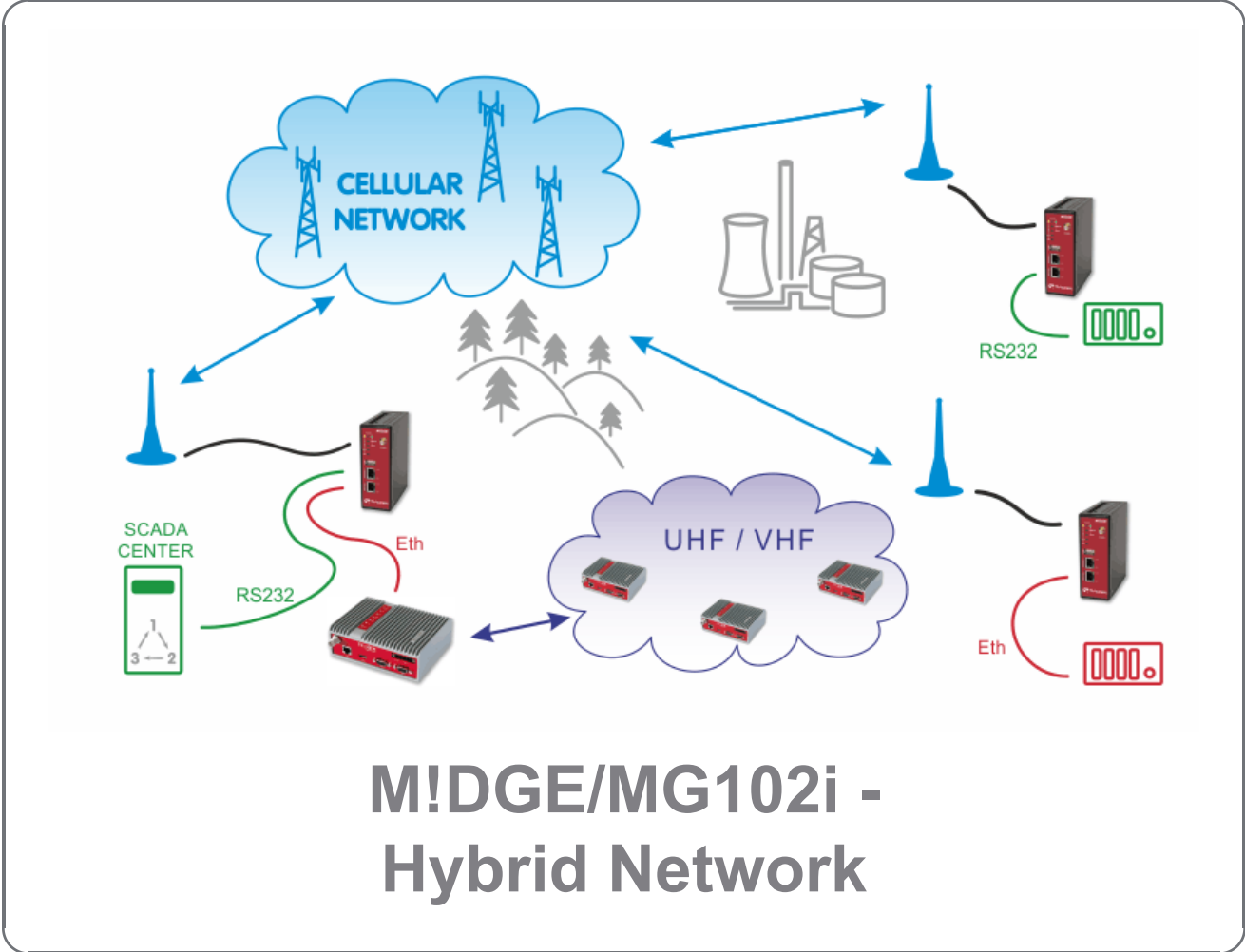




Application notes



version 1.1
3/2/2018

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Introduction

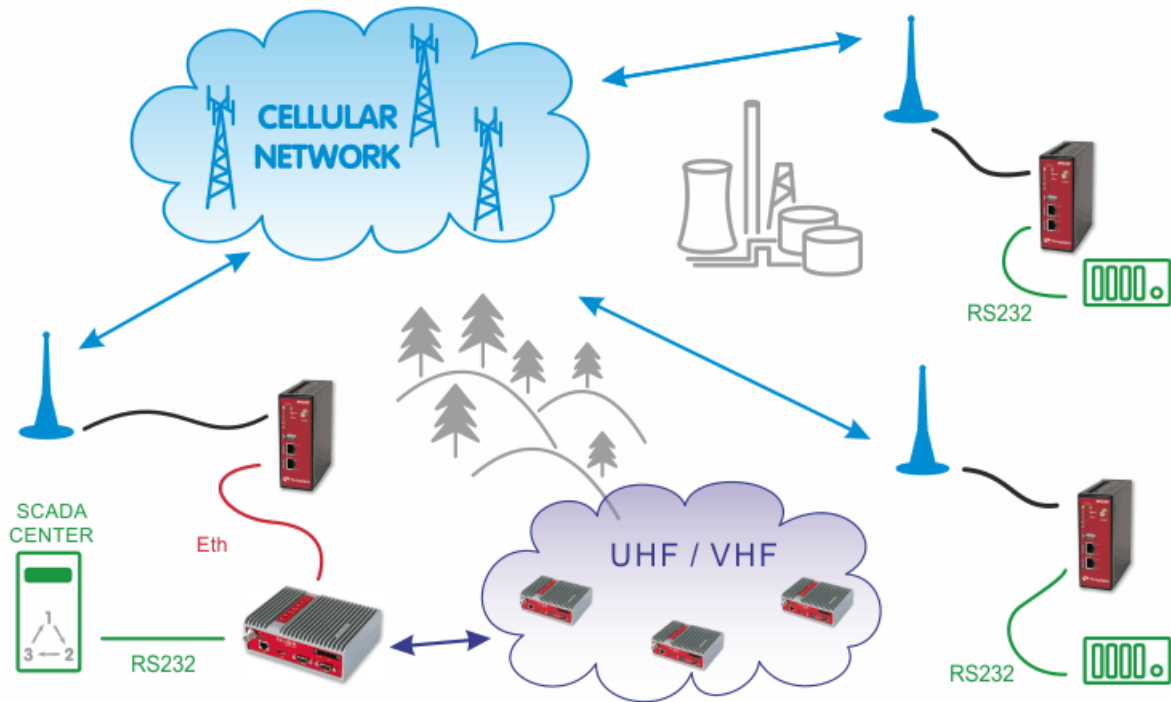


Fig. 1: UHF/VHF and Cellular network Combination

The picture above describes an arrangement, where part of the remote sites is connected over a private UHF/VHF radio network (e.g. sites requiring 99.9% availability) and the remaining sites are connected over a cellular public network (very remote location, but with a good cellular signal).

The SCADA Center can be connected either to central RipEX or even to MIDGE, both can serve as the Master unit. Please see the following example of one possible settings. MIDGE units use the private APN with static IP addresses.

1. Practical Example

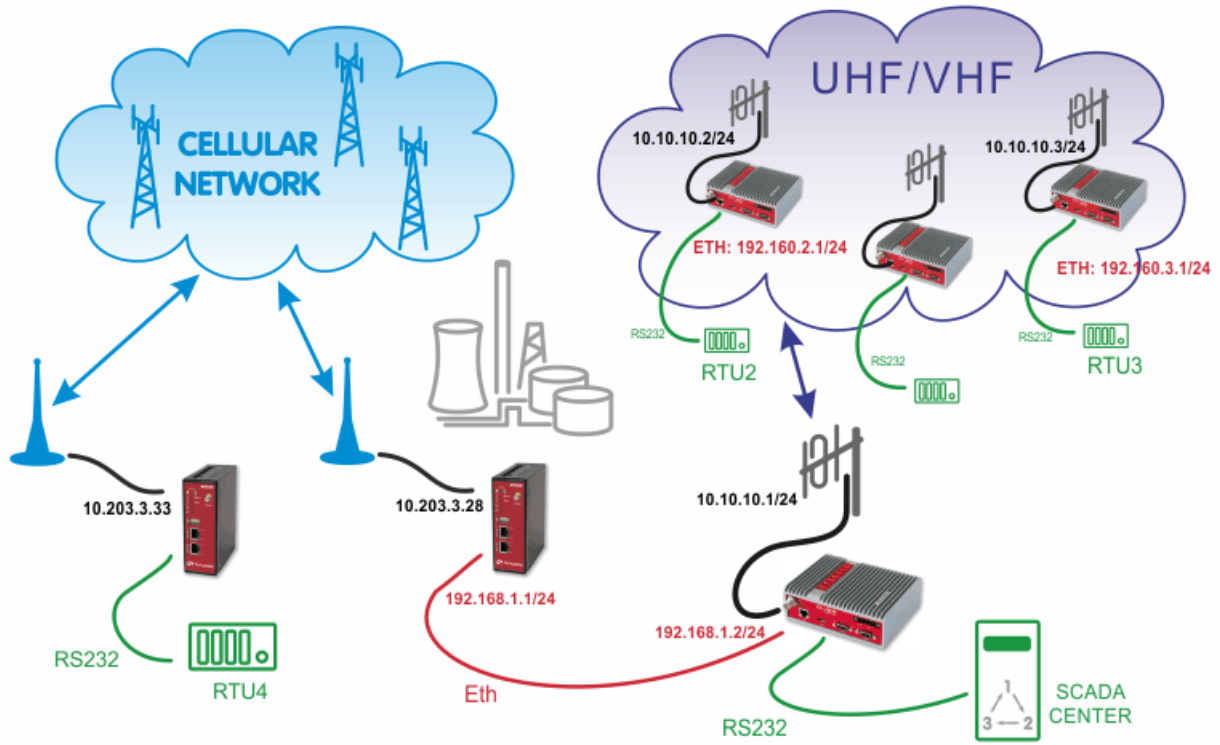


Fig. 1.1: UHF/VHF and Cellular network combination example

In the example, the SCADA Center is connected via RS232 interface to RipEX1 (COM1). The Center is utilized with Modbus RTU Master configuration and polls two RTUs connected via RipEX network. There is one distant RTU4 location which is reachable over the cellular network.

1.1. RipEX Center Configuration

The screenshot shows the RipEX Center configuration interface for a Radio modem & Router. The interface is divided into several sections:

- Device:** Unit name is R1, Operating mode is Router, Time is Manual, Alarm management is Default, Neighbours&Statistics is Default, Hot Standby is Off, SNMP is Off, Power management is Always On, Graphs is Default, Firewall is Off, WiFi is On, and Management is Default.
- Radio:** IP is 10.10.10.1, Mask is 255.255.255.0, TX frequency is 436.000.000, RX frequency is 436.000.000, Channel spacing [kHz] is 25.0, Modulation rate [kbps] is 83.33 | 16DEQAM, RF power [W] is 0.5, FEC is Off, Optimization is Off, Encryption is Off, and MTU [bytes] is 1500.
- ETH:** IP is 192.168.1.2, Mask is 255.255.255.0, DHCP is Off, Shaping is Off, Speed is Auto, Modbus TCP is Off, Terminal servers is Off, TCP proxy is Off, and ARP proxy & VLAN is Off.
- COM's:** COM 1 and COM 2 are both RS232, Baud rate [bps] is 19200, Data bits is 8, Parity is None, Stop bits is 1, Idle [bytes] is 5, MRU [bytes] is 1600, Flow control is None, and Protocol is Modbus.

Buttons for 'Apply' and 'Cancel' are visible at the bottom of the configuration area.

Fig. 1.2: RipEX Center Settings

Apply the correct IP addresses within the Router mode and set the COM1 protocol.

The screenshot shows the Modbus Master configuration dialog box. The 'Protocol' is set to Modbus, the 'Mode of Connected device' is Master, 'Broadcast' is Off, and 'Address translation' is Table.

Hex	Modbus addr.	IP	Interface (UDP port)	Note	Active	Modify
02		192.168.2.1	COM1 (8881)	RipEX2	<input checked="" type="checkbox"/>	Delete Add
03		192.168.3.1	COM2 (8882)	RipEX3	<input checked="" type="checkbox"/>	Delete Add
04		10.203.3.33	COM2 (8882)	Remote MIDGE	<input checked="" type="checkbox"/>	Delete Add
						Add

Buttons for 'OK' and 'Cancel' are visible at the bottom of the dialog box.

Fig. 1.3: Modbus Master configuration

In the example, hexadecimal Modbus addresses 02 and 03 are transferred to the RipEX network on the Ethernet IP addresses. The Slave 04 is transferred via the cellular network and the destination IP address is the mobile IP address of the remote M!DGE unit. The COM port must be COM2 with UDP port 8882, otherwise the remote M!DGE would not handle the traffic correctly.

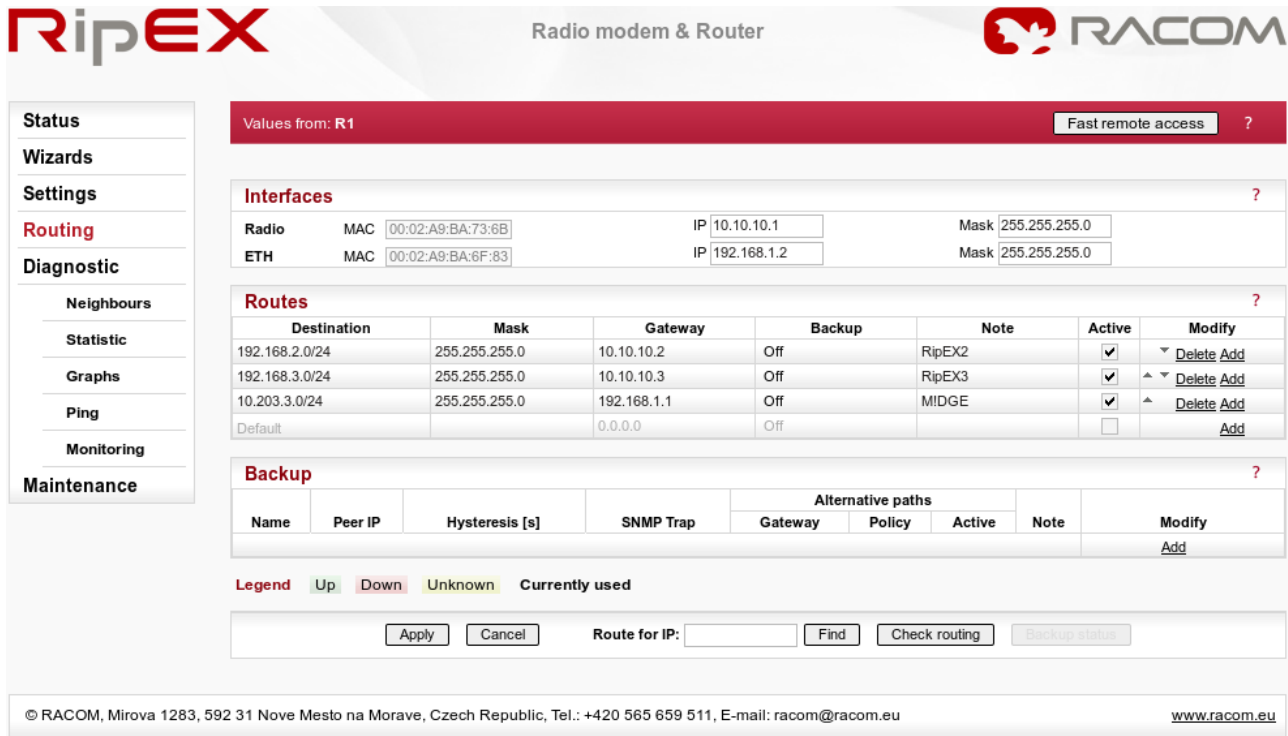


Fig. 1.4: Central RipEX routing menu

In the Routing menu, three routes have to be added. First two are the LAN subnets of RipEX units and the third line defines the APN subnet (the gateway is the local M!DGE Ethernet IP address).

1.2. Remote RipEX Configuration

Both remote RipEX units have almost the same configuration so only R2 unit is described. Configure the correct IP addresses (together with RF frequency, ...) and set the COM1 port as the Modbus Slave as in the following screenshot.

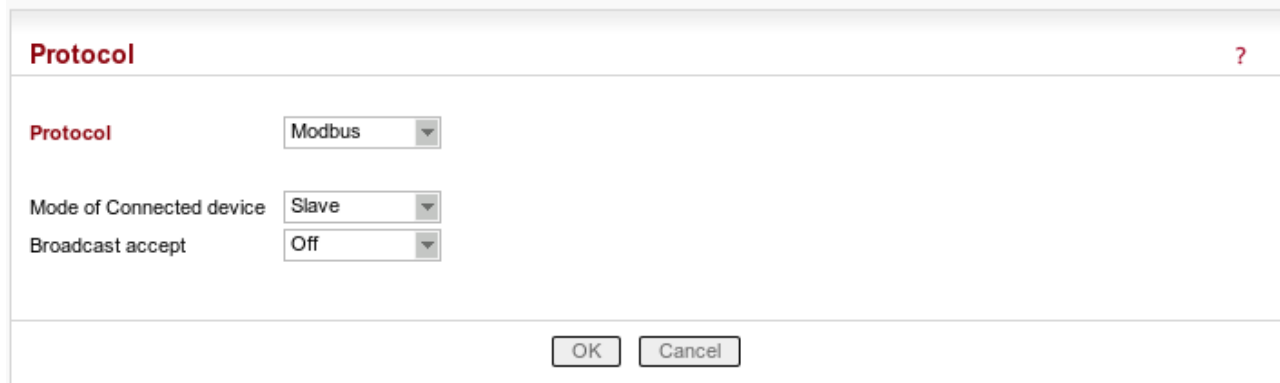


Fig. 1.5: Remote RipEX Modbus Slave configuration

The only missing configuration is the Routing rule to the central RipEX subnet (192.168.1.1/24).

The screenshot shows the RipEX web interface for a Radio modem & Router. The interface includes a sidebar with navigation options: Status, Wizards, Settings, Routing (highlighted), Diagnostic, Neighbours, Statistic, Graphs, Ping, Monitoring, and Maintenance. The main content area is titled 'Remote Connection Active' and shows the 'Remote IP' as 10.10.10.2. Below this, there are sections for 'Interfaces', 'Routes', and 'Backup'.

Interfaces

Radio	MAC	00:02:A9:BA:54:2B	IP	10.10.10.2	Mask	255.255.255.0
ETH	MAC	00:02:A9:BA:50:43	IP	192.168.2.1	Mask	255.255.255.0

Routes

Destination	Mask	Gateway	Backup	Note	Active	Modify
192.168.1.1/24	255.255.255.0	10.10.10.1	Off		<input checked="" type="checkbox"/>	Delete Add
Default		0.0.0.0	Off		<input type="checkbox"/>	Add

Backup

Name	Peer IP	Hysteresis [s]	SNMP Trap	Alternative paths			Note	Modify
				Gateway	Policy	Active		
								Add

Legend: Up (green), Down (red), Unknown (yellow), Currently used (blue)

Buttons: Apply, Cancel, Route for IP: [input], Find, Check routing, Backup status

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Fig. 1.6: Remote RipEX Routing menu

1.3. Central M!DGE Configuration

M!DGE



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

WWAN1

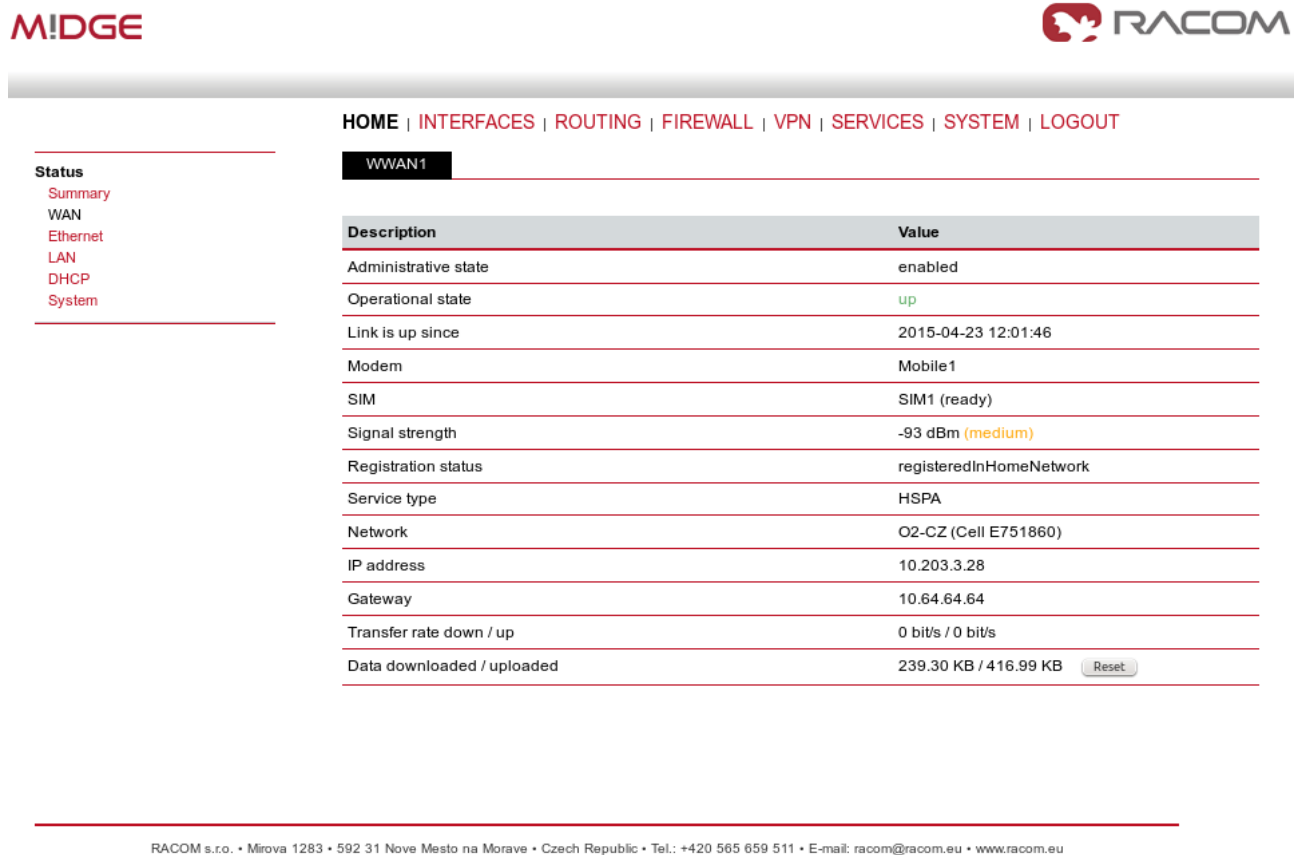
Description	Value
Administrative state	enabled
Operational state	up
Link is up since	2015-04-23 12:01:46
Modem	Mobile1
SIM	SIM1 (ready)
Signal strength	-93 dBm (medium)
Registration status	registeredInHomeNetwork
Service type	HSPA
Network	O2-CZ (Cell E751860)
IP address	10.203.3.28
Gateway	10.64.64.64
Transfer rate down / up	0 bit/s / 0 bit/s
Data downloaded / uploaded	239.30 KB / 416.99 KB <input type="button" value="Reset"/>

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Fig. 1.7: Central M!DGE Status menu

The central M!DGE just needs to be configured so it is connected via the private APN, no other special configuration is needed.

1.4. Remote M!DGE Configuration



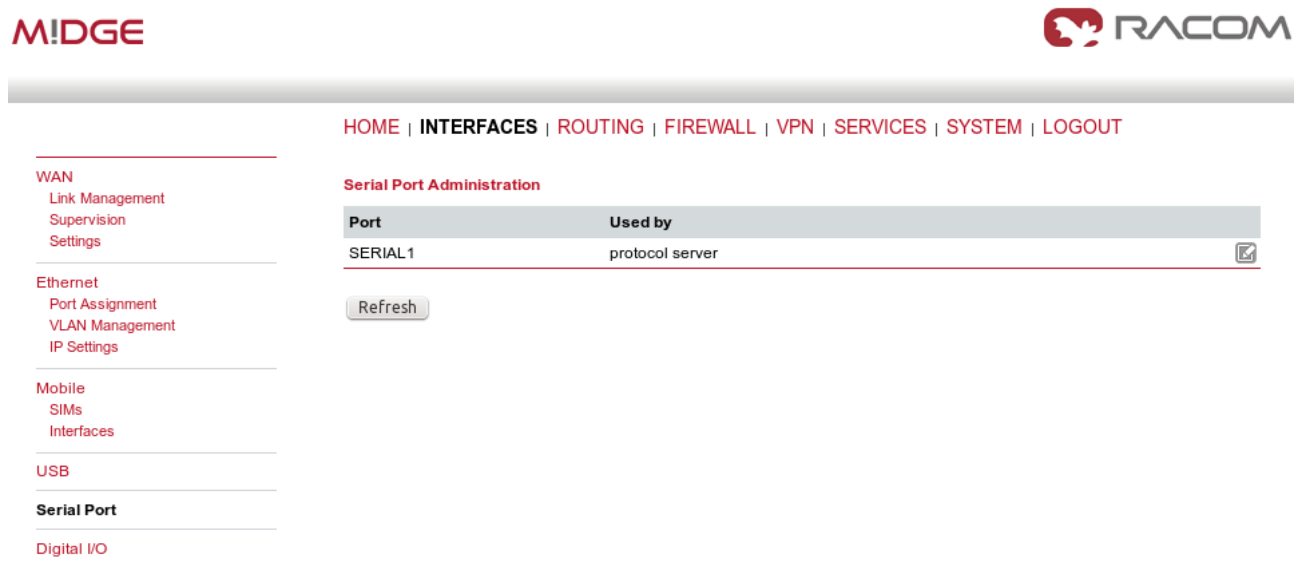
The screenshot shows the M!DGE web interface. At the top right is the RACOM logo. Below it is a navigation bar with links: HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT. On the left is a sidebar menu with 'Status' selected, and sub-items: Summary, WAN, Ethernet, LAN, DHCP, System. The main content area is titled 'WWAN1' and contains a table with the following data:

Description	Value
Administrative state	enabled
Operational state	up
Link is up since	2015-04-23 12:01:46
Modem	Mobile1
SIM	SIM1 (ready)
Signal strength	-93 dBm (medium)
Registration status	registeredInHomeNetwork
Service type	HSPA
Network	O2-CZ (Cell E751860)
IP address	10.203.3.28
Gateway	10.64.64.64
Transfer rate down / up	0 bit/s / 0 bit/s
Data downloaded / uploaded	239.30 KB / 416.99 KB Reset

At the bottom of the page, there is a footer with contact information: RACOM s.r.o. • Mirova 1283 • 592 31 Nove Mesto na Morave • Czech Republic • Tel.: +420 565 659 511 • E-mail: racom@racom.eu • www.racom.eu

Fig. 1.8: The remote M!DGE Status menu

After connecting to the private APN, only the Protocol server needs to be configured. In the INTERFACES – Serial Port, choose the Protocol server.



The screenshot shows the M!DGE web interface. At the top right is the RACOM logo. Below it is a navigation bar with links: HOME | INTERFACES | ROUTING | FIREWALL | VPN | SERVICES | SYSTEM | LOGOUT. On the left is a sidebar menu with 'Serial Port' selected, and sub-items: WAN, Ethernet, Mobile, USB, Digital I/O. The main content area is titled 'Serial Port Administration' and contains a table with the following data:

Port	Used by
SERIAL1	protocol server

Below the table is a 'Refresh' button. At the bottom of the page, there is a footer with contact information: RACOM s.r.o. • Mirova 1283 • 592 31 Nove Mesto na Morave • Czech Republic • Tel.: +420 565 659 511 • E-mail: racom@racom.eu • www.racom.eu

Fig. 1.9: Serial Port configuration

Set the desired port settings.

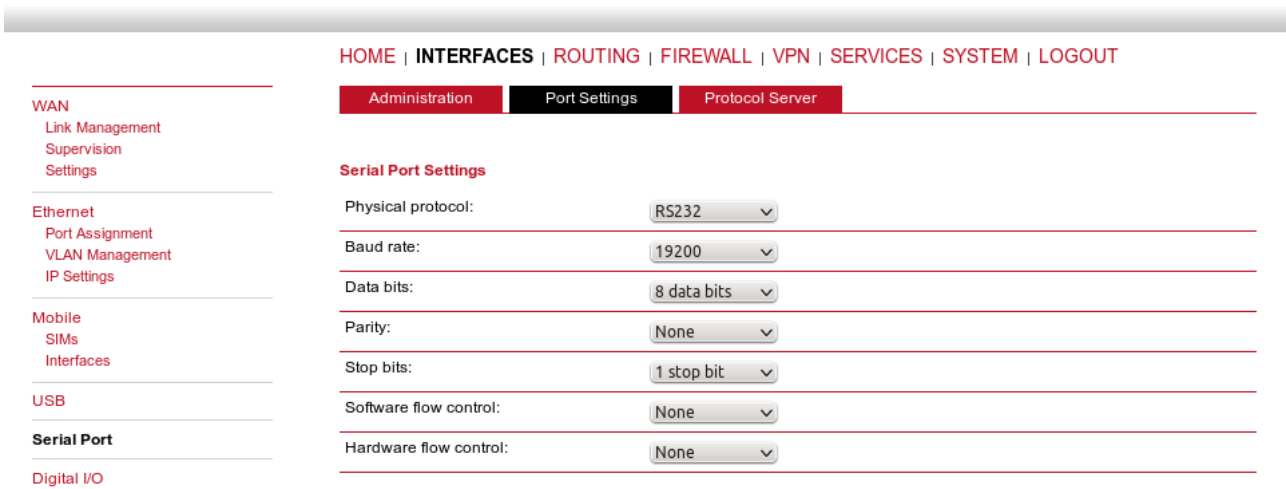


Fig. 1.10: Port settings

And as the last step, configure the Protocol server as the Modbus slave.

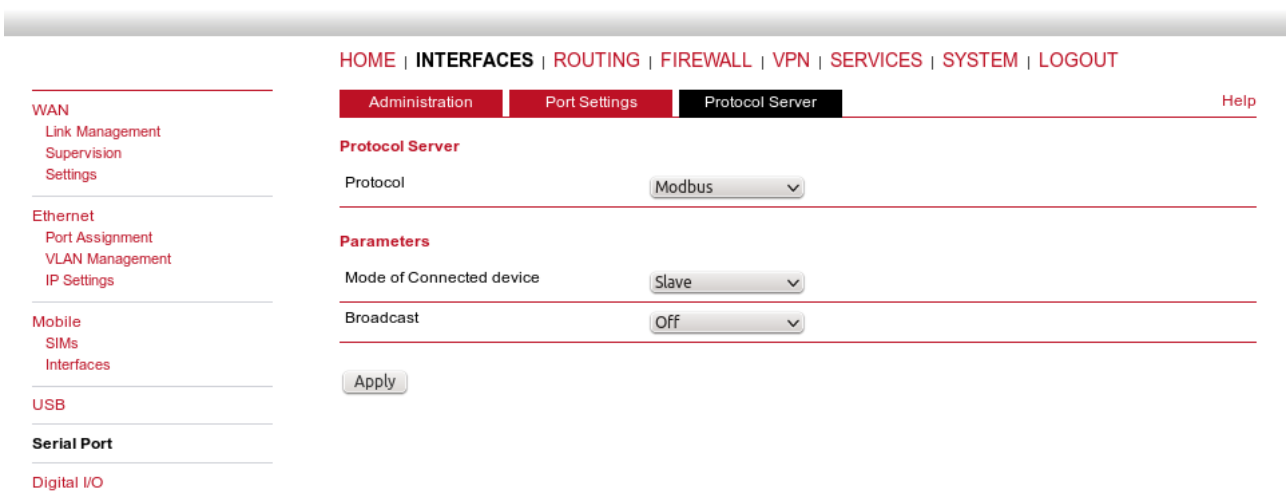


Fig. 1.11: Modbus Slave M!DGE configuration

Now you should be able to poll the required information from all RTUs within the UHF/VHF or cellular network.



Note

If you do not use the private APN, you need to configure the VPN tunnels. See *VPN Configuration*¹ application note and *SCADA Protocols*² public APN.

¹ <http://www.racom.eu/eng/products/m/midge/app/vpn/index.html>

² http://www.racom.eu/eng/products/m/midge/app/ser/SCADA_Protocols_public_APN.html

Appendix A. Revision History

Revision 1.0 2017-12-07
First issue

Revision 1.1 2018-02-28
Termination of M!DGE UMTS routers manufacturing