TECH NOTE :: ClipX as OPC-UA server
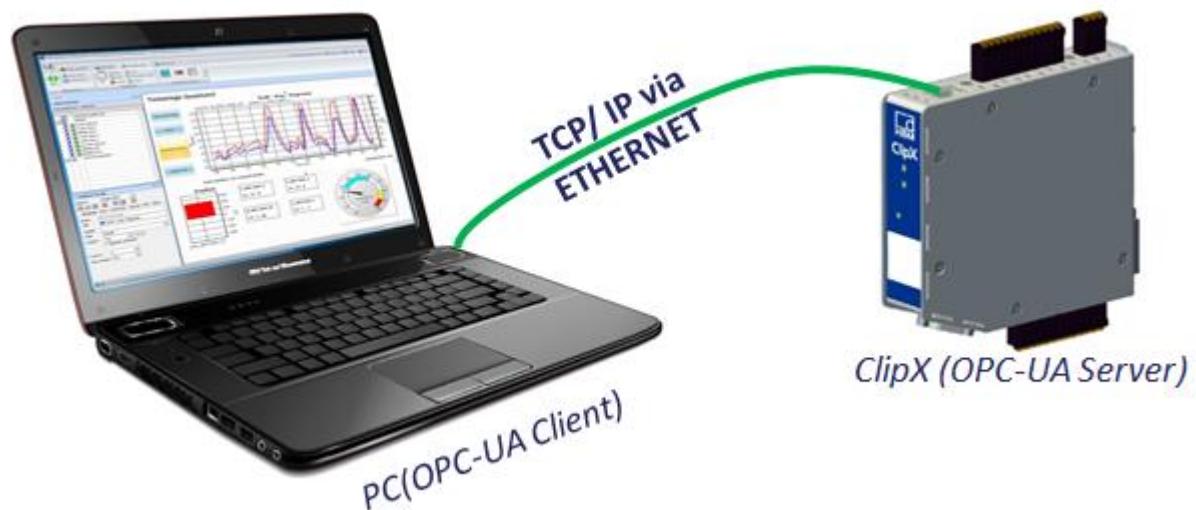
Version: 2018-11-20
Author: Michael Guckes
Status: HBM: Public

Brief description

This is a quick guide for using a ClipX-module as an OPC-UA server by controlling it with a pc.

In the following examples, the Software 'dataFEED' of the Company Softing is used. The Software can be downloaded via the following link (free account must be created):

https://data-intelligence.softing.com/de/produkte/opc-software-plattform/datafeed-opc-suite/#tx-dftabs-tabContent2


Building sketch

Introduction

OPC Unified Architecture

OPC Unified Architecture (short OPC UA) is developed by the OPC Foundation. It is a TCP/IP based communication technology, which makes it possible not only to transmit machine data, but also to describe it machine-readable semantically. OPC-UA allows the user an independent exchange of data and information in the field of the industrial automation and is also designated as M2M (machine-to-machine) communication protocol.

This technology brings a lot of advantages for the user:

- The new network and communications technologies enable processes to be streamlined and made more transparent
- Production control becomes easier, since it is extensively automated and remote-controlled
- The systems themselves report on their "health", which optimizes maintenance
- Using modern systems in the IIoT helps lower manufacturing costs while boosting quality and speed
- Deployment of a lot of manpower and staff trainings is no longer required.

Furthermore, OPC-UA covers a large part of the three-dimensional reference architecture model for Industry 4.0:
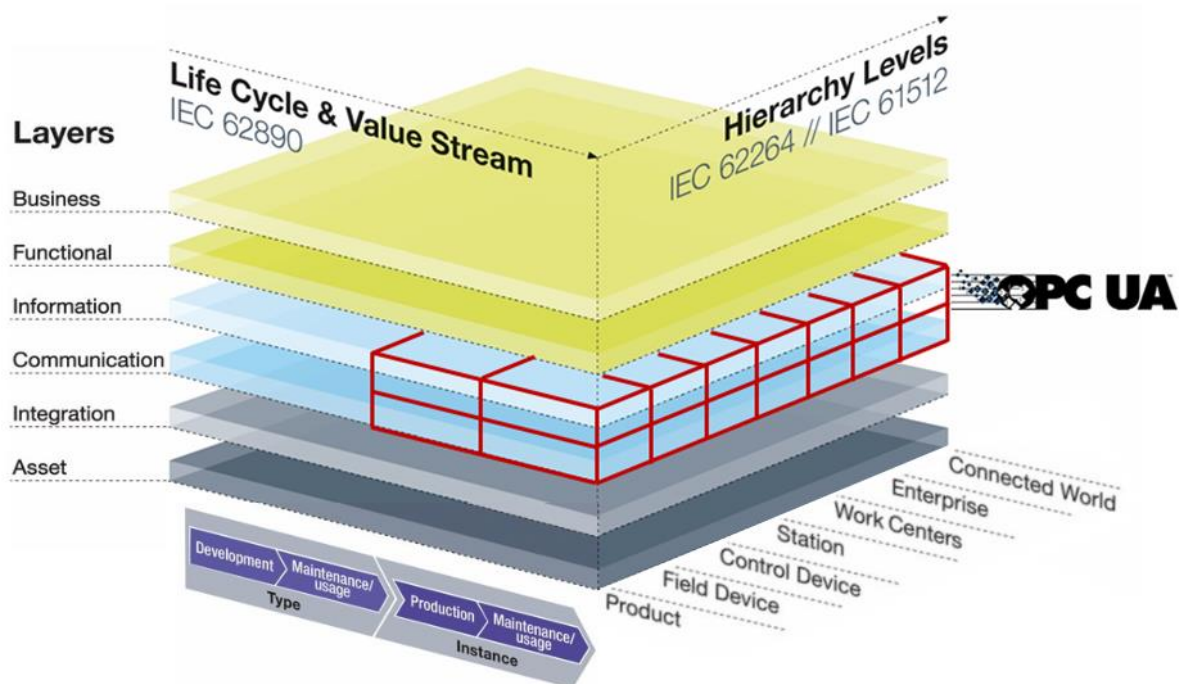
Connecting the PC (Client) to the ClipX OPC-UA Server

To control the ClipX OPC-UA server via a client (e.g. PC(C#), OPC-UA client, scada systems with OPC-UA), the client is connected via an Ethernet cable to the Ethernet port of the ClipX. The ClipX module can be connected directly to the client (Building sketch on page 1), or - to use several modules – via a switch (figure below).
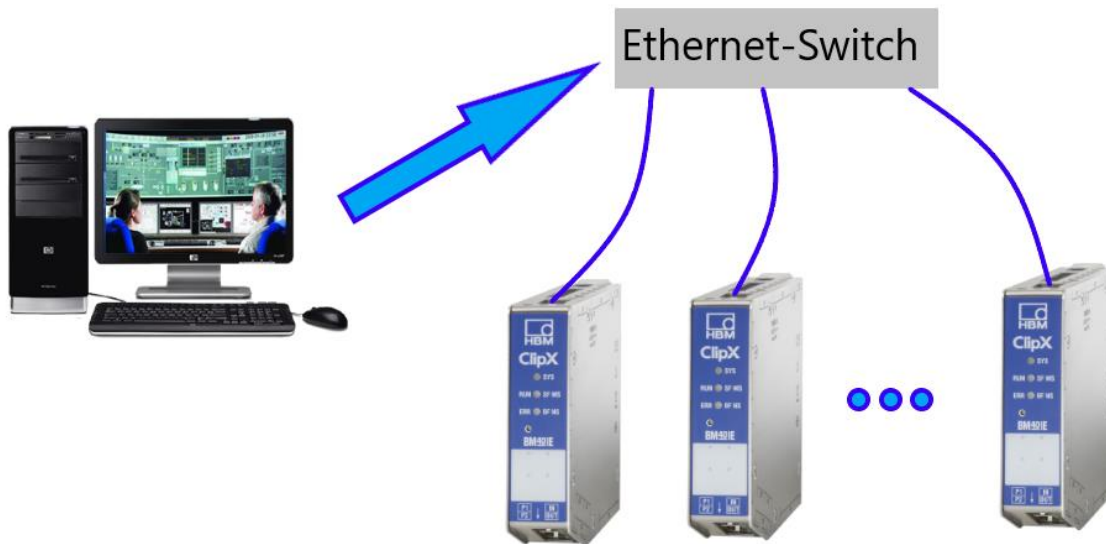

Figure: Connection of several ClipX-modules (OPC-UA Server) with a PC (Client)

This way up to several hundred ClipX modules can be controlled and used as a server. Optional the ClipX modules can be interconnected via the ClipX-bus (max. 6 modules), whereby only one module per group hast to be connected to the switch or the client.

- Data rate up 20 Hz with NTP(Network Time protocol)-time-stamp (jitter up to 50ms)
- Up to 2 Sessions per device
- 1 subscription per device
- Up to 4 values per device
- All measured values and calculated channels are simultaneously available as data from the fieldbus
- Sampling interval 50ms
- Publishing interval 100ms (Queue size 1…10)
- Full configuration with commands of the software (C#) or the OPC-UA client

Outlook:

Furthermore an intelligent, networked and communicating production environment will be created, whereby maintenance, operation and the production process can be improved and simultaneously costs can be lowered.
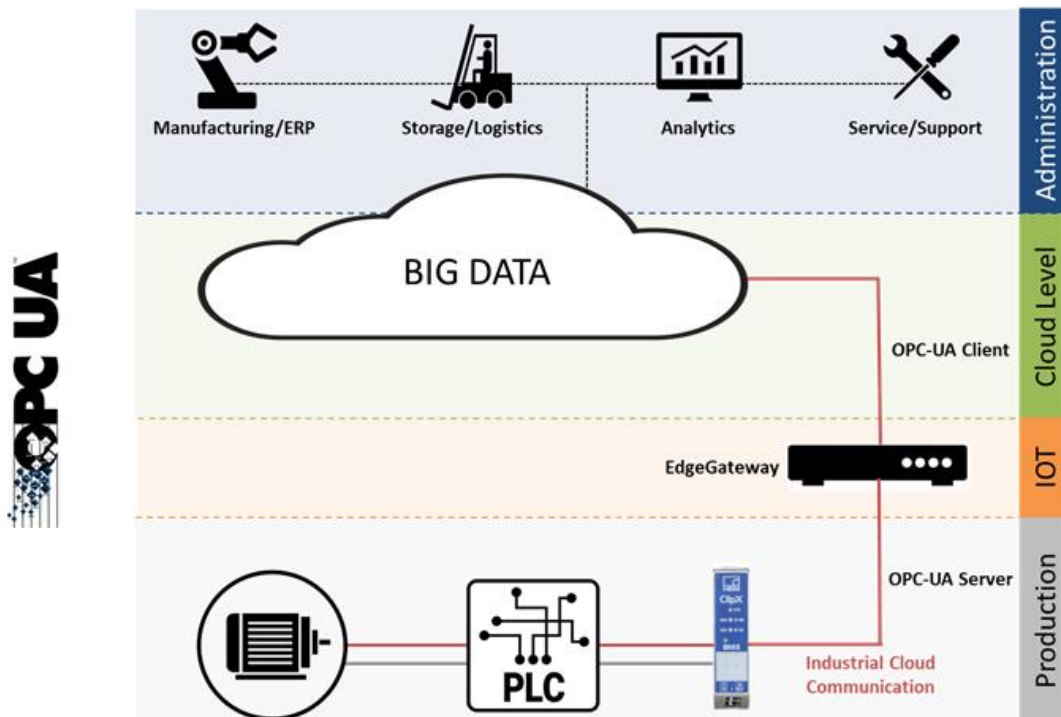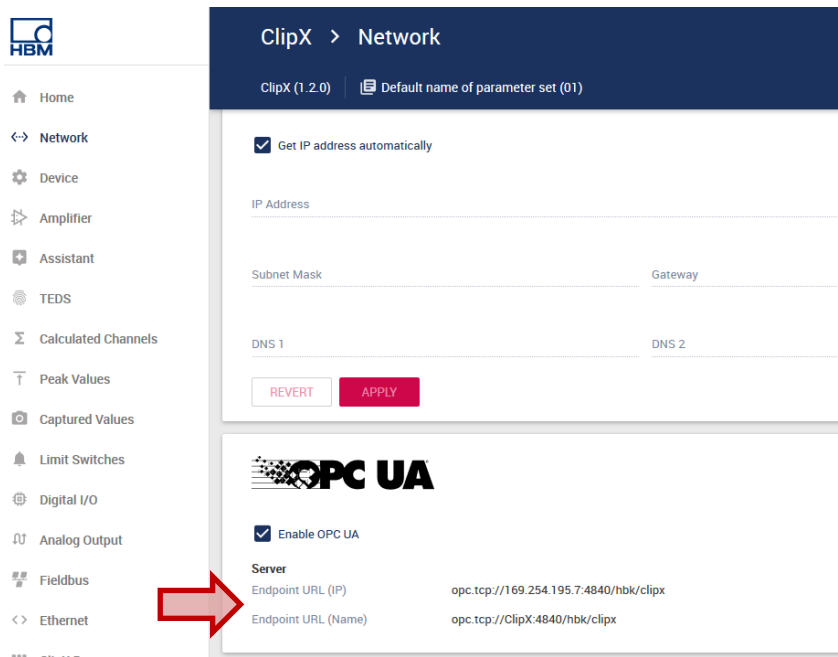

Figure: Example of integration into the Cloud

Set up

In the following, a few examples are shown, which illustrate using OPC-UA with the software 'dataFEED' of the company Softing.

To link the ClipX module with the software, the Endpoint-URL (IP or name) of the ClipX is required. This can be found in the ClipX network settings:

Now the device will be added in dataFEED. Therefor open dataFEED and double-click 'Double Click to add Session'. The window (shown below) will be opened. In this window, the session name and the Endpoint-URL has to be added. After that, confirm by clicking 'OK'.
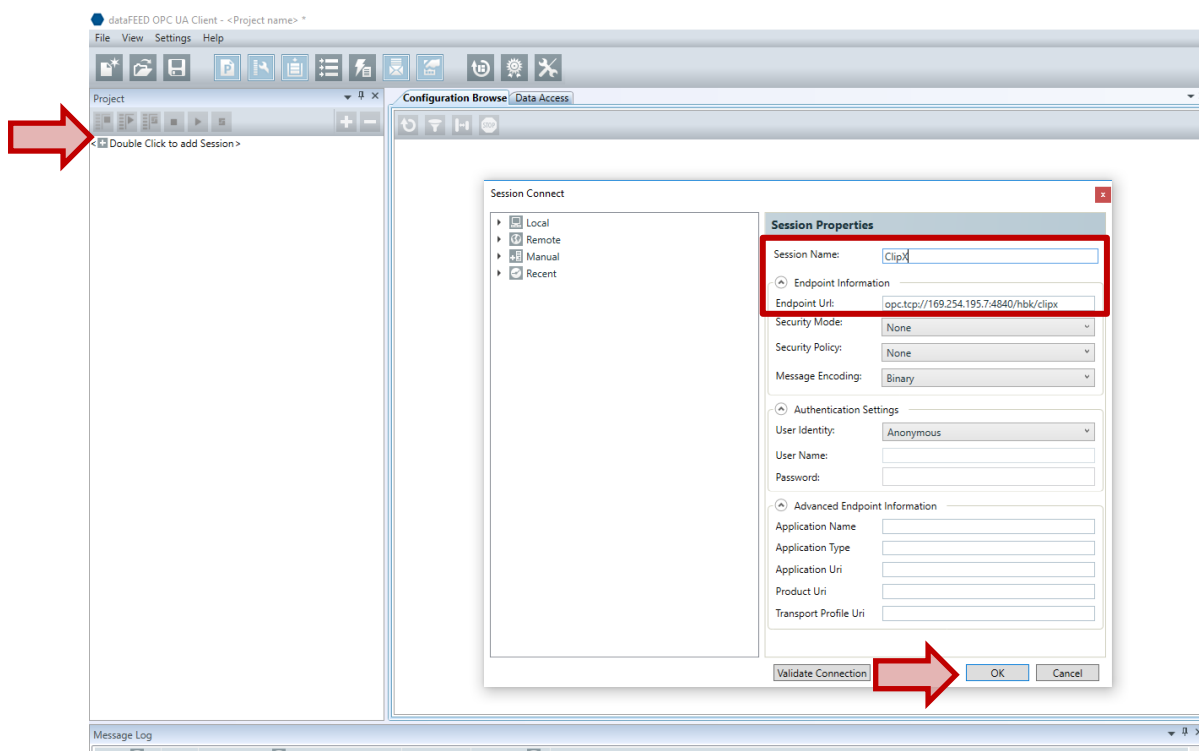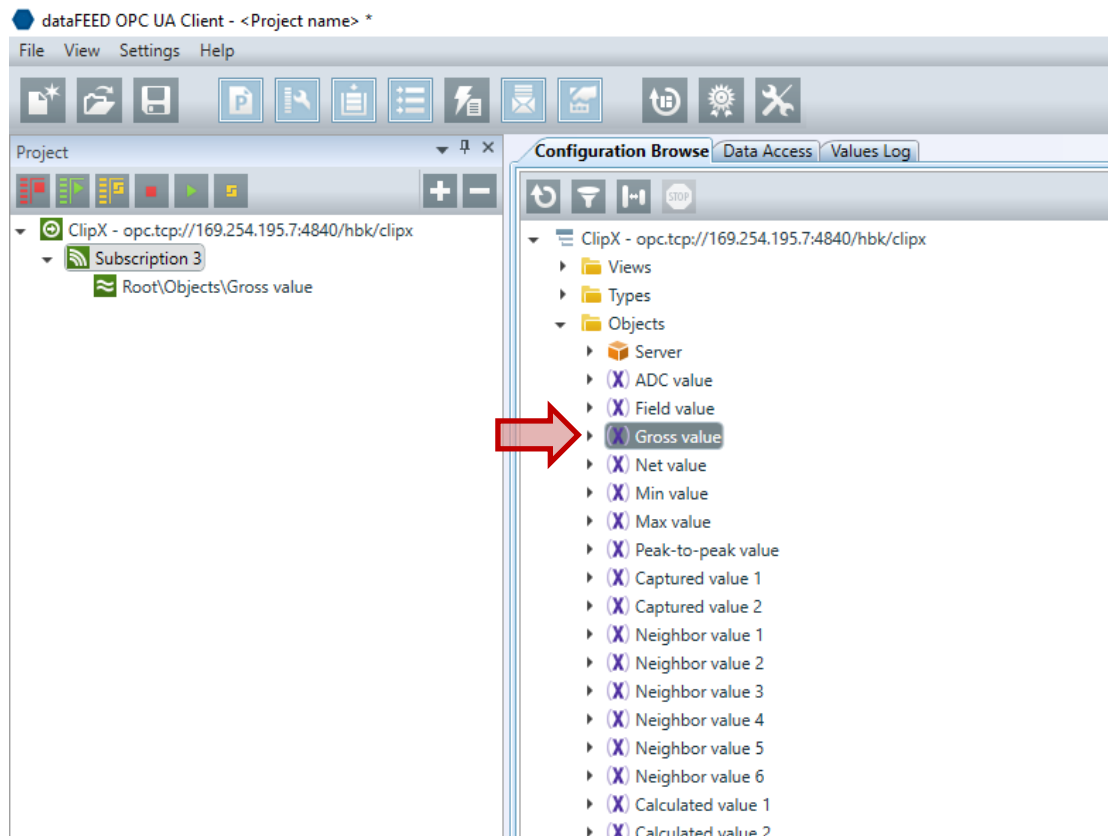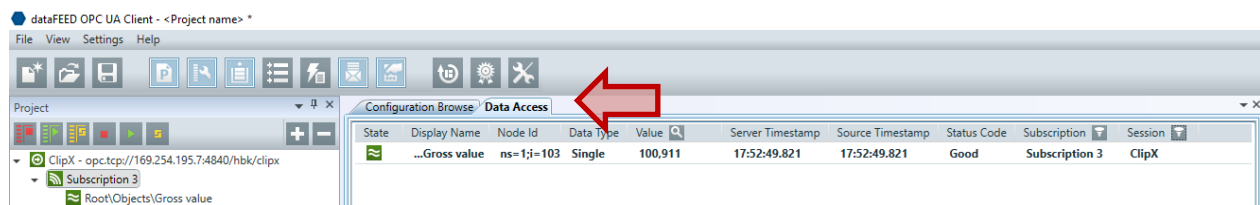
Examples

Monitoring a Signal

Now a Signal should be added to 'Data Access'.

- Open, as shown below, the folder 'Objects' and add a signal by double-clicking it.
- In our example we add the signal 'Gross-value':

The signal is now also listed at the left side in the menu item 'Subscription'.

- Double-click 'Data Access' to open the list with the chosen signals

Here you can see your signal with its actual value, a time stamp and the actual status of the signal (Good/Bad). This will quickly tell you, if a signal is valid or not.
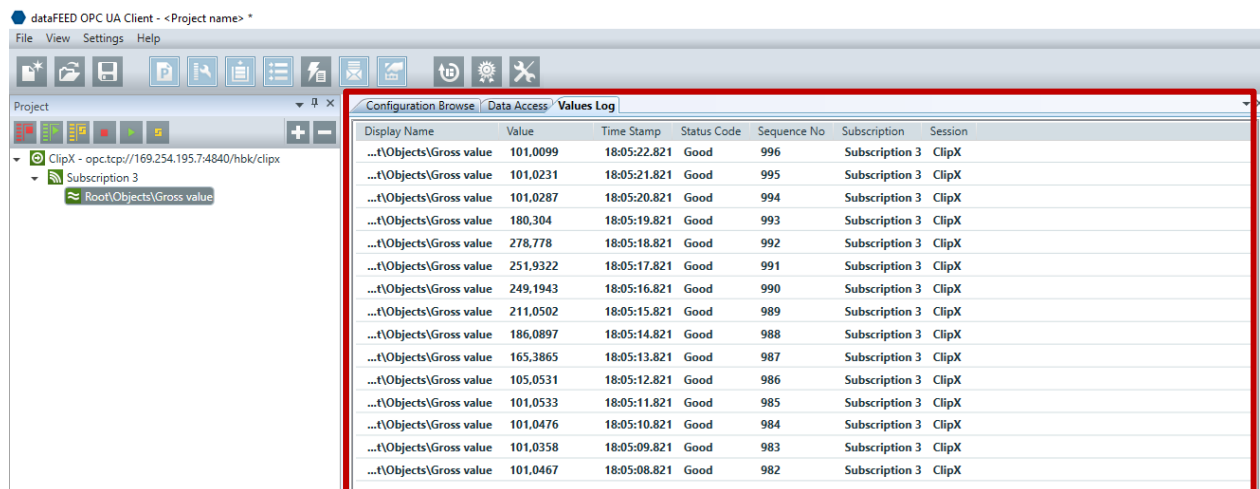
Logging a signal

Now the values of an added signal should be logged.

- Switch to the window 'Data Access'
- Right click the signal, which values should be logged
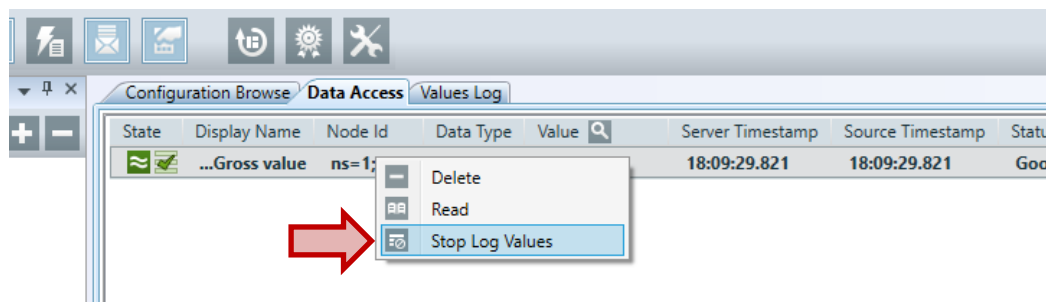- Select 'Start Log Values'
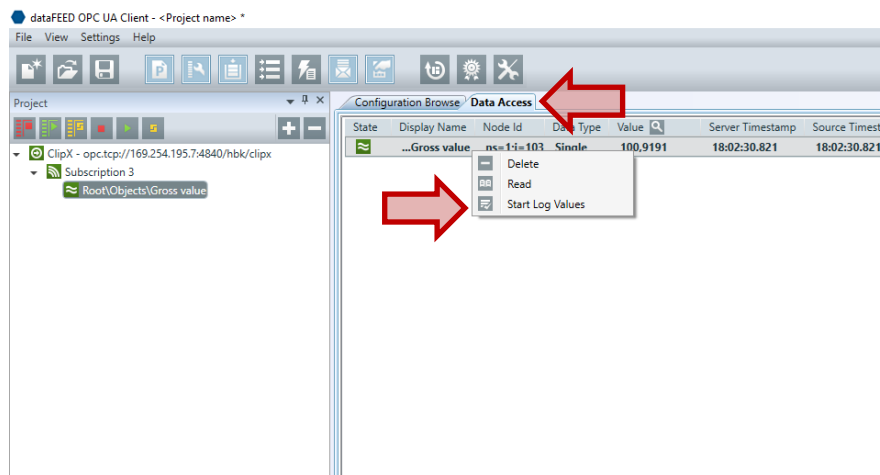
- The window 'Values Log' opens automatically, in which the values are entered
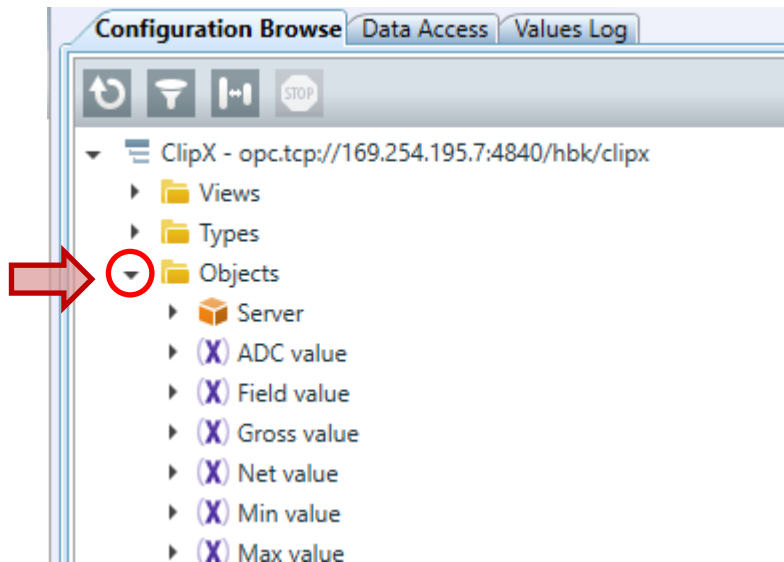

Stopping the log:

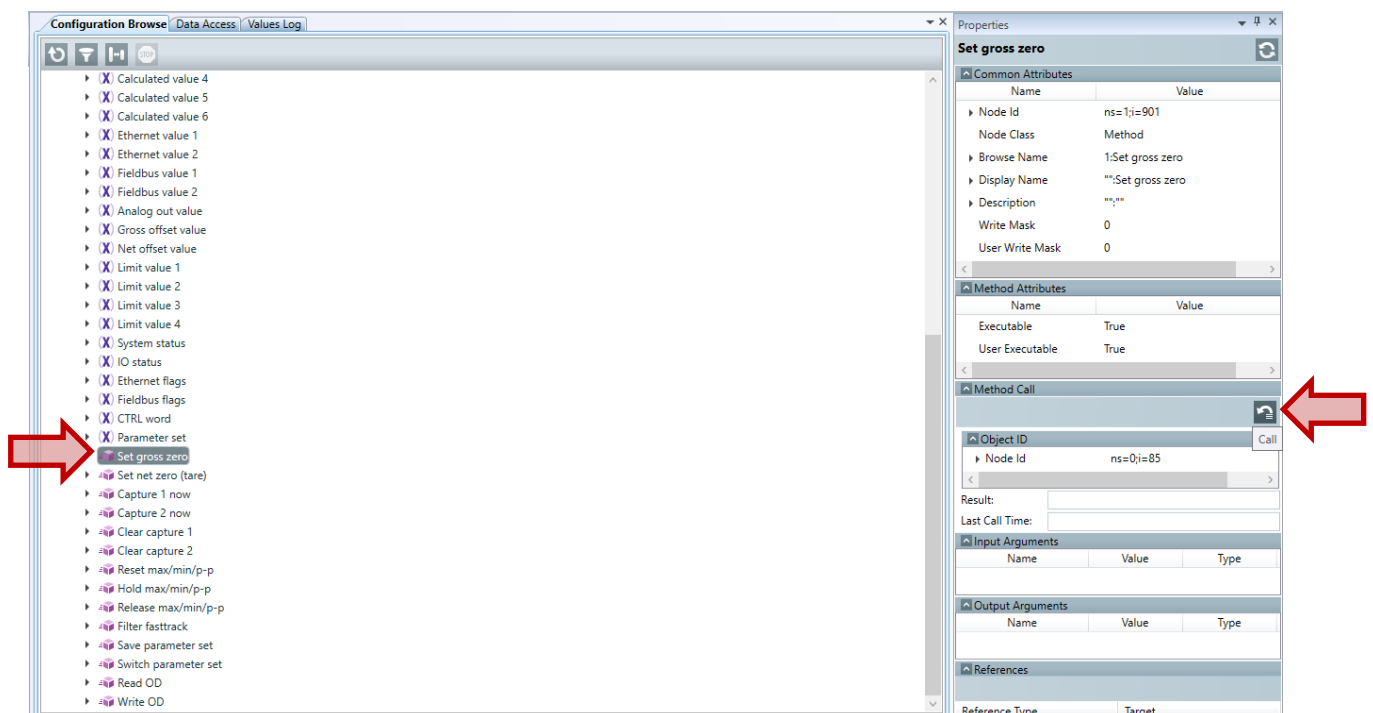- At 'Data Access', right click the signal
- Select 'Stop Log Value'

Function call „Set … zero"

In this example we want to set our gross value to zero.

- Open the folder 'Objects'

- To set the value, select 'Set gross zero' in the list
- After that, click on the symbol at the menu item 'Method Call' on the right side to call the function

- Now the value is zeroed

Function call „Object directory read/write"

Preparation: To read the object directory or write in it, the following data is required:

Task	Read	Write
Index	Yes	Yes
Subindex	Yes	Yes
Value & Type	No	Yes

Therefore, the object directory of the ClipX has to be downloaded. (ClipX menu item 'Device Storage'; clipx_od.csv)

In our example we want to read from the object directory, which filter is currently used.
After that, we want we want to set the filter from Bessel (=3) to Butterworth (=2).

The following data can be taken from the csv-file:

|	A109		f_x	measval/					
	A	B		Idx	SubIdx	Type	Access	Description	H	I
1	Path	Name		Idx	SubIdx	Type	Access	Description		
105	teds/	usrDefIdStr		0x4300	22	STRING	RO	User defined ID		
106	teds/	uccStr		0x4300	23	STRING	RO	UCC string		
107	measval/	transdModeEnum		0x4400	1	UINT8	RWS	Transducer and mode enum		
108	measval/scaling/	pt100OutUnitEnum		0x4400	3	UINT8	RWS	PT100 output unit 0:degC, 1:degK, 2:degF		
109	measval/	filterType		0x4401	1	UINT8	RWS	Filter type, 3=Bes, 2=But		
110	measval/	filterCutOffFreq		0x4401	2	FLOAT	RWS	Filter cut-off frequency in Hz		

Index = 0x4401   Subindex = 1   Type = UINT8 → corresponds to Byte

Read:
- In the list 'Objects', select the item 'Read OD'
- On the right side, the input arguments can be entered (index and sub index)

- The reading is started by clicking the button at 'Method Call'
- The read value appears below at the item 'Output Arguments'
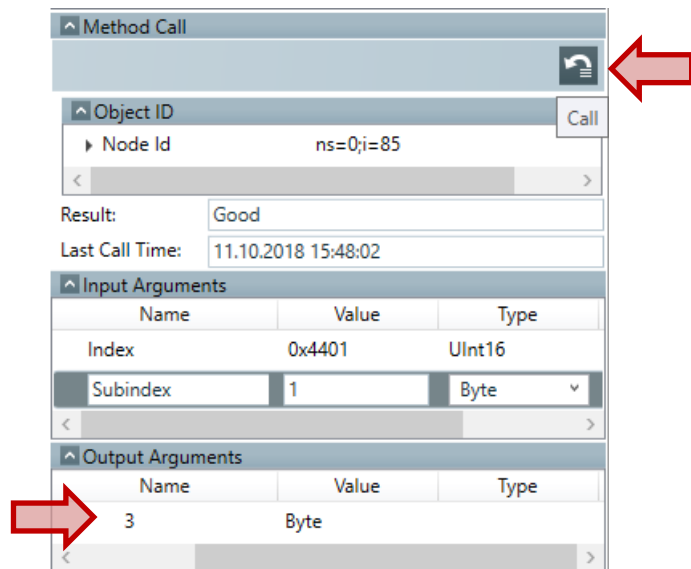
The displayed value is in our example 3, which stands (as you can see in the csv-file) for the Bessel filter.

Write:

Now we want to set the filter to 'Butterworth'. This filter corresponds, as you can see in the csv-file, to the value 2.

- In the list 'Objects', select the item 'Write OD'
- In the right column, the input arguments (index, sub index and value) are entered

Hint: Be sure to select the correct type. If a wrong type is selected, you will receive an error message. In our case, the type is 'UINT8' or 'Byte'.
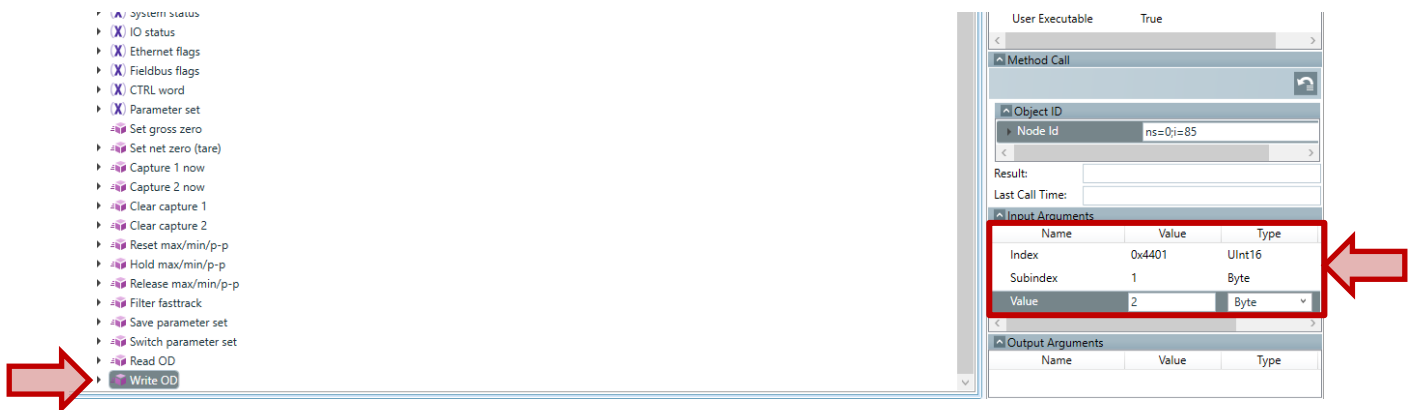
- After that, the writing is started by clicking the symbol at the item 'Method Call' on the right side
- Below at 'Result' you will receive the feedback 'Good', if the writing was successfully
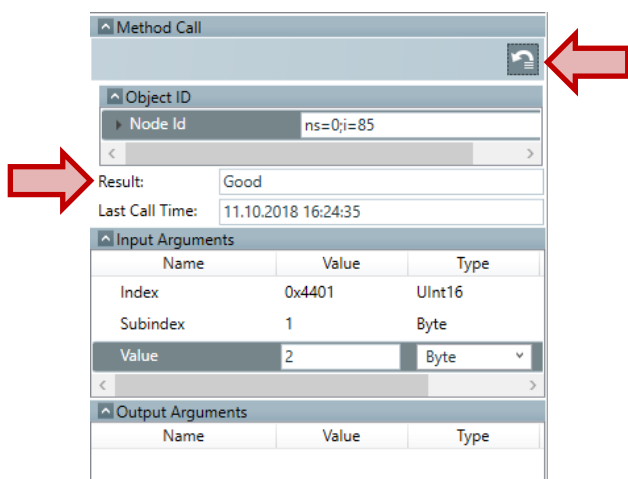
Now the filter is changed.

Disclaimer

These examples are for illustrative purposes only. They cannot be used as the basis for any warranty or liability claims.