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ASTERISK



*MikroTik*

МикроТік в сетях  
ІР-телефонии Asterisk

# ЧТО ТАКОЕ **ASTERISK**

## **Asterisk** – это как Mikrotik, но только в IP-телефонии



АБСОЛЮТНО  
БЕСПЛАТЕН



СВОБОДНОЕ И  
ОТКРЫТОЕ ПО



16 ЛЕТ  
РАЗВИТИЯ



ПОЗВОЛЯЕТ СДЕЛАТЬ  
ПРАКТИЧЕСКИ ВСЁ,  
ЧТО МОЖЕТ ПРИЙТИ  
К ВАМ В ГОЛОВУ



ПОПУЛЯРЕН  
В 170+ СТРАН



ИСПОЛЬЗУЕТСЯ БОЛЕЕ  
ЧЕМ НА 1,000,000  
СЕРВЕРОВ ВО ВСЕМ  
МИРЕ

# О НАС



ГЕОГРАФИЯ НАШИХ КЛИЕНТОВ –  
ОТ КАЛИНИНГРАДА  
О ПЕТРОПАВЛОВСКА-КАМЧАТСКОГО



МЫ ВЫПОЛНИЛИ  
ПОРЯДКА 400 ПРОЕКТОВ  
ПО ВНЕДРЕНИЮ СИСТЕМ  
IP-ТЕЛЕФОНИИ



НАМ ВСЕГО 5 ЛЕТ



НАШИ СОТРУДНИКИ РАБОТАЮТ ИЗ 7-МИ ГОРОДОВ,  
И ЭТО – НЕ ФРИЛАНСЕРЫ



МЫ – САМАЯ КРУПНАЯ В РФ КОМПАНИЯ,  
СПЕЦИАЛИЗИРУЮЩАЯСЯ НА ВНЕДРЕНИИ  
САМОЙ ПОПУЛЯРНОЙ СИСТЕМЫ  
IP-ТЕЛЕФОНИИ ASTERISK



МЫ ПРОВОДИМ ЕЖЕГОДНУЮ  
КОНФЕРЕНЦИЮ ПО ASTERISK



КАЖДЫЙ МЕСЯЦ МЫ ПРОВОДИМ  
КУРСЫ ПО IP-ТЕЛЕФОНИИ  
НА БАЗЕ ASTERISK



# ПОЧЕМУ MIKROTIK НЕЗАМЕНИМ В VOIP?



IP-телефония и качество её работы зависит от сети передачи данных.

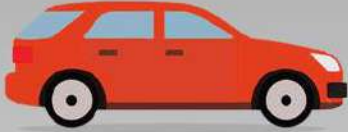


Хорошую, управляемую и масштабируемую сеть можно и нужно строить на Mikrotik

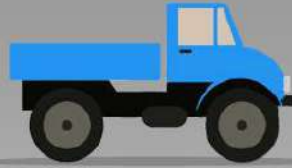
## Инструменты Mikrotik для управления сетью



# QoS



# QoS

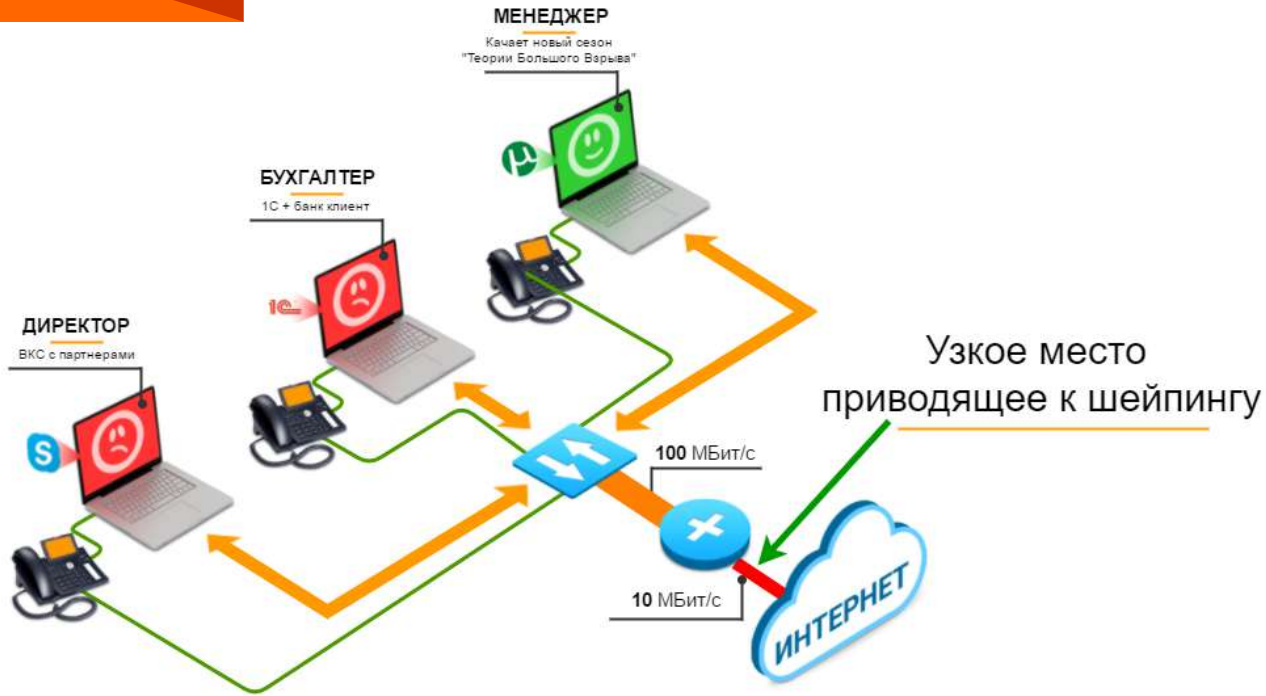


A



A

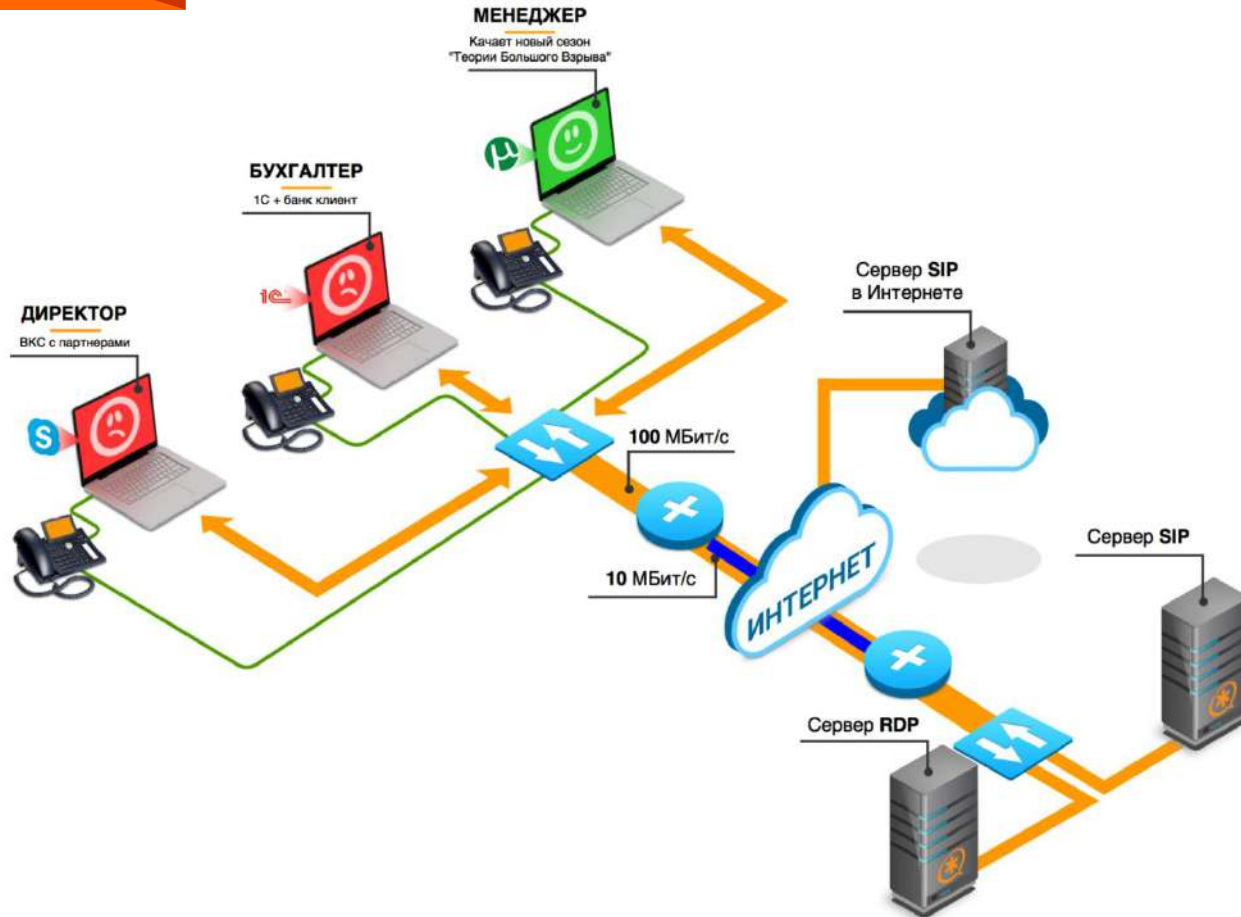
# QoS



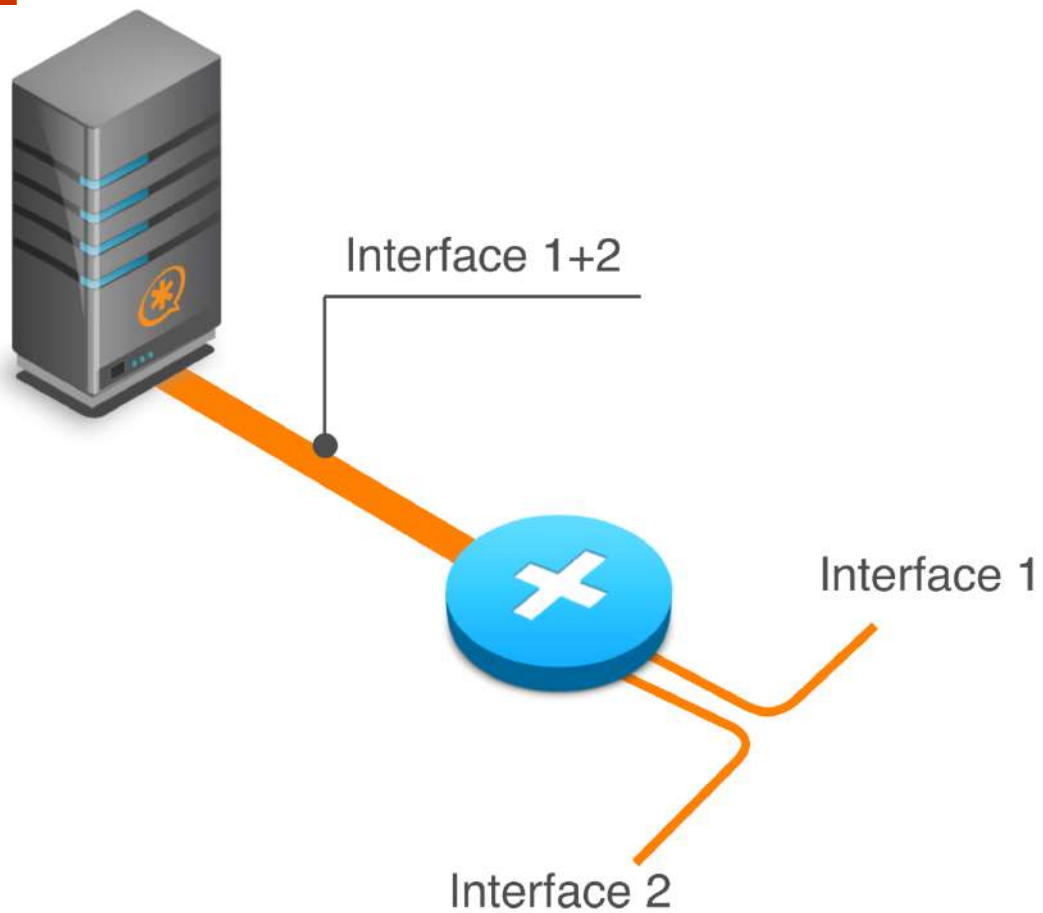
Официальные спонсоры  
лагов на канале



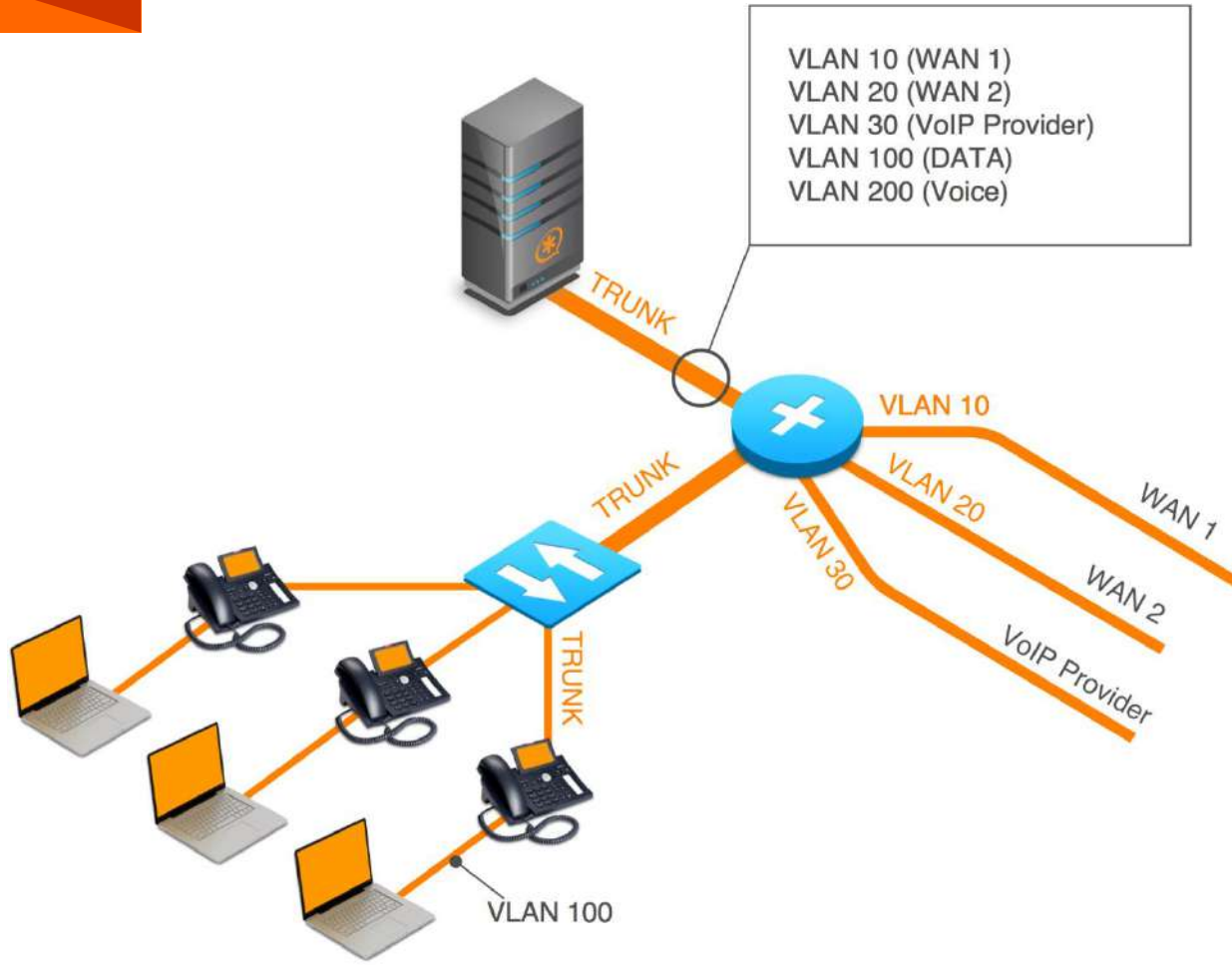
# QoS внутри VPN



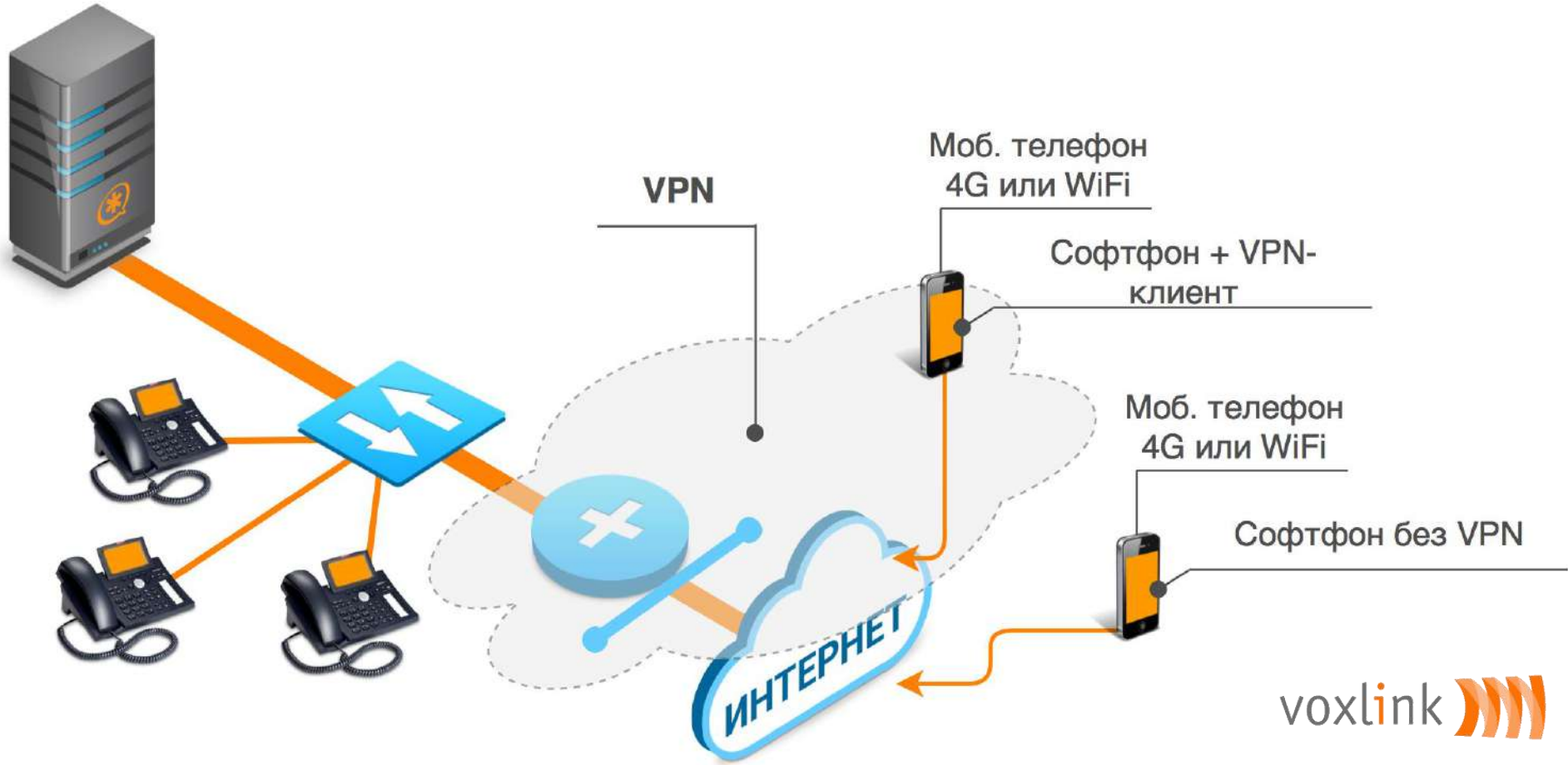
# VLAN



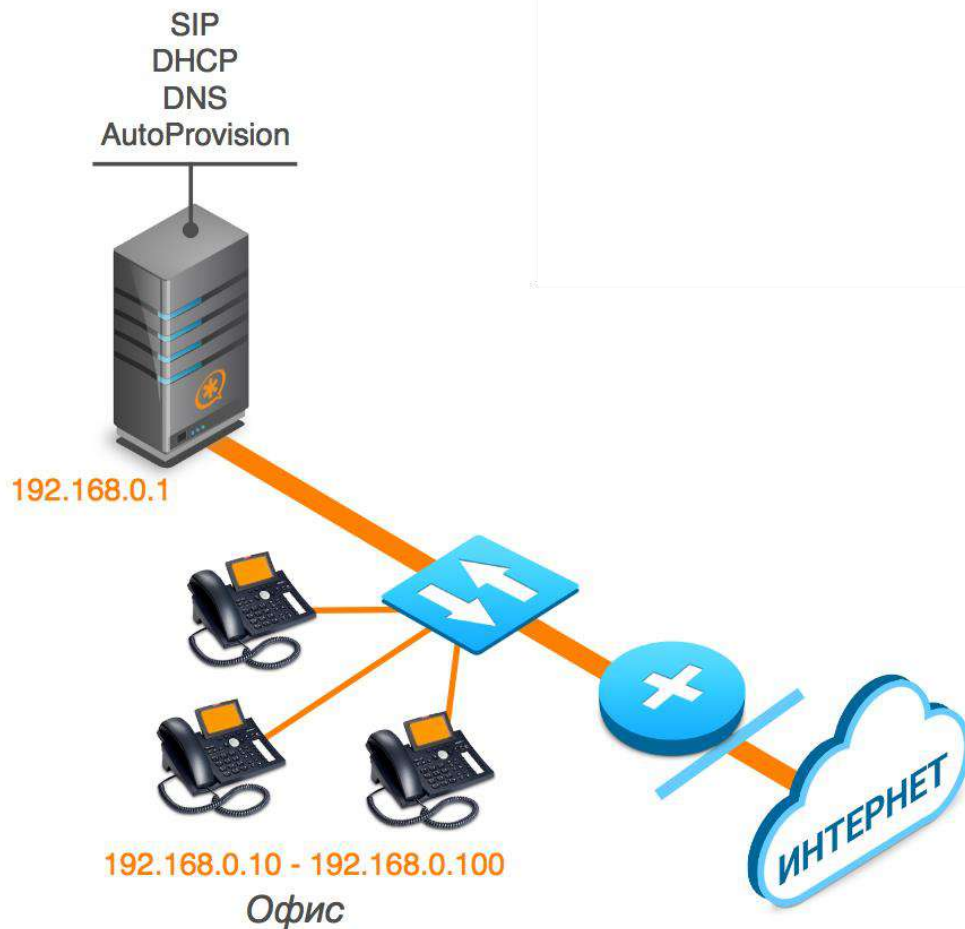
# VLAN: Server-On-A-Stick



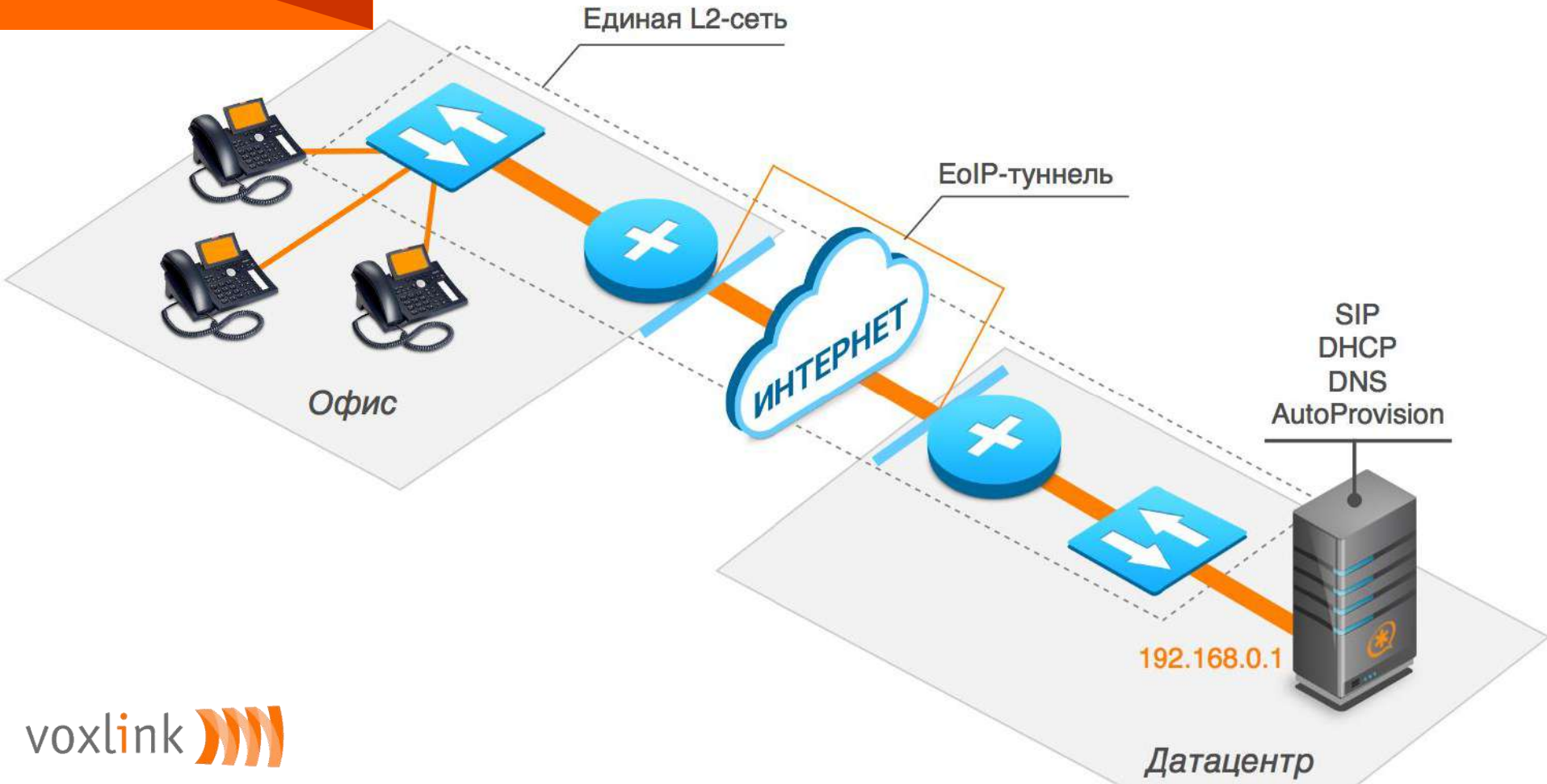
# VPN



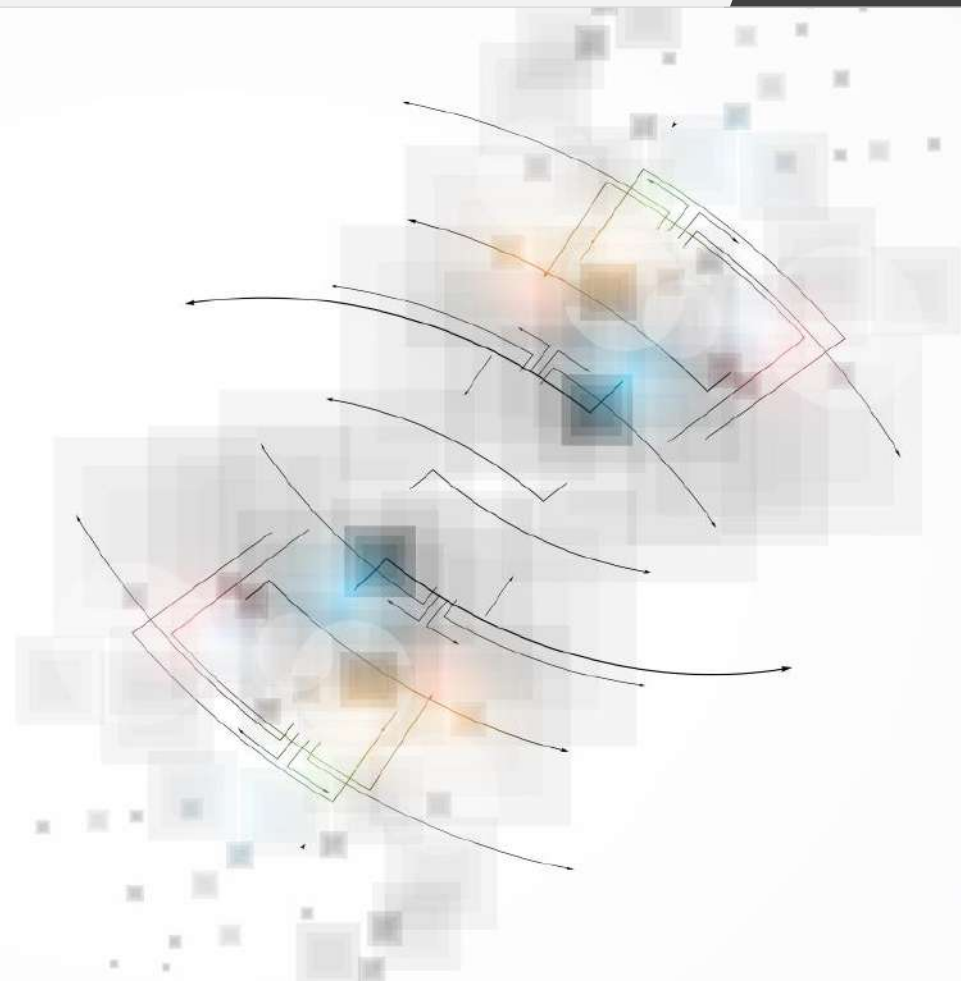
# ЕoIP: ВЫНОС в ДЦ



# EoIP: вынос в ДЦ



## Функциональные ВОЗМОЖНОСТИ



## **Asterisk и Mikrotik можно интегрировать между собой.**

- Asterisk может посылать команды на Mikrotik
- Mikrotik может посылать команды на Asterisk

### *Примеры использования такой интеграции:*

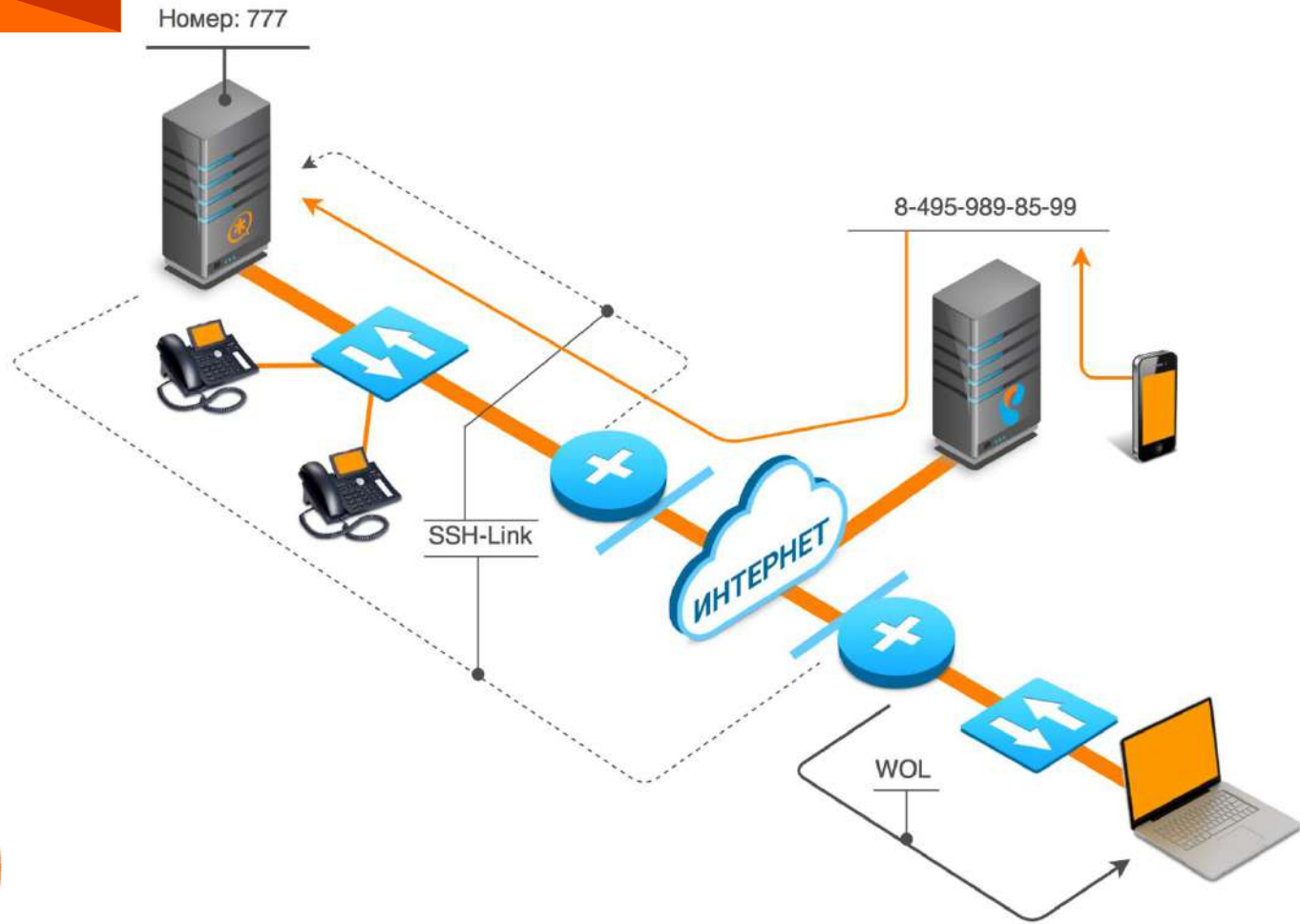
- Управление Mikrotik с любого телефонного аппарата (хоть Panasonic)
- Изменение настроек Asterisk при смене IP-адреса при Dual-WAN
- Выполнение произвольных скриптов на Asterisk при событии на Mikrotik
- Выполнение произвольных скриптов на Mikrotik при событии на Asterisk

Как делается интеграция:

- По API
- По SSH



# Связь Mikrotik & Asterisk



# DHCP сервер

RouterOS WinBox

192.168.192.1 (Office-314-RouterSwitch) - WinBox v6.35.2 on CRS125-24G-1S-2HnD (mipsbe)

Safe Mode  Hide Passwords

### DHCP Server

DHCP Networks Leases Options Option Sets Alerts

Find

| Address  | Gateway | DNS Servers | Domain | WINS Servers | Next Server |
|--|---------|-------------|--------|--------------|-------------|
| ::: Для загрузки CiscoOS Asterisk: BootFileName: pxelinux.0/::: Для загрузки WTWare: 5.4.16/rtware.pxe |         |             |        |              |             |
| 192.168.10.0/24  |         |             |        |              | 192.168...  |
| 192.168.66.0/24  |         |             |        |              |             |
| 192.168.100.0/24   |         |             |        |              |             |
| 192.168.192.0/24   |         |             |        |              | 192.168...  |

#### DHCP Network <192.168.192.0/24>

Address: 192.168.192.0/24

Gateway: 192.168.192.1

Netmask: 24

DNS Servers: 192.168.192.1

Domain: voxlink.ru

WINS Servers:

NTP Servers: 79.137.209.155

CAPS Managers:

Next Server: 192.168.192.102

Boot File Name:

DHCP Options: tftpd66

DHCP Option Set:

4 items (1 selected)

# DHCP сервер

168.192.1 (Office-314-RouterSwitch) - WinBox v6.35.2 on CRS125-24G-1S-2HnD (mipsbe)

Safe Mode  Hide Passwords

### DHCP Server

DHCP Networks Leases Options Option Sets Alerts

+ - Filter Find

| Name               | Code      | Value              |
|--------------------|-----------|--------------------|
| 128                | 128       | s'192.127.200.155' |
| 129                | 129       | s'                 |
| 130                | 130       | s'                 |
| 131                | 131       | s'                 |
| 132                | 132       | s'                 |
| 133                | 133       | s'                 |
| 134                | 134       | s'                 |
| local              | 66        | s'                 |
| mitel              | 43        | s'                 |
| mitel_new          | 43        | s'                 |
| option-150         | 150       | s'                 |
| tftp66-trainer     | 66        | s'                 |
| <b>tftp66_test</b> | <b>66</b> | <b>s'</b>          |
| tftpd66            | 66        | s'                 |
| tftpd66-Grush...   | 66        | s'                 |

#### DHCP Option <tftp66\_test>

Name:  OK

Code:  Cancel

Value:  Apply

Raw Value:  Copy

Remove

WinBox

- Quick Set
- CAPsMAN
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- LCD
- MetaROUTER



# TFTP сервер

192.168.192.1 (Office-314-RouterSwitch) - WinBox v6.35.2 on CRS125-24G-1S-2HnD (mipsbe)

Safe Mode  Hide Passwords

Quick Set  
CAPsMAN  
Interfaces  
Wireless  
Bridge  
PPP  
Switch  
Mesh  
IP  
Routing  
System  
Queues  
Files  
Log  
Radius  
Tools  
New Terminal  
LCD  
MetaROUTER  
Partition  
Make Supout.tif

DHCP Server

DHCP Networks Leases Options Option Sets Alerts

DHCP Lease <192.168.192.203, 0.0.0.0>

TFTP

New TFTP

IP Addresses: 0.0.0.0

Req. Filename:

Real Filename:

Allow  
 Read Only

Hits: 0

enabled

OK  
Cancel  
Apply  
Disable  
Copy  
Remove

| # | IP A | Read O... | Hits |
|---|------|-----------|------|
| 0 |      |           |      |

0 items

| Address List: |  |    |            |
|---------------|--|----|------------|
| D 192.168.1   |  | 84 | 2C:27:D7:3 |
| D 192.168.1   |  | 75 | 44:6D:6C:C |
| D 192.168.1   |  | 41 | 2C:27:D7:3 |

# Cloud DynDNS

11.1 (MikroTik) - WinBox v6.29.1 on RB2011UiAS-2HnD (mipsbe)

Memory: 101.9 MiB CPU: 7%  Hide Passwords

Safe Mode

Terminal

Quick Set  
Interfaces  
Wireless  
Bridge  
PPP  
Switch  
Mesh  
IP  
IPv6  
MPLS  
Routing  
System  
Queues  
Files  
Log  
Radius  
Tools  
New Terminal  
LCD  
MetaROUTER

DHCP Server

DHCP Networks Leases

Address / Gateway

192.168.11.0/24

DHCP Network <192.168.11.0/24>

Address: 192.168.11.0/24  
Gateway: 192.168.11.1  
Netmask: 24

OK  
Cancel  
Apply

Cloud

DDNS Enabled  
 Update Time

Public Address: 37.204.156.82  
DNS Name: 444a024a1c16.sn.mynetname.net

OK  
Cancel  
Apply  
Force Update

updated

Next Server:  
Boot File Name:  
DHCP Options:  
DHCP Option Set:

# SIP-ALG

The screenshot shows the Mikrotik WinBox interface with the Firewall Service configuration window open. The main window displays a list of services, with 'sip' selected. The 'Firewalling Service <sip>' dialog box is in the foreground, showing the configuration for the 'sip' service.

| Name | Ports      | SIP Direct Media |
|------|------------|------------------|
| ftp  | 21         |                  |
| h323 |            |                  |
| irc  | 6667       |                  |
| pptp |            |                  |
| sip  | 5060, 5061 | yes              |
| tftp | 69         |                  |

**Firewalling Service <sip>**

Name: sip

Ports: 5060  
5061

SIP Direct Media

OK  
Cancel  
Apply  
Enable

disabled

# Connection List

RouterOS WinBox

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

□
Firewall

Filter Rules NAT Mangle Service Ports Connections Address Lists Layer7 Protocols

Tracking Find

|      | Src. Address         | Dst. Address          | Pr...    | Connecti... | Timeout  | TCP State | Orig./Repl. Rate  |
|------|----------------------|-----------------------|----------|-------------|----------|-----------|-------------------|
| SAC  | 85.30.235.148:1701   | 217.174.103.170:1701  | 17 (u... |             | 00:02:54 |           | 0 bps/0 bps       |
| SACs | 192.168.10.35:5060   | 192.168.10.155:5060   | 17 (u... |             | 00:02:46 |           | 0 bps/0 bps       |
| SACs | 192.168.10.101:5060  | 89.208.190.2:5060     | 17 (u... |             | 00:02:15 |           | 0 bps/0 bps       |
| SACs | 192.168.10.102:5060  | 89.208.190.2:5060     | 17 (u... |             | 00:02:00 |           | 0 bps/0 bps       |
| SACs | 192.168.10.103:5060  | 89.208.190.2:5060     | 17 (u... |             | 00:02:38 |           | 0 bps/0 bps       |
| SACs | 192.168.10.104:5060  | 89.208.190.2:5060     | 17 (u... |             | 00:02:24 |           | 0 bps/0 bps       |
| SACs | 192.168.10.105:5060  | 89.208.190.2:5060     | 17 (u... |             | 00:02:18 |           | 0 bps/0 bps       |
| SACs | 192.168.10.106:5060  | 89.208.190.2:5060     | 17 (u... |             | 00:02:53 |           | 0 bps/0 bps       |
| SCs  | 192.168.10.106:16544 | 8.8.8.8:53            | 17 (u... |             | 00:00:03 |           | 0 bps/0 bps       |
| SCs  | 192.168.10.106:17960 | 8.8.8.8:53            | 17 (u... |             | 00:00:03 |           | 0 bps/0 bps       |
| SCs  | 192.168.10.106:18099 | 8.8.8.8:53            | 17 (u... |             | 00:00:03 |           | 0 bps/0 bps       |
| SCs  | 192.168.10.106:62933 | 8.8.8.8:53            | 17 (u... |             | 00:00:03 |           | 0 bps/0 bps       |
| SACs | 192.168.10.107:5060  | 192.168.10.190.2:5060 | 17 (u... |             | 00:01:40 |           | 0 bps/0 bps       |
| SACs | 192.168.10.108:5060  | 192.168.10.190.2:5060 | 17 (u... |             | 00:02:58 |           | 4.4 kbps/3.6 kbps |
| SACs | 192.168.10.111:5060  | 209.155.5060          | 17 (u... |             | 00:02:41 |           | 0 bps/0 bps       |
| SACs | 192.168.10.114:4569  | 209.155.4569          | 17 (u... |             | 00:02:52 |           | 0 bps/0 bps       |
| SACs | 192.168.10.114:5060  | 192.168.10.190.2:5060 | 17 (u... |             | 00:02:53 |           | 0 bps/0 bps       |
| Cs   | 192.168.10.114:5060  | 209.3.5060            | 17 (u... |             | 00:00:02 |           | 0 bps/0 bps       |
| SACs | 192.168.10.114:33227 | 209.156.1197          | 17 (u... |             | 00:02:51 |           | 0 bps/0 bps       |
| SACs | 192.168.10.125:5060  | 209.155.5060          | 17 (u... |             | 00:02:41 |           | 0 bps/0 bps       |
| SACs | 192.168.10.149:50960 | 232.247.443           | 17 (u... |             | 00:00:44 |           | 0 bps/0 bps       |
| SCs  | 192.168.10.149:56685 | 77.88.8.8:53          | 17 (u... |             | 00:00:02 |           | 0 bps/0 bps       |
| SACs | 192.168.10.149:56778 | 173.194.122.201:443   | 17 (u... |             | 00:02:06 |           | 0 bps/0 bps       |
| SACs | 192.168.10.149:62271 | 108.177.14.189:443    | 17 (u... |             | 00:02:56 |           | 0 bps/0 bps       |
| SACs | 192.168.10.149:62704 | 173.194.32.151:443    | 17 (u... |             | 00:02:45 |           | 0 bps/0 bps       |
| SCs  | 192.168.10.149:64035 | 84.245.131.253:2544   | 17 (u... |             | 00:00:02 |           | 0 bps/0 bps       |



# WAKE ON LAN

The screenshot shows the MikroTik WinBox interface. On the left is a navigation tree with categories like CAPSMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, Routing, System, Queues, Files, Log, Radius, Tools, New Terminal, LCD, MetaROUTER, Partition, Make Supout.rf, Manual, and Exit. The main area displays a terminal window titled 'Terminal' with the following commands and output:

```
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] >
[voxlink@Office-314-RouterSwitch] > /tool wol
interface mac
[voxlink@Office-314-RouterSwitch] > /tool wol interface=
GRE-FAVIMedia      eoip-cluster-tunnel  vlan10-class-329      eoip-MKP
GRE-VPN-SERVER     ether...             vlan192-office-314   pptp-Sheremetyevo
Grushko-Home       l2tp-in1             vlan217-Internet     vlan10
bridge-comp-class  l2tp_m1              voxlink-guest        vlan192
bridge-global      loopback              wlan1                 <l2tp-gorlov>
bridge-local       sfp1                  GRE-KRD               <l2tp-mediastyle>
[voxlink@Office-314-RouterSwitch] > /tool wol interface=bridge-local mac=00:00:00
:00:00:00
```

At the bottom of the terminal window, it says '6 items (1 selected)'. The 'voxlink' logo is visible in the bottom right corner of the image.

## Asterisk на Mikrotik

Asterisk может быть установлен непосредственно на Mikrotik в Metarouter

Производительность – несколько вызовов в секунду.

Как увеличить:

- Использовать Direct IP (“Canreinvite”)
- Отключить транскодирование
- Не использовать MoH, Voice Announcements
- Упростить диалплан

METAROUTER

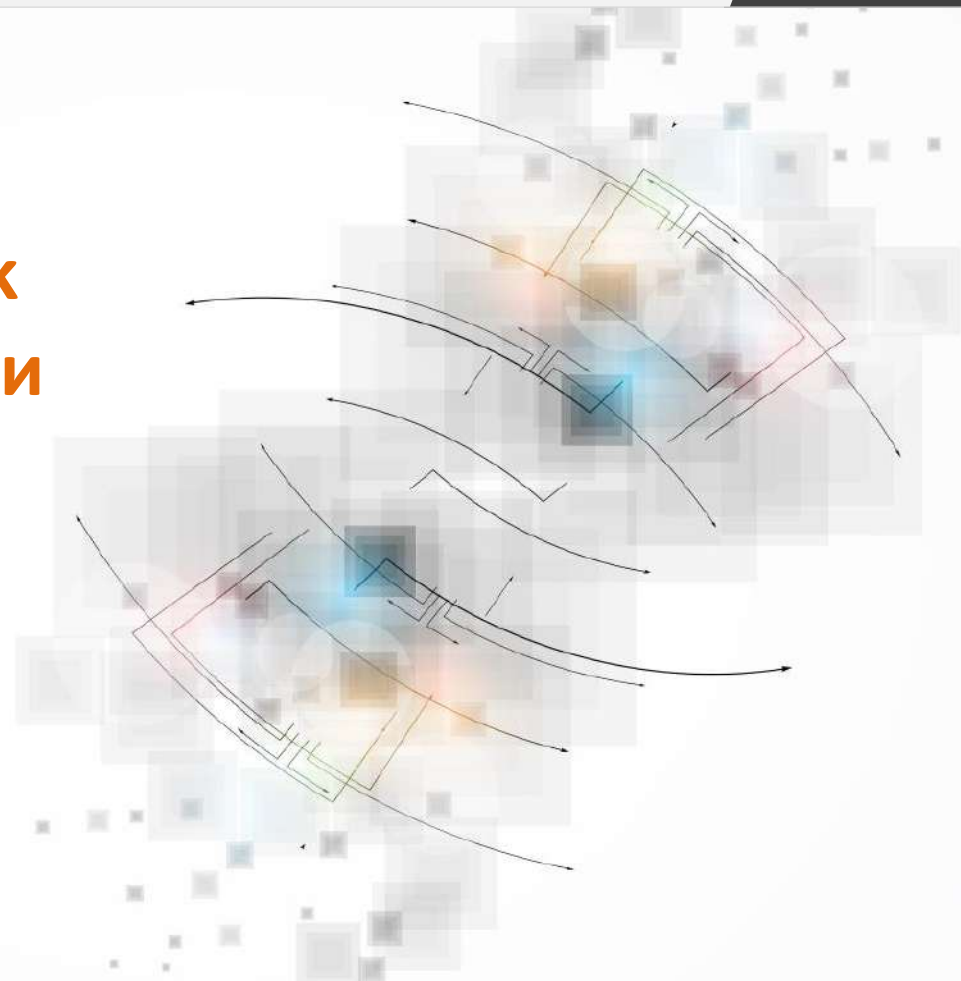
MikroTik



Asterisk™



## Инструменты Mikrotik для траблшутинга сети



# TORCH

Code

Memory: 101.6 MiB CPU: 6%  Hide Passwords

- Quick Set
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- IPv6
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- LCD
- MetaROUTER
- Partition
- Make Supout.nf
- Manual
- Exit

## Torch (Running)

- Basic

Interface: ether1-trunk

Entry Timeout: 00:00:03 s

- Collect

- Src. Address
- Dst. Address
- MAC Protocol
- Protocol
- DSCP
- Src. Address6
- Dst. Address6
- Port
- VLAN Id

- Filters

Src. Address: 0.0.0.0/0

Dst. Address: 0.0.0.0/0

Src. Address6: ::/0

Dst. Address6: ::/0

MAC Protocol: all

Protocol: any

Port: any

VLAN Id: any

DSCP: any

- Start
- Stop
- Close
- New Win

| Et...    | Prot... | Src.            | Dst.            | VLAN Id | DSCP | Tx Rate    | Rx Rate    | Tx Pack |
|----------|---------|-----------------|-----------------|---------|------|------------|------------|---------|
| 800 (ip) |         | 192.168.11.37   | 192.168.11.1    |         |      | 154.0 k... | 8.8 kbps   |         |
| 800 (ip) |         | 192.168.11.38   | 79.137.209.167  |         |      | 310.4 k... | 28.2 kbps  |         |
| 800 (ip) |         | 79.137.209.167  | 37.204.156.82   |         |      | 27.2 kbps  | 311.8 k... |         |
| 800 (ip) |         | 192.168.11.37   | 192.168.192.1   |         |      | 542.5 k... | 15.1 kbps  |         |
| 800 (ip) |         | 217.174.103.170 | 37.204.156.82   |         |      | 18.3 kbps  | 553.4 k... |         |
| 800 (ip) |         | 192.168.11.38   | 93.158.134.3    |         |      | 592 bps    | 624 bps    |         |
| 800 (ip) |         | 93.158.134.3    | 37.204.156.82   |         |      | 592 bps    | 624 bps    |         |
| 800 (ip) |         | 192.168.11.37   | 94.100.180.59   |         |      | 0 bps      | 0 bps      |         |
| 800 (ip) |         | 94.100.180.59   | 192.168.11.37   |         |      | 0 bps      | 0 bps      |         |
| 800 (ip) |         | 144.76.57.164   | 37.204.156.82   |         |      | 440 bps    | 560 bps    |         |
| 800 (ip) |         | 192.168.11.38   | 144.76.57.164   |         |      | 528 bps    | 512 bps    |         |
| 800 (ip) |         | 192.168.11.37   | 255.255.255.255 |         |      | 0 bps      | 0 bps      |         |
| 800 (ip) |         | 192.168.11.75   | 79.137.209.155  |         |      | 0 bps      | 0 bps      |         |
| 800 (ip) |         | 79.137.209.155  | 37.204.156.82   |         |      | 0 bps      | 0 bps      |         |
| 800 (ip) |         | 192.168.11.38   | 111.221.77.164  |         |      | 0 bps      | 0 bps      |         |

RouterOS WinBox



# Отладка

The screenshot displays the MikroTik WinBox Firewall configuration interface. The main window is titled "Firewall" and has tabs for "Filter Rules", "NAT", "Mangle", "Service Ports", "Connections", "Address Lists", and "Layer7 Protocols". A "Terminal" window is open, showing the command prompt for a user named "voxlink" on a device named "Office-314-RouterSwitch".

The "Packet Sniffer Settings" dialog box is open, showing the "Filter" tab. The "Memory Limit" is set to 1000 kb, and the "File Name" is set to "123.pcap". The "File Limit" is set to 10000 kb. The "Apply" and "Start" buttons are highlighted with red boxes.

The "File List" dialog box is also open, showing a list of files. The file "123.pcap" is highlighted with a red box. The list includes various files such as "Office-314-RouterSwitch-20140524-...", "Office-314-RouterSwitch-20140602-...", "Office-314-RouterSwitch-20140602-...", "Office-314-RouterSwitch-20140714-...", "ar9330-3.10.fwf", "audiocodes.pcap", "auto-before-reset.backup", "autosupout.old.rif", "autosupout.rif", "bc.rsc", "bpdu.pcap", "console-dump.txt", and "dark-login-fom".

The "RouterOS WinBox" logo is visible in the bottom left corner. The "voxlink" logo is visible in the bottom right corner.

# PACKET SNIFFER + WIRESHARK

Filter:  Expression... Clear Apply Save

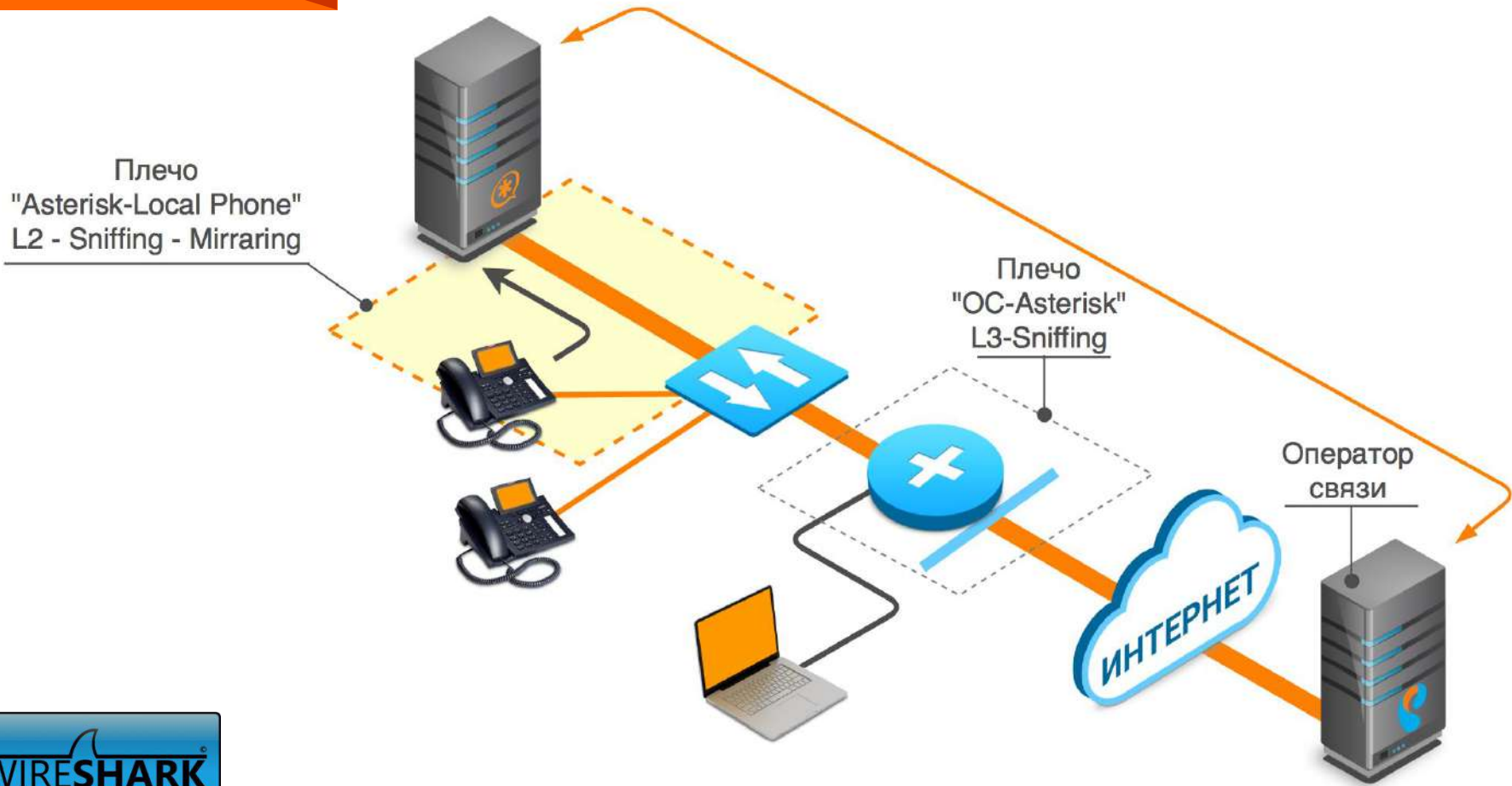
| No. | Time     | Source         | Destination    | Protocol | Length | Info  |
|-----|----------|----------------|----------------|----------|--------|---|
| 1   | 0.000000 | 79.137.209.155 | 91.231.214.10  | SIP/SDF  | 1257   | Request: INVITE sip:89257049756@91.231.214.10 |
| 2   | 0.003382 | 91.231.214.10  | 79.137.209.155 | SIP      | 323    | Status: 100 Trying                            |
| 3   | 0.008129 | 91.231.214.10  | 79.137.209.155 | SIP      | 565    | Status: 401 Unauthorized                      |
| 4   | 0.008446 | 79.137.209.155 | 91.231.214.10  | SIP      | 429    | Request: ACK sip:89257049756@91.231.214.10    |
| 5   | 0.008970 | 79.137.209.155 | 91.231.214.10  | SIP/SDF  | 1505   | Request: INVITE sip:89257049756@91.231.214.10 |

**Frame 3: 565 bytes on wire (4520 bits), 565 bytes captured (4520 bits)**

- Ethernet II, Src: CiscoInc\_d6:8c:00 (00:22:0c:d6:8c:00), Dst: vmware\_c5:f9:f5 (00:0c:29:c5:f9:f5)
- Internet Protocol Version 4, Src: 91.231.214.10 (91.231.214.10), Dst: 79.137.209.155 (79.137.209.155)
- User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
- Session Initiation Protocol (401)
  - Status-Line: SIP/2.0 401 Unauthorized
  - Message Header
    - From: <sip:74956362904@91.231.214.10>;tag=as469eb3b1
    - To: <sip:89257049756@91.231.214.10>;tag=16dbf9d0  
Call-ID: 582e47f463850c35450a50d84cee42c4@91.231.214.10
    - CSeq: 102 INVITE  
Server: vocl-essentra-bax/8.1f5.514
    - www-authenticate: Digest realm="74956362904",qop="auth",algorithm=MD5,nonce="02b0f8e4010e3728c102b0f8e4010e3728c1"
    - Contact: <sip:91.231.214.10:5060;vt-service=CallControl.callControlServlet>
    - Via: SIP/2.0/UDP 79.137.209.155:5060;branch=z9hg4bk4b82bd29  
Content-Length: 0

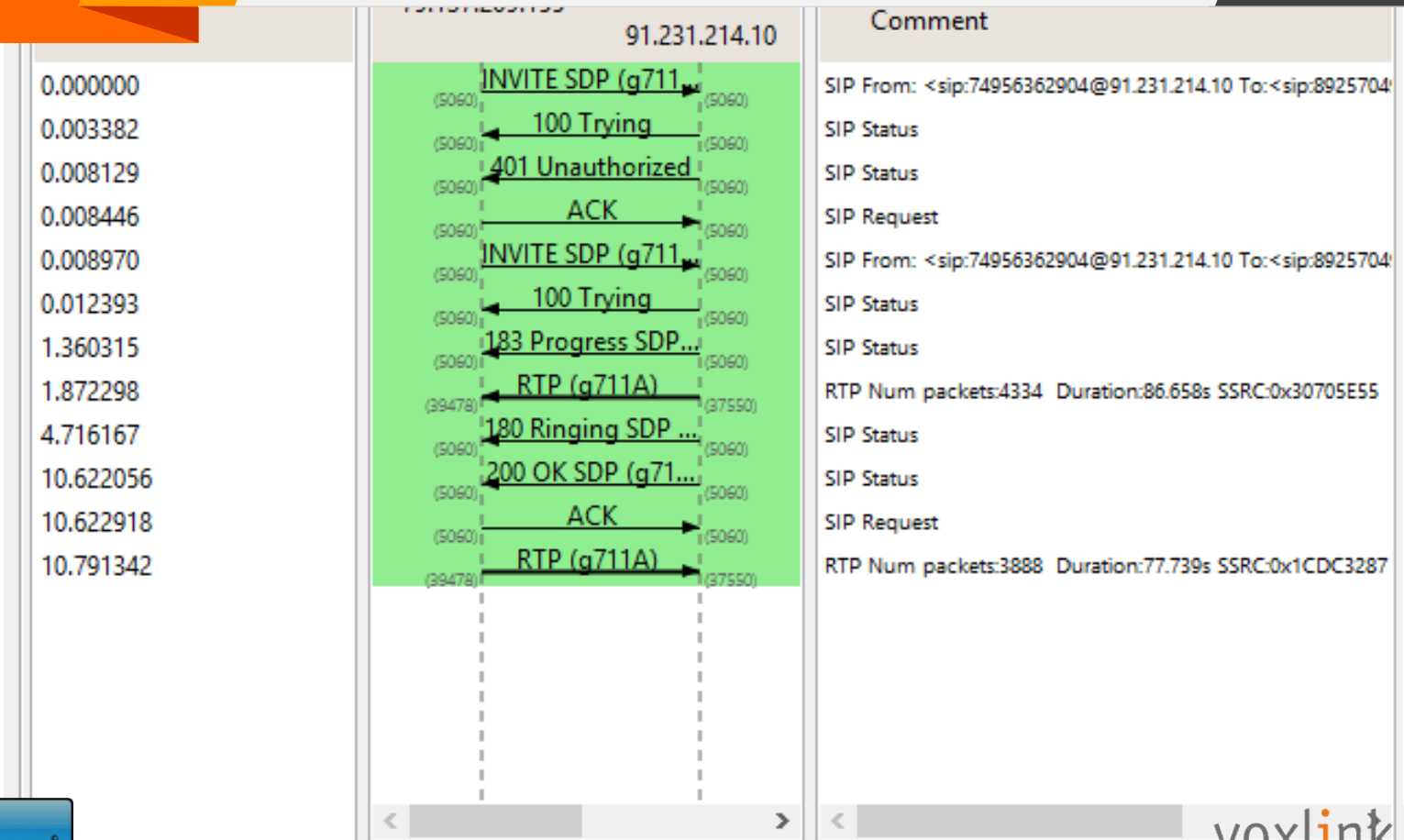


# PACKET SNIFFER + WIRESHARK





# PACKET SNIFFER + WIRESHARK



# PACKET SNIFFER + WIRESHARK

Detected 1 VoIP Call. Selected 1 Call.

Start Time: 20160103-133856-74956362904-89257049756-582e47f463850c35450a50d84cee42c4@91.231.214.10.pcap - RTP Player

From 91.231.214.10:37550 to 79.137.209.155:39478 Duration:86,68 Drop by Jitter Buff:0(0,0%) Out of Seq: 0(0,0%) Wrong Timestamp: 0(0,0%)

From 79.137.209.155:39478 to 91.231.214.10:37550 Duration:77,76 Drop by Jitter Buff:0(0,0%) Out of Seq: 0(0,0%) Wrong Timestamp: 0(0,0%)

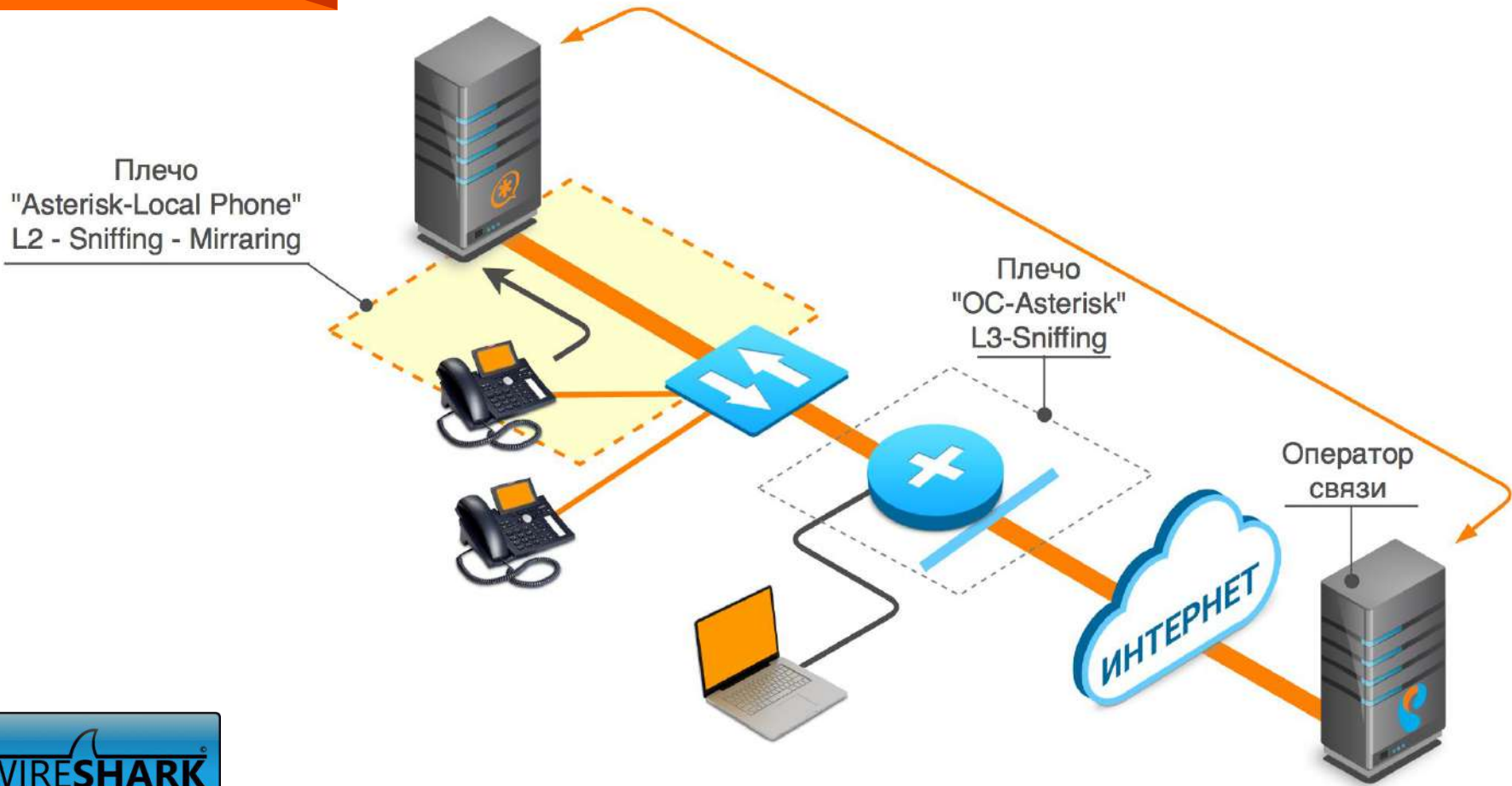
View as time of day

Jitter buffer [ms] 50  Jitter buffer  Use RTP timestamp  Uninterrupted mode Decode Play Pause S

|      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |          |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----------|
| 0000 | 00 | 0c | 2d |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |          |
| 0010 | 02 | 27 | 0c |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |          |
| 0020 | d1 | 9b | 13 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |          |
| 0030 | 30 | 20 | 34 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |          |
| 0040 | 65 | 64 | 0d |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |          |
| 0050 | 34 | 39 | 35 | 36 | 33 | 36 | 32 | 39 | 30 | 34 | 40 | 39 | 31 | 2e | 32 | 33 | 49 | 56   | 36 | 29       |
| 0060 | 31 | 2e | 32 | 31 | 34 | 2e | 31 | 30 | 3e | 3b | 74 | 61 | 67 | 3d | 61 | 73 | 1. | 214. | 10 | >;tag=as |
| 0070 | 24 | 26 | 28 | 65 | 62 | 33 | 62 | 21 | ed | 9a | f4 | 65 | 21 | 28 | 2e | 72 | 46 | 0a   | b2 | b3       |



# REALTIME WIRESHARK



# REALTIME WIRESHARK

**Capture**

| Capture                  | Interface   | Link-layer header | Prom. Mode | Snaplen [B] | Buffer [MiB] | Capture Filter |
|--------------------------|---|-------------------|------------|-------------|--------------|----------------|
| <input type="checkbox"/> | 192.168.15.45<br><b>Ethernet 2</b><br>fe80:d1d4:279febfb:37c2<br>10.10.51.1 | Ethernet          | enabled    | 262144      | 2            |                |

Capture on all interfaces  
 Use promiscuous mode on all interfaces

Capture Filter:

**Capture Files**

File:

Use multiple files

Next file every  packet(s)

Next file every  megabyte(s)

Ring buffer with  megabyte(s)

Stop Capture Automatically After...

packet(s)   megabyte(s)

file(s)   minute(s)

**Interface Management**

Pipes Local Interfaces Remote Interfaces

Remote Interfaces

Host

**Wireshark: Remote Interface**

Host:

Port:

Authentication

Null authentication

Password authentication

Username:

Password:

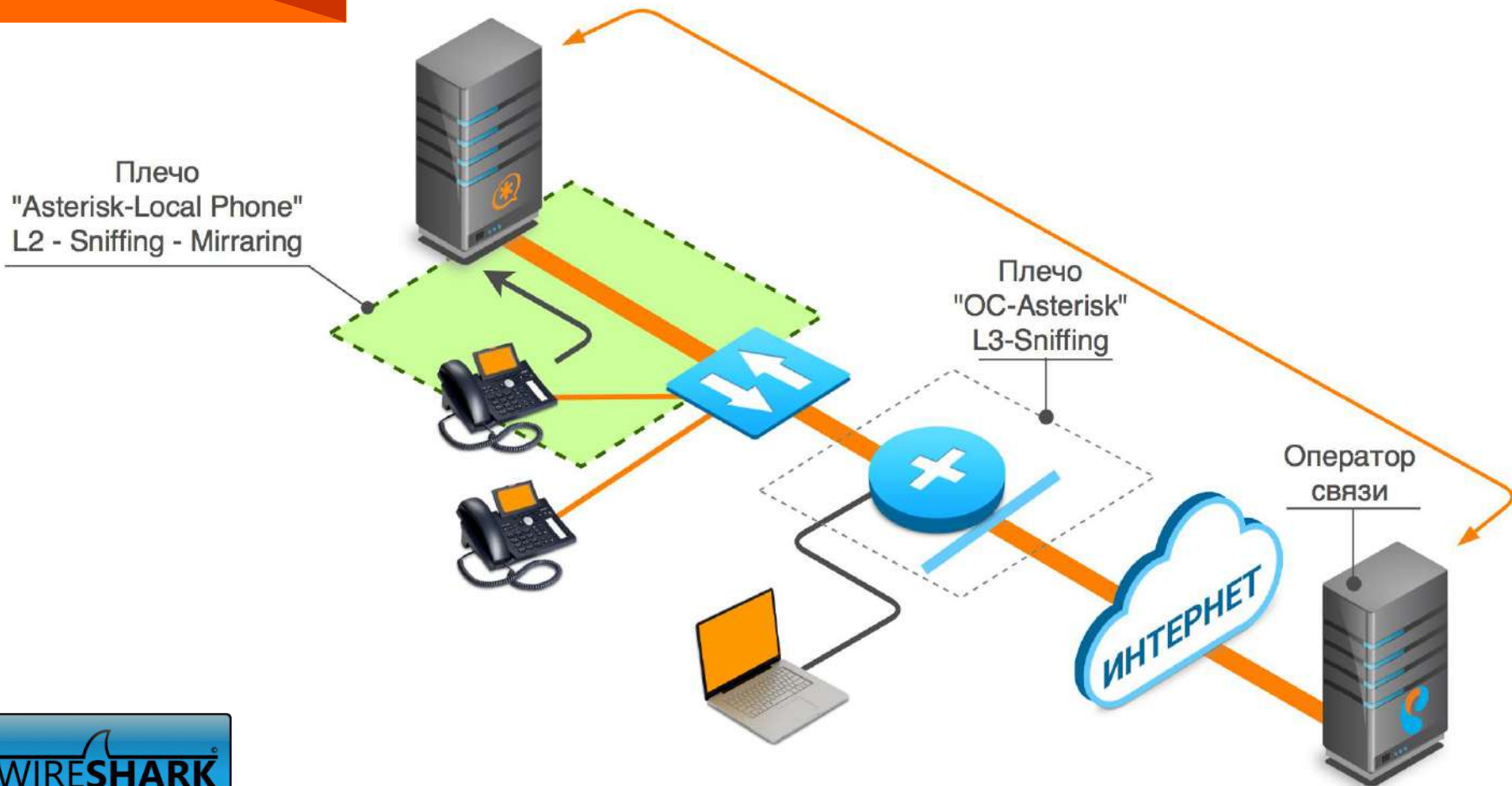
Resolve network-layer names

Resolve transport-layer name

Use external network name resolver



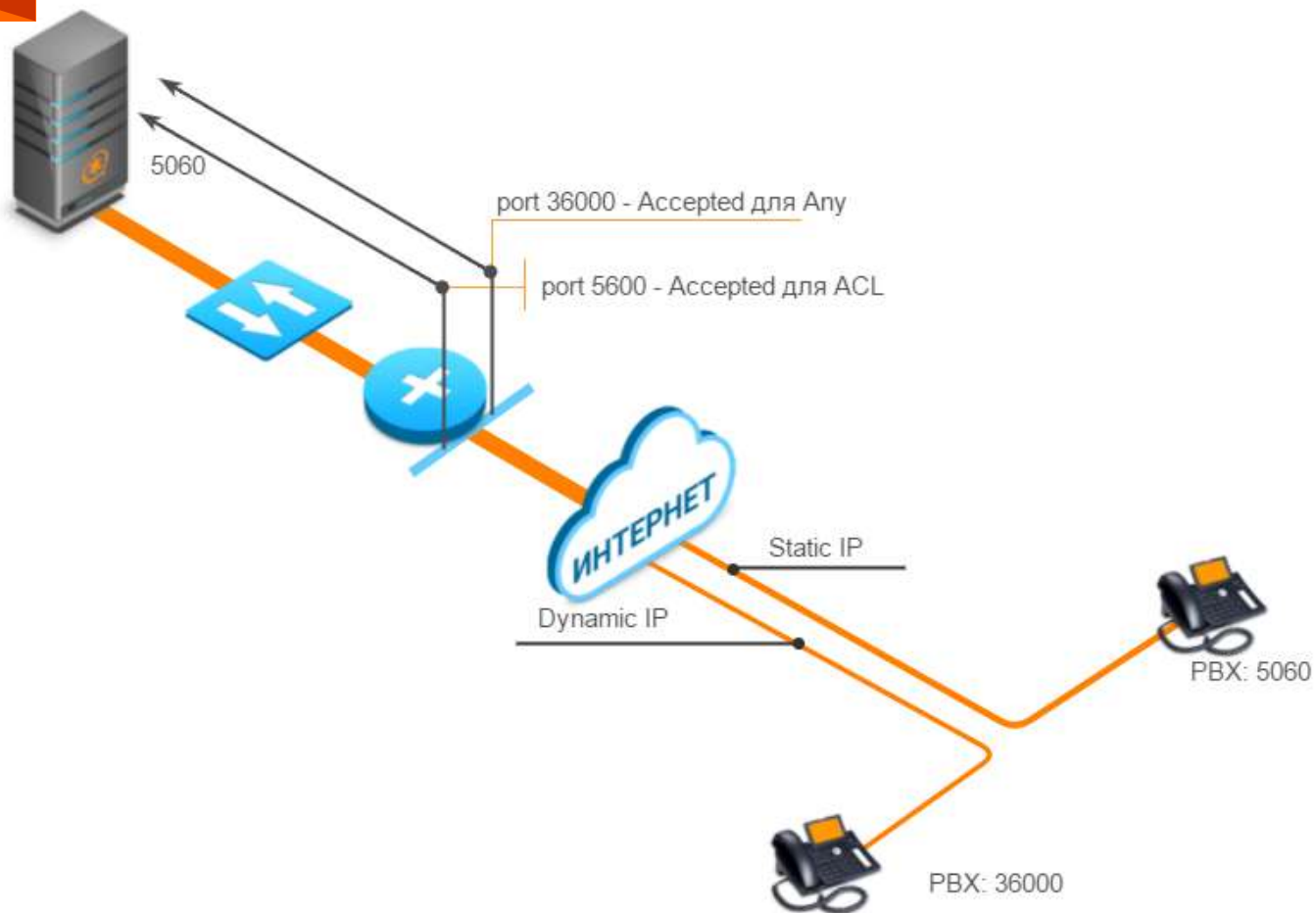
# ЗЕРКАЛИРОВАНИЕ SWITCH-ПОРТА



## Инструменты Mikrotik для обеспечения Безопасности Asterisk



# ПЕРЕНОС SIP-ПОРТА



# ФИЛЬТРАЦИЯ НЕ-РФ СЕТЕЙ





# ФИЛЬТРАЦИЯ СКАНИРОВАНИЯ SIP

New Firewall Rule

General Advanced Extra Action Statistics

Connection Limit  
Limit: 100  
Netmask: 32

Limit  
Rate: 1 / sec  
Burst: 5

Dst. Limit  
Rate: 1 / sec  
Burst: 5  
Limit By: dst. address  
Expire: 100.00 s

Nth  
Every: 2  
Packet: 0

Time  
Time: 00:00:00 - 1d 00:00:00  
 sun  mon  tue  wed  thu  fri  sat

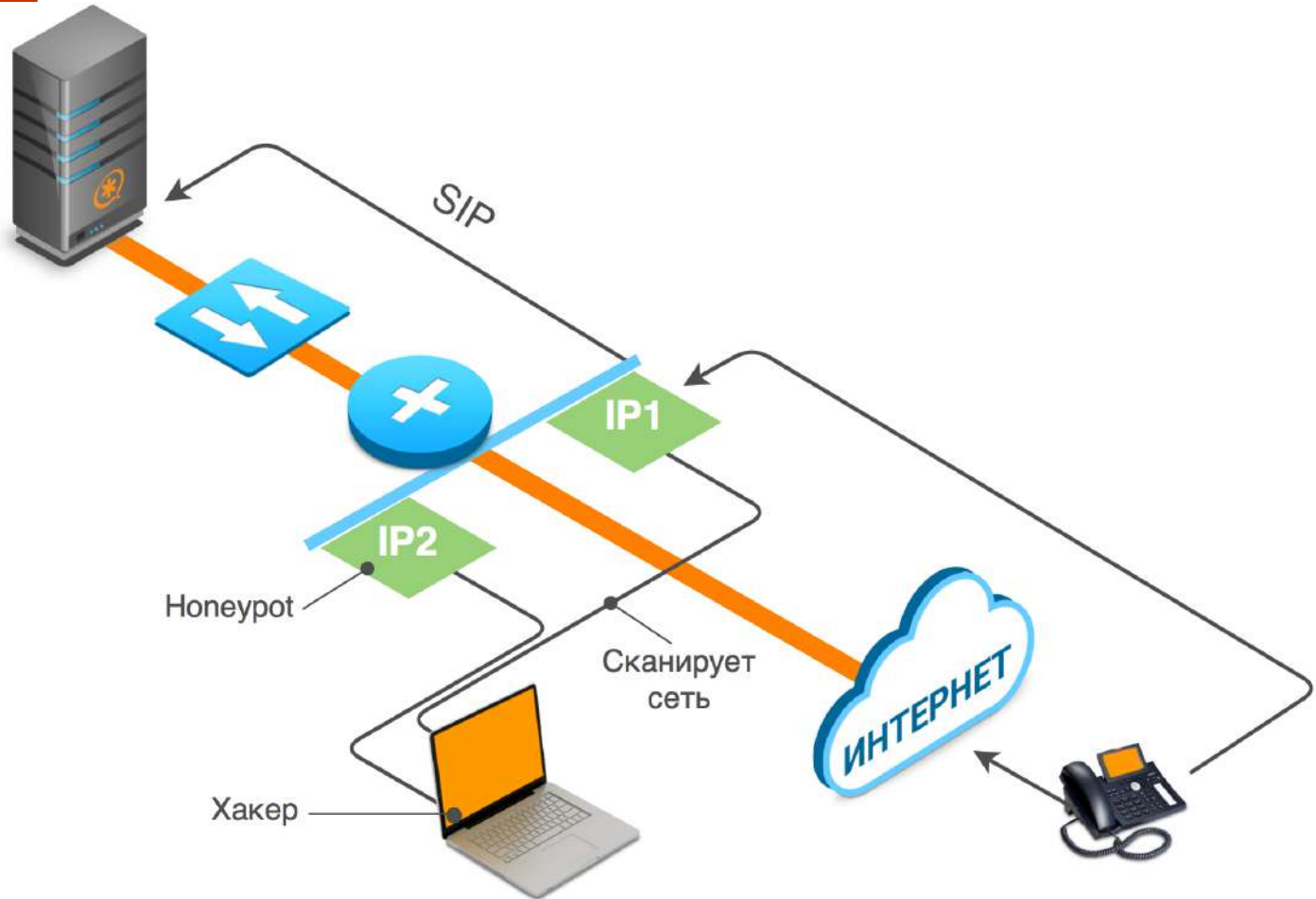
Src. Address Type  
Address Type:  
 Invert

Dst. Address Type  
Address Type: unicast  
 Invert

PSD  
Weight Threshold: 21  
Delay Threshold: 00:00:03  
Low Port Weight: 3  
High Port Weight: 1

OK  
Cancel  
Apply  
Disable  
Comment  
Copy  
Remove  
Reset Counters  
Reset All Counters

# SIP-HoneyPot



# НОЧНОЕ ЗАКРЫТИЕ ПОРТОВ

Hide Passwords

Quick Set  
CAPsMAN  
Interfaces  
Wireless  
Bridge  
PPP  
Switch  
Mesh  
IP  
Routing  
System  
Queues  
Files  
Log  
Radius  
Tools  
New Terminal  
LCD  
MetaROUTER  
Partition  
Make Supout.rf

Firewall

Filter Rules NAT Mangle

| #                            | Action       | Chain  |
|------------------------------|--------------|--------|
| ::: Prevent NAT to private   |              |        |
| 0                            | return       | srcnat |
| 1                            | X +   dst... | dstnat |
| 2                            | X +   dst... | dstnat |
| ::: place hotspot rules here |              |        |
| 3                            | X pas...     | unused |
| 4                            | +  * dst...  | dstnat |
| 5                            | +  * dst...  | dstnat |
| 6                            | +  * dst...  | dstnat |
| 7                            | =   mas...   | srcnat |
| 8                            | +  * dst...  | dstnat |
| 9                            | +  * dst...  | dstnat |
| ::: SSH from ESXlx to ESX    |              |        |
| 10                           | +  * dst...  | dstnat |
| 11                           | +  * dst...  | dstnat |
| 12                           | +  * dst...  | dstnat |
| 13                           | +  * dst...  | dstnat |
| 14                           | +  * dst...  | dstnat |
| ::: ESX 329                  |              |        |
| 15                           | X +   dst... | dstnat |
| 16                           | +  * dst...  | dstnat |
| 17                           | +  * dst...  | dstnat |
| 18                           | +  * dst...  | dstnat |
| 19                           | X +   dst... | dstnat |
| 20                           | +  * dst...  | dstnat |

NAT Rule <5090>

General Advanced Extra Action Statistics

Connection Limit  
Limit  
Dst. Limit  
Nth

Time  
Time: 00:00:00 - 1d 00:00:00

sun  mon  tue  wed  thu  fri  sat

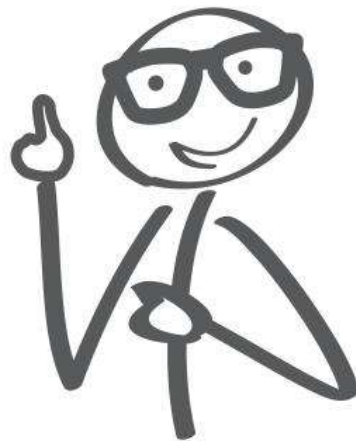
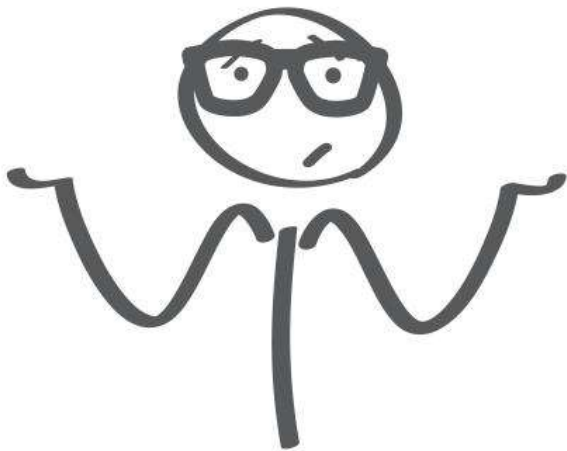
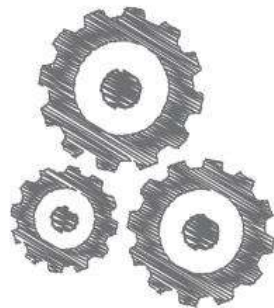
Src. Address Type  
Dst. Address Type  
PSD  
Hotspot  
IP Fragment

OK  
Cancel  
Apply  
Disable  
Comment  
Copy  
Remove  
Reset Counters  
Reset All Counters

В последних версиях RouterOS появилась возможность добавлять в Firewall FQDN-адреса вместо IP-адресов

Это позволяет нам прописывать в ACL клиентов, работающих с динамическими адресами

# В чем главная проблема Mikrotik



## *В чем главная проблема Mikrotik*

А теперь попробуйте объяснить своему клиенту, что все что перечислено выше – может стоить всего от 20 долларов и тут нет никакого подвоха!



**1390** руб.



**3800** руб.

# Спасибо за внимание!

The logo for Voxlink, featuring the word "voxl" in grey, "ink" in orange, and a stylized orange graphic of four curved lines to the right.

voxl**ink**

Внедрение IP-телефонии  
на IP-АТС Asterisk

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