TEST GPON/4GE/2POTS/WIFI

EXTRALINK TYTAN

TYTAN

GPON/4GE/2POTS/WIFI

- 802.11 B/G/N WI-FI
- 4 X GIGABIT ETHERNET
- 2 X POTS PORT
- 1 X GPON OPTIC INTERFACE, FSAN G.984.2

  DOWNLINK 2.448 GBIT/S, UPLINK 1.244 GBIT/S
  SC SINGLE-MODE FIBER SPLIT RATIO: 1:128
  TRANSMISSION DISTANCE 30KM

- FULLY COMPATIBLE WITH ITU-T G.984
- OMCI AND TR069 FOR REMOTEMANAGEMENT
- WEB FOR LOCAL MANAGEMENT
- IGMP SNOOPING
- BROADCOM CHIPSET

Here we present subsequent tests of EXTRALINK devices from a new line of their products. This time we deal with **GPON/4GE/POTS/WIFI EXTRALINK**, named **TYTAN**.

First of all, GPON is the latest generation of PON network. Protocol used in the GPON standard is ITU-T G984. GPON standard differs from other PON standards that it achieves higher throughput and performance, using larger packets of variable wavelength.

GPON offers efficient encapsulation, using frame segmentation. It allows better quality of services which tend to lag e.g. voice transmission or video. GPON network provides the reliability and performance, which helps a lot in business solutions. It also enables the delivery of housing services like telephone, television and Internet, in a very attractive way.

ONT GPON TYTAN FD614GW is a CPE unit, which makes it ideal for FTTH/FTTO networks. It enables data transmission i.e. voice and video in HD. **TYTAN** operates on Broadcom chipset, which supports two POTS ports, four Gigabit Ethernet ports and Wi-Fi interface working in 802.11 n/b/g standard.

The test of **EXTRALINK TYTAN GPON/4GE/POTS/WIFI** has been mainly done in order to check its performance, functionality of hardware and software, and compatibility with the LMS platform.

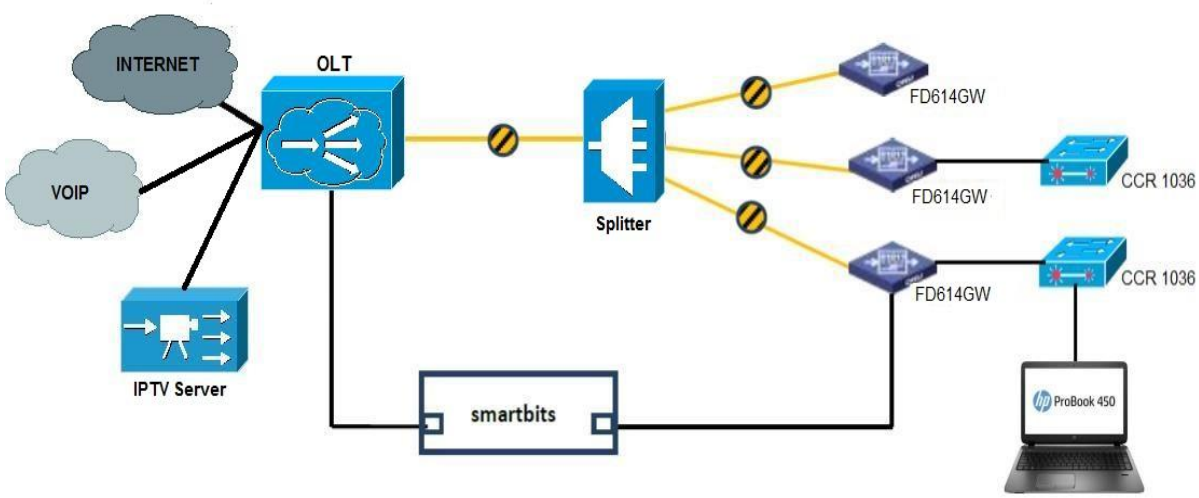
All performed tests are consistent with the technical standards of GPON devices.

1. The description of units, network diagram

Tests were carried out using the following equipment:

Device	Model/Version
OLT	ZTE C300
ONU	Extralink Tytan GPON FD614GW (4GE)
SPLITTER	EXTRALINK 1:8 PLC SPLITTER SC/UPC 900UM 1.5M
MIKROTIK ROUTERBOARD	CCR1036-12G-4S-RM
SMARTBITS	Smartwin8.51
LAPTOP	HP Pro Book 450 System: Windows 10

Network diagram:



2. Hardware productivity:

	Element tested		Condition	Result	Attempts	
HARDWARE PRODUCTIVITY	ONU	Throughput	Frame's length: 64,128,512,1024,1280,1518 Testtime: 15s	Frame's length 64: Uplink 350Mbps, Downlink 600Mbps, Other frame's length: Uplink 900Mbps, Downlink 950Mbps	2	Pass
		Packet loss rate	Frame's length: 64,512,1518, Flow set on 90% performance , Testtime: 1000s	Loss of packets- 0	2	Pass
		Time delay	Flow set on 90% performance Frame's length: 64,128,512,1024,1280,1518	Downlink below 500us , Uplink below 1.5ms	2	Pass
		Long-term packet loss rate	Flow set on max performance, Different frame's length, Testtime: 12h	Loss of packets- 0	2	Pass
		Hundred meters cable test	ONU I and measuring device connected by 100m cable Testtime: 12h	Loss of packets- 0	2	Pass
		20km fiber optic connection	Optical link between ONU and OLT I is 20km, Testtime: 12h	Loss of packets- 0	2	Pass
	WiFi	Output power	B Mode @11Mbps 18dBm G Mode @54Mbps 16dBm 11n Mode @HT20 16dBm	±2.0dB	2	Pass
		Frequency offset	CH1 ~ CH13	≤±20ppm	2	Pass
		Threshold	CH1 ~ CH13	5%	2	Pass
		Receive EVM	802.11b	-96dBm@1M, -93dBm@2M, -91dBm@5.5M-8 8dBm@11M	2	Pass
			802.11g	-90dBm@6M -89dBm@9M&12M -86dBm@18M -83dBm@24M -79@36M -75dBm@48M&54M	2	Pass

			802.11n	-96dBm@1M -88dBm@11M -90dBm@6M -75dBm@54M	2	Pass

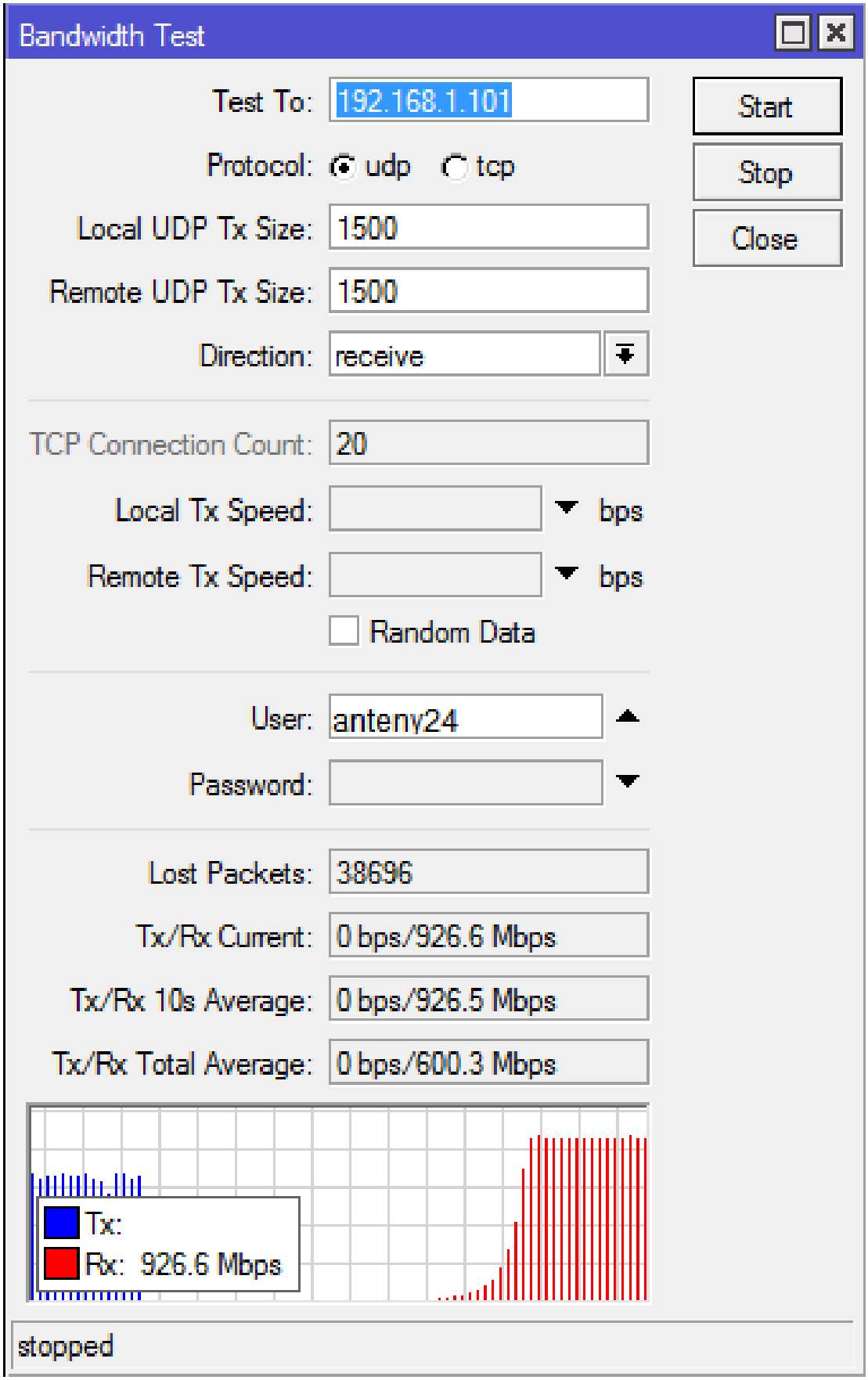
3. Hardware durability:

	Element tested		Condition	Result	Attempts	
HARDWARE DURABILITY	Environment	Low temperature	Low temperature: -10 °C , Different frame's length, Testtime: 24h	Normal start, Loss of packets- 0	2	Pass
		High temperature	High temperature 50°C , Different frame's length, Testtime: 24h	Loss of packets- 0	2	Pass
		Variable temperature	Temperature 0°C -50°C, change: 1°C per minute Testtime: 13 cycles	Loss of packets- 0	2	Pass
	Hardware	Status of diodes	Adjusted to test conditions	diodes- normal	2	Pass
		Status of optical interface	Fiber connector- connected 20 times	Normal registration, no occurrence of reboot	2	Pass
		POWER button	switched on and off- 20 times	Normal start	2	Pass
		RESET button	Short 1s - reboot of the device, Long 10s - restoration of factory defaults	There is no problem with the reboot and restoration of factory defaults	2	Pass

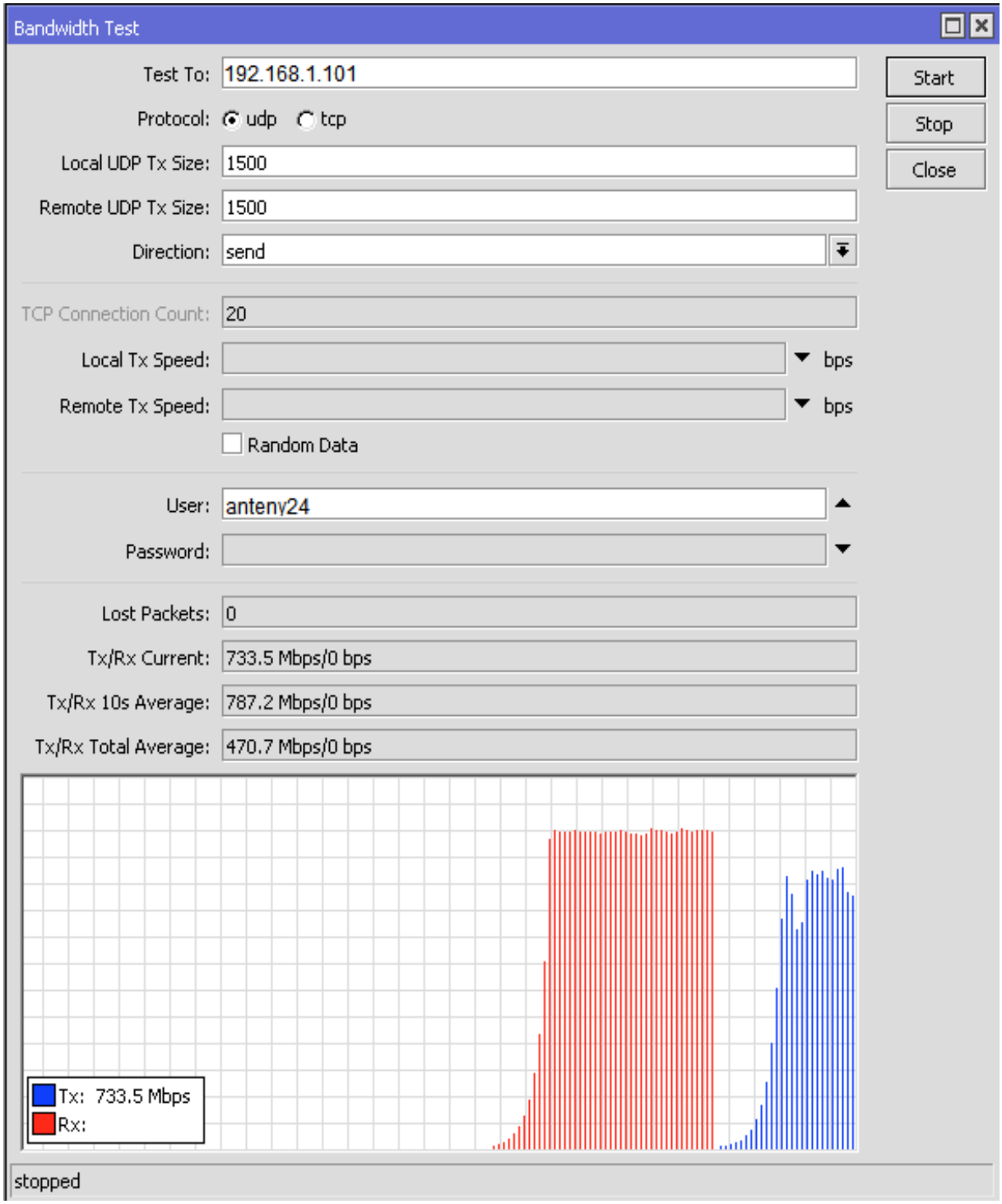
4. Bandwidth test (Speed test)

Bandwidth was tested by using two **TYTAN GPON/4GE/POTS/WIFI,** two **Mikrotiks RouterBoard CCR1036-12G-4S-RM** and **OLT ZTE C300**. The measurements were carried out by using the Mikrotik Bandwidth Test mechanism and public bandwidth Speedtest (within obtaining real bandwidth).

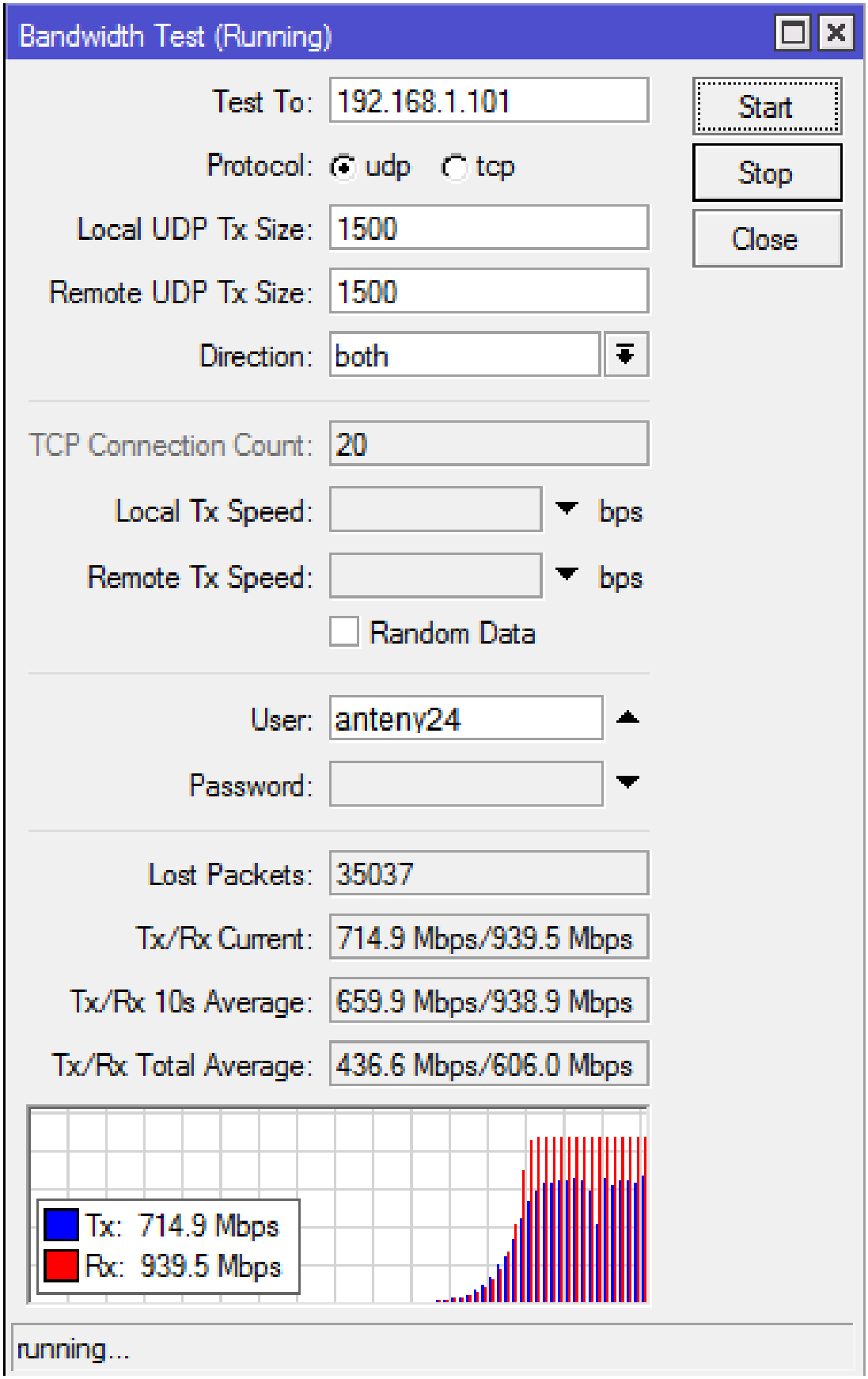
Mikrotik Bandwidth Test UDP receive



Mikrotik Bandwidth Test UDP send

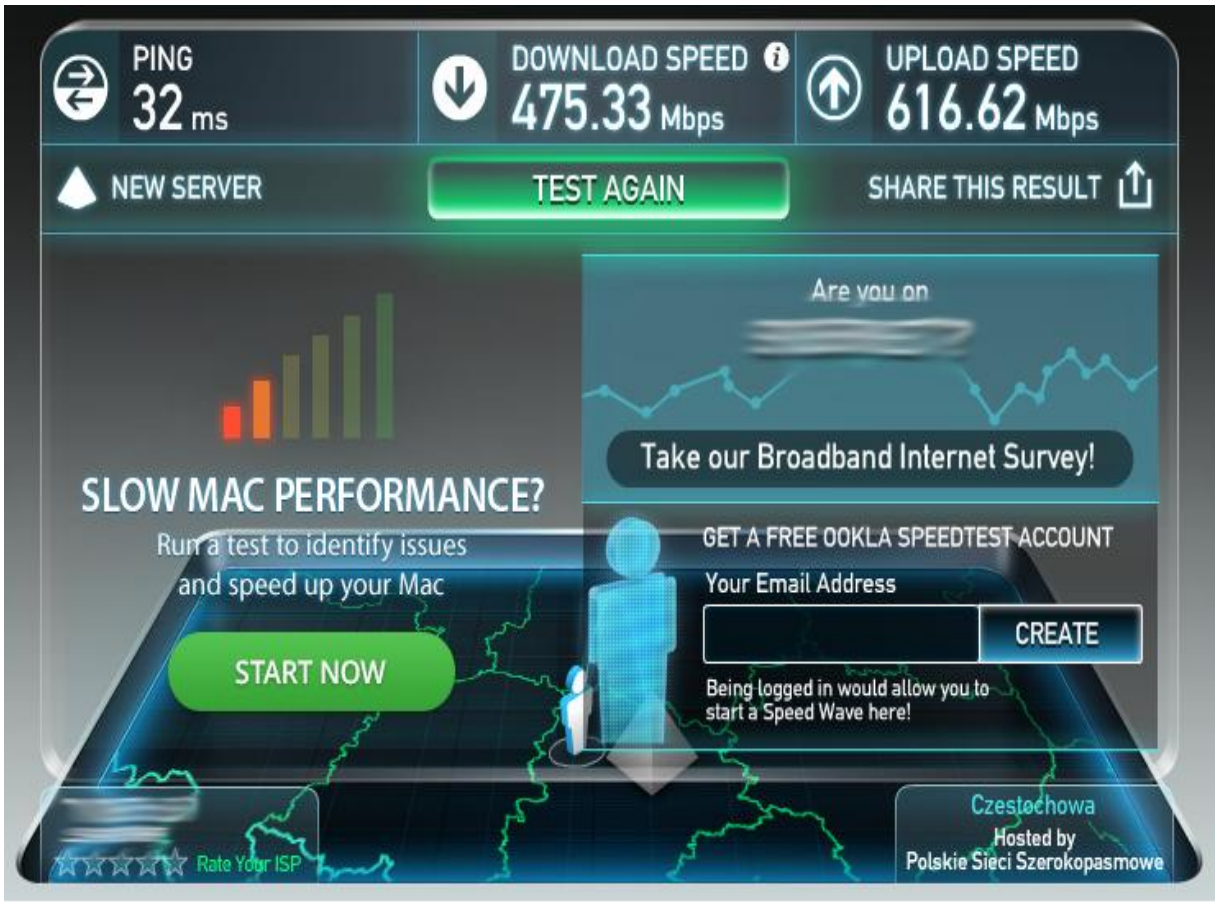


Mikrotik Bandwidth Test UDP both



Speedtest

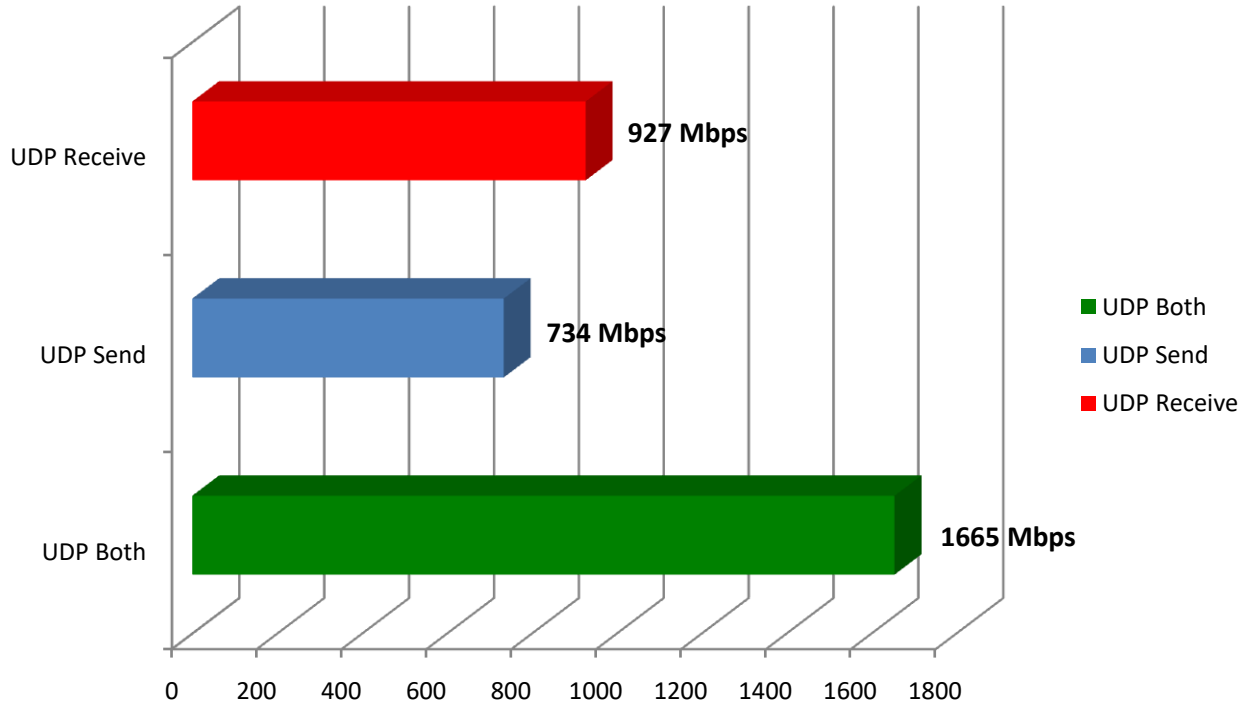
A practical test of the resulting bandwidth access to the Internet was carried out using widely available service OOKLA Speedtest.net.



The results are very satisfying. Achieved download speed is 500 Mbit/s with 600 Mbit/s of upload. Nowadays, this is a very good result. Any inaccuracy in the measurement of bandwidth and undervaluation of download/upload speed may result from the current server load, on which the measurements were made.

Results

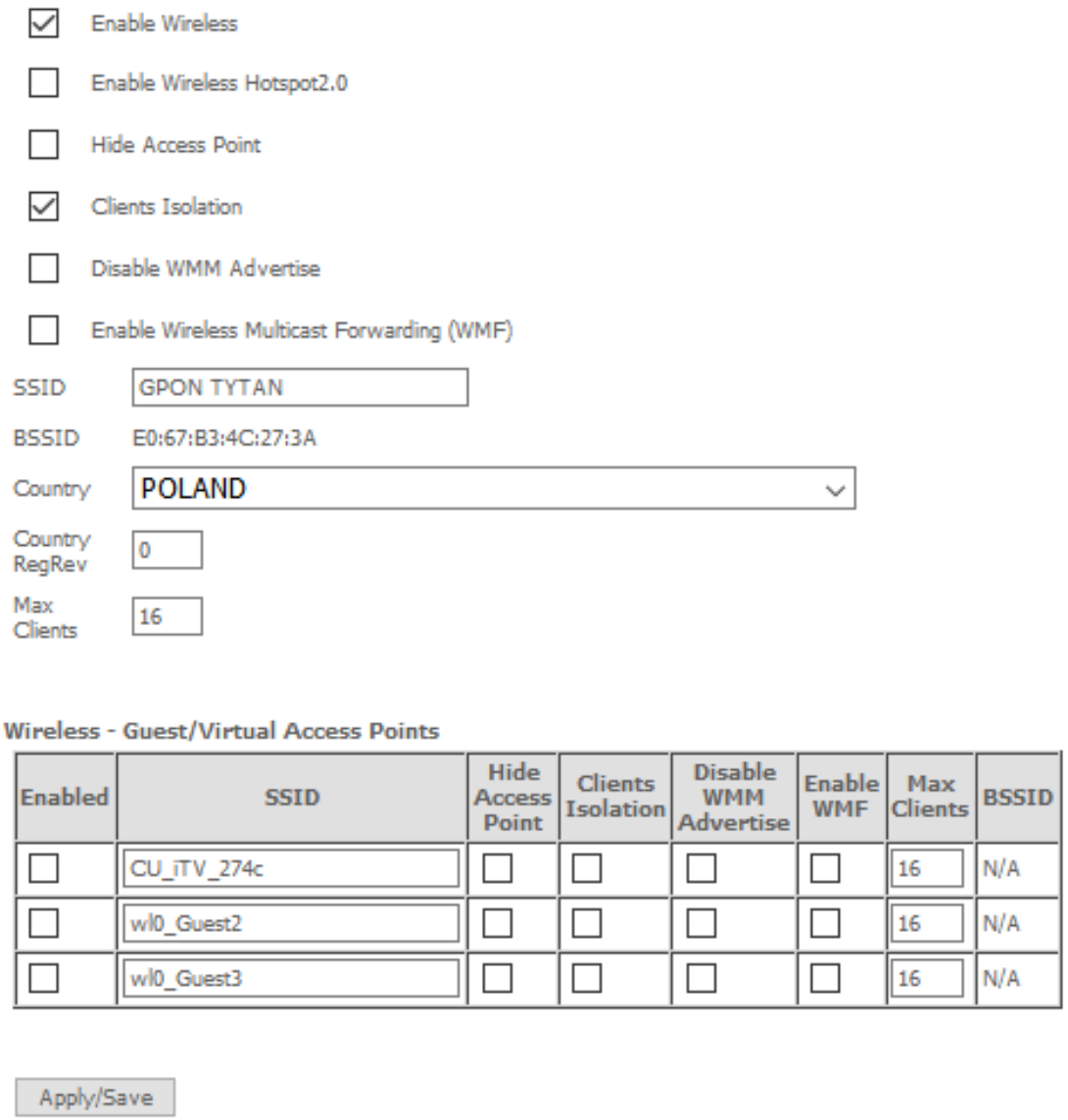
Mikrotik Bandwidth UDP Test



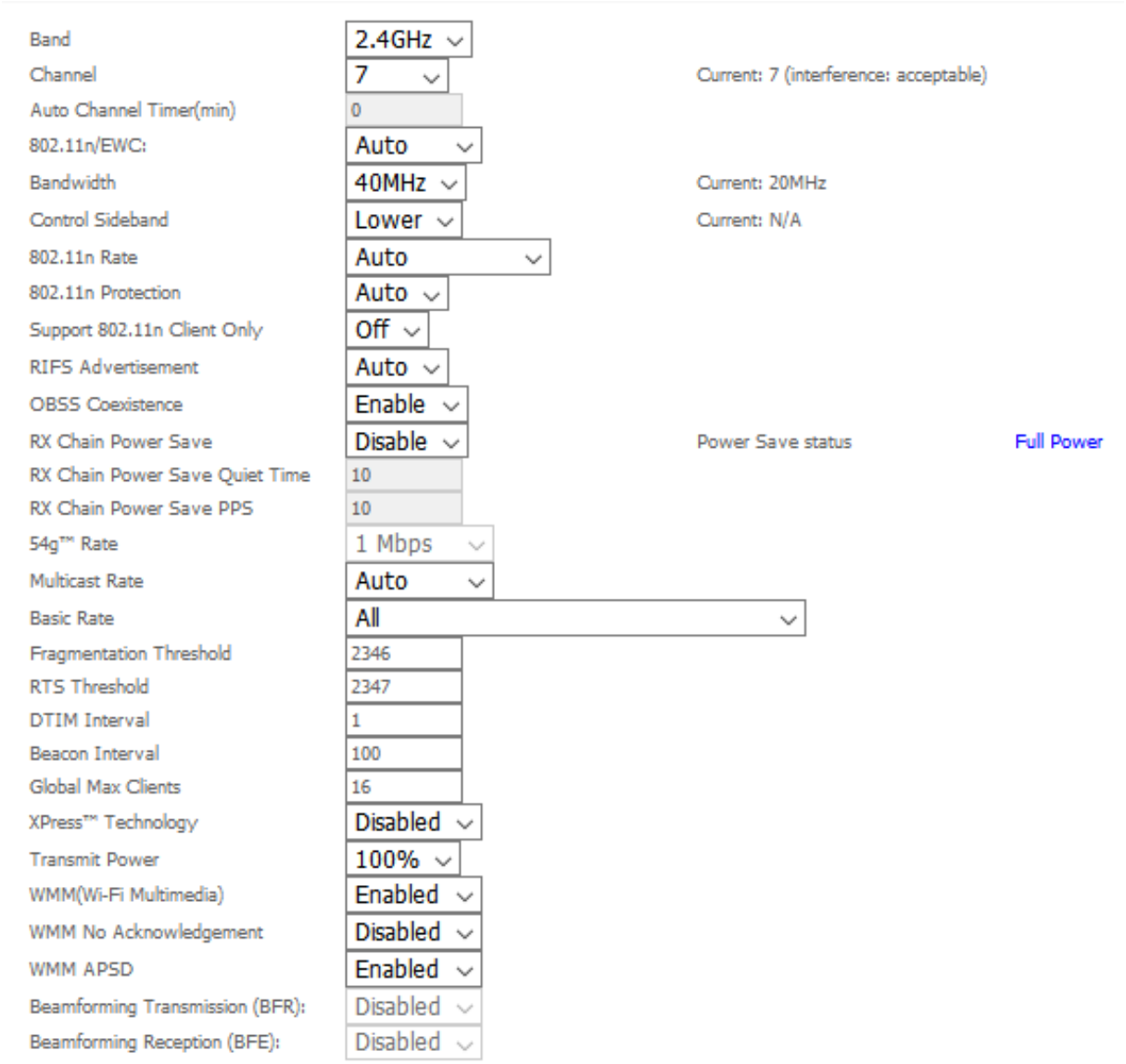
In the above chart **EXTRALINK TITANIUM GPON / 4GE / POTS / WIFI** stands for its great throughput performance. Virtually, one of four Gigabit Ethernet ports has been used 100%. This is very good achievement because the test has been carried out during rush-hour in the network.

5. Wireless performance

Wi-Fi network settings have been configured as follows: Poland, channel 7, channel width 20MHz, WPA2 encryption and isolation mode of connected client's was enabled.



WPS and guest network were turned off, the other parameters remain default.



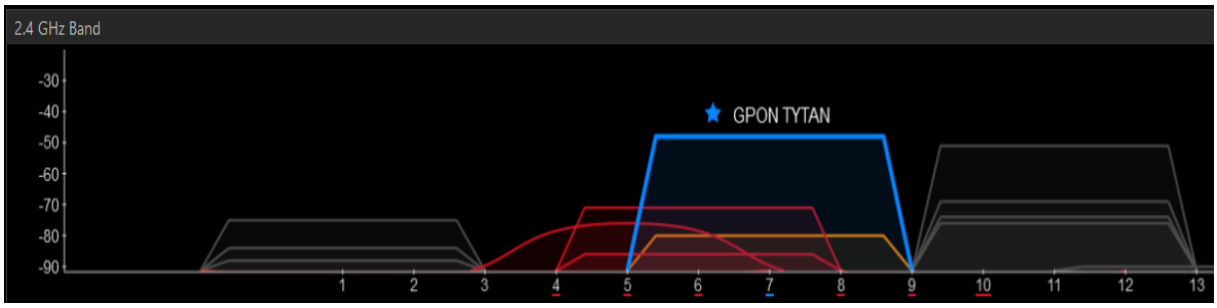
The test was carried out at a distance of 30m, in a high-density wireless local networks area (on different channels).

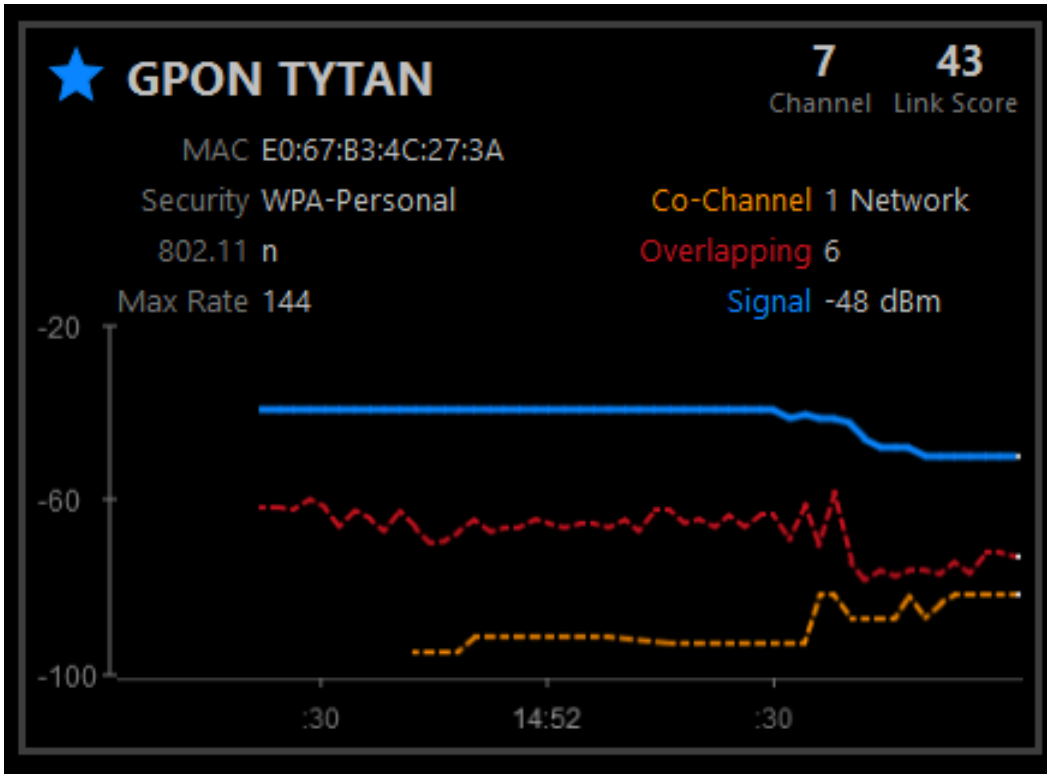
In order to show that tests are reliable router was placed behind two partition walls.

Here are the results:

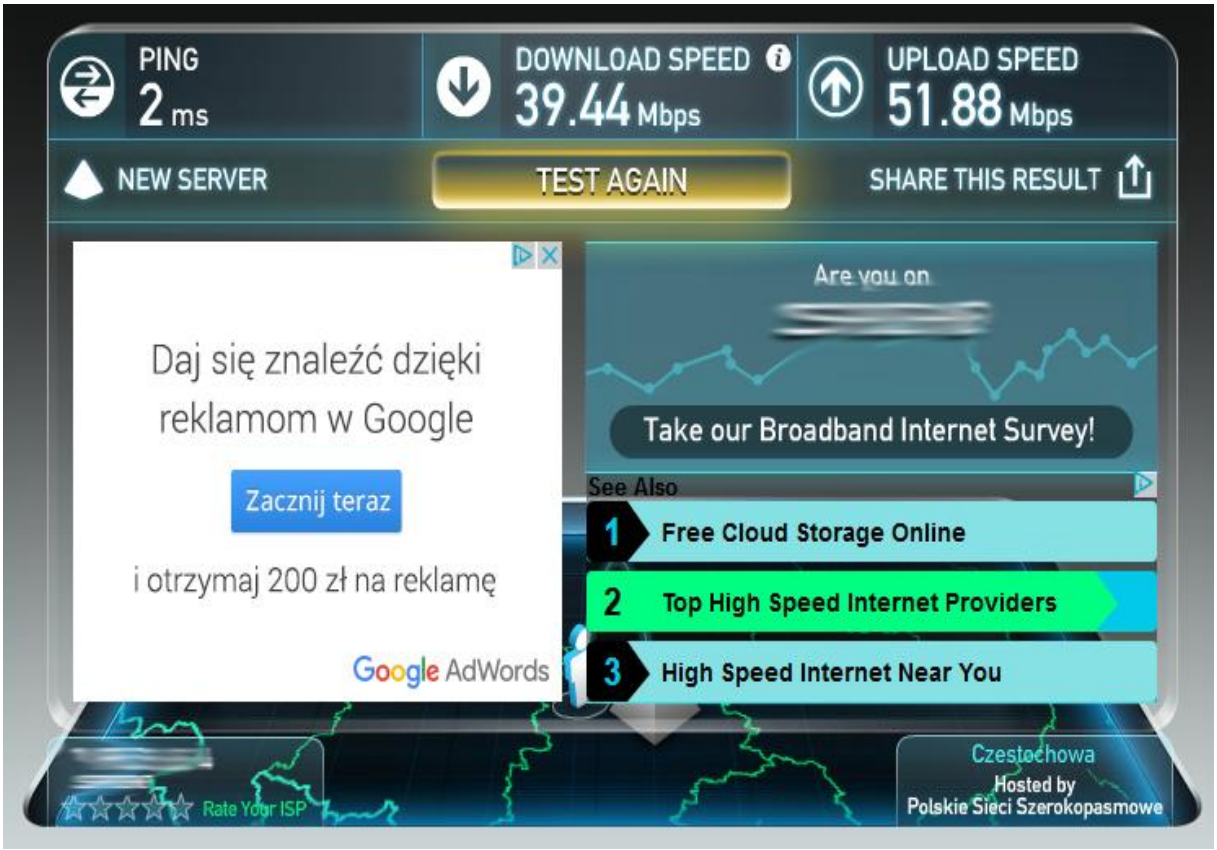
Spectrum Analyzer

SSID	SIGNAL	CHANNEL	SECURITY	MAC ADDRESS	802.11
GPON TYTAN	-48	7	WPA-Personal	E0:67:B3:4C:27:3A	n
[redacted]	-51	11	WPA2-Personal	[redacted]	n
[redacted]	-69	11	Open	[redacted]	g
[redacted]	-71	6	WPA2-Personal	[redacted]	n
[redacted]	-74	11	WPA2-Personal	[redacted]	n
[redacted]	-75	1	WPA-Personal	[redacted]	g
[redacted]	-76	11	Open	[redacted]	g
[redacted]	-76	5	Open	[redacted]	b
[redacted]	-80	7	WPA2-Personal	[redacted]	n
[redacted]	-84	1	WPA2-Personal	[redacted]	n
[redacted]	-86	6	WPA-Personal	[redacted]	g
[redacted]	-88	1	WEP	[redacted]	g
[redacted]	-90	13	WPA-Personal	[redacted]	g





OOAKLA Speedtest



As previously mentioned, the performance tests of WiFi network were carried out so as to resemble the real conditions. The measurements were made at a distance of 30m , in a situation where router was behind two partition walls (in order to show demanding conditions of using wireless network).

In addition, it is worth mentioning that the device receiving the signal was HP laptop equipped with a Ralink RT 3290 802.11bgn Wi-Fi adapter.

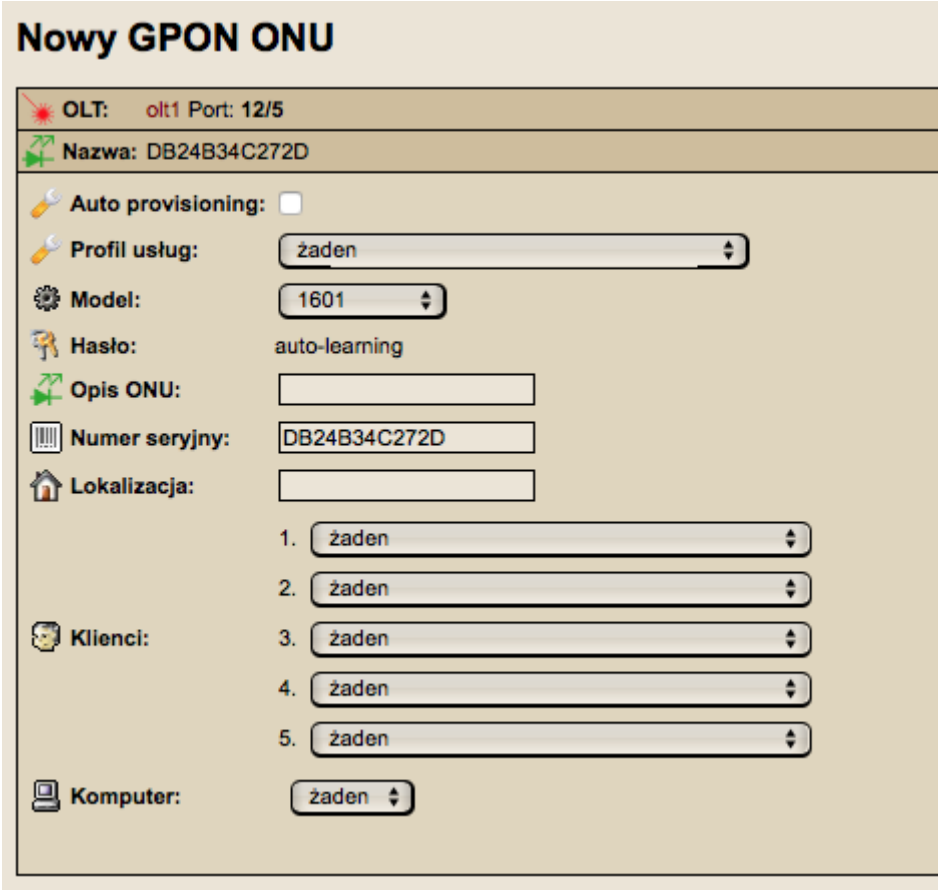
Despite the difficult conditions of using wireless network and extensive local networks working on similar channels, **EXTRALINK TITANIUM GPON / 4GE / POTS / WIFI** proved to be a very good product with great signal strength and a very decent results of obtained bandwidth (download / upload).

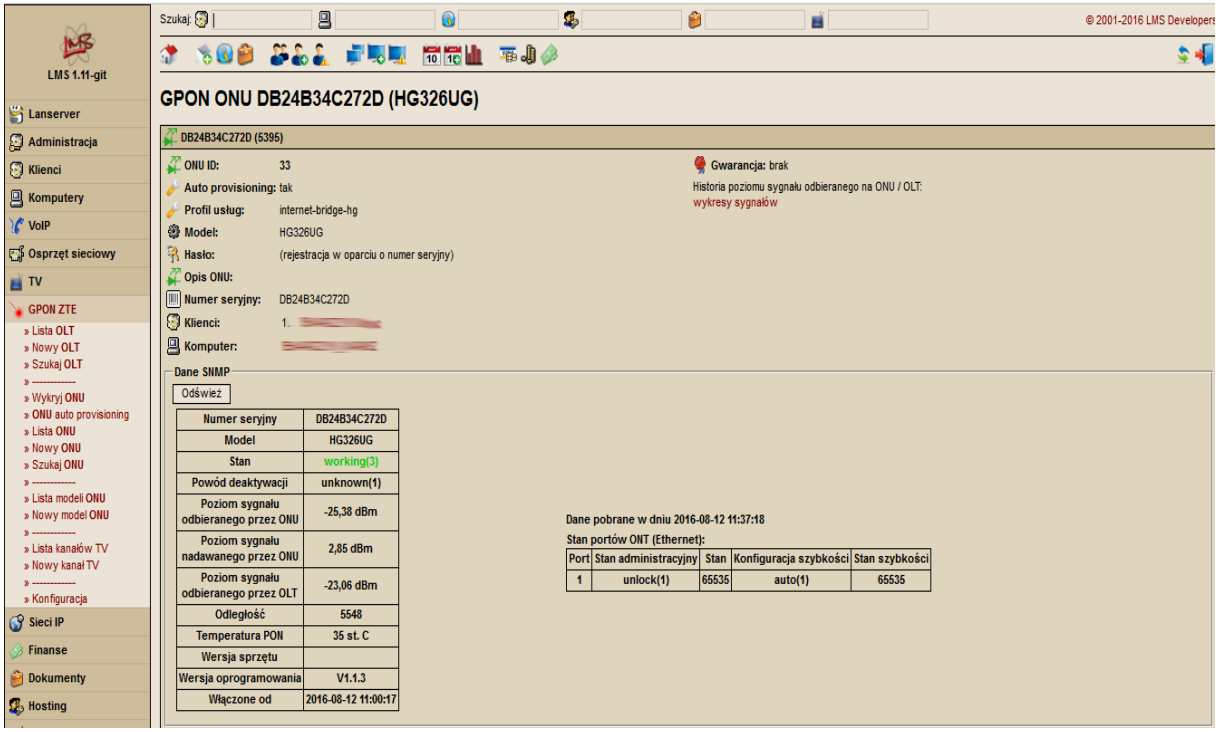
6. Compatibility with LMS plus system and CPE's registration on OLT

Each device connected to GPON network must be compatible with software of most OLT's available on the market and software intended for network managing. EXTRALINK TITANIUM GPON / 4GE / POTS / WIFI is compatible with both OLT ZTE C300 and integrated network management system **LMS** (LAN Management System) designed for Internet providers.

The fact that the process of CPE's connection to the network has been automatized is very helpful for the administrators and installers/technicians. You no longer have to write particular commands registering CPE on OLT- just click "detect ONU".

Then LMS automatically finds a new device and directly allows you to register ONU and start launching access to the Internet.





After you add the device, LMS system by using SNMP protocol enables you to get access to detailed information related to the connection parameters such

as, signal's level received by both ONU and OLT, distance, PON temperature and so on.

SNMP Information

Refresh

Serial number	DB24B34C272D
Model	HG326UG
Condition	working(3)
Cause of disablement	unknown(1)
Signal's level received by ONU	-25,38 dBm
Signal's level transmitted by ONU	2,85 dBm
Signal's level received by OLT	-23,06 dBm
Distance	5548
PON temperature	35 st. C
Hardware's edition	
Software's edition	V1.1.3
Enabled from	2016-08-12 11:00:17

As you can see, LMS system finely supports new CPEs from the **EXTRALINK TYTAN GPON/4GE/POTS/WIFI** series, which greatly simplifies the work of administrators and installers.

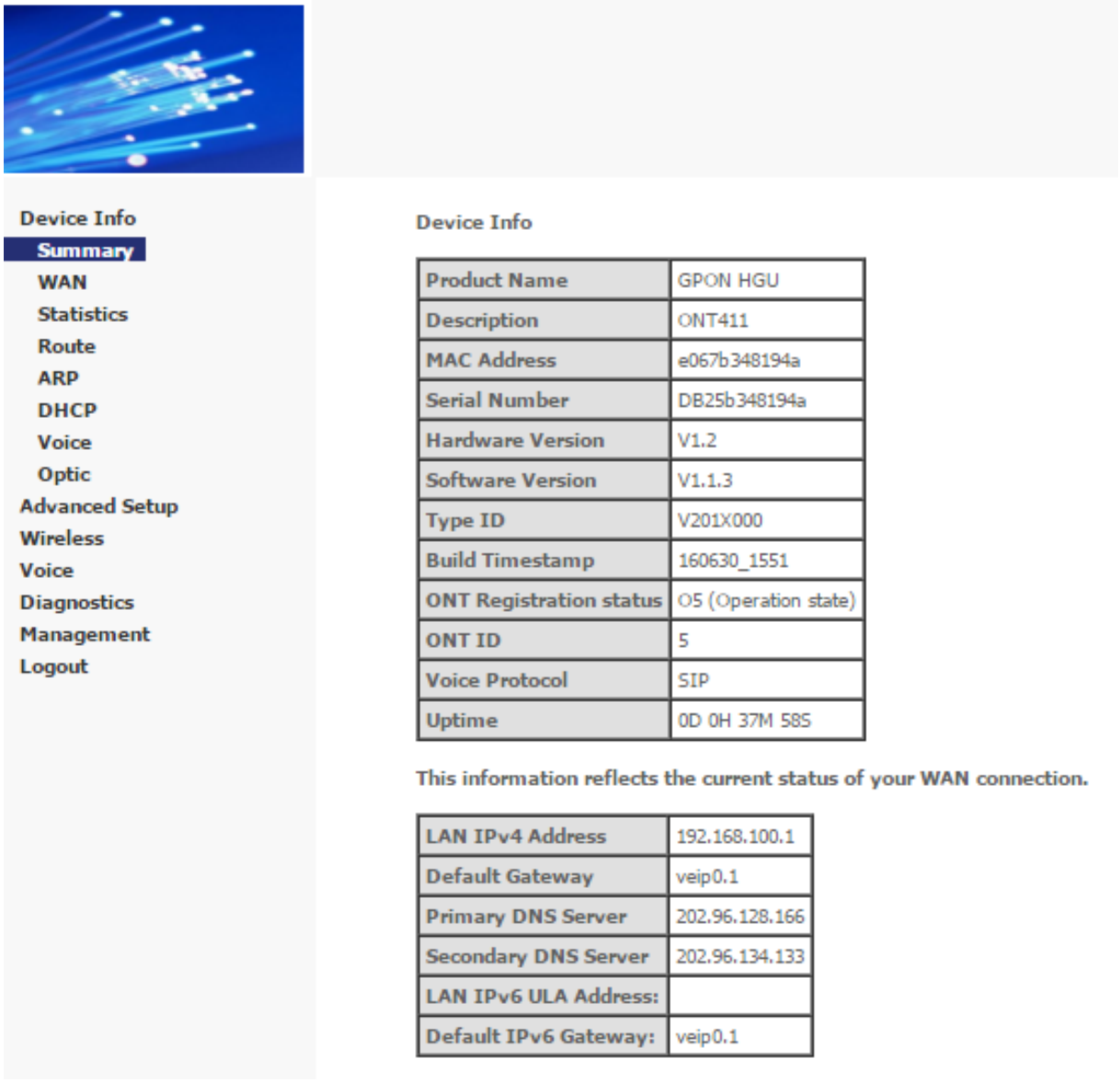
Taking into consideration that in earlier editions of LMS there was no such support (every CPE has to be registered manually on ZTE OLT C300), it is a very useful solution.

The following example presents the manual process of registration:

```
olt1.[redacted].pl(config-if)#show pon onu uncfg
OltIndex            Model            Ver              SN
---------------------------------------------------------------------------
gpon-olt_1/12/5     N/A              V1.1.3           DB24B34C272D
```

```
olt1(config-if)# onu 1 type  HG326UG sn DB24B34C272D
olt1(config-if)#exit


olt1(config)#interface gpon-onu_1/12/5:1

olt1(config-if)#tcont 1 profile 100M

olt1(config-if)#gemport 1 unicast tcont 1

olt1(config-if)#service-port 1 user-vlan 1000 vlan 1000

olt1(config)#show running-config interface gpon-onu_1/12/5:1
Building configuration...
!
interface gpon-onu_1/12/5:1
  tcont 1 profile 100M
  gemport 1 unicast tcont 1 dir both
  switchport mode hybrid vport 1
  service-port 1 vport 1 user-vlan 1000 vlan 1000
!
end

olt1(config)#show onu r config gpon-onu_1/12/5:1
pon-onu-mng gpon-onu_1/12/5:1
!

olt1(config)#pon-onu-mng gpon-onu_1/2/1:1

olt1(gpon-onu-mng)#service internet gemport 1 vlan 1000

olt1(gpon-onu-mng)#exit

olt1(config)#show gpon onu state
OnuIndex               Admin State  OMCC State   O7 State     Phase State
-------------------------------------------------------------------------------
gpon-onu_1/12/5:1       enable       enable       operation    working
```

The registration of ONU, both via the LMS and directly from OLT, is very easy and intuitive. After properly configured WAN interface you can see the following information on CPE- **EXTRALINK TYTAN**.



In conclusion, **EXTRALINK TITANIUM GPON / 4GE / 2POTS / WIFI** is the perfect CPE for use in FTTH / FTTO networks because:

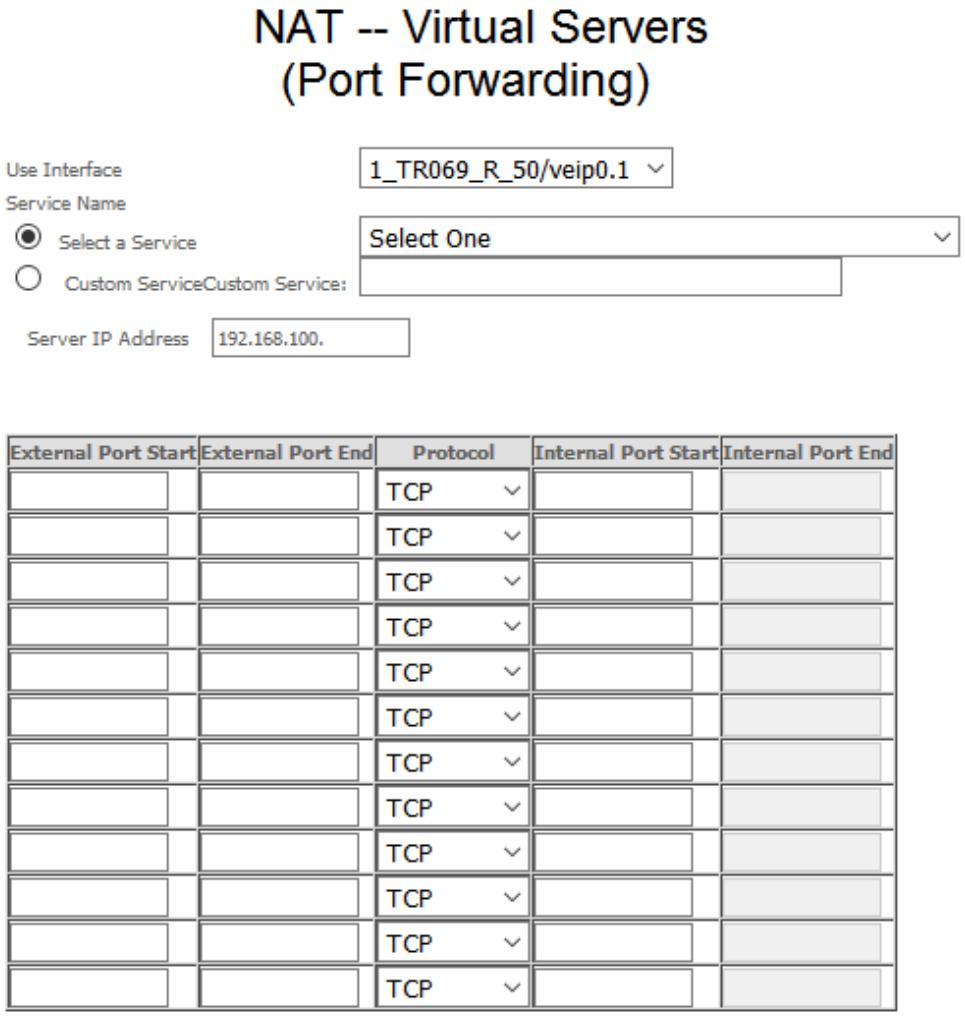
- It is compatible with LMS system
- It has huge possibilities in wireless transferring of data (also by cable)
- It is in excellent price

7. Functionality (Web interface)

Web Interface in EXTRALINK TITANIUM GPON / 4GE / 2POTS / WIFI is very clear. Besides, various configuration settings are arranged in a very intuitive

way. The only thing that needs attention is the **"Port Binding"**, herein referred to as **"Interface Grouping"**.

Here are a few useful features of **TYTAN**:



PORT TRIGGERING

Use Interface: 1_TR069_R_50/veip0.1

Application Name

- (•) Select an application: Select One
- ( ) Custom application:

Trigger Port Start	Trigger Port End	Trigger Protocol	Open Port Start	Open Port End	Open Protocol
		TCP			TCP
		TCP			TCP
		TCP			TCP
		TCP			TCP
		TCP			TCP
		TCP			TCP
		TCP			TCP
		TCP			TCP

TCP/UDP
TCP
UDP

Apply/Save

MAC FILTERING

Create a filter to identify the MAC layer frames by specifying at least one condition below. If multiple conditions are specified, all of them take effect. Click "Apply" to save and activate the filter.

Protocol Type: IPv4

Destination MAC Address:

Source MAC Address:

Frame Direction: LAN<=>WAN

LAN<=>WAN
WAN=>LAN
LAN=>WAN

WAN Interfaces (Configured in Bridge

2_INTERNET_B_1/veip0.2

Apply/Save

URL FILTERING

Enter the URL address and port number then click "Apply/Save" to add the entry to the URL filter.

URL Address:

Port Number: (Default 80 will be applied if leave blank.)

ACCESS TIME RESTRICTION

username	anteny24
(•) Browser's MAC Address	a4:5d:36:c7:f1:17
( ) Other MAC Address	

Days of the week	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Click to select	☐	☐	☐	☐	☐	☐	☐

Start Blocking Time (hh:mm)	
End Blocking Time (hh:mm)	

VOICE

Global parameters | **Service Provider 0**

Voice -- SIP configuration

Enter the SIP parameters and click Start/Stop to save the parameters and start/stop the voice application

Locale selection*: POL - POLAND (Note: Requires the SIP client to be stopped and then started to take affect)

SIP Domain name*: anteny24.pl

Dialplan:

```
[2-8]xxxxxxx|01[34578]xxxxxxxxx|1[34578]xxxxxxxxx|0[1-9]xxxxxxxxxxxxx|10010|10011|116114|11[0249]|179090x+|200|201|400xxxxxx|600xxxxxxx|800xxxxxxx|9xxxx|*xx.#|*xx.*x.#|#xx.#|*#xx.#|#xx.*x.#|*#xx.*x.#|*#xx.*#|*xx.*#|*xx.*x.*x.*x.#|x.#|3x+|12[13]xx|1000x+|00x+|**x+
```

Use SIP Proxy

SIP Proxy: sip.fcn.pl

SIP Proxy Port: 5060

Use SIP Outbound Proxy

SIP Outbound Proxy: sip.fcn.pl

SIP Outbound Proxy Port: 5060

Use SIP Registrar

SIP Registrar: sip.fcn.pl

SIP Registrar Port: 5060

SIP Account	0	1
Enabled	☑	☑
Extension	1001	2001
Display name		
Authentication name		
password		
Physical Terminal Assignment	☑ FXS 0 ☑ FXS 1	☑ FXS 0 ☑ FXS 1
Preferred ptime	20	20
Preferred codec 1	G.711ALaw	G.711ALaw
Preferred codec 2	G.711MuLaw	G.711MuLaw
Preferred codec 3	G.723.1	G.723.1
Preferred codec 4	G.726_24	G.726_24
Preferred codec 5	G.726_32	G.726_32
Preferred codec 6	G.729a	G.729a

CONNECTING THE NEW TECHNOLOGY