



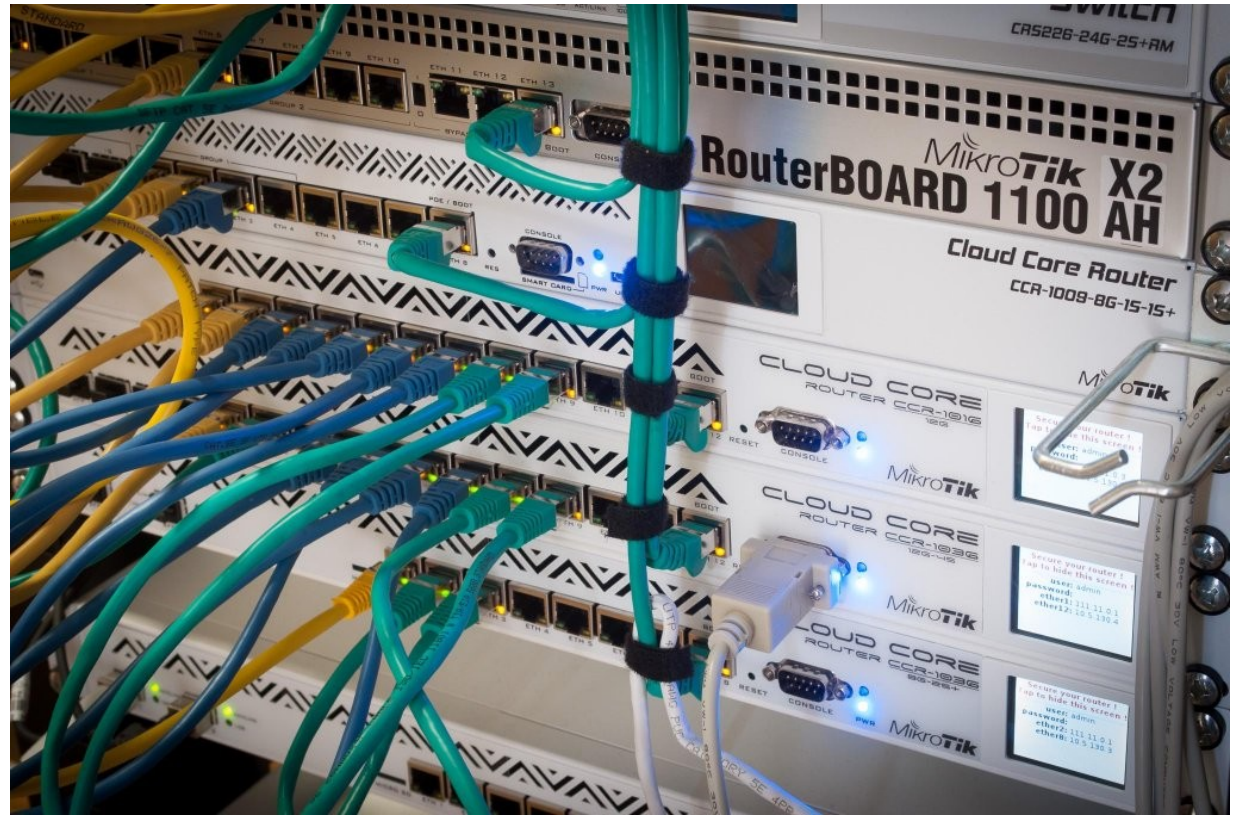
# Построение распределенных локальных сетей

Сергей Осауленко

Киев, Украина

# Почему Mikrotik?

1. Цена
2. Mikrotik software
3. Модельный ряд
4. Опыт использования



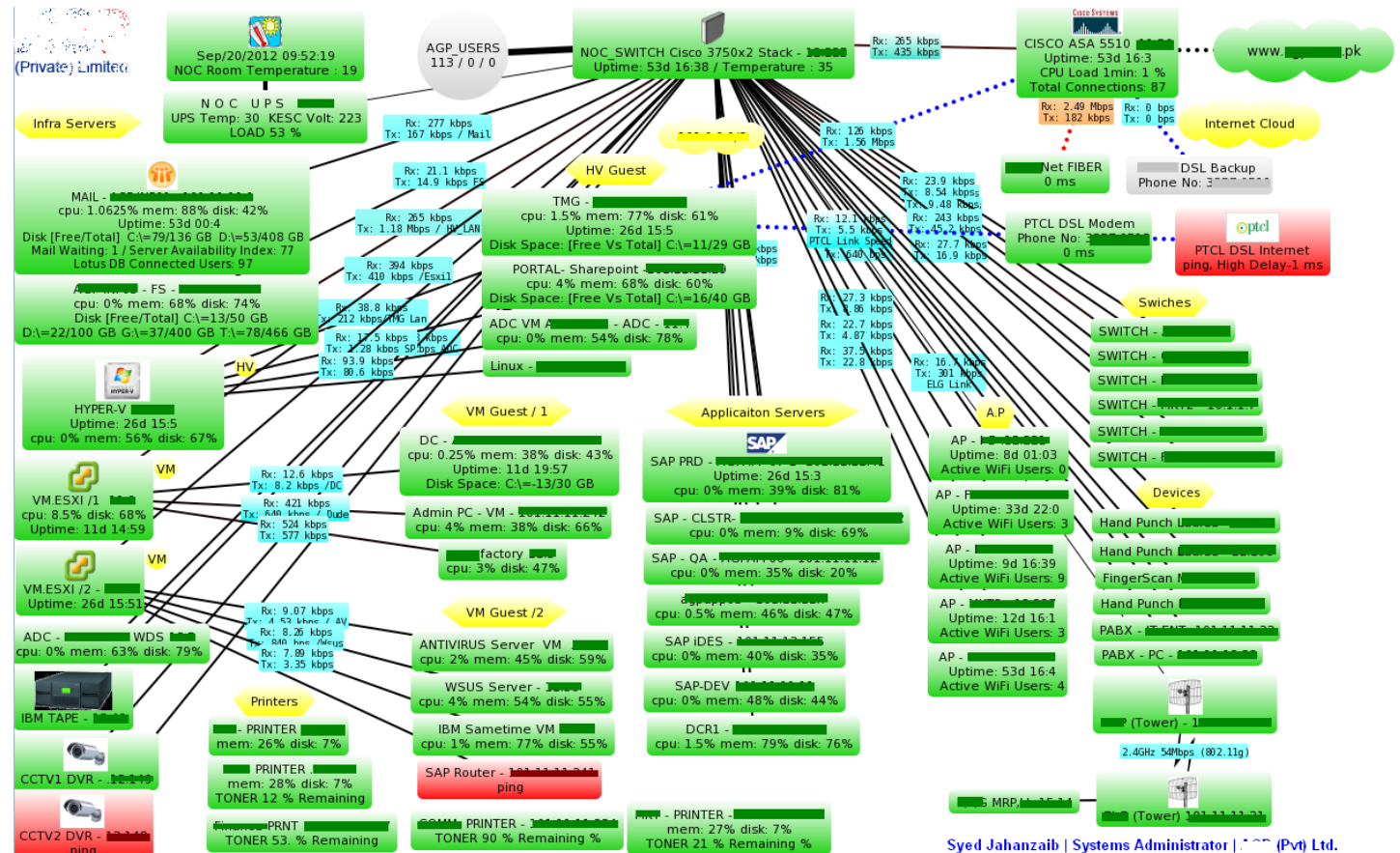
# Цена

- Сравнительная таблица цен на 10 устройств

| Название | MikroTik          | Цена     | Аналоги        | Цена  |
|----------|-------------------|----------|----------------|-------|
| SONO     | hAP lite(RB941)   | \$21     | TL-WR720N      | \$14  |
|          | RB951G-2HnD       | \$80     | Keenetic Extra | \$59  |
|          | hAP ac (RB952)    | \$50     | EA2700         | \$57  |
| wireless | mAP               | \$45     | UniFi          | \$66  |
|          | SXT 5ac           | \$109    | 5m-25          | \$199 |
|          | Meta1 9HPn        | \$129    | Loco M9        | \$160 |
| Cable    | CRS125-24G-1S-RM  | \$199    | TL-SG3424P     | \$493 |
|          | RB3011UiAS-RM     | \$179    | RV082          | \$238 |
|          | CCR1009-8G-1S-1S+ | \$495.00 | MSR1000        | \$862 |

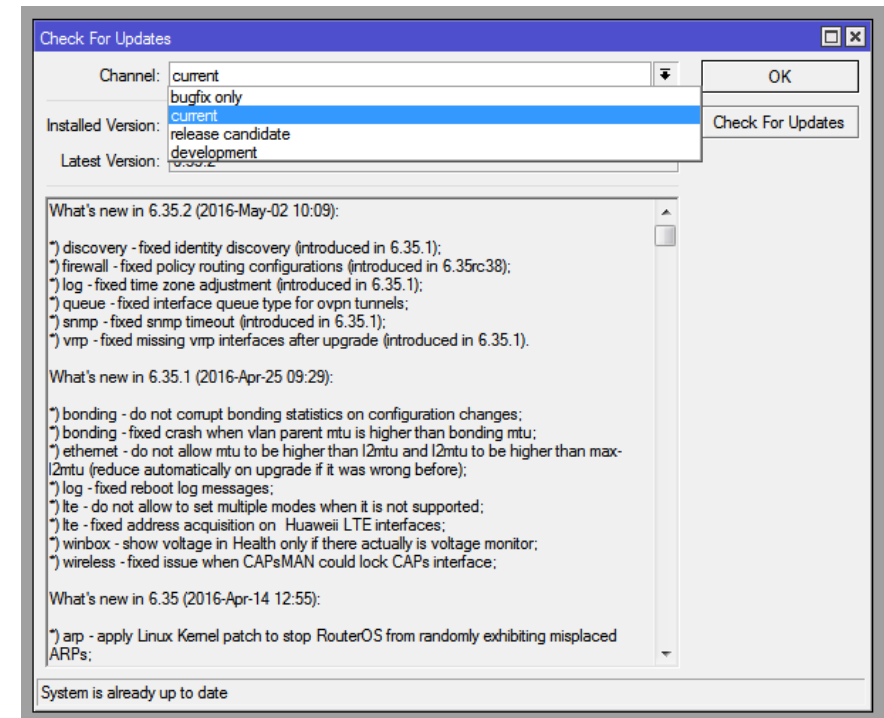
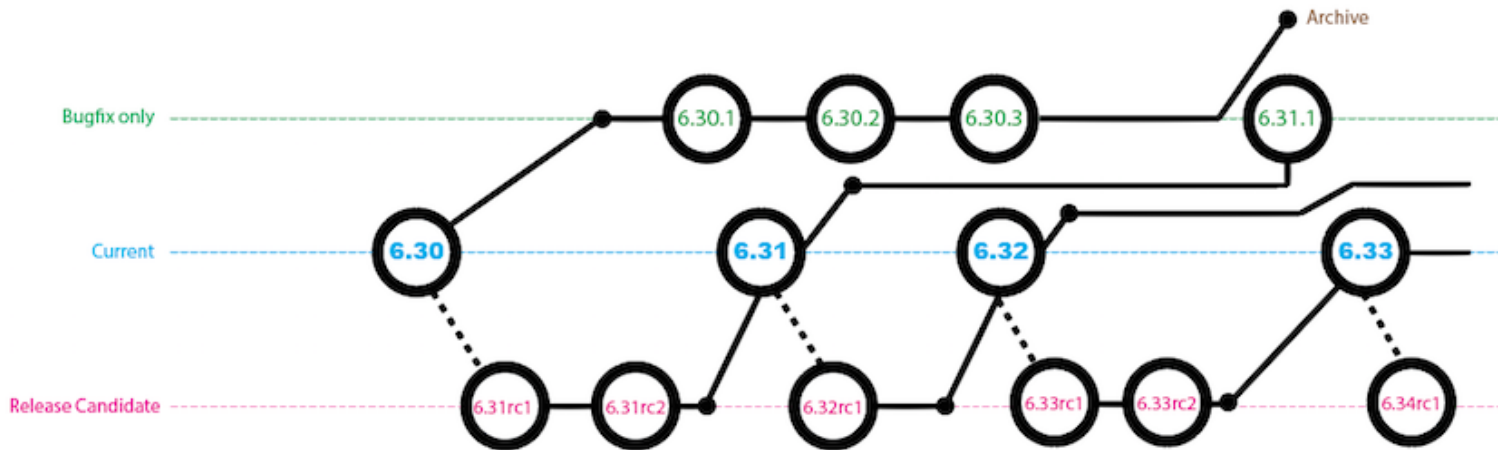
# MikroTik software

- RouterOS
- Winbox
- The Dude
- CAPSMAN
- .etc



# RouterOS – явные преимущества

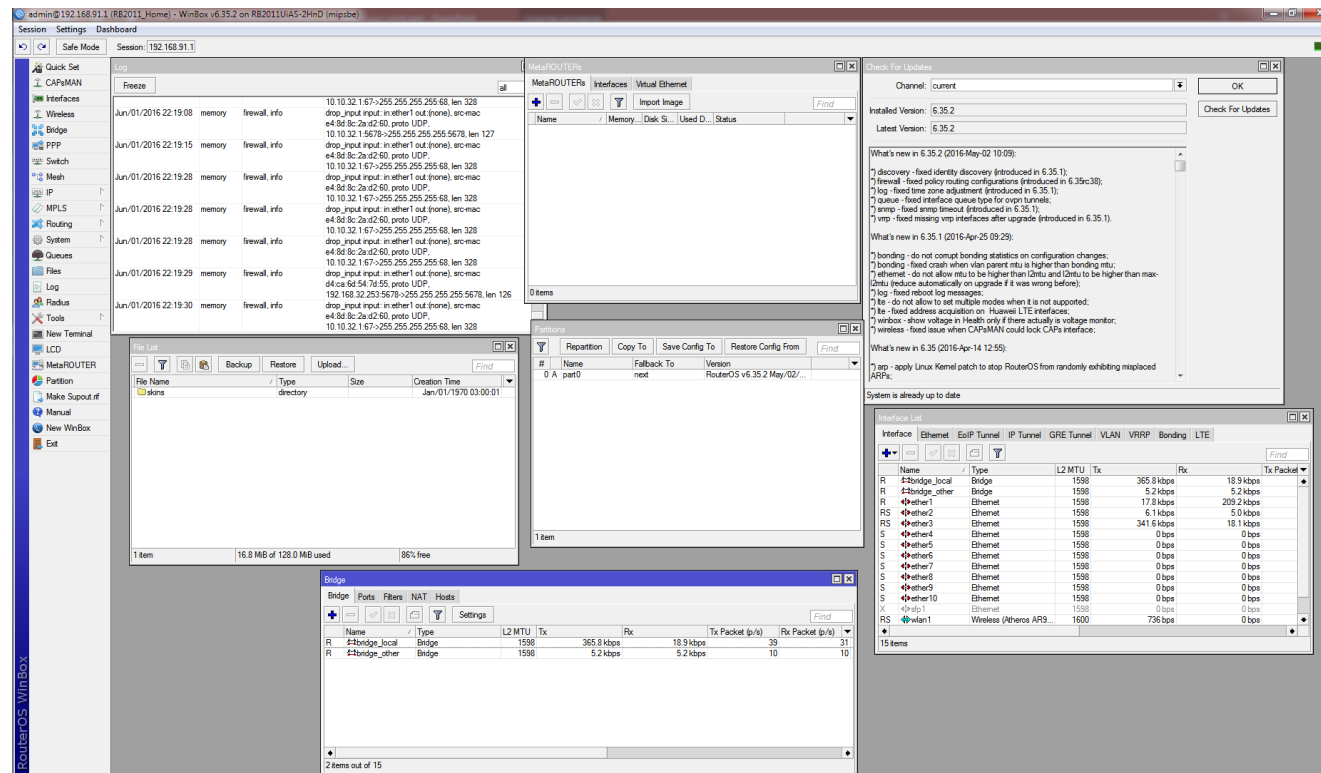
- Простая загрузка прошивки из 4 веток





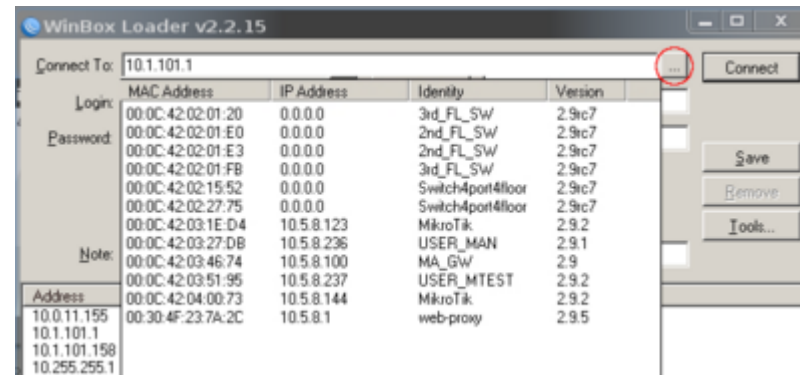
# RouterOS – явные преимущества

- Наличие своего мультиоконного клиента (winbox)



# RouterOS – явные преимущества

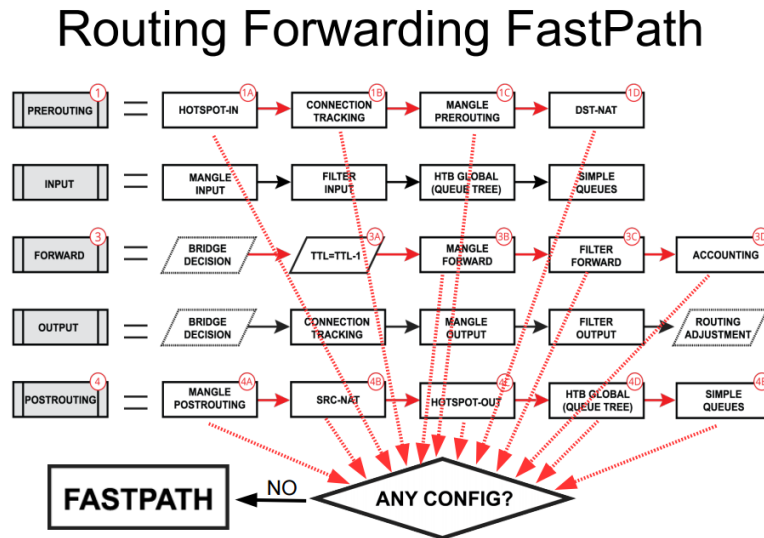
- MAC access
- MAC Telnet Server
- MAC WinBox Server
- MAC Scan
- Mikrotik Neighbor Discovery protocol (MNDP)



# RouterOS – явные преимущества

- Технология Fasttrack connection + Fast Path

| FastTrack                                 |                    |
|-------------------------------------------|--------------------|
| Without                                   | With               |
| 360Mbps                                   | <b>890Mbps</b>     |
| CPU 100%                                  | <b>CPU 86%</b>     |
| 44% CPU on firewall                       | 6% CPU on firewall |
| * tested on RB2011 with single TCP stream |                    |



IP Settings

☒ IP Forward

☒ Send Redirects

☐ Accept Redirects

☒ Secure Redirects

☐ Accept Source Route

☒ Allow Fast Path

☒ Route Cache

RP Filter: no

☐ TCP SynCookies

Max Neighbor Entries: 8192

ARP Timeout: 00:00:30

ICMP Rate Limit: 10

☐ IPv4 Fast Path Active

IPv4 Fast Path Packets: 0

IPv4 Fast Path Bytes: 0 B

☒ IPv4 Fasttrack Active

IPv4 Fasttrack Packets: 121 007 812

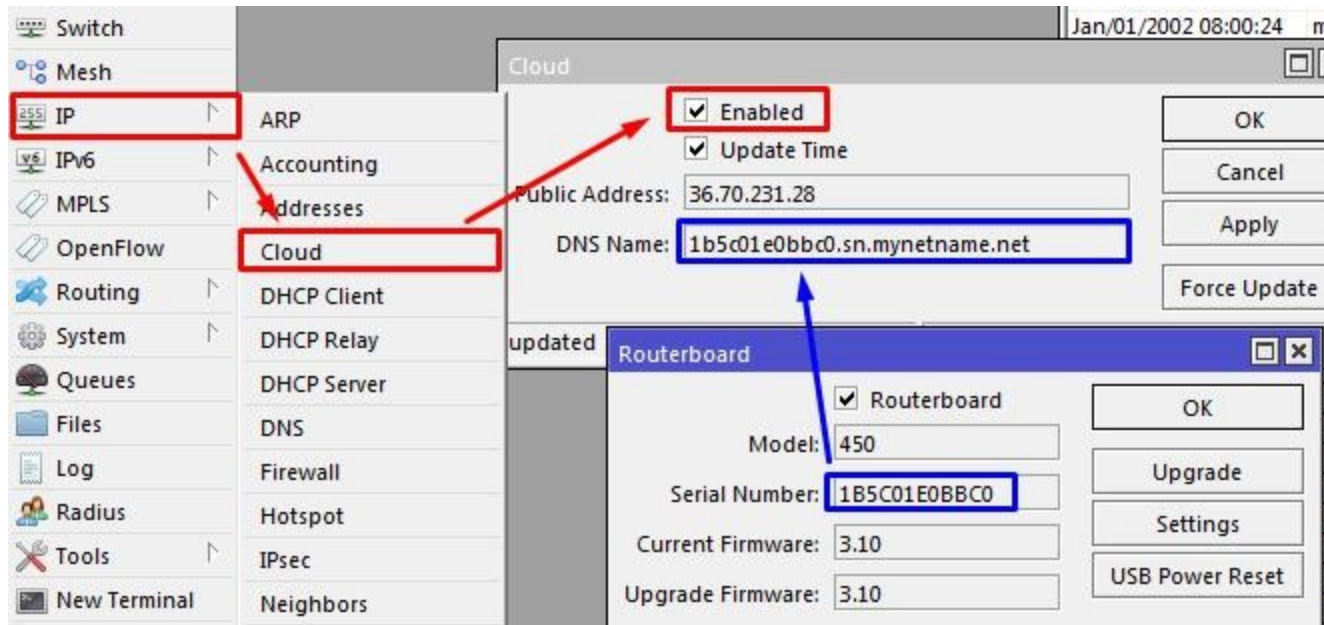
IPv4 Fasttrack Bytes: 84.1 GiB

OK Cancel Apply



# RouterOS – явные преимущества

- IP Cloud



Всё хорошо, что хорошо кончается. [\[нов\]](#)

[Aa](#) — 213 Комментариев / 36 новых; пришло от [psionika](#) 59 дней назад [mikrotik](#) [роутеры](#) [воровство](#) [текст](#) [📄](#) [+](#)

Некоторое время назад, была вскрыта и обворована квартира. При этом, помимо всего остального, был украден и роутер Mikrotik. Естественно полиция, все дела. Но "оперативные мероприятия" результата не дали. Уже попрощались со всем добром. Совет "мониторить" авито (и прочие сайты объявлений) на всплывшие вещи особо не помог.

Так бы можно было попрощаться с техникой если бы не попытались через полтора месяца подключиться к адресу микротика, прибитому через IP-Cloud (аналог DDNS для этой фирмы) к данному роутеру. И тут момент - в данных роутерах, адрес этот неизменяемый и связан с серийным номером. Так что сменить его нельзя. Бинго! Есть подключение!

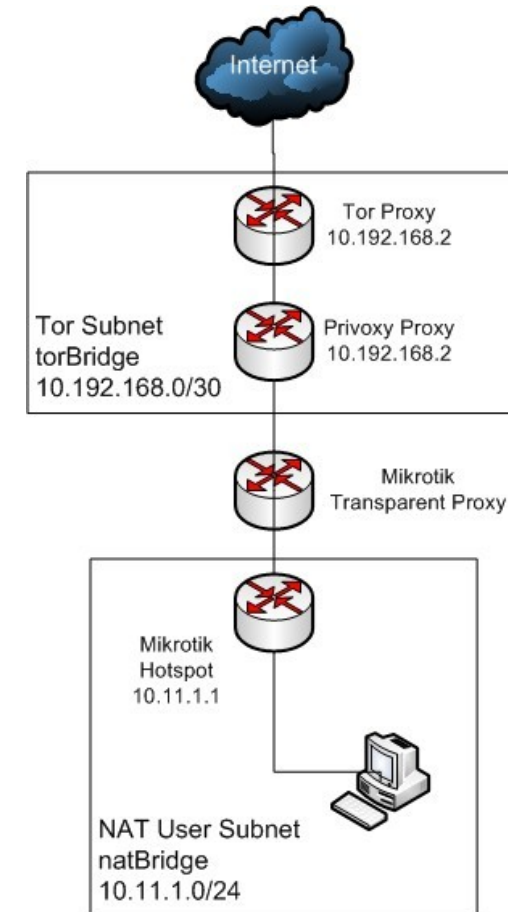
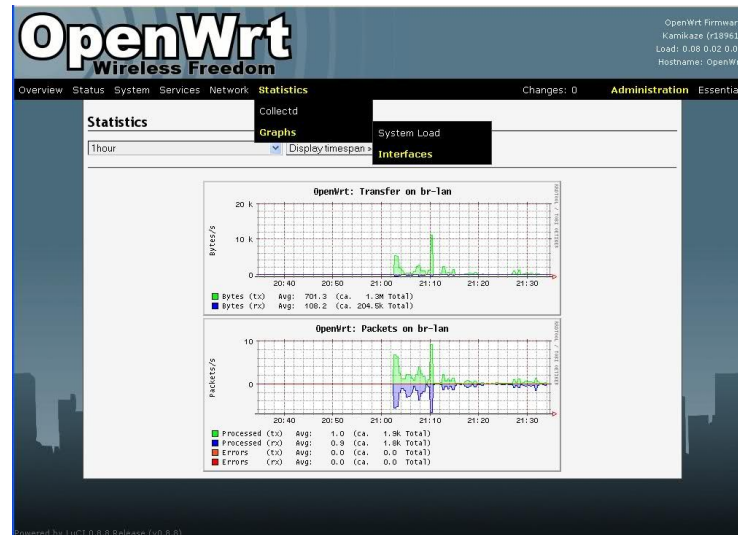
Тут же берём IP-адрес, провайдера, время и со всем этим идём в полицию, где уже делают официальный запрос, на тему, кто сидел в это время с этого айпишника. Получив уже физический адрес, наведались. Там сидит парень, купивший с рук. Но знающий людей у которых купил. Попугали скупкой краденного, роутер вернул, "продавцов" сдал. А уже у тех кто продал, нашли и половину другого ушедшего добра.

К сожалению, вторую половину они уже распродали, но возврат даже оставшихся вещей уже хорошо :)

▲▼ свернуть

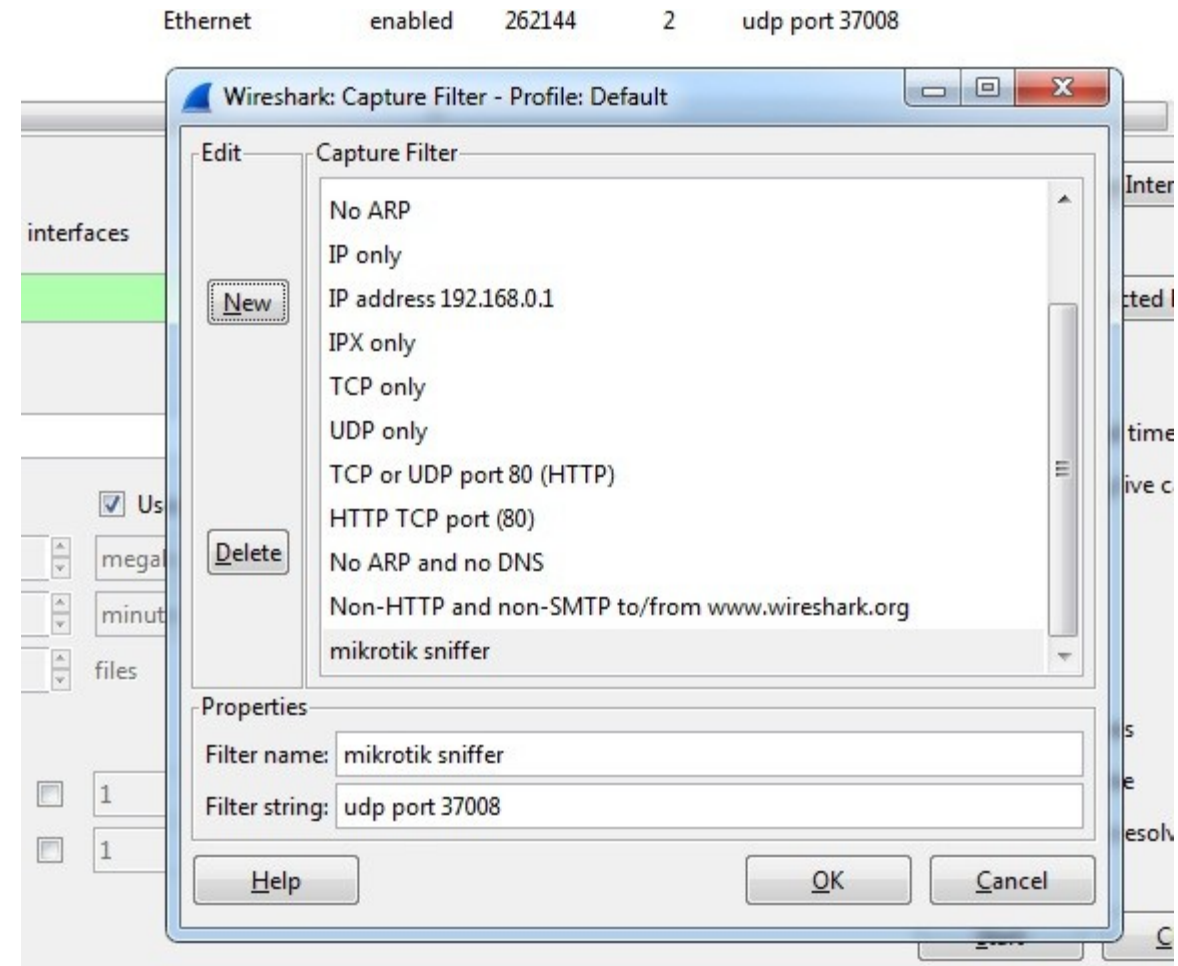
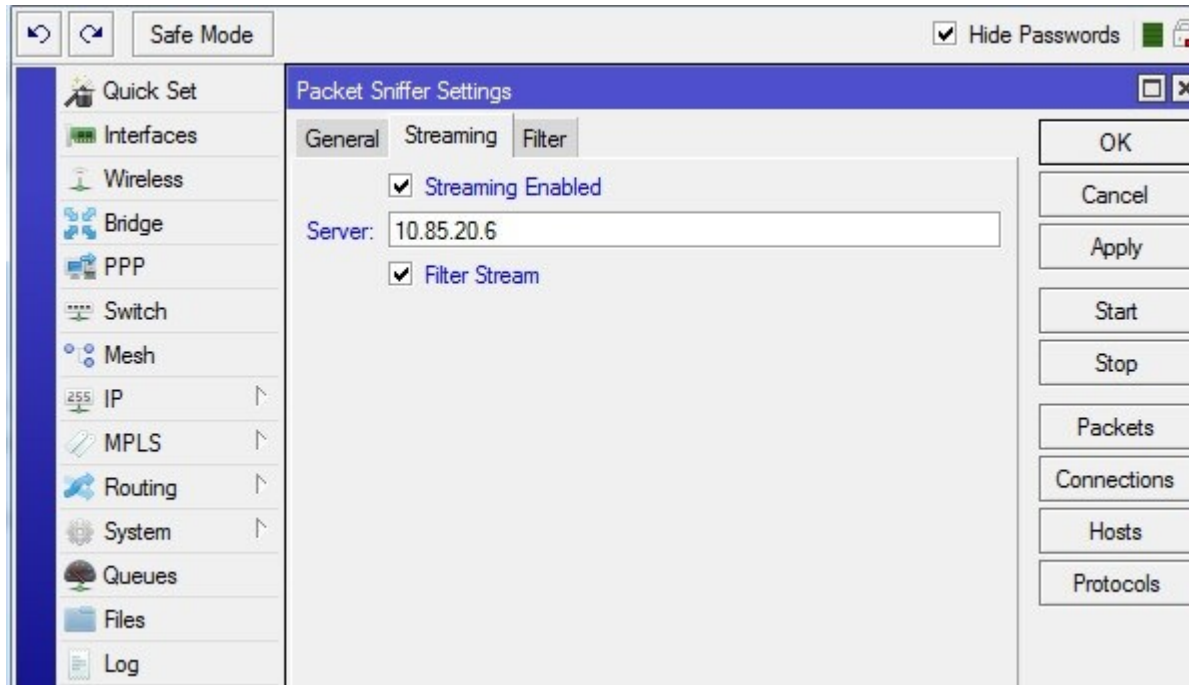
# RouterOS – явные преимущества

- MetaRouter



# RouterOS – явные преимущества

- Поддержка стримминга для Wireshark



# RouterOS + hardware

- CCR серия – возможно, наилучшее распределение нагрузки равномерно по ядрам.

The screenshot displays the Mikrotik WinBox interface. The 'Interface List' window is open, showing a table of network interfaces. Below it, the 'Resources' window is open, displaying system statistics. To the right, the 'CPU' window is open, showing a detailed list of CPU cores and their respective loads.

**Interface List**

| Interface | Name         | Type    | MTU  | L2 MTU | Tx         | Rx         | Tx Packet (p/s) | Rx Packet (p/s) |
|-----------|--------------|---------|------|--------|------------|------------|-----------------|-----------------|
| R         | bonding1-wan | Bonding | 1500 |        | 227.8 Mbps | 869.1 Mbps | 75 287          | 101 369         |
| RS        | bonding2-lan | Bonding | 1500 |        | 870.0 Mbps | 228.6 Mbps | 101 510         | 75 476          |

**Resources**

Uptime: 167d 07:45:36

Free Memory: 3323.4 MiB

Total Memory: 3966.6 MiB

CPU: tilegx

CPU Count: 36

CPU Frequency: 1200 MHz

CPU Load: 13 %

Free HDD Space: 887.5 MiB

Total HDD Size: 1024.0 MiB

Architecture Name: tile

Board Name: CCR1036-8G-2S+

Version: 6.32.3

Build Time: Oct/19/2015 11:13:47

**CPU**

| CPU   | Load (%) | IRQ (%) | Disk (%) |
|-------|----------|---------|----------|
| cpu0  | 14       | 14      | 0        |
| cpu1  | 11       | 11      | 0        |
| cpu2  | 19       | 19      | 0        |
| cpu3  | 12       | 12      | 0        |
| cpu4  | 8        | 8       | 0        |
| cpu5  | 7        | 7       | 0        |
| cpu6  | 19       | 19      | 0        |
| cpu7  | 5        | 4       | 0        |
| cpu8  | 19       | 19      | 0        |
| cpu9  | 23       | 23      | 0        |
| cpu10 | 19       | 18      | 0        |
| cpu11 | 5        | 5       | 0        |
| cpu12 | 13       | 13      | 0        |
| cpu13 | 7        | 7       | 0        |
| cpu14 | 13       | 13      | 0        |
| cpu15 | 22       | 22      | 0        |
| cpu16 | 15       | 15      | 0        |
| cpu17 | 9        | 9       | 0        |
| cpu18 | 20       | 20      | 0        |
| cpu19 | 19       | 19      | 0        |
| cpu20 | 8        | 8       | 0        |
| cpu21 | 11       | 9       | 0        |
| cpu22 | 16       | 16      | 0        |
| cpu23 | 21       | 21      | 0        |
| cpu24 | 20       | 20      | 0        |
| cpu25 | 7        | 4       | 0        |
| cpu26 | 7        | 5       | 0        |
| cpu27 | 14       | 14      | 0        |
| cpu28 | 16       | 16      | 0        |
| cpu29 | 22       | 17      | 0        |
| cpu30 | 22       | 22      | 0        |
| cpu31 | 15       | 15      | 0        |
| cpu32 | 13       | 13      | 0        |
| cpu33 | 9        | 9       | 0        |
| cpu34 | 14       | 14      | 0        |
| cpu35 | 5        | 5       | 0        |

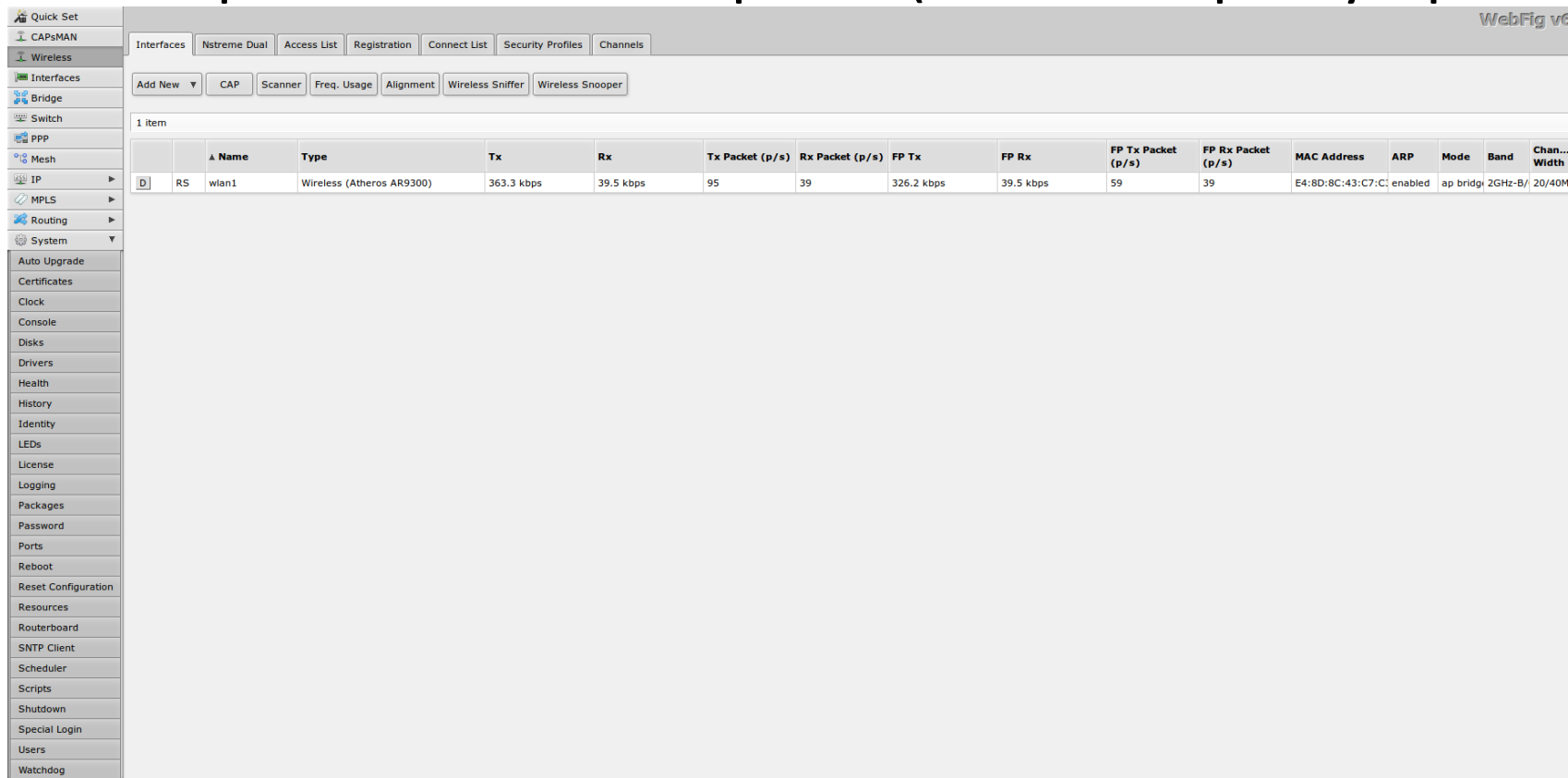
# RouterOS + hardware

- hAP Lite (RB941-2ND)
- CPU 650 MHz
- wireless 802.11b/g/n
- Input voltage 5V (MicroUSB)
- RouterOS L4
- Price \$22



# МИНУСЫ

- Непереносимость конфигов (на некоторых устройствах)



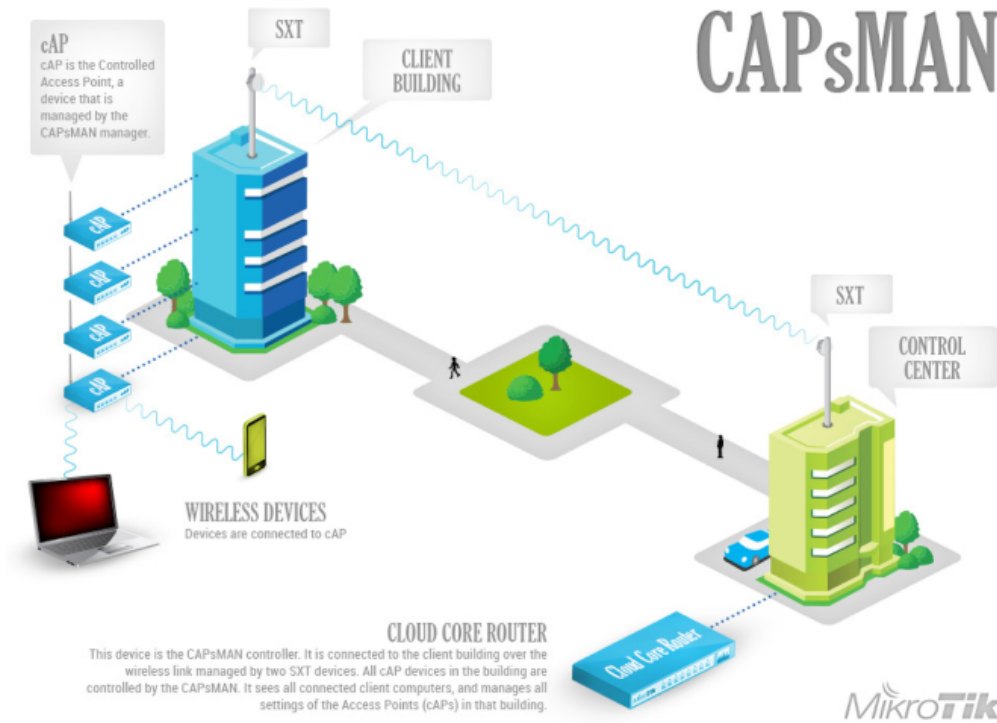
The screenshot shows the Mikrotik WinBox interface for configuring wireless interfaces. The left sidebar contains a menu with various system and network settings. The main panel displays the 'Wireless' configuration for the 'wlan1' interface. The 'Interfaces' tab is selected, showing a table with one item.

|   | ▲ Name   | Type                      | Tx         | Rx        | Tx Packet (p/s) | Rx Packet (p/s) | FP Tx      | FP Rx     | FP Tx Packet (p/s) | FP Rx Packet (p/s) | MAC Address      | ARP     | Mode      | Band    | Chan... | Width |
|---|----------|---------------------------|------------|-----------|-----------------|-----------------|------------|-----------|--------------------|--------------------|------------------|---------|-----------|---------|---------|-------|
| D | RS wlan1 | Wireless (Atheros AR9300) | 363.3 kbps | 39.5 kbps | 95              | 39              | 326.2 kbps | 39.5 kbps | 59                 | 39                 | E4:8D:8C:43:C7:C | enabled | ap bridgi | 2GHz-B/ | 20/40M  |       |



# МИНУСЫ

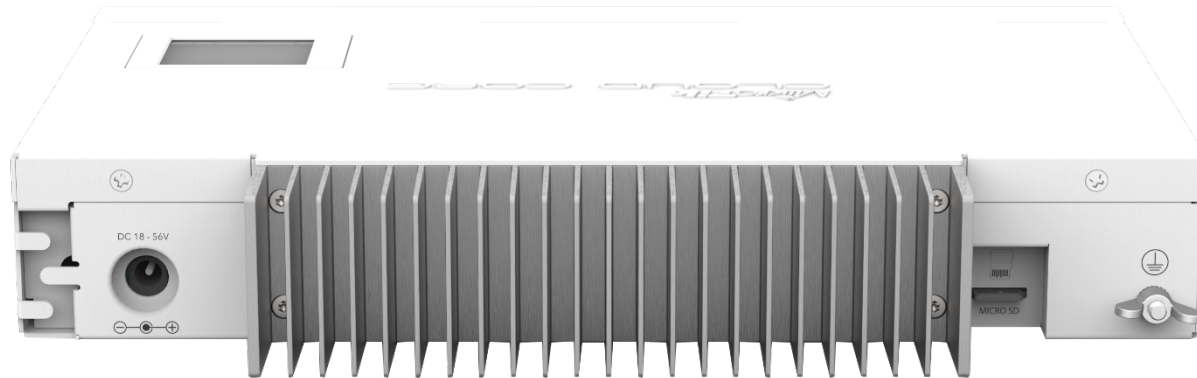
- Нестабильная работа CAPsMAN



# Минусы

- 2 Блока питания только в CCR1072

CCR1009-8G-1S-1S+PC



CCR1072-1G-8S+



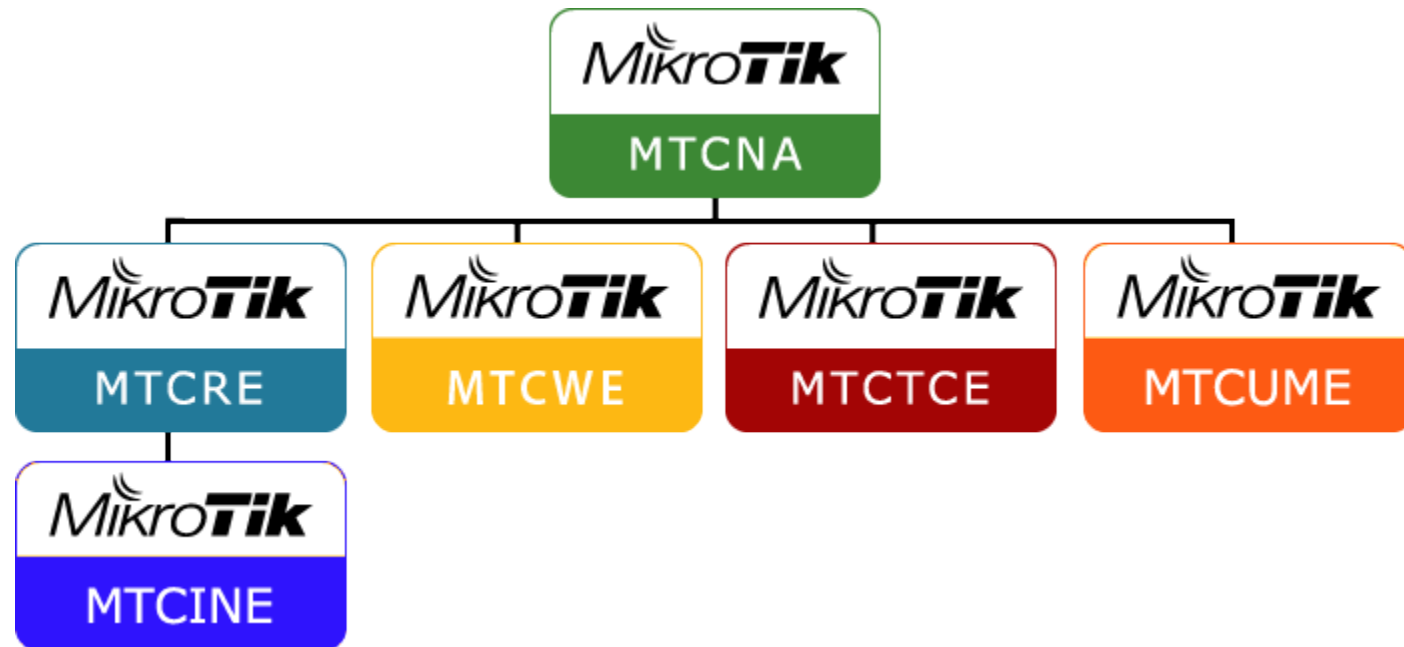
# Минусы

- Неполная поддержка OpenVPN



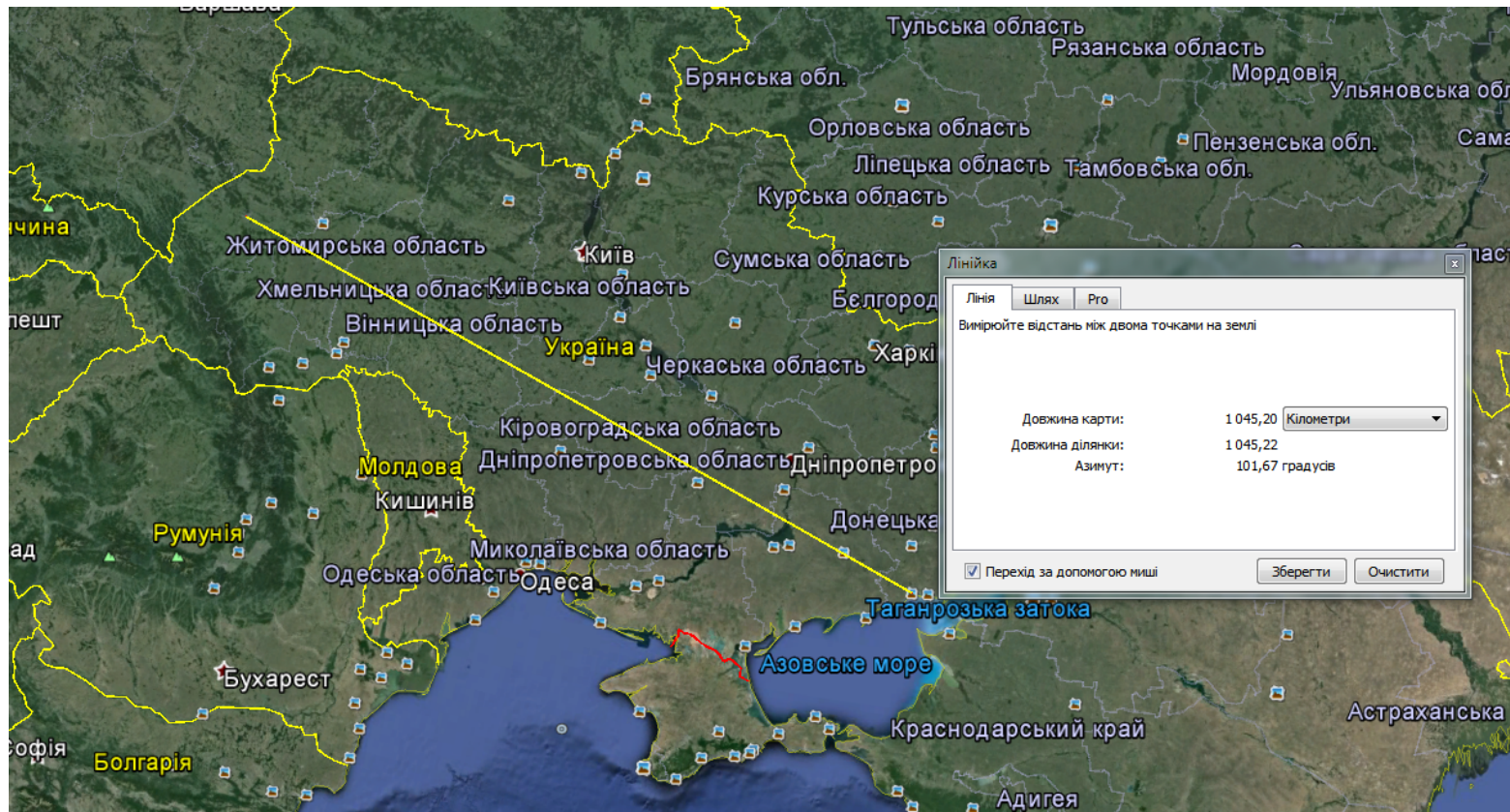
# МИНУСЫ

- Цена сертификации



# Опыт использования

- Расстояние между крайними сетями



# АВТОНОМНЫЕ локальные сети

- Потребление электропитания (источник питания от 14 до 57V)

| Название           | Max Power consumption |
|--------------------|-----------------------|
| RB2011UiAS-2HnD-IN | 11W                   |
| CCR1009-8G-1S-1S+  | 35W                   |
| CRS125-24G-1S-RM   | 15W                   |
| RB850Gx2           | 8W                    |
| RB411U             | 10W                   |
| cAP 2n             | 2W                    |
| SXT 5              | 11W                   |
| Metal 5SHpN        | 11.5W                 |
| RB951G-2HnD        | 7W                    |



# АВТОНОМНЫЕ локальные сети

Возможность использования автономного питания



# АВТОНОМНЫЕ локальные сети

Создание ретранслятора на 50 км



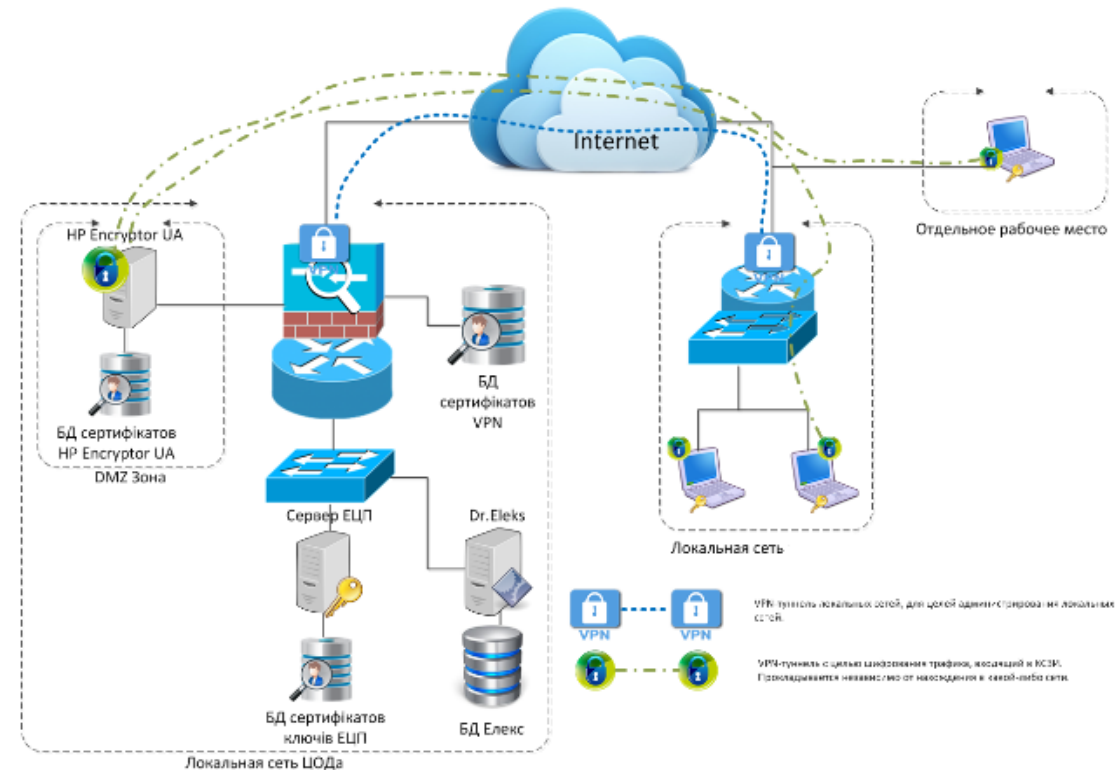
# АВТОНОМНЫЕ локальные сети

Создание ретранслятора на 50 км



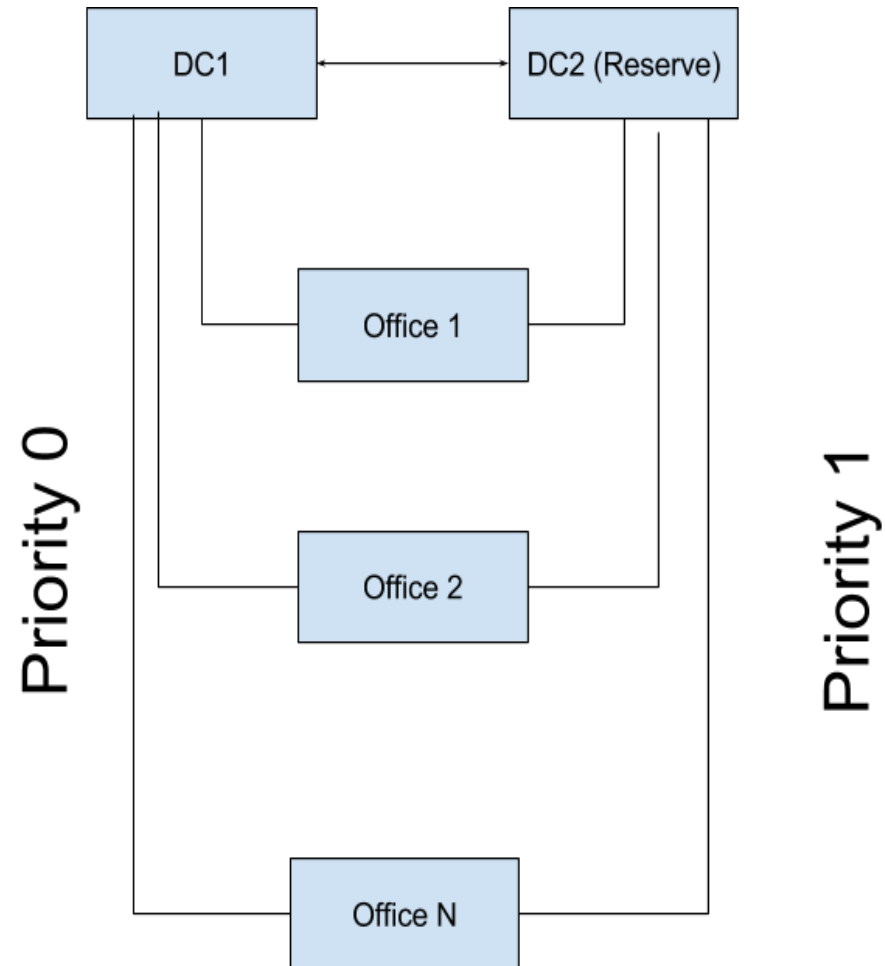
# Архитектурные решения

## Использование в МИС



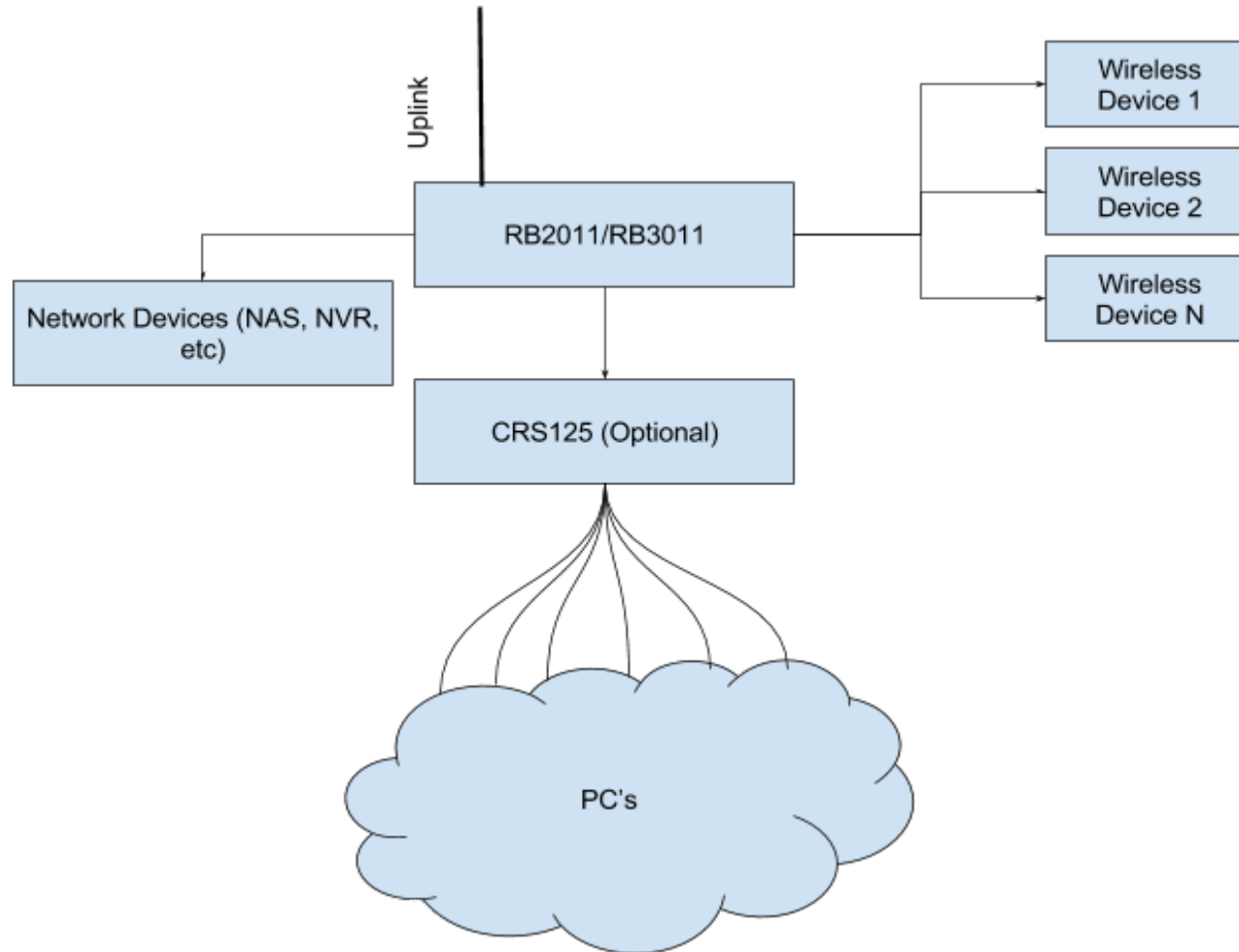
# Архитектурные решения

объединение локальных сетей



# Архитектурные решения

## Архитектура локальных сетей





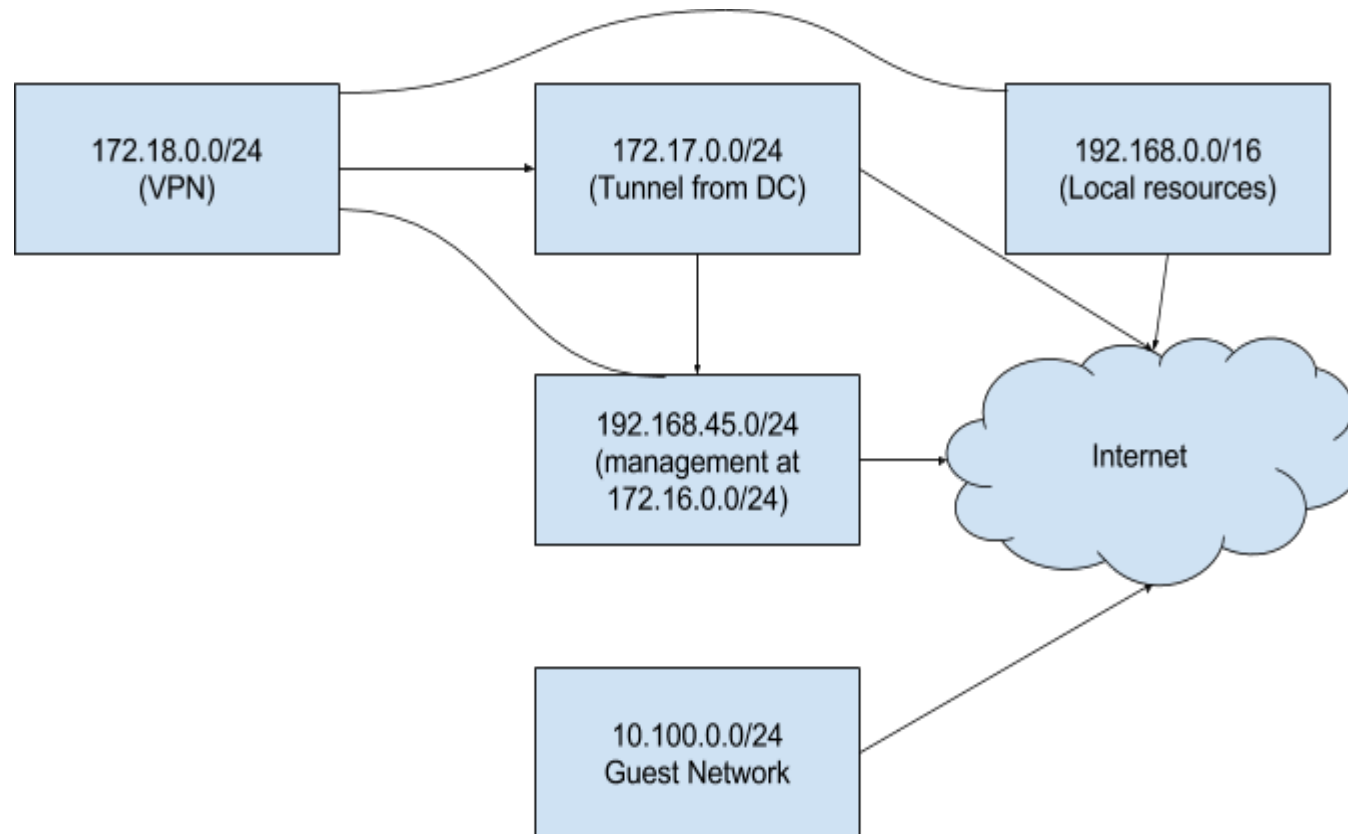
# Архитектурные решения

## Подсети

| Подсеть        | Описание                                     |
|----------------|----------------------------------------------|
| 192.168.0.0/16 | Подсети офисов                               |
| 172.16.0.0/24  | Подсеть для управления сетевыми устройствами |
| 172.17.0.0/24  | Тоннели между офисами                        |
| 172.18.0.0/22  | VPN для удаленного подключения               |
| 10.100.0.0/24  | Гостевой доступ (мобильные устройства)       |

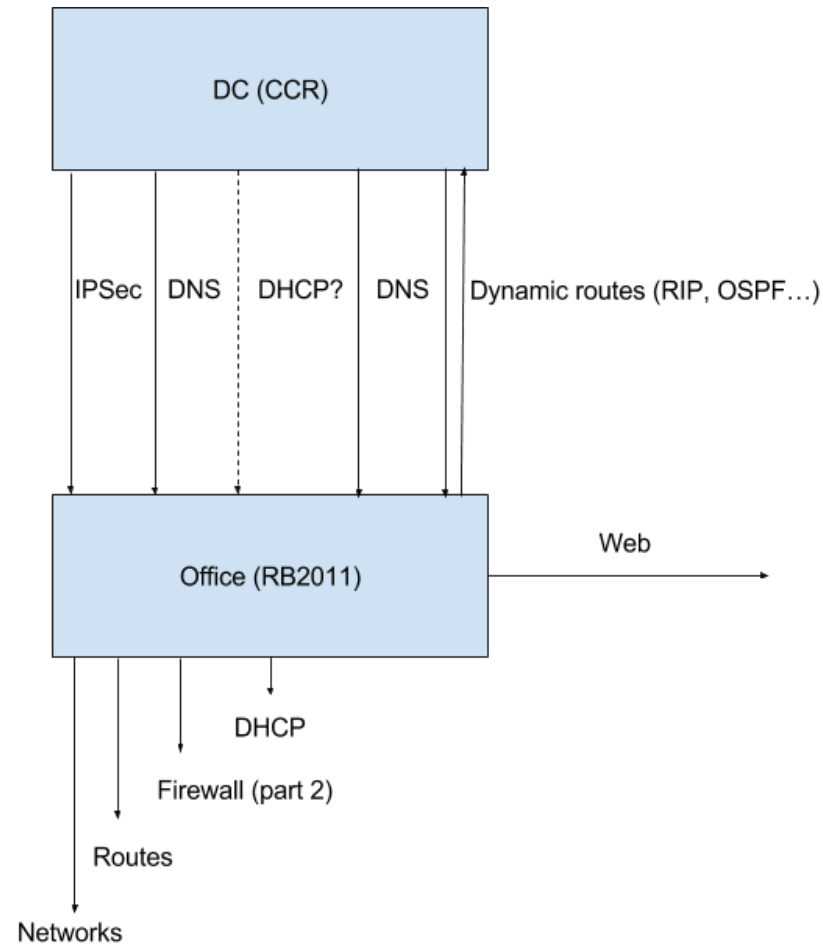
# Архитектурные решения

И их доступность



# Архитектурные решения

## Использование сервисов



# Примененное оборудование

- hEX lite
- RB2011iL-IN, RB2011UiAS-RM, RB2011UiAS-2HnD-IN
- RB3011UiAS-RM
- CCR1009-8G-1S-1S+PC
- CCR1036-8G-2S+
- CRS125-24G-1S-RM
- SXT 5 ac
- SXT Lite2
- Groove 52HPn
- OmniTIK U-5HnD
- Metal 2SHPn
- hAP lite, hAP, hAP ac lite
- mAP 2n
- 911 Lite2
- RB411
- RB433
- RB450
- RB850Gx2
- Может быть ещё что-то забыл...

# Примеры

## Использование сервисов

The screenshot displays the Mikrotik WinBox interface, which is used for configuring and managing Mikrotik routers. The interface is divided into several panels:

- Interface List:** A table showing the status of various network interfaces. The selected interface is `ether8`.
- Resources:** A panel showing system resources such as Uptime, Free Memory, Total Memory, CPU, CPU Count, CPU Frequency, CPU Load, Free HDD Space, Total HDD Size, Architecture Name, Board Name, Version, and Build Time.
- Filter Rules:** A panel showing a list of filter rules. The selected rule is `acc...`.
- Log:** A panel showing a list of system logs. The selected log is `memory system_error critical login failure for user root from 221.232.129.51 via ssh`.
- CPU:** A panel showing CPU usage statistics for `cpu0` and `cpu1`.

| Interface | Ethernet     | EoIP Tunnel | IP Tunnel | GRE Tunnel  | VLAN            | VRPP            | Bonding | LTE         |                    |                    |
|-----------|--------------|-------------|-----------|-------------|-----------------|-----------------|---------|-------------|--------------------|--------------------|
| Name      | Type         | L2 MTU      | Tx        | Rx          | Tx Packet (p/s) | Rx Packet (p/s) | FP Tx   | FP Rx       | FP Tx Packet (p/s) | FP Rx Packet (p/s) |
| R         | bridge-guest | Bridge      | 1594      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |
| R         | bridge-local | Bridge      | 1598      | 1732.8 kbps | 1418.7 kbps     | 288             | 314     | 658.8 kbps  | 1406.5 kbps        | 106                |
| R         | ether1       | Ethernet    | 1598      | 14.0 Mbps   | 2.5 Mbps        | 1.458           | 747     | 12.8 Mbps   | 2.0 Mbps           | 1.324              |
| S         | ether2       | Ethernet    | 1598      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |
| RS        | ether3       | Ethernet    | 1598      | 2.1 Mbps    | 549.8 kbps      | 332             | 261     | 1735.2 kbps | 1403.0 kbps        | 284                |
| XS        | ether4       | Ethernet    | 1598      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |
| XS        | ether5       | Ethernet    | 1598      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |
| RS        | ether6       | Ethernet    | 1598      | 10.7 kbps   | 0 bps           | 10              | 0       | 14.4 kbps   | 0 bps              | 14                 |
| RS        | guest_on6    | VLAN        | 1594      | 424 bps     | 0 bps           | 1               | 0       | 0 bps       | 0 bps              | 0                  |
| RS        | ether7       | Ethernet    | 1598      | 5.6 kbps    | 7.9 kbps        | 6               | 8       | 5.2 kbps    | 11.6 kbps          | 6                  |
| RS        | guest_on7    | VLAN        | 1594      | 0 bps       | 448 bps         | 0               | 1       | 0 bps       | 448 bps            | 0                  |
| XS        | ether8       | Ethernet    | 1598      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |
| S         | guest_on8    | VLAN        | 1594      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |
| RS        | ether9       | Ethernet    | 1598      | 14.0 kbps   | 5.6 kbps        | 15              | 4       | 19.4 kbps   | 5.9 kbps           | 22                 |
| RS        | guest_on9    | VLAN        | 1594      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |
| RS        | ether10      | Ethernet    | 1598      | 10.7 kbps   | 0 bps           | 10              | 0       | 14.4 kbps   | 0 bps              | 14                 |
| RS        | guest_on10   | VLAN        | 1594      | 424 bps     | 0 bps           | 1               | 0       | 0 bps       | 0 bps              | 0                  |
| R         | 2p-out1      | L2TP Client | 1600      | 742.0 kbps  | 1041.8 kbps     | 183             | 196     | 0 bps       | 0 bps              | 0                  |
| X         | isp1         | Ethernet    | 1600      | 0 bps       | 0 bps           | 0               | 0       | 0 bps       | 0 bps              | 0                  |

| #  | Action                                        | Chain      | Src. Address | Dst. Address | Proto... | Src. Port | Dst. Port | In. Inter... | Out. Int... | Bytes      | Packets     |
|----|-----------------------------------------------|------------|--------------|--------------|----------|-----------|-----------|--------------|-------------|------------|-------------|
| 0  | special dummy rule to show fasttrack counters |            |              |              |          |           |           |              |             | 81.8 GiB   | 117 473 ... |
| 1  | acc...                                        | forward    |              |              |          |           |           |              |             | 21.3 GiB   | 28 215 770  |
| 2  | acc...                                        | input      |              |              |          |           |           |              |             | 905.0 MB   | 1 348 738   |
| 3  | acc...                                        | forward    |              |              |          |           |           |              |             | 3447.1 KiB | 71 244      |
| 4  | Allow established & related connections       |            |              |              |          |           |           | ether1       |             | 2343.7 MB  | 37 139 318  |
| 5  | acc...                                        | forward    |              |              |          |           |           |              |             | 21.1 GiB   | 26 057 692  |
| 6  | Drop invalid connections                      |            |              |              |          |           |           | ether1       |             | 678.3 KiB  | 11 514      |
| 7  | Drop invalid connections                      |            |              |              |          |           |           | ether1       |             | 0 B        | 0           |
| 8  | acc...                                        | input      |              |              |          |           |           | ether1       |             | 36.8 MB    | 339 642     |
| 9  | Block "bogon"                                 |            |              |              |          |           |           |              |             | 0 B        | 0           |
| 10 | Jump TCP                                      | forward    |              |              | 6 (tcp)  |           |           |              |             | 49.5 MB    | 814 517     |
| 11 | Jump UDP                                      | forward    |              |              | 17 (u... |           |           |              |             | 192.5 MB   | 1 272 269   |
| 12 | Jump ICMP                                     | forward    |              |              | 1 (ic... |           |           |              |             | 4016 B     | 48          |
| 13 | Deny FTP                                      |            |              |              | 6 (tcp)  | 69        |           |              |             | 0 B        | 0           |
| 14 | Deny RPC                                      | portmapper |              |              | 6 (tcp)  | 111       |           |              |             | 0 B        | 0           |
| 15 | Deny RPC                                      | portmapper |              |              | 6 (tcp)  | 135       |           |              |             | 0 B        | 0           |

| CPU  | Load (%) | IRQ (%) | Disk (%) |
|------|----------|---------|----------|
| cpu0 | 20       | 1       | 0        |
| cpu1 | 0        | 0       | 0        |

| Log                  | Freeze                                                                                    |
|----------------------|-------------------------------------------------------------------------------------------|
| Jun/02/2016 09:07:32 | memory system_error critical login failure for user root from 221.232.129.51 via ssh      |
| Jun/02/2016 09:07:32 | memory system_error critical login failure for user root from 221.232.129.51 via ssh      |
| Jun/02/2016 09:07:33 | memory system_error critical login failure for user root from 221.232.129.51 via ssh      |
| Jun/02/2016 09:28:53 | memory system_error critical login failure for user logan from 221.232.129.51 via ssh     |
| Jun/02/2016 09:38:23 | memory system_error critical login failure for user help from 221.232.129.51 via ssh      |
| Jun/02/2016 09:42:21 | memory dhcp_info dhcp2 assigned 192.168.45.40 to 2C:56:DC:74:7C:F5                        |
| Jun/02/2016 09:52:27 | memory dhcp_info dhcp2 assigned 10.10.45.23 to 10:2A:B3:79:C0:9D                          |
| Jun/02/2016 09:53:37 | memory dhcp_info dhcp2 assigned 192.168.45.237 to 38:C9:86:0A:37:ED                       |
| Jun/02/2016 09:54:20 | memory dhcp_info dhcp2 assigned 10.10.45.21 to 68:DB:CA:3E:74:2A                          |
| Jun/02/2016 09:54:32 | memory dhcp_info dhcp2 assigned 192.168.45.235 to AC:BC:32:C2:20:9D                       |
| Jun/02/2016 09:57:06 | memory system_error critical login failure for user jose from 221.232.129.51 via ssh      |
| Jun/02/2016 09:58:59 | memory dhcp_info dhcp2 assigned 10.10.45.26 to A4:5E:60:EB:18:A1                          |
| Jun/02/2016 09:59:59 | memory dhcp_info dhcp2 assigned 10.10.45.25 to F8:27:93:14:54:A7                          |
| Jun/02/2016 10:04:13 | memory dhcp_info dhcp2 assigned 192.168.45.26 to 28:F0:76:12:70:B8                        |
| Jun/02/2016 10:04:18 | memory dhcp_info dhcp2 assigned 192.168.45.227 to 38:C9:86:0E:B2:CE                       |
| Jun/02/2016 10:10:43 | memory dhcp_info dhcp2 assigned 10.10.45.24 to 1C:80:94:84:0D:47                          |
| Jun/02/2016 10:12:10 | memory dhcp_info dhcp2 assigned 10.10.45.27 to 38:C9:86:B6:19:BF                          |
| Jun/02/2016 10:16:50 | memory system_error critical login failure for user openerp from 221.232.129.51 via ssh   |
| Jun/02/2016 10:26:31 | memory system_error critical login failure for user nathaniel from 221.232.129.51 via ssh |
| Jun/02/2016 10:36:27 | memory system_error critical login failure for user jaxon from 221.232.129.51 via ssh     |
| Jun/02/2016 10:42:10 | memory dhcp_info dhcp2 deassigned 10.10.45.27 from 38:C9:86:B6:19:BF                      |
| Jun/02/2016 10:44:36 | memory dhcp_info dhcp2 assigned 10.10.45.22 to 30:F7:C5:7C:1D:AB                          |
| Jun/02/2016 10:55:41 | memory system_error critical login failure for user jack from 221.232.129.51 via ssh      |
| Jun/02/2016 11:02:15 | memory system_info user sergey_kiev logged in from 192.168.212.225 via winbox             |
| Jun/02/2016 11:04:04 | memory system_info device changed by sergey_kiev                                          |
| Jun/02/2016 11:04:21 | memory system_info device changed by sergey_kiev                                          |

# Примеры

```
/interface bridge
add name=bridge-guest
add name=bridge-local
/ip neighbor discovery
set ether1 discover=no
set ether2 discover=no
set ether3 discover=no
set ether4 discover=no
set ether6 discover=no
set ether7 discover=no
set ether8 discover=no
set ether9 discover=no
set ether10 discover=no
set sfp1 discover=no
set bridge-guest discover=no
set bridge-local discover=no
```

## RB3011

```
set guest_on6 discover=no
set guest_on7 discover=no
set guest_on8 discover=no
set guest_on9 discover=no
set guest_on10 discover=no
```

```
/interface vlan
add interface=ether6 name=guest_on6 vlan-id=1045
add interface=ether7 name=guest_on7 vlan-id=1045
add interface=ether8 name=guest_on8 vlan-id=1045
add interface=ether9 name=guest_on9 vlan-id=1045
add interface=ether10 name=guest_on10 vlan-id=1045
```

# Примеры

RB3011

```
/ip pool
```

```
add name=dhcp_pool1 ranges=192.168.45.20-192.168.45.254
```

```
add name=dhcp_pool2 ranges=10.10.45.20-10.10.45.254
```

```
/ip dhcp-server
```

```
add address-pool=dhcp_pool1 disabled=no interface=bridge-  
local lease-time=12h \
```

```
    name=dhcp1
```

```
add address-pool=dhcp_pool2 disabled=no interface=bridge-  
guest lease-time=30m \
```

```
    name=dhcp2
```

```
add bridge=bridge-guest interface=guest_on6
```

```
add bridge=bridge-guest interface=guest_on7
```

```
add bridge=bridge-guest interface=guest_on8
```

```
add bridge=bridge-guest interface=guest_on9
```

```
add bridge=bridge-guest interface=guest_on10
```

```
/ip address
```

```
add address=192.168.45.1/24 interface=bridge-local  
network=192.168.45.0
```

```
add address=10.10.45.1/24 interface=bridge-guest  
network=10.10.45.0
```



# Примеры

RB952

```
/interface bridge
add name=bridge_guest
add name=bridge_local
/interface wireless
set [ find default-name=wlan1 ] band=2ghz-b/g/n channel-
width=20/40mhz-Ce \
    country=ukraine disabled=no frequency=auto frequency-
mode=regulatory-domain \
    mode=ap-bridge preamble-mode=long rx-chains=0
ssid="Monster 2GHz" \
    tx-chains=0
set [ find default-name=wlan2 ] band=5ghz-onlyac channel-
width=20/40/80mhz-Ceee \
    country=ukraine disabled=no frequency=auto frequency-
mode=regulatory-domain \
    mode=ap-bridge preamble-mode=long ssid="Monster 5GHz"
```

```
/ip neighbor discovery
set ether2 discover=no
set ether3 discover=no
set ether4 discover=no
set ether5 discover=no
set wlan1 discover=no
set wlan2 discover=no

/interface bridge port
add bridge=bridge_local interface=ether1
add bridge=bridge_local interface=ether2
add bridge=bridge_local interface=ether3
add bridge=bridge_local interface=ether4
add bridge=bridge_local interface=ether5
add bridge=bridge_local interface=wlan1
add bridge=bridge_local interface=wlan2
add bridge=bridge_guest interface=vlan_guest
add bridge=bridge_guest interface=wlan3
```

Destination

6(a)

Source

Спасибо за внимание!

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