address=192.168.1.38 mac-address=00:11:22:33:44:37 server=dhcp1
add address=192.168.1.39 mac-address=00:11:22:33:44:38 server=dhcp1
add address=192.168.1.40 mac-address=00:11:22:33:44:39 server=dhcp1
add address=192.168.1.41 mac-address=00:11:22:33:44:40 server=dhcp1
add address=192.168.1.42 mac-address=00:11:22:33:44:41 server=dhcp1
add address=192.168.1.43 mac-address=00:11:22:33:44:42 server=dhcp1
add address=192.168.1.44 mac-address=00:11:22:33:44:43 server=dhcp1
add address=192.168.1.45 mac-address=00:11:22:33:44:44 server=dhcp1
add address=192.168.1.46 mac-address=00:11:22:33:44:45 server=dhcp1
add address=192.168.1.47 mac-address=00:11:22:33:44:46 server=dhcp1
add address=192.168.1.48 mac-address=00:11:22:33:44:47 server=dhcp1
```

Prepare CLI rules for “massive” configuration

admin@192.168.1.1 (MikroTik) - WinBox v6.34.2 on hAP lite (smips)

Sessions Settings Dashboard

Safe Mode Session: 192.168.1.1

RouterOS WinBox

- Quick Set
- CAPsMAN
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- Make Supout.rif
- Manual
- New WinBox
- Exit

DHCP Server

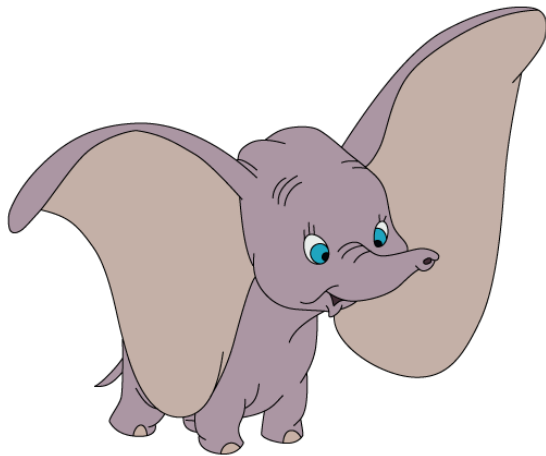
DHCP Networks Leases Options Option Sets Alerts

+ - ✓ ✗ [icon] [icon] Check Status Find

Address	MAC Address	Client ID	Server	Active Add...	Active MAC A...	Active H...	Expires After	Status
192.168.1.19	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.20	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.21	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.22	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.23	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.24	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.25	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.26	00:11:22:33:44:...		dhcp1					waiting
...#example								
192.168.1.27	00:11:22:33:44:...		dhcp1					waiting

200 items

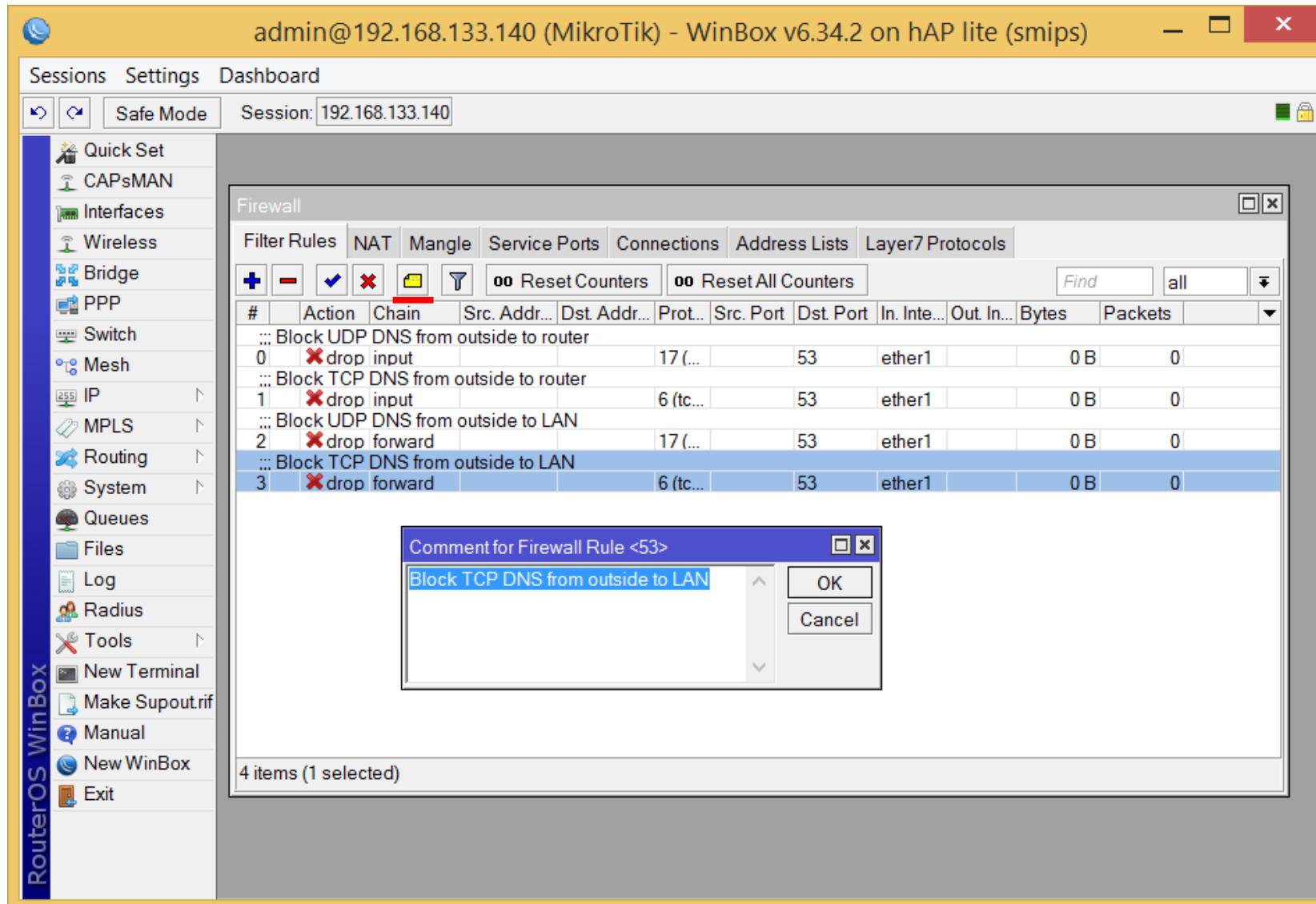
And now for something
completely different



Comment your configuration

- Adding comments is very useful!
- Questions after few years – “why the h*ll did I put this rule here?” 😊
- Especially useful in Firewall – where it’s impossible to list all attributes

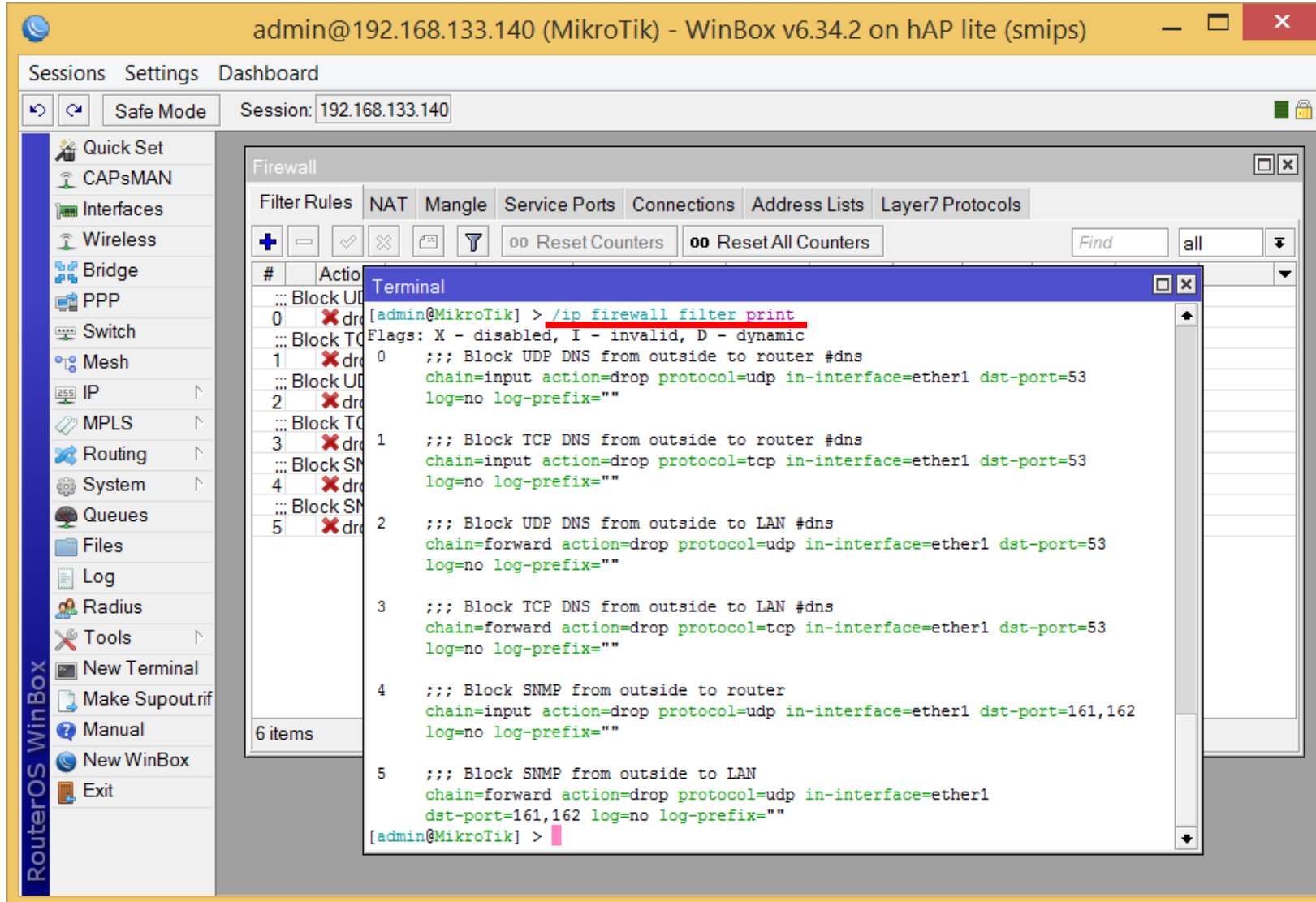
Comment your configuration



Use #hashtags to group your rules

- Having many firewall rules for specific hosts or services?
- Having many DHCP leases for specific users?
- Having many firewall address-list addresses for some users?
- Add hashtags in comments, like:
 - #server1, #server1, #dstarnowski, #jsmith
- Easy to find by **[find comment~"#hashtag"]**

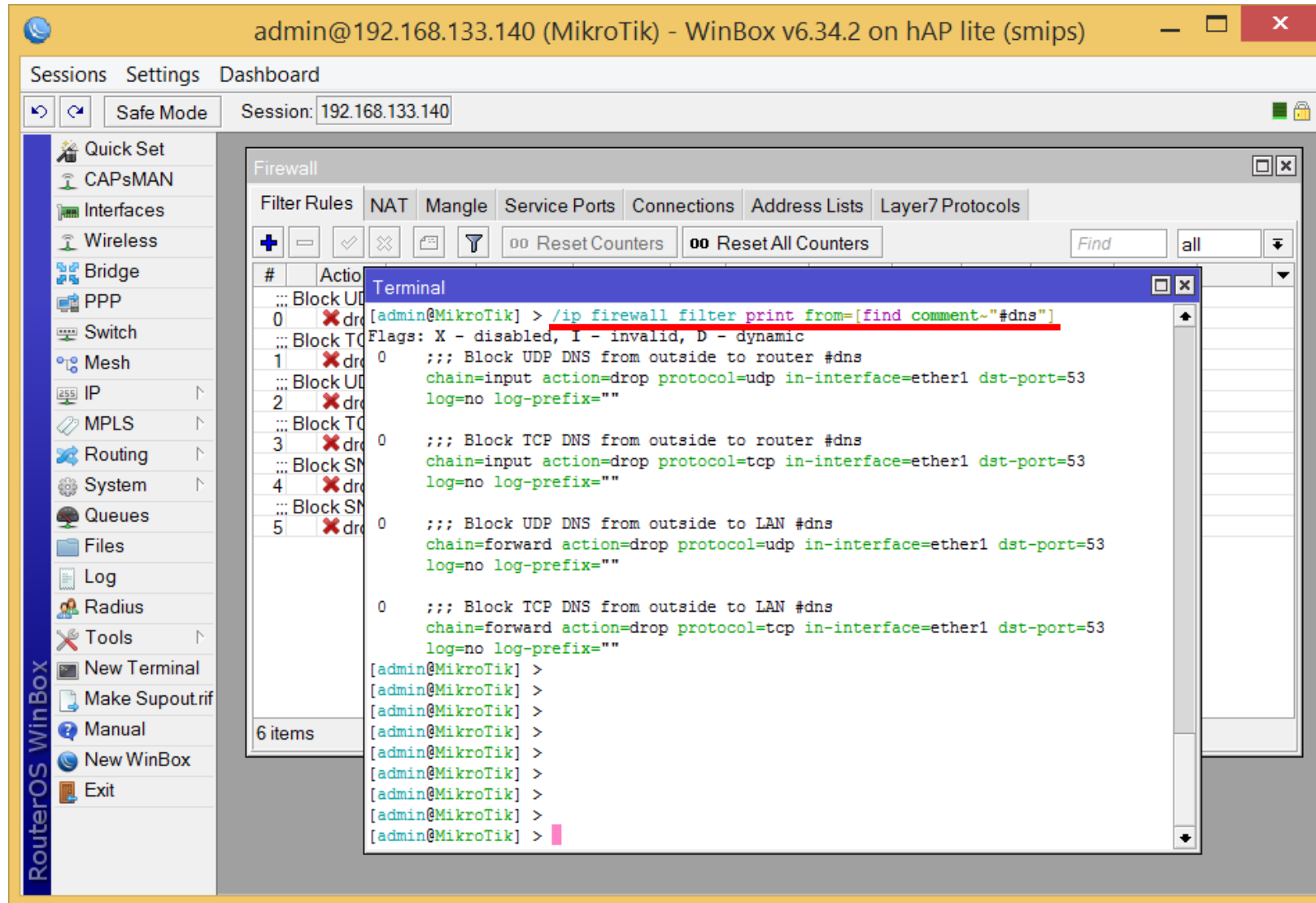
Use #hashtags to group your rules



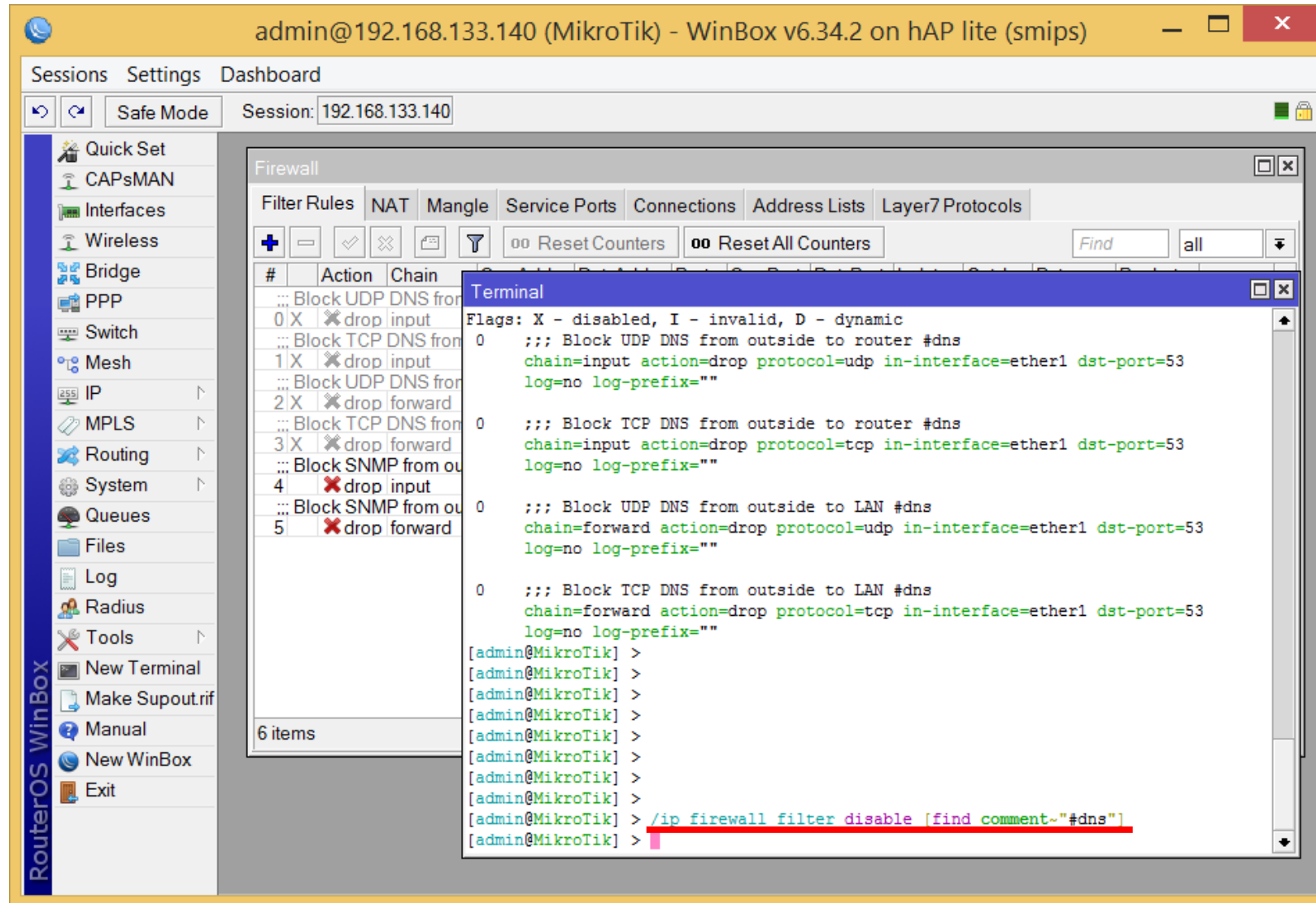
The screenshot shows the MikroTik WinBox interface. The top bar indicates the user is 'admin@192.168.133.140 (MikroTik)' using 'WinBox v6.34.2 on hAP lite (smips)'. The left sidebar contains navigation options like 'Quick Set', 'CAPsMAN', 'Interfaces', 'Wireless', 'Bridge', 'PPP', 'Switch', 'Mesh', 'IP', 'MPLS', 'Routing', 'System', 'Queues', 'Files', 'Log', 'Radius', 'Tools', 'New Terminal', 'Make Supout.rif', 'Manual', 'New WinBox', and 'Exit'. The main panel is titled 'Firewall' and has tabs for 'Filter Rules', 'NAT', 'Mangle', 'Service Ports', 'Connections', 'Address Lists', and 'Layer7 Protocols'. The 'Filter Rules' tab is active, showing a list of 6 items. A terminal window is open over the list, displaying the command `/ip firewall filter print` and its output. The output shows six rules, each starting with a comment (e.g., 'Block UDP DNS from outside to router #dns') and followed by configuration details like chain, action, protocol, and interface. The rules are numbered 0 through 5. The terminal window title is 'Terminal'.

#	Action	Comment	Chain	Action	Protocol	In-Interface	Dst-Port	Log	Log-Prefix
0	drop	Block UDP DNS from outside to router #dns	input	drop	udp	ether1	53	no	
1	drop	Block TCP DNS from outside to router #dns	input	drop	tcp	ether1	53	no	
2	drop	Block UDP DNS from outside to LAN #dns	forward	drop	udp	ether1	53	no	
3	drop	Block TCP DNS from outside to LAN #dns	forward	drop	tcp	ether1	53	no	
4	drop	Block SNMP from outside to router	input	drop	udp	ether1	161,162	no	
5	drop	Block SNMP from outside to LAN	forward	drop	udp	ether1	161,162	no	

Use #hashtags to group your rules



Use #hashtags to group your rules

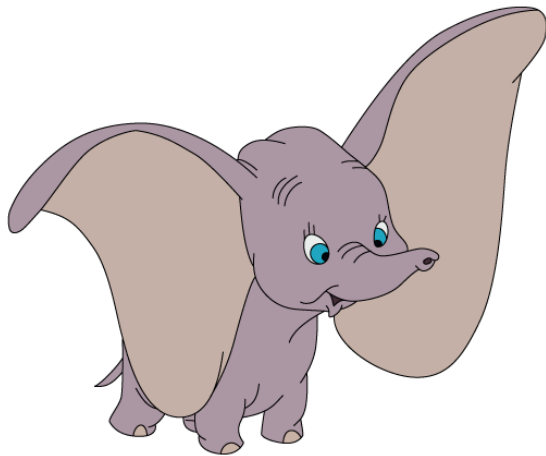


The screenshot shows the MikroTik WinBox interface. The top bar indicates the user is 'admin@192.168.133.140 (MikroTik)' using 'WinBox v6.34.2 on hAP lite (smips)'. The left sidebar contains navigation options like 'Quick Set', 'CAPsMAN', 'Interfaces', 'Wireless', 'Bridge', 'PPP', 'Switch', 'Mesh', 'IP', 'MPLS', 'Routing', 'System', 'Queues', 'Files', 'Log', 'Radius', 'Tools', 'New Terminal', 'Make Supout.rif', 'Manual', 'New WinBox', and 'Exit'. The main window is titled 'Firewall' and shows a list of filter rules. A terminal window is open, displaying the following commands and their output:

```
Flags: X - disabled, I - invalid, D - dynamic
0 ;;; Block UDP DNS from outside to router #dns
chain=input action=drop protocol=udp in-interface=ether1 dst-port=53
log=no log-prefix=""
0 ;;; Block TCP DNS from outside to router #dns
chain=input action=drop protocol=tcp in-interface=ether1 dst-port=53
log=no log-prefix=""
0 ;;; Block UDP DNS from outside to LAN #dns
chain=forward action=drop protocol=udp in-interface=ether1 dst-port=53
log=no log-prefix=""
0 ;;; Block TCP DNS from outside to LAN #dns
chain=forward action=drop protocol=tcp in-interface=ether1 dst-port=53
log=no log-prefix=""
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] >
[admin@MikroTik] > /ip firewall filter disable [find comment~"#dns"]
[admin@MikroTik] >
```

The terminal output shows that the rules are being disabled. The final command is `/ip firewall filter disable [find comment~"#dns"]`.

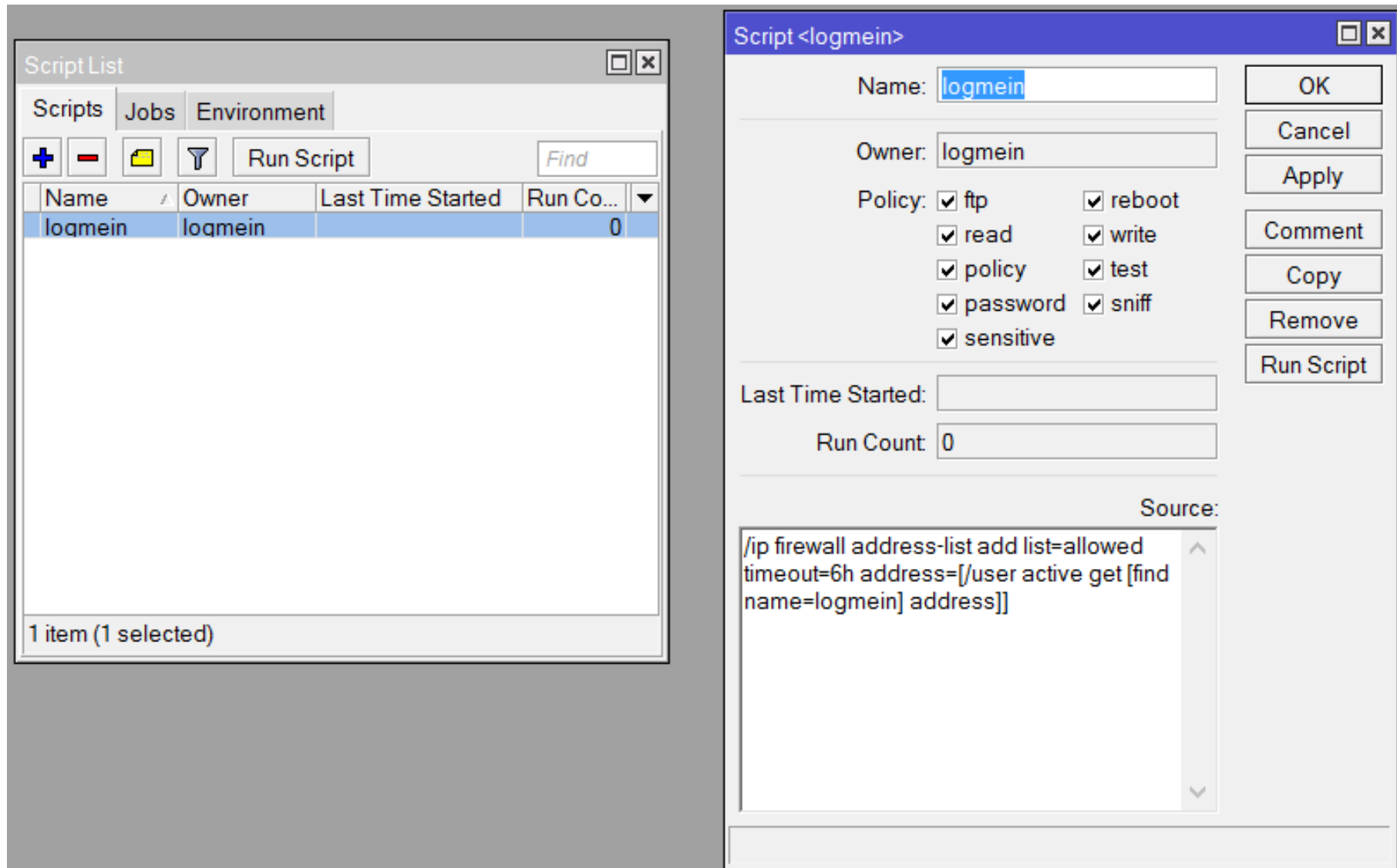
And now for something
completely different



Remember you can write your scripts

- Scripts can be useful to speed things up
- My example – home MikroTik with public IP address
- Only SSH (on a non-standard port) open to the world
- Some servers inside, a network disk with FTP, etc. – with dst-nat rules (port forwarding) only for trusted IP addresses from address list
- One simple script to add my current IP address

Remember you can write your scripts



Remember you can write your scripts

- To access my local servers, I log in via SSH with username **logme**
- I run the script: **/system script run logmein**
- The script does the following:

```
/ip firewall address-list add  
list=allowed  
timeout=6h  
address=[/user active get [find name=logme] address]]
```

- My IP address is added to the list for 6 hours
- Of course – I can also add a “logmeout” script to delete it earlier

SNMP – I want to see everything!

- Only some values can be monitored with SNMP
- All values can be monitored with CLI, WinBox, API...
- But I don't want my NMS to open NNNN TCP connections to my NNNN MikroTik routers every minute, I want SNMP!
- Let's take an example – hw_frames in wireless connection

SNMP – I want to see everything!

```
Terminal
[Tab]          Completes the command/word. If the input is ambiguous,
                a second [Tab] gives possible options

/              Move up to base level
..            Move up one level
/command      Use command at the base level
[admin@MikroTik] > interface wireless registration-table
[admin@MikroTik] /interface wireless registration-table> print stats
0 interface=wlan1 mac-address=48:51:B7:C0:C3:E9 ap=no wds=no bridge=no
  rx-rate="150Mbps-40MHz/1S/SGI" tx-rate="135Mbps-40MHz/1S" packets=49011,32901
  bytes=53740690,6247165 frames=45063,32913 frame-bytes=53906360,6051344 hw-frames=57888,33809
  hw-frame-bytes=70539749,7493037 tx-frames-timed-out=0 uptime=5m52s last-activity=0ms
  signal-strength=-48dBm@HT40-7 signal-to-noise=59dB signal-strength-ch0=-48dBm
  strength-at-rates=-45dBm@1Mbps 4m43s730ms,-50dBm@2Mbps 18m16s400ms,-44dBm@5.5Mbps 20m3s550ms,-
    42dBm@6Mbps 1s,-47dBm@9Mbps 19m56s920ms,-50dBm@12Mbps 27m42s870ms,-51dBm@18Mbps
    27m24s700ms,-53dBm@24Mbps 27m12s400ms,-45dBm@36Mbps 20m9s470ms,-44dBm@48Mbps
    2m15s710ms,-46dBm@54Mbps 5m46s220ms,-58dBm@HT40-1 27m27s20ms,-48dBm@HT40-2
    19m56s910ms,-47dBm@HT40-3 19m56s940ms,-47dBm@HT40-4 5m44s460ms,-45dBm@HT40-5
    5s720ms,-46dBm@HT40-6 4s930ms,-48dBm@HT40-7 0ms
  tx-ccq=81% p-throughput=94472 distance=3 last-ip=192.168.1.254 802.1x-port-enabled=yes
  authentication-type=wpa2-psk encryption=aes-ccm group-encryption=aes-ccm
  management-protection=no wmm-enabled=yes
  tx-rate-set="CCK:1-11 OFDM:6-54 BW:1x-2x SGI:1x-2x HT:0-7"
[admin@MikroTik] /interface wireless registration-table>
```

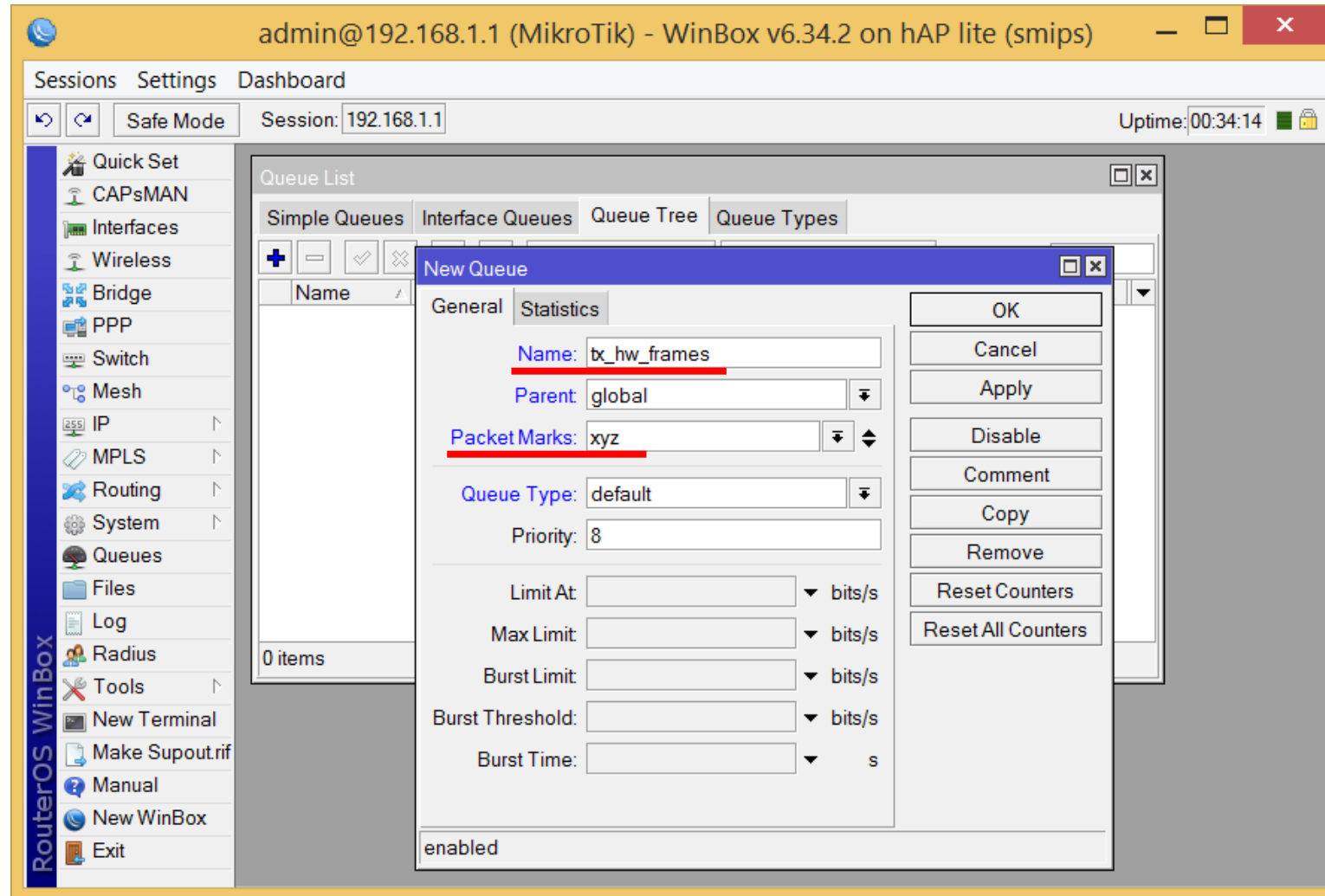
SNMP – I want to see everything!

```
Terminal

/           Move up to base level
..          Move up one level
/command    Use command at the base level
[admin@MikroTik] > interface wireless registration-table
[admin@MikroTik] /interface wireless registration-table> print oid
0 signal-strength=.1.3.6.1.4.1.14988.1.1.1.2.1.3.72.81.183.192.195.233.5
  tx-signal-strength=.1.3.6.1.4.1.14988.1.1.1.2.1.19.72.81.183.192.195.233.5
  tx-bytes=.1.3.6.1.4.1.14988.1.1.1.2.1.4.72.81.183.192.195.233.5
  rx-bytes=.1.3.6.1.4.1.14988.1.1.1.2.1.5.72.81.183.192.195.233.5
  tx-packets=.1.3.6.1.4.1.14988.1.1.1.2.1.6.72.81.183.192.195.233.5
  rx-packets=.1.3.6.1.4.1.14988.1.1.1.2.1.7.72.81.183.192.195.233.5
  tx-rate=.1.3.6.1.4.1.14988.1.1.1.2.1.8.72.81.183.192.195.233.5
  rx-rate=.1.3.6.1.4.1.14988.1.1.1.2.1.9.72.81.183.192.195.233.5
  routeros-version=.1.3.6.1.4.1.14988.1.1.1.2.1.10.72.81.183.192.195.233.5
  uptime=.1.3.6.1.4.1.14988.1.1.1.2.1.11.72.81.183.192.195.233.5
  signal-to-noise=.1.3.6.1.4.1.14988.1.1.1.2.1.12.72.81.183.192.195.233.5
  tx-signal-strength-ch0=.1.3.6.1.4.1.14988.1.1.1.2.1.13.72.81.183.192.195.233.5
  signal-strength-ch0=.1.3.6.1.4.1.14988.1.1.1.2.1.14.72.81.183.192.195.233.5
  tx-signal-strength-ch1=.1.3.6.1.4.1.14988.1.1.1.2.1.15.72.81.183.192.195.233.5
  signal-strength-ch1=.1.3.6.1.4.1.14988.1.1.1.2.1.16.72.81.183.192.195.233.5
  tx-signal-strength-ch2=.1.3.6.1.4.1.14988.1.1.1.2.1.17.72.81.183.192.195.233.5
  signal-strength-ch2=.1.3.6.1.4.1.14988.1.1.1.2.1.18.72.81.183.192.195.233.5
[admin@MikroTik] /interface wireless registration-table>
```

SNMP – I want to see everything!

- Use **/queue tree** and some “dummy” entries!



SNMP – I want to see everything!

```
Terminal
MMM MM MMM III KKKKK RRR RRR OOO OOO TTT III KKKKK
MMM   MMM III KKK KKK RRRRRR OOO OOO TTT III KKK KKK
MMM   MMM III KKK KKK RRR RRR OOOOOO TTT III KKK KKK

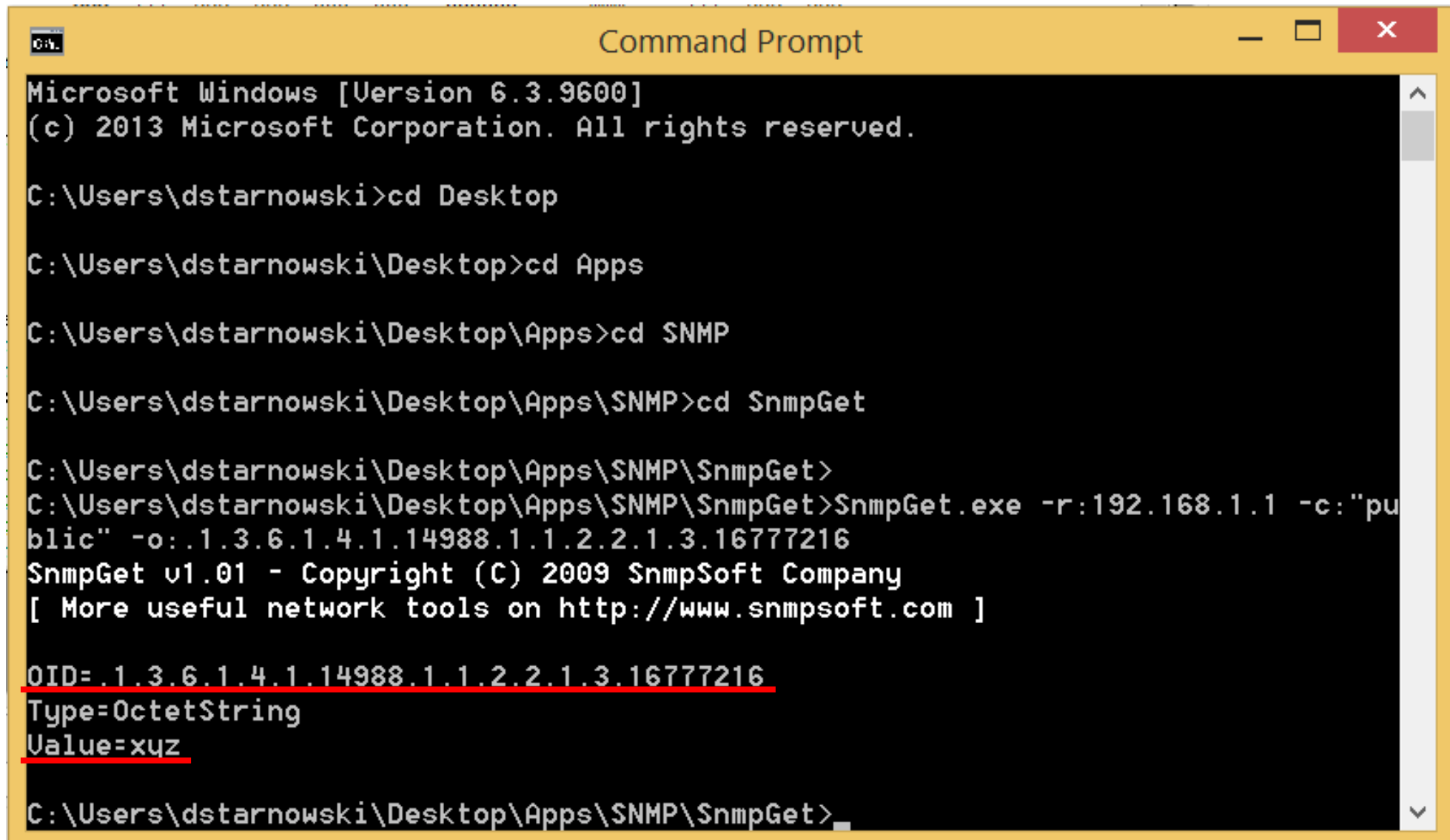
MikroTik RouterOS 6.34.2 (c) 1999-2015      http://www.mikrotik.com/

[?]          Gives the list of available commands
command [?]  Gives help on the command and list of arguments

[Tab]        Completes the command/word. If the input is ambiguous,
              a second [Tab] gives possible options

/            Move up to base level
..          Move up one level
/command     Use command at the base level
[admin@MikroTik] > queue tree
[admin@MikroTik] /queue tree> print oid
Flags: X - disabled, I - invalid
 0  name=.1.3.6.1.4.1.14988.1.1.2.2.1.2.16777216
    packet-mark=.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216
    bytes=.1.3.6.1.4.1.14988.1.1.2.2.1.7.16777216
    packets=.1.3.6.1.4.1.14988.1.1.2.2.1.6.16777216
    queues=.1.3.6.1.4.1.14988.1.1.2.2.1.8.16777216
[admin@MikroTik] /queue tree> 
```

SNMP – I want to see everything!



```
Command Prompt
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\dstarnowski>cd Desktop

C:\Users\dstarnowski\Desktop>cd Apps

C:\Users\dstarnowski\Desktop\Apps>cd SNMP

C:\Users\dstarnowski\Desktop\Apps\SNMP>cd SnmpGet

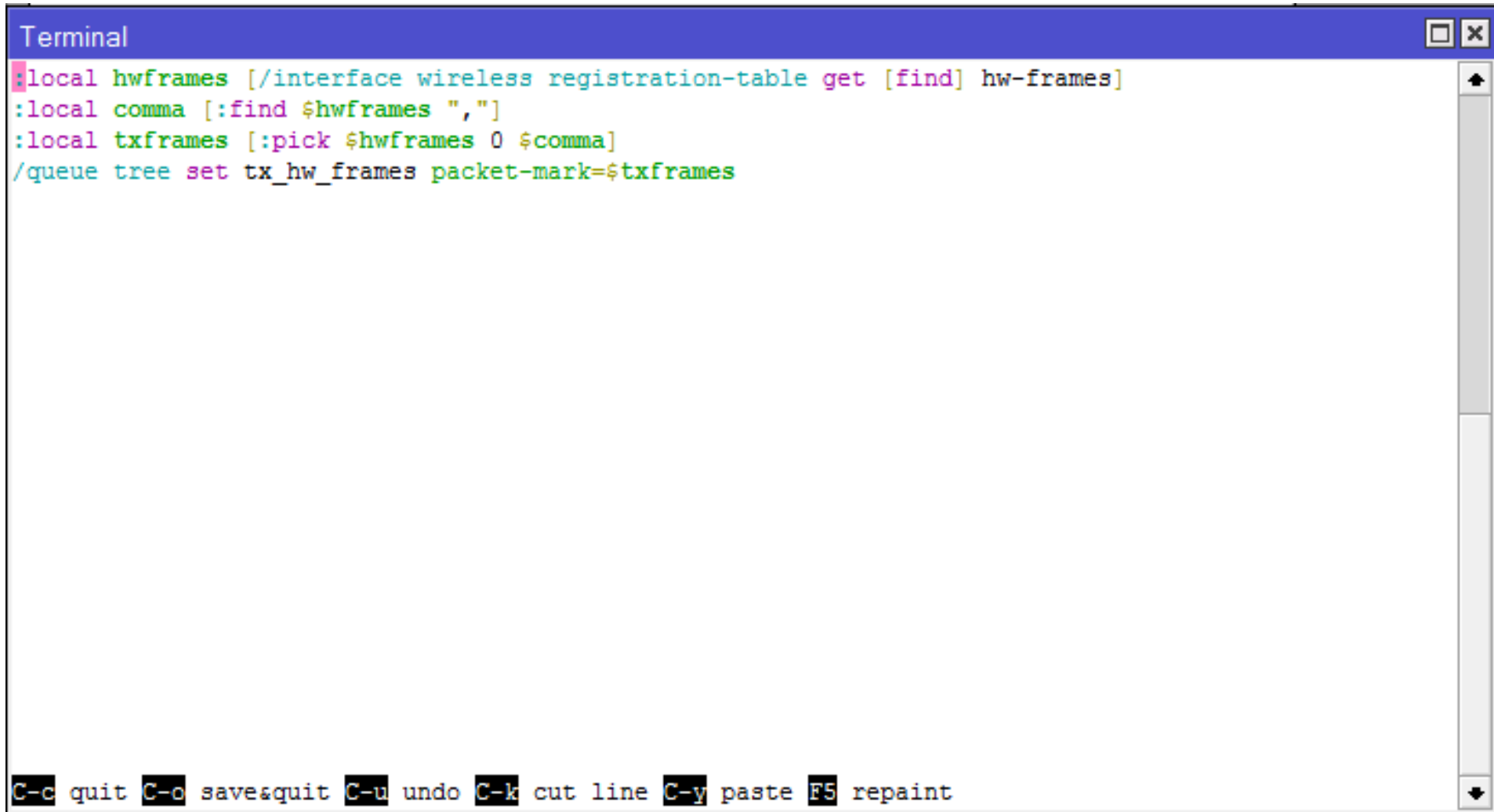
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>SnmpGet.exe -r:192.168.1.1 -c:"public" -o:.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216
SnmpGet v1.01 - Copyright (C) 2009 SnmpSoft Company
[ More useful network tools on http://www.snmpsoft.com ]

OID=.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216
Type=OctetString
Value=xuz

C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
```

SNMP – I want to see everything!

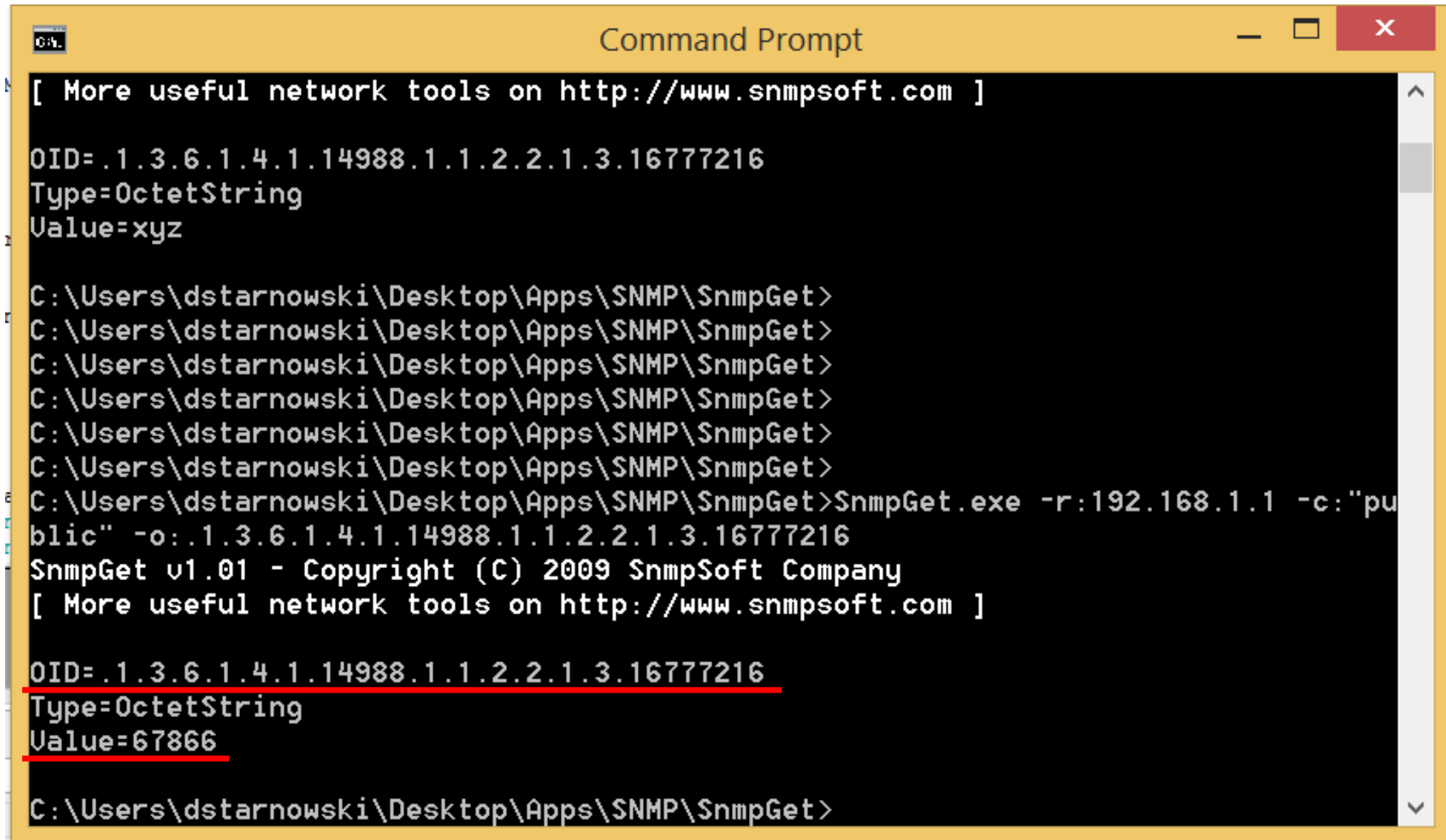
- Now let's create a script to put hw_frames value to packet mark 😊



```
Terminal
:local hwframes [/interface wireless registration-table get [find] hw-frames]
:local comma [:find $hwframes ","]
:local txframes [:pick $hwframes 0 $comma]
/queue tree set tx_hw_frames packet-mark=$txframes

C-c quit C-o save&quit C-u undo C-k cut line C-y paste F5 repaint
```

SNMP – I want to see everything!

A screenshot of a Windows Command Prompt window titled "Command Prompt". The window has a yellow title bar and standard Windows window controls (minimize, maximize, close). The background is black with white text. The text shows the execution of the "SnmpGet" tool. It starts with a message: "[More useful network tools on http://www.snmpsoft.com]". Then it shows the output of a previous command: "OID=.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216", "Type=OctetString", and "Value=xyz". This is followed by several lines of "C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>" prompts. Then the command "SnmpGet.exe -r:192.168.1.1 -c:"public" -o:.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216" is entered. The output shows "SnmpGet v1.01 - Copyright (C) 2009 SnmpSoft Company" and another message: "[More useful network tools on http://www.snmpsoft.com]". Finally, the output of the current command is shown: "OID=.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216", "Type=OctetString", and "Value=67866". The last line is another "C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>" prompt. The text "OID=.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216" and "Value=67866" are underlined in red in the original image.

```
Command Prompt

[ More useful network tools on http://www.snmpsoft.com ]

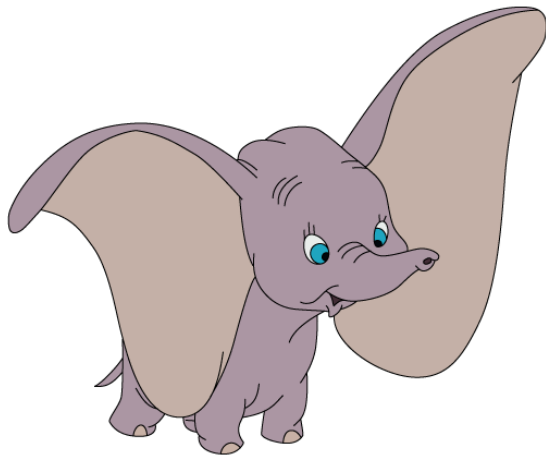
OID=.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216
Type=OctetString
Value=xyz

C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>SnmpGet.exe -r:192.168.1.1 -c:"pu
blic" -o:.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216
SnmpGet v1.01 - Copyright (C) 2009 SnmpSoft Company
[ More useful network tools on http://www.snmpsoft.com ]

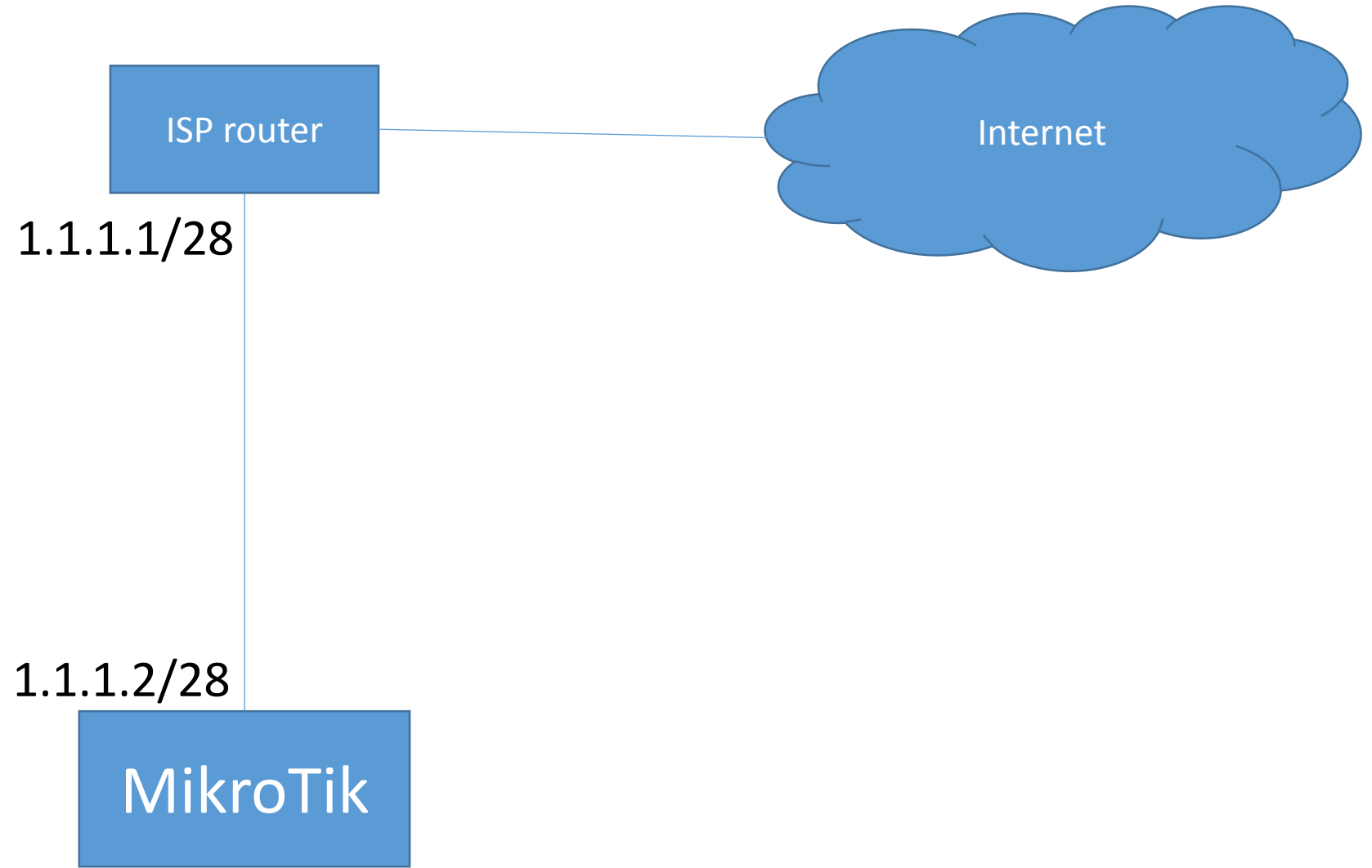
OID=.1.3.6.1.4.1.14988.1.1.2.2.1.3.16777216
Type=OctetString
Value=67866

C:\Users\dstarnowski\Desktop\Apps\SNMP\SnmpGet>
```


And now for something
completely different



IP and ARP – short introduction



IP and ARP – short introduction

The screenshot displays the MikroTik WinBox v6.34.2 interface. The top bar shows the user 'admin@4C:5E:0C:08:0D:30 (MikroTik)' and the device 'hAP lite (smips)'. The left sidebar contains a menu with various configuration options, including 'IP' which is currently selected. The main window is divided into two panes. The top pane, titled 'Address List', shows a table with one entry: '1.1.1.2/28' assigned to the 'ether1' interface. The bottom pane, titled 'Route List', shows a table with one entry: '1.1.1.0/28' with a gateway of 'ether1 reachable' and a distance of '0'. The status bar at the bottom indicates '1 item'.

admin@4C:5E:0C:08:0D:30 (MikroTik) - WinBox v6.34.2 on hAP lite (smips)

Sessions Settings Dashboard

Safe Mode Session: 4C:5E:0C:08:0D:30 Uptime: 01:11:51

Quick Set CAPsMAN Interfaces Wireless Bridge PPP Switch Mesh IP MPLS Routing System Queues Files Log Radius Tools New Terminal Make Supout.tif Manual New WinBox Exit

Address List

Address	Network	Interface
1.1.1.2/28	1.1.1.0	ether1

Route List

Routes	Nexthops	Rules	VRF	
Dst Address	Gateway	Distance	Routing M...	Pref. Source
1.1.1.0/28	ether1 reachable	0		1.1.1.2

1 item

IP and ARP – short introduction

- We configure IP address 1.1.1.2/28 on ether1 interface
- This means three things:
 - 1. The address 1.1.1.2 is one of our router's IP addresses
 - 2. The network on ether1 is 1.1.1.0/28
 - 3. Packets going to this network, originated on our router, will have source IP 1.1.1.2

IP and ARP – short introduction

	Dst. Address	Gateway	Distance	Routing M...	Pref. Source	
AS	0.0.0.0/0	1.1.1.1 reachable ether1	1			
DAC	1.1.1.0/28	ether1 reachable	0		1.1.1.2	

2 items

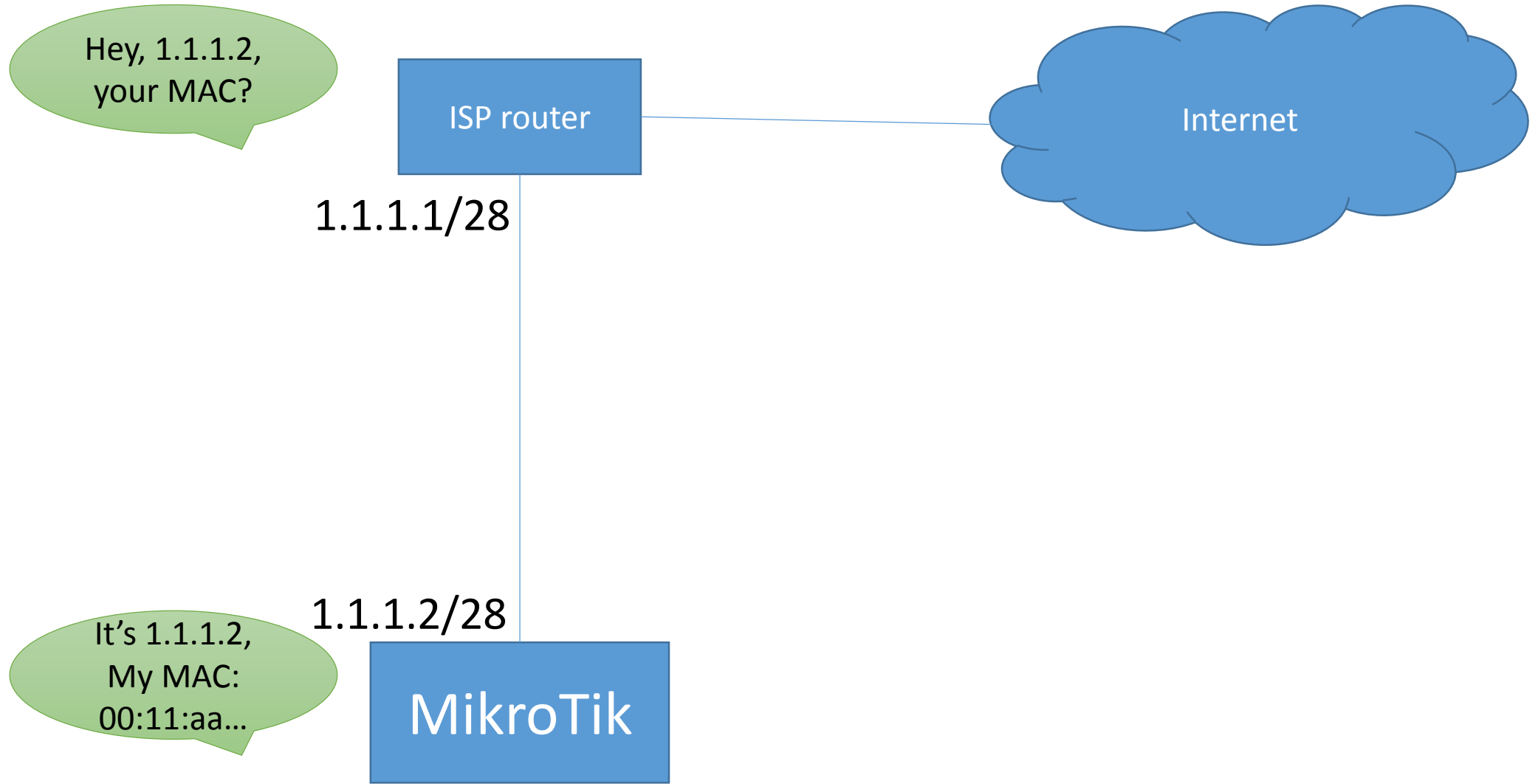
IP and ARP – short introduction

- We add 1.1.1.1 as our default gateway (static route to 0.0.0.0/0)
- We want to send a packet to 8.8.8.8
- MikroTik checks route to 8.8.8.8 – it fits 0.0.0.0/0, so it's via 1.1.1.1
- MikroTik checks route to 1.1.1.1 – it fits 1.1.1.0/28, so it's on ether1
- MikroTik checks 1.1.1.1's MAC address with ARP request
- MikroTik sends the packet to:
 - Destination IP: 8.8.8.8
 - Destination MAC: MAC of 1.1.1.1

IP and ARP – short introduction

- The provider's router (1.1.1.1) does the same.
- When a packet comes to 1.1.1.2, it looks for it in routing table
- It's directly connected (1.1.1.0/28) on its ethernet interface
- It asks for MAC address of 1.1.1.2 using ARP request
- It sends packet to 1.1.1.2 using the MAC address it got

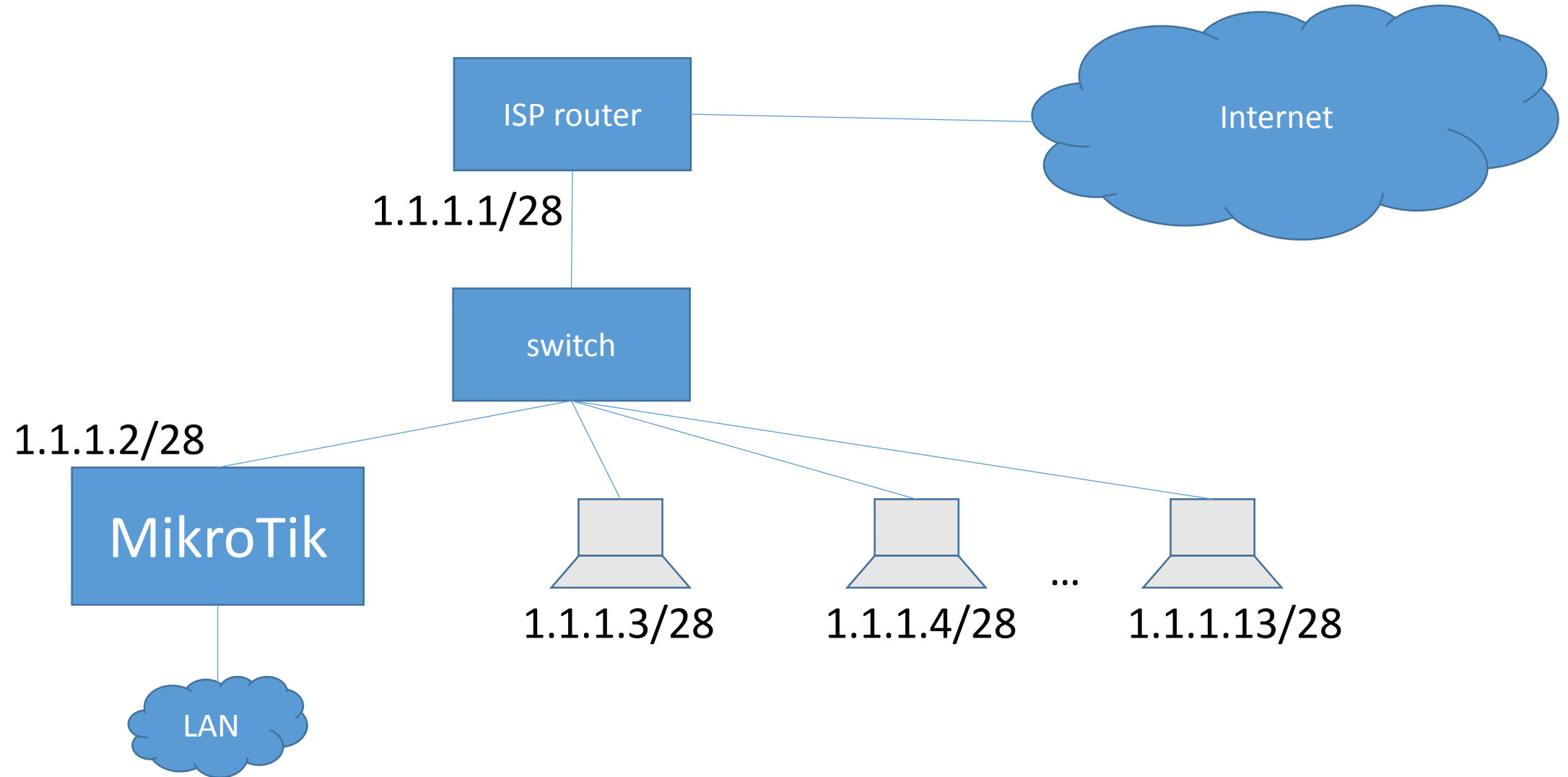
IP and ARP – short introduction



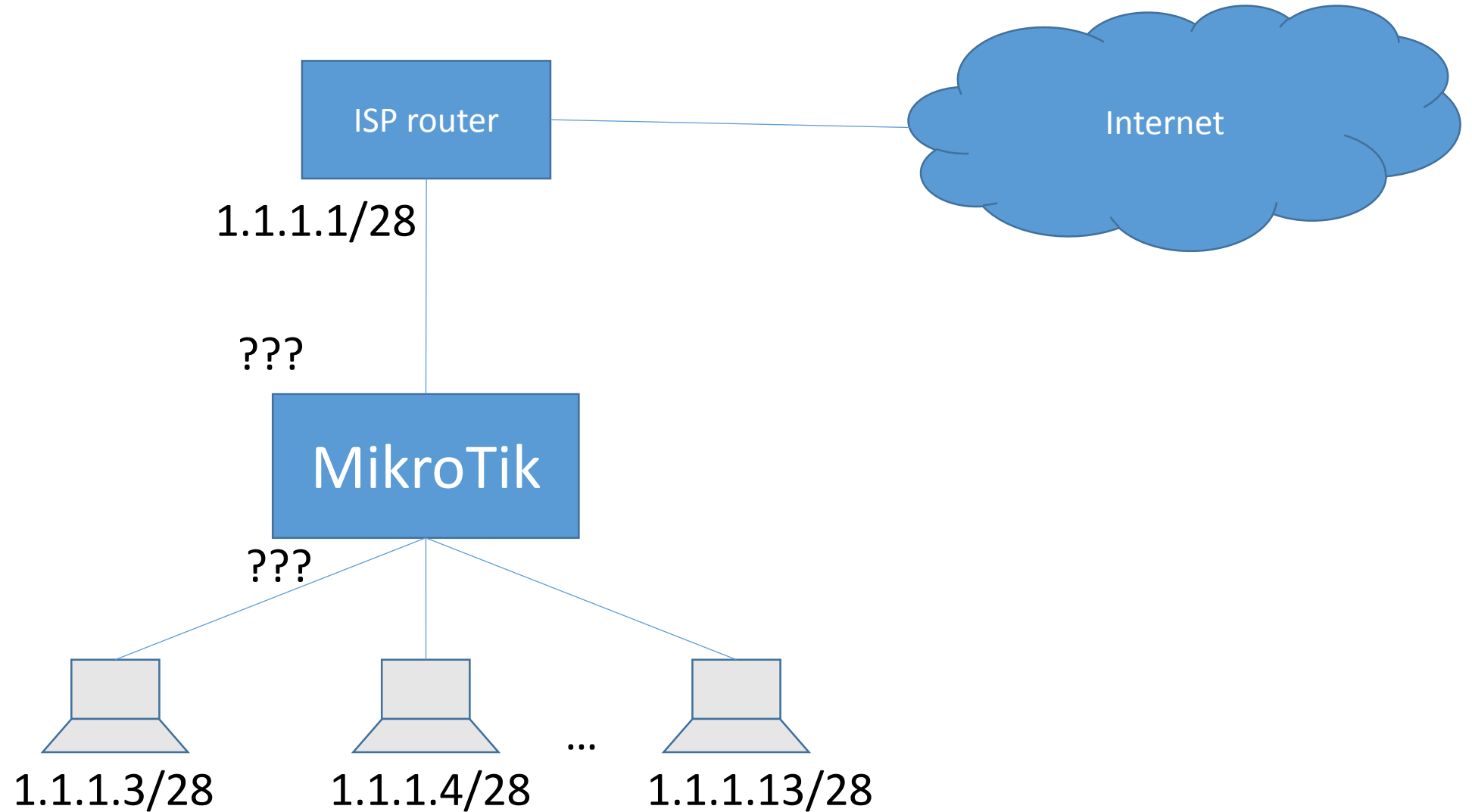
Problem 1 – IP pool from provider

- ISP gives us an IP pool 1.1.1.0/28, with 1.1.1.1 being provider's router
 - We can use any IP between .2 and .14
 - It gives us 13 “usable” IP addresses
-
- Only one problem – the IP addresses are in one LAN

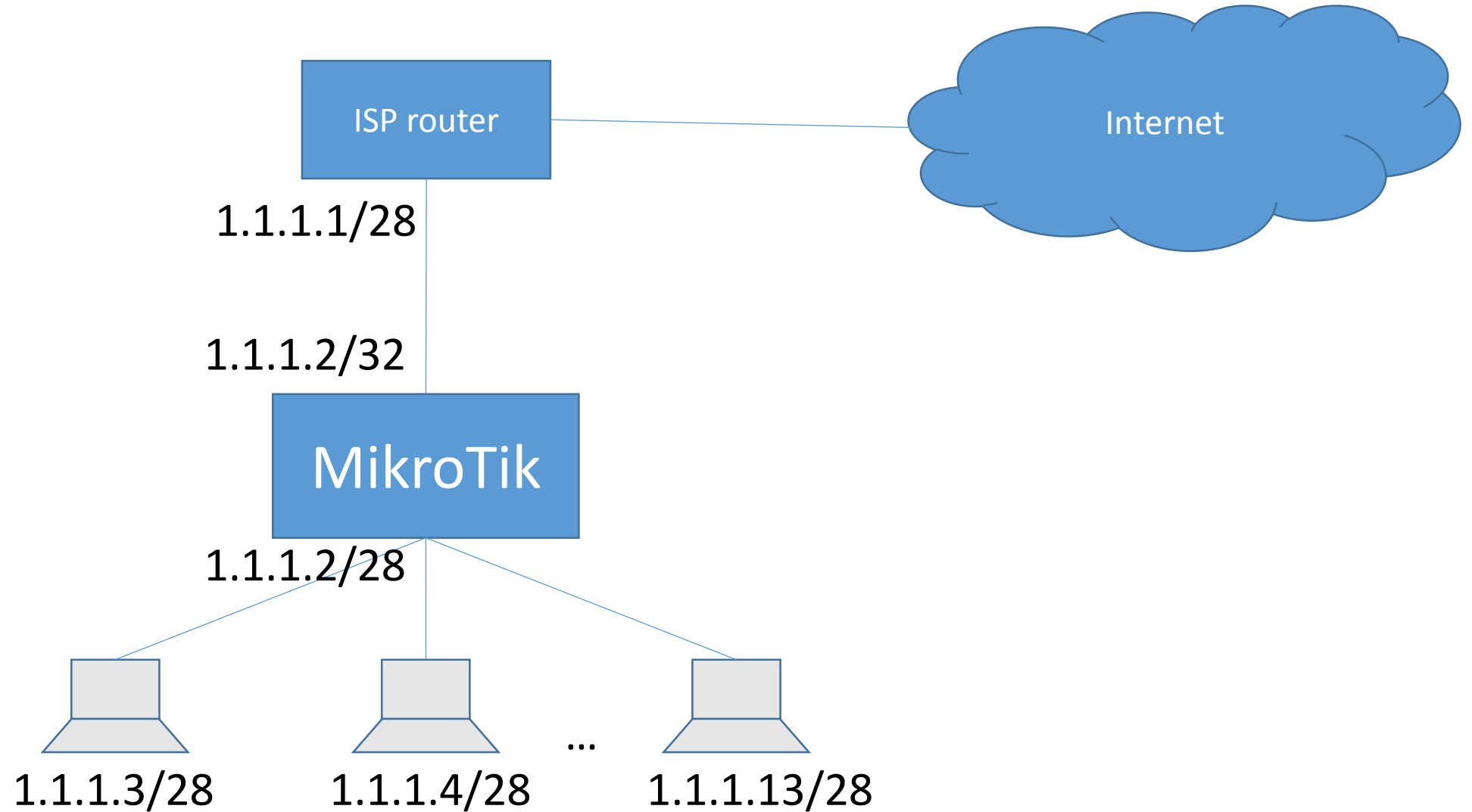
Problem 1 – IP pool from provider



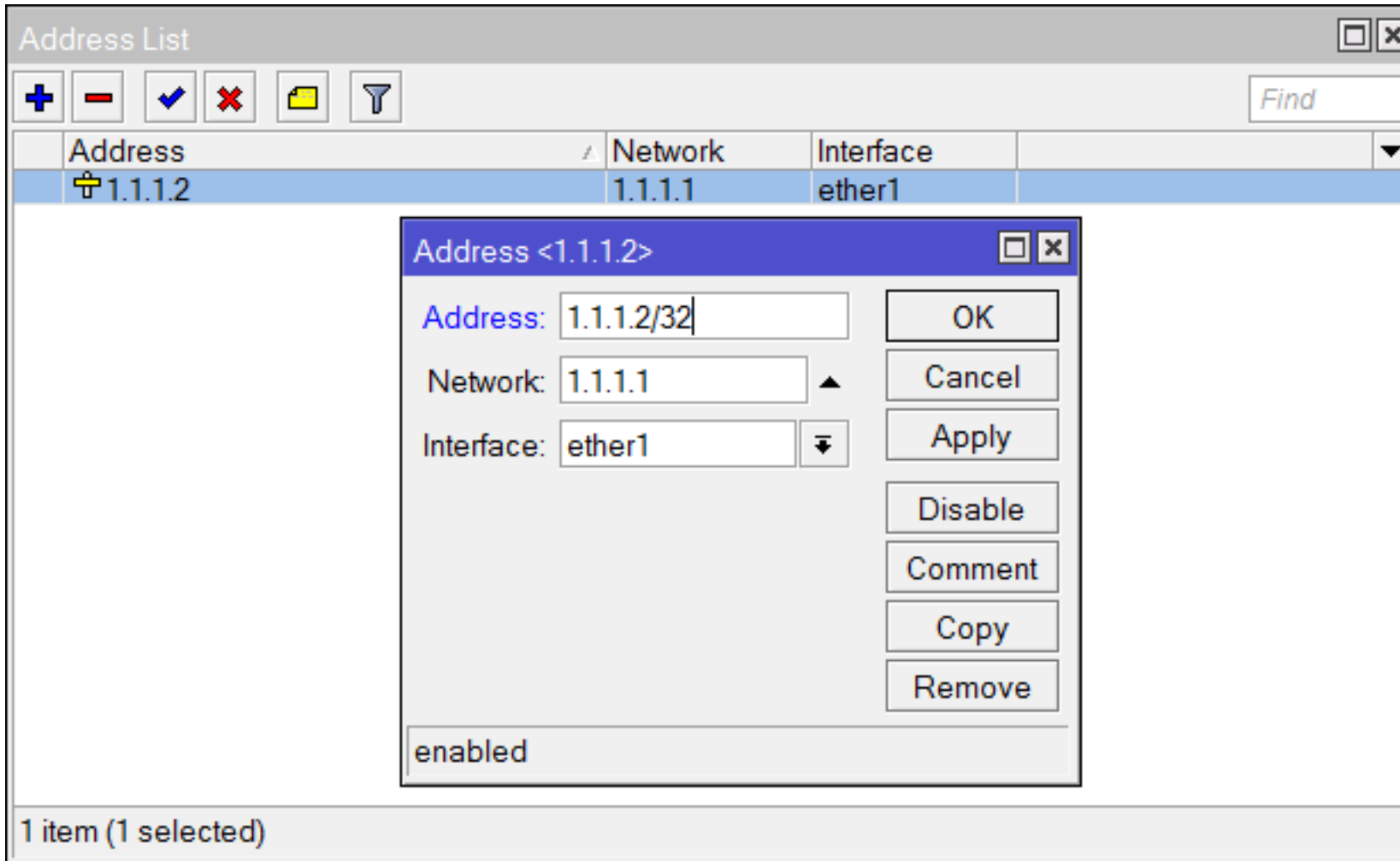
Problem 1 – IP pool from provider



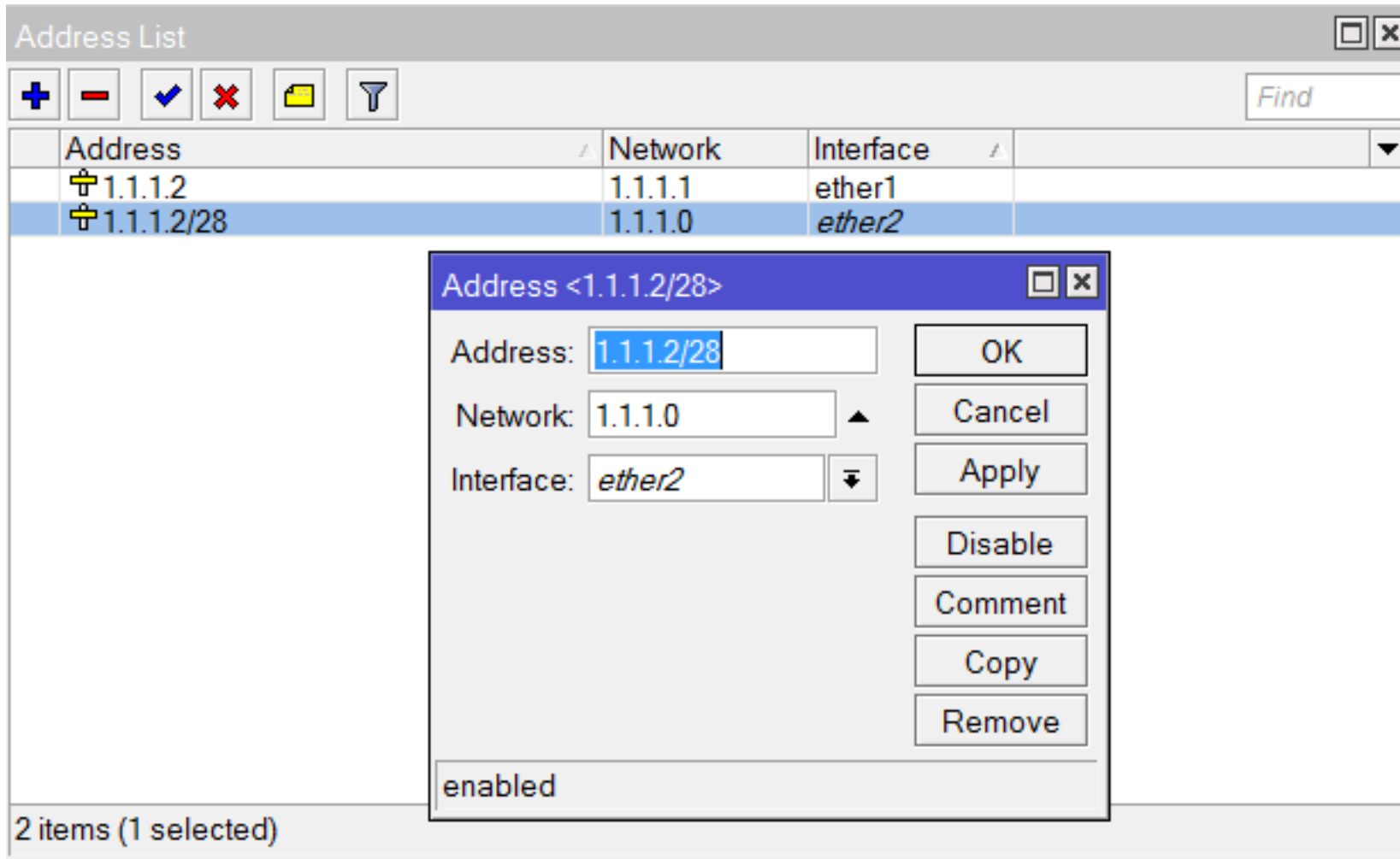
Problem 1 – IP pool from provider



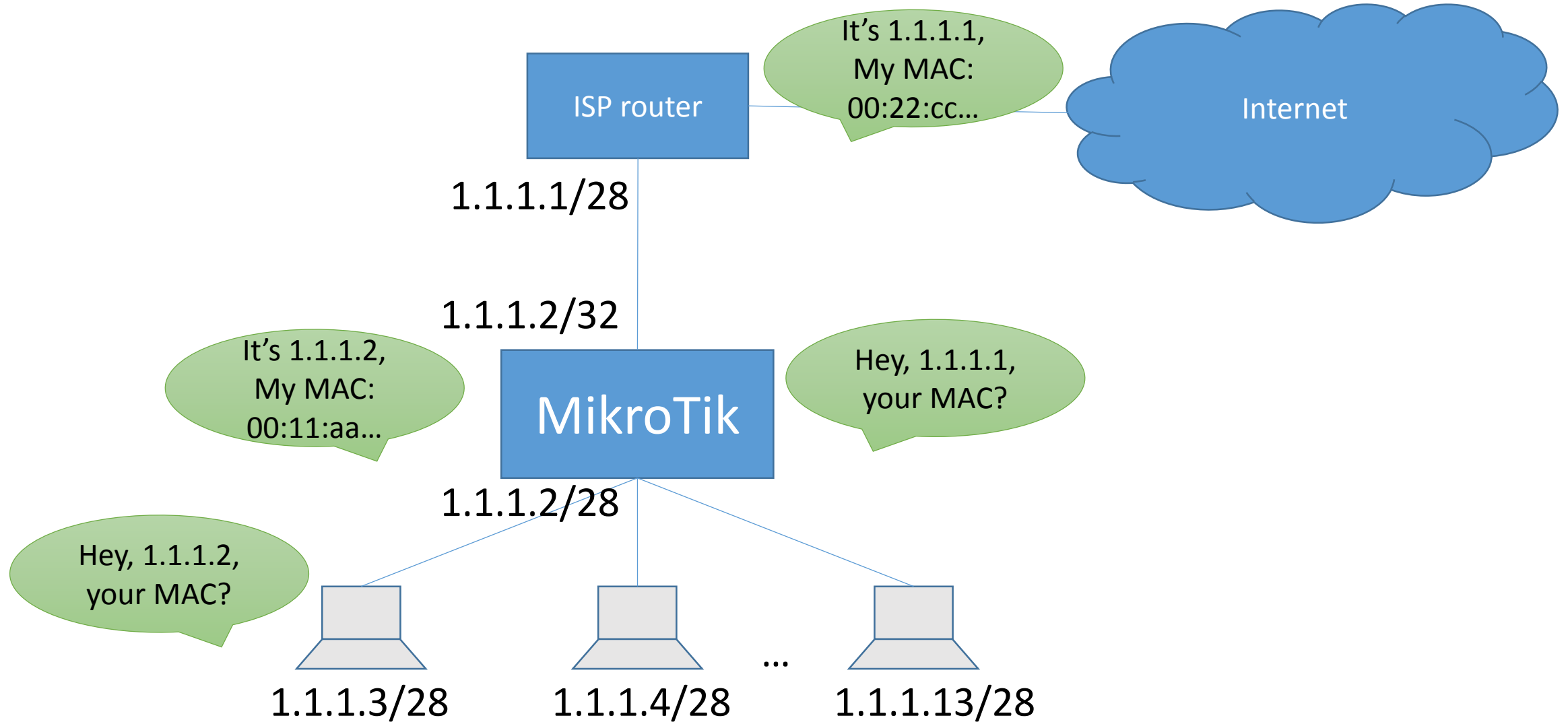
Problem 1 – IP pool from provider



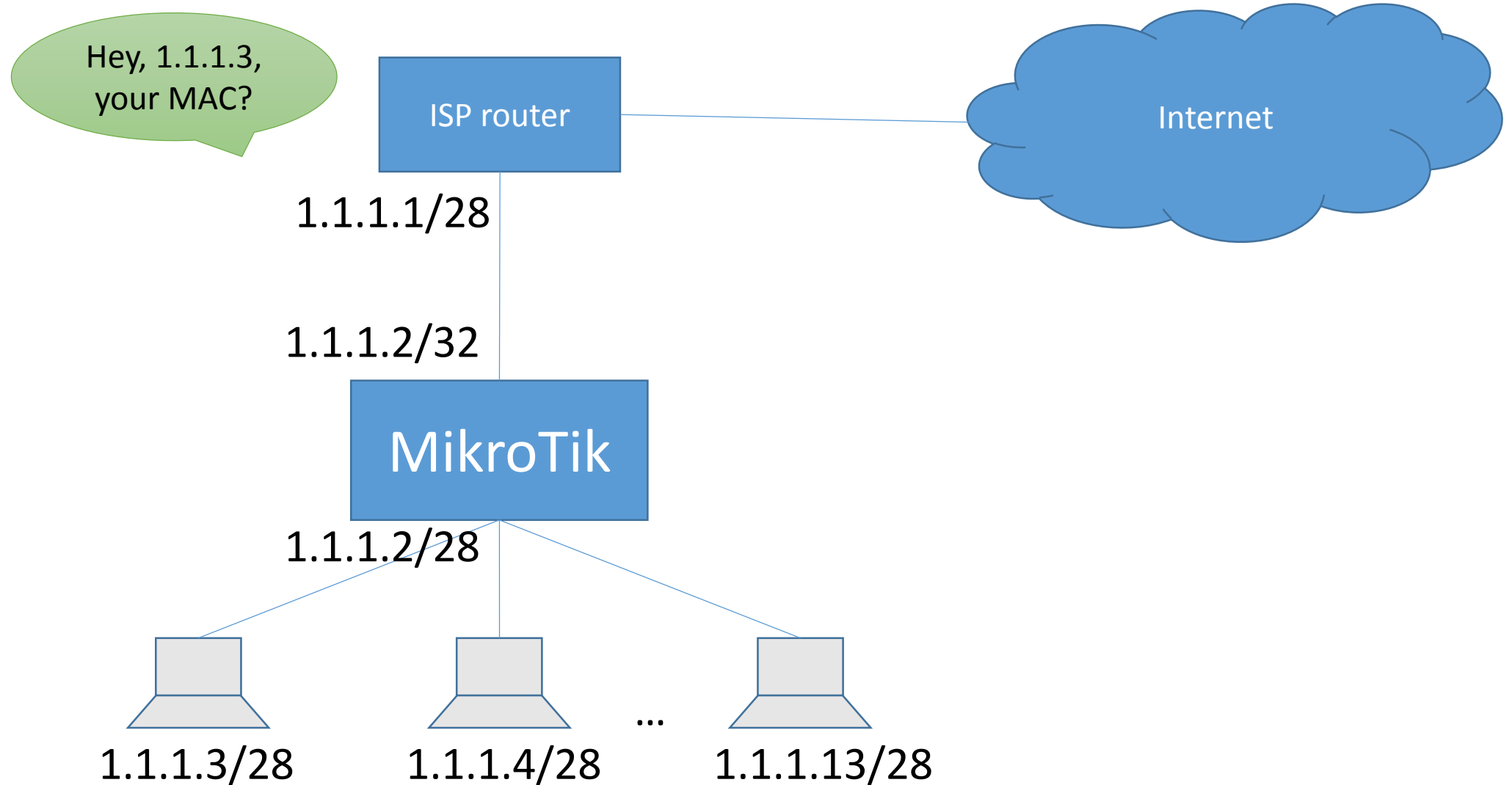
Problem 1 – IP pool from provider



Problem 1 – IP pool from provider



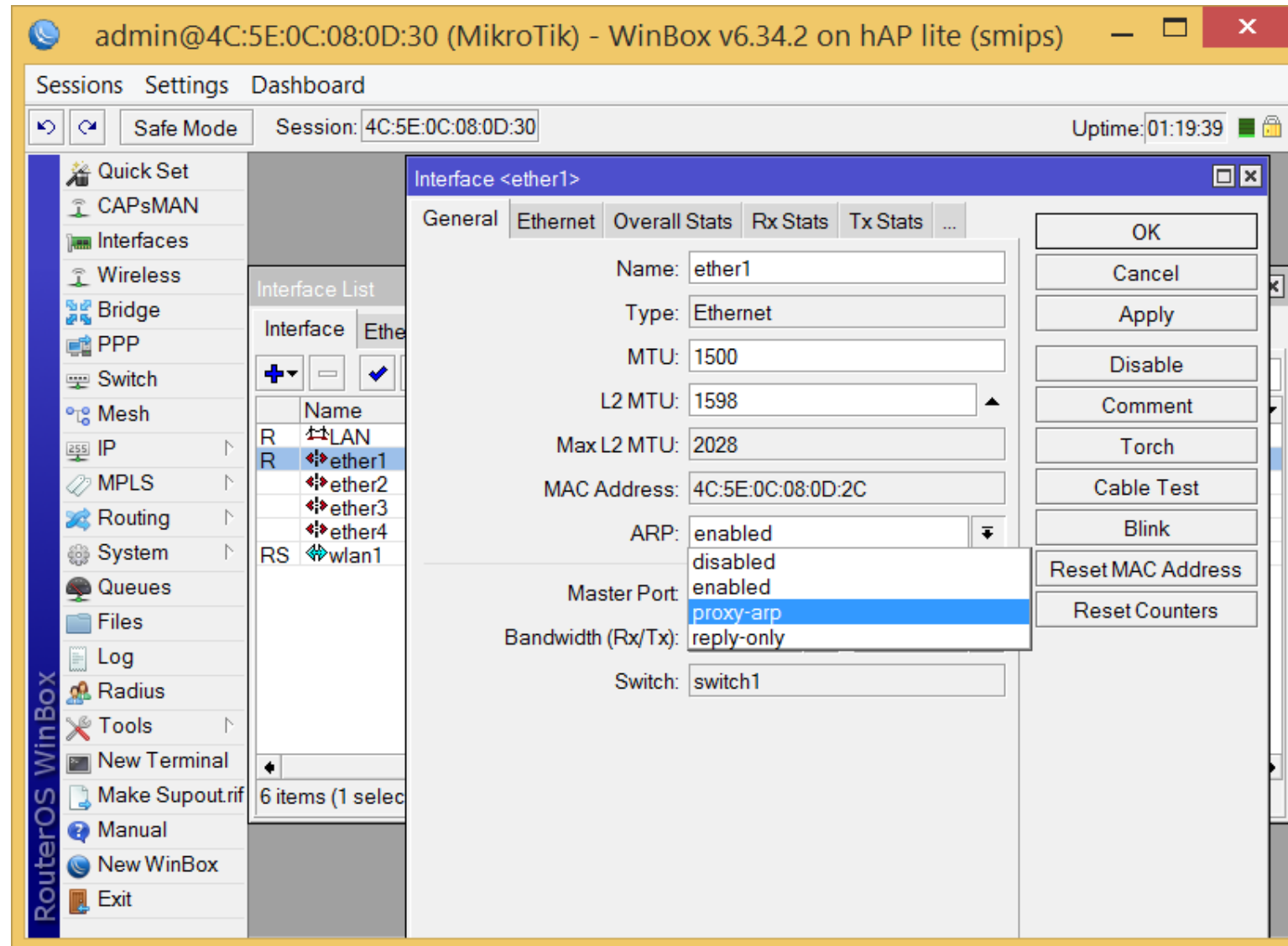
Problem 1 – IP pool from provider



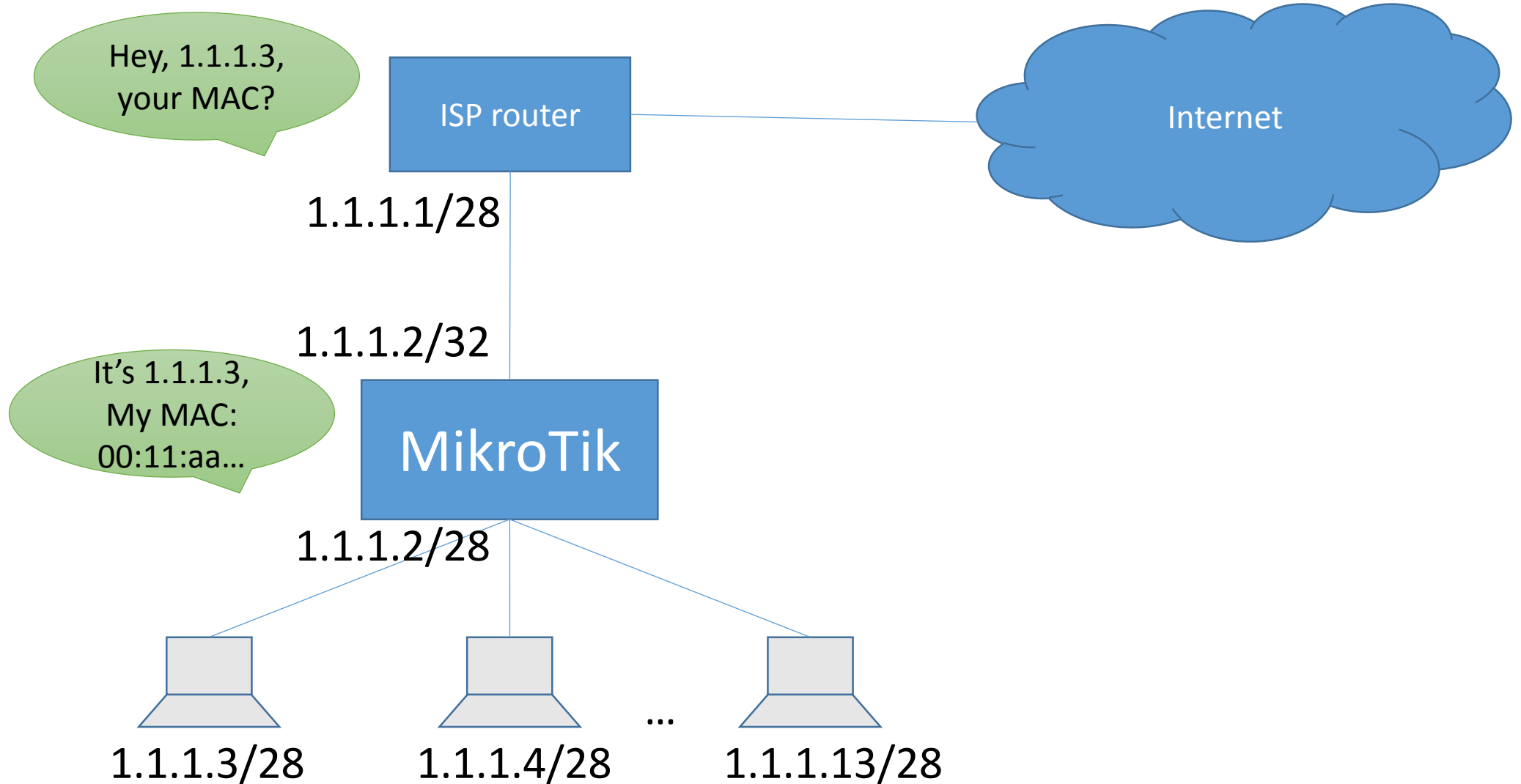
Problem 1 – IP pool from provider

- Only thing we miss is proxy-arp on ether1
- MikroTik will respond to any ARP request on ether1 with its own MAC address if the requested IP address is on a network directly connected to the MikroTik

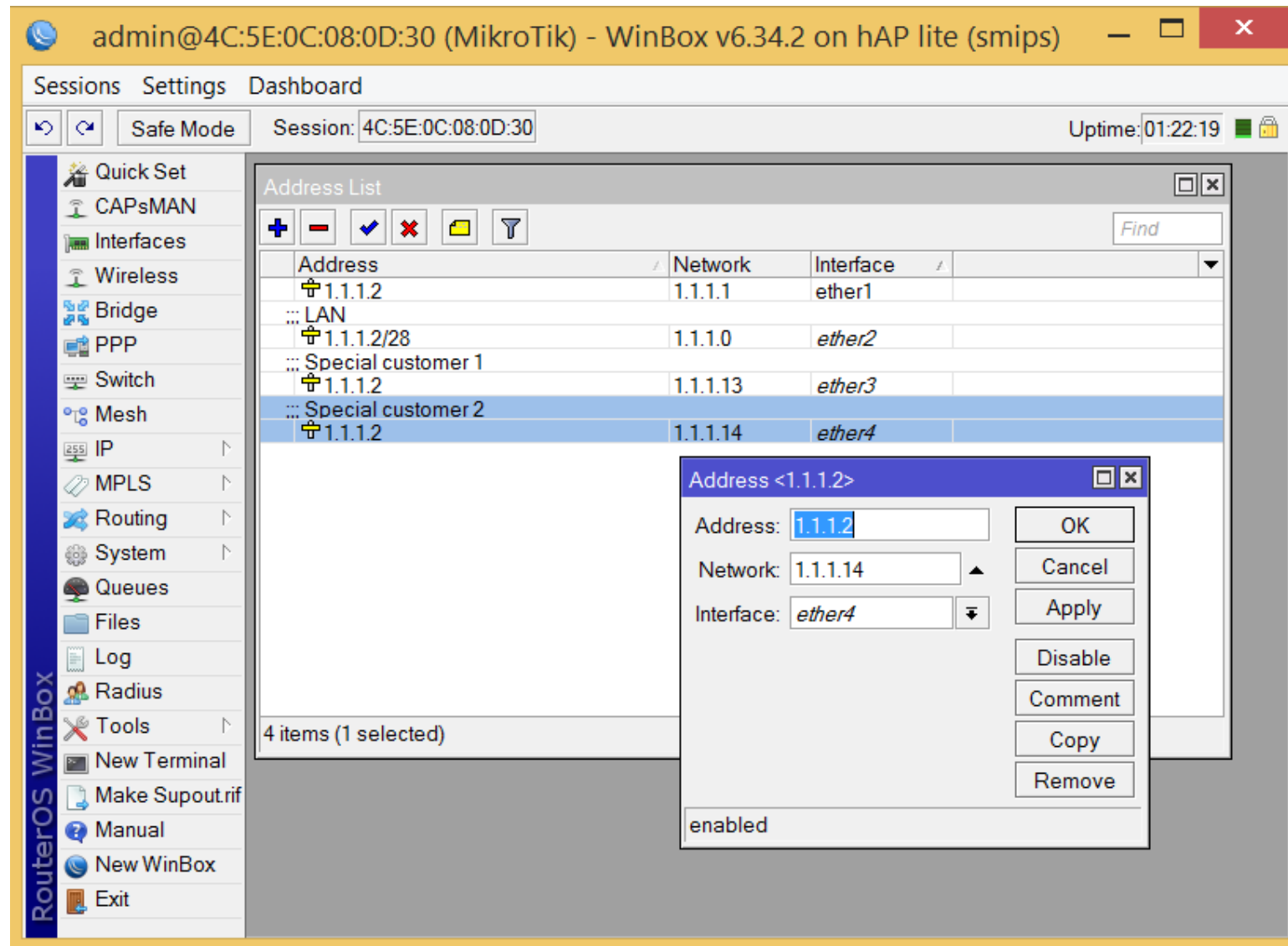
Problem 1 – IP pool from provider



Problem 1 – IP pool from provider



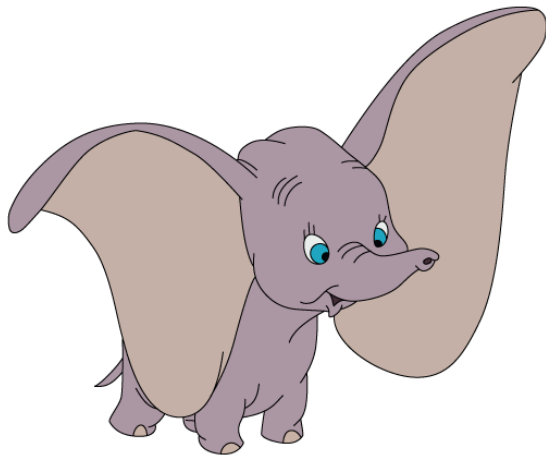
We can do even more!



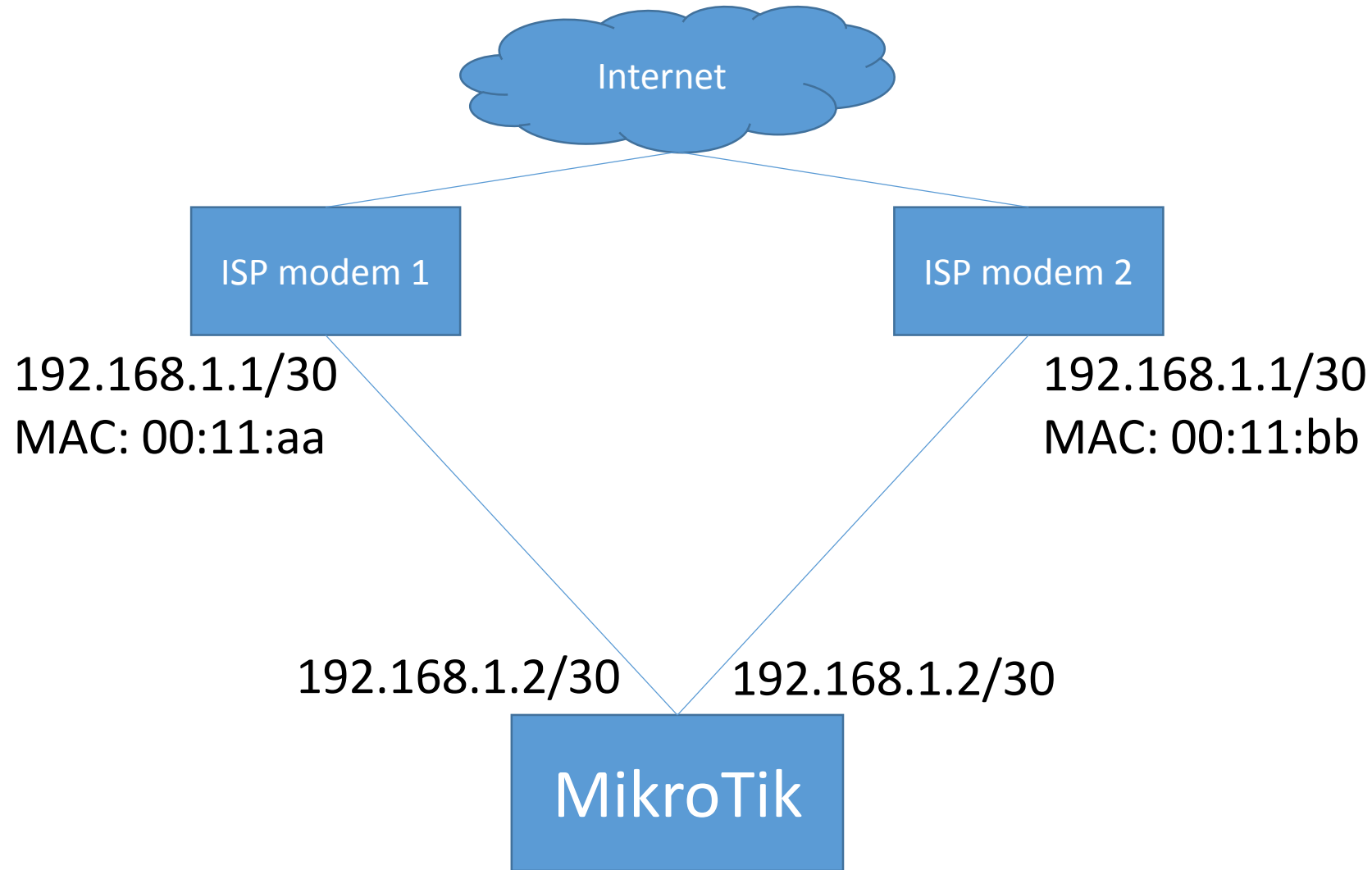
We can do even more!

- We can add /32 addresses and proxy-arp for some special machines on separate ethernet ports
- The machines will think they are part of /28 network, we will treat them as individual networks
- The ethernet ports will not be bridged, treated as separate interfaces
- Example – we configure different DHCP server on each interface
- DHCP server giving only 1 IP address on 1 port, to any connected MAC

And now for something
completely... crazy!



2 interfaces with the same IP address?



2 interfaces with the same IP address?

The screenshot shows the MikroTik WinBox interface. The top bar indicates the user is 'admin@4C:5E:0C:08:0D:30 (MikroTik)' using 'WinBox v6.34.2 on hAP lite (smips)'. The left sidebar contains various configuration options like Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, Routing, System, Queues, Files, Log, Radius, Tools, New Terminal, Make Supout.rif, Manual, New WinBox, and Exit. The main panel displays the 'Address List' and 'Route List' windows.

Address List

Address	Network	Interface
10.0.0.1/24	10.0.0.0	LAN
192.168.1.2/30	192.168.1.0	WAN1
192.168.1.2/30	192.168.1.0	WAN2

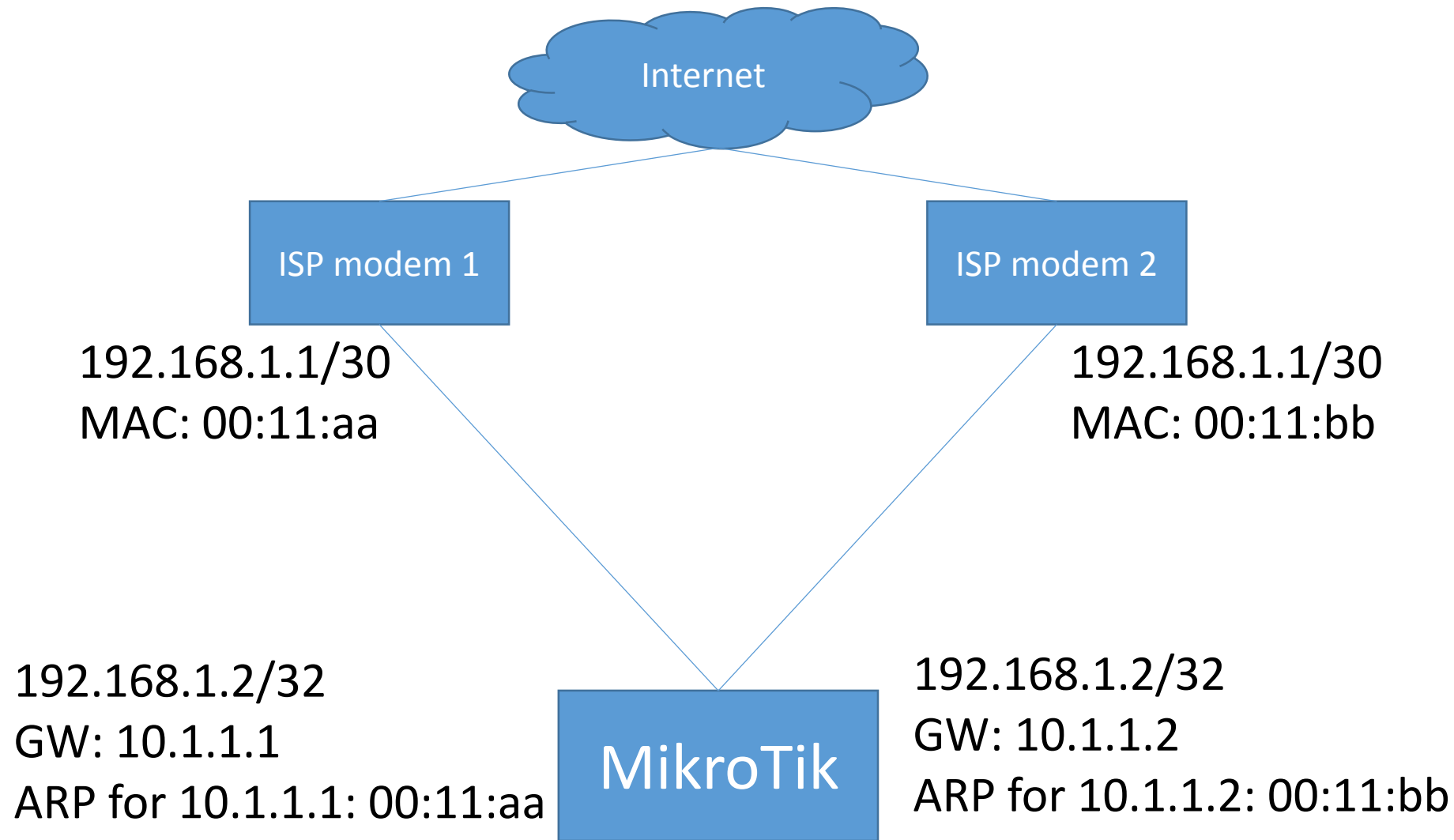
Route List

Routes	Next hops	Rules	VRF
AS	0.0.0.0	192.168.1.1 reachable WAN1	1
DAC	10.0.0.0/24	LAN reachable	0
DAC	192.168.1.0/30	WAN2 reachable, WAN1 reachable	0

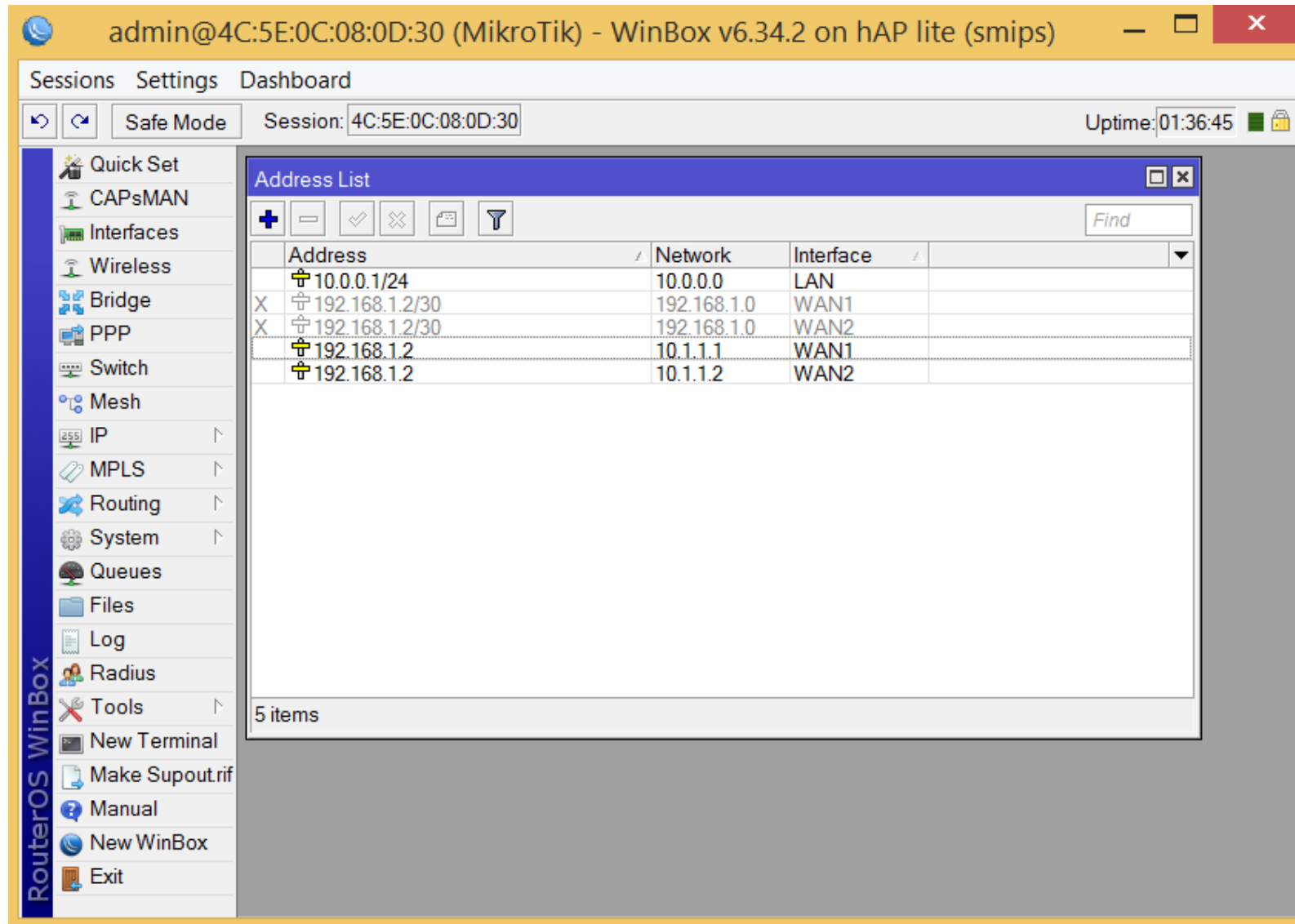
IP and ARP – short introduction (reminder)

- We add 1.1.1.1 as our default gateway (static route to 0.0.0.0/0)
- We want to send a packet to 8.8.8.8
- MikroTik checks route to 8.8.8.8 – it fits 0.0.0.0/0, so it's via 1.1.1.1
- MikroTik checks route to 1.1.1.1 – it fits 1.1.1.0/28, so it's on ether1
- MikroTik checks 1.1.1.1's MAC address with ARP request
- MikroTik sends the packet to:
 - Destination IP: 8.8.8.8
 - Destination MAC: MAC of 1.1.1.1
- **We configure IP of gateway only to use it's MAC!!!**

2 interfaces with the same IP address?



2 interfaces with the same IP address?



2 interfaces with the same IP address?

The screenshot shows the MikroTik WinBox interface. The top bar indicates the user is 'admin@4C:5E:0C:08:0D:30 (MikroTik)' using 'WinBox v6.34.2 on hAP lite (smips)'. The 'Sessions' tab is active, showing 'Safe Mode' and 'Session: 4C:5E:0C:08:0D:30' with an 'Uptime: 01:40:12'.

The left sidebar contains a menu with options: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, Routing, System, Queues, Files, Log, Radius, Tools, New Terminal, Make Supout.rif, Manual, New WinBox, and Exit.

The main window displays the 'Address List' table, which shows 5 items (1 selected). The table has columns for Address, Network, and Interface. The selected row is 192.168.1.2 on WAN1.

Address	Network	Interface
10.0.0.1/24	10.0.0.0	LAN
192.168.1.2/30	192.168.1.0	WAN1
192.168.1.2/30	192.168.1.0	WAN2
192.168.1.2	10.1.1.1	WAN1
192.168.1.2	10.1.1.2	WAN2

An 'ARP List' window is open, showing 2 items. The table has columns for IP Address, MAC Address, and Interface. The selected row is 10.1.1.1 on WAN1.

IP Address	MAC Address	Interface
10.1.1.1	00:00:00:00:00:11	WAN1
10.1.1.2	00:00:00:00:00:22	WAN2

2 interfaces with the same IP address?

The screenshot shows the MikroTik WinBox v6.34.2 interface. The top bar indicates the user is 'admin@4C:5E:0C:08:0D:30 (MikroTik)' and the device is 'hAP lite (smips)'. The 'Sessions' tab is active, showing 'Safe Mode' and 'Session: 4C:5E:0C:08:0D:30'. The 'Uptime' is 01:41:26.

The left sidebar contains a menu with the following items: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, Routing, System, Queues, Files, Log, Radius, Tools, New Terminal, Make Supout.rif, Manual, New WinBox, and Exit.

The main window displays the 'Address List' and 'Route List' windows.

Address List:

Address	Network	Interface
10.0.0.1/24	10.0.0.0	LAN
X 192.168.1.2/30	192.168.1.0	WAN1
X 192.168.1.2/30	192.168.1.0	WAN2
192.168.1.2	10.1.1.1	WAN1

Route List:

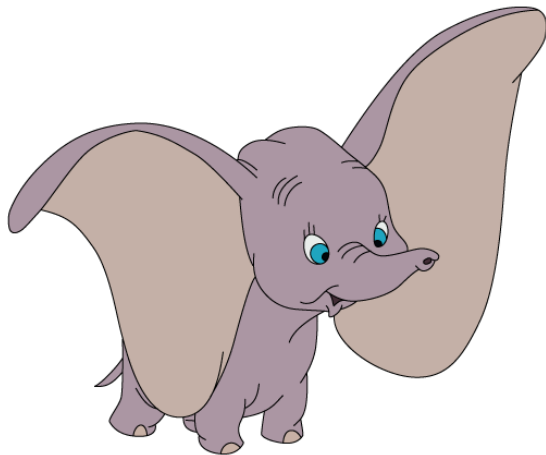
Routes	Next hops	Rules	VRF
AS	0.0.0.0/0	10.1.1.1 reachable WAN1	1 wan1
AS	0.0.0.0/0	10.1.1.2 reachable WAN2	1 wan2
DAC	10.0.0.0/24	LAN reachable	0
DAC	10.1.1.1	WAN1 reachable	0
DAC	10.1.1.2	WAN2 reachable	0

The 'Route List' window shows 5 items.

2 interfaces with the same IP address?

- We can use the 2 gateways simultaneously
- We can use them for different routing marks and do load balancing
- We can do a normal failover if one of the links goes down (but not using “check-gateway”)
- We can write a script to periodically check the MAC addresses for ARP
- If the IP addresses are given by DHCP, we can also write the script to set the 2 gateways.

Questions? Comments?



Thanks!

