

RouterBOARD / RouterOS:

ИСПОЛЬЗОВАНИЕ В ВАЖНЫХ ГОЛОСОВЫХ ПРИЛОЖЕНИЯХ

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Декабрь 2015

Цели проекта:

- **Отказоустойчивость**
- **Повышенная эффективность**
- **Сетевая безопасность**
- **Масштабируемость**
- **Оптимальная стоимость**

Используемые технологии:

- **Fiber Optics**
- **Ethernet, IP**
- **VLAN**
- **OSPF**
- **Wi-Fi, NV2**

- **VPLS**
- **TDMoIP**
- **FXO, FXS**
- **SIP**

Оборудование транспортной сети:

CCR1009-8G-1S



CPU 9 cores 1.2Ghz, RAM 1Gb

CCR1036-12G-4S



CPU 36 cores 1.2Ghz, RAM 4Gb

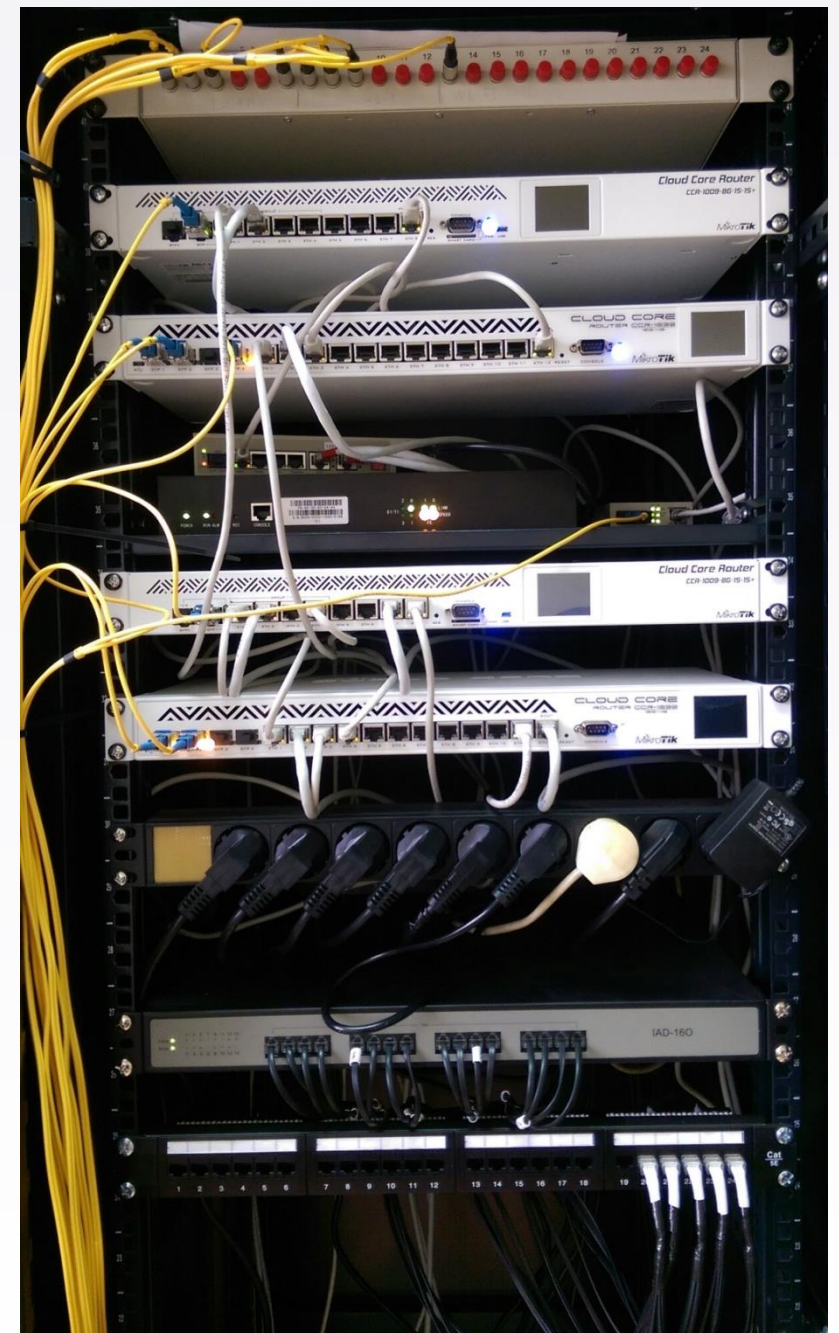
RB260GS



S-3553LC20D



1.25G, 1310nm/1550nm



Оборудование транспортной сети:

QRT 5 ac

Outdoor, 720 Mhz, 128Mb, 802.11ac,
24dBi



ANT4958D20T-90DP

90°H/4°V, 2x20dBi



NetMetal 5

Outdoor, 720 Mhz, 128Mb, SFP,
802.11ac



Оборудование транспортной сети:



Оборудование VoIP сети:

Dinstar MTG-600



Gaoke MG6016



Gaoke MG6008



ADNET AN-TDM-IP-2E1

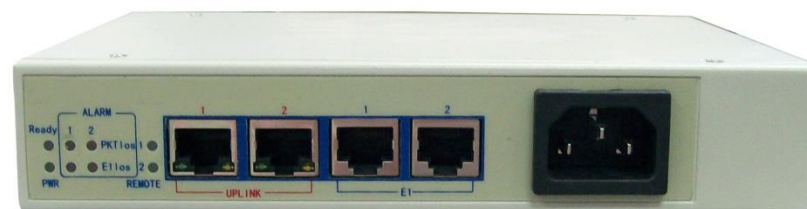


Схема транспортной сети:

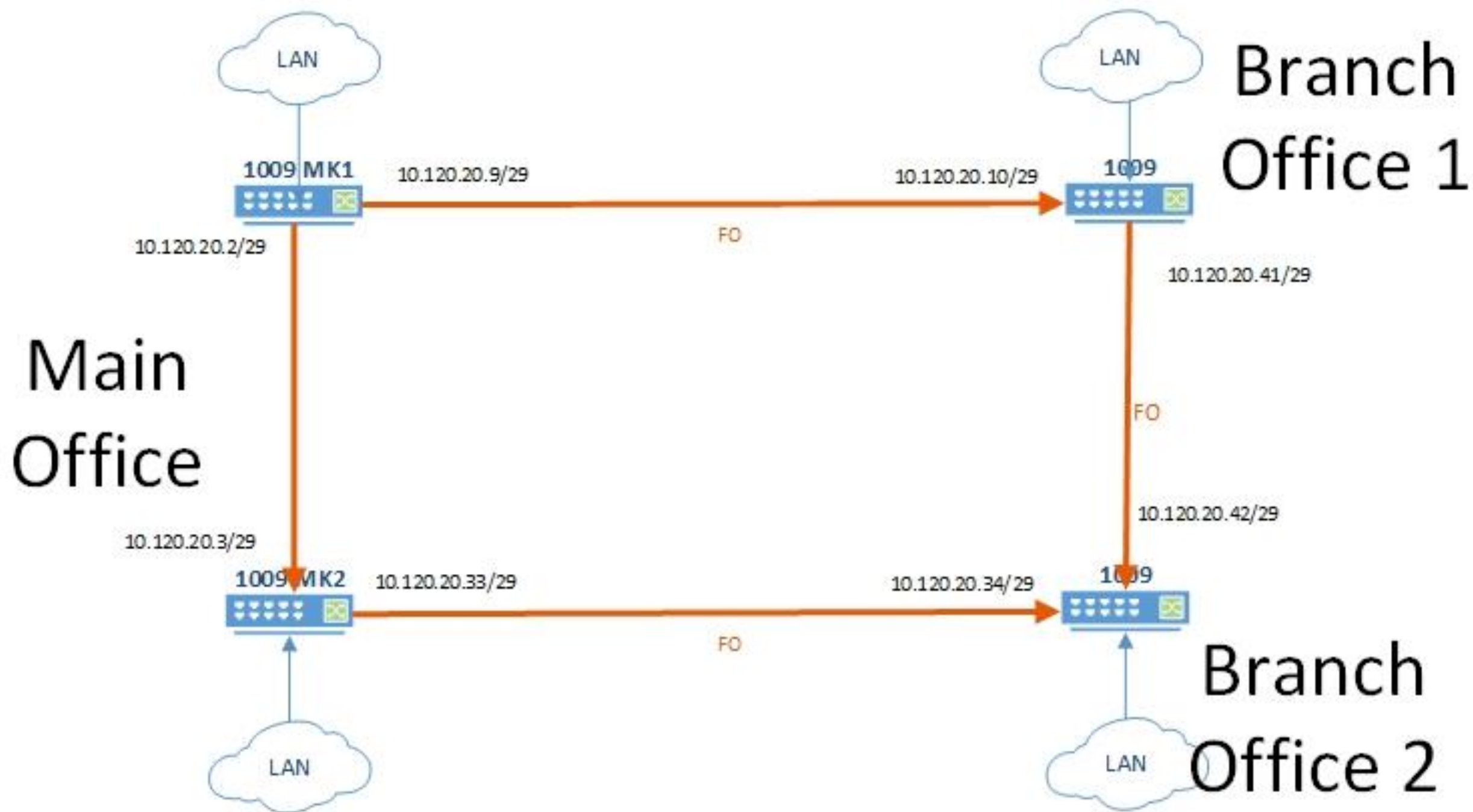


Схема транспортной сети:

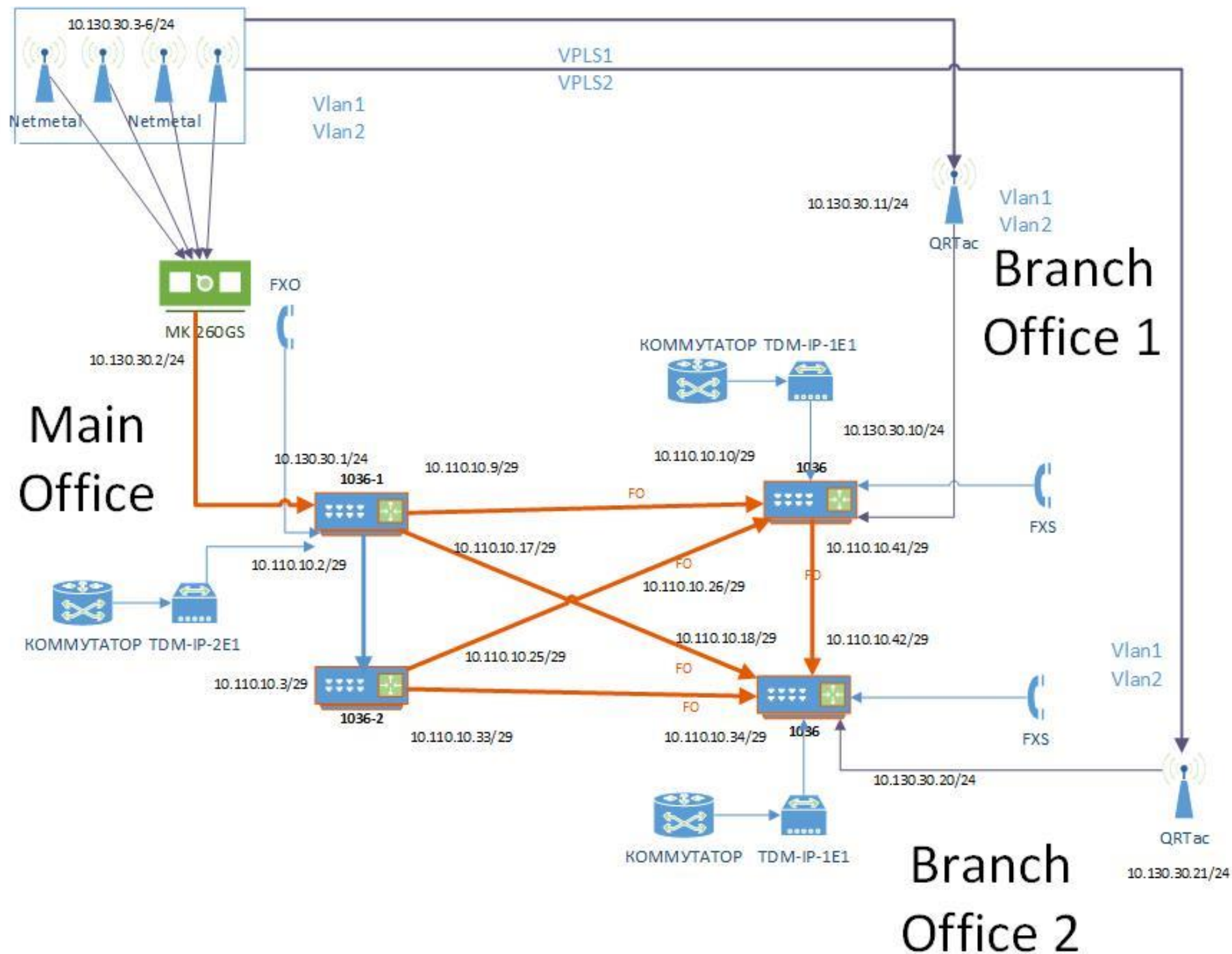
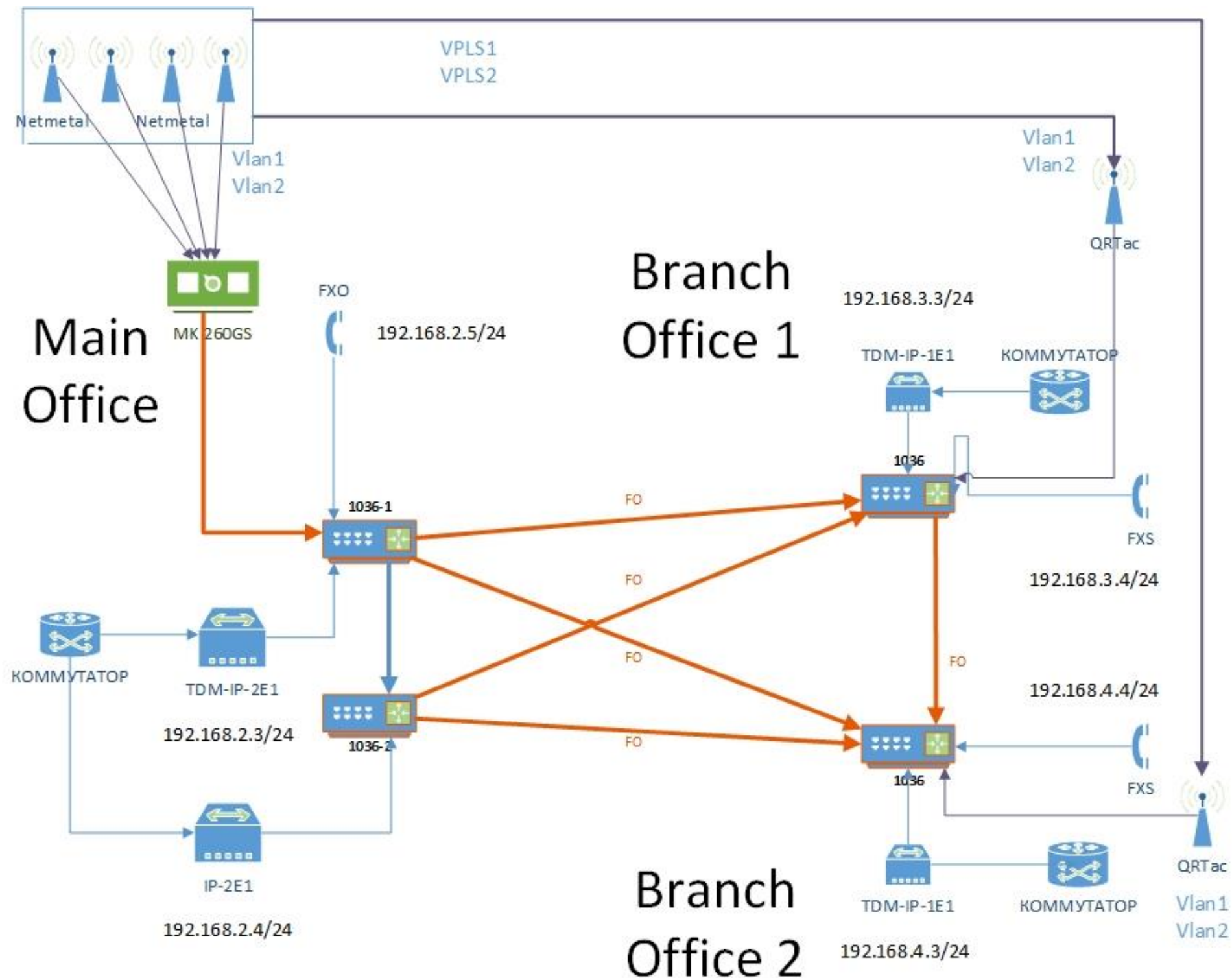


Схема VoIP сети:



Конфигурация RouterOS:

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
Name	Type	L2 MTU	Tx					
::: WIFI								
R	sfp4	Ethernet	1580					
RS	vlan600_wifi	VLAN	1576					
R	vlan500_WIFI	VLAN	1576				16	
	sfp2	Ethernet	1580					
::: TO_ -1036								
R	sfp2	Ethernet	1580				2.5	
R	vlan500-sfp2	VLAN	1576				2.5	
::: TO_ 1036								
R	sfp1	Ethernet	1580				2.5	
R	vlan500-sfp1	VLAN	1576				2.5	
RS	ether12	Ethernet	1580				9.8	

OSPF

Instance	Router ID	Address	Interface	State C...
default	10.0.0.1	10.0.0.0/24	vlan500-sfp2-...	5
default	192.168.1.1	10.0.0.0/24	vlan500_WIFI	5
default	10.0.0.1	10.0.0.0/24	vlan500_WIFI	2
default	10.0.0.1	10.0.0.0/24	vlan500_WIFI	28387
default	10.0.0.1	10.0.0.0/24	vlan500_WIFI	287020
default	10.0.0.1	10.0.0.0/24	vlan500-eth1...	5
default	10.0.0.1	10.0.0.0/24	vlan500_WIFI	12514
default	192.168.1.1	10.0.0.0/24	vlan500-sfp1-...	6
default	10.0.0.1	10.0.0.0/24	vlan500_WIFI	2
default	10.0.0.1	10.0.0.0/24	vlan500_WIFI	2
default	10.0.0.1	10.0.0.0/24	vlan500_WIFI	7

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE	
Name	Type	MTU	L2 ...	Tx	Rx	Tx...	Rx...	VLAN ID	
R	vlan500-eth1	1036-2	VLAN	1500	1576	76.9 kbps	7.1 kbps	10 6	500
R	vlan500-sfp1	1036	VLAN	1500	1576	2.5 Mbps	2.4 Mbps	1 ... 1 ...	500
R	vlan500-sfp2	-1036	VLAN	1500	1576	2.5 Mbps	2.4 Mbps	1 ... 1 ...	500
R	vlan500_WIFI		VLAN	1500	1576	8.0 kbps	75.9 kbps	7 12	500
S	vlan600_	_Mikr...	VLAN	1500	1576	0 bps	0 bps	0 0	600
RS	vlan600_wifi		VLAN	1500	1576	264 bps	1064 bps	1 3	600

OSPF

Instance	Area	Dst. Address	Gateway	Interface	Cost	State
default	backbone	192.168.1.24	10.10.10.10	vlan500-sfp1-...	20	intra area
default	backbone	192.168.1.24	0.0.0.0	bridge-VoIP	10	intra area
default	backbone	10.0.0.0/29	0.0.0.0	vlan500-eth1...	10	intra area
default	backbone	10.0.0.0/24	0.0.0.0	vlan500_WIFI	80	intra area
default	backbone	10.0.0.0/29	0.0.0.0	vlan500-sfp1-...	10	intra area
default	backbone	10.0.0.0/29	10.10.10.3, 1...	vlan500-eth1...	60	intra area
default	backbone	10.0.0.0/29	0.0.0.0	vlan500-sfp2-...	10	intra area
default		0.0.0.0/0	10.10.10.3	vlan500-eth1...	11	ext 1
default	backbone	10.0.0.0/29	10.10.10.10, ...	vlan500-sfp1-...	20	intra area
default	backbone	192.168.1.24	10.10.10.18	vlan500-sfp2-...	20	intra area
default	backbone	10.0.0.0/29	10.10.10.3, 1...	vlan500-eth1...	60	intra area

OSPF

Interface	Cost	P...	Aut...	Aut...	Network ...	Insta...	Area	N..	State
P	bridge-VoIP	10	1	none	*****	broadcast	default backbone	0	passive
D	vlan500-eth1_	-1036-2	10	1	none	*****	broadcast default backbone	1	designated router
D	vlan500-sfp1_	-1036	10	1	none	*****	broadcast default backbone	1	backup
D	vlan500-sfp2_	-1036	10	1	none	*****	broadcast default backbone	1	backup
	vlan500_WIFI		80	1	none	*****	broadcast default backbone	8	dr other

Конфигурация RouterOS:

The image displays three screenshots of the RouterOS configuration interface for the wlan1 interface, showing different tabs and sections.

Top Left Screenshot: General Tab

- Mode: ap bridge
- Band: 5GHz-only-AC
- Channel Width: 20/40/80MHz eCee
- Frequency: auto MHz
- SSID: Wi-Fi CET2-MM3
- Scan List: 5540-5600, 5650-5725
- Wireless Protocol: nv2
- Security Profile: profile1
- Bridge Mode: enabled
- VLAN Mode: no tag
- VLAN ID: 1
- Default AP Tx Rate: bps

Top Right Screenshot: NV2 Tab

- TDMA Period Size: 2ms
- Cell Radius: 30 km
- Security:
- Preshared Key:
- Queue Count: 2
- QoS: default

Bottom Left Screenshot: Wireless Tables

Radio Name	MAC Address	Interf...	Uptime	AP	W...	Last ...	Tx/Rx Signal ...	Tx Rate	Rx Rate
4C5E0C8B3F0C	4C:5E:0C:8B:3F:0C	wlan1	00:10:10	no	no	0.000	-51/-51	65Mbps-2...	57.7Mb
4C5E0C8B3F16	4C:5E:0C:8B:3F:16	wlan1	00:10:11	no	no	0.000	-55/-55	72.2Mbps-...	57.7Mb

Bottom Right Screenshot: Status Tab

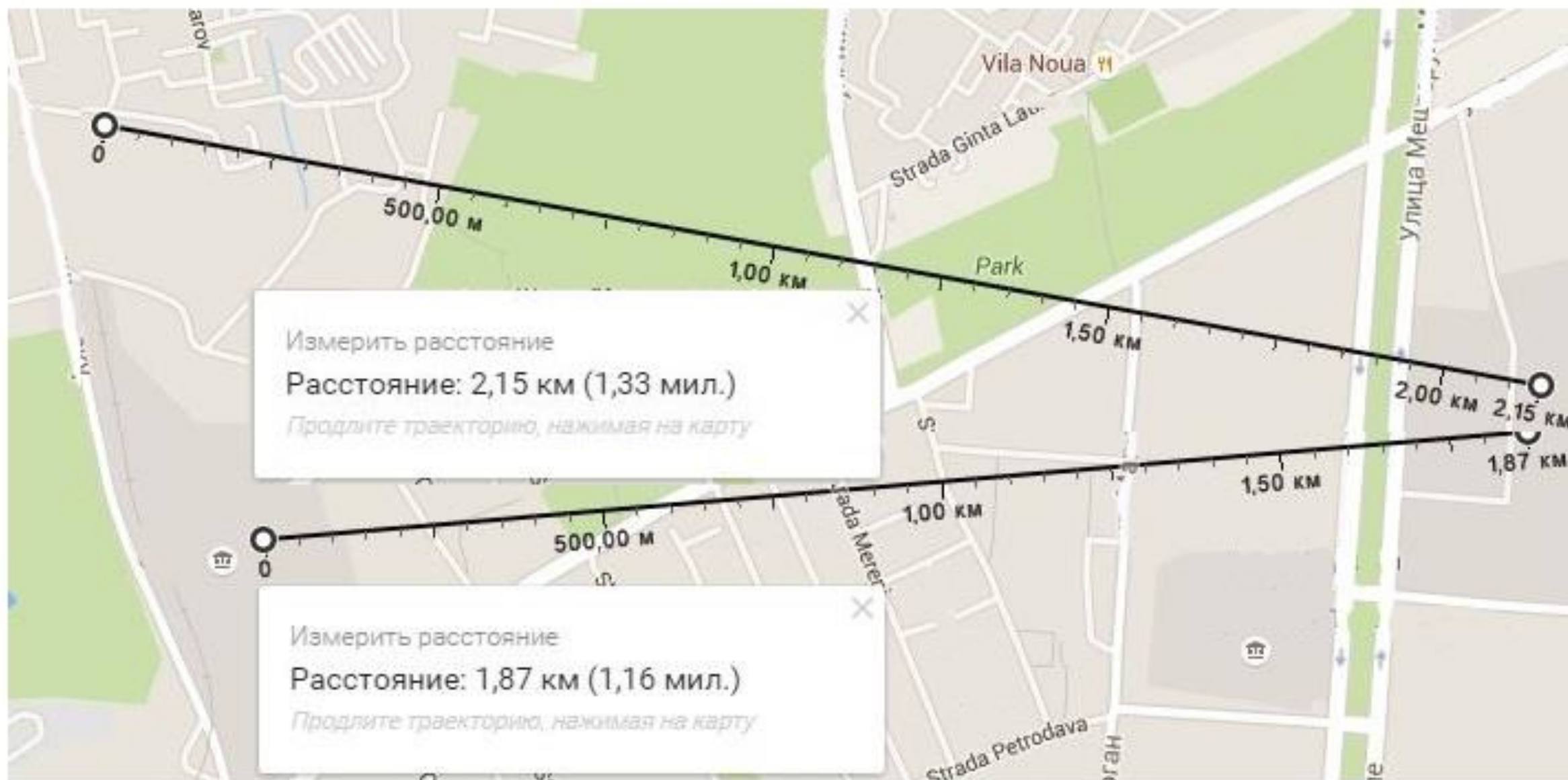
- Tx/Rx Rate: 3.1 kbps / 3.4 kbps
- Tx/Rx Packet Rate: 5 p/s / 5 p/s
- Tx/Rx Bytes: 5.4 GiB / 3129.8 MiB
- Tx/Rx Packets: 52 368 984 / 29 065 183
- Tx/Rx Drops: 0 / 0
- Tx/Rx Errors: 0 / 0

Two line graphs show traffic over time:

- Graph 1: Tx (blue) at 3.1 kbps, Rx (red) at 3.4 kbps.
- Graph 2: Tx Packet (blue) at 5 p/s, Rx Packet (red) at 5 p/s.

Bottom status bar: enabled, running, slave, running ap

Тесты:



Тесты:

Ping

General | Advanced

Ping To: 10.10.10

Interface:

ARP Ping

Packet Count:

Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # / Host	Time	Reply Size	TTL	Status
0 10.10.10	0ms	50	64	
1 10.10.10	0ms	50	64	
19 10.10.10	0ms	50	64	
20 10.10.10	0ms	50	64	
21 10.10.10	0ms	50	64	
22 10.10.10	0ms	50	64	
23 10.10.10	0ms	50	64	
24 10.10.10	0ms	50	64	

30 items | 30 of 30 packets r... | 0% packet loss | Min: 0 ms | Avg: 0 ms | Max: 0 ms

Ping

General | Advanced

Ping To: 10.10.18

Interface:

ARP Ping

Packet Count:

Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # / Host	Time	Reply Size	TTL	Status
0 10.10.18	0ms	50	64	
1 10.10.18	0ms	50	64	
19 10.10.18	0ms	50	64	
20 10.10.18	0ms	50	64	
21 10.10.18	0ms	50	64	
22 10.10.18	0ms	50	64	
23 10.10.18	0ms	50	64	
24 10.10.18	0ms	50	64	

30 items | 30 of 30 packets r... | 0% packet loss | Min: 0 ms | Avg: 0 ms | Max: 0 ms

Bandwidth Test

Test To: 10.10.11

Protocol: udp tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: both

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

Random Data

User: admin

Password:

Lost Packets: 116

Tx/Rx Current: 14.5 Mbps/28.4 Mbps

Tx/Rx 10s Average: 14.0 Mbps/25.9 Mbps

Tx/Rx Total Average: 13.8 Mbps/24.3 Mbps

stopped

Ping

General | Advanced

Ping To: 10.10.11

Interface:

ARP Ping

Packet Count:

Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # / Host	Time	Reply Size	TTL	Status
45 10.10.11	2ms	50	64	
55 10.10.11	2ms	50	64	
56 10.10.11	9ms	50	64	
57 10.10.11	2ms	50	64	
58 10.10.11	11ms	50	64	
59 10.10.11	3ms	50	64	

60 items | 60 of 60 packets re... | 0% packet loss | Min: 2 ms | Avg: 3 ms | Max: 11 ms

Ping

General | Advanced

Ping To: 10.10.21

Interface:

ARP Ping

Packet Count:

Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # / Host	Time	Reply Size	TTL	Status
45 10.10.21	3ms	50	64	
55 10.10.21	2ms	50	64	
56 10.10.21	3ms	50	64	
57 10.10.21	2ms	50	64	
58 10.10.21	2ms	50	64	
59 10.10.21	1ms	50	64	

60 items | 60 of 60 packets re... | 0% packet loss | Min: 1 ms | Avg: 2 ms | Max: 5 ms

Тесты:

E1 Management --> E1 Port (PW Configuration)

Port	Service Name	Enable	Timing Mode	Jitter Buffer	Destination IP	UDP Port	
						Source	Destination
1	<input type="text"/>	<input checked="" type="checkbox"/>	Adaptive ▾	10 ms	<input type="text"/>	2142	2142

E1 Management --> E1 Port (PW Configuration)

Port	Service Name	Enable	Timing Mode	Jitter Buffer	Destination IP	UDP Port	
						Source	Destination
1	<input type="text"/>	<input checked="" type="checkbox"/>	Adaptive ▾	30 ms	<input type="text"/>	2142	2142



Спасибо за внимание!

Александр Новаковский
Декабрь 2015