BMT-RTR/SC
BACnet/SC Router
User Manual

Table of content

1 Preamble

1.1 About this User Manual

This document describes the operation of the **BMT-RTR/SC** (BACnet/SC Router), P/N **11088101** and P/N **1108810170** The description contains information on the use and installation of the device. If you have any questions that cannot be answered with the help of this manual, please contact the manufacturer for further information.

The stated installation and assembly regulations and guidelines apply to the Federal Republic of Germany. If the device is being used abroad, the national regulations must be observed at the sole responsibility of the system manufacturer or operator.

1.2 Document history

Version	Date	Author	Description
V 2.0	2024-03-27		Transfer from the Pre-Version

1.3 Safety instructions

For the installation and use of the device, the respectively valid industrial safety, accident prevention and VDE regulations must be observed. Skilled workers or installers are advised that they must discharge themselves properly before installing or servicing the equipment. Assembly and installation work on the devices may only be carried out by qualified personnel, see section "qualified personnel". Every person who uses the device must read the descriptions of this have read and understood this manual.

Warning of dangerous electrical voltage!

Improper connection may result in danger to life. Serious physical injury or considerable damage to property may occur. Before working on the system, it must be disconnected from the power supply.

1.4 Qualified specialists

Qualified technical specialists in the sense of this manual are persons who are familiar with the described devices and have a qualification corresponding to their activity.

This includes, for example:

- Authorization to connect the device in accordance with VDE regulations and local EVU regulations, as well as authorization to switch the device on, off and on in accordance with internal company regulations.
- Knowledge of the accident prevention regulations.
- Knowledge of the use and application of the device within the system, etc.

1.5 Warranty terms

METZ CONNECT GmbH does not assume any liability or guarantee for consequences resulting from improper use, in particular non-observance of the instructions for use and installation. The user must ensure that the device is not operated outside the specified technical parameters. Any unauthorized alteration or modification of the device, as well as any repairs carried out by the user on his own authority, shall constitute "misuse" and/or "negligence" within the meaning of the warranty for the product and shall therefore exclude the warranty for the coverage of possible consequential damage. Furthermore the warranty claim expires.

1.6 Disclaimer of warranty

The contents of this document have been carefully compiled and checked for conformity with the product in terms of hardware and software. However, deviations cannot be completely ruled out. For this reason, the information contained in this manual does not imply any obligation or warranty of any kind. As a result, authors, companies and publishers do not assume any legal responsibility and will not assume any resulting or other liability arising in any way from the use of this information or parts thereof, including for infringement of patent rights and other rights of third parties that may result therefrom.

2 Description of the device

BMT-RTR/SC (screw type block) BMT-F-RTR/SC (Push-in) device is a compact and quickly installable BACnet (ISO 16484-5:2017) router with BACnet/IP, BACnet Ethernet (ISO 8802-3), BACnet MS/TP and BACnet/SC protocols support. There are two 4-pin connectors on the front panel to connect to METZ CONNECT expansion modules. Third-party BACnet MS/TP fieldbus I/O-modules can be connected via the device terminal block. A built-in web server is used for parameter setting, management and monitoring. The web interface is also used to update the firmware. The device provides broadcast search and configuration even if the network settings in the gateway are set incorrectly.
The BMT-RTR/SC device is used in a variety of applications in the following areas:

- Building automation
- Industrial automation
- Automated Process Control Systems (APCS)

2.1 Technical Data

Ethernet interface	
Network connection	1 x Ethernet Port (IEC 60603-7-51 (2010))
Speed	10/100-BaseT with auto-negotiation
Protocols	BACnet/IP, BACnet Ethernet, BACnet/SC, HTTP 1.0, HTTP 1.1, TLS 1.3, HTTPS
RS485-interface (BACnet MS/TP)	
Protocol	BACnet MS/TP
Baud rate	9600 (default), 19200, 38400, 57600, 76800, 115200
Parity	None
Stopbits	1
Galvanic isolation	1.5 kV
Bus termination resistor	120 Ohm switchable
TLS Cipher Suites and Digital Signature Algorithms (HTTPS, BACnet/SC)	
TLS Cipher Suite	TLS_AES_128_GCM_SHA256
Digital Signature Algorithm	ecdsa_secp256r1_sha256
TLS Key Exchange Method	secp256r1
Power supply	
Operating voltage	24 V DC +/-10 % (SELV)
Maximum current consumption	50 mA
Power loss (max.)	1,3 W
Indicators	
Type of indicators	LEDs
„RDY“ (Ready to operate)	Green
„LINK 10/100“ (LAN connection)	Green - 100 Mbit / yellow 10 Mbit
“MS/TP TX”	Green
“MS/TP RX”	Green
Housing	
Dimension (W x H x D)	35 x 69,3 x 60 mm / 1.378 in. 2.728 in. x 2.362 in.
Weight	64 g
Mounting style	Rail TH35
Built-in	Any
Apposition	Without distance
Connection type	Screw type terminal blocks (BMT-RTR/SC) or Push-In (BMT-F-RTR/SC)

Materials	
Material - Housing	Polyamide 6.6 V0
Color	Gray
Material – Terminal block	Polyamide 6.6 V0
Material – Covers	Polycarbonate
REACH – substance (SVHC)	Lead / 7439-92-1
Temperature range	
Operating	-5 °C - 55 °C / 23 °F – 131 °F
Storage	-20 °C - 70 °C / -4°F – 158°F

3 Installation

3.1 Installation location and state

The electrical installation and device connection may only be carried out by qualified personnel in compliance with VDE regulations and local regulations. Before working on the system, it must be disconnected from the power supply. The BMT-RTR/SC is intended for fixed installation and operation inside enclosed rooms in electrical distribution boards and suitable control panels. The BMT-RTR/SC is designed for mounting on TH35 mounting rails in accordance with IEC 60715. It can be installed in any position. Horizontal installation is recommended. It is possible to add them to other control cabinet components without spacing.

3.2 Mounting

The BMT-RTR/SC is suitable for decentralized mounting in electrical sub-distribution boards or in switch cabinets on TH35 mounting rails according to IEC 60715. The BMT-RTR/SC can be snapped onto a TH35 mounting rail according to IEC 60715 for installation in an electrical distributor or small enclosure. The device has to be accessible for operating, testing, inspection and maintenance.

Figure 1 Mounting of BMT-RTR

3.3 Dismounting und disposal

Before disassembling, it must be ensured that the BMT-RTR/SC has been taken out of operation and that all supply lines are de-energized. Once all supply lines have been removed, use a slotted screwdriver to move the bolt on the BMT-RTR/SC outwards and remove the device from the mounting rail.

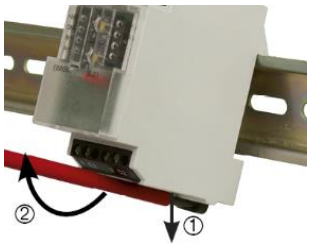


Figure 2 Dismounting of BMT-RTR/SC

1 unlocking lever with a screwdriver

2 remove the device to the front

After using, the BMT-RTR/SC must be disposed of as electronic scrap in accordance with the WEEE Directive and the laws in force in the respective country. Further information is available from METZ CONNECT GmbH.

Figure 3 WEEE identification

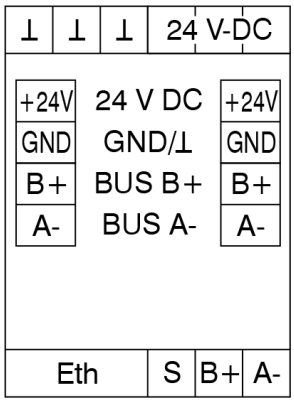
3.4 Connection

Warning of dangerous electrical voltage

Incorrect connection may result in fatal injury. Serious bodily injury or considerable damage to property can occur. Before working on the system, it must be disconnected from the power supply.

The electrical installation and device connection may only be carried out by qualified personnel in compliance with VDE regulations and local regulations. The correct connection must be checked before commissioning. Incorrect connection can destroy the BMT-RTR/SC.

3.4.1 Connection diagram- and principle diagram



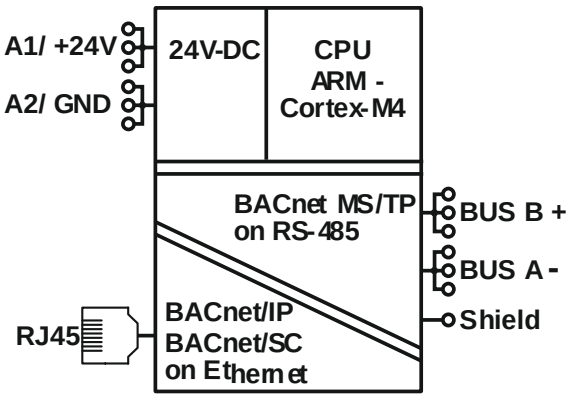


Figure 4 Connection diagram- and principle diagram

3.4.2 Power Supply

The operating voltage of the BMT-RTR/SC is 24 Volt DC +/- 10% (SELV) and is either provided via a jumper plug and the NG4 power supply unit from METZ CONNECT (Figure 5) or directly via the power supply terminals on the device.

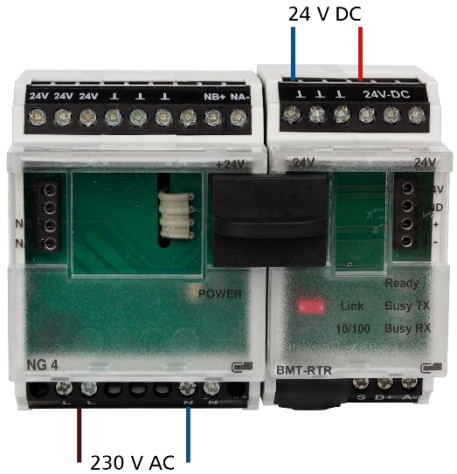


Figure 5 Power supply and RS485 bus connection via jumper plug

Danger!

The voltage of the power supply NG4 is 230 V AC. Serious physical injury or considerable damage to property may occur. Before working on the system, it must be disconnected from the power supply.

3.5 Indicators

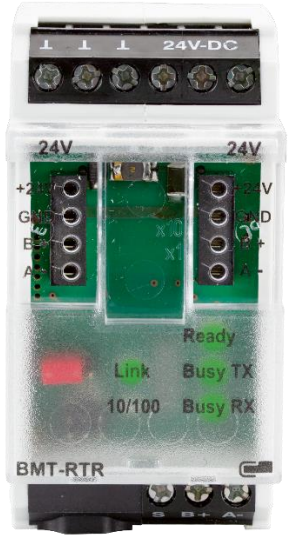


Figure 6 LED Display

Designation	Function	LED-Display		Description
Ready	Operation	Green	LED: On	BACnet/SC Router is ready to operate
			LED: Off	BACnet/SC Router is not ready to operate
Link 10/100	LAN connection	Green	LED: On	BACnet/SC Router is connected to LAN speed 100 Mbit/s
			LED: Off	BACnet/SC Router is not connected to LAN
		Yellow	LED: On	BACnet/SC Router is connected to LAN speed 10 Mbit/s
			LED: Off	BACnet/SC Router is not connected to LAN
Busy TX	MS/TP TX	Green	LED: On	Flash on 50ms when sending any MS/TP frame except "Token" and "Poll For Master".
			LED: Off	BACnet/SC Router is not transmitting Data
Busy RX	MS/TP RX	Green	LED: On	Flash on 50ms when receiving any correct BACnet MS/TP frame
			LED: Off	BACnet/SC Router is not receiving Data

4 Configuration

4.1 Web interface

The BMT-RTR/SC has an integrated and intuitive web interface for parameter settings, management and monitoring of router in responsive design. The Ethernet connection is established via a standard patch cable and the RJ45 connector on the device.

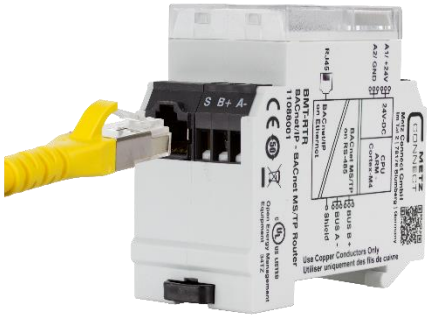


Figure 7 Ethernet- connection with RJ-45 connector

4.1.1 Network integration

The BMT-RTR/SC can be configured using the integrated web interface and the default IP address ***192.168.0.112*** (in case no DHCP server is available). If a DHCP server is available, the BMT-RTR/SC will use the IP address assigned by the DHCP server (use the free software tool ***MC-Search Utility (www.metz-connect.com)*** or the DHCP server user interface to find it).

4.1.2 Web interface configuration

The BMT-RTR/SC is configured as follows:

Description	Address
DHCP	On
IP address (without DHCP server)	192.168.0.112
Subnet mask (without DHCP server)	255.255.255.0
Standard gateway (without DHCP server)	192.168.0.1
DNS Server (without DHCP server)	0.0.0.0
WEB access password	<empty>

The BMT-RTR/SC device supports most modern versions of browsers, including:

- Mozilla Firefox 47 or newer
- Google Chrome 48 or newer

- Microsoft Internet Explorer 9 or newer
- Microsoft Edge
- Apple Safari 8 or newer

Other browsers may not be supported. We recommend that you install the latest available version of the browser and regularly install security updates for it.

4.2 Getting Started

To connect to the device using a WEB browser, follow these steps:

1. Supply +24 volts power to the BMT-RTR/SC.
2. Connect the device to an Ethernet network using the patch cord.
3. Start your web browser and type **192.168.0.112** (or the IP address assigned by the DHCP server) in the address bar.

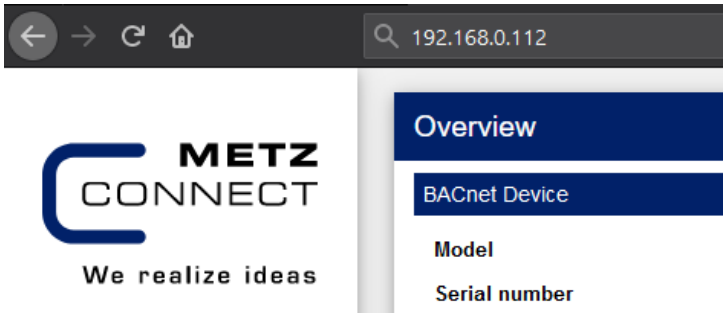


Figure 8 Access to the web interface via default IP address

First, you need to make sure that the parameters of your local network match to the settings of the device. If necessary, you should change the network settings of your computer or review the network settings of BMT-RTR/SC using the MC-Search Utility.

If you have connected to a new device that does not yet have a password, you will see a message at the beginning:

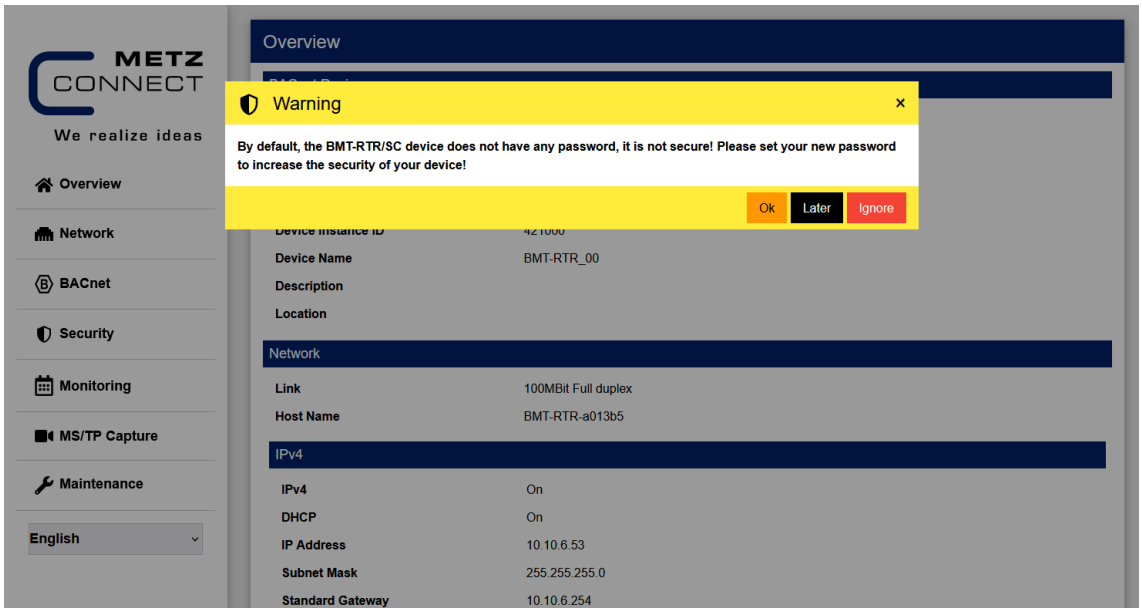


Figure 9 Warning message

If you click the "Ok" button, you will be redirected to the password settings section. If you click the "Later" button, the work without a password will continue during the current browser session. If you click the "Ignore" button (not recommended), the request to set a password will no longer be shown.

If the device password has already been set, you may see the following login form:

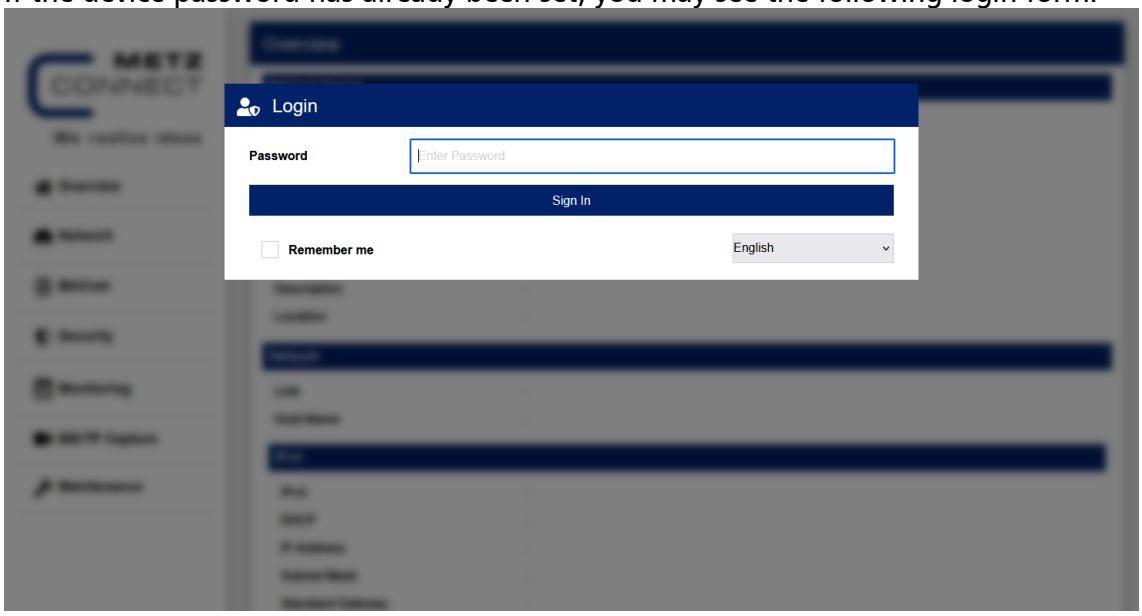


Figure 10 Enter password

If you set the "Remember me" checkbox, the password value you entered will be saved in the browser's memory. In addition, you can choose your preferred language for the device interface.

For BACnet/SC operation, the next step is to upload valid TLS certificate data to the device. This can be done using the "Security" menu item (see section 4.9). After valid TLS certificate data was uploaded, BACnet/SC can be enabled via the "BACnet" menu item, scrolling down to the "BACnet/SC" section there (see section 4.8).

4.3 Reset to factory default

The configurations and the password can be reset via a jumper on the top of the device. For this purpose, the housing cover must be removed and the jumper must be set to the „ON“ position. The flashing of all LEDs indicates that the device is reset to factory settings. The device is only ready for operation again after the jumper has been set to the „OFF“ position. Replace the housing cover and start up the device.

Figure 11 Default- jumper settings

4.4 Overview

The overview page shows the values of the basic settings of the device.

After the login process has been successfully completed, you will be taken to the start page of the web interface. The menu item Overview displays the current settings of the BMT-RTR/SC. Clicking on the METZ CONNECT logo takes you directly to the product page on www.metz-connect.com

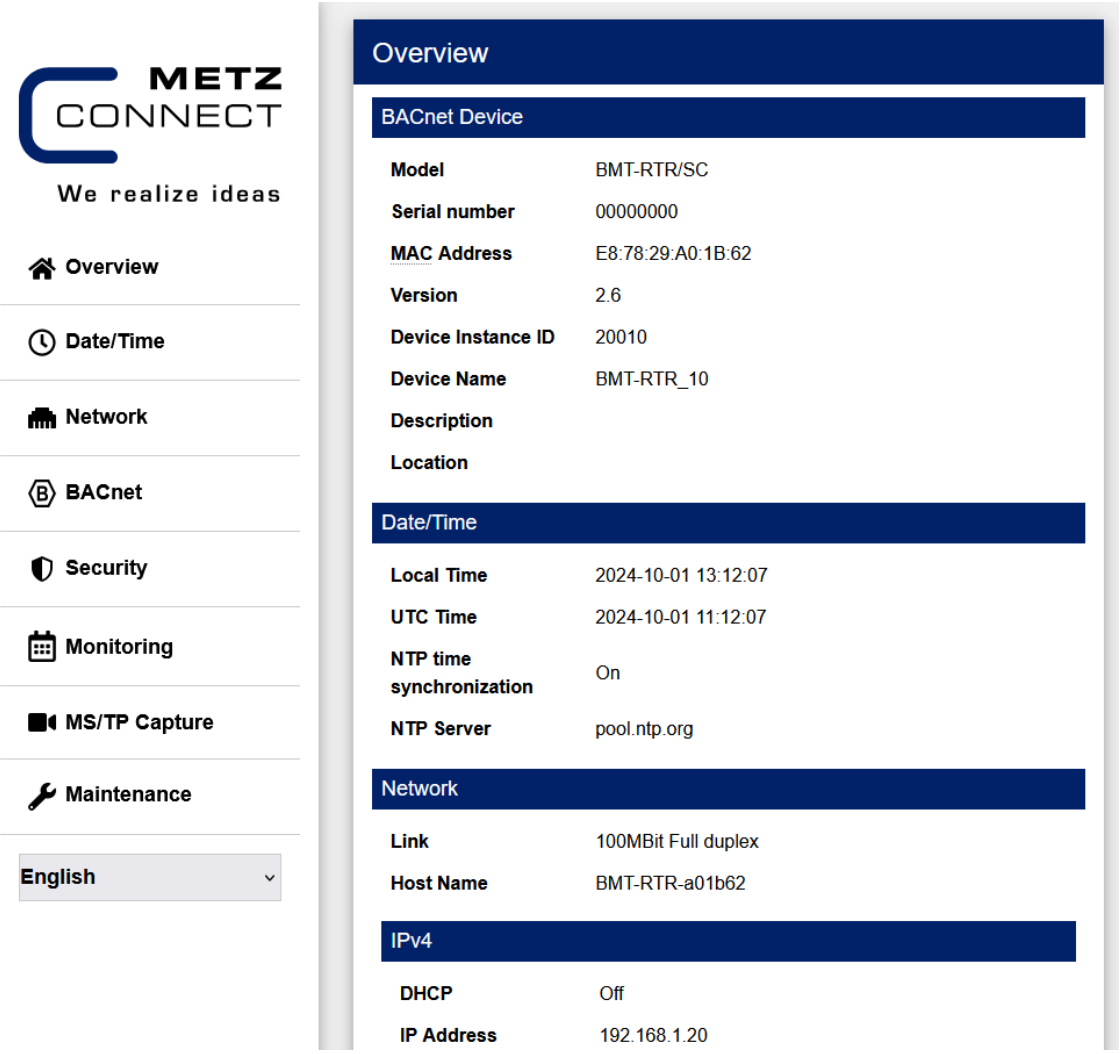


Figure 12 Overview of the current device settings

4.5 Dynamic window adaptation

The size and resolution of the web interface adapt to the display device used. The window size of the web interface can be reduced and adjusted as required. For example, on small screens, the navigation menu will be hidden. To restore the navigation menu, click the "☰" button.

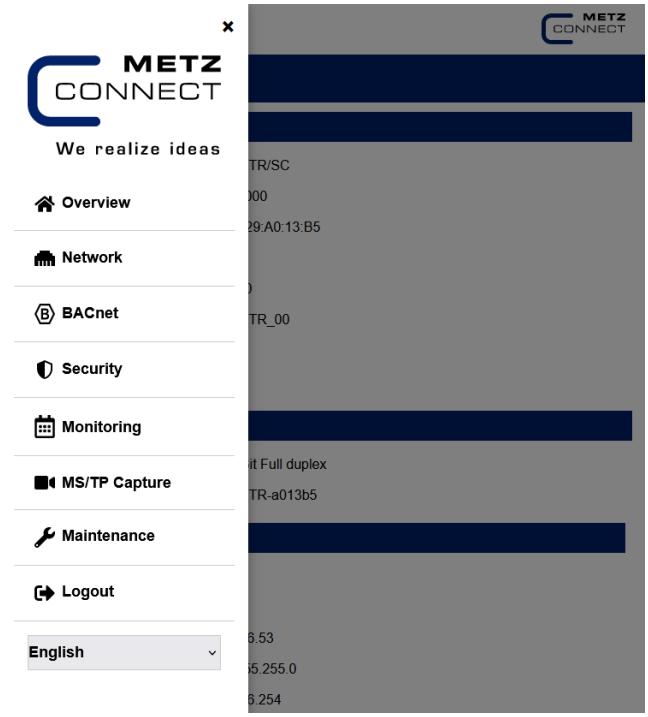


Figure 13 Expanded navigation menu example

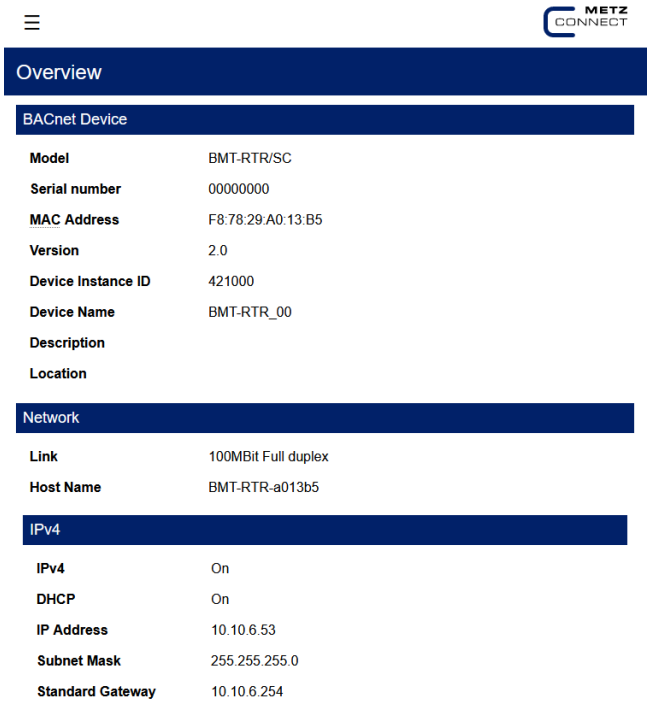


Figure 14 Collapsed navigation menu example

4.6 Date/Time

This displays the current system time of the device. The clock must be configured once during initial commissioning.

Configuration options:

- Manual input: Date and time can be entered directly
- Automatic synchronization: Time synchronization via NTP server

Important information: Incorrect date or time settings can lead to certificate validation errors and impair device functionality. Ensure that the displayed time matches the actual local time.

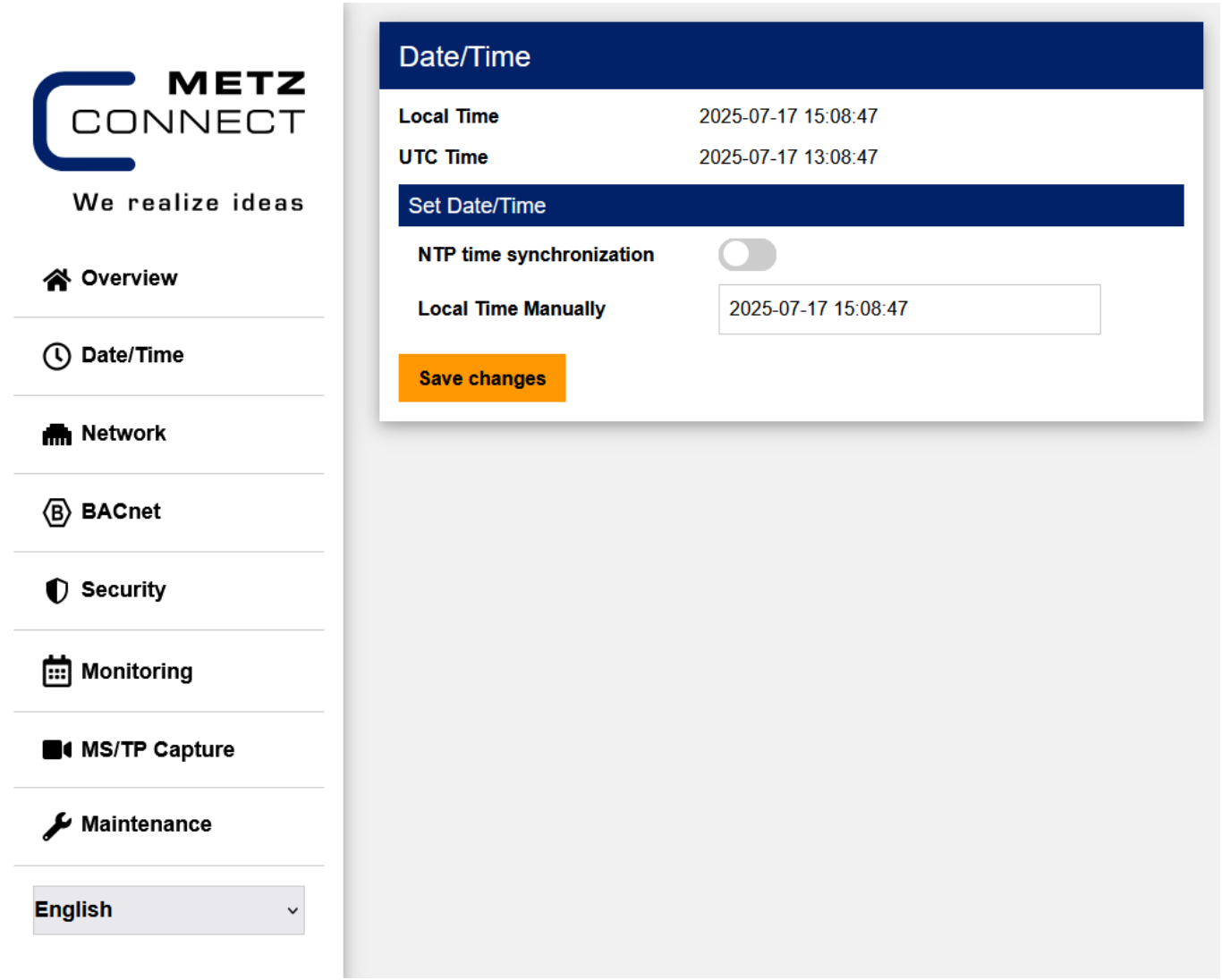


Figure 15 Menu item Date/Time

4.7 Network

On the menu item "Network", you can set the values of the device's network parameters.

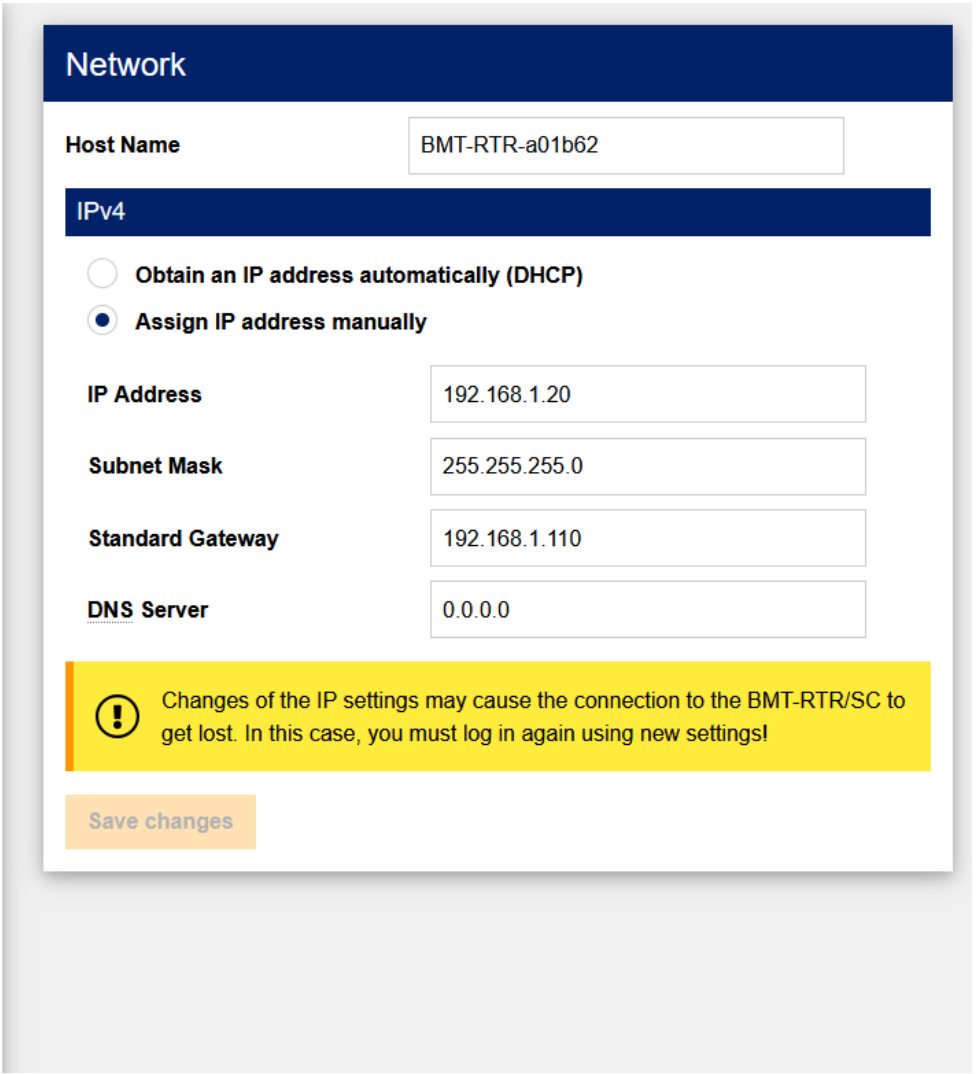


Figure 166 Menu item Network

If you have selected "Obtain an IP address automatically (DHCP)", the IP address, subnet mask, and default gateway values will be assigned automatically by the DHCP server. If you do not specify the DNS server address, the device will try to use the standard gateway address for this purpose.

If you have specified a valid DNS server address, are using DHCP mode, and your DHCP server is configured to issue a DNS server address, then your BMT-RTR/SC device will use two DNS servers.

When you finish changing the settings, do not forget to click the "Save changes" button.

If the IP address of your device has changed as a result of your actions, you will see the following warning messages:

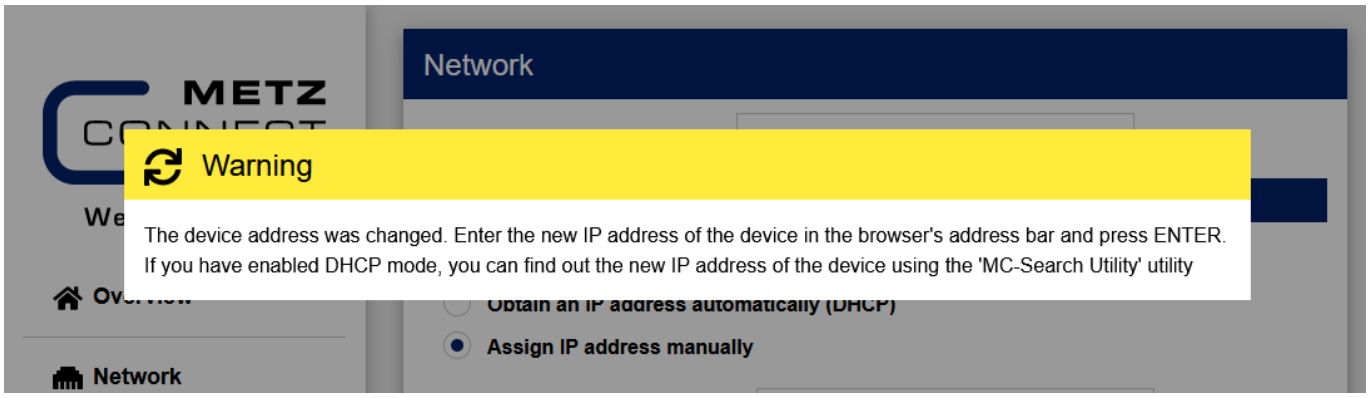


Figure 177 Warning message

In this case, to continue working, the new IP address must be specified in the address bar of the browser.

4.8 BACnet

The menu item “BACnet” contains a large number of settings dedicated to the operation of the BMT-RTR/SC router.

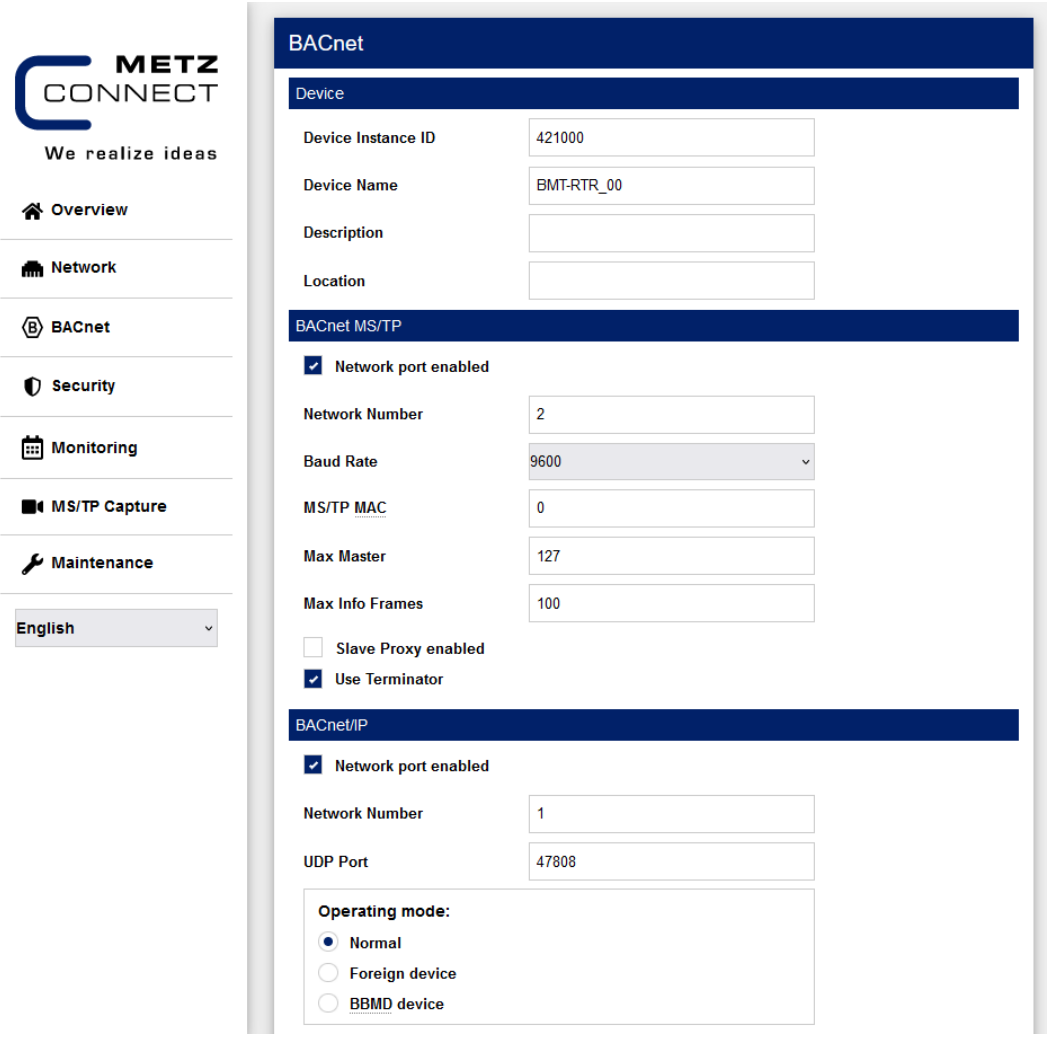


Figure 18 Menu item BACnet (upper part)

Some parameters are present on the page only if you have chosen a certain mode of operation of the device. The parameters on the "BACnet" page are divided into six groups:

- Settings of the object "Device".
- Settings of the object "Network Port: MS/TP".
- Settings of the object "Network Port: BACnet/IP".
- Settings of the object "Network Port: BACnet Ethernet".
- Settings of the object "Network Port: BACnet/SC".

All network ports can be enabled or disabled using the "Network port enabled" check boxes. Parameters that relate to disabled network ports are not displayed.

Group “Device”	
Device Instance ID	This parameter is a numeric code that is used to identify the device. The “Device Instance ID” identifier shall be unique internetwork-wide.
Device Name	This parameter may be used to describe the application being carried out by the BMT-RTR/SC device or other locally desired descriptive information.
Description	This parameter may be used to describe the application being carried out by the BMT-RTR/SC device or other locally desired descriptive information.
Location	This parameter indicates the physical location of the BMT-RTR/SC device.
Group "BACnet MS/TP"	
Network port enabled	This parameter is of type Boolean and allows you to enable or disable the operation of BACnet MS/TP network port. When the network port is disabled, the value of the OutOfService property of the NetworkPort object BACnet MS/TP is set to TRUE.
Network Number	This parameter, of type Unsigned16, represents the BACnet network number associated with this network. The parameter value must be in the range from 1 to 65534. Each of the network ports (BACnet MS/TP, BACnet/IP, BACnet/IPv6, BACnet Ethernet, BACnet/SC) must have a unique Network Number value.
Baud Rate	The data transfer rate for the RS485 interface. The value can be selected from the list: 9600, 19200, 38400, 57600, 76800, 115200. All devices on the MS/TP network must have the same data rate setting.
MS/TP MAC	This parameter specifies the MAC address of the router on the MS/TP network. The value must be in the range 0...127.
Max Master	The value specifies the highest allowable address for master nodes. The value of this parameter shall be less than or equal to 127.
Max Info Frames	The value of “Max Info Frames” specifies the maximum number of information frames the node may send before it must pass the token. “Max Info Frames” may have different values on different nodes but shall have a minimum value of 1 and a maximum value of 255. This may be used to allocate more or less of the available link bandwidth to particular nodes.
Slave Proxy enabled	This parameter is an indication of whether (TRUE) or not (FALSE) the device will perform Slave-Proxy functions for this port.
Auto Slave Discovery	*Only when “Slave Proxy” is enabled.* This parameter, of type BOOLEAN, is an indication whether (TRUE) or not (FALSE) the device will perform automatic slave detection

	functions for this MS/TP port. Search interval can be set via telnet command, default value of the search interval is 120 s. When this feature is disabled, you will probably need to manually specify the contents of the MSAB table. When this feature is enabled, the router's bandwidth is reduced, so disable this feature when it is not required.
Edit MSAB table...	*Only when "Slave Proxy" is enabled.* Button for editing the Manual Slave Address Binding table.
Use Terminator	Enables the 120 Ohm terminator for the RS485 serial interface.
Group "BACnet/IP"	
Network port enabled	This parameter is of type Boolean and allows you to enable or disable the operation of BACnet/IP network port. When the network port is disabled, the value of the OutOfService property of the NetworkPort object BACnet/IP is set to TRUE.
Network Number	This parameter, of type Unsigned16, represents the BACnet network number associated with this network. The parameter value must be in the range from 1 to 65534. Each of the network ports (BACnet MS/TP, BACnet/IP, BACnet/IPv6, BACnet Ethernet, BACnet/SC) must have a unique Network Number value.
UDP Port	This parameter indicates the BACnet/IP UDP port number of this network port. The parameter value must be a number in the range from 1024 to 65535.
Operating mode	This parameter indicates the BACnet/IP mode of this network port. This parameter shall have one of the following values: **Normal** - The router is operating as neither a foreign device nor a BBMD; **Foreign device** - The router is operating as a foreign device; **BBMD device** - The router is operating as a BBMD.
Accept FD registration	*Only for "BBMD device" operating mode.* Allow foreign devices registration. Status of foreign devices registration (Foreign device table) can be monitored on the "Monitoring / BBMD" page.
Edit BDT...	*Only for "BBMD device" operating mode.* Button for editing the Broadcast Distribution Table.
BBMD device address	*Only for "Foreign device" operating mode.* This parameter contains the address of the BBMD device. An IP address or network name can be used.

BBMD UDP Port	*Only for "Foreign device" operating mode.* This parameter contains the UDP port number of the BBMD device. The parameter value must be a number in the range from 1024 to 65535.
Subscription lifetime	*Only for "Foreign device" operating mode.* This parameter indicates the Time-To-Live value to be used in the "Register-Foreign-Device BVLL" message. The parameter value must be a number in the range from 1 to 65535 (time in seconds).
Group "BACnet Ethernet (ISO 8802-3)"	
Network port enabled	This parameter is of type Boolean and allows you to enable or disable the operation of BACnet Ethernet network port. When the network port is disabled, the value of the OutOfService property of the NetworkPort object BACnet Ethernet is set to TRUE.
Network Number	This parameter, of type Unsigned16, represents the BACnet network number associated with this network. The parameter value must be in the range from 1 to 65534. Each of the network ports (BACnet MS/TP, BACnet/IP, BACnet/IPv6, BACnet Ethernet, BACnet/SC) must have a unique Network Number value.
Group "BACnet/SC"	
Network port enabled	This parameter is of type Boolean and allows you to enable or disable the operation of BACnet/SC network port. When the network port is disabled, the value of the OutOfService property of the NetworkPort object BACnet/SC is set to TRUE.
Network Number	This parameter, of type Unsigned16, represents the BACnet network number associated with this network. The parameter value must be in the range from 1 to 65534. Each of the network ports (BACnet MS/TP, BACnet/IP, BACnet/IPv6, BACnet Ethernet, BACnet/SC) must have a unique Network Number value.
VMAC	This parameter specifies the VMAC address of the router on the BACnet/SC network. The value consists of six bytes to be specified in hexadecimal, separated by colons (same format as Ethernet MAC addresses).
UUID	This parameter specifies the universally unique identifier of the router on the BACnet/SC network. The parameter value must be specified in the format described in IETF RFC 4122 (UUID variant according to version 4).
Operating mode	The router is operating as a BACnet/SC node
Reconnect Timeout, s	Timeout for reattempting hub connections after a connection failure in seconds. The parameter value must be in the range from 2 to 60.

Primary hub URI	URI of primary hub. The parameter value must be a URI in the form of wss://*host*:*port* where *host* is the IP address and *port* is the TCP port to connect to.
Failover hub URI	URI of failover hub. The parameter value must be a URI in the form of wss://*host*:*port* where *host* is the IP address and *port* is the TCP port to connect to.
Direct Connect enabled	Enables the acceptance of direct connections from other BACnet/SC nodes if checked.
TCP Port	*Only if "Direct Connect enabled" is checked.* TCP port for accepting incoming BACnet/SC connections. The parameter value must be in the range from 128 to 65535.
Direct Connect URI	*Only if "Direct Connect enabled" is checked.* Displays URI values that can be configured in other BACnet/SC devices to initiate direct connections to the BMT-RTR/SC device.

When you finish editing the parameters on the BACnet page, do not forget to click the "Save Changes" button!

4.8.1 Editing the Manual Slave Address Binding (MSAB) table

To edit the MSAB table, you need set "Slave Proxy enabled" checkbox in the BACnet MS/TP group and click the "Edit MSAB table" button.

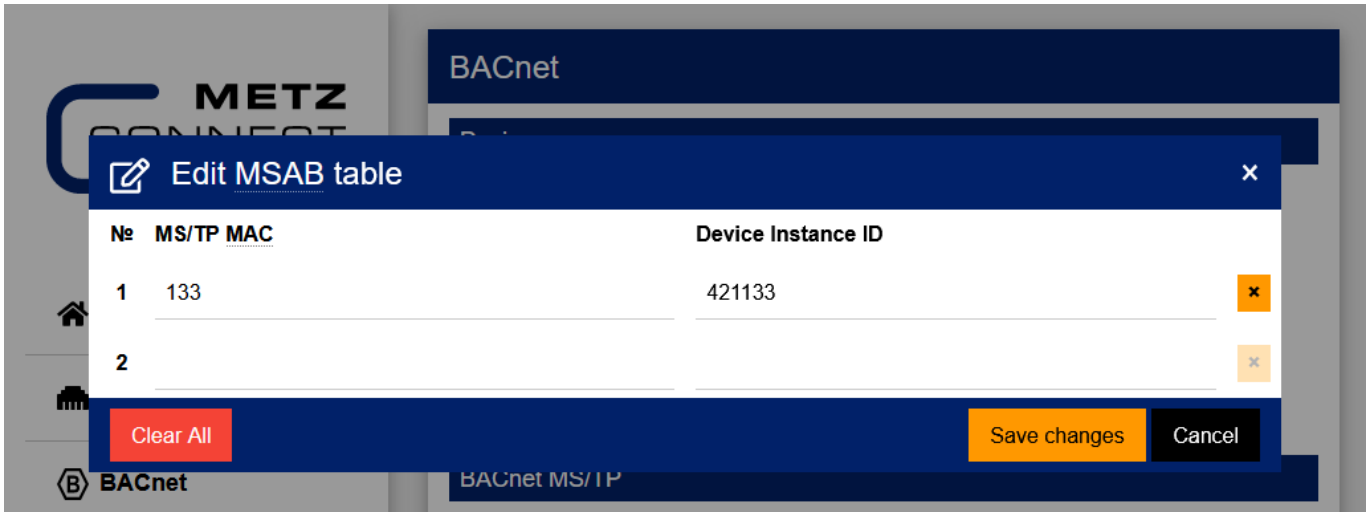


Figure 19 Edit MSAB table

You can add new table elements by entering the MAC address and Device Instance ID values. To delete any row in the table, click the button with the "X" icon. To delete all entries in the table, click "Clear All". When you finish editing the MSAB table, do not forget to click the "Save changes" button.

4.8.2 Editing the Broadcast Distribution Table (BDT)

To edit the BDT table, you need choose "BBMD device" operation mode for BACnet/IP network port and click the "Edit BDT" button.

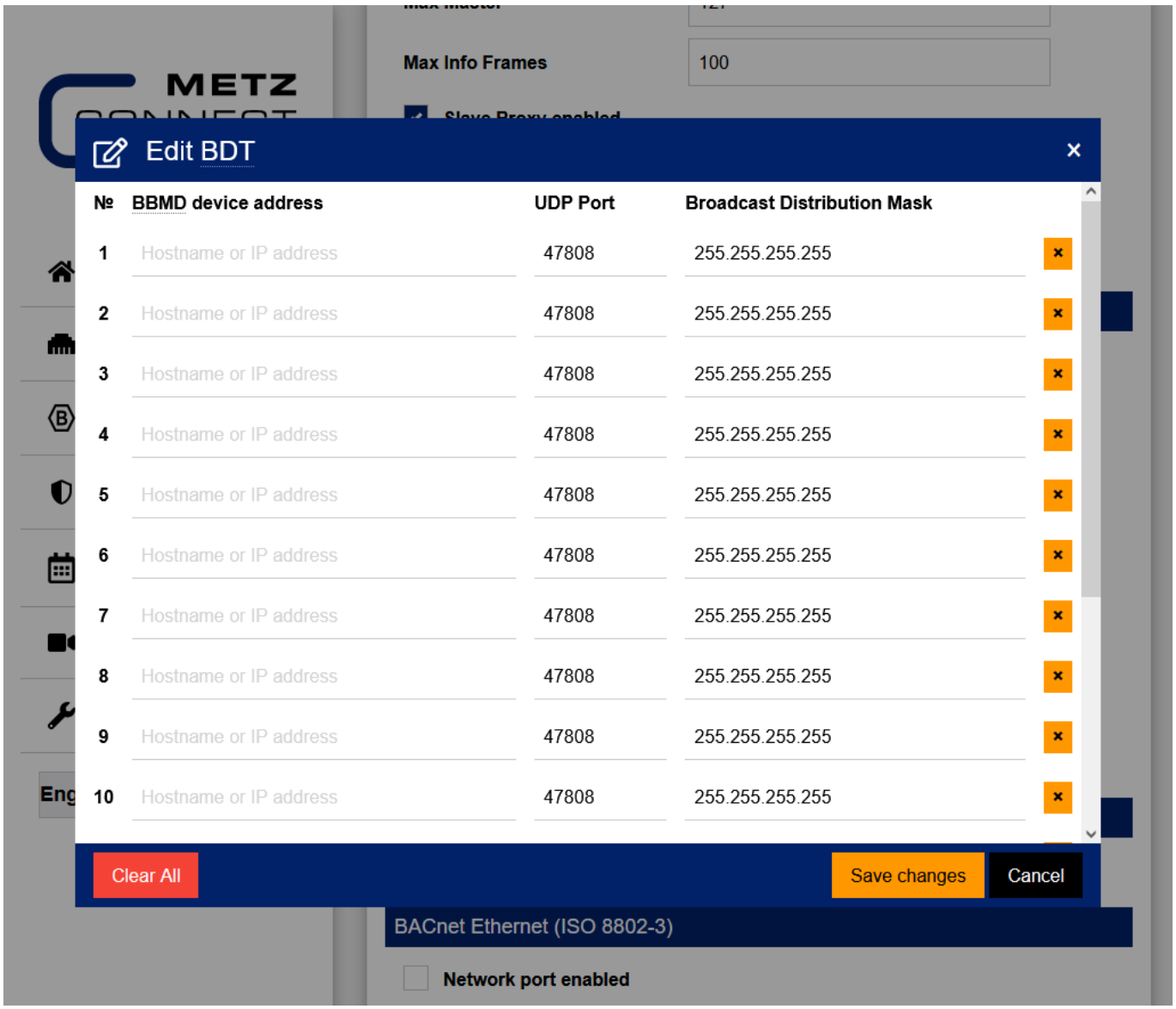


Figure 20 Edit BDT

The BDT table can contain up to 16 records.

You can add a new entry by specifying the host name or IP address of the BBMD device, the UDP port number and the Broadcast Distribution Mask value. To clear the table entries, you can click the "X" button (clear one record) or the "Clear All" button (clear all records).

When you finish editing the BDT table, do not forget to click the "Save changes" button.

4.9 Security

The "Security" page contains parameters that relate to security and restricting access to the BMT-RTR/SC device as well as for provisioning of the cryptographic certificate and key data that is needed for BACnet/SC operation.

Using this page, you can:

- Set or change the password for the device's WEB interface.
- Set a password to execute the DCC and RD BACnet services.
- Enable write protection for critical BACnet property values.
- Allow the BACnet/IP protocol to work only for a certain range of IP addresses.

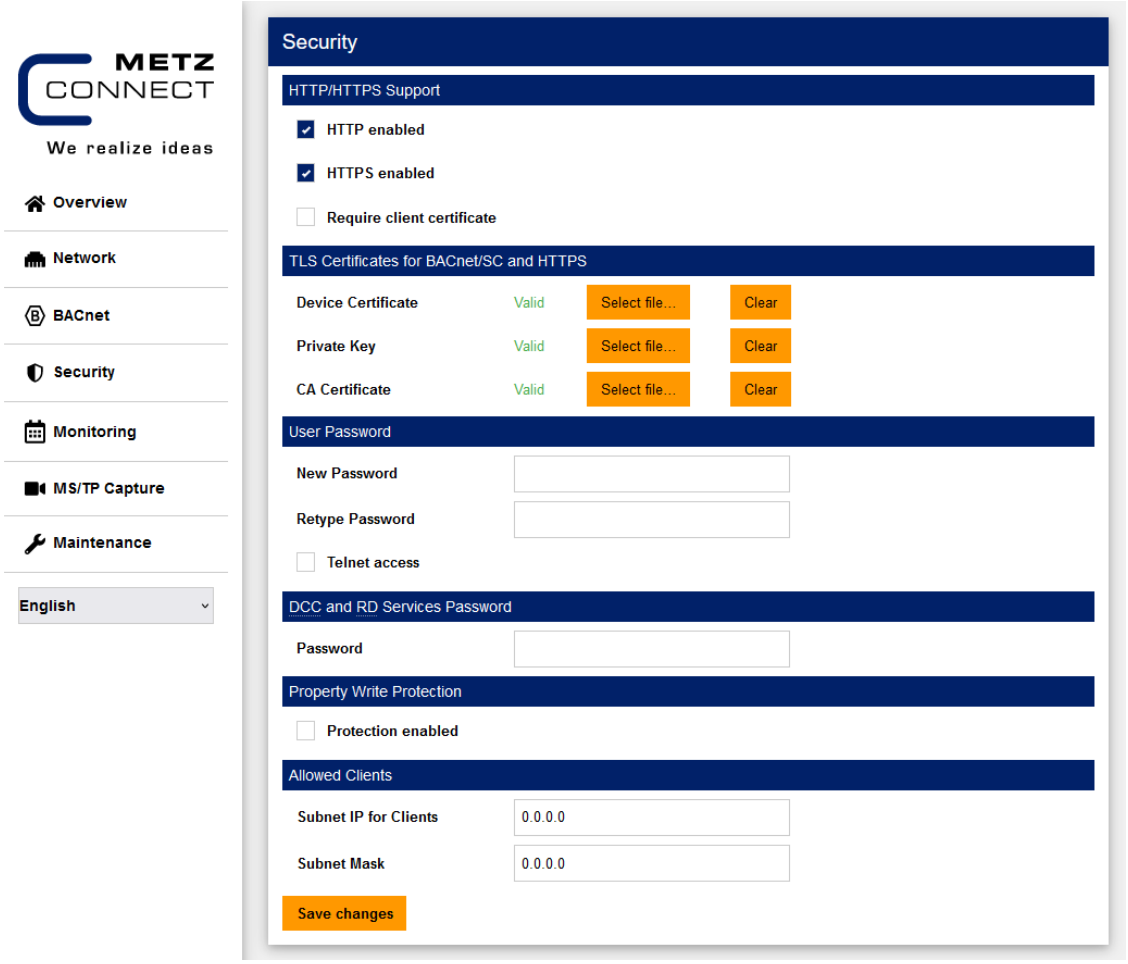


Figure 21 Menu item Security

Before HTTPS support can be enabled, a valid TLS certificate and associated private key (both in PEM format, using signature algorithm ecdsa_secp256r1_sha256) must be uploaded to the device first. To do this, click the "Select file…" button in the "Device Certificate" or "Private Key" line. You will then have the opportunity to select a PEM file via the browser and upload it to the device. Both the device certificate and the private key must show a "Valid" status after uploading, otherwise the uploaded data cannot be used.

For BACnet/SC, a CA certificate is also required, which is used to check the trustworthiness of the other side of a BACnet/SC connection. A BACnet/SC connection is only accepted if both sides present valid

TLS certificates signed with the same CA certificate. The network administrator is responsible for managing the TLS certificates of all BACnet/SC devices.

To upload a CA certificate to the device, press the "Select file…" button in the "CA Certificate" line. The CA certificate file must also be in PEM format, using signature algorithm ecdsa_secp256r1_sha256. After uploading, the validity of the uploaded data is displayed here again.

The open source tools XCA (https://www.hohnstaedt.de/xca/) and OpenSSL (https://www.openssl.org/), among others, can be used to generate all the certificates and private keys required here.

Enabling the checkbox "Require client certificate" in the "HTTP/HTTPS Support" section allows to require client certificates signed by the uploaded CA certificate as needed for BACnet/SC connections for web interface access as well. Together with disabling HTTP support, this brings the web interface to the same security level as BACnet/SC.

The IP address range limit of section "Allowed Clients" applies only to BACnet/IP, the WEB interface and telnet can work from any IP address and is limited only by a password.

For example: If you want to restrict the router to the 192.168.0.0/24 network only, you must specify the following values:

Subnet IP for Clients	192.168.0.0
Subnet Mask	255.255.255.0

To allow BACnet/IP work from any IP addresses, set the value "0.0.0.0" for the parameters "Subnet IP for Clients" and "Subnet Mask".

When you finish changing the settings, do not forget to click the "Save changes" button.

4.10 Monitoring

The menu item “Monitoring” is designed to display the current state of the BMT-RTR/SC device.

The monitoring page contains several additional tabs, the content of which depends on the selected modes of operation of the network ports of the BMT-RTR/SC.

4.10.1 Statistics Tab

The tab shows the received, sent, and error packet counters for all network ports on the device. Additionally, on this tab, you can monitor the current value of the power supply voltage of the device BMT-RTR/SC.

By clicking on the name of the network port, you can see graphs of the intensity of network traffic.

The graphs of received, transmitted, and erroneous packets are displayed in different colours.

The MS/TP service packet counter shows the number of received data link layer frames the "Poll-For-Master" and "Token".

If you observe an increasing value of the MS/TP error packet counter, it means poor communication quality over the RS485 line. This may be caused by incorrect design or a faulty device in the RS485 line. Also, this may mean incorrect "Baud rate" settings for one or more devices on the MS/TP network.

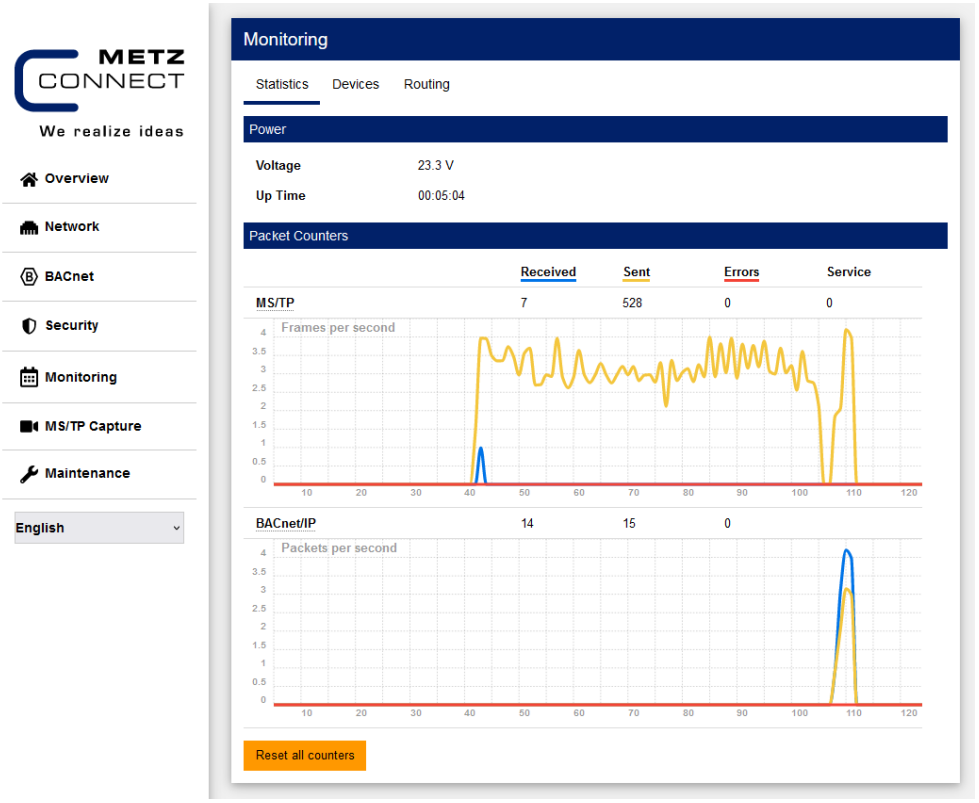


Figure 22 Monitoring

Remote monitoring of the power supply voltage of the device will allow you to identify a faulty or overloaded power source. The value of the "Up Time" parameter shows how long the router has been running without reboots.

To reset the packet counters to zero, click the "Reset all counters" button.

4.10.2 Devices Tab

The Devices tab shows the discovered BACnet MS/TP devices.

The master and slave devices are shown in different colours. Also, a separate colour shows the router that you are currently working with.

Slave device discovering is performed only when the "Auto Slave Discovery" function is enabled for network port "BACnet MS/TP" on the BACnet settings page.

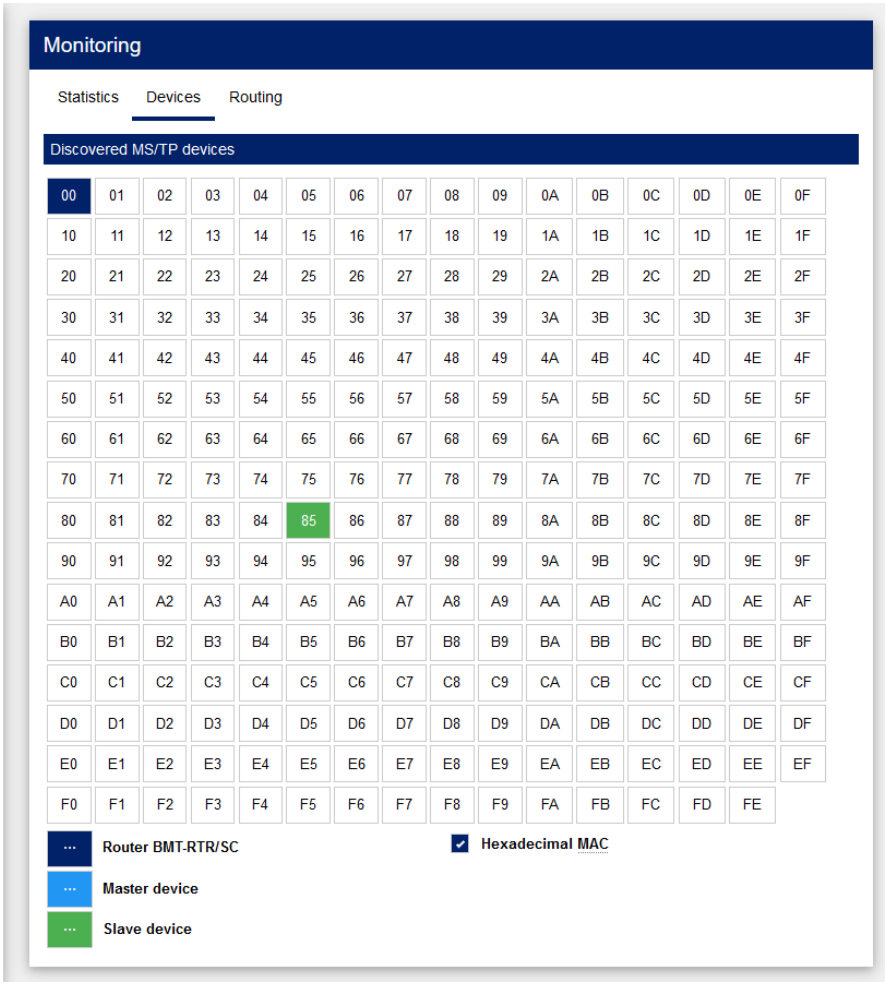


Figure 23 Discovered MS/TP devices

MAC addresses can be displayed in decimal or hexadecimal notation. To switch the display mode, use the checkbox "Hexadecimal MAC". For more information about the slave devices, you can click on it in the grid. This only works for slave devices. The scan is carried out once. Afterwards, it must be restarted. One address is scanned per second. The devices found are marked green in the table. The entire scan takes up to 256 seconds.

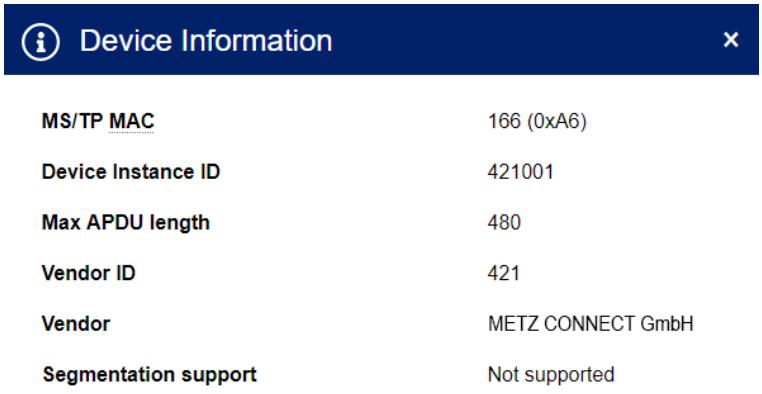


Figure 24 Device information

To determine the vendor name, the official data of the site www.bacnet.org is used.

4.10.3 Routing Tab

The "Routing" tab shows the current state of the device routing table.

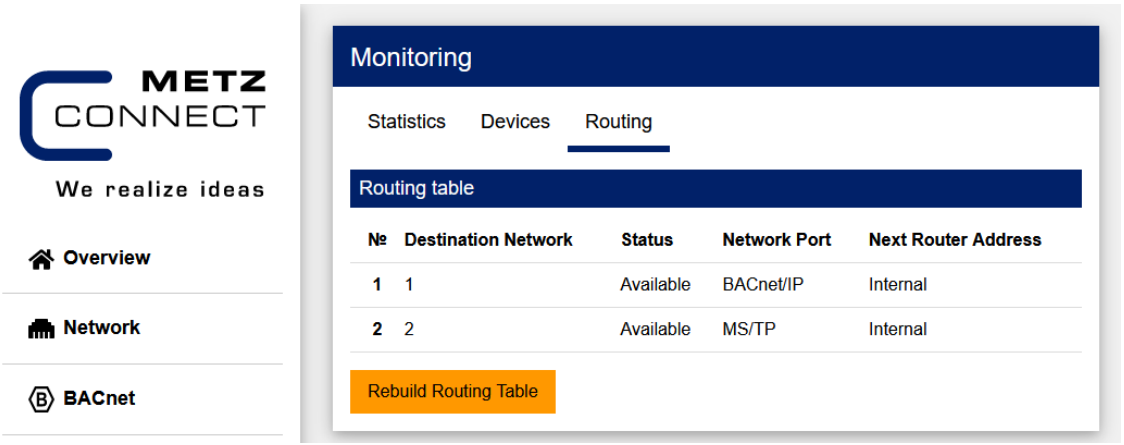


Figure 25 Monitoring – Routing table

Clicking the "Rebuild Routing Table" button clears the routing table and sends the "Who-Is-Router-To-Network" broadcast BACnet message. Next, routing information is automatically filled in based on the received responses from other BACnet routers.

4.10.4BBMD Tab

If the "BBMD device" mode is selected for the network port "BACnet/IP" or "BACnet/IPv6" and the "Accept FD registration" function is enabled, then this tab shows the connection status of the Foreign Devices.

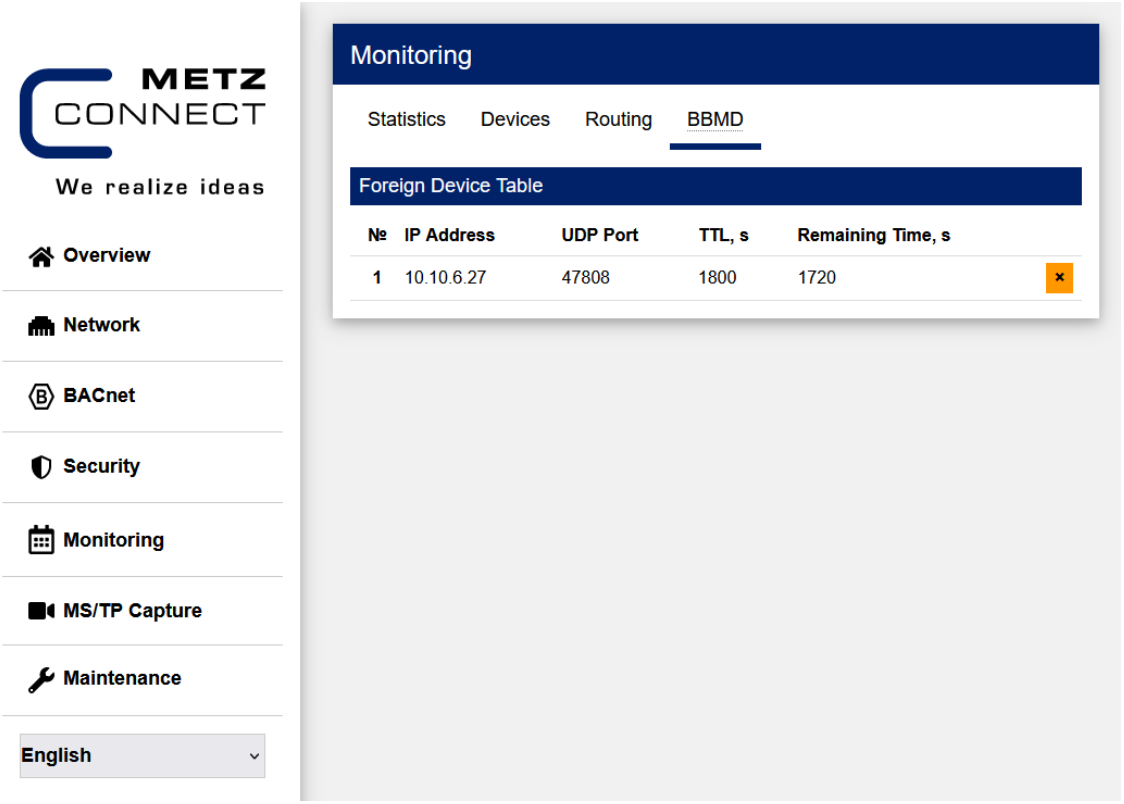


Figure 26 Monitoring – Foreign Device Table

The foreign device can be forcibly disconnected by clicking the "X" button.

4.10.5 BACnet/SC Tab

If the "BACnet/SC" network port is enabled, then this tab shows the status of the BACnet/SC connections.

The "Nodes" section displays the connection status and remote station of the internal BACnet/SC node.

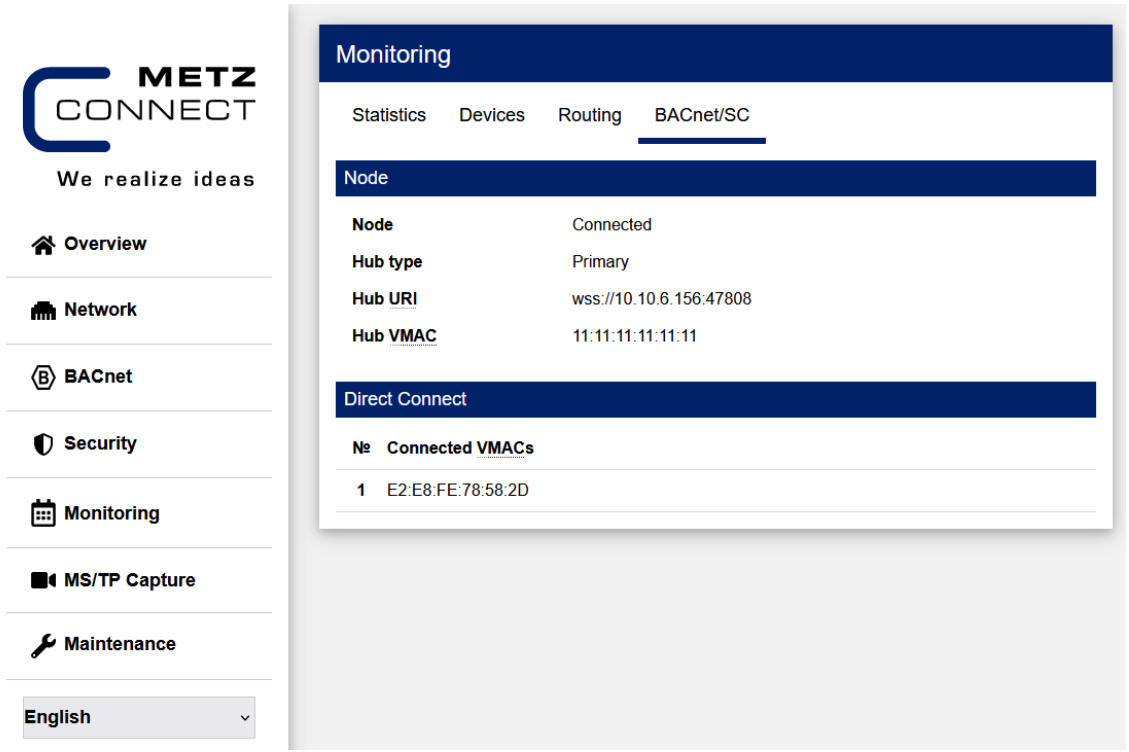


Figure 27 Monitoring – BACnet/SC in node operating mode

In the "Direct Connect" section, in the BACnet/SC node operating mode with activated direct connections, all active direct connections of the internal BACnet/SC node are displayed (also with details of the VMAC address of the remote station).

4.11 MS/TP Capture

The function allows you to record all the traffic passing through the MS/TP network in a PCAP file. This file can then be opened and examined in a traffic analyzer program, such as Wireshark™ or similar. This feature is only supported in the latest versions of WEB browsers. The maximum duration of frames recording is limited only by the amount of RAM on your computer.

If you are connected to the device by several WEB browsers at the same time, then MS/TP frame recording is available only from one of them.

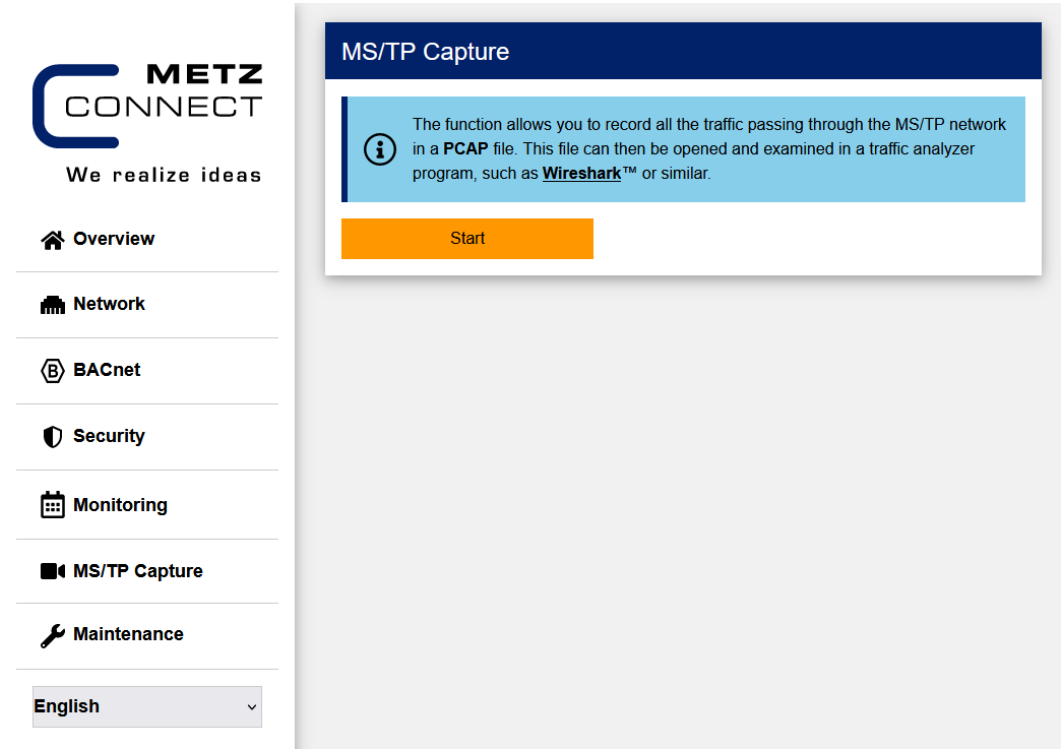


Figure 28 MS/TP Capture

To start recording MS/TP frames, press the "Start" button.

Figure 29 Capture in progress…

When recording, you can watch the number of captured MS/TP frames.
To stop recording and write the results to a file, click the "Stop and save results" button.

4.12 Maintenance

This menu item contains the maintenance functions of the BMT-RTR/SC device.

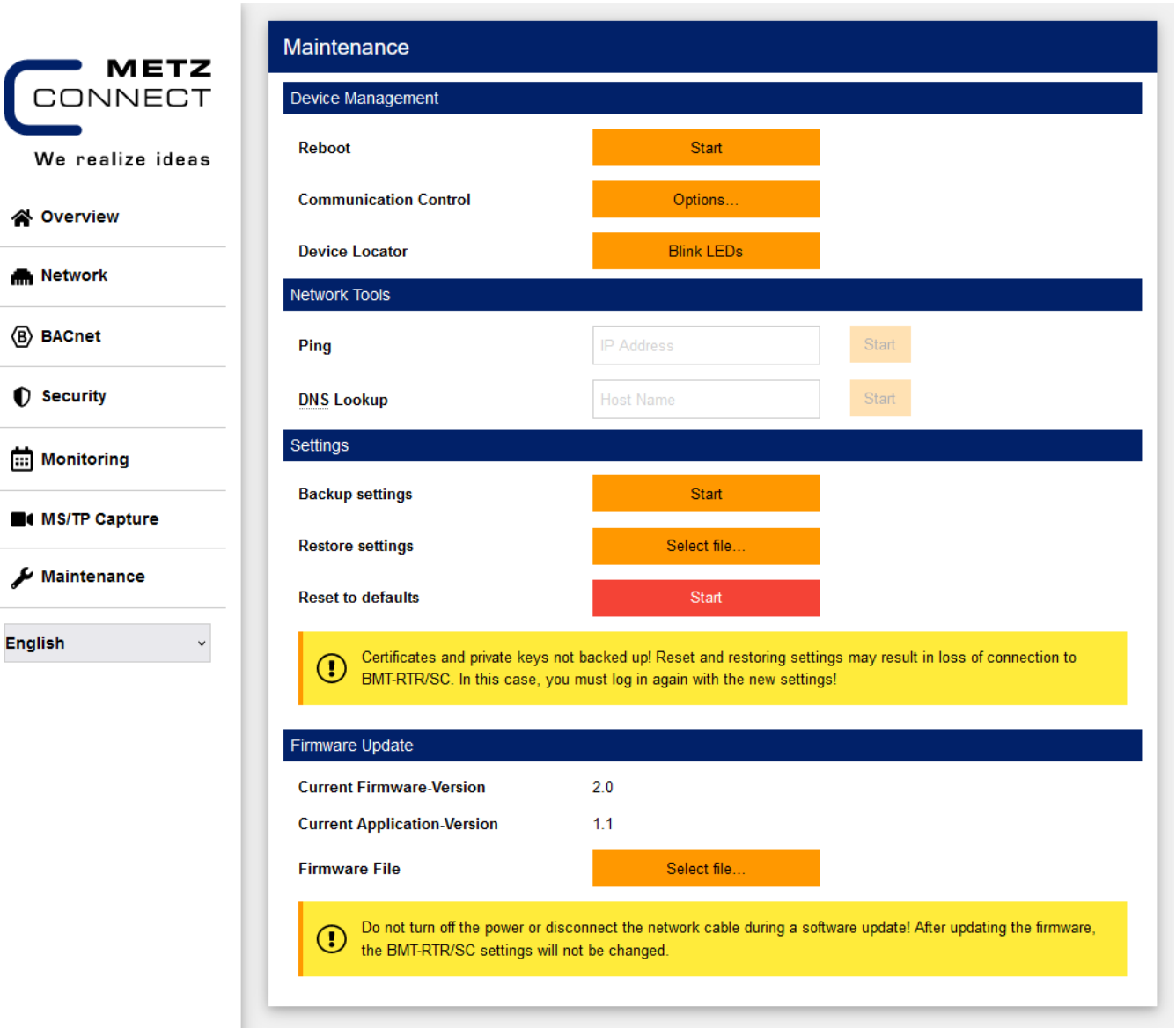


Figure 30 Menu item Maintenance

4.12.1 Device Management

4.12.1.1 Reboot

The "Reboot" function is designed to reboot the device. Its execution is equivalent to executing the BACnet "Reinitialize Device" service with the "COLDSTART" parameter.

4.12.1.2 Communication Control

The "Communication Control" function is equivalent to running the BACnet "Device Communication Control" service. The "DeviceCommunicationControl" service is used by a BACnet client to instruct a remote device to stop responding to all APDUs, except DeviceCommunicationControl or ReinitializeDevice on the communication network or internetwork for a specified duration of time. After pressing the "Options..." button, you can set the time interval during which the device will not respond to all APDUs.

Figure 31 Change value

If the "Communication control" function is active, a warning is displayed in the upper-right part of the browser window:

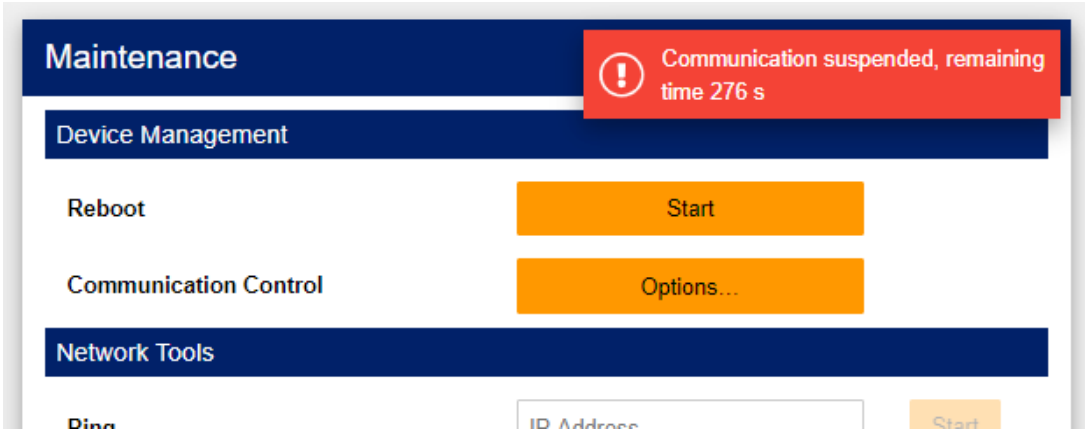


Figure 32 Warning

4.12.1.3 Device Locator

When you press the "Device Locator" button, all the LED indicators of the device flash at a frequency of 5 Hz for 5 seconds. This function helps you determine the location of the device among other equipment.

4.12.2 Device Settings

This section contains functions that allow you to save the current device settings to a file, restore settings from a file, and restore factory default settings.

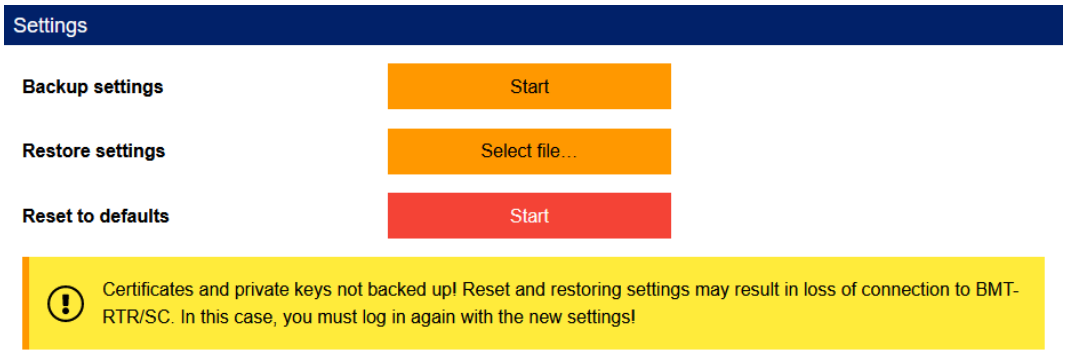


Figure 33 Settings

Backup settings *Start*	Save configuration backup file *.cfg to local drive
Restore settings *Select file...*	Select “storage location” and open backup file *.cfg
Reset to defaults *Start*	Reset BMT-RTR/SC to default settings

If you choose to restore the factory default settings, you can see confirmation window with a list of the parameter values that will be set.

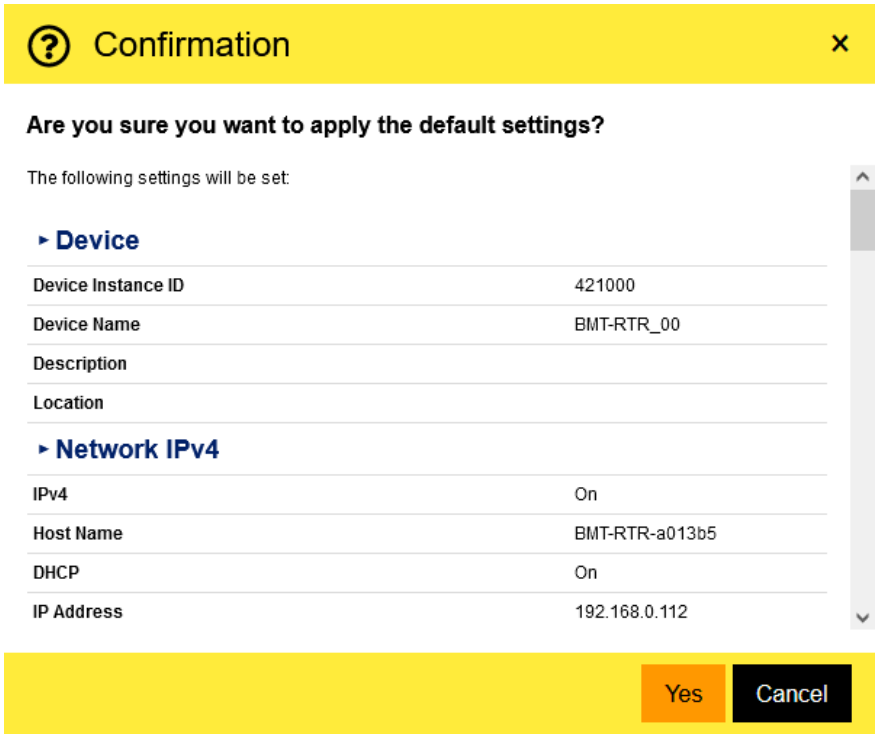


Figure 34 Confirmation

4.12.3 Firmware Update

To update the software of the BMT-RTR/SC, a firmware update can be carried out. The latest firmware is available on the METZ CONNECT homepage.

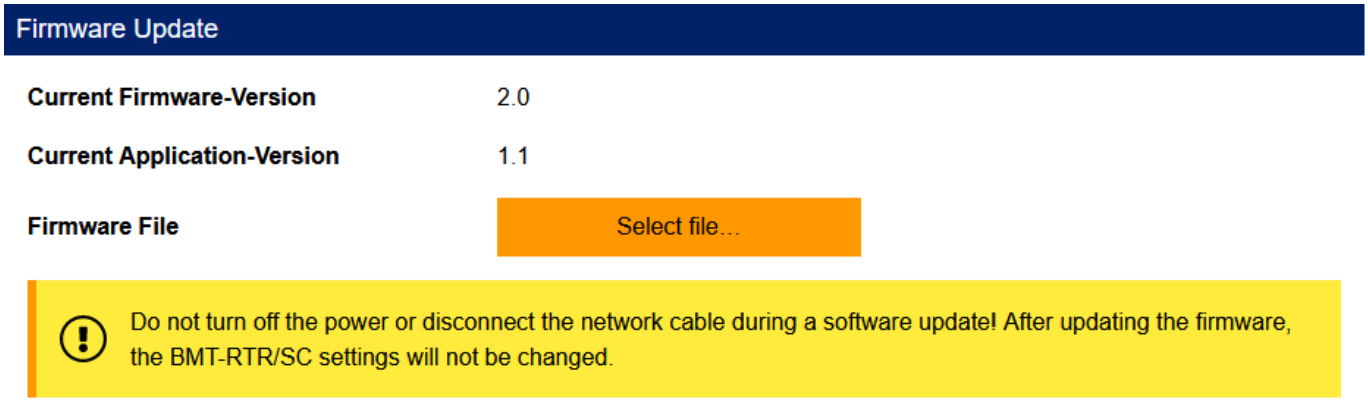


Figure 35 Firmware Update

Current Version	Current firmware version of BMT-RTR/SC
Firmware File *Select file...*	Select “storage location” and open firmware file ***.bsc**

4.13 REST-Webservices

An example python script is available on the METZ CONNECT homepage on how to use the webservices.

4.13.1 Introduction

The REST-api allows you to exchange data with the device without using the webserver.

GET: Read data from device.
POST: Add a new resource to the device.

Important: To access the data authentication is required via the header. Details see next section.

4.13.2 Authentication

The authentication is passed to the device via the header. In addition, the Username and Password needs to be 64 bit encoded. You can use e.g. Python base64 class to do this job:

```
auth_string = f"{username}:{password}"
auth_encoded = base64.b64encode(auth_string.encode()).decode()
with:
username=1
password=<user_password>
```

4.13.3 Curl example

With the correct base64 authentication string the curl request could be send:

```
curl -i -H "Content-Type: application/json" -H "Authorization: Basic <base64_authstring>" http://<ip-address>/config.json
```

Example to get the complete config from the device using curl:

```
curl -i -H "Content-Type: application/json" -H "Authorization: Basic auth_encoded"  http://192.168.0.112/config.json
```

The response is given as a json string containing – e.g. the content from config.json:

HTTP/1.0 200 OK

Connection: close

Content-Length: 1244

Content-type: application/json

{"serial":"0", …

… }

4.13.4 Write the certificates / keys

The BACnet/SC standard demands a regularly certificate exchange (since a certificate usually expires after a given period).
Following assets could be replaced using the REST-API:

cert
The certificate contains the public part of the private key.
pkey
Private key – counterpart of the Cert.
ca_cert
A certificate singed by a certificate authority.

To write one of theses three candidates a POST request is needed. The header data contains Content-Type and Authorization, see chapter 4.13.2 and 4.13.3.
The data contains a key/value pair, in json format, e.g.:

data_cert = '{"cert":"-----BEGIN CERTIFICATE-----\nMIIBl…..QsGOU\n-----END CERTIFICATE-----\n"}'
data_key = '{"pkey":"-----BEGIN PRIVATE KEY-----\nMIGHAgE…. Np6\n-----END PRIVATE KEY-----\n"}'
data_ca_cert = '{"ca_cert":"-----BEGIN CERTIFICATE-----\naBevx…..cdfE\n-----END CERTIFICATE-----\n"}'

The POST request needs to be send also against the config.json, e.g. using curl with the option -d:

```
curl -i -H "Content-Type: application/json" -H "Authorization: Basic auth_encoded" -d "data_cert"
http://192.168.0.112/config.json
```

Note
The newline from the certificate needs to be replaced by an “\n”.

4.13.5 Troubleshooting

The API returns 403 – Forbidden?

Most likely the Authentication data is not correct, see also section 4.13.2 Authentication.

Ensure that:

1. Username is always “1”
2. The username and password are encoded correctly using base64

For further information a python script is provided on our website.

The API returns 200 – OK but my new certificate seems not be overtaken by the device?

Most likely the data format is not correct.

Ensure that:

1. Make sure the format is correct
2. When editing the certificate file use “UTF-8” encoding as (text editor option)
3. Replace the line endings by “\n”

4.14 Network Detection using the "MC-Search Utility"

MC-Search Utility is a Windows-based and free tool for the BMT-RTR/SC, which detects all connected devices in a TCP/IP network.

The utility allows you to quickly find the device parameters even if its network parameters are incorrectly configured. This can be useful if you don't know the current device network settings.

Unlike the BACnet router device BMT-RTR without BACnet/SC support, the device parameters of BMT-RTR/SC can only be displayed, but not changed with the ***MC-Search Utility***. This is for security reasons.

For the access to the web interface of BMT-RTR/SC, the network settings can be determined via the ***MC-Search Utility*** tool:

1. Download ***MC-Search Utility*** from the Metz Connect homepage
2. Installation of the Software
3. Connect +24V power supply to the BMT-RTR/SC device
4. Connect the device with an Ethernet patch cable to your PC.
5. Run the installed of ***MC-Search Utility***
6. A list of all found devices appears in the selection list
7. Select the required device

The "Info" tab is used to display basic information about the BMT-RTR/SC router.

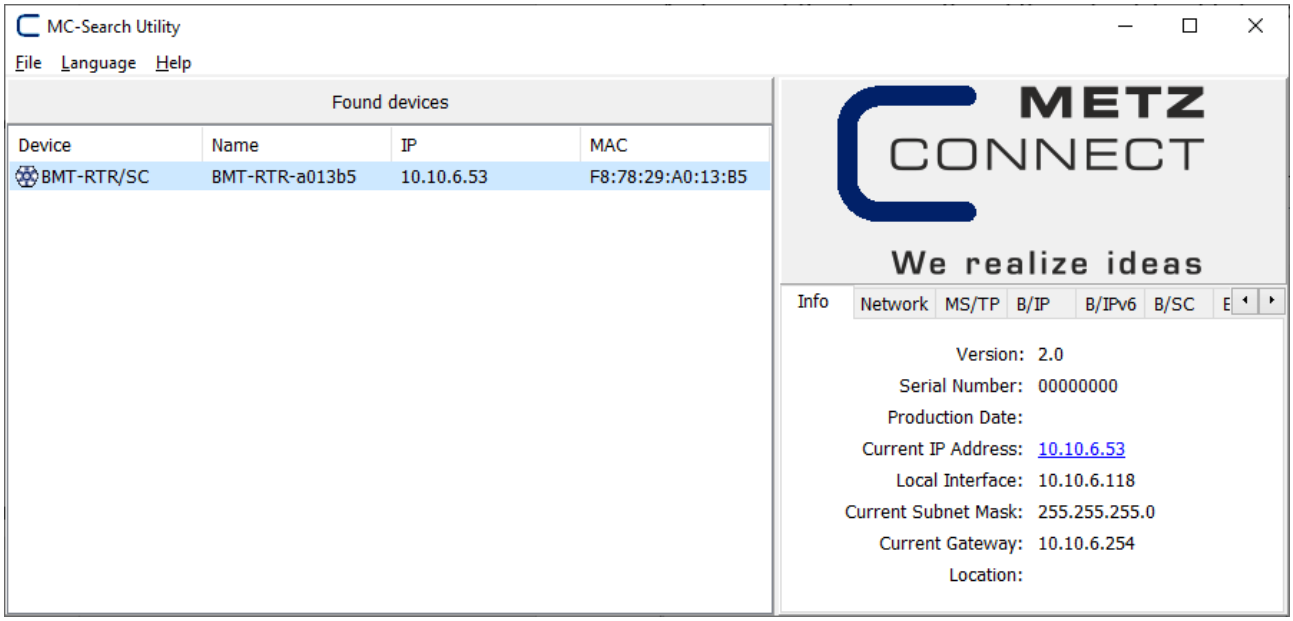


Figure 36 MC-Search Utility – Info tab

The “Network” tab is used to display the network settings of the BMT-RTR/SC router.

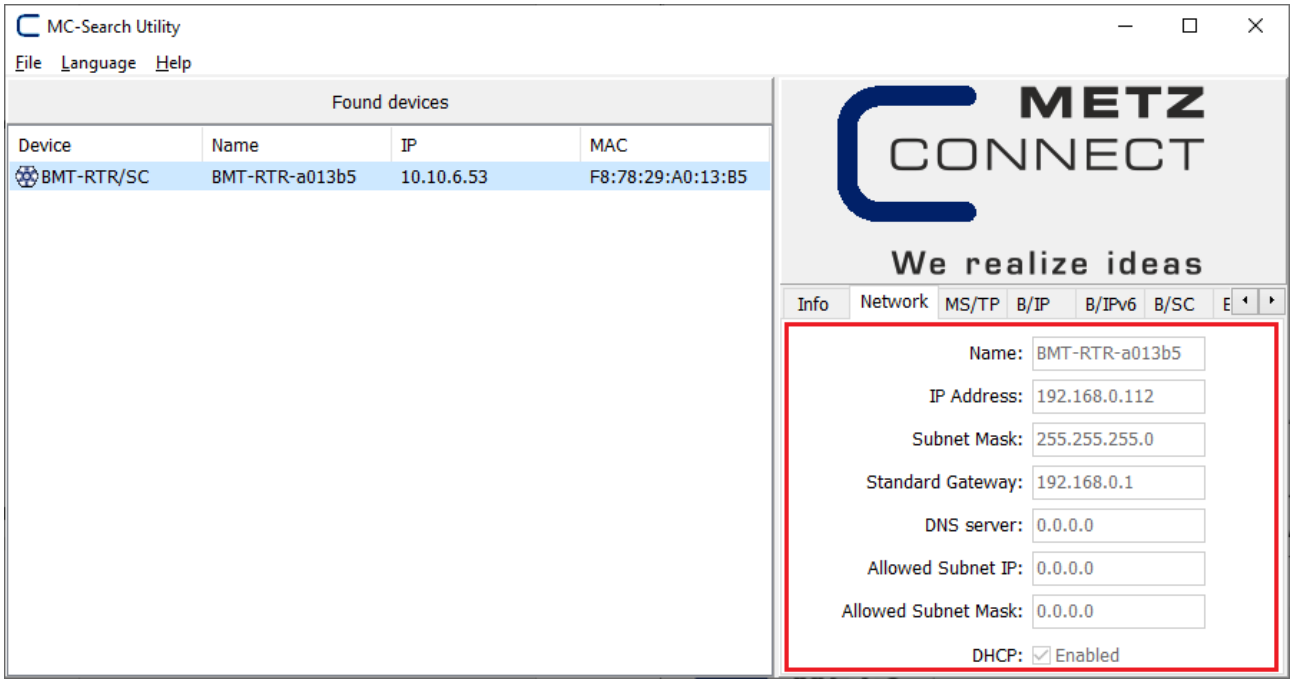


Figure 37 MC-Search Utility – Network tab

The “MS/TP”, “B/IP”, “B/IPv6”, “B/SC” and “ETHERNET” tabs are used to display the main BACnet settings of the BMT-RTR/SC router. Only the basic BACnet settings are presented here. For more detailed information, we recommend using the WEB interface.

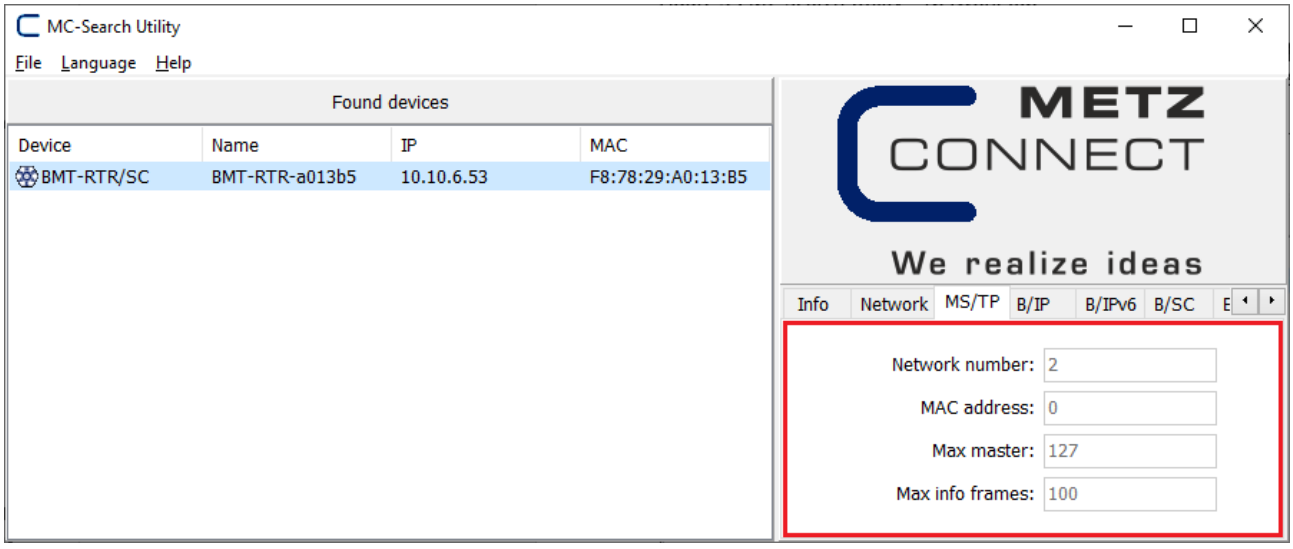


Figure 38 MC-Search Utility – MS/TP tab

For a description of the parameter assignment, see the section configuration descriptions via the WEB interface.