

RouterBOARD / RouterOS:

ИСПОЛЬЗОВАНИЕ В ВАЖНЫХ ГОЛОСОВЫХ ПРИЛОЖЕНИЯХ

Александр Новаковский

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

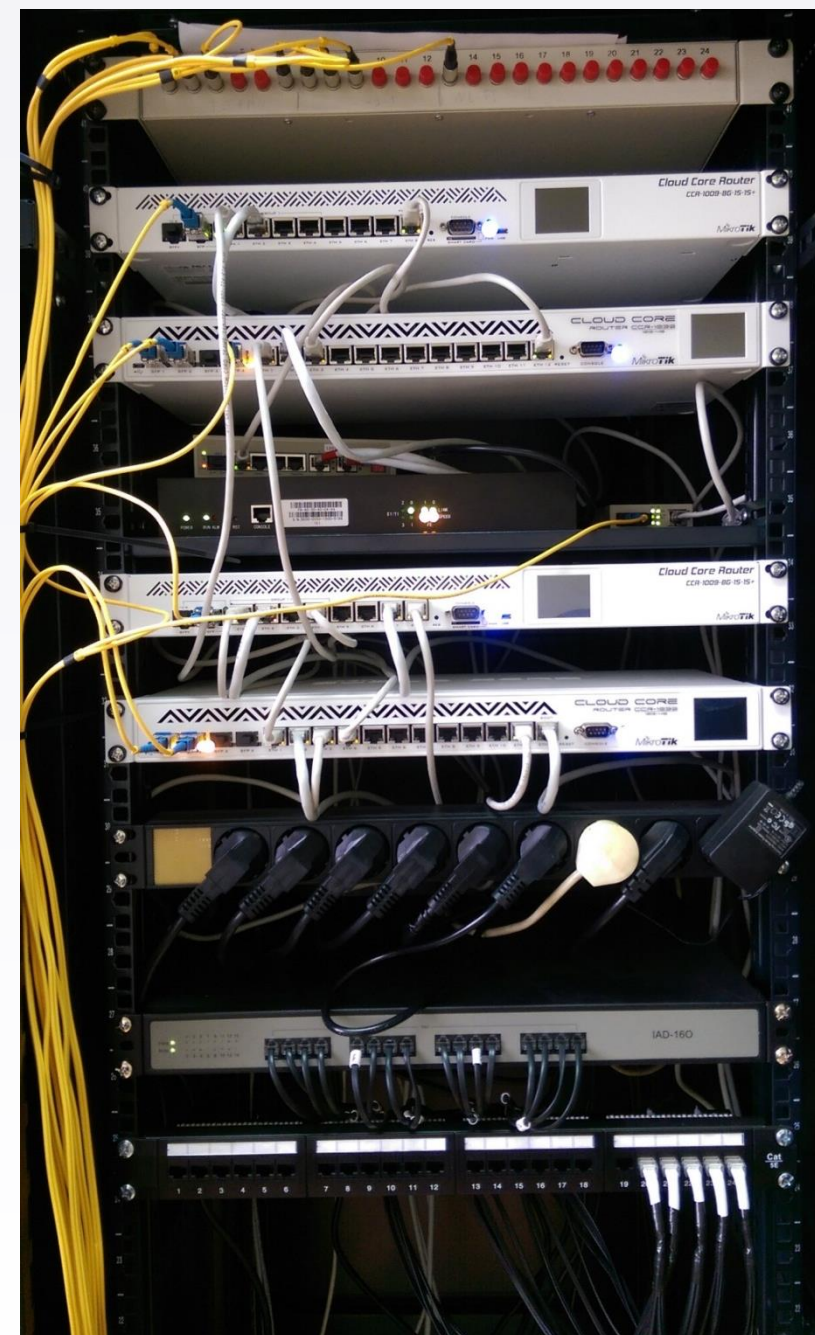
RB260GS



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

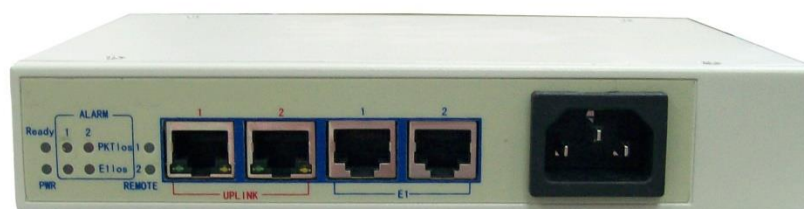


Схема транспортной сети:

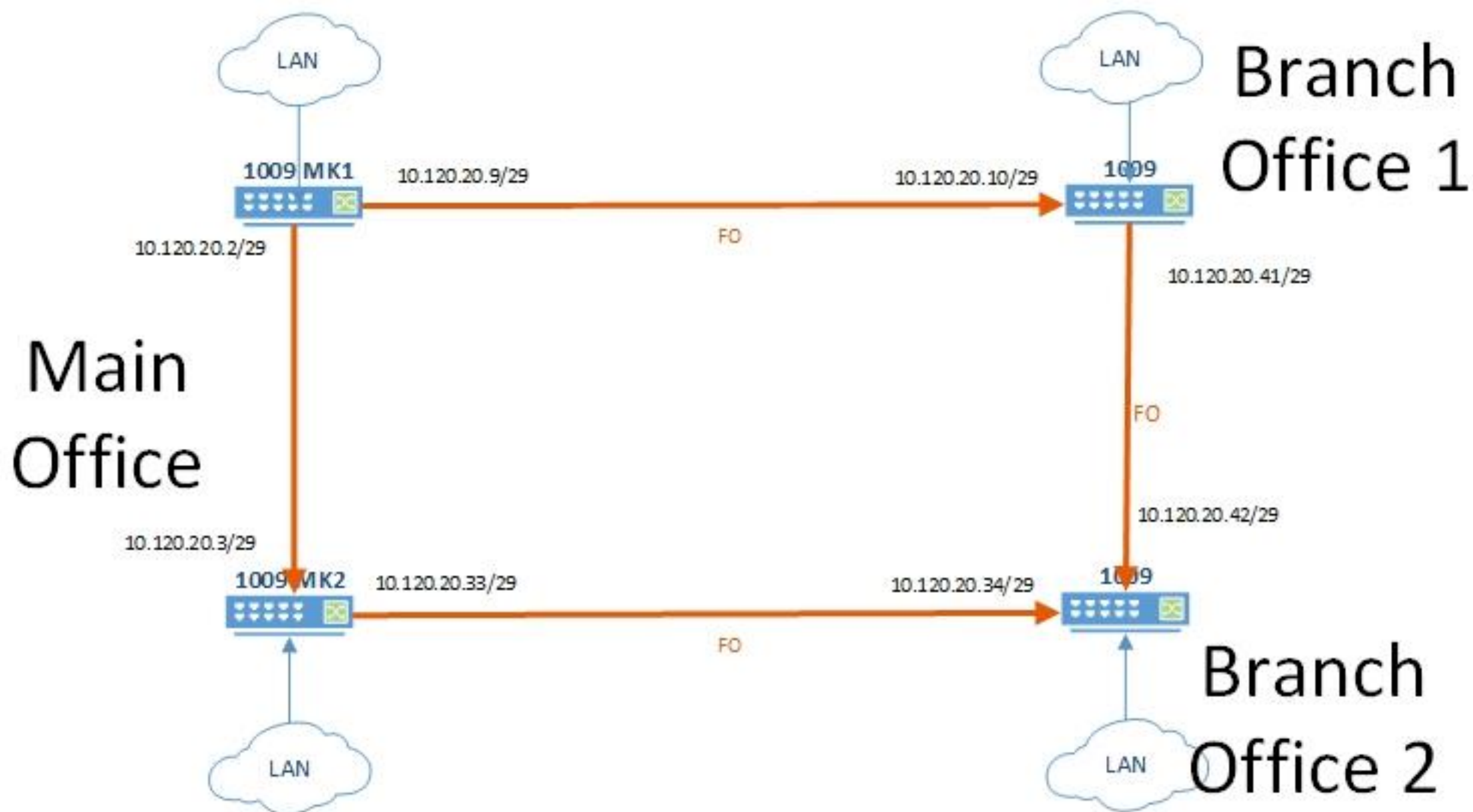


Схема транспортной сети:

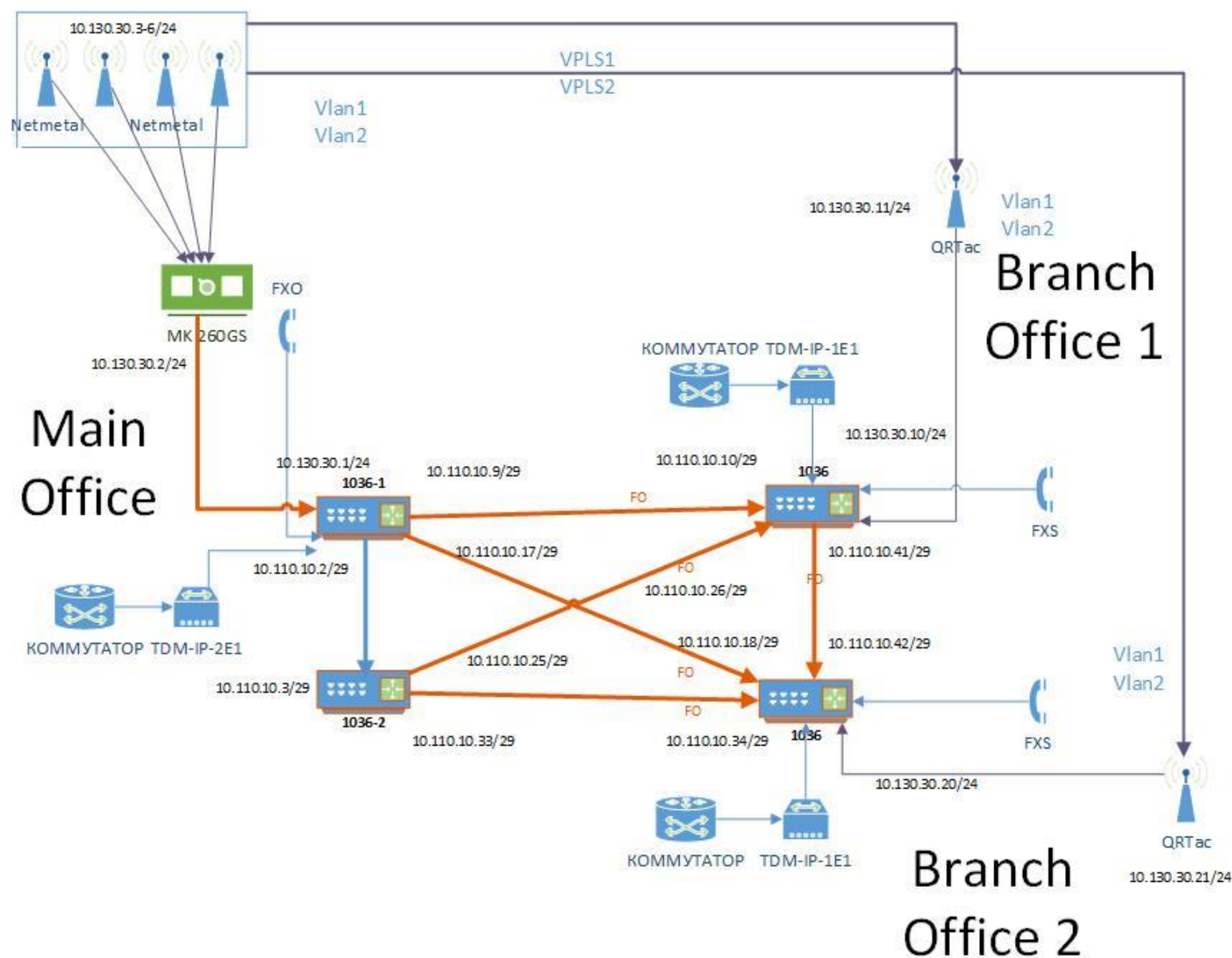
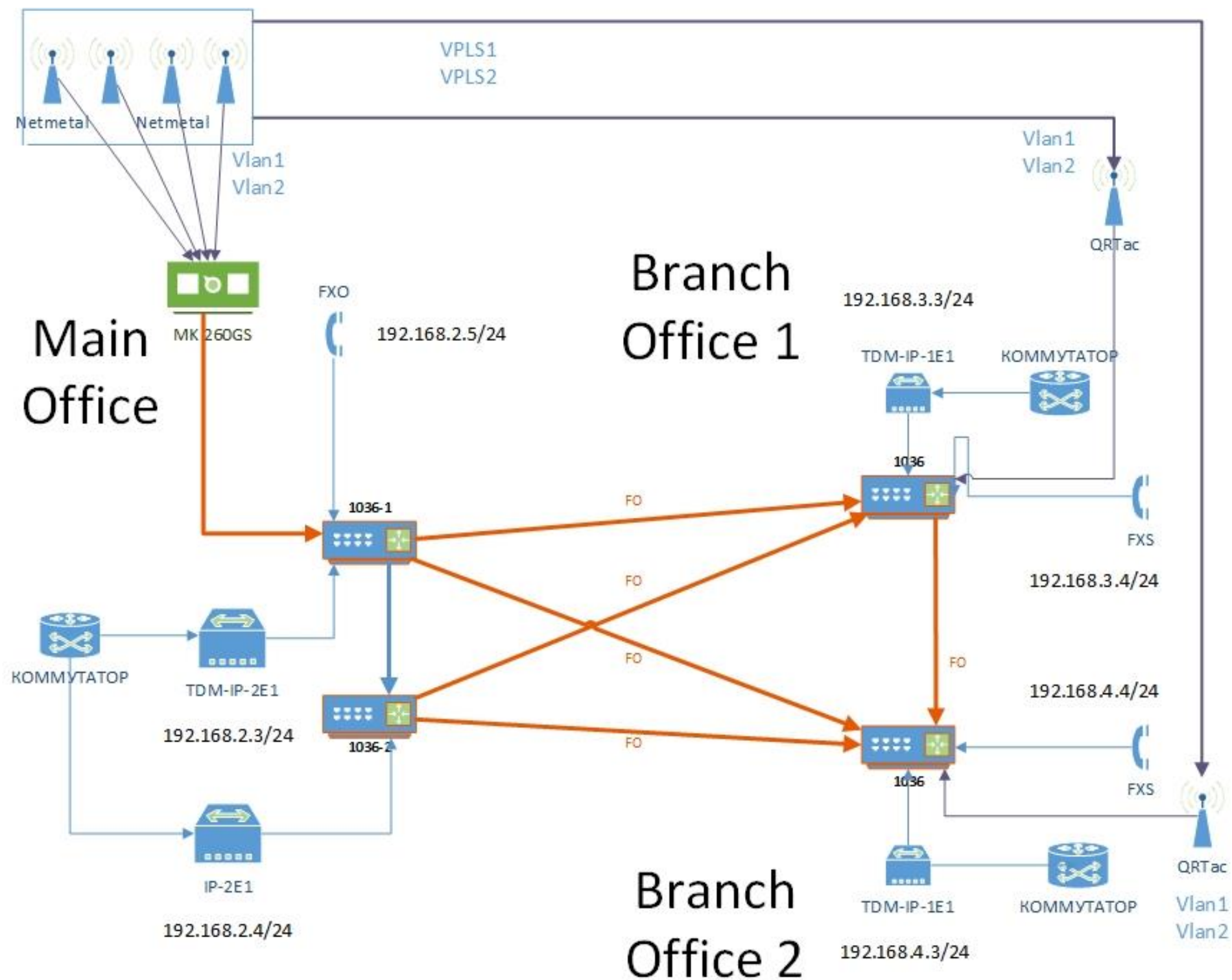


Схема VoIP сети:



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
	↔ sfp3	Ethernet	1580		
::: TO_ -1036					
R	↔ sfp2 1036	Ethernet	1580		2.5
R	↔ vlan500-sfp2 1036	VLAN	1576		2.5
::: TO_ 1036					
R	↔ sfp1 1036	Ethernet	1580		2.5
R	↔ vlan500-sfp1 1036	VLAN	1576		2.5
RS	↔ ether12	Ethernet	1580		9.8

OSPF					
Interfaces Instances Networks Areas Area Ranges Virtual Links Neighbors NBMA Neighbors					
🔍					
Instance /	Router ID	Address	Interface	State C...	
default	10.3	10.3	vlan500-sfp2-...	5	
default	192.168.1.1	10.3	vlan500_WIFI	5	
default	10.3	10.3	vlan500_WIFI	2	
default	10.3	10.3	vlan500_WIFI	28387	
default	10.3	10.3	vlan500_WIFI	287020	
default	10.3	10.3	vlan500-eth1...	5	
default	10.3	10.3	vlan500_WIFI	12514	
default	192.168.1.1	10.3	vlan500-sfp1-...	6	
default	10.3	10.3	vlan500_WIFI	2	
default	10.3	10.3	vlan500_WIFI	2	
default	10.3	10.3	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							
Interfaces Instances Networks Areas Area Ranges Virtual Links Neighbors NBMA Neighbors Sha							
🔍							
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	10.10.10.3/29	0.0.0.0	vlan500-eth1...	10	intra area	
default	backbone	10.10.10.3/24	0.0.0.0	vlan500_WIFI	80	intra area	
default	backbone	10.10.10.3/29	0.0.0.0	vlan500-sfp1-...	10	intra area	
default	backbone	10.10.10.3, 1...	10.10.10.3, 1...	vlan500-eth1...	60	intra area	
default	backbone	10.10.10.3/29	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	10.10.10.3/29	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	10.10.10.3/29	10.10.10.3, 1...	vlan500-eth1...	60	intra area	

OSPF										
Interfaces Instances Networks Areas Area Ranges Virtual Links Neighbors NBMA Neighbors Sham Links LSA										
+ - ✓ ✗ 📁 🔍										
	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:

Interface <wlan1>

General Wireless HT WDS Nstreme NV2 ...

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

OK, Cancel, Apply, Disable, Comment, Advanced Mode, Torch, Scan..., Freq. Usage..., Align..., Sniff..., Snooper..., Reset Configuration

Interface <wlan1>

General Wireless HT WDS Nstreme NV2 Status Traffic

TDMA Period Size: 2ms

Cell Radius: 30 km

☐ Security

Preshared Key:

Queue Count: 2

QoS: default

OK, Cancel, Apply, Disable, Comment, Advanced Mode, Torch, Scan..., Freq. Usage...

Interface <wlan1>

General Wireless HT WDS Nstreme NV2 Status Traffic

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

OK, Cancel, Apply, Disable, Comment, Advanced Mode, Torch, Scan..., Freq. Usage..., Align..., Sniff..., Snooper..., Reset Configuration

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles Channels

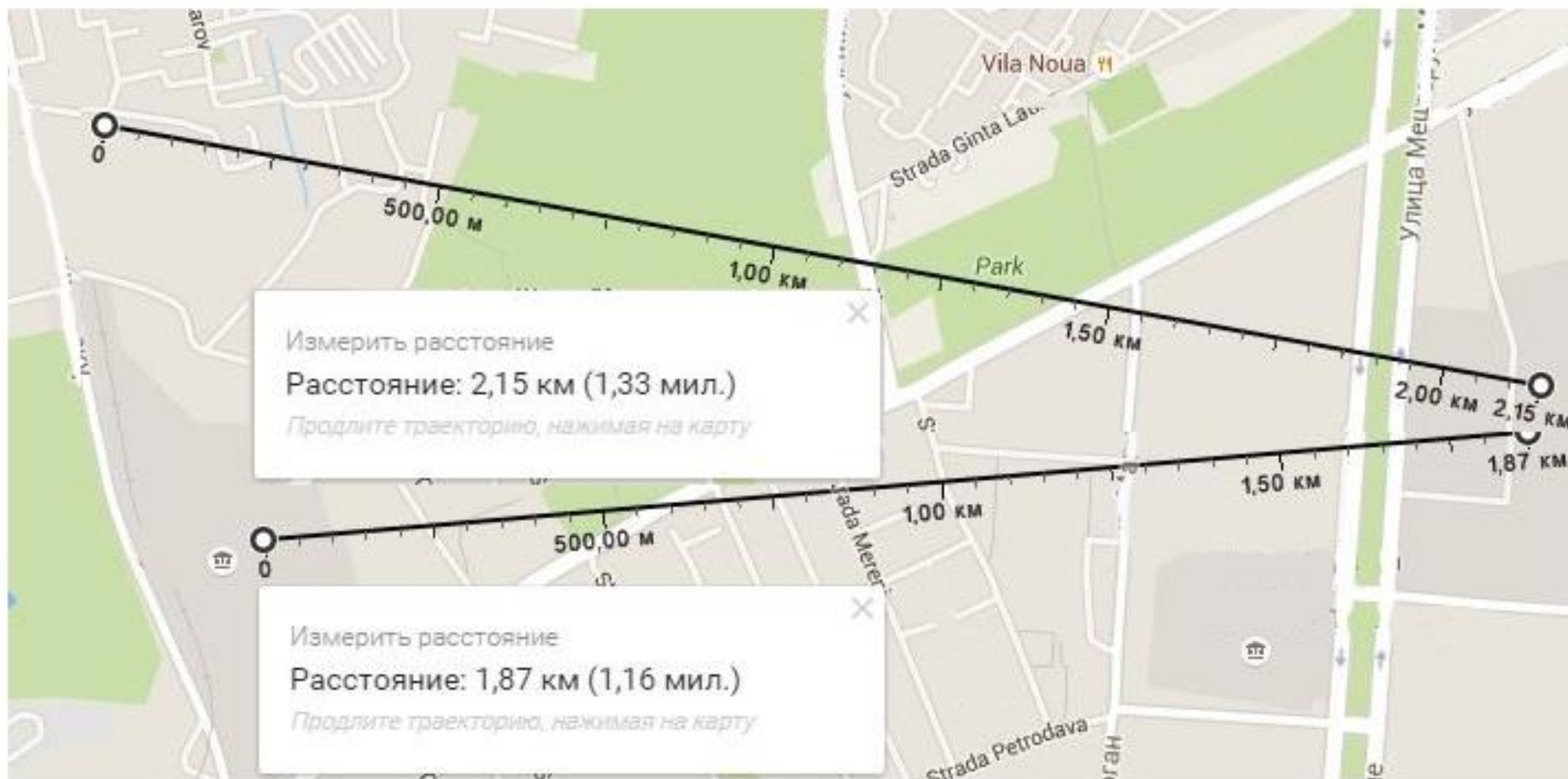
Reset

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

2 items

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

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

Bandwidth Test

Test To: 10.10.10

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

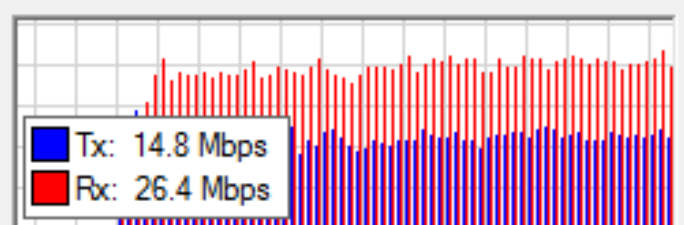
Password:

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

Тесты:

E1 Management --> E1 Port (PW Configuration)

Port	Service Name	Enable	Timing Mode	Jitter Buffer	Destination IP	UDP Port	
						Source	Destination
1		☒	Adaptive ▼	10 ms		2142	2142

E1 Management --> E1 Port (PW Configuration)

Port	Service Name	Enable	Timing Mode	Jitter Buffer	Destination IP	UDP Port	
						Source	Destination
1		☒	Adaptive ▼	30 ms		2142	2142



Спасибо за внимание!

Александр Новаковский
Декабрь 2015