

DEMO handbook



RipEX – Radio modem & Router

version 1.4

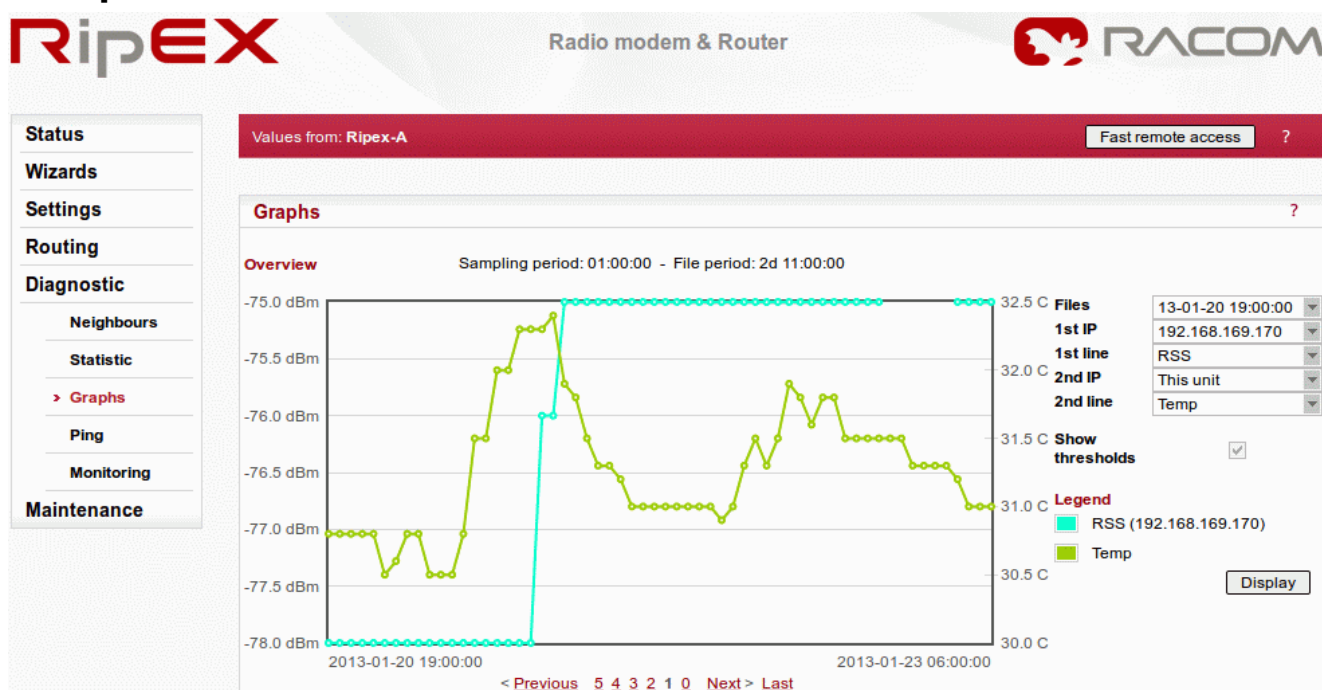
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1. RipEX – Live Demo



1.1. Introduction

RipEX Live demo should answer most of your questions regarding the RipEX product and give you a quick and easy summary about the product itself.

There are two RipEX units connected to each other via a radio channel available 24/7 for testing. The units are set to factory settings every day at 02:00 GMT. Each access password is valid for one week and is changed every Monday at 02:00 GMT. The login name remains the same.

You may access RipEX live demo units on the following IP addresses:

- RipEX-A: <https://ripexa.racom.eu>
- RipEX-B: <https://ripexb.racom.eu>

If you do not have the login credentials yet, feel free to contact us using the following link:
<http://www.racom.eu/eng/products/remote-access.html#load%28product=ripex%29>

RipEX Live demo settings have the following minor changes compared to RipEX factory settings:

- **Unit names** – RipEX-A and RipEX-B
- **Ethernet IP addresses** – 192.168.169.169 and 192.168.169.170
- **Modulation rate** – 20.83 Kbps (4CPFSK)
- **RX/TX frequency** – 448.250 MHz

1.2. General Overview

RipEX Live demo gives you the most straightforward way to discover and understand all RipEX features and functionalities. Pay attention to the Settings tab, where one can set most configuration parameters. A few clicks will give you an easy summary about the product faster than reading many pages of text.

For detailed parameter descriptions, click on the Help button. Kindly note, balloon tips are also available for some parameters.

Keep in mind that accessibility of some parameters depends on the settings of other parameters. For example serial SCADA protocols on COM ports can only be set when Operating mode is set to the Router mode.

Fig. 1.1: Help question marks and balloon tips

1.3. Wizard Configuration

The easiest procedure to configure the units in real usage is to use our Wizard feature. Click on the Wizard tab to be guided through all necessary settings. The Wizard will provide you with helpful notes for respective parameters.

1.4. Practical Tests

Since the best way to understand the product is through practice, we have described a few practical tests you may wish to conduct.

1.4.1. Ping

Ping is the basic tool for checking connectivity between two hosts with IP addresses. Because RipEX is a native IP device, ping can also be used for radio link testing.

Go to the **Ping** tab in the **Diagnostic** menu. You can either set the Ping Type to „**ICMP**“ (common ping) or to „**RSS**“. The RSS type is a RipEX proprietary ping with extended reports.

The destination is the remote RipEX's IP address. For example when you are locally connected to RipEX-A (192.168.169.169), fill in 192.168.169.170 and vice versa.

When Ping is started, you will see the following on-line report on your screen.

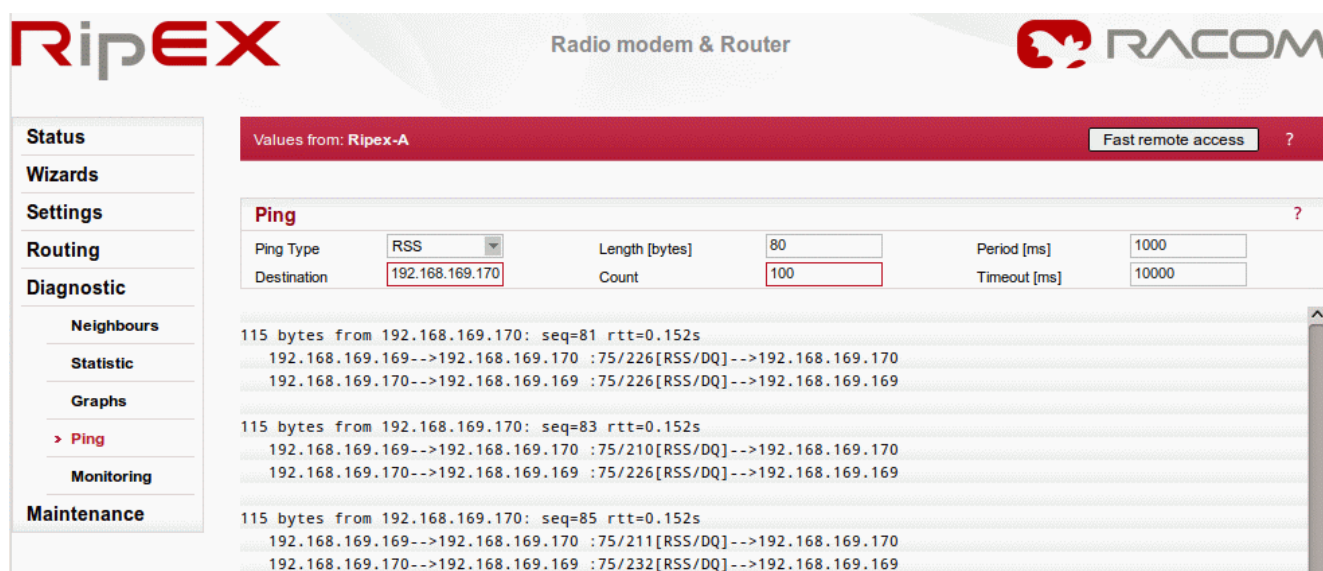


Fig. 1.2: Ping on-line report

When the specified count of ping packets is transmitted, following detailed summary is displayed. It consists of: throughput usage, PER/BER, RSS, Data Quality (DQ) and Round Trip Time (RTT) histogram. It can be very useful during RipEX unit installation and coverage optimisation.

Please read the detailed Ping report description by clicking on the Help question mark.

Status

Wizards

Settings

Routing

Diagnostic

Neighbours

Statistic

Graphs

> Ping

Monitoring

Maintenance

Values from: **Ripex-A**

Fast remote access ?

Ping ?

Ping Type

RSS

Length [bytes]

80

Period [ms]

1000

Destination

192.168.169.170

Count

100

Timeout [ms]

10000

192.168.169.170 --> 192.168.169.170: 73/220 [RSS/DQ] --> 192.168.169.170

No response seq: 100

---RSS Ping from 192.168.169.169 to 192.168.169.170 statistics---

100 packet(s) transmitted, 66 received, 34.00% packet loss (0 corrupted), time 109 sec

rtt: min/avg/max/mdev = 0.152/0.153/0.227/0.00914 sec.

Load: 902 bps

Throughput: 595 bps

PER: 34.00% round trip, 18.76% one way

BER: 0.42% round trip, 0.21% one way

Radio hop with the lowest RSS - direction to Destination

RSS: 74.0/74.9/75.0/0.3 min/avg/max/mdev

DQ : 195.0/215.8/231.0/7.2 min/avg/max/mdev

Radio hop with the lowest RSS - direction from Destination

RSS: 74.0/75.0/75.0/0.1 min/avg/max/mdev

DQ : 211.0/225.3/238.0/5.8 min/avg/max/mdev

rtt histogram (time interval in sec.: %, count)

0 -	2.5: 100.00%	66	XXXXXXXXXX
2.5 -	5: 0.00%	0	
5 -	7.5: 0.00%	0	
7.5 -	10: 0.00%	0	
10 -	inf: 0.00%	0	

Fig. 1.3: Detailed Ping report

Feel free to change the packet length (Ping option) or the Modulation rate (Settings tab) in order to see the impact on the measured RTT. Do not forget to set the same Modulation rate in both units.

1.5. Diagnostic

RipEX web interface is equipped with comprehensive and detailed statistics and graphs. One could say, there is an embedded NMS (Network Management System) within RipEX.

Every RipEX can broadcast its **Watched values** to other reachable RipEX units within the network. Among these Watched values are: current supply voltage, internal temperature, RF output power, Voltage Standing Wave Ratio on the antenna feed line, packet counters on separate interfaces and other values.

1.5.1. Neighbours

These Watched values are displayed in the **Diagnostic** → **Neighbours** menu. See the following example with one neighbouring unit.

Values from: Ripex-A Fast remote access ?

Neighbours ?

Date Log start 2013-01-23 02:04 Last upd. 2013-01-23 10:09 Log uptime 08:05:05 Log save period [Manual](#)

IP		Received headers [Count]	RSS [dBm]	DQ	TxLost [%]	Ucc [V]	Temp [°C]	PWR [W]	VSWR	Packets [Rx/Tx]		
										ETH	COM1	COM2
This unit	Last	-	-	-	0	13.5	32.3	0.1	1.1	0 /	0 /	0 /
	Avg	-	-	-	0.00	13.50	32.30	0.10	1.10	0	0	0
192.168.169.170	Last	5	-75	226	0	28.6	33.0	0.1	1.6	0 /	0 /	0 /
	Avg	-	-75.00	226.74	0.00	28.60	33.00	0.10	1.60	0	0	0
RADIO BROADCAST	Last	122	-75	224	NA	NA	NA	NA	NA	NA /	NA /	NA /
	Avg	-	-75.00	224.09	NA	NA	NA	NA	NA	NA	NA	NA

Legend Alarm monitored, Alarm Alarm monitored, No alarm

< Previous 20 ... 3 2 1 0 Refresh Save Difference: Clear Display

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Fig. 1.4: Neighbours menu

1.5.2. Statistic

The **Diagnostic** → **Statistic** menu provides you with information about data volume on all interfaces: Radio, Ethernet, COM1 and COM2. The menu displays the number of received and transmitted packets, their sizes and current throughput. Moreover, a detailed division into user and service packets is available for the radio channel.

The quick value descriptions are displayed in the balloon tips (place the cursor on any column header). The detailed description can be read in the respective Help.

RipEX

Radio modem & Router

Status
Wizards
Settings
Routing
Diagnostic
 Neighbours
 > Statistic
 Graphs
 Ping
 Monitoring
Maintenance

Values from: Ripex-A
Fast remote access ?

Statistic ?

Date
Log start 2013-01-23 02:04
Last upd. 2013-01-23 10:09
Log uptime 08:05:39
Log save period [Manual](#)

Radio ?

IP	Rx Tx	DATA				RADIO PROTOCOL								TOTAL		
		Packets		Bytes		Duplicates		Data error		Rejected		Control packets		Packets		
		count	count/s	total	avg	count	%	count	%	count	%	count	%	count	Bytes	B/s
TOTAL	Rx	122	0.00	19796	162.3	0	0.00	0	0.00	-	-	5	3.94	127	20073	0.69
	Tx	182	0.01	22504	123.6	0	0.00	0	0.00	3	1.65	5	2.67	187	22776	0.78
192.168.169.170	Rx	121	0.00	19741	163.1	0	0.00	0	0.00	-	-	5	3.97	126	20018	0.69
	Tx	180	0.01	22394	124.4	0	0.00	0	0.00	3	1.67	0	0.00	180	22394	0.77
RADIO BROADCAST	Rx	1	0.00	55	55.0	0	0.00	0	0.00	-	-	0	0.00	1	55	0.00
	Tx	2	0.00	110	55.0	0	0.00	0	0.00	0	0.00	5	71.43	7	382	0.01

IP error
[count]
0

Header error
[count]
0/0

False sync.
[count]
0

ETH & COM ?

		Packets total		Bytes	
		count	count/s	total	avg
		ETH	Rx	0	0
	Tx	0	0	0	-
COM1	Rx	0	0	0	-
	Tx	0	0	0	-
COM2	Rx	0	0	0	-
	Tx	0	0	0	-

ETH Protocols ?

		Packets total		Bytes	
		count	count/s	total	avg
		Modbus TCP	Rx	NA	-
	Tx	NA	-	NA	-
Terminal Server 1	Rx	NA	-	NA	-
	Tx	NA	-	NA	-
Terminal Server 2	Rx	NA	-	NA	-
	Tx	NA	-	NA	-
Terminal Server 3	Rx	NA	-	NA	-
	Tx	NA	-	NA	-
Terminal Server 4	Rx	NA	-	NA	-
	Tx	NA	-	NA	-
Terminal Server 5	Rx	NA	-	NA	-
	Tx	NA	-	NA	-

< Previous 20 ... 3 2 1 0 Refresh
Save
Difference: Clear
Display

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Fig. 1.5: Statistic menu

1.5.3. Graphs

Neighbours and Statistic values can also be displayed as graphs in the **Diagnostic** → **Graphs** menu. Each graph is available in a summary or detailed version and can display two different elements at once. The detailed graphs can be created continuously or can be triggered whenever monitored values are out of their threshold ranges. Each graph can be created based on the values of the unit itself or any other neighbouring unit.

The detailed Graphs description can be read in the respective Help.

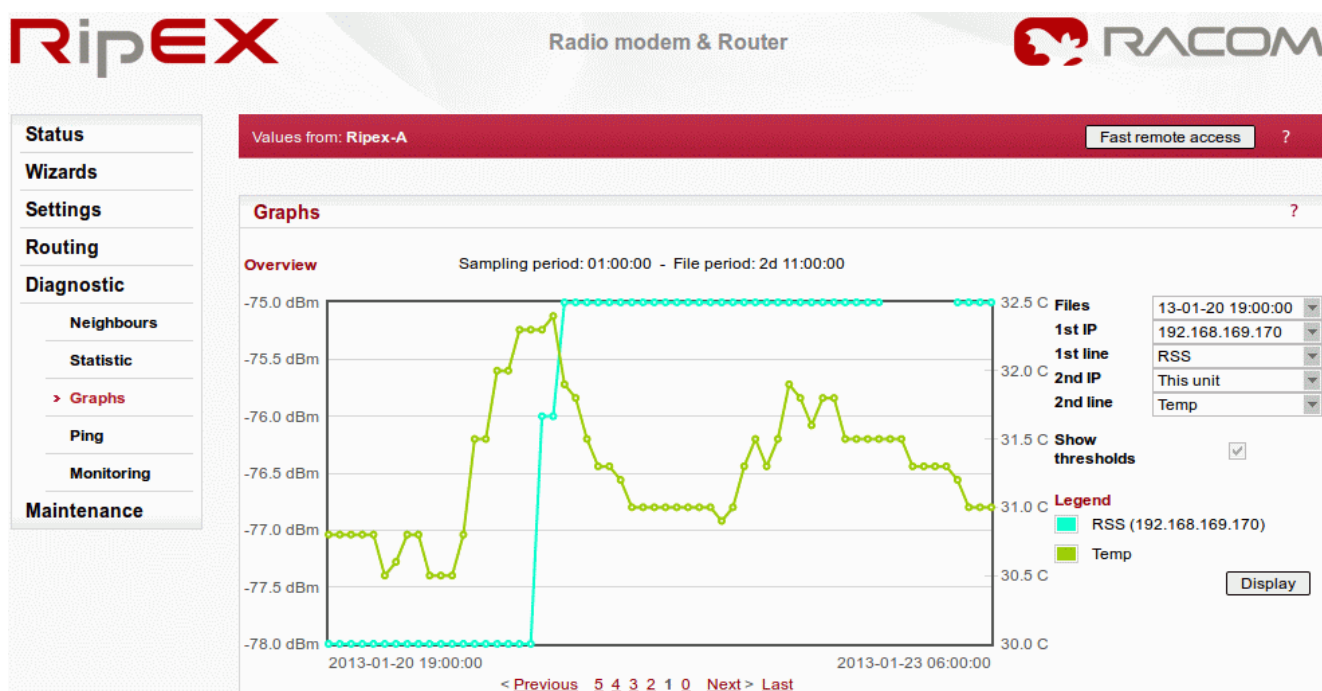


Fig. 1.6: Graph menu

1.5.4. Monitoring

Monitoring is an advanced on-line diagnostic tool, which enables detailed communication analysis over any RipEX interface. In addition to all physical interfaces (Radio, Ethernet, COM1 and COM2), several internal interfaces between software modules can be monitored.

Go to the **Diagnostic** → **Monitoring** menu and just click on the **Start** button. In the default settings, it will display packet timing and payload on the Radio channel.

For example, you can test Monitoring while performing the *Ping test*.

Note: In order to see both on-line reports (Ping as well as Monitoring), start Ping in a new independent window or panel in your browser.

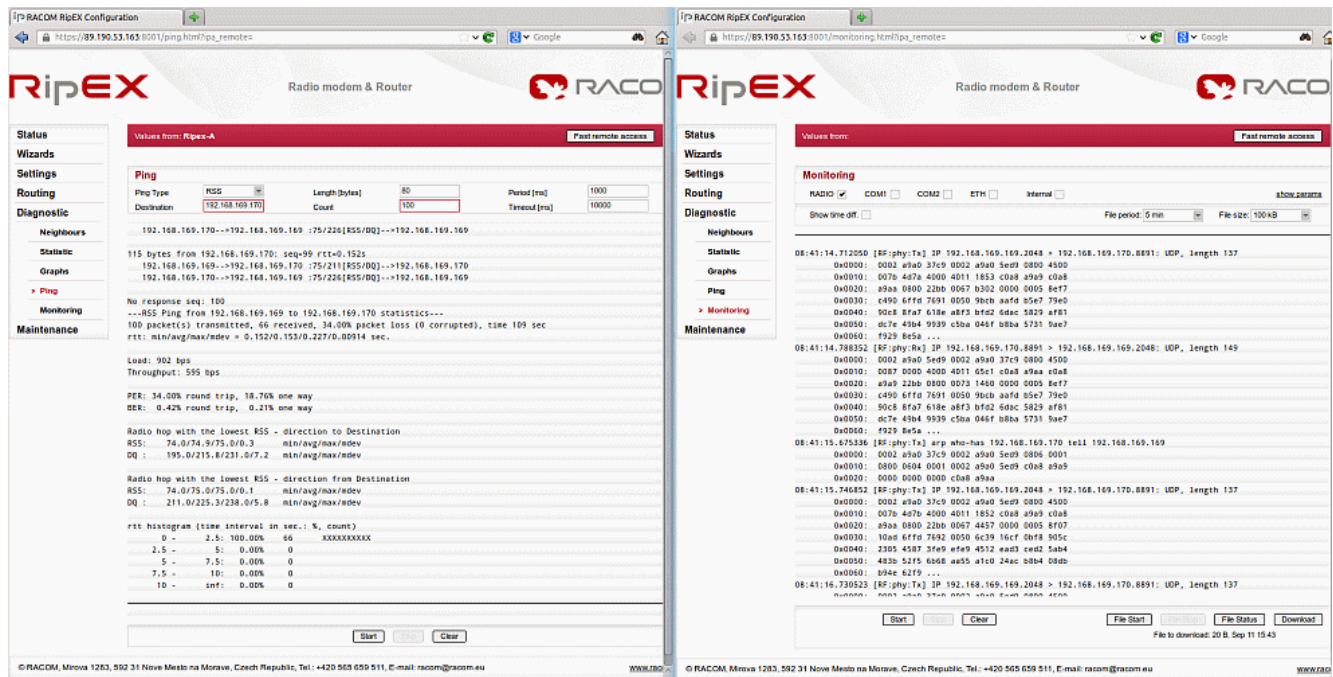


Fig. 1.7: Monitoring the ping packets in two separate windows

1.6. Summary

We have described just a few examples of Live demo usage. Feel free to download the *RipEX User manual*¹ from <http://www.racom.eu> or the *RipEX Application notes*² from <http://www.racom.eu> to conduct further tests.

Do not hesitate to contact us if you have any questions:

RACOM technical support team

E-mail: <support@racom.eu>

Tel.: +420 565 659 511

¹ <http://www.racom.eu/download/hw/ripex/free/eng/ripex-m-en.pdf>

² <http://www.racom.eu/download/hw/ripex/free/eng/ripex-app-en.pdf>

2. ZABBIX – Live DEMO



2.1. Introduction

RACOM has many years of experience with **Network Management System** (NMS) – 15 years ago we started to build our own proprietary NMS called RANEC. RANEC is built upon similar principles like today's NMS. It was optimized to be used within narrow bandwidth radio networks so the customers could get all the valuable information about the network.

The NMS development and customer requirements to integrate our proprietary solution into their NMS have led us to implement **Simple Network Management Protocol** (SNMP) support for all the new generation RACOM products.

Many RACOM customers use their own NMS, in which they need to manage our products. We can offer them this opportunity with general SNMP implementation. The following text is intended for all customers who are searching for the network management system applied to the RACOM products. The text will demonstrate the possibilities of a standardised NMS.

Almost any NMS can be used for accessing SNMP values. The **Zabbix** open source monitoring system was chosen as a demonstration of basic functionalities. We have prepared a **Zabbix Live demo** so you can browse the Zabbix web interface and see most of the important features.



Tip

Contact our Sales department for the Zabbix Live demo credentials.

Please find more details in the following chapters.

2.2. Zabbix Overview

Zabbix authors provide the following description:

Zabbix is the ultimate enterprise-level software designed for monitoring availability and performance of IT infrastructure components. Zabbix is open source and comes at no cost.

With Zabbix it is possible to gather virtually limitless types of data from the network. High performance real-time monitoring means that tens of thousands of servers, virtual machines and network devices can be monitored simultaneously. Along with storing the data, visualization features are available (overviews, maps, graphs, screens, etc), as well as very flexible ways of analyzing the data for the purpose of alerting.

Zabbix offers great performance for data gathering and can be scaled to very large environments. Distributed monitoring options are available with the use of Zabbix proxies. Zabbix comes with a web-based interface, secure user authentication and a flexible user permission schema. Polling and trapping is supported, with native high performance agents gathering data from virtually any popular operating system; agent-less monitoring methods are available as well.

Web monitoring as well as monitoring of VMware virtual machines is possible with Zabbix. Zabbix can automatically discover network servers and devices, as well as perform low-level discovery with methods of automatically assigning performance and availability checks to discovered entities.

For detailed information, see the Zabbix documentation:

- [*http://www.zabbix.com/documentation.php*](http://www.zabbix.com/documentation.php)

You can also read RipEX Application note, Chapter 2: RipEX SNMP Configuration Guide

- [*http://www.racom.eu/eng/products/m/ripex/app/snmp.html*](http://www.racom.eu/eng/products/m/ripex/app/snmp.html)

2.3. Zabbix Live Demo

We believe the Zabbix Live demo will answer most of your questions regarding Zabbix and the SNMP functionality by giving you a quick and easy summary about all our products themselves rather than reading many pages of text.

This chapter will guide you through essential features which Zabbix offers you with the RACOM equipment.

2.3.1. Login screen

The Zabbix front-end is available for your testing 24/7. Each access password is valid for one week and is changed every Monday at 02:00 GMT. The login name remains the same.

You may access Zabbix live demo here: <http://demo-zabbix.racom.eu/zabbix/>

Login credentials are as follows:

User name: customer

Password: RacomDemo1234

Feel free to go through all the menus. The user access is read-only. You cannot change any configuration parameters.

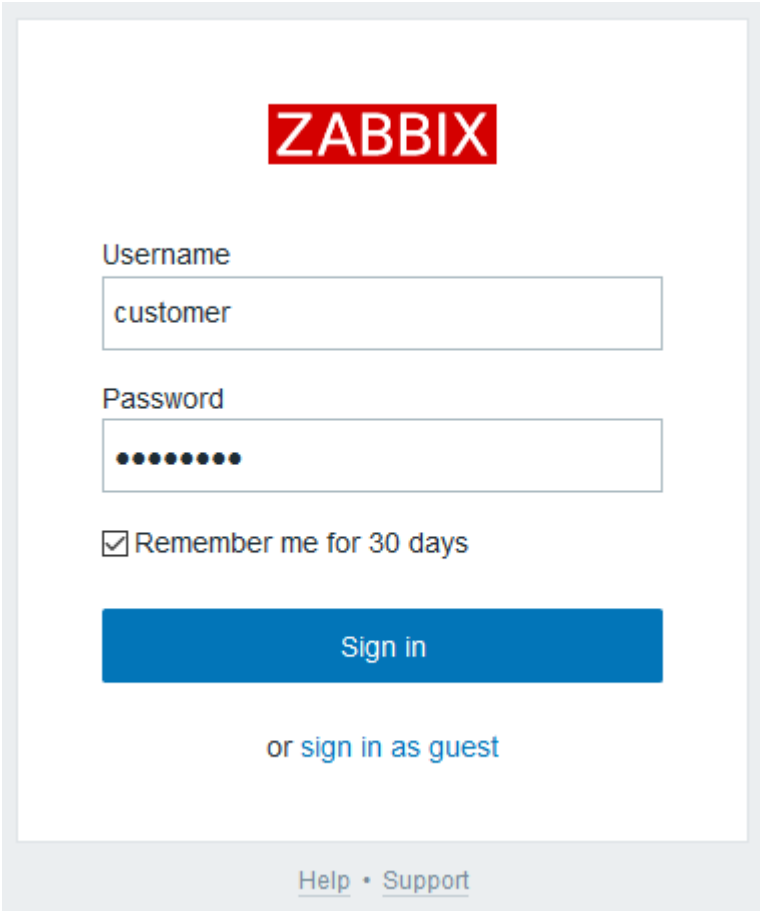
The image shows the Zabbix login interface. At the top, the 'ZABBIX' logo is displayed in white text on a red rectangular background. Below the logo, there are two input fields: 'Username' with the text 'customer' entered, and 'Password' with masked characters represented by dots. Under the password field, there is a checkbox labeled 'Remember me for 30 days' which is checked. A large blue button with the text 'Sign in' is positioned below the checkbox. Underneath the button, the text 'or sign in as guest' is shown in a smaller, blue font. At the bottom of the login area, there are links for 'Help' and 'Support' separated by a dot.

Fig. 2.1: Zabbix login screen

2.3.2. Dashboard

Personal Dashboard is displayed after you login. With full-access you would be able to change the layout as you wish.

On the following picture, you can see that NMS monitors two RAY units, two RipEX units and two GPRS units (MIDGE and MG102). Zabbix is monitoring itself too.

Several triggers were defined to display the warning if any unit is in the undesired state (e.g. modem temperature is too high, RSS level is out of the threshold range, etc.). In our example, there is a problem events with RAY2-17-U unit (temperature is too high) and one event with MIDGE unit (WAN interface is down).

On the left side Zabbix menu, you can add favourite **graphs**, **screens** and **maps**. We provide several examples which are described in the following sections.

The main Zabbix **navigation bar** is at the top of the screen.

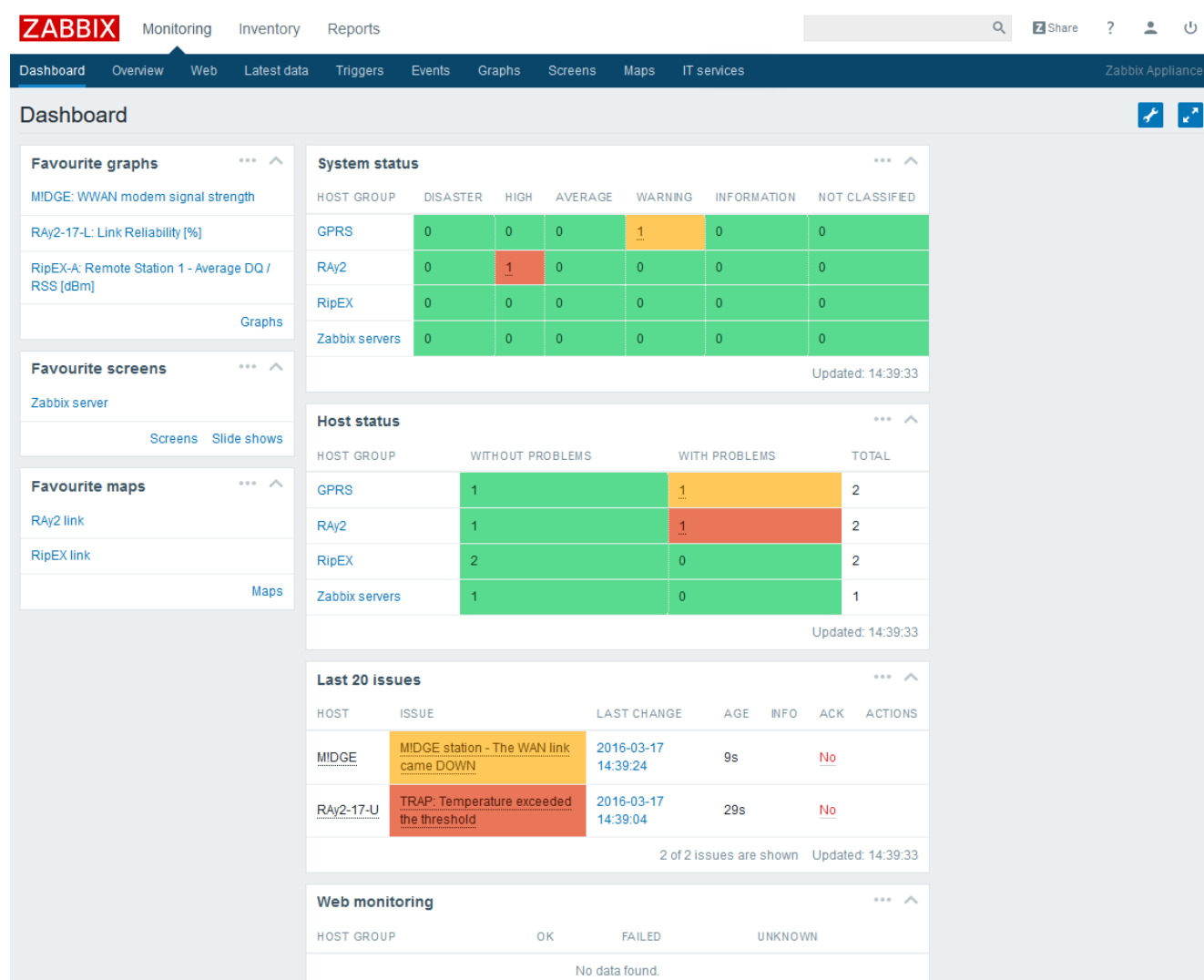


Fig. 2.2: Dashboard

2.3.3. Latest Data

You can see all monitored values of all monitored units in this menu. On the following example, Zabbix displays M!DGE WWAN statistics (e.g. current signal strength, Local Area Identification – LAI, ...).

We provide many values which can be obtained from our products. Just go through all of them to see the details.

For every value, Zabbix provides its history. If the value is numerical, there is also a graph. The history values are stored in MySQL database for a defined time period.



Note

You can use a different database engine in your Zabbix installation.

The screenshot shows the Zabbix web interface. The top navigation bar includes 'ZABBIX', 'Monitoring', 'Inventory', and 'Reports'. Below it, a secondary navigation bar has 'Dashboard', 'Overview', 'Web', 'Latest data' (selected), 'Triggers', 'Events', 'Graphs', 'Screens', 'Maps', 'IT services', and 'Zabbix Appliance'. The 'Latest data' section has a 'Filter' button and a search bar. The filter section includes 'Host groups' (type here to search), 'Hosts' (M!DGE selected), 'Application' (empty), and 'Name' (empty). There are 'Select' buttons for each filter field. To the right of the filter section are checkboxes for 'Show items without data' (checked) and 'Show details' (unchecked). Below the filter section are 'Filter' and 'Reset' buttons. The main table displays the latest data for the selected host. The table has columns: 'NAME', 'LAST CHECK', 'LAST VALUE', and 'CHANGE'. The data is grouped by host groups: 'admin (5 Items)', 'PING statistics (2 Items)', 'TRAPS (18 Items)', and 'wwan (11 Items)'. The 'wwan' group is expanded, showing 11 items. Each item has a checkbox, a description, the last check time, the last value, and a link to the history or graph.

NAME	LAST CHECK	LAST VALUE	CHANGE
admin (5 Items)			
PING statistics (2 Items)			
TRAPS (18 Items)			
wwan (11 Items)			
<input type="checkbox"/> The current Cell ID (CID) to which the WWAN modem is currently registered	2016-03-17 14:40:02	20A7	History
<input type="checkbox"/> The current LAI to which the WWAN modem is currently registered	2016-03-17 14:40:02	23002	History
<input type="checkbox"/> The current Local Area Code (LAC) to which the WWAN modem is currently registered	2016-03-17 14:40:02	725	History
<input type="checkbox"/> The current Local Area Identification (LAI) to which the WWAN modem is currently reg...	2016-03-17 14:40:02	02-CZ	History
<input type="checkbox"/> The current WWAN modem signal strength (-999 equals unknown)	2016-03-17 14:40:02	-81	Graph
<input type="checkbox"/> The current WWAN modem temperature	2016-03-17 14:40:02		History
<input type="checkbox"/> The name of the WWAN modem	2016-03-17 02:00:02	wwan0	History
<input type="checkbox"/> WWAN modem current registration state	2016-03-17 14:40:02	registeredInHome...	History
<input type="checkbox"/> WWAN modem current service type	2016-03-17 14:40:02	edge	History
<input type="checkbox"/> WWAN modem index	2016-03-17 02:00:02	0	Graph
<input type="checkbox"/> WWAN modem type	2016-03-17 02:00:02	em770	History

Fig. 2.3: Latest data

2.3.4. Graphs

Each numerical monitored value can be displayed as a graph and in every graph, there can be more values displayed.

You can define various colours, types of lines, legends and other parameters. You can also change the time period of the displayed graph.

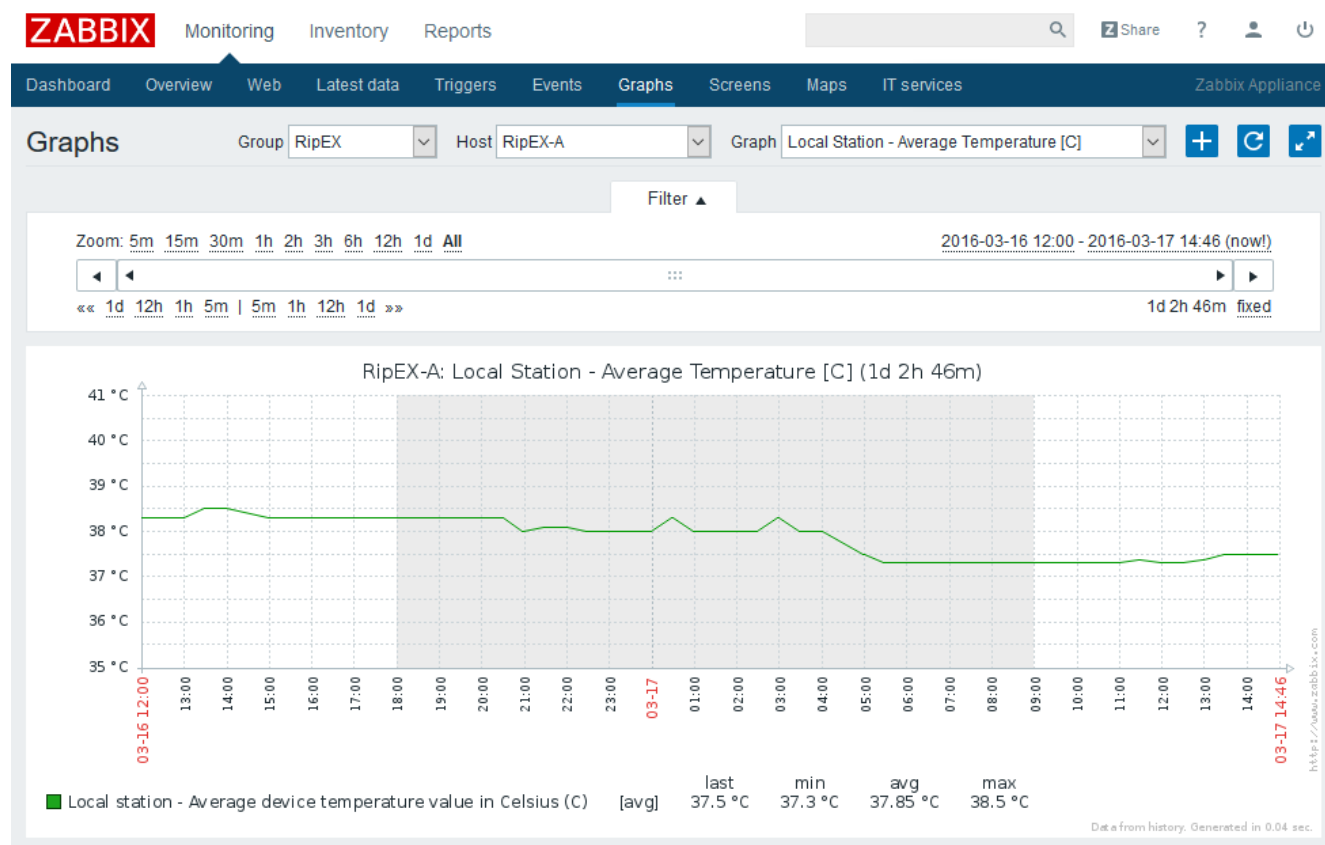


Fig. 2.4: Graphs

2.3.5. Screens

You can define comprehensive screens with many graphs displayed on a single page.

In the example below, we have Zabbix appliance graphs displaying CPU utilization and Zabbix performance.



Fig. 2.5: Screens

2.3.6. Maps

Zabbix offers the possibility to display user-defined maps. You can upload any background image and insert any unit on this map. For each unit, you can display various statistics and you can see each unit's status.

In our example, there are two linked RipEX units with temperature, RSS and DQ values. The background image is the raster map of Nové Město na Moravě.

User-defined scripts can be executed on the units. As an example in our Demo Zabbix, you can check the current RSS value or do the configuration backup of RipEX units. Other scripts are supported by Ray2 units.



Note

Any user-defined icon can be imported into the Zabbix, which can be coloured according to unit status.

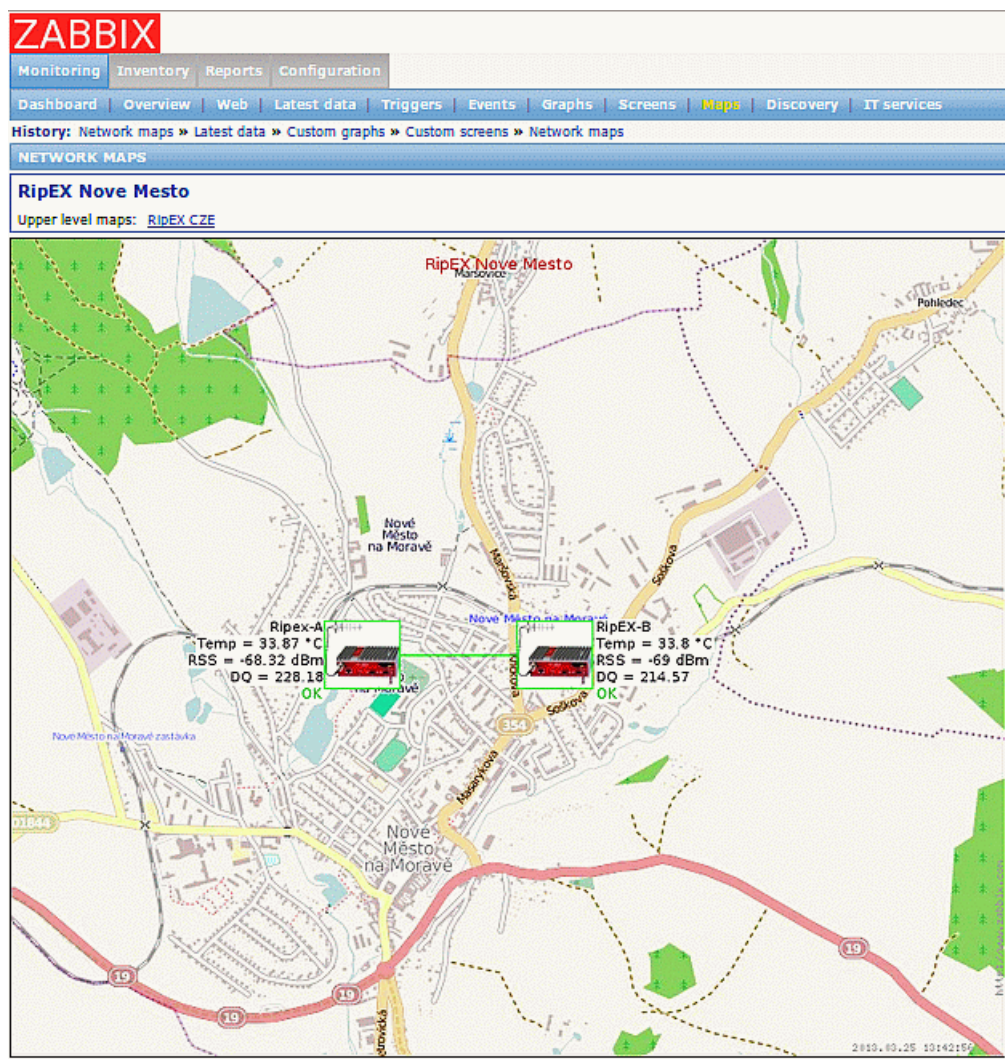


Fig. 2.6: Maps

2.3.7. Overview

The overview menu gives you a quick summary of the states of all or selected units.

You can also display the values as in the Latest data menu.



Fig. 2.7: Overview

2.3.8. Inaccessible Features

The customer account is limited and you cannot create or edit hosts, templates, maps and others. You cannot, for example, see the Administration menu with User accounts or Theme selection. Several menus are accessible, but the information is not displayed.

If you need the Zabbix with full-access enabled, please install it on your machine or see the Zabbix manual for more detailed documentation.

2.4. Summary

We have described just a few of the Zabbix features.

Feel free to download the "*RipEX Application notes*¹" with SNMP Configuration Guide from <http://www.racom.eu>, or "*RAY2 – Microwave link Application notes*²" from <http://www.racom.eu> and go through the Zabbix documentation: <http://www.zabbix.com/documentation.php>.

Do not hesitate to contact us if you have any questions:

RACOM technical support team

E-mail: <support@racom.eu>

¹ <http://www.racom.eu/download/hw/ripex/free/eng/ripex-app-en.pdf>

² http://www.racom.eu/download/hw/ray/free/eng/01_ray/RAY-AppNote-en.pdf

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RACOM sales department

Contact your respective sales manager or our Sales department ([<racom@racom.eu>](mailto:racom@racom.eu))

3. Demo Case – RipEX & M!DGE



3.1. Introduction

RipEX Demo case should answer most of your questions regarding the RipEX product and give you a quick and easy summary about the product itself.

There are three RipEX units and one M!dge unit in the case. All units are in the default state.

See the following chapters for a detailed description.

3.2. Demo Case

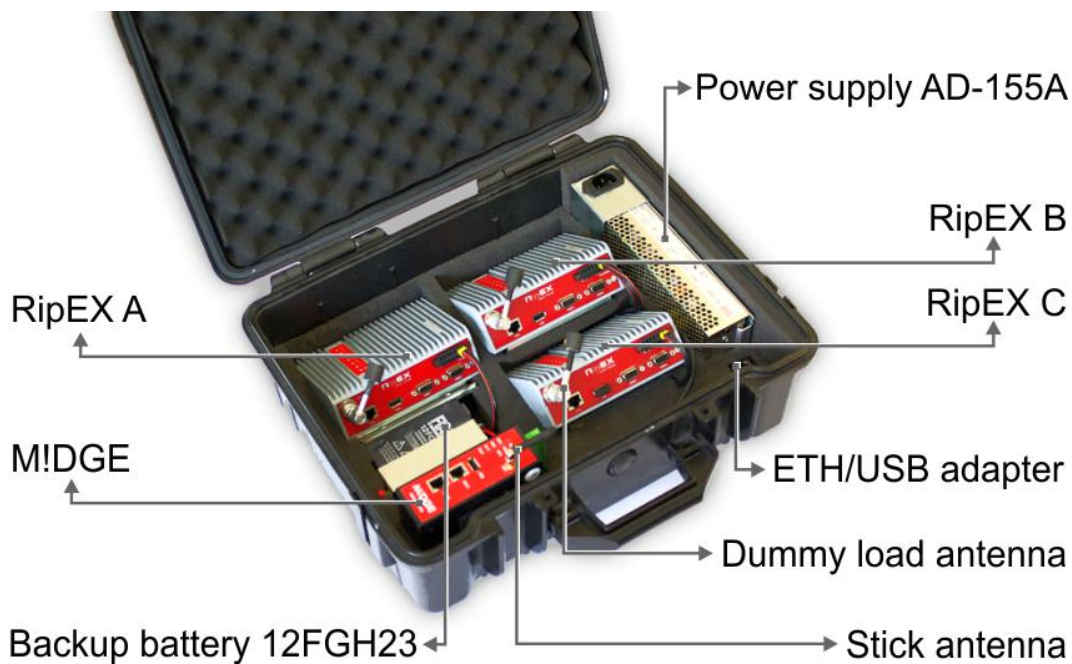


Fig. 3.1: Demo case contents

3.2.1. Case contents

- Brackets and cabling for installation of three RipEXes and one M!DGE (units are not part of the delivery)
- 1× power supply Mean Well AD-155A (100-240 V AC 50-60 Hz/13.8 V DC)
- 1× Backup battery (12 V/5 Ah, FASTON.250), e.g. Fiamm 12FGH23
- 1× Power cable (European Schuko CEE 7/7 to IEC 320 C13)
- 1× Ethernet patch cable (3 m, UTP CAT 5E, 2× RJ-45)
- Quick start guide

RipEX accessories

- 3× Dummy load antennas
- 1× L-bracket, 1× Flat-bracket samples
- 1× ETH/USB adapter
- 1× Wifi adapter

M!DGE accessories

- Stick antenna (900–2100 MHz, 2.2 dBi, vertical)

Mechanical properties of case

- Outside dimension: 455 × 365 × 185 mm
- Weight approx. 4 kg (excluding the RipEx and M!DGE units)

3.3. Wifi adapter

Your PC will get its IP settings from the built-in DHCP server and you have to type `http://10.9.8.7` in your browser. Remaining steps are the same and you do not need to worry about other RipEX'es, since you will be connected to the local unit in all cases.

Wifi adapter for service access to the web interface via USB connector. Includes a built-in DHCP server which provides up to 5 leases. To access the RipEX always use the fixed IP 10.9.8.7.



Fig. 3.2: WiFi dapter

We recommend using the "W1" - external Wifi adapter (an optional accessory of the RipEX). Connect your PC or tablet or smart phone to RipEX Wifi AP first. Its default SSID is "RipEX + Unit name + S/N". The W1 contains a built-in DHCP server, so if you have a DHCP client in your PC (as most users do), you don't need to set anything up. The RipEX's IP address for access over the ETH/USB adapter is fixed: 10.9.8.7.

3.4. Programming RipEX via Computer

To configure a RipEX you can connect it to your PC in two ways:

1. Using the – external ETH/USB adapter
2. Directly over the ethernet interface

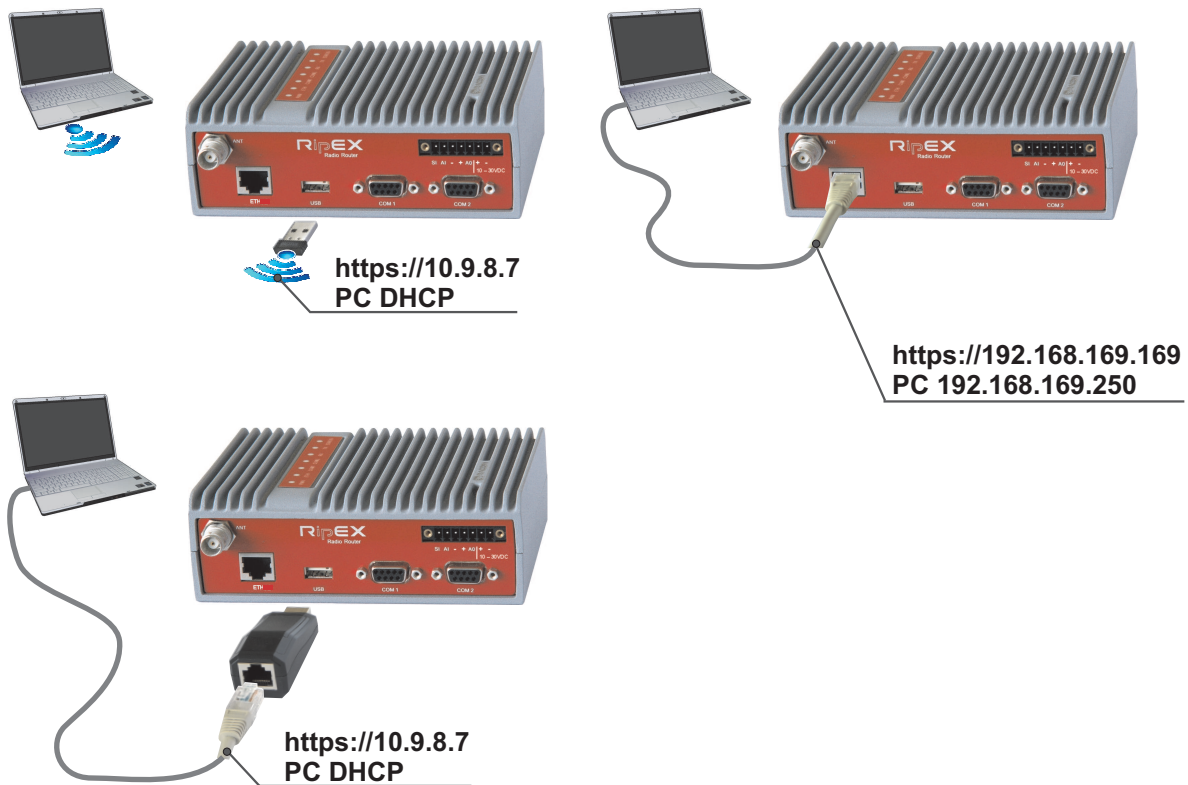


Fig. 3.3: Connecting to a PC over ETH and over ETH/USB adapter

1. PC connected via ETH/USB adapter

We recommend using the "X5" - external ETH/USB adapter (an optional accessory of the RipEX). The ETH/USB contains a built-in DHCP server, so if you have a DHCP client in your PC as most users, you don't need to set anything up. The RipEX's IP address for access over the ETH/USB adapter is fixed: 10.9.8.7.

Go to 3. Login to RipEX

2. PC connected directly to ETH port

Set a static IP address in PC, example for Windows XP:

Start > Settings > Network Connections > Local Area Connections
Right Click > Properties > General
select Internet Protocol (TCP/IP) > Properties > General
IP address 192.168.169.250 - for RipEX in the default state
Subnet mask 255.255.255.0
Default gateway leave empty
OK (Internet Protocol Properties window)
OK (Local Area Properties window)
Some Operating systems may require you to reboot your PC.

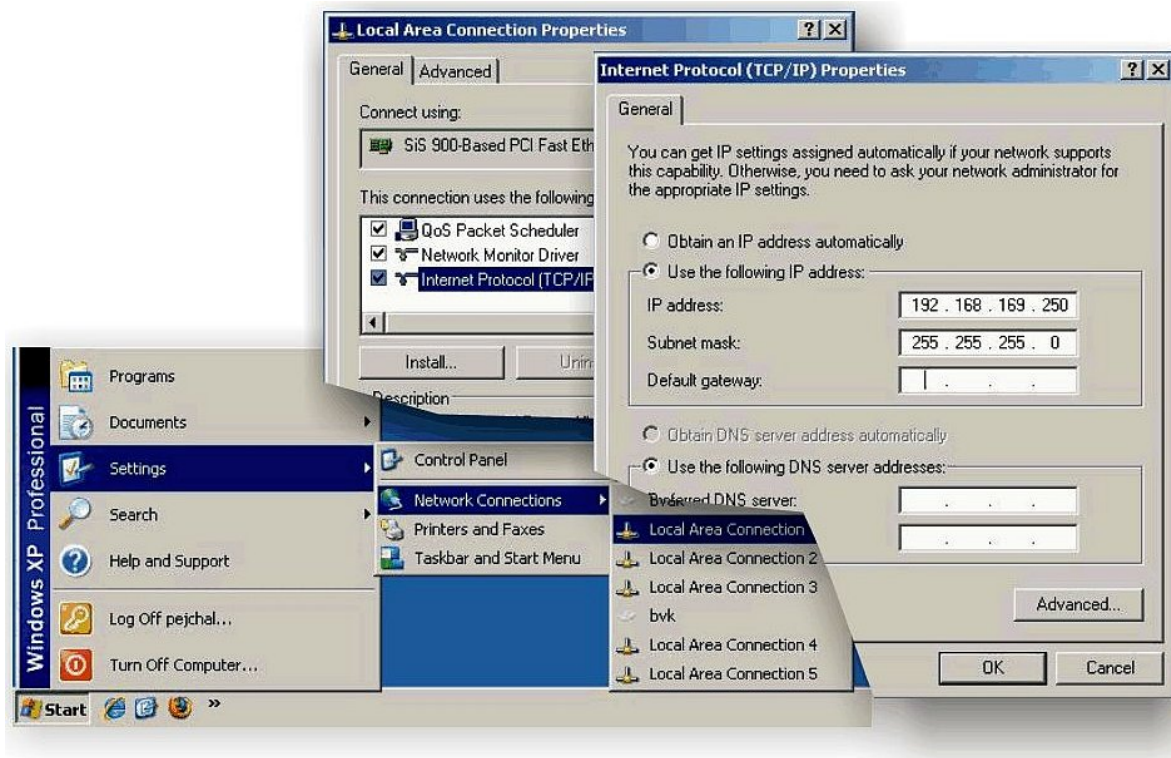


Fig. 3.4: PC address setting

Note: When you change the RipEX ETH address from the default value later on and the new IP network does not include the default one, you will have to change your PC's static IP again to be able to continue configuring the RipEX.

3. Login to RipEX

Start a web browser (Mozilla Firefox, Internet Explorer – JavaScript enabled) on your PC and type the RipEX's default IP in the address line field:

- **10.9.8.7** – when connected via "X5" – an external ETH/USB adapter. IP address 10.9.8.7 is fixed and cannot be changed; it is independent of the IP address of the RipEX's Ethernet interface.)
- **192.168.169.169** – when connected directly to ETH



Note

https - For security reasons the communication between the PC and RipEX is conducted using the protocol https with ssl encryption. The https protocol requires a security certificate. You must install this certificate into your web browser (Mozilla Firefox, Internet Explorer). The first time you connect to the RipEX, your computer will ask you for authorisation to import the certificate into your computer. The certificate is signed by the certification authority Racom s.r.o. It meets all security regulations and you need not be concerned about importing it into your computer. Confirm the import with all warnings and exceptions that your browser may display during installation.

The login screen appears:

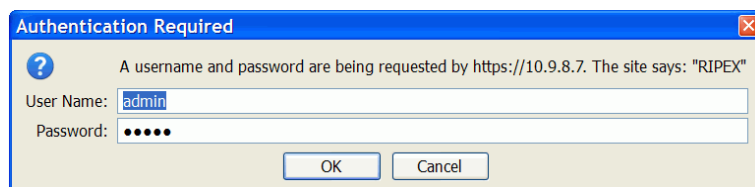


Fig. 3.5: Authentication

The default entries for a new RipEX are:

User name: admin

Password: admin

Click OK.

Initial screen should appear then:

RipEX Radio modem & Router **RACOM** Logout

Values from: R222 Fast remote access ?

Status

Wizards

Settings

Routing

Routing

Nomadic mode

VPN

IPsec

GRE

Diagnostic

Neighbours

Statistic

Graphs

Ping

Monitoring

Maintenance

Device ?

Unit name	R222	Operating mode	Router
Type	RipEX-400	Date & Time	2018-02-26 13:09:41
Code	RipEX-400S	Uptime	00:31:23
Serial No. (S/N)	11260354	SW feature keys	Master, COM2, Router, 10W, 166/83 kbps, Backup routes, Lite, QAM

Radio

HW version	1.1.100.2
SDDR version	0.24.0.57 (0/0)
Driver version	0.5.19.0
MAC	00:02:A9:AB:D5:AA
Radio protocol	Flexible
IP	10.10.10.222
TX frequency	422.012.500 MHz
RX frequency	422.012.500 MHz
RF power	0.1 W
Channel spacing	25.0 kHz
	20.8314CPFSK
Modulation rate	kbps
Encryption	Off

ETH

HW version	1.0.41.3
FW version	1.7.1.18
Bootloader version	3.0.2.20
MAC	00:02:A9:AB:D1:C2
IP	192.168.141.222
Speed	Auto

COM

COM1	19200,N,8,1; None
COM2	19200,N,8,1; None

Diagnostic

TxLost	0.00%
Ucc	13.50 V
Temp	36.50 °C
PWR	0.10 W
VSWR	1.20
ETH	1359/311
COM1	0/0
COM2	0/0

Refresh

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Fig. 3.6: Status Menu

Warning: Before you start any configuration, make sure only one unit is powered ON. Otherwise, a different radio modem could reply to your requests! (All units share the same IP address and are in Bridge mode when in factory settings.)

4. IP address unknown

If you don't have the adapter or you have forgotten the password, you can reset the access parameters to defaults, see chapter *Reset button*¹ in RipEX manual.

3.5. RipEX General Overview

RipEX Demo case gives you the most straightforward way to discover and understand all RipEX features and functionalities. Pay attention to the **Settings** tab, where one can set most configuration parameters. A few clicks will give you an easy summary about the product faster than reading many pages of text.

For detailed parameter descriptions, click on the **Help** button. Kindly note, **balloon tips** are also available for some parameters.

Keep in mind that accessibility of some parameters depends on the settings of other parameters. For example serial SCADA protocols on COM ports can only be set when Operating mode is set to the Router mode.

The screenshot shows the 'RipEX Configuration' web interface in a browser. The address bar shows 'https://10.9.8.7/settings.html?ipa_remote='. The interface has a sidebar on the left with tabs: Status, Wizards, Settings (selected), Routing, Diagnostic, Neighbours, Statistic, Graphs, Ping, Monitoring, and Maintenance. The main content area is titled 'Radio modem & Router' and 'RACOM'. It features a red header bar with 'Values from: RipEX A' and a 'Fast remote access' button. Below this, there are several configuration sections: 'Device' (Unit name: RipEX A, Time: Manual, Alarm management: Default, Neighbours&Statistics: Default, Operating mode: Bridge, Firewall: Off, Power management: Always On, Hot Standby: Off), 'Radio' (TX frequency: 432.000.000, RX frequency: 432.000.000, RF power [W]: 0.1, Channel spacing [kHz]: 25.0, Modulation rate [kbps]: 20.83 | 4CPFSK, FEC: Off, Encryption: Off), 'ETH' (IP: 192.168.1.101, Mask: 255.255.255.0, Default GW: 0.0.0.0, Speed: Auto, Terminal servers: Off), and 'COM's' (COM 1 and COM 2 settings for Type, Baud rate, Data bits, Parity, Stop bits, Idle bytes, MRU, and Flow control). Each section has a help icon (question mark in a circle). At the bottom, there are 'Apply' and 'Cancel' buttons. The footer contains contact information for RACOM and the website URL 'www.racom.eu'.

Fig. 3.7: Help question marks and balloon tips

3.6. RipEX Wizard Configuration

The easiest procedure to configure the units in real usage is to use our Wizard feature. Click on the Wizard tab to be guided through all necessary settings. The Wizard will provide you with helpful notes for respective parameters.

In this application note, we will use the following basic scenario:

¹ <http://www.racom.eu/eng/products/m/ripex/product.html#reset>

- **RipEX A:** 192.168.1.101/24
- **RipEX B:** 192.168.1.102/24
- **RipEX C:** 192.168.1.103/24

After successful connection to the RipEX unit, go to the Wizards menu.

RipEX Radio modem & Router **RACOM**

Values from: NoName Fast remote access ?

Wizard menu

Important
Before you start any configuration be sure only one unit is powered ON. Otherwise the second unit could reply your requests over-the-air!
(All units have the same default IP address)

- Global network parameter - must be the same in all units within the network

Network type
Point-to-Multipoint – suitable for Master-Slave application where polling-type communication protocol is used. This Wizard is also suitable for Point-to-Point Network type.
Multipoint – suitable for Multi-master applications with any combination of polling and/or spontaneous data protocols.

▪ **Network type** Point-to-Multipoint

Next

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Fig. 3.8: Wizard menu

Leave everything in the default state except IP address and unit name. See the example for RipEX A.

Ethernet

The whole network of RipEX units behaves like a standard Ethernet network bridge, so IP address of Ethernet interface itself is not significant. However it is very recommended to set unique IP address for each unit, otherwise remote access via Radio channel will not be possible. If you will administrate the unit from different subnet, enter also the default Gateway for this subnet:

IP	192.168.1.101
Mask	255.255.255.0
GW	0.0.0.0

Important
When you set IP address outside original network, connection from your PC will be lost after Apply (Last step of Wizard). IP and Mask of your PC has to be within the same network as connected RipEX.

Next

Fig. 3.9: Wizard menu – IP address

Unit name

For your convenience it is possible to set unique name of each unit (up to 40 characters):

Unit Name RipEX A

Next

Fig. 3.10: Wizard menu – Unit name

After the Wizard is completed, click on the "OK" button. You will be forwarded into the Settings menu. Click on the "Apply" button and accept the changes.

The screenshot shows the RipEX web interface with the 'Settings' menu selected. The interface is titled 'Radio modem & Router' and features the RACOM logo. A sidebar on the left contains navigation links: Status, Wizards, Settings (highlighted), Routing, Diagnostic, Neighbours, Statistic, Graphs, Ping, Monitoring, and Maintenance. The main content area displays configuration settings for a device named 'RipEX A'. At the top, a red banner indicates 'Values from: NoName' and a 'Fast remote access' button. The settings are organized into sections: 'Device' (Unit name, Time, Alarm management, Neighbours&Statistics, Operating mode, Firewall, Power management, Hot Standby), 'Radio' (TX frequency, RX frequency, RF power, Channel spacing, Modulation rate, FEC, Encryption), 'ETH' (IP, Mask, Default GW, Speed, Terminal servers), and 'COM's' (COM 1 and COM 2 settings including Type, Baud rate, Data bits, Parity, Stop bits, Idle bytes, MRU, and Flow control). At the bottom, there are 'Apply' and 'Cancel' buttons. The footer contains copyright information for RACOM and the website URL.

Fig. 3.11: Wizard menu – Applying the changes

Repeat the procedure for other RipEX units. Do not forget to use the appropriate IP addresses and Unit names.

3.7. RipEX Practical Tests

Since the best way to understand the product is through practice, we have described a few practical tests you may wish to conduct.

3.7.1. RipEX-to-RipEX Ping

Ping is the basic tool for checking connectivity between two hosts with IP addresses. Because RipEX is a native IP device, ping can also be used for radio link testing.

Go to the **Ping** tab in the **Diagnostic** menu. You can either set the Ping Type to „ICMP“ (common ping) or to „RSS“. The RSS type is a RipEX proprietary ping with extended reports.

The destination is the remote RipEX's IP address. For example when you are locally connected to RipEX A (192.168.1.101), fill in 192.168.1.102.

When Ping is started, you will see the following on-line report on your screen.

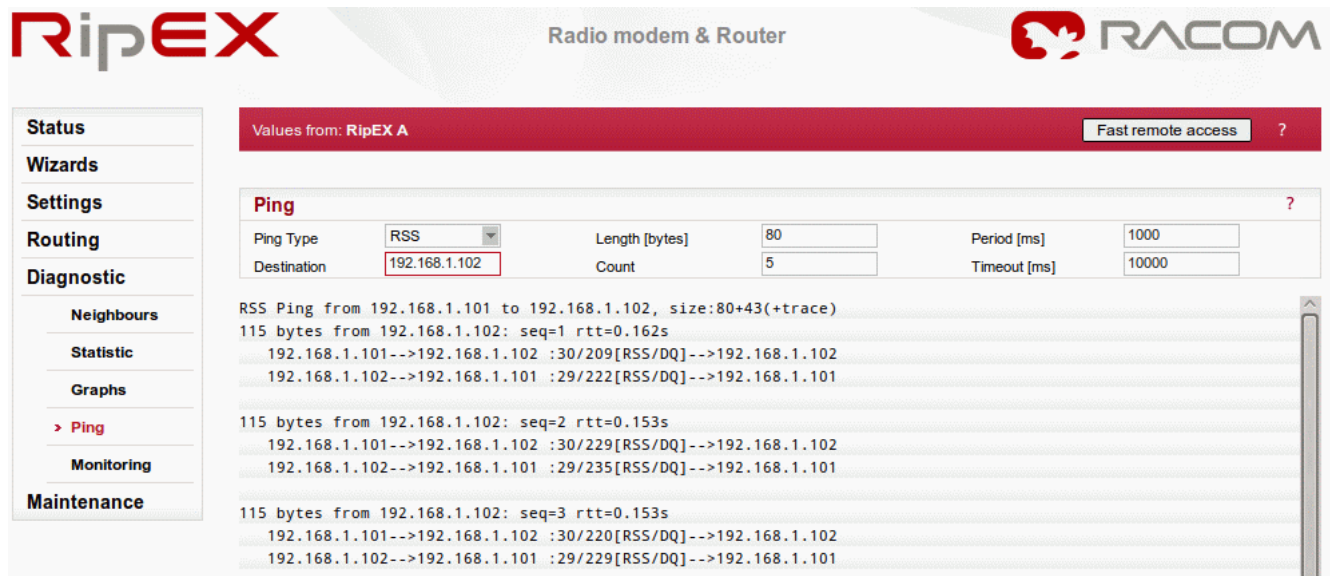


Fig. 3.12: Ping on-line report

When the specified count of ping packets is transmitted, following detailed summary is displayed. It consists of: throughput usage, PER/BER, RSS, Data Quality (DQ) and Round Trip Time (RTT) histogram. It can be very useful during RipEX unit installation and coverage optimisation.

Please read the detailed Ping report description by clicking on the Help question mark.

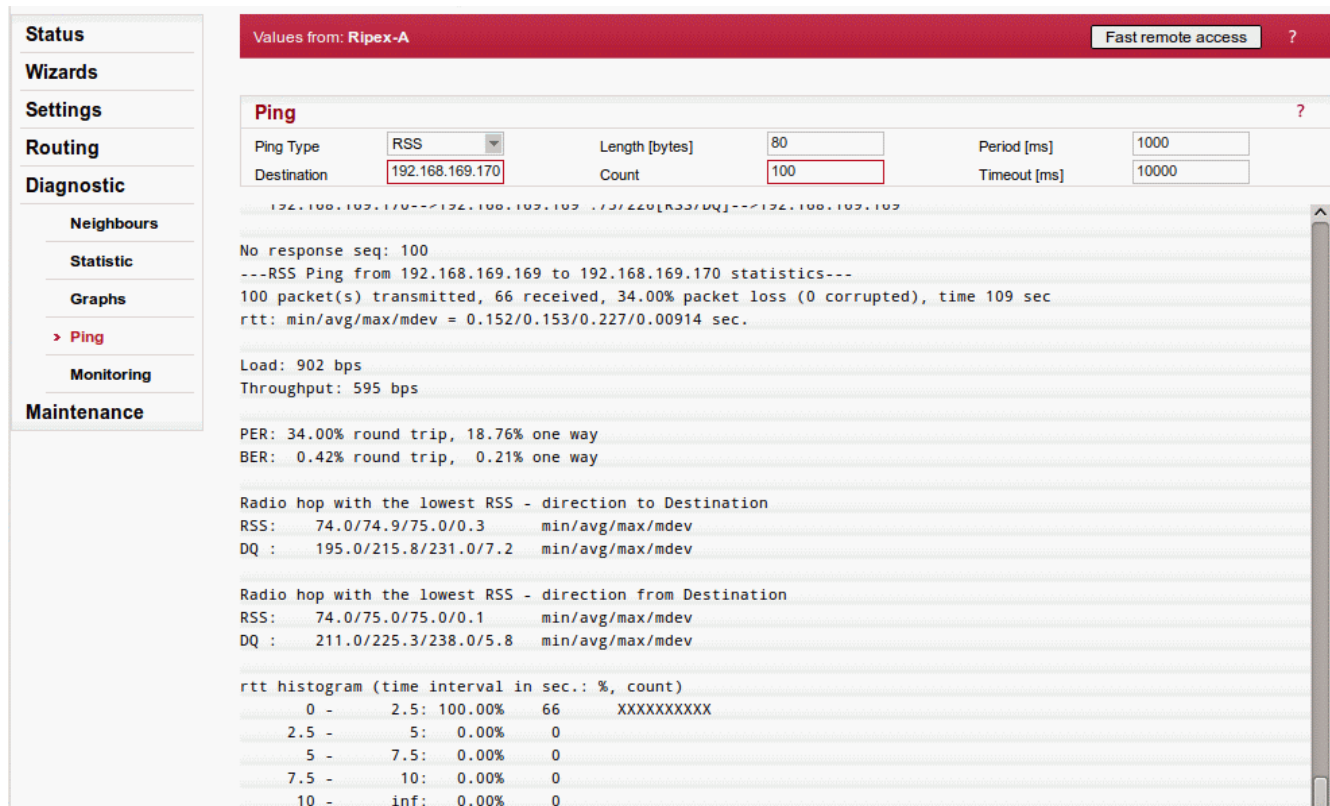


Fig. 3.13: Detailed Ping report

Feel free to change the packet length (Ping option) or the Modulation rate (Settings tab) in order to see the impact on the measured RTT. Do not forget to set the same Modulation rate in both units.

End-to-End Connectivity

You can also check the end-to-end connectivity by connecting two PCs to RipEX units (see the following diagram).

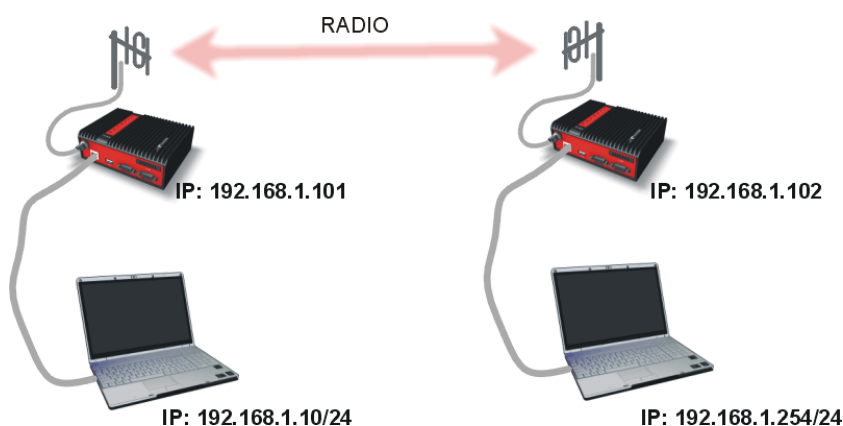


Fig. 3.14: End-to-End Connectivity test

RipEX units are already configured in the Bridge mode. We need to configure PCs with unique IP addresses within the network subnet (192.168.1.0/24). For example 192.168.1.10 for PC 1 and 192.168.1.254 for PC 2. A description of how to set a static IP address in your Windows PC can be found in *Section 3.4, "Programming RipEX via Computer"*.

Check the connectivity by executing a **ping** command.

To run this command in Windows, you need to execute **Windows Command Processor** (cmd). Click on the **Start** button and then type *Command Prompt* or *cmd* in the **Start Search** field. Select the **Command Prompt** icon.

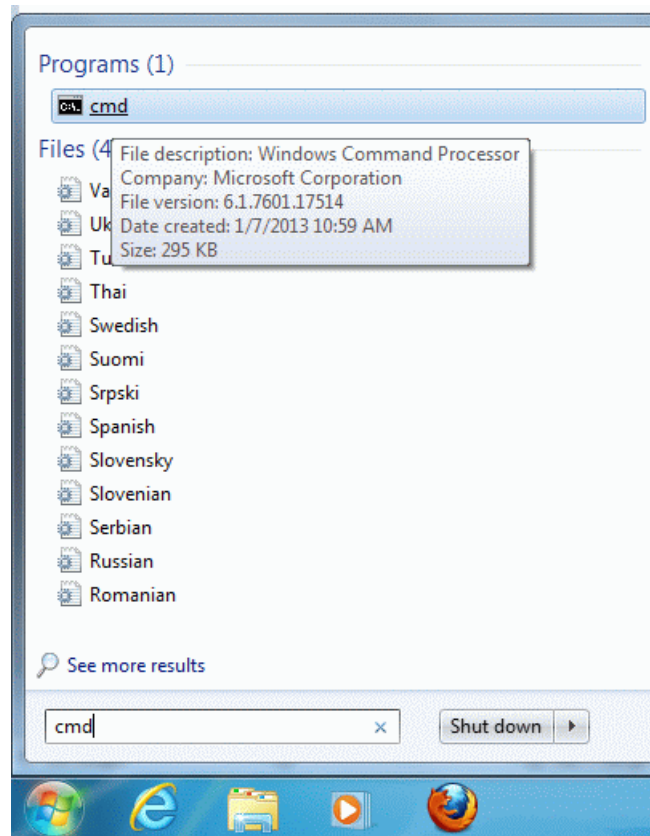


Fig. 3.15: Command Prompt

After the Command Prompt window appears, type "ping 192.168.1.254" if you are executing the ping from the PC with IP 192.168.1.10 and check the results. You can also try the other direction, just switch IP addresses. See the following example:

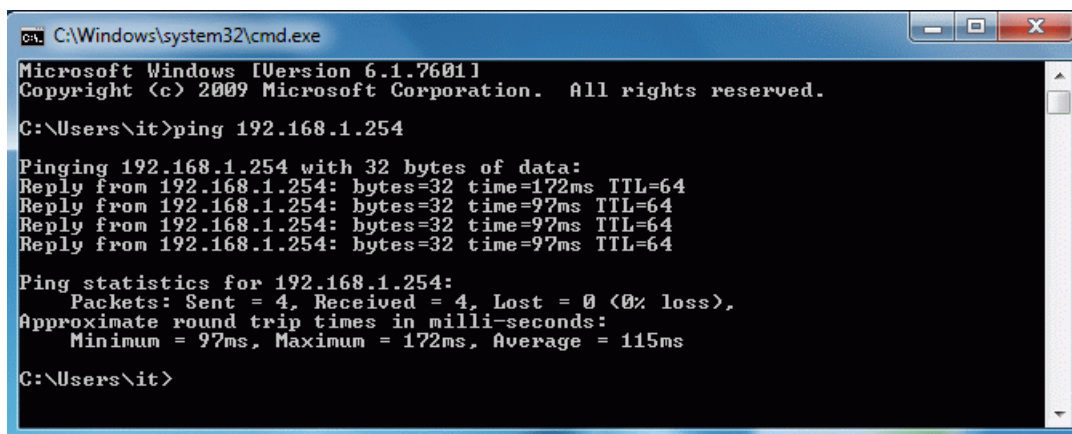


Fig. 3.16: Detailed Ping report



Note

If the ping is not successful, try to turn the Windows firewall off. It can block the ping packets.

3.7.2. Fast Remote Access

Fast Remote Access is a unique RipEX feature used to minimize the data amount transferred when accessing the Remote station over the radio channel. The trick is that we do not transfer static data (e.g. web page graphical objects). All static data are downloaded from the local RipEX and only information specific to the remote RipEX is transferred over the radio channel.

To test this feature, just click on the Fast remote access button at the top of the screen, fill in the remote RipEX IP Ethernet address and click on the Connect button.

In the following example, we are locally (Ethernet) connected to RipEX A and we want to connect remotely to RipEX B.

Fig. 3.17: Connection via Fast Remote Access

Now you are accessing the remote unit over the radio link. The latency is dependent on the radio link Modulation rate. Feel free to change the Modulation rate (Settings tab) in order to see the impact on the remote access response time. Do not forget to set the same Modulation rate in all units you want to access.

Click on the **Disconnect** button to logout from the remote unit.

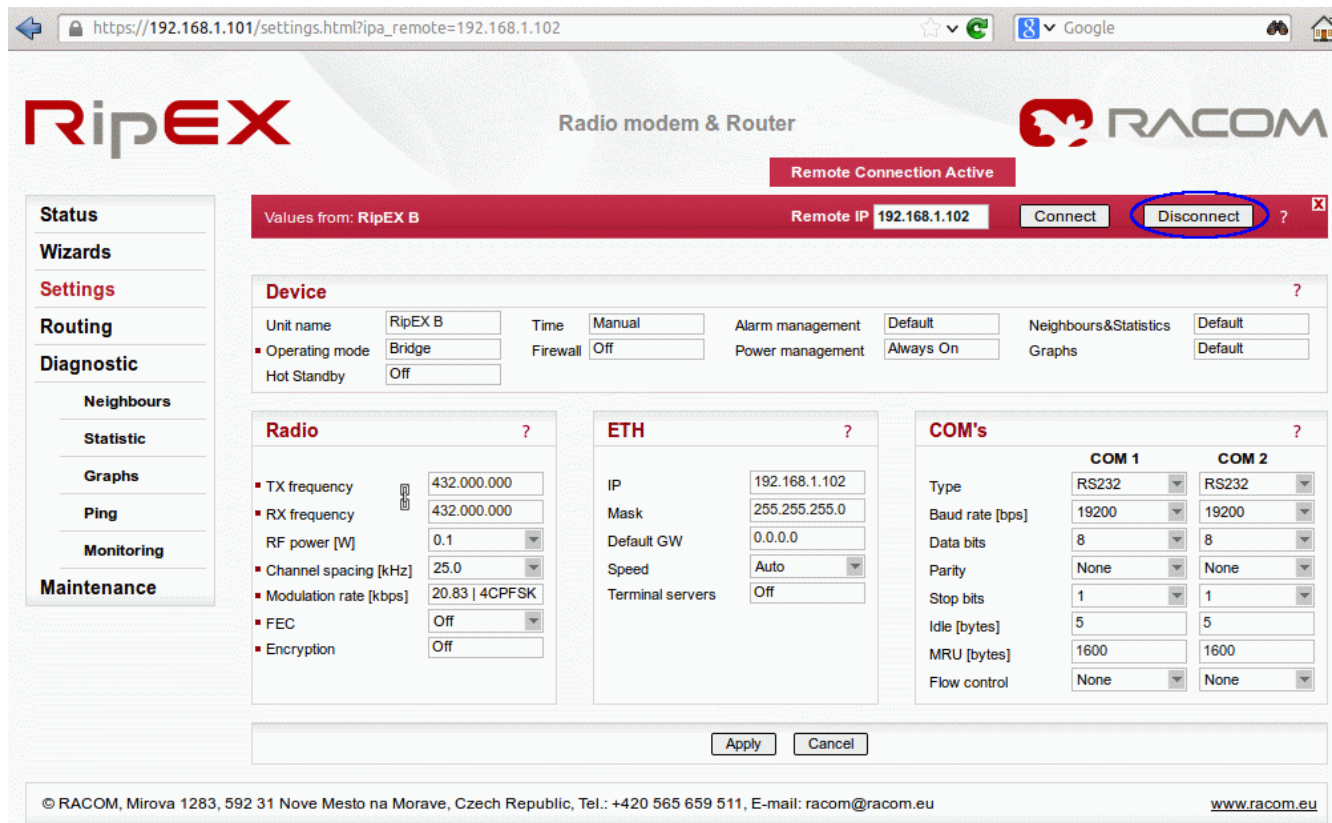


Fig. 3.18: Disconnection from the remote RipEX

Access Time Comparison

You can also try to access the remote RipEX unit without using Fast Remote Access feature. When locally connected to RipEX A, just type RipEX B's IP address (192.168.1.102) into the browser and wait for the page to load.

You will see a huge impact on the access time. Again, feel free to change the Modulation rate (Settings tab) or changing the default Bridge mode to the Router mode.



Note

You need to configure routing accordingly if the Router mode is active.

3.7.3. Alarm Management – Usage Example

The Demo case also contains a red light emitting diode connected to the RipEX A using HW alarm output, see Fig. 3.19, "Red light emitting diode using the Alarm output". Generally, you can define conditions when RipEX is in the alarm state. E.g. when the temperature is out of its threshold range, HW alarm output lights up the diode.

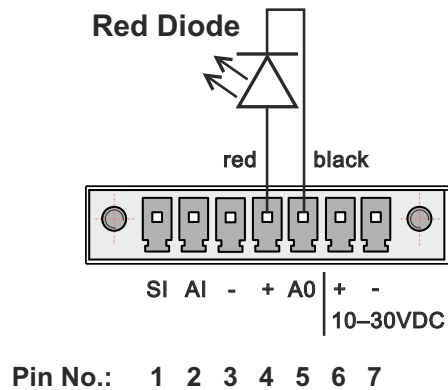


Fig. 3.19: Red light emitting diode using the Alarm output

**Note**

Connect the diode only as depicted, otherwise, it could be destroyed.

In the following example, the Alarm output will be triggered whenever the temperature is out of its threshold range. In the real environment, any watched value can be used to trigger the Alarm output and control any attached device.

The current temperature can be displayed in the Status menu. Check the value shown in the picture below; the temperature of 36.5 °C is not highlighted and so it's OK.

RipEX Radio modem & Router **RACOM**

Values from: **RipEX A** Fast remote access ?

Status (circled in blue)

Wizards
Settings
Routing
Diagnostic
Neighbours
Statistic
Graphs
Ping
Monitoring
Maintenance

Device		Operating mode	
Unit name	RipEX A	Operating mode	Router
Type	RipEX-400	Date & Time	2015-04-07 08:51:13
Code	RipEX-432	Uptime	23:25:34
Serial No. (S/N)	12218243	SW feature keys	Master

Radio		ETH	
HW version	1.1.80.0	HW version	1.0.41.3
SDDR version	0.21.0.54 (0/1)	FW version	1.4.4.0
Driver version	0.5.18.0	Bootloader version	3.0.2.17
MAC	00:02:A9:BA:73:6B	MAC	00:02:A9:BA:6F:83
IP	10.10.10.1	IP	192.168.1.1
TX frequency	435.750.000 MHz	Speed	Auto
RX frequency	435.750.000 MHz		
RF power	0.5 W		
Channel spacing	25.0 kHz		
Modulation rate	83.33 16DEQAM kbps		
Encryption	Off		

COM's	
COM1	19200 N 8.1: None
COM2	19200 N 8.1: None

Diagnostic	
TxLost	0.00%
Ucc	13.60 V
Temp	36.50 °C (circled in blue)
PWR	0.00 W
VSWR	1.00
ETH	11029/10290
COM1	1/0
COM2	0/0

Refresh

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Fig. 3.20: RipEX current temperature

You can now test the Alarm output functionality by editing the Alarm management. By default, the temperature threshold range falls into the interval from -25 to +85 °C. You can manually edit these values so that the current temperature would be almost out of its allowed interval.

Go to the **Settings** menu and click on the **Alarm management** button.

The screenshot shows the RipEX web interface. On the left is a sidebar menu with options: Status, Wizards, Settings (highlighted in red), Routing, Diagnostic, Neighbours, Statistic, Graphs, Ping, Monitoring, and Maintenance. The main content area is titled 'Radio modem & Router' and 'RACOM'. Below the title bar, there's a red banner with 'Values from: RipEX A' and a 'Fast remote access' button. The 'Device' section contains several configuration fields: Unit name (RipEX A), Time (Manual), Alarm management (Manual, highlighted with a blue circle), Neighbours&Statistics (Default), Operating mode (Router), SNMP (Off), Power management (Always On), Graphs (Manual), Hot Standby (Off), Firewall (Off), WiFi (On), and Management (Default). Below the 'Device' section are three tabs: 'Radio', 'ETH', and 'COM's'. The 'Radio' tab is active, showing fields for IP (10.10.10.1), Mask (255.255.255.0), TX frequency (435.750.000), RX frequency (435.750.000), Channel spacing [kHz] (25.0), Modulation rate [kbps] (83.33 | 16DEQAI), RF power [W] (0.5), FEC (Off), Optimization (Off), Encryption (Off), and MTU [bytes] (1500). The 'ETH' tab shows fields for IP (192.168.1.1), Mask (255.255.255.0), DHCP (Off), Shaping (Off), Speed (Auto), Modbus TCP (On), Terminal servers (Off), TCP proxy (Off), and ARP proxy & VLAN (Off). The 'COM's' tab shows two columns for COM 1 and COM 2, with fields for Type (RS232), Baud rate [bps] (19200), Data bits (8), Parity (None), Stop bits (1), Idle [bytes] (5), MRU [bytes] (1600), Flow control (None), and Protocol (None). At the bottom of the main content area are 'Apply' and 'Cancel' buttons. The footer contains copyright information for RACOM and the website URL www.racom.eu.

Fig. 3.21: Alarm management location

RipEX does not control the diode by default. You need to set the following parameters:

- Threshold to **"Manual"** (if you do not want to use the default threshold range)
- HW Alarm Output to **"N.O. (Normally opened)"**
- Temperature threshold (for testing, set the upper limit very close to the current temperature, e.g. in our example we have the current temperature 36.5 °C so the upper limit is set to 37 °C)
- HW Alarm **Output checked**

Alarm management

?

Threshold Manual

HW Alarm Output N.O. (Normal)

Type	Threshold		Out of Threshold interval		
	Min	Max	SNMP Trap	HW Alarm Output	Detail Graphs start
RSScom [-dBm]	0	115	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DQcom	30	255	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TxLost [%]	0	50	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ucc [V]	5	32	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temp [°C]	30	37	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
PWR [W]	0	12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VSWR	1	4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ETH [Rx/Tx]	0.1	10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COM1 [Rx/Tx]	0.1	10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COM2 [Rx/Tx]	0.1	10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HW Alarm Input	Off		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unit ready	Off		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 3.22: Alarm management settings

Whenever the temperature is out of its threshold range, the red diode is turned on until the temperature falls back into the allowed interval.

To increase the temperature, you can for example:

- close the demo case cover
- ping other RipEX units (Diagnostic → Ping)
- turn on the Monitoring (Diagnostic → Monitoring)

For the testing purposes, we can turn on the detailed graphs functionality. Go to the **Settings** → **Device** → **Graphs** menu and set the "Detail graph start" option to "Continual". Apply the changes. With this feature on, you can check the temperature graph in one minute intervals.

Check the temperature in the Status menu. The value should be highlighted as in the below picture.

Diagnostic	
TxLost	0.00%
Ucc	13.60 V
Temp	37.84 °C
PWR	0.40 W
VSWR	1.50
ETH	11023/10290
COM1	1/0
COM2	0/0

Fig. 3.23: RipEX temperature out of its threshold range

In our example, the upper limit was set to 37 °C. In the detailed graph below, you can see the temperature to be increasing from a value just below 36 °C to a maximum value over 41 °C. The alarm was triggered at the level of 37 °C (see the red line on the bottom) and the red diode was turned on.

The second line represents the number of transmitted packets which was the main reason for the temperature increase. Immediately after stopping the traffic, the temperature started to decrease again.

The picture also contains a small fragment of the Overview graph.

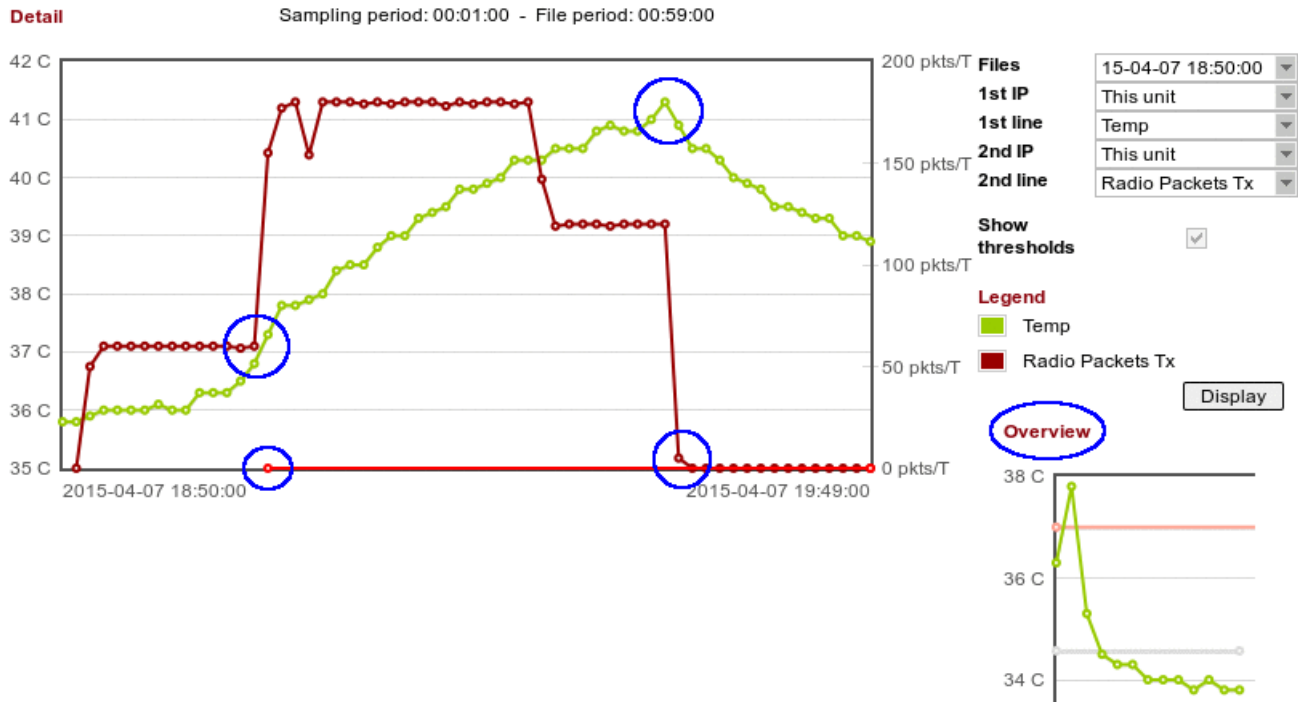


Fig. 3.24: Detailed graph (temperature, transmitted packets) with a small Overview graph

This example just shows the basic usage of the alarm output. You can attach whatever device you need and control the alarm via any watched values.

3.8. RipEX Diagnostic

RipEX web interface is equipped with comprehensive and detailed statistics and graphs. One could say, there is an embedded NMS (Network Management System) within RipEX.

Every RipEX can broadcast its **Watched values** to other reachable RipEX units within the network. Among these Watched values are: current supply voltage, internal temperature, RF output power, Voltage Standing Wave Ratio on the antenna feed line, packet counters on separate interfaces and other values.

3.8.1. Neighbours

These Watched values are displayed in the Diagnostic → Neighbours menu. See the following example with two neighbouring units.

RipEX Radio modem & Router **RACOM**

Values from: **RipEX A** [Fast remote access](#) ?

Neighbours ?

Date Log start 2013-02-20 06:30 Last upd. 2013-02-20 12:48 Log uptime 06:17:02 Log save period [Manual](#)

IP		Received headers [Count]	RSS [dBm]	DQ	TxLost [%]	Ucc [V]	Temp [°C]	PWR [W]	VSWR	Packets [Rx/Tx]		
										ETH	COM1	COM2
This unit	Last	-	-	-	0	13.7	38.8	0.1	1.0	1947 /	0 /	0 /
	Avg	-	-	-	0.00	13.73	38.80	0.10	1.00	1614	0	0
192.168.1.102	Last	3	-29	232	0	13.8	39.5	0.1	1.0	360 /	0 /	0 /
	Avg	-	-29.00	233.09	0.00	13.80	39.50	0.10	1.00	65	0	0
192.168.1.103	Last	3	-29	235	0	13.7	40.3	0.1	2.4	0 /	0 /	0 /
	Avg	-	-29.00	231.02	0.00	13.70	40.30	0.10	2.40	0	0	0
RADIO BROADCAST	Last	674	-29	235	NA	NA	NA	NA	NA	NA /	NA /	NA /
	Avg	-	-29.00	233.28	NA	NA	NA	NA	NA	NA	NA	NA

Legend Alarm monitored, Alarm Alarm monitored, No alarm

< Previous 2 1 0 Refresh Save Difference: Clear Display

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Fig. 3.25: Neighbours menu

3.8.2. Statistic

The **Diagnostic** → **Statistic** menu provides you with information about data volume on all interfaces: Radio, Ethernet, COM1 and COM2. The menu displays the number of received and transmitted packets, their sizes and current throughput. Moreover, a detailed division into user and service packets is available for the radio channel.

The quick value descriptions are displayed in the balloon tips (place the cursor on any column header). The detailed description can be read in the respective Help.

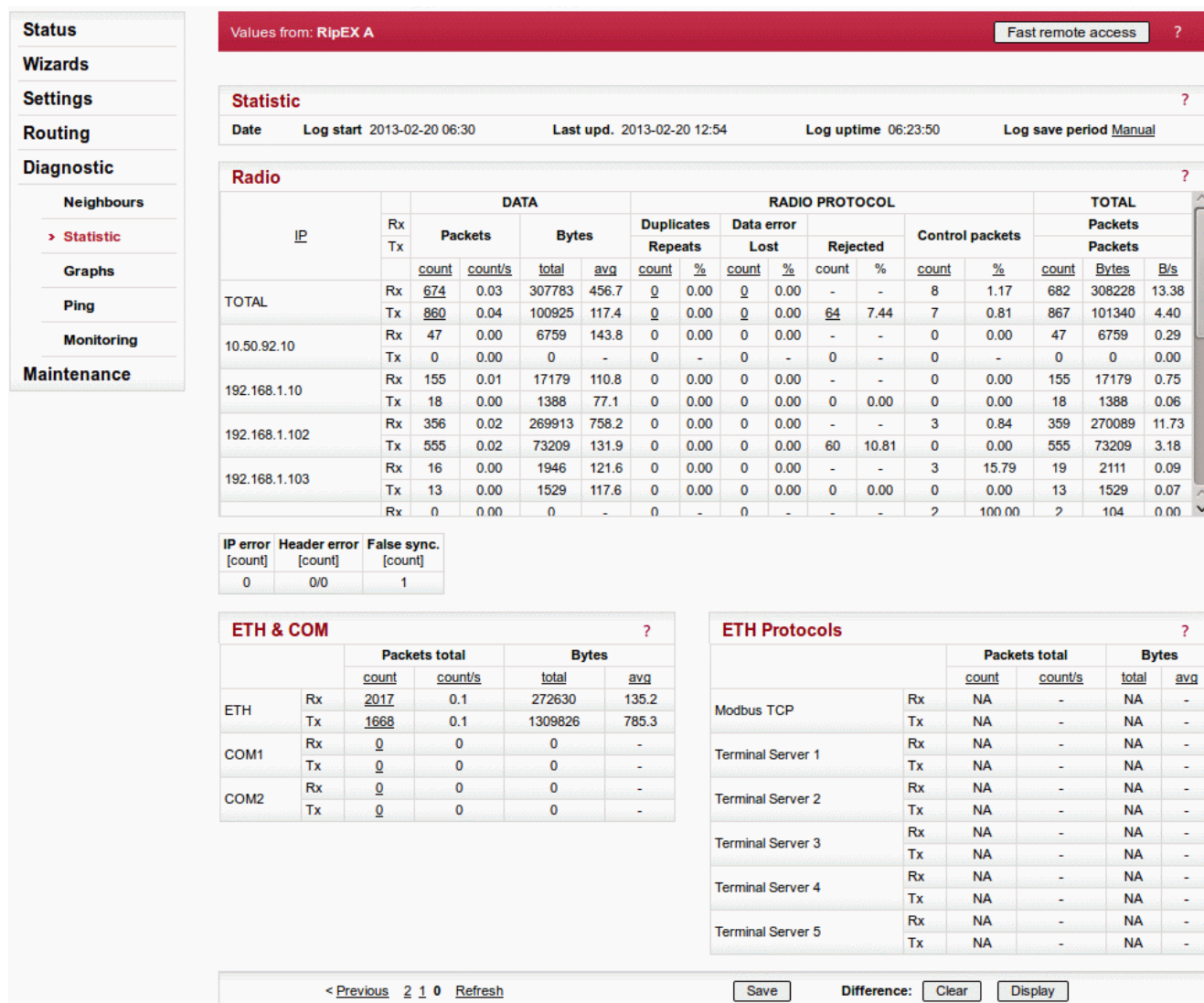


Fig. 3.26: Statistic menu

3.8.3. Graphs

Neighbours and Statistic values can also be displayed as graphs in the **Diagnostic** → **Graphs** menu. Each graph is available in a summary or detailed version and can display two different elements at once. Detailed graphs can be created continuously or can be triggered whenever monitored values are out of their threshold ranges. Each graph can be created based on the values of the unit itself or any other neighbouring unit.

The detailed graphs description can be read in the respective Help.

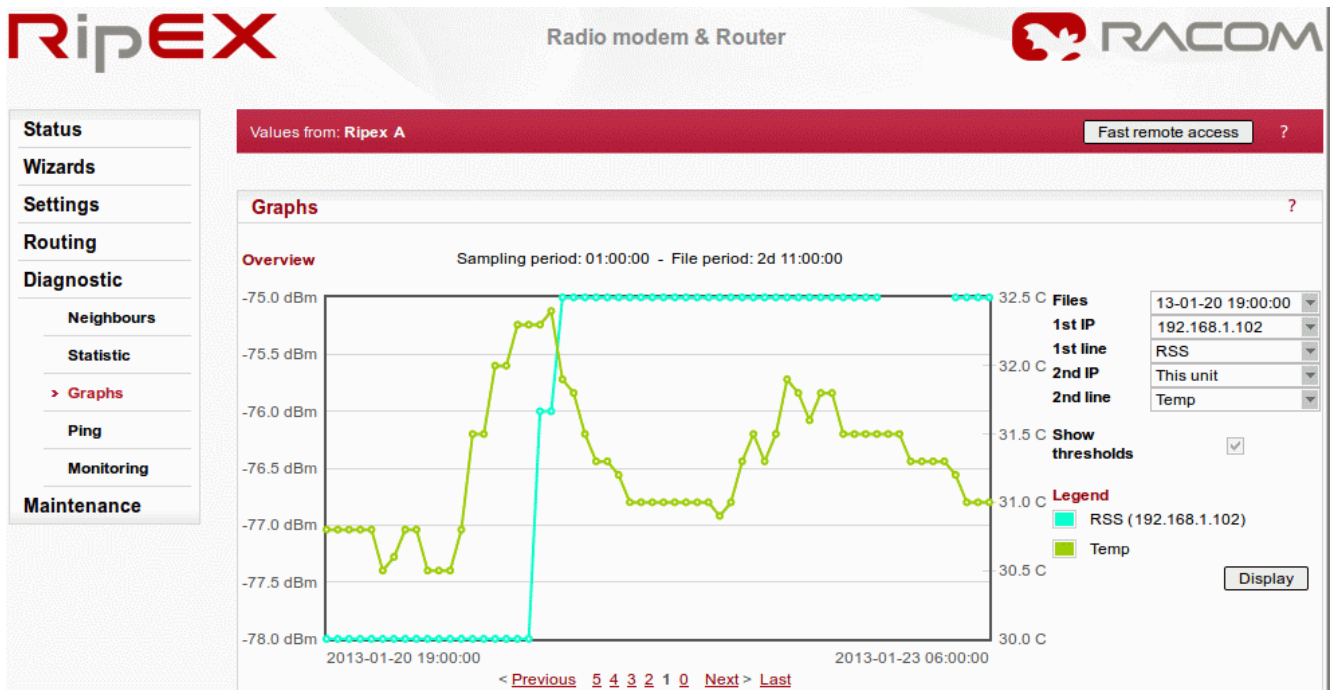


Fig. 3.27: Graph menu

3.8.4. Monitoring

Monitoring is an advanced on-line diagnostic tool, which enables detailed communication analysis over any RipEX interface. In addition to all physical interfaces (Radio, Ethernet, COM1 and COM2), several internal interfaces between software modules can be monitored.

Go to the **Diagnostic** → **Monitoring** menu and just click on the **Start** button. In the default settings, it will display packet timing and payload on the Radio channel. For example, you can test Monitoring while performing the Ping test (Chapter Section 3.7.1, “RipEX-to-RipEX Ping”).



Note

In order to see both on-line reports (Ping as well as Monitoring), start Ping in a new independent window or tab in your browser.

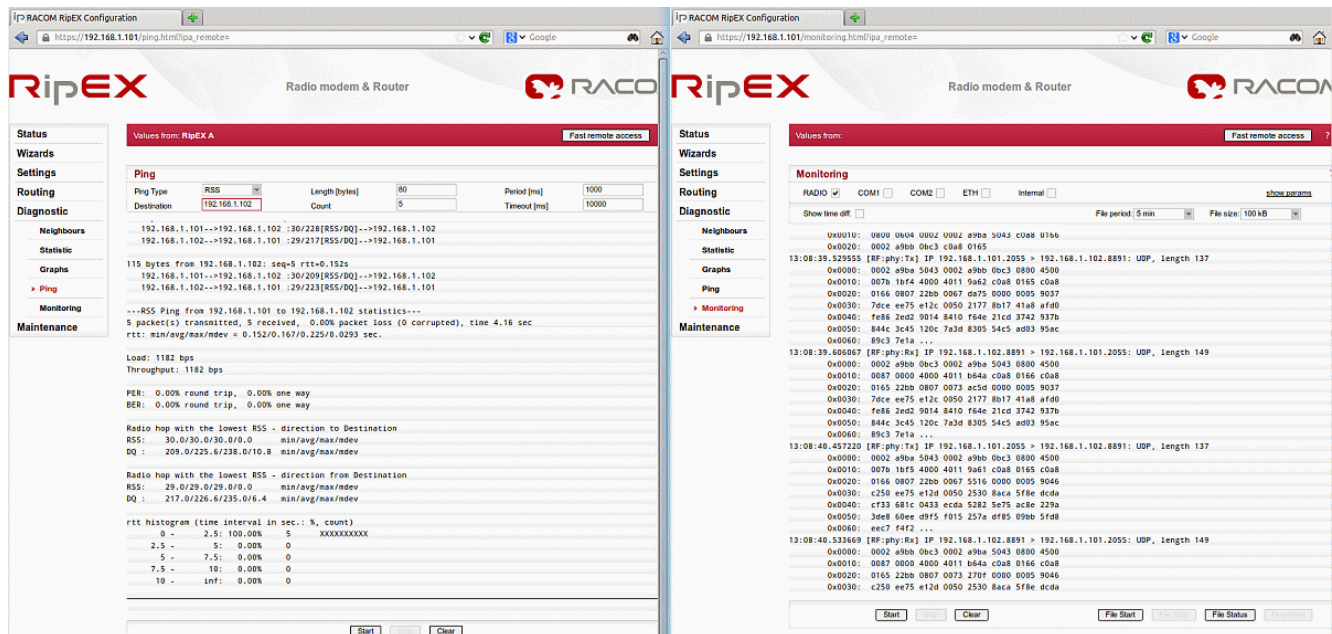


Fig. 3.28: Monitoring the ping packets in two separate windows

3.9. RipEX Advanced Tests

The Demo case is an ideal tool for conducting laboratory tests and benchmarks, which shows you how the particular application will behave with cooperation with RipEX radio modems.

1. Connecting RTUs and central SW

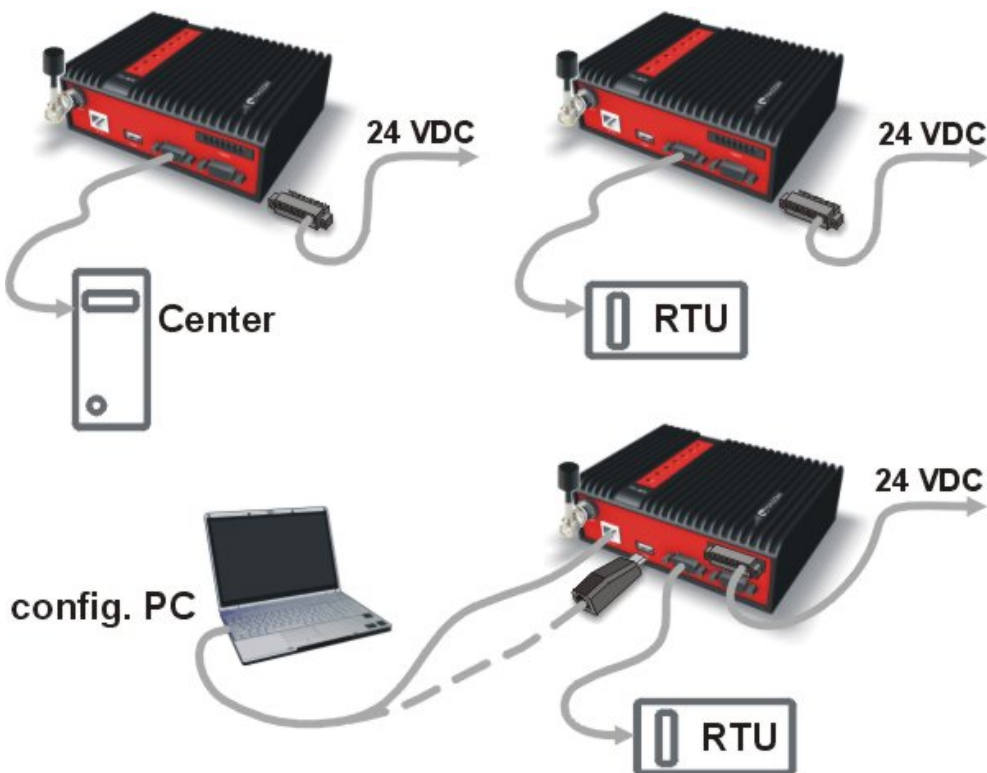


Fig. 3.29: Bench Test

- **Bridge mode**
 - Configure the RipEX units in the Wizard menu.
 - **Bridge mode with a repeater**
 - Configure the RipEX units in the Wizard menu. Set the RipEX B as a repeater. You can check the features described in the RipEX manual, Chapter Bridge Mode: http://www.racom.eu/eng/products/m/ripex/ripex-detail.html#bridge_mode
 - For example, you can check that although the packet is received twice (directly and over the repeater), it is transmitted only once to the RTU.
 - **Router mode (with repeater)**
 - This mode is suitable for more complex networks and "Report by exception" applications. Its configuration is not straightforward and the Wizard is currently disabled.
 - Please refer to the manual for configuration examples, Chapter Router mode: http://www.racom.eu/eng/products/m/ripex/ripex-detail.html#router_mode
 - We support drivers for various SCADA protocols in the Router mode: Async Link, C24, Cactus, Comli, DF1, DNP3, IEC101, ITT Flygt, Modbus, Profibus, RP570 or UNI.
2. **Alarm Management, SNMP**
- You can test RipEX SNMP (reading various values like Temperature, RSS, Serial number with snmpget or snmpwalk commands).
 - You can also test how your Network Management System cooperates with RipEX units.
 - For more details, see the Application Note, Chapter 2, RipEX SNMP Configuration Guide: <http://www.racom.eu/eng/products/m/ripex/app/snmp.html>.
3. **Troubleshooting**
- RipEX has sophisticated monitoring features (see Chapter Section 3.8, "RipEX Diagnostic") which make troubleshooting straightforward.
 - You can save the monitored traffic into the pcap format and examine it in the Wireshark or tcpdump program.
 - We have described several troubleshooting issues in the manual, Chapter Troubleshooting: <http://www.racom.eu/eng/products/m/ripex/trouble.html>.
- **And many others...**

3.10. M!DGE General Overview

Within the RipEX Demo case, there is also one M!DGE 3G SCADA router so you can understand all M!DGE features and functionalities too. A few clicks will give you an easy summary about the product faster than reading many pages of text. Before any configuration changes, we recommend inserting a SIM card and connecting to the mobile network.

3.11. Accessing M!DGE

Before starting work with the HW please be sure that you have a SIM card enabled for data and you have all the necessary information from the mobile operator (PIN, APN, login, password).

3.11.1. Connecting the Hardware

Insert a SIM card into the SIM socket. Make sure the SIM is suitable for data transmission.



There are two reasons for installing the SIM card as the first task:

- The SIM card may be damaged if inserted into a powered-up unit.
- SIM card information is read only after power-up.

Connect one M!DGE Ethernet port to your computer using an ETH cat.5 cable.

3.11.2. Programming M!DGE via Computer

If not yet enabled, please enable the Dynamic Host Configuration Protocol (DHCP) so that your computer can lease an IP address from M!DGE. Wait a moment until your PC has received the parameters (IP address, subnet mask, default gateway, DNS server). E.g. using Windows XP:

Start > Connect To > Show all connections > Local Area Connection > Right Click > Properties > Internet Protocol (TCP/IP) > Properties > Obtain an IP address automatically.

Alternative: Instead of using the DHCP, configure a static IP address on your PC (e.g. 192.168.1.10, mask 255.255.255.0) so that it is operating in the same subnet as the M!DGE.



The PC settings are very similar to the description in Chapter *Section 3.4, "Programming RipEX via Computer"*.

The factory defaults (with DHCP enabled):

- IP address – 192.168.1.1 (ETH1), 192.168.2.1 (ETH2)
- Subnet mask – 255.255.255.0

Start a Web Browser on your PC. Type the IP address into the address line: *http://192.168.1.1*.

Please set a password for the admin user account. Choose something that is both easy to remember and a strong password (such as one that contains numbers, letters and punctuation). The password must have a minimum length of 6 characters. It must contain a minimum of 2 numbers and 2 letters.



Admin Password Setup

Please set a password for the admin user account. Choose something that is both easy to remember and a strong password (such as one that contains numbers, letters and punctuation).

The password shall have a minimum length of 6 characters. It shall contain a minimum of 2 numbers and 2 letters.

Username:

Enter new password:

Confirm new password:

Fig. 3.30: M!DGE Login screen

The Web Manager can always be reached via the Ethernet interface. After the successful setup, Web Manager can also be accessed via the mobile interface.

3.12. Basic M!DGE Configuration

Before you begin any operation in the mobile network, at least the following steps have to be performed:

- Defining the admin password (already done in Chapter Section 3.11.2, “Programming M!DGE via Computer”).
- Entering the PIN code for the SIM card if required.
- Configuring the Access Point Name (APN).
- Starting the mobile connection.

Please see the M!DGE manual for configuration details:
<http://www.racom.eu/eng/products/m/midge1/index.html>

Since the best way to understand the product is through practice, we have described a few practical tests you may wish to conduct.

3.12.1. First Mobile Connection

If you have a SIM card inserted and you are logged into the M!DGE unit, we can proceed with a basic Mobile configuration steps.

SIM Configuration

Go to the **INTERFACES** → **Mobile** → **SIMs** menu and click on the **Edit** button.

M!DGE **RACOM**

HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT

WAN
 Link Management
 Settings
 Supervision

Ethernet
 Port Settings
 Link Settings
 IP Settings

Mobile
 SIMs
 Interfaces

USB

Serial Port

Digital I/O

SIM Cards

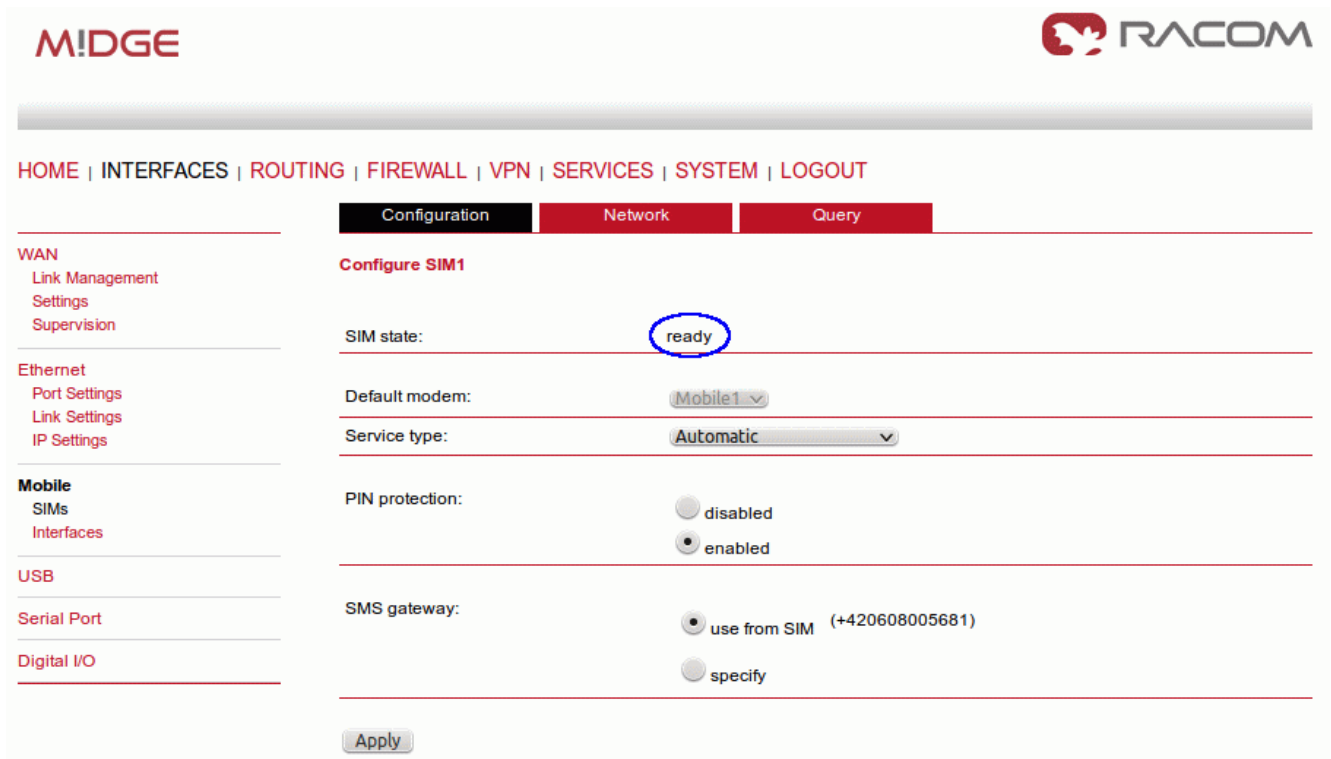
This menu can be used to assign a default modem to each SIM which will also be used by SMS and GSM voice services. However, a SIM card might be switched in case of multiple WWAN interfaces sharing the same modem.

SIM	Default	Current	State	PIN Protection	Registered
SIM1	Mobile1	Mobile1	PIN required	unknown	no

Update

Fig. 3.31: Edit the SIM configuration

In the following screen, fill in the correct PIN code, other parameters can be left at their defaults. After applying the changes, you should see a similar screen with SIM state set to **ready**.



M!DGE **RACOM**

HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT

Configuration Network Query

Configure SIM1

SIM state: ready

Default modem: Mobile1

Service type: Automatic

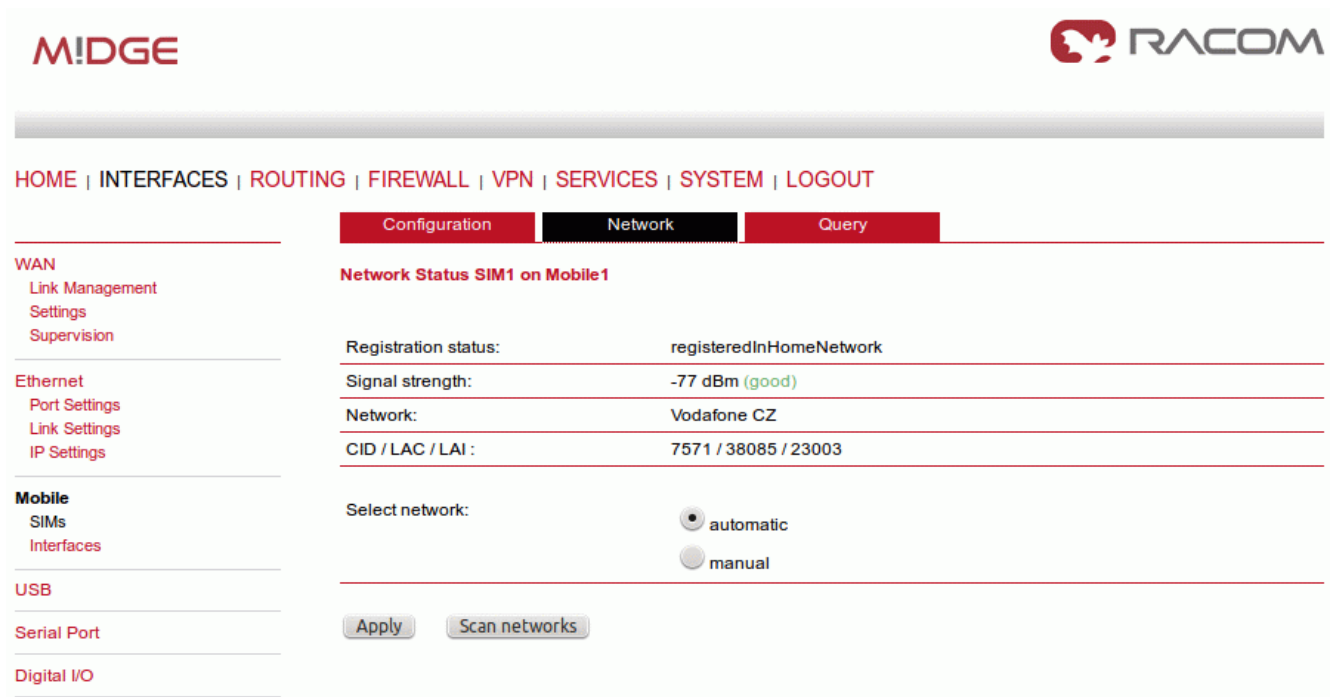
PIN protection: ☒ disabled ☒ enabled

SMS gateway: ☒ use from SIM (+420608005681) ☐ specify

Apply

Fig. 3.32: SIM state ready

The next step is to click on the Network submenu to check whether we are successfully registered into the mobile network.



M!DGE **RACOM**

HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT

Configuration Network Query

Network Status SIM1 on Mobile1

Registration status: registeredInHomeNetwork

Signal strength: -77 dBm (good)

Network: Vodafone CZ

CID / LAC / LAI : 7571 / 38085 / 23003

Select network: ☒ automatic ☐ manual

Apply Scan networks

Fig. 3.33: SIM card registered in the network

Mobile Interface Configuration

Now go to the Interfaces menu in the left section (Mobile menu) and click on the Add button.

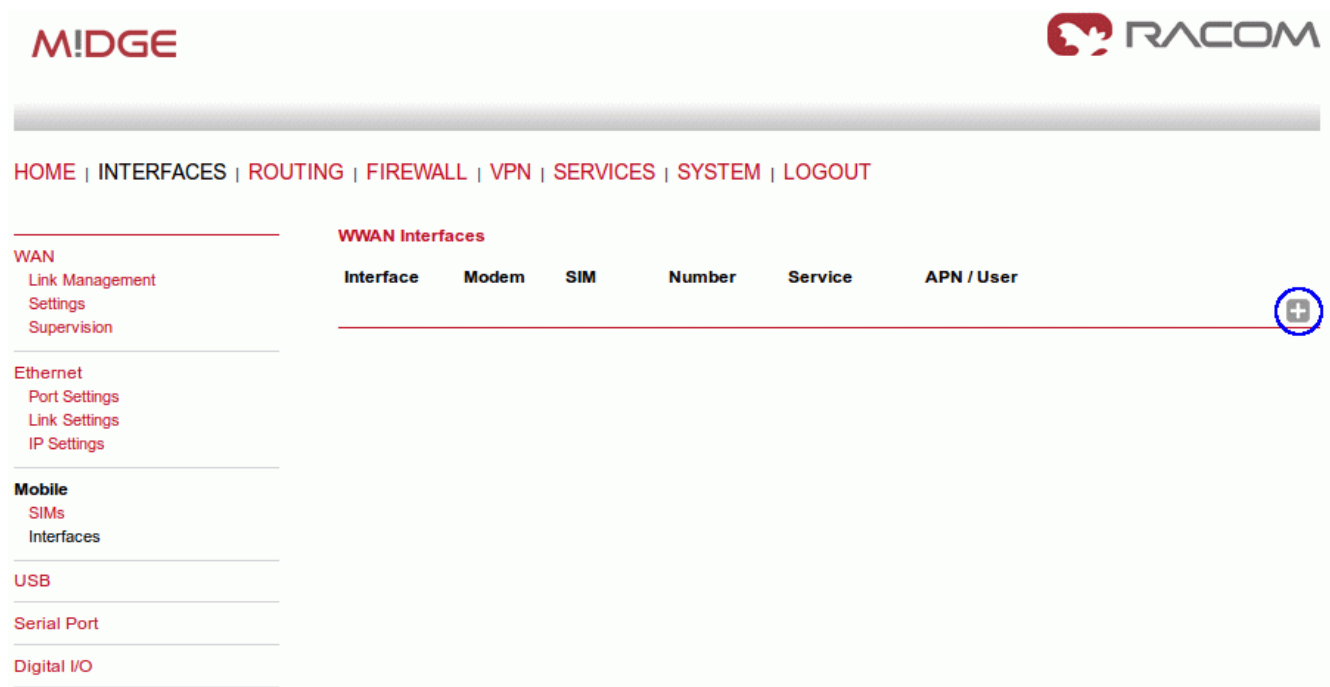


Fig. 3.34: Add the Mobile interface

Fill in all appropriate values. You should get these values from your mobile operator.

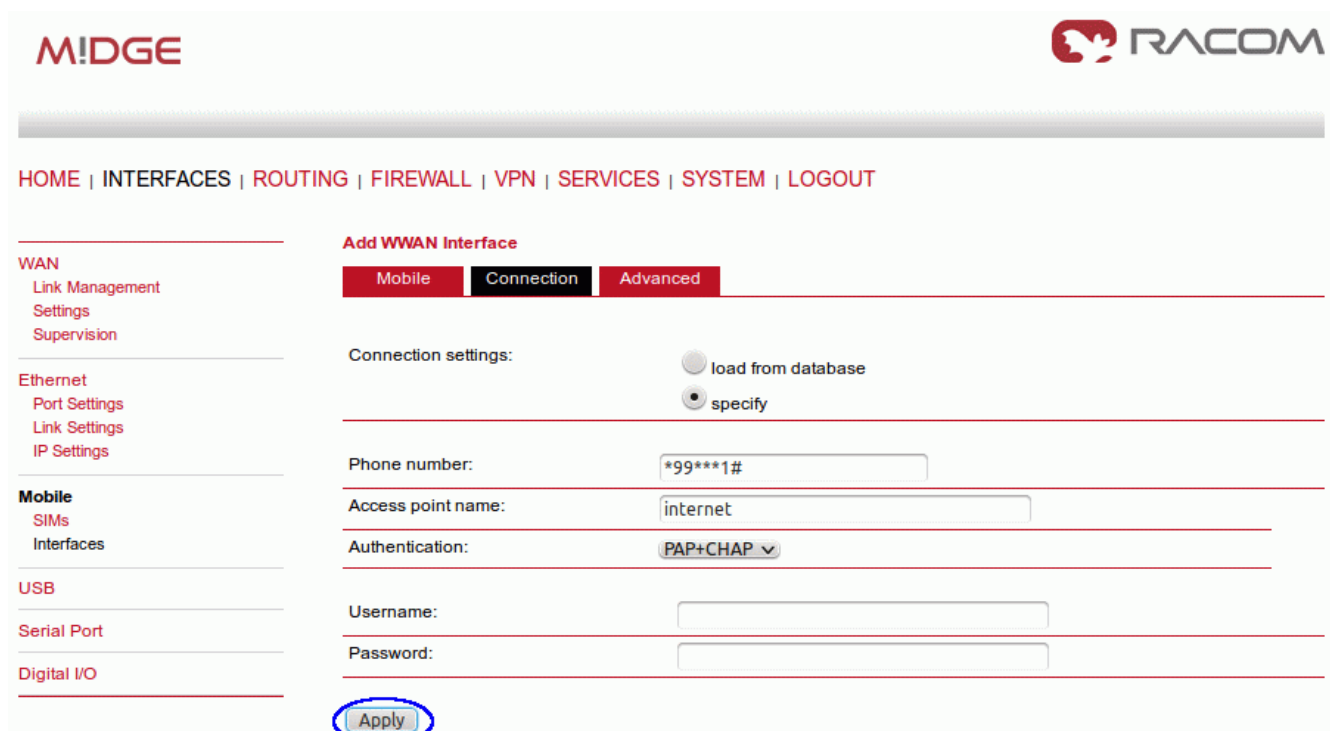


Fig. 3.35: Specify the APN and access credentials

Check the Connection Status

The router should be connecting to the network now. Check whether the mobile connection is enabled in the **INTERFACES** → **WAN** → **Link Management** menu. You should have a WWAN1 interface selected as permanently connected.

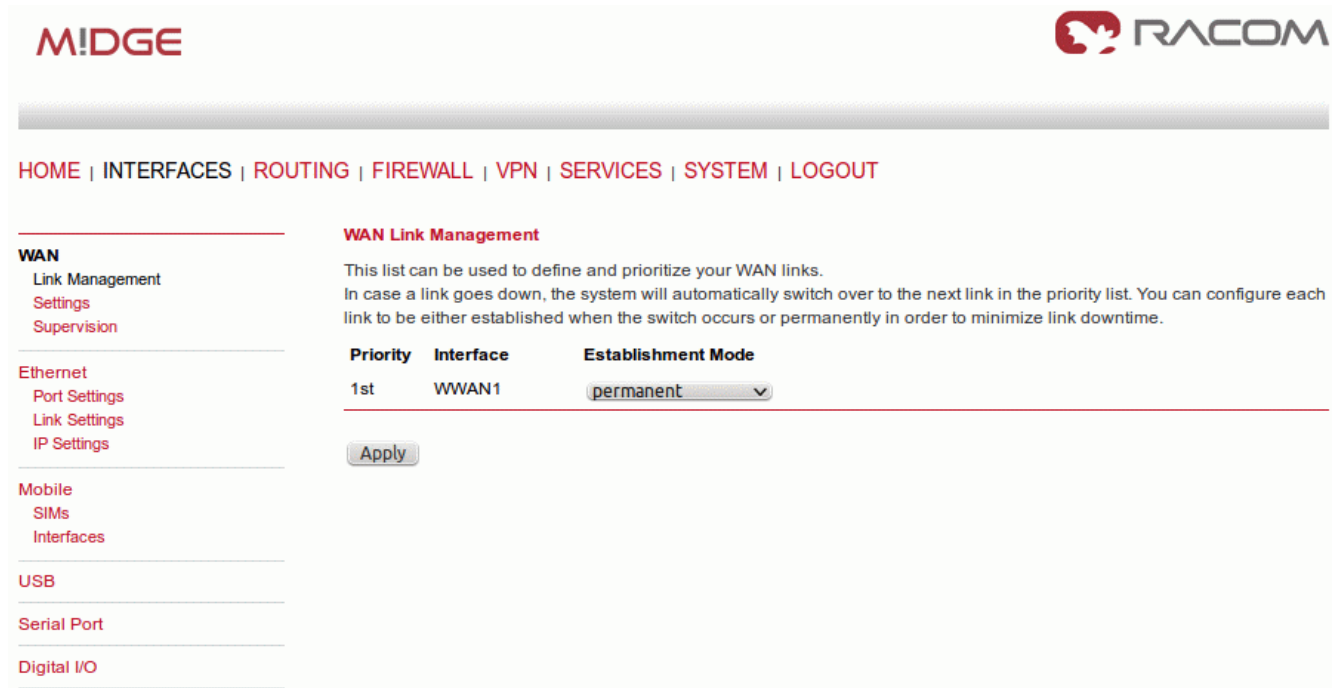


Fig. 3.36: WWAN1 Establishment Mode

In the HOME menu, you should now see that the Operational Status is up and so the router is connected to the Mobile network. Click on the WWAN1 submenu to see the details like IP address, Signal strength, Service type and other parameters.

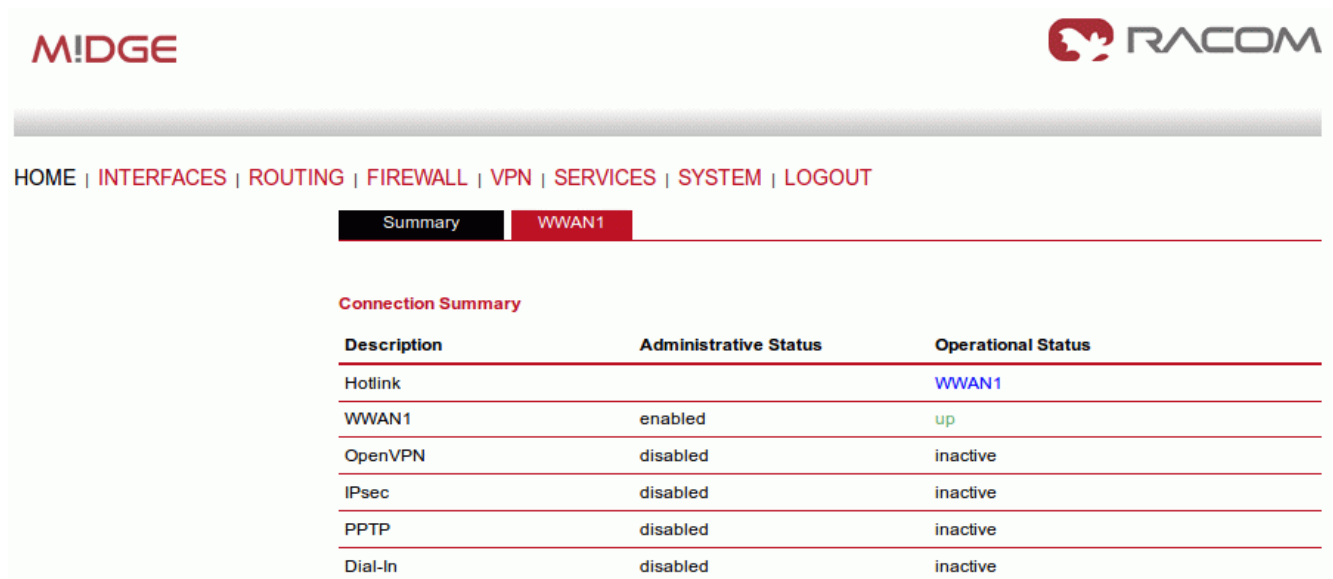


Fig. 3.37: WWAN1 Summary

3.13. Practical Tests

3.13.1. Ping

Internet IP address

If you are connected to the APN which can reach Internet IP addresses, you can check the connectivity by sending ping packets to any desired IP address.



Note

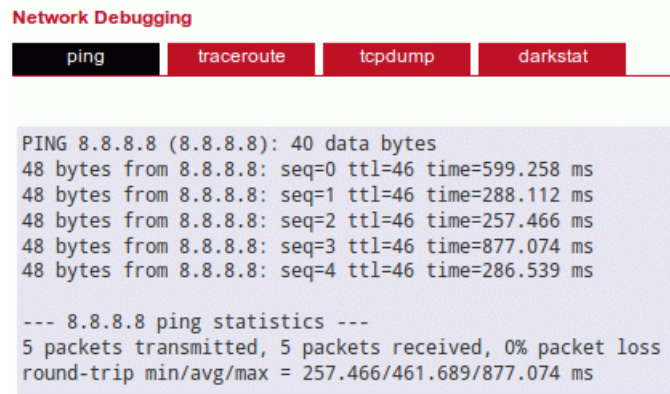
If you cannot access Internet IP addresses, you should be able to access other IP addresses. It depends on the SIM and APN settings.

Go to the **SYSTEM** → **Troubleshooting** → **Network Debugging** menu. Fill in the Host IP address and other parameters and click on the **Start** button.

The screenshot shows the M!DGE web interface. At the top, there are logos for M!DGE and RACOM. Below the logos is a navigation bar with links: HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT. The left sidebar contains a menu with the following items: System (Settings, Time & Region, System Information, Restart), Authentication (Authentication, User Accounts, Remote Authentication), Software Update (Manual Software Update, Automatic Software Update), Configuration (Manual File Configuration, Automatic File Configuration, Factory Configuration), Troubleshooting (Network Debugging, System Debugging, Tech Support), Keys & Certificates, and Licensing. The main content area is titled 'Network Debugging' and has four tabs: ping, traceroute, tcpdump, and darkstat. The 'ping' tab is selected. Below the tabs, there is a text description: 'The ping utility can be used to verify whether a remote host can be reached via IP.' Below this, there are three input fields: 'Host' with the value '8.8.8.8', 'Packet count' with the value '5', and 'Packet size' with the value '40'. At the bottom of the form is a 'Start' button.

Fig. 3.38: Ping the public IP address

If the IP address is accessible, you should see an output like:



The screenshot shows a web interface titled "Network Debugging" with four tabs: "ping", "traceroute", "tcpdump", and "darkstat". The "ping" tab is selected, displaying the following text:

```
PING 8.8.8.8 (8.8.8.8): 40 data bytes
48 bytes from 8.8.8.8: seq=0 ttl=46 time=599.258 ms
48 bytes from 8.8.8.8: seq=1 ttl=46 time=288.112 ms
48 bytes from 8.8.8.8: seq=2 ttl=46 time=257.466 ms
48 bytes from 8.8.8.8: seq=3 ttl=46 time=877.074 ms
48 bytes from 8.8.8.8: seq=4 ttl=46 time=286.539 ms

--- 8.8.8.8 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 257.466/461.689/877.074 ms
```

Fig. 3.39: Ping results

**Note**

Once you can access public Internet IP addresses, you can also run your Web browser and fill in e.g. www.racom.eu² to see our website.

M!DGE – RipEX – RipEX

In this test, we will demonstrate the interconnectivity of M!DGE and RipEX units. You need to have at least two RipEX units (e.g. RipEX A, B) configured as described in Chapter *Section 3.6, “RipEX Wizard Configuration”*.

You can have M!DGE in the default state (just after successful login procedure). Connect your PC to the M!DGE ETH2 interface and set the PC to obtain the IP address by DHCP.

The M!DGE unit should provide the PC with an IP address from the 192.168.2.0/24 range, e.g. 192.168.2.108.

**Note**

See Chapter *Section 3.7, “RipEX Practical Tests”* to know how to configure your PC and execute a ping command.

² <http://www.racom.eu>

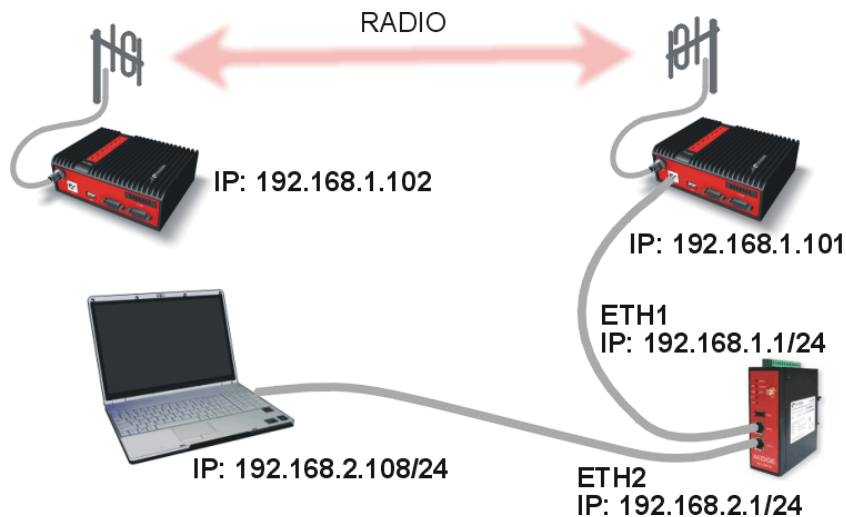




Fig. 3.40: M!DGE – RipEX – RipEX connectivity

Open your web browser and type in the M!DGE IP address (<http://192.168.2.1>). After successful login, go to the **SYSTEM** → **Troubleshooting** → **Network Debugging** menu.

Fill in the RipEX B IP address (192.168.1.102) and click on the Start button. You should see successful ping attempts between the M!DGE unit and the remote RipEX unit. The ping packets are transmitted over the Ethernet cable to the local RipEX and via the radio link to the remote RipEX and back again.

HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT

System

- Settings
- Time & Region
- System Information
- Restart

Authentication

- Authentication
- User Accounts
- Remote Authentication

Software Update

- Manual Software Update
- Automatic Software Update

Configuration

- Manual File Configuration
- Automatic File Configuration
- Factory Configuration

Troubleshooting

- Network Debugging
- System Debugging
- Tech Support

Keys & Certificates

Licensing

Network Debugging

ping
tracert
tcpdump
darkstat

```

PING 192.168.1.102 (192.168.1.102): 40 data bytes
48 bytes from 192.168.1.102: seq=0 ttl=64 time=82.468 ms
48 bytes from 192.168.1.102: seq=1 ttl=64 time=82.444 ms
48 bytes from 192.168.1.102: seq=2 ttl=64 time=82.076 ms
48 bytes from 192.168.1.102: seq=3 ttl=64 time=82.062 ms
48 bytes from 192.168.1.102: seq=4 ttl=64 time=82.064 ms

--- 192.168.1.102 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 82.062/82.222/82.468 ms
                
```

Run again

Fig. 3.41: Ping results

3.13.2. Troubleshooting

M!DGE offers you several ways to debug and troubleshoot configuration issues.

Network Debugging

The Network Debugging menu consists of well known tools: **ping**, **traceroute** and **tcpdump**. We have already described ping. Traceroute can provide you with a packet route to the destination and with tcpdump you can capture the incoming and outgoing traffic on any interface. When the capturing is done, you can open the saved PCAP file in Wireshark or a similar program.

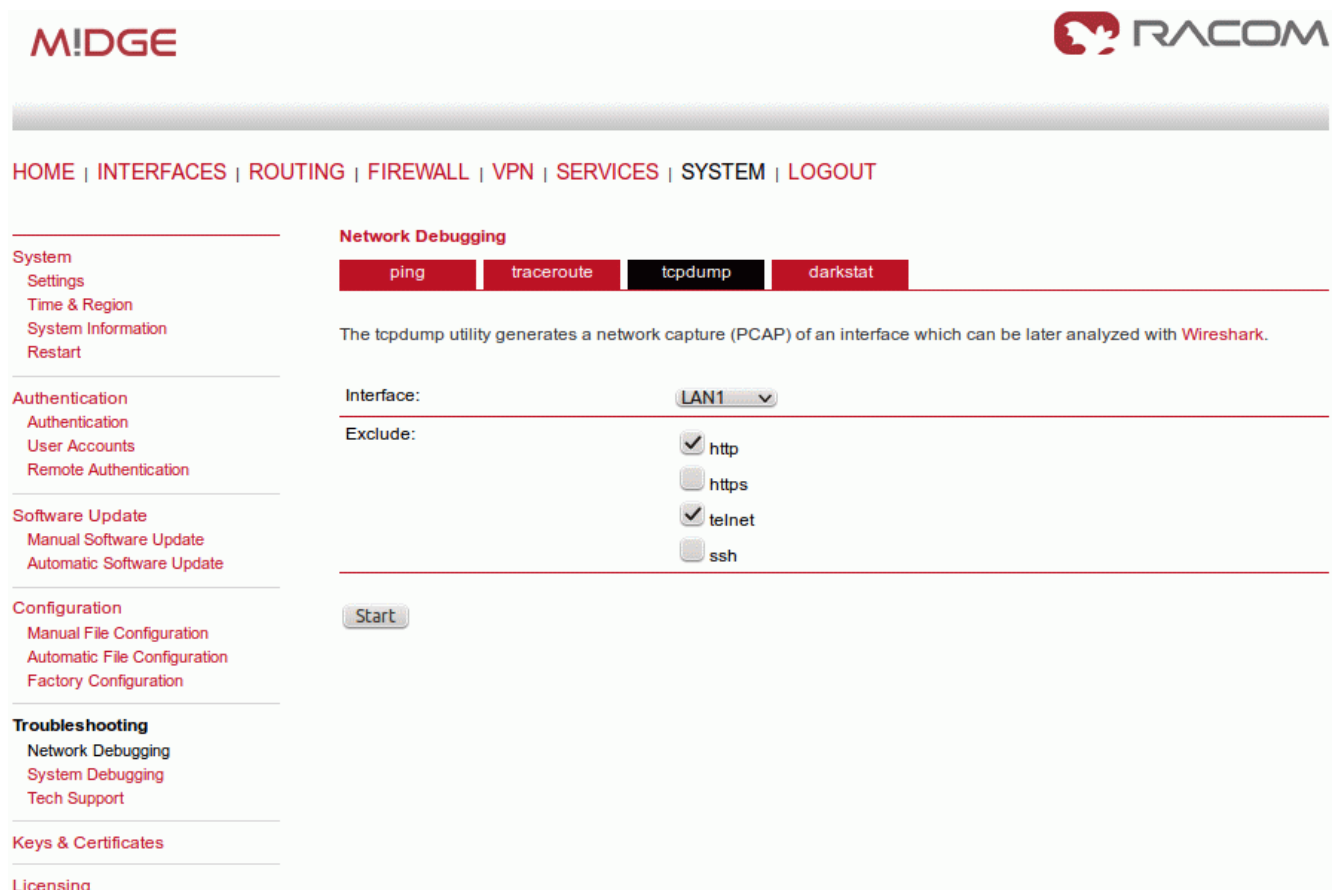


Fig. 3.42: M!DGE tcpdump feature

Another tool is **darkstat**, which creates graphs based on the traffic volume on any interface.

To run the darkstat tool, just click on the darkstat submenu, choose the interface and click on the Start button.

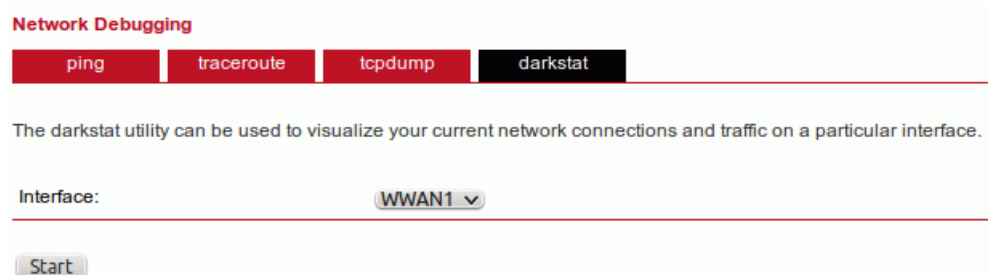


Fig. 3.43: M!DGE darkstat tool

We can see for how long the tool is running, how many packets/bytes have been stored and four graphs with different intervals. See the following example.

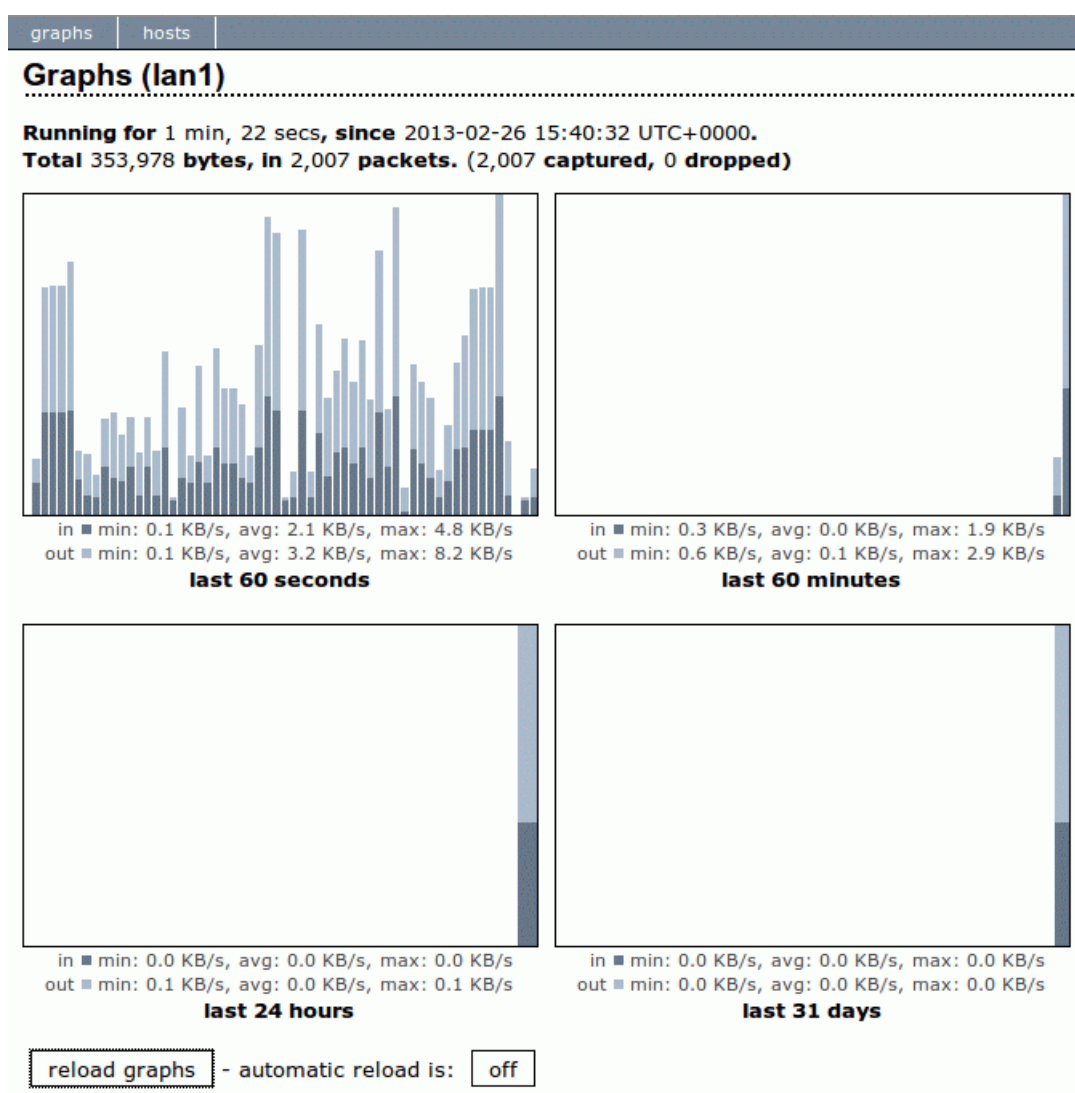


Fig. 3.44: M!DGE darkstat tool

System Debugging and Tech Support

The log files can be viewed, downloaded and reset in this menu. Please study them carefully in case of any issues.

In the Tech Support menu, you can generate and download a tech support file, which you should send to our support team to speed up resolving the issue.

M!DGE **RACOM**

HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT

System Debugging

Log Viewer | Debug Levels

Select log:

- ☒ System logs
- ☐ Boot logs
- ☐ Script logs

Number of lines to be displayed:

- ☐ all
- ☒ last 100 lines << >>

```
Feb 27 07:40:19 midge user.info kernel: PHY: mdio@e0024520:19 - Link is Down
Feb 27 07:41:25 midge user.info kernel: PHY: mdio@e0024520:19 - Link is Up - 100/Full
Feb 27 07:41:25 midge daemon.info dnsmasq-dhcp[3398]: DHCPDISCOVER(1an1)
192.168.131.225 00:23:ae:02:5e:e0
Feb 27 07:41:25 midge daemon.info dnsmasq-dhcp[3398]: DHCPOFFER(1an1) 192.168.2.108
00:23:ae:02:5e:e0
Feb 27 07:41:25 midge daemon.info dnsmasq-dhcp[3398]: DHCPREQUEST(1an1) 192.168.2.108
00:23:ae:02:5e:e0
Feb 27 07:41:25 midge daemon.info dnsmasq-dhcp[3398]: DHCPACK(1an1) 192.168.2.108
00:23:ae:02:5e:e0 mrazek-Inspiron-1525
Feb 27 07:43:24 midge user.info kernel: PHY: mdio@e0024520:19 - Link is Down
Feb 27 08:19:46 midge user.info kernel: PHY: mdio@e0024520:19 - Link is Up - 100/Full
Feb 27 08:19:49 midge user.info kernel: PHY: mdio@e0024520:19 - Link is Down
Feb 27 08:19:51 midge user.info kernel: PHY: mdio@e0024520:19 - Link is Up - 100/Full
Feb 27 08:19:54 midge daemon.info dnsmasq-dhcp[3398]: DHCPREQUEST(1an1)
192.168.131.225 00:23:ae:02:5e:e0
Feb 27 08:19:54 midge daemon.info dnsmasq-dhcp[3398]: DHCPNAK(1an1) 192.168.131.225
00:23:ae:02:5e:e0 wrong address
Feb 27 08:19:54 midge daemon.info dnsmasq-dhcp[3398]: DHCPDISCOVER(1an1)
00:23:ae:02:5e:e0
Feb 27 08:19:54 midge daemon.info dnsmasq-dhcp[3398]: DHCPOFFER(1an1) 192.168.2.108
00:23:ae:02:5e:e0
Feb 27 08:19:54 midge daemon.info dnsmasq-dhcp[3398]: DHCPREQUEST(1an1) 192.168.2.108
00:23:ae:02:5e:e0
Feb 27 08:19:54 midge daemon.info dnsmasq-dhcp[3398]: DHCPACK(1an1) 192.168.2.108
00:23:ae:02:5e:e0 mrazek-Inspiron-1525
Feb 27 08:20:30 midge user.notice event-manager[749]: received event 'User login
succeeded (admin) via web-manager'
```

Reset

Fig. 3.45: M!DGE Log Viewer

3.14. M!DGE Advanced Tests

The Demo case is an ideal tool for conducting laboratory tests and benchmarks, which shows you how the particular application will behave in cooperation with M!DGE 3G SCADA router.

- **VPN Tunnels**
 - M!DGE provides three types of tunneling – **OpenVPN**, **IPsec** and **PPTP**. Each of them is configurable via the web interface.
 - With VPN tunnels, you can access M!DGE or connect various networks in a secure way.
 - For more details, see the M!DGE manual:
http://www.racom.eu/eng/products/m/midge1/web_conf.html#VPN
- **Connection Supervision**

- Connection Supervision is used for switching between several connections if available. In addition it is possible to set an emergency action in case that no connection is available for a specified length of time.
- For more details, see the M!DGE manual:
http://www.racom.eu/eng/products/m/midge1/web_conf.html#interfaces
- **SNMP**
 - M!DGE is equipped with an SNMP daemon, supporting basic MIB tables (such as ifTable), plus additional enterprise MIBs to manage multiple systems.
 - You can also test how your Network Management System cooperates with M!DGE units.
 - For more details, see the M!DGE manual:
http://www.racom.eu/eng/products/m/midge1/web_conf.html#services
- **Software Development Kit (SDK)**
 - RACOM 3G routers ship with a Software Development Kit (SDK) which offers a simple and fast way to implement customer-specific functions and applications.
 - For example, you can control your M!DGE router with SMS messages – rebooting, reading connection status or digital outputs, ...
 - For more details, see the M!DGE manual:
http://www.racom.eu/eng/products/m/midge1/web_conf.html#services
- **SCADA application and M!DGE**
 - M!DGE is ready for SCADA applications even with serial SCADA protocols on the RS232 interface.
 - For more details, see the Application note:
<http://www.racom.eu/eng/products/m/midge/app/index.html>
 - The Application notes consist of various examples of static/dynamic addressing, various network centre designs, Hybrid 3G/Radio networks etc.
- **And many others...**

3.15. Summary

We have described just a few examples of Demo case usage. Feel free to download the "*RipEX User manual*³" from <http://www.racom.eu> or the "*RipEX Application notes*⁴" from <http://www.racom.eu> to conduct further tests.

With your M!DGE 3G router, you can easily extend the RipEX UHF/VHF network. Download the "*M!DGE Operating manual*⁵" from <http://www.racom.eu> or the "*M!DGE Application notes*⁶" from <http://www.racom.eu> for more details.

Do not hesitate to contact us if you have any questions:

RACOM technical support team

E-mail: <support@racom.eu>

Tel.: +420 565 659 511

³ <http://www.racom.eu/download/hw/ripex/free/eng/ripex-m-en.pdf>

⁴ <http://www.racom.eu/download/hw/ripex/free/eng/ripex-app-en.pdf>

⁵ <http://www.racom.eu/download/hw/midge/free/eng/midge-m-en.pdf>

⁶ <http://www.racom.eu/download/hw/midge/free/eng/midge-app-en.pdf>

Appendix A. Revision History

Revision 1.0 2013-04-24
First issue

Revision 1.1 2015-03-10
Changing IP addresses <https://demo.racom.eu>
Added info about Wifi adapter

Revision 1.2 2015-04-10
Added *Section 3.7.3, “Alarm Management – Usage Example”*

Revision 1.3 2016-04-10
Update *Chapter 2, ZABBIX – Live DEMO*

Revision 1.4 2019-01-15
Update links of demo units instalation (*RipEX* and *Zabbix*)