

# BACnet-2-OPC MANUAL

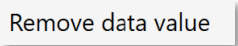


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# 1 Introduction

## Notation and symbols used

|   |  |
|---|--|
| <Buttons>   | The notation <Button> is used to mention specific buttons within the text body.  |
|  | Graphic symbols are also used for buttons, where suitable.   |
| Network commands, file and product names  | Network commands, such as <i>tracert</i> or <i>ping</i> , as well as file and product names, are all written in italics. |
| Menu designations and paths   | As a rule, menu functions will be localised in the MAIN MENU / SUBMENU / ... form.                                       |
| Screenshots   | The essential illustrations show the software under a Microsoft Windows 10 installation.                                 |

## Licensing

A **product key** is required for licensing, which is provided when the software is purchased. Information on how to do this can be found in Chapter 7 Licensing.

## Copyright protection

This document is protected by copyright. Reproduction, reprinting, even of extracts, as well as reproduction of the images, even in a modified state, is only permitted with the written consent of the manufacturer.

## Warranty

This manual must be read carefully before installing and commissioning the software. The warranty entitlement lapses if the software is installed by untrained personnel.

**Limitation of liability**

All information and notes in this manual were compiled taking the applicable standards and regulations, best engineering practice and the manufacturer's extensive knowledge and experience into consideration. The manufacturer assumes no liability for indirect and direct damage due to:

- Ignorance of this manual
- Improper use
- Use of untrained personnel
- Damage due to incorrect installation
- Unauthorised modifications to the software
- Use of non-approved components

The obligations agreed in the delivery contract, the general terms and conditions as well as the manufacturer's delivery conditions and the legal regulations applicable at the time of the conclusion of the contract apply.

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BACnet und ASHRAE<sup>®</sup>

are registered trademarks of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, INC. (ASHRAEi).

OPC<sup>®</sup>

is a registered trademark of the OPC Foundation.

**Target group**

This manual is intended exclusively for specialist personnel who are familiar with network configuration in Ethernet, BACnet and OPC.

**Intended use**

BACnet-2-OPC is intended to provide a software gateway to connect BACnet networks to OPC-based applications.

## 2 Safety

The software present no direct hazards. However, in their function as a gateway between networks in building infrastructures, they are able to seriously disrupt the interaction of network components.



### Warning

#### **Misconfiguration of hardware and software!**

Faulty configuration of hardware and software can cause malfunctions in the building infrastructure on network components, sensors or actuators, **for example:**

- Monitoring devices, such as fire alarm or intrusion detection systems, are deactivated.
- Machines and fans start up unexpectedly.
- Gate valves and other valves open or close unintentionally.

Under certain circumstances, this can lead to serious injuries or death.

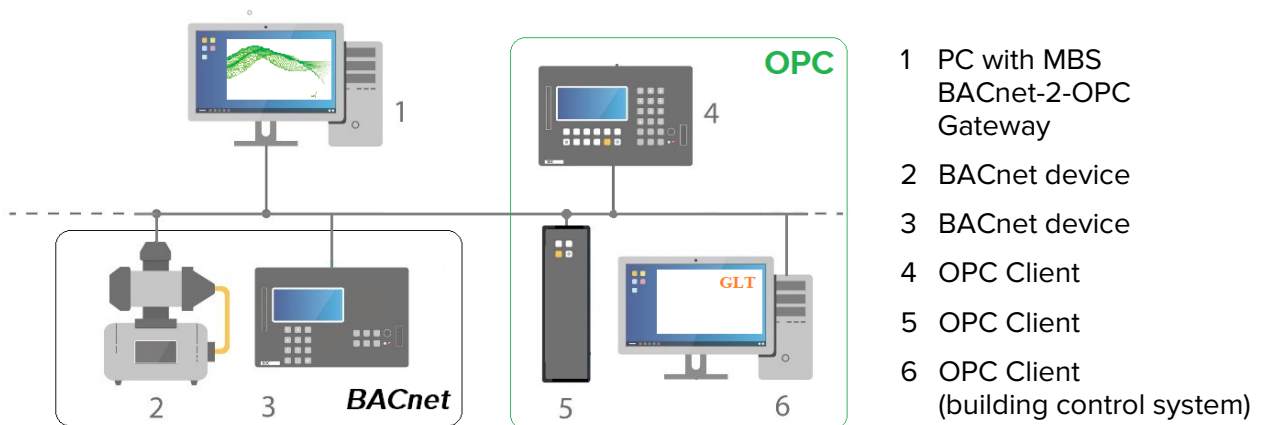
The gateway should only be configured by specialist personnel who are familiar with network configuration in Ethernet, BACnet and OPC!

### 3 Classification and purpose

**Classification** BACnet-2-OPC works as a software gateway on Windows-based hardware platforms.

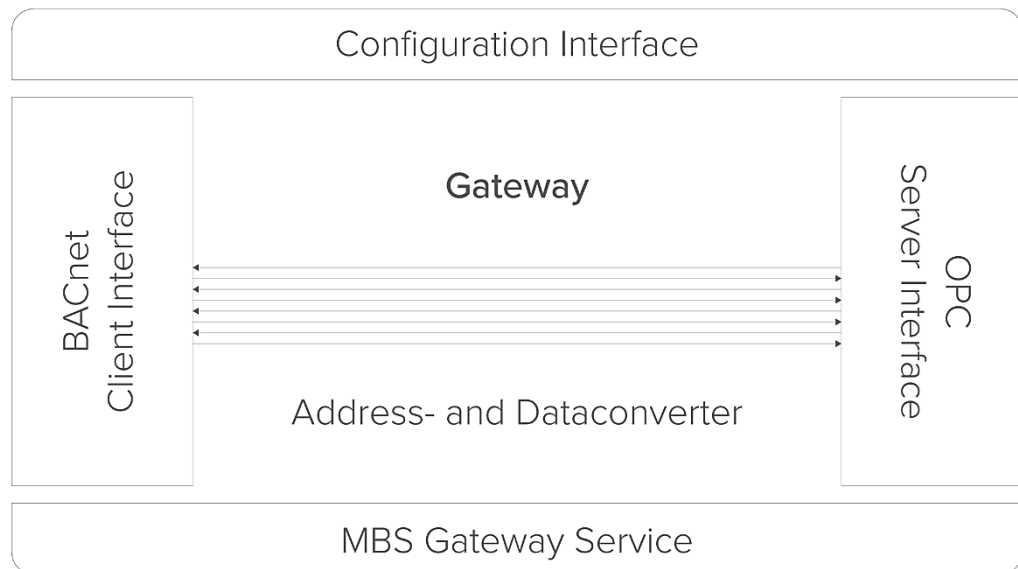
**Purpose** BACnet-2-OPC works as a client on the BACnet side and supplies BACnet data points as an OPC server; OPC UA and OPC DA can thereby be operated.

#### Schematic view of a typical BACnet/OPC network



## 4 Structure and features

Block diagram of the BACnet-2-OPC gateway



### Protocols

|         |   |
|---------|---|
| BACnet: | Revision 14   |
| OPC UA: | UA Data Access Server<br>Standard UA Server<br>UA Alarms and Condition Server |
| OPC DA: | DA V2.05a<br>DA V3.00<br>AE V1.10   |

## 5 System requirements

|                            |   |
|----------------------------|---|
| <b>Operating systems</b>   | <ul style="list-style-type: none"> <li>• Windows 10</li> <li>• Windows 7</li> <li>• Windows Server 2019</li> <li>• Windows Server 2016</li> <li>• Windows Server 2012 (R2)</li> <li>• Windows Server 2008 (R2)</li> </ul>   |
| <b>Runtime environment</b> | <ul style="list-style-type: none"> <li>• Microsoft .NET Version 4.6</li> </ul>  |
| <b>Minimum hardware</b>    | <ul style="list-style-type: none"> <li>• 1 gigahertz (GHz), 32-bit (x86) or 64-bit (x64) processor</li> <li>• 1 GB RAM (32 bit) or 2 GB RAM (64 bit)</li> <li>• 16 GB of available space on the hard drive (32-bit) or 20 GB (64-bit)</li> <li>• DirectX 9 graphics card with WDDM 1.0 or higher</li> </ul> |

### Notice

The gateway can only work properly on a computer if no other application is using the UDP port established on the BACnet client side and no firewalls are blocking the port.

The standard setting for the UDP port is 47808.

As a result, applications such as the BACnet Explorer *BACeye* cannot be run on this computer at the same time.



## 6 Installation / Removal

### Installation

#### Scope of supply

The software is supplied in the form of the executable file *MBS\_BACnet-2-OPC\_x.x.x.x\_Install.exe*. This contains the following programmes:

|   |
|---|
| Installation assistant                          |
| MBS BACnet-2-OPC x.x                            |
| OPC Core Components Redistributable (x64) 106.0 |
| OPC UA Local Discovery Server 1.03              |

#### Notice



Administrator rights are required for installation.

Administrator rights are also required for configuration and operation when using the *OPC DA Server*.

#### Installation procedure

After running the installation file, proceed as follows:

|           |  |
|-----------|--|
| <b>1.</b> | Language selection for BACnet-2-OPC  |
| <b>2.</b> | Choose the destination folder. The standard path is:<br>C:\Program Files (x86)\MBS GmbH\BACnet-2-OPC\  |
| <b>3.</b> | Install OPC Core Components Redistributable: <ul style="list-style-type: none"> <li>• Accept the installation</li> <li>• Accept the licence agreement (English)</li> <li>• Choose the destination folder</li> <li>• Define users (recommended: "Everyone").</li> </ul> |
| <b>4.</b> | Install local OPC UA Discovery Server, install OPC Core Components Redistributable: <ul style="list-style-type: none"> <li>• Accept the installation</li> <li>• Accept the licence agreement</li> </ul>  |

## Notice



The installation process will also install and start the *MBS GatewayService*.

The software cannot perform its functions without this service.

The service continues to run after the configuration interface has been closed.



Administrator rights are required for configuration and operation when using the *OPC DA Server*.

For more information, refer to the block diagram in chapter 4 *Structure and features*.

## Removal



Removal is carried out via the Windows system settings under *Apps & features*.

The following programs must be removed to complete this process:

|   |
|---|
| MBS BACnet-2-OPC x.x                            |
| OPC Core Components Redistributable (x64) 106.0 |
| OPC UA Local Discovery Server 1.03              |



## 7 Licensing

### General

The software is activated by means of a licence key, which permits a **single** installation on **one** Windows computer. The licensing process records a hardware-related fingerprint of the computer

The following methods are possible for this:

### Online (Automatic activation)

The destination computer needs to have an active internet connection in order to connect to the MBS licensing server as part of the licensing process.

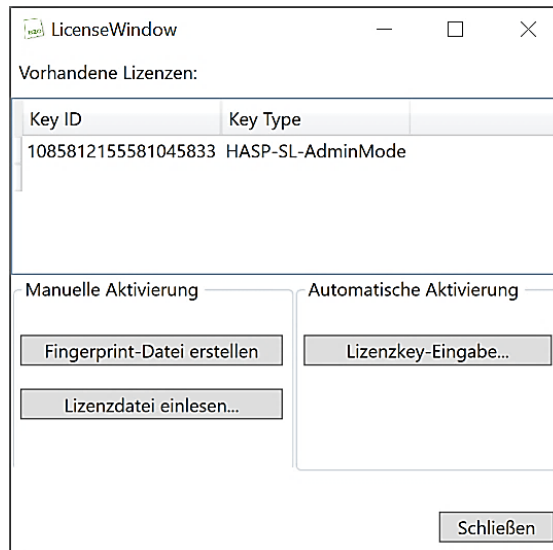
The licence key provided at the time of purchase is automatically entered and checked the first time the software is started. Thereafter, an internet connection is no longer required.

### Offline (Manual activation)

If no internet connection is available, the files must be manually transferred from the licensing server to the destination computer.

The first time the software is started, a fingerprint file for the destination computer is generated via the licensing dialogue. This file must be manually emailed to MBS Support; it is used to create an individual licence file which is sent back to the licensee via email. The licence file must then be transferred to the destination computer and input via the licensing dialogue.

## Licensing dialogue in the basic menu

| Key ID              | Key Type          |
|---------------------|-------------------|
| 1085812155581045833 | HASP-SL-AdminMode |

Manuelle Aktivierung

Fingerprint-Datei erstellen

Lizenzdatei einlesen...

Automatische Aktivierung

Lizenzkey-Eingabe...

Schließen

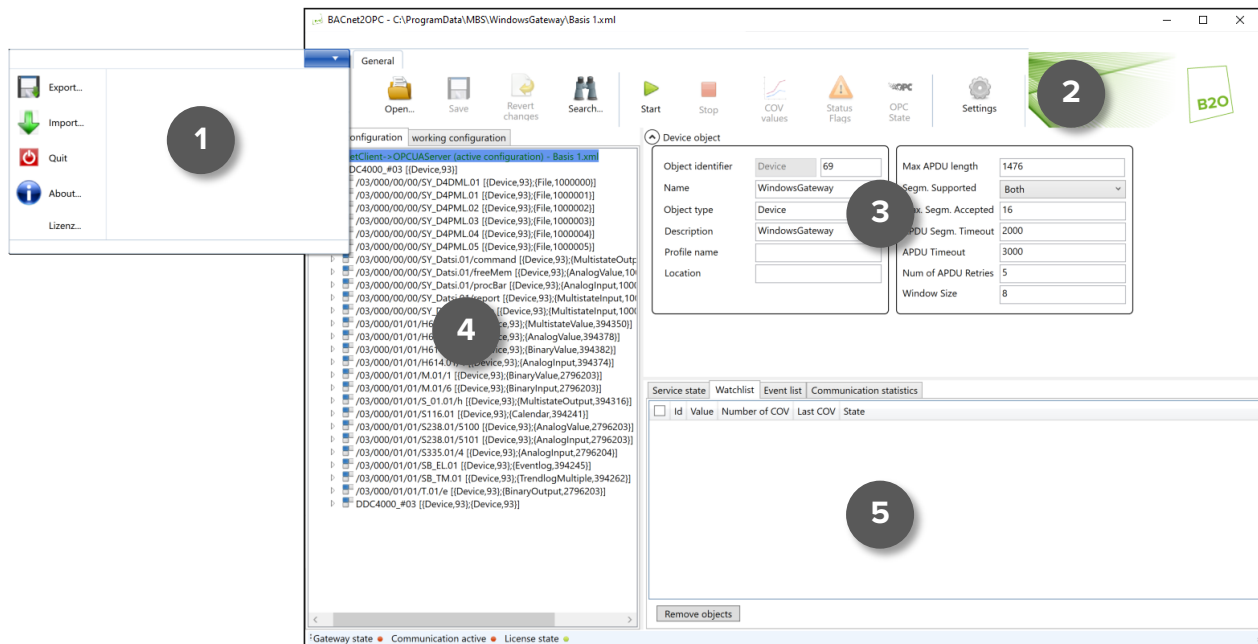
## Notice

If the software needs to be transferred to another computer at a later date, note the following:


|   |  |
|---|--|
| <p>a) If the original computer is still working.</p>  | <p>A <b>support tool</b> is used to transfer the fingerprint from the original computer to the new computer.</p> <p>In this case, MBS Support can offer assistance by providing the tool and guiding you through the procedure.</p> <p>The procedure can only be carried out in one direction; returning the fingerprint to the original hardware is not possible.</p> |
| <p>b) If the original computer is no longer working. A fingerprint cannot be transferred to the new destination computer.</p> | <p>In this case, re-licensing must be arranged with MBS Support.</p>   |

## 8 Configuration screen






### Overview








|   |                    |  |
|---|--------------------|--|
| 1 | Basic menu         | <ul style="list-style-type: none"> <li>• Exporting/importing a configuration</li> <li>• Closing the configuration screen</li> <li>• Software information</li> <li>• Licensing dialogue</li> </ul>  |
| 2 | Ribbon             | Control elements for configuration and operation of the gateway.   |
| 3 | Properties         | Properties display for the elements selected in the configuration tree.  |
| 4 | Configuration tree | <p><b>Active configuration:</b> Configuration for the ongoing operation of BACnet-2-OPC</p> <p><b>Working configuration:</b> Design area for a configuration</p> <p><b>BACnet hierarchy:</b> Configuration name /device /object / property</p> |

|   |              |  |
|---|--------------|--|
|  | Status lists | <p>Display of current operating data:</p> <ul style="list-style-type: none"> <li>- <b>Service state</b> of the active configuration</li> <li>- <b>Watchlist</b>, filled by <i>dragging and dropping</i> from the configuration tree</li> <li>- <b>Event list</b></li> <li>- <b>Communication statistics</b></li> </ul> |
|---|--------------|--|




## Configuration

|   |                |  |
|---|----------------|--|
|   | New...         | Creates a new configuration file                                     |
|  | Open...        | Opens an existing configuration file                                 |
|  | Save           | Saves the currently selected configuration                           |
|  | Revert changes | Discards all unsaved changes to the currently selected configuration |
|  | Search...      | Full text search by entries in the configuration tree                |

## Gateway operation

|   |              |   |
|---|--------------|---|
|    | Start        | Starts the gateway with the active configuration. After starting the gateway, the configuration screen is not required for operation and may be closed. |
|    | Stop         | Stops the gateway operation.  |
|    | COV-values   | Displays the PresentValue for all objects.<br>Example: „0“  |
|   | Status Flags | Displays the status flags for all objects.<br><b>!</b> „Alarm“ / <b>⚡</b> „Fault“ / <b>✘</b> „OutOfService“   |
|  | OPC Status   | Displays the OPC status for all objects.<br>„Good“ / „Bad“ / „Uncertain“  |

Example display in the configuration tree:


|   |                          |                                    |              |      |   |
|---|--------------------------|------------------------------------|--------------|------|---|
| ▶  | /03/000/01/01/H614.01/18 | [[Device,93];{AnalogValue,394378}] | <b>✘</b>     | Good | 0 |
| ▶  | /03/000/01/01/H614.01/19 | [[Device,93];{BinaryValue,394382}] |              | Good | 0 |
| ▶  | /03/000/01/01/H614.01/4  | [[Device,93];{AnalogInput,394374}] | <b>! ⚡ ✘</b> | Good | 0 |

### Notice

Operation of the gateway continues after the configuration screen has been closed.

If the option under *Settings / General / Start communication automatically* has been enabled, the gateway will automatically resume operation with the active configuration when the computer is restarted.

## Gateway settings

|   |  |  |
|---|--|--|
| <b>General</b><br> | Language                               | Choose between system language (Windows), German or English.   |
|   | Service IP address                     | Default: localhost   |
|   | Service http port                      | Default: 9000  |
|   | Loglevel                               | Error / Normal / Debug   |
|   | Start communication automatically      | Yes / No<br>Starts the MBS GatewayService with the <i>active configuration</i> when the computer is restarted. |
|   | Sorting                                | By name/by instance number   |
|   | Updating COV value display             | Default: 5 seconds   |
|   | CSV separator                          | for EDE file:<br>Semicolon/comma/tab   |
| <b>BACnet client settings</b><br>BACnet general   | Device search                          | Settings for device searches on the BACnet side of the gateway.  |
|   | Build OPC node names from object names | On / Off   |
|   | OPC NodeIDs numeric                    | On / Off   |
| Network settings  | Deactivate BACnet routing              | On / Off   |
|   | Data link                              | IP / Ethernet  |
|   | Network adapter                        | Select the network card for operation of the gateway.  |
|   | UDP port                               | BACnet default: 47808  |
|   | IP mode                                | Normal / BBMD / Foreign device   |




|                                 |  |
|---------------------------------|--|
| <b>Specification datapoints</b> | Preselection of frequently used objects and properties for data point transfer in the configuration. Data points not expected to be used can be deselected here. |
| <b>Writing data values</b>      | Approval of describability of data points from OPC to BACnet.  |

## 9 Configuration examples

### Initial configuration

1. Define which network adapter of the computer shall be used:

 General / BACnet client settings / Network adapter

2. Create new configuration:

 New... / Name of configuration / select OPC server type

The standard path for the configuration file is

*C:\ProgramData\MBS\WindowsGateway*

3. Assign the object identifier in the “Device object” configuration area and click <Save>.



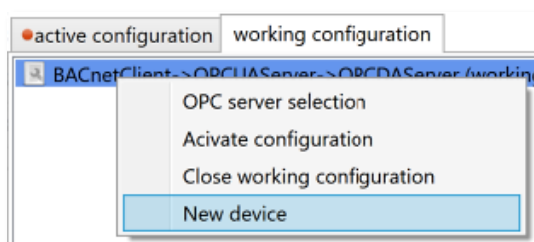
Device Objekt

|                   |              |
|-------------------|--------------|
| Objekt Identifier | Device       |
| Name              | BACnet-2-OPC |

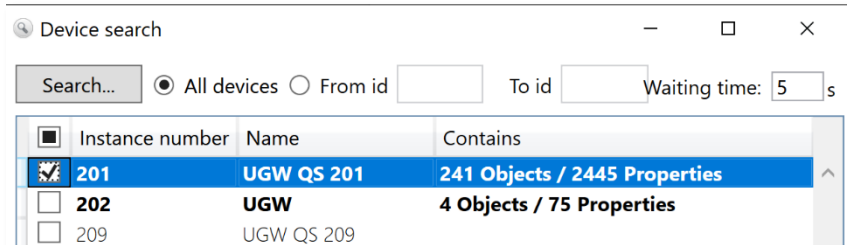
### Notice

The BACnet device ID may **not be assigned more than once** within a network. The possible address range is 0 to 4194303.

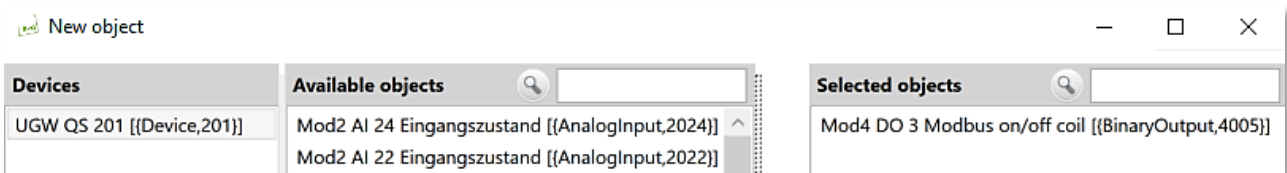
4. Add a device for configuration  
(context menu in the configuration tree):



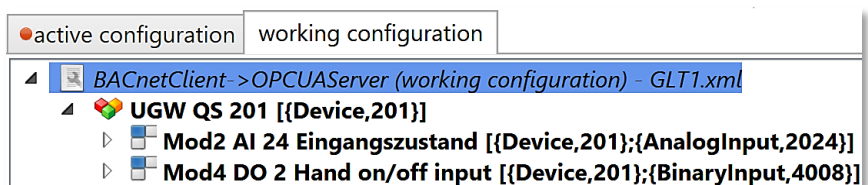
5. <Search>, select the device, <Scan device(s)> (Objects/Properties), <Apply>:




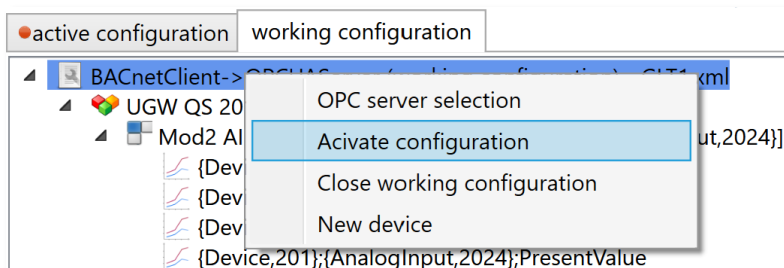
6.  Remove / add objects 




7. Added objects are managed in the configuration tree. Unsaved configurations are shown in **BOLD**.



8.  Save and Activate configuration (context menu).



9.  The active configuration is initiated with <Start>.

## Notice

Operation of the gateway continues after the configuration screen has been closed and after the computer is restarted.

See the section *Gateway Start communication automatically*.

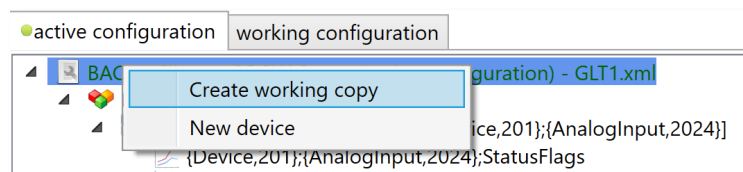
## Modifications (examples)

## Notice

The following modifications to the configuration can also be made during ongoing operation under the *Active configuration* tab. Any changes take effect as soon as <Save> is clicked. It is not necessary to terminate the gateway communication with <Stop>.

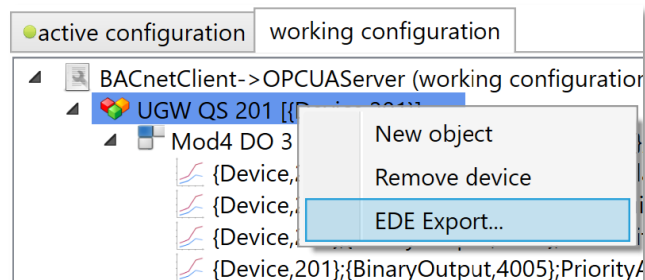
### Create working copy

A *working configuration* can be created from an *active configuration* in order to make modifications outside of the active configuration.



### Engineering Data Exchange EDE Export

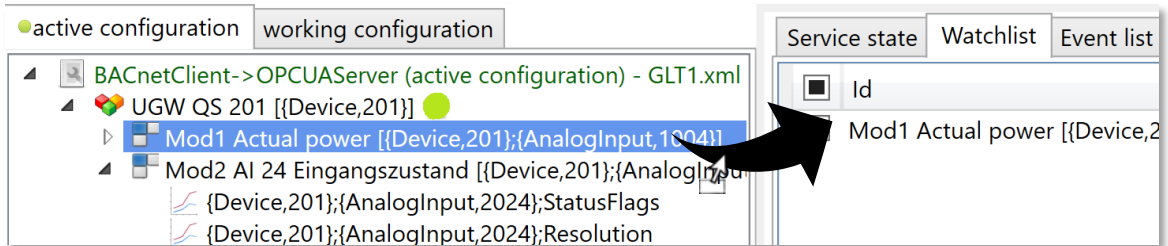
The export process for an object's data point lists is initiated via the context menu in the configuration tree.



**Fill watchlist**

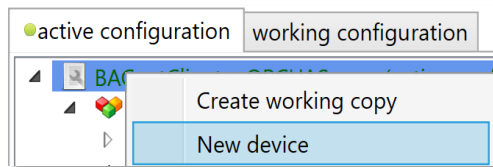
The watchlist is filled by dragging and dropping from the configuration tree or via <Watch> (context menu).

<Remove objects> deletes the entries again.

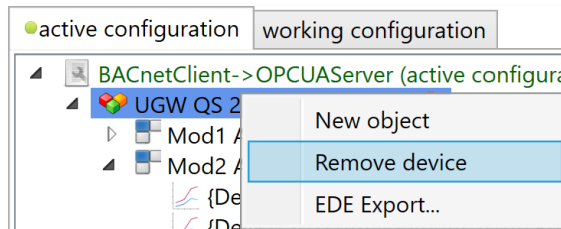


**Add / remove device**

Add devices (context menu):

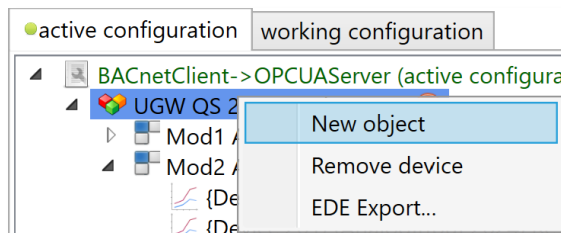


Remove devices (context menu):

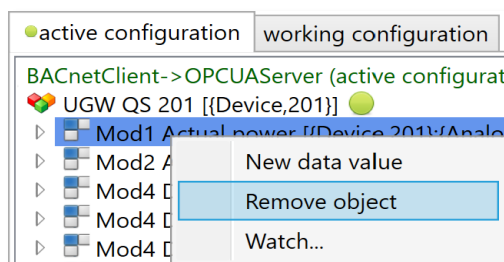


**Add / remove object**

Add object to the device (context menu):

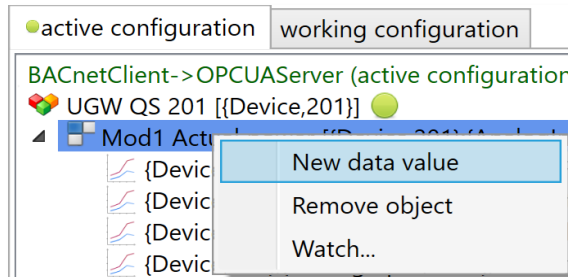


Remove object (context menu):

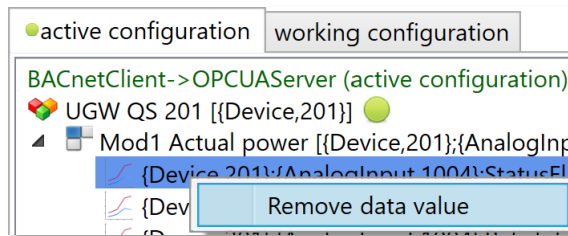


**Add / remove data value**

Add data value (context menu):

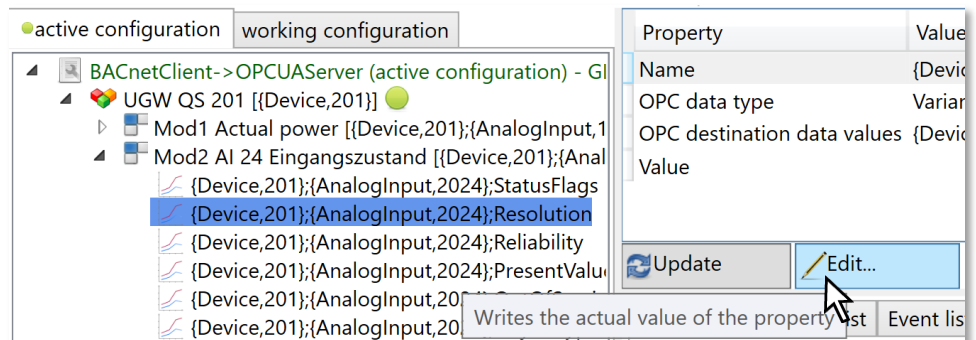


Remove data value (context menu):



**Edit data value**

Edit the current value of a data point:



This is possible only during ongoing gateway communication!

## Notice

Gateway communication must be halted with <Stop> to make the following modifications to the configuration.

### Change the gateway's BACnet client properties

Stop gateway communication and mark the BACnet client in the configuration tree.

Change the properties under *Device object*:

Device object

|                   |                |    |                     |      |
|-------------------|----------------|----|---------------------|------|
| Object identifier | Device         | 69 | Max APDU length     | 1476 |
| Name              | BACnet-2-OPC   |    | Segm. Supported     | Both |
| Object type       | Device         |    | Max. Segm. Accepted | 16   |
| Description       | WindowsGateway |    | APDU Segm. Timeout  | 2000 |
| Profile name      |                |    | APDU Timeout        | 3000 |
| Location          |                |    | Num of APDU Retries | 5    |
|                   |                |    | Window Size         | 8    |

### Change device properties

Stop gateway communication and mark the device in the configuration tree.

Change the *Communication settings*:

Communication settings

|                                |  |
|--------------------------------|--|
| Client poll                    | <input type="checkbox"/>   |
| Poll interval [sec]            | <input type="text"/>   |
| COV resubscribe interval [sec] | <input type="text"/>   |
| COV resubscribe time           | <input type="checkbox"/> <input type="text"/> : <input type="text"/> |

## 10 FAQs

### The computer's gateway communication is not running properly or not running at all.

- a) The computer's Windows Defender firewall is blocking BACnet or OPC communication.
- b) Firewalls in the network are blocking the UDP port used.
- c) Firewalls in the network are blocking the OPC UA port used (default 61510).
- d) The device ID for the gateway is assigned multiple times in the network (see Initial configuration step 3).
- e) Other applications (e.g. BACeye) are also using the UDP port defined on the BACnet client side (default 47808).
- f) The BBMD configuration is incorrect.
- g) The computer was assigned a new IP address following a restart (dynamic IP address assignment).  
  
The previous IP address is still saved in the settings (see Initial configuration step 1). The gateway tries to start automatically but cannot then communicate with the BACnet devices.  
  
The IP address for the network adapter should be statically assigned, if possible.





## 11 Product support

|                      |   |
|----------------------|---|
| <b>Manufacturer</b>  | MBS GmbH<br>Römerstraße 15<br>47809 Krefeld       |
| <b>Telephone</b>     | +49 21 51 72 94-0                                 |
| <b>Fax</b>           | +49 21 51 72 94-50                                |
| <b>E-Mail</b>        | support@mbs-solutions.de                          |
| <b>Internet</b>      | www.mbs-solutions.de                              |
|                      | wiki.mbs-software.info                            |
| <b>Service times</b> | Monday to Friday: 8:30 to 12:00<br>13:00 to 17:00 |

## 12 Other sources of information

|   |  |
|---|--|
| <p>ANSI/ASHRAE Standard<br/>135-2016<br/><i>BACnet - A Data<br/>Communication Protocol<br/>for Building Automation<br/>and Control Networks<br/>(ANSI Approved)</i></p> | <p>The official standard work of ASHRAE on the subject of BACnet outlines the complete ASHRAE standard 135-2016 (BACnet).<br/>A number of supplements and appendices to this work can be accessed via the BACnet homepage (<a href="http://www.bacnet.org">www.bacnet.org</a>). The literature can be obtained from:<br/>cci Dialog GmbH, PO Box 1910, D-76007 Karlsruhe, Germany (<a href="http://cci-dialog.de">cci-dialog.de</a>) or directly from ASHRAE's online bookstore (<a href="http://www.ashrae.org">www.ashrae.org</a>)</p> |
| <p>DIN EN ISO 16484</p>   | <p>DIN EN ISO 16484-5:2017-12 (E)<br/>Building automation and control systems (BACS)<br/>Part 5: Data communication protocol<br/><br/>DIN EN ISO 16484-6:2014-09 (E)<br/>Building automation and control systems (BACS)<br/>Part 6: Data communication conformance testing</p>   |
| <p><a href="http://www.bacnet.org">www.bacnet.org</a></p>   | <p>Official homepage of ASHRAE on the subject of BACnet; probably the most important source of technical information on BACnet.</p>  |
| <p><a href="http://www.big-eu.org">www.big-eu.org</a></p>   | <p>Homepage of BACnet Interest Group Europe (BIG-EU), containing information on the activities and events of the BACnet Interest Group Europe e.V.</p>   |
| <p><a href="http://www.mbs-solutions.de">www.mbs-solutions.de</a></p>   | <p>Homepage of MBS GmbH, providing information about our all-round service, tailor-made software and hardware development, OEM products, consulting, training and support, as well as on-site commissioning.<br/><br/>MBS has been an innovator in industrial and building automation for over 30 years, providing state-of-the-art hardware and software and supporting its customers with technical solutions<br/>– Made in Germany.</p>   |