

## **IEC 61850 Goose Protocol Description for Earthfault-Detection-Relay EOR-3D**

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Release Date:



## Content

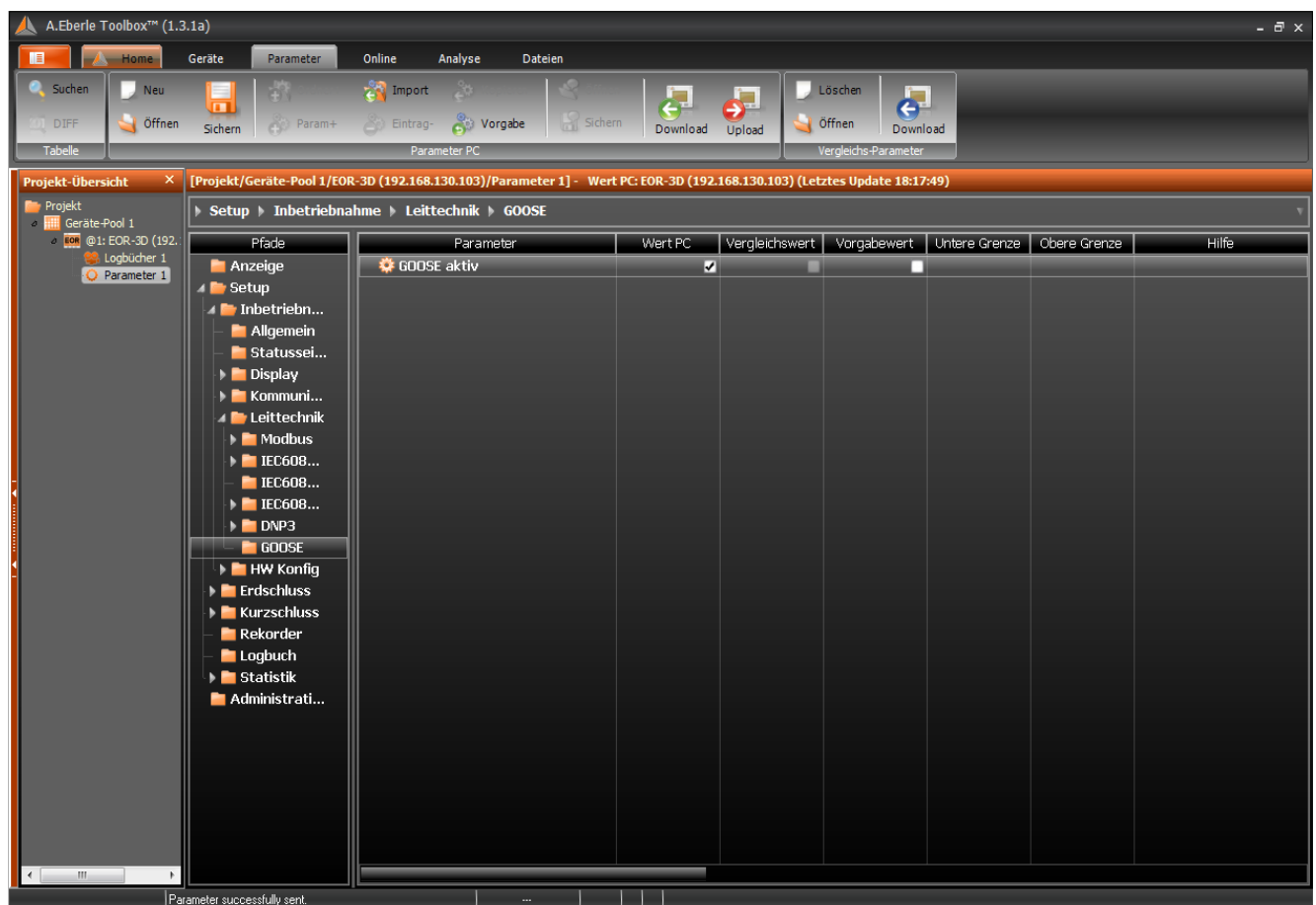
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## 1 IEC 61850 Goose Protocol

This document describes the characteristics of the IEC 61850 goose communication protocol of EORD-3D device.

## 2 IEC 61850 Goose Toolbox

- Goose active (disable - 0 / enable - 1)  
 --> On a changed from 0 to 1 the IEC 61850 goose slave starts



Picture 1: Toolbox enable

## 3 SCL-CONFIG-E3D

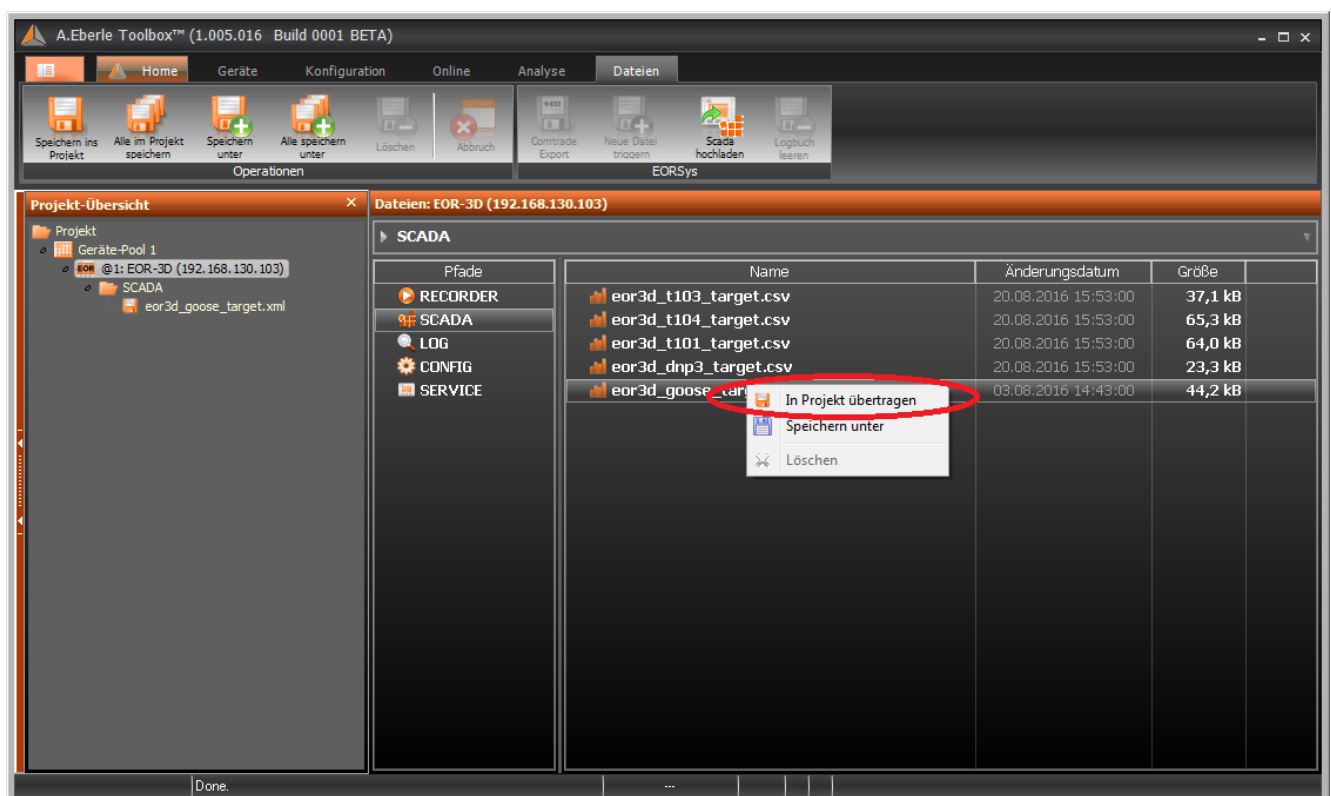
### 3.1 Task

- Editing XML GOOSE configuration
- Creating XML GOOSE configuration
- Support GOOSE configuration from Third-party software

### 3.2 Start

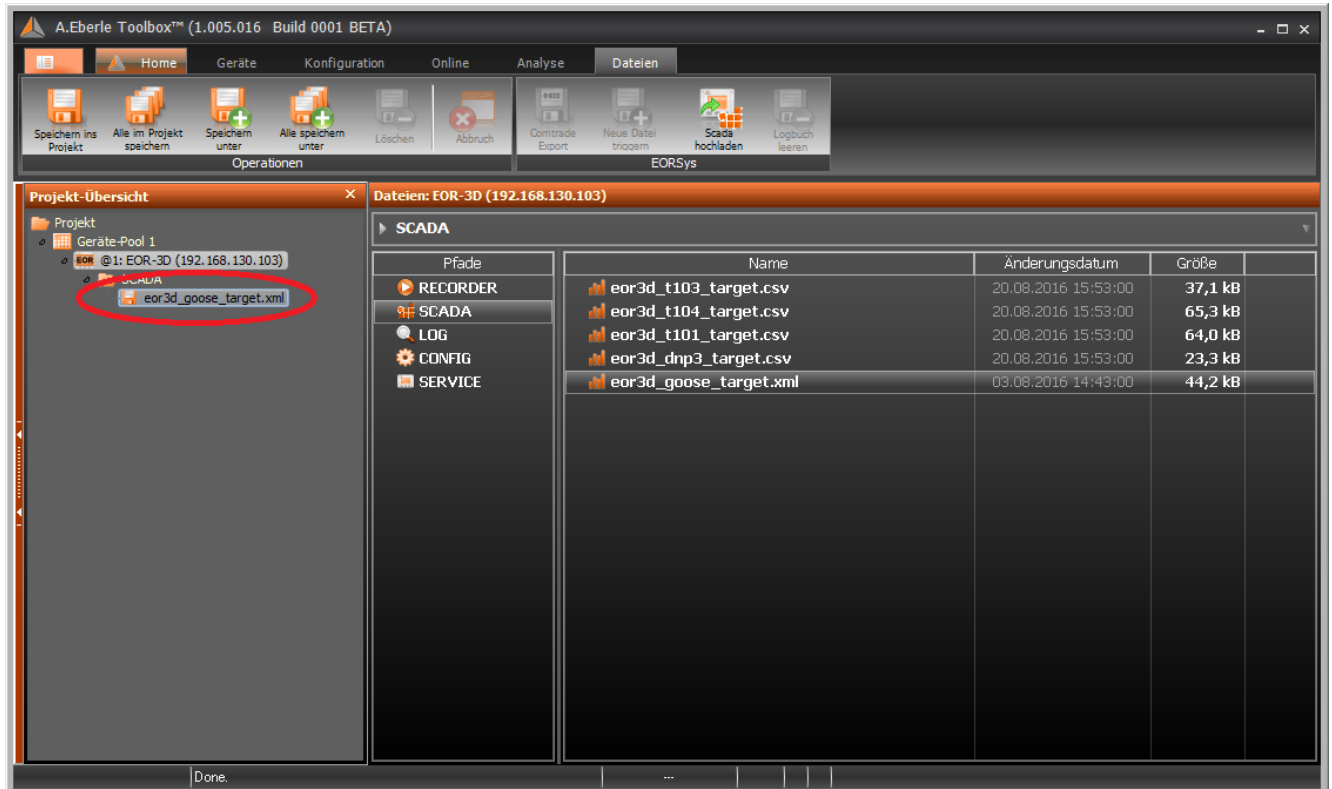
#### 3.2.1 Start from Toolbox

Use the Toolbox file panel to download the GOOSE XML configuration.



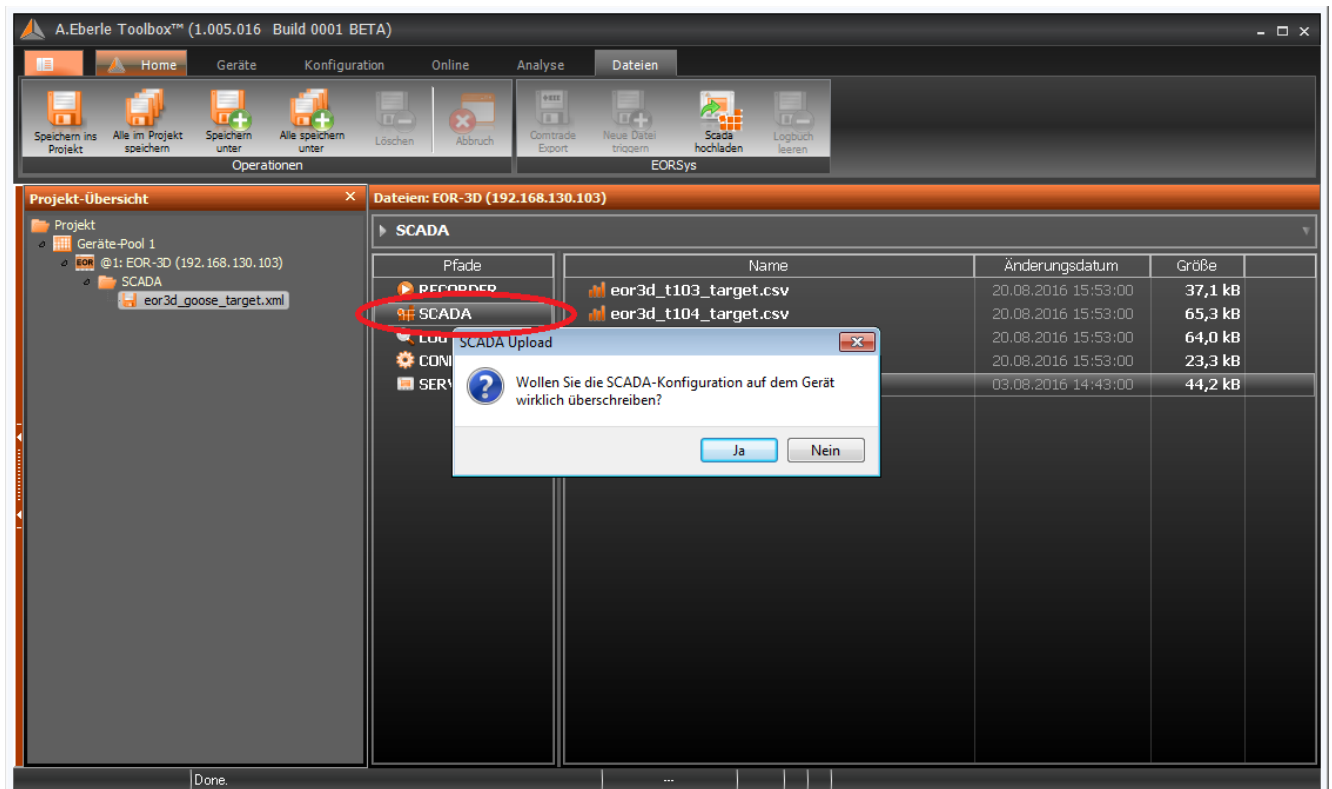
Picture 2: Download GOOSE XML

Start the SCL-Config with click on the GOOSE XML file, the Editor will start.



Picture 3: Start editor

Upload the GOOSE XML file after changing, to the device, with drag and drop to the SCADA entry.



Picture 4: Upload GOOSE XML

### 3.2.2 From Batch File

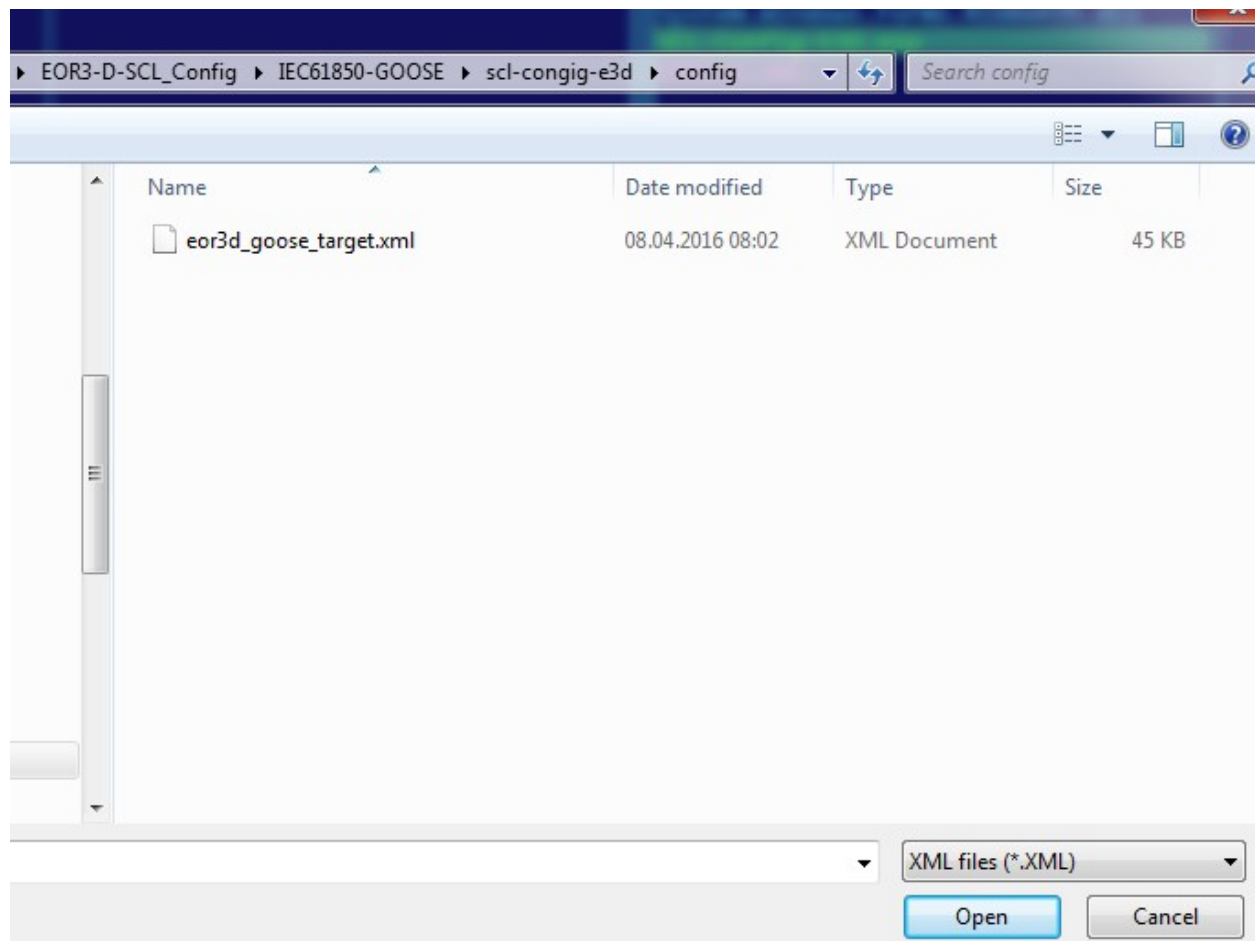
- Command line: SCL-Config-E3D.exe -e 5 -x "..\config\eor3d\_goose\_target.xml"
- or as normal windows application

### 3.2.3 From Third-party software

- SCL-Config-E3D.exe -e 5 -x "..\path\eor3d\_goose\_target.xml"

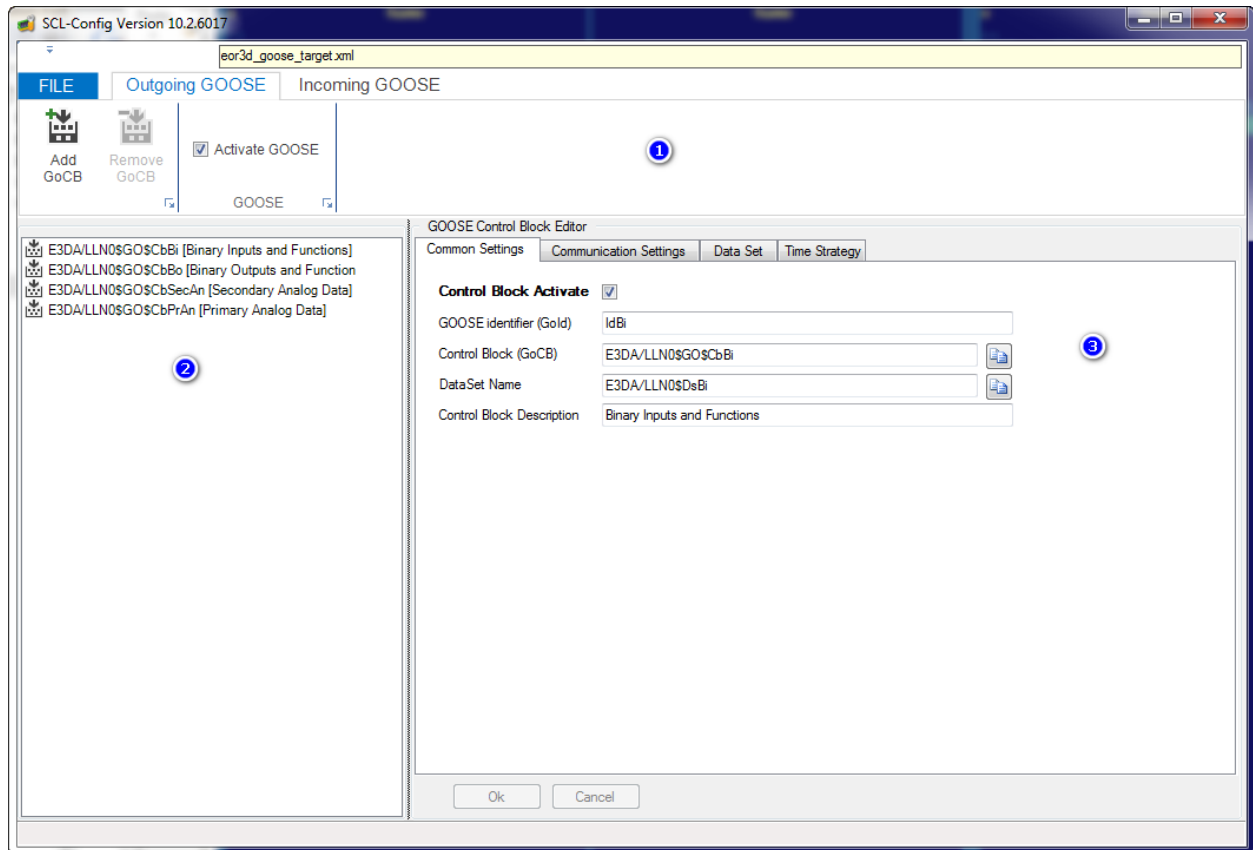
### 3.2.4 Start as normal windows application

- Select XML file (configuration file with GOOSE settings)



**Picture 5: XML**

If the file is correct, the Main window will open.

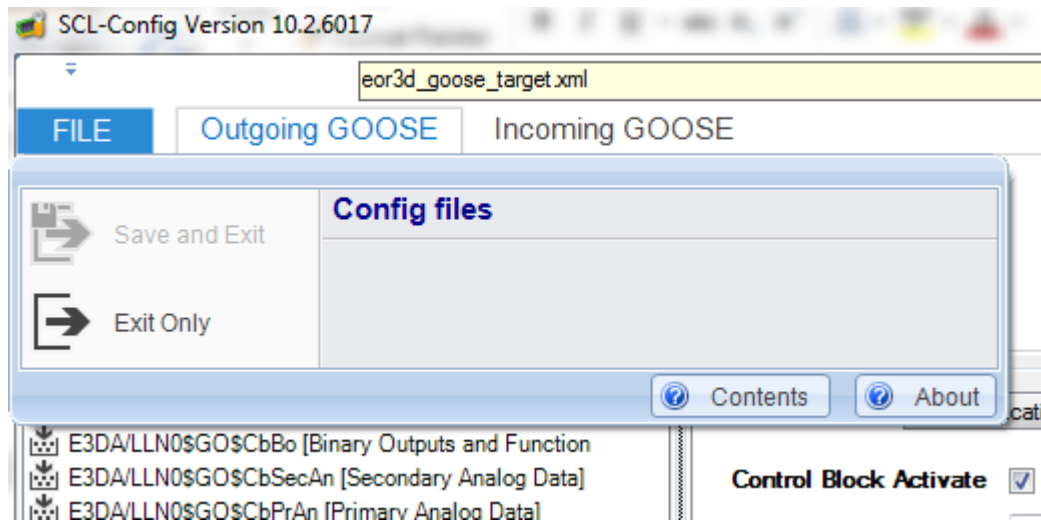


**Picture 6: Main Window**

- 1 – functional tabs with incoming and outgoing GOOSE
- 2 – GOOSE control blocks
- 3 – Configuration panel with editors



### 3.3 File operations (Save, Exit, Ignore changes)



Picture 7: 3.4 File operations

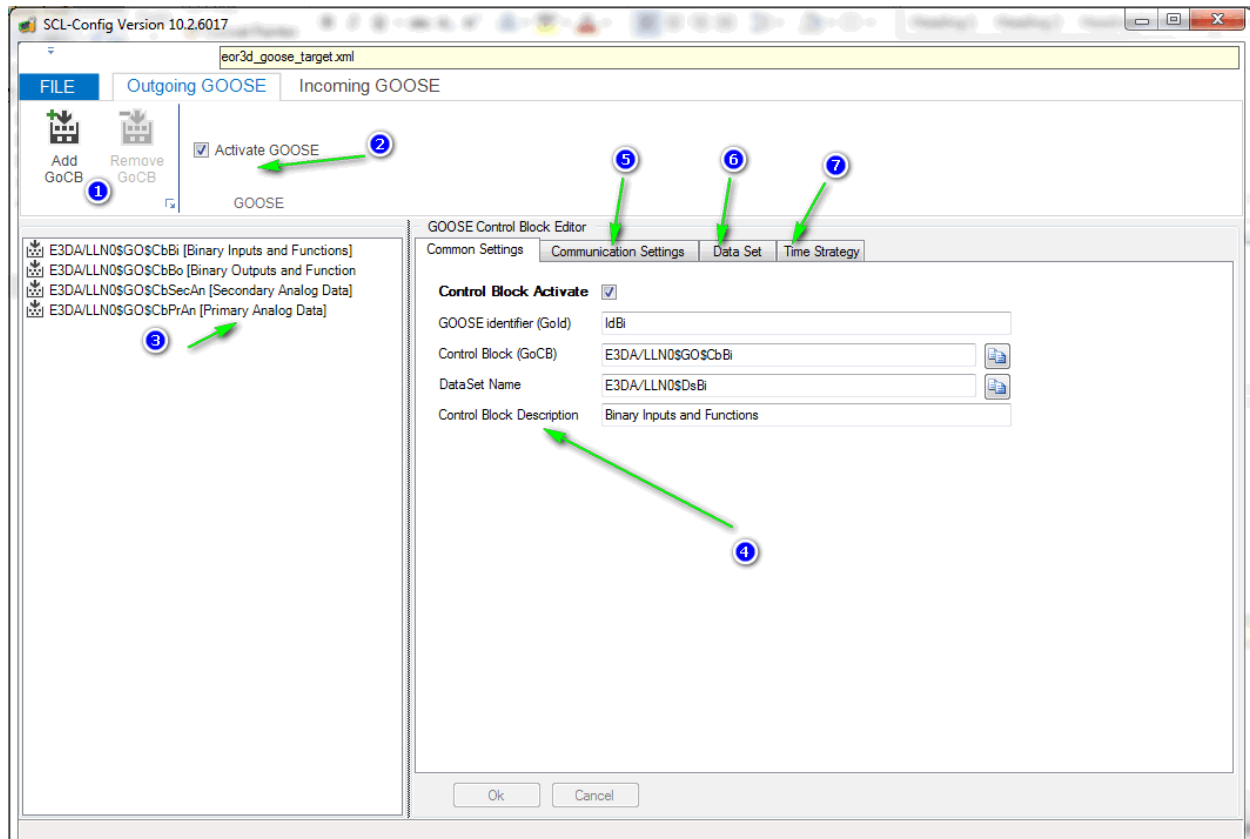
#### 3.3.1 Save and Exit

If any changes have been done, the pictogram will be activate.

#### 3.3.2 Exit only

Ignore all changes and exit

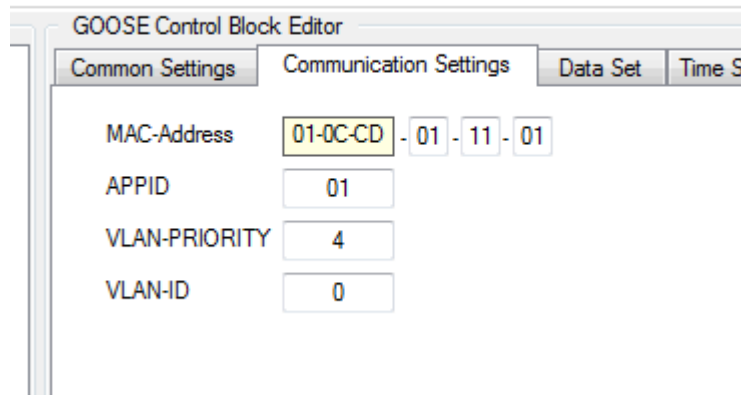
## 3.4 Outgoing GOOSE



Picture 8: Outgoing GOOSE

- 1) Add and remove GOOSE control block
- 2) Activate/deactivate outgoing GOOSE
- 3) List of outgoing GOOSE control block (GoCB)
- 4) Parameters of the GoCB
- 5) Communication settings
- 6) Data set description
- 7) Time strategy for outgoing GOOSE

This defines the GSE GOOSE addressing. The values and character restrictions are defined in Table.



GOOSE Control Block Editor

Common Settings | **Communication Settings** | Data Set | Time S

MAC-Address: 01-0C-CD - 01 - 11 - 01

APPID: 01

VLAN-PRIORITY: 4

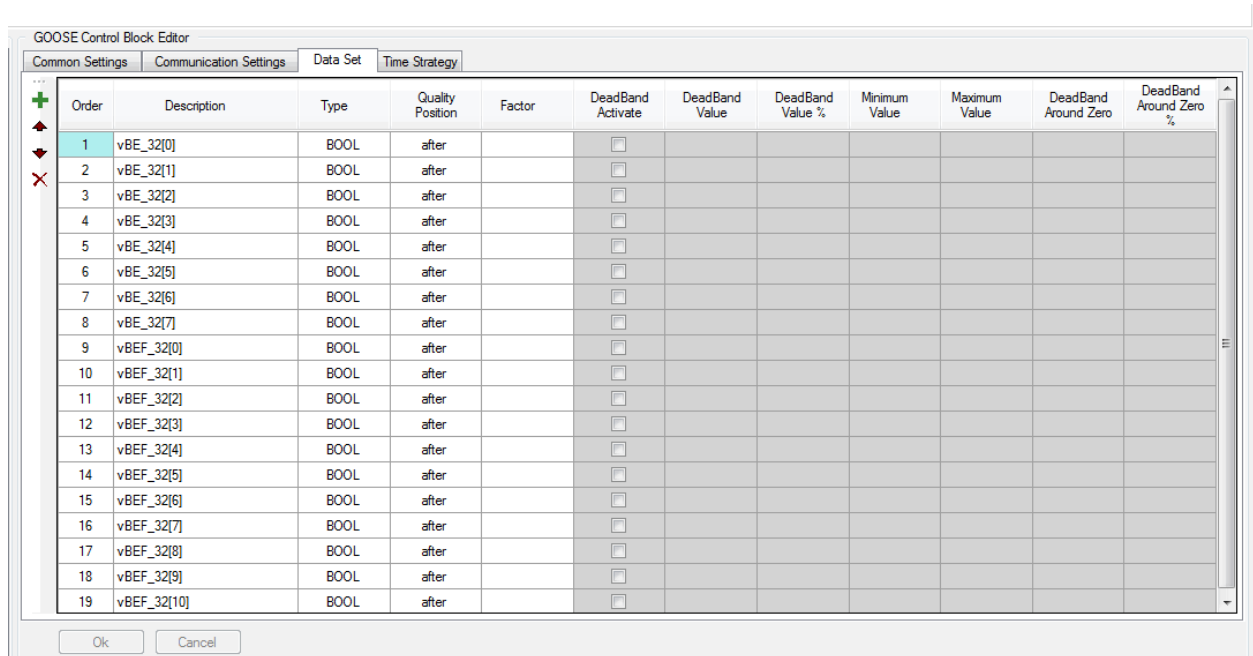
VLAN-ID: 0

**Picture 9: Communication Settings**

**Table Definitions for GSE SCL**

P-Type designation	Description	m/o	Restrictions/comments
MAC-Address	Media access address value	m	Shall be 6 groups of 2 visible characters separated by hyphens(-). Characters shall be limited to 0 to 9 and A to F.
APPID	Application identifier	o	Shall be 4 characters. Characters shall be limited to 0 to 9 and A to F.
VLAN-PRIORITY	VLAN user priority	c1	Shall be a single character. Characters shall be limited to 0 to 7.
VLAN-ID	VLAN ID	o	Shall be 3 characters. Characters shall be limited to 0 to 9 and A to F.
c1 Shall only be present if VLAN is also present.			

A **data-set** is an ordered group of **DataObjects**, organized as a single collection for the publisher of GOOSE. The references are called the members of the data set. The membership and order in a **data-set** shall be known to the subscriber.

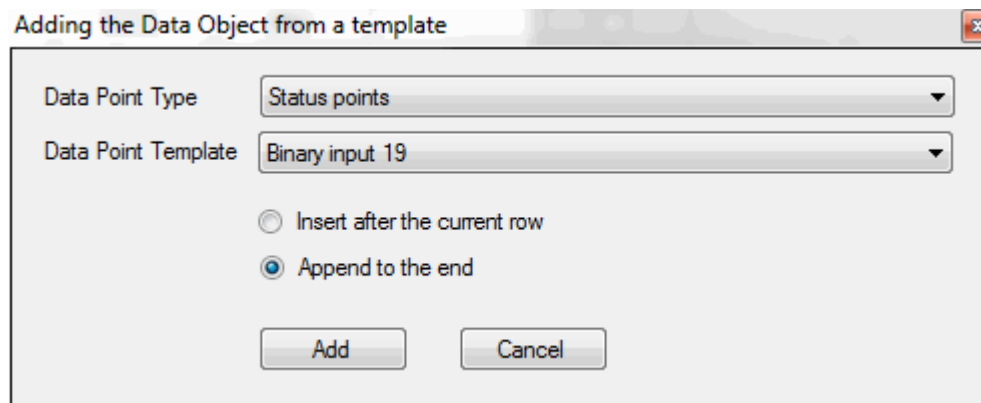


Order	Description	Type	Quality Position	Factor	DeadBand Activate	DeadBand Value	DeadBand Value %	Minimum Value	Maximum Value	DeadBand Around Zero	DeadBand Around Zero %
1	vBE_32[0]	BOOL	after		<input type="checkbox"/>						
2	vBE_32[1]	BOOL	after		<input type="checkbox"/>						
3	vBE_32[2]	BOOL	after		<input type="checkbox"/>						
4	vBE_32[3]	BOOL	after		<input type="checkbox"/>						
5	vBE_32[4]	BOOL	after		<input type="checkbox"/>						
6	vBE_32[5]	BOOL	after		<input type="checkbox"/>						
7	vBE_32[6]	BOOL	after		<input type="checkbox"/>						
8	vBE_32[7]	BOOL	after		<input type="checkbox"/>						
9	vBEF_32[0]	BOOL	after		<input type="checkbox"/>						
10	vBEF_32[1]	BOOL	after		<input type="checkbox"/>						
11	vBEF_32[2]	BOOL	after		<input type="checkbox"/>						
12	vBEF_32[3]	BOOL	after		<input type="checkbox"/>						
13	vBEF_32[4]	BOOL	after		<input type="checkbox"/>						
14	vBEF_32[5]	BOOL	after		<input type="checkbox"/>						
15	vBEF_32[6]	BOOL	after		<input type="checkbox"/>						
16	vBEF_32[7]	BOOL	after		<input type="checkbox"/>						
17	vBEF_32[8]	BOOL	after		<input type="checkbox"/>						
18	vBEF_32[9]	BOOL	after		<input type="checkbox"/>						
19	vBEF_32[10]	BOOL	after		<input type="checkbox"/>						

Picture 10: Data Set

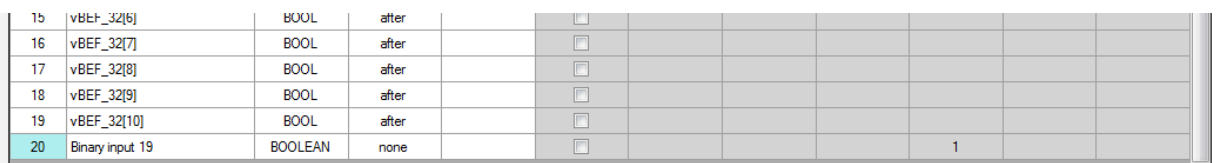
Features:

“+” - add new data object in outgoing GOOSE



Picture 11: Adding

After adding we find a new member in end of list.  
We can reorder data set and rename all member.



15	vBEF_32[6]	BOOL	after		<input type="checkbox"/>						
16	vBEF_32[7]	BOOL	after		<input type="checkbox"/>						
17	vBEF_32[8]	BOOL	after		<input type="checkbox"/>						
18	vBEF_32[9]	BOOL	after		<input type="checkbox"/>						
19	vBEF_32[10]	BOOL	after		<input type="checkbox"/>						
20	Binary input 19	BOOLEAN	none		<input type="checkbox"/>				1		

Picture 12: New Data

GOOSE Control Block Editor

Common Settings   Communication Settings   **Data Set**   Time Strategy

Order	Description	Type	Quality Position	Factor	DeadBand Activate	DeadBand Value	DeadBand Value %	Minimum Value	Maximum Value
3	vBE_32[2]	BOOL	after		<input type="checkbox"/>				
4	vBE_32[3]	BOOL	after		<input type="checkbox"/>				
5	vBE_32[4]	BOOL	after		<input type="checkbox"/>				
6	vBE_32[5]	BOOL	after		<input type="checkbox"/>				
7	vBE_32[6]	BOOL	after		<input type="checkbox"/>				
8	vBE_32[7]	BOOL	after		<input type="checkbox"/>				
9	vBEF_32[0]	BOOL	after		<input type="checkbox"/>				
10	vBEF_32[1]	BOOL	after		<input type="checkbox"/>				
11	vBEF_32[2]	BOOL	after		<input type="checkbox"/>				
12	vBEF_32[3]	BOOL	after		<input type="checkbox"/>				
13	vBEF_32[4]	BOOL	after		<input type="checkbox"/>				
14	Binary input 19	BOOLEAN	none		<input type="checkbox"/>				
15	vBEF_32[5]	BOOL	after		<input type="checkbox"/>				
16	vBEF_32[6]	BOOL	after		<input type="checkbox"/>				
17	vBEF_32[7]	BOOL	after		<input type="checkbox"/>				
18	vBEF_32[8]	BOOL	after		<input type="checkbox"/>				

Picture 13: Move

Delete member

3	vBE_32[2]	BOOL	after		<input type="checkbox"/>				
4	vBE_32[3]	BOOL	after		<input type="checkbox"/>				
5	vBE_32[4]	BOOL							
6	vBE_32[5]	BOOL							
7	vBE_32[6]	BOOL							
8	vBE_32[7]	BOOL							
9	vBEF_32[0]	BOOL							
10	vBEF_32[1]	BOOL							
11	vBEF_32[2]	BOOL							
12	vBEF_32[3]	BOOL							
13	vBEF_32[4]	BOOL	after		<input type="checkbox"/>				
14	Binary input 19	BOOLEAN	none		<input type="checkbox"/>				
15	vBEF_32[5]	BOOL	after		<input type="checkbox"/>				
16	vBEF_32[6]	BOOL	after		<input type="checkbox"/>				
17	vBEF_32[7]	BOOL	after		<input type="checkbox"/>				
18	vBEF_32[8]	BOOL	after		<input type="checkbox"/>				

Question

? Are you sure to delete DO from Dataset?

Picture 14: Delete

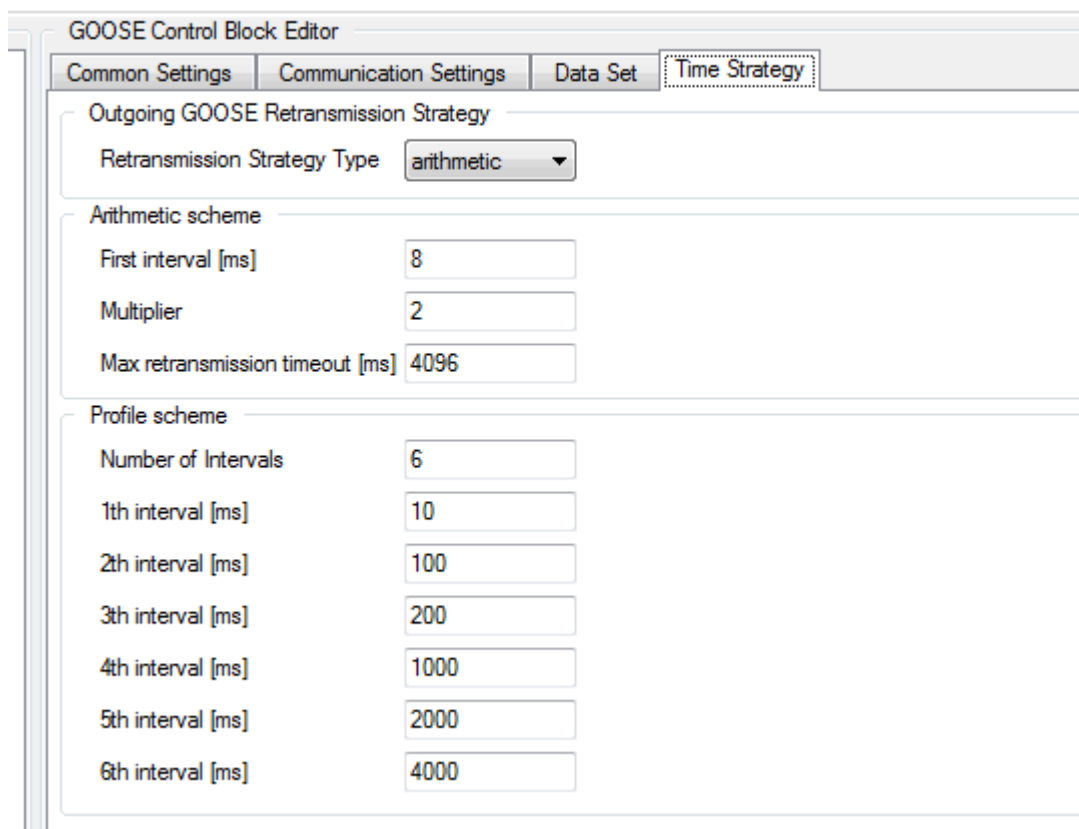
### 3.4.1 Goose Re-transmission Strategies

The Goose protocol as defined by IEC 61850 includes a re transmission scheme, that allow for some variants for timing.

The software includes a the two Goose strategy: arithmetic and profile.  
The arithmetic scheme has three parameters:

- 1) first interval,
- 2) multiplier
- 3) maximum interval.

The profile scheme allows for a specific set of intervals to be specified.



GOOSE Control Block Editor

Common Settings | Communication Settings | Data Set | **Time Strategy**

Outgoing GOOSE Retransmission Strategy

Retransmission Strategy Type: **arithmetic**

Arithmetic scheme

First interval [ms]: 8

Multiplier: 2

Max retransmission timeout [ms]: 4096

Profile scheme

Number of Intervals: 6

1th interval [ms]: 10

2th interval [ms]: 100

3th interval [ms]: 200

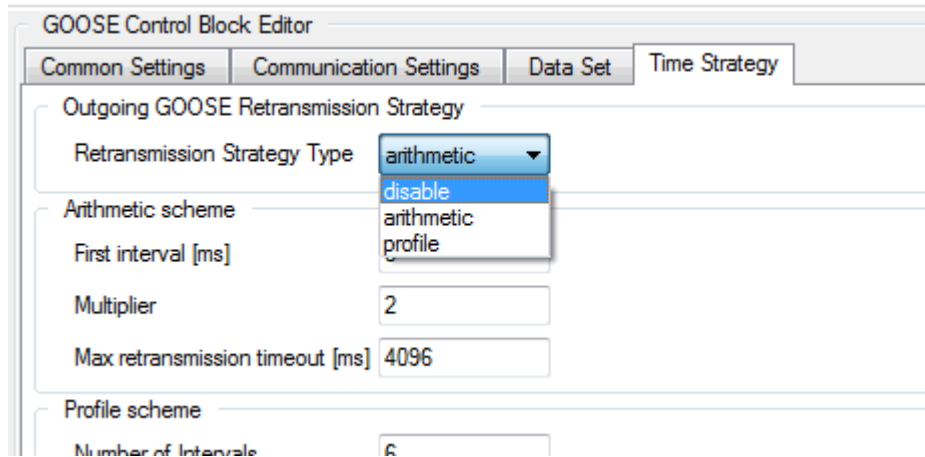
4th interval [ms]: 1000

5th interval [ms]: 2000

6th interval [ms]: 4000

**Picture 15: Time Strategy**

Selection of the type or re transmission strategy:

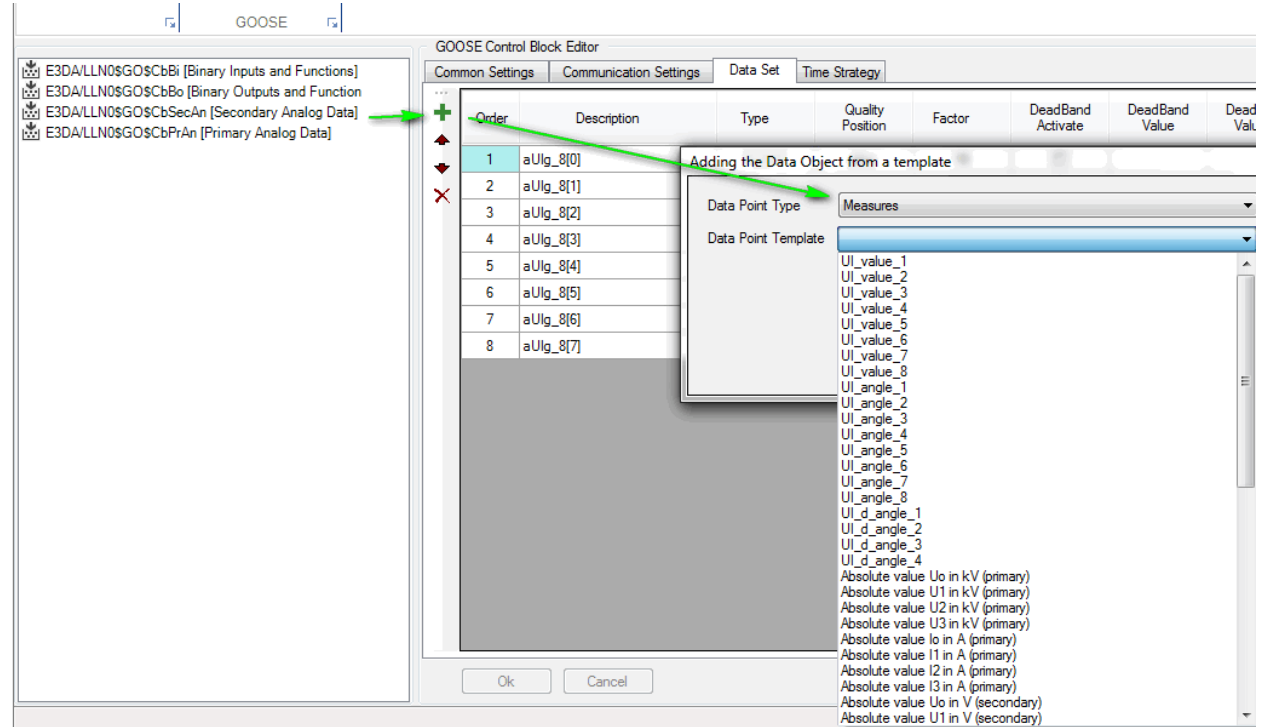


Picture 16: Re-transmission strategy

## 3.5 Incoming GOOSE

The interface looks like the outgoing GOOSE.  
Each incoming GOOSE can cause to EOR3-D command

Selection of the command

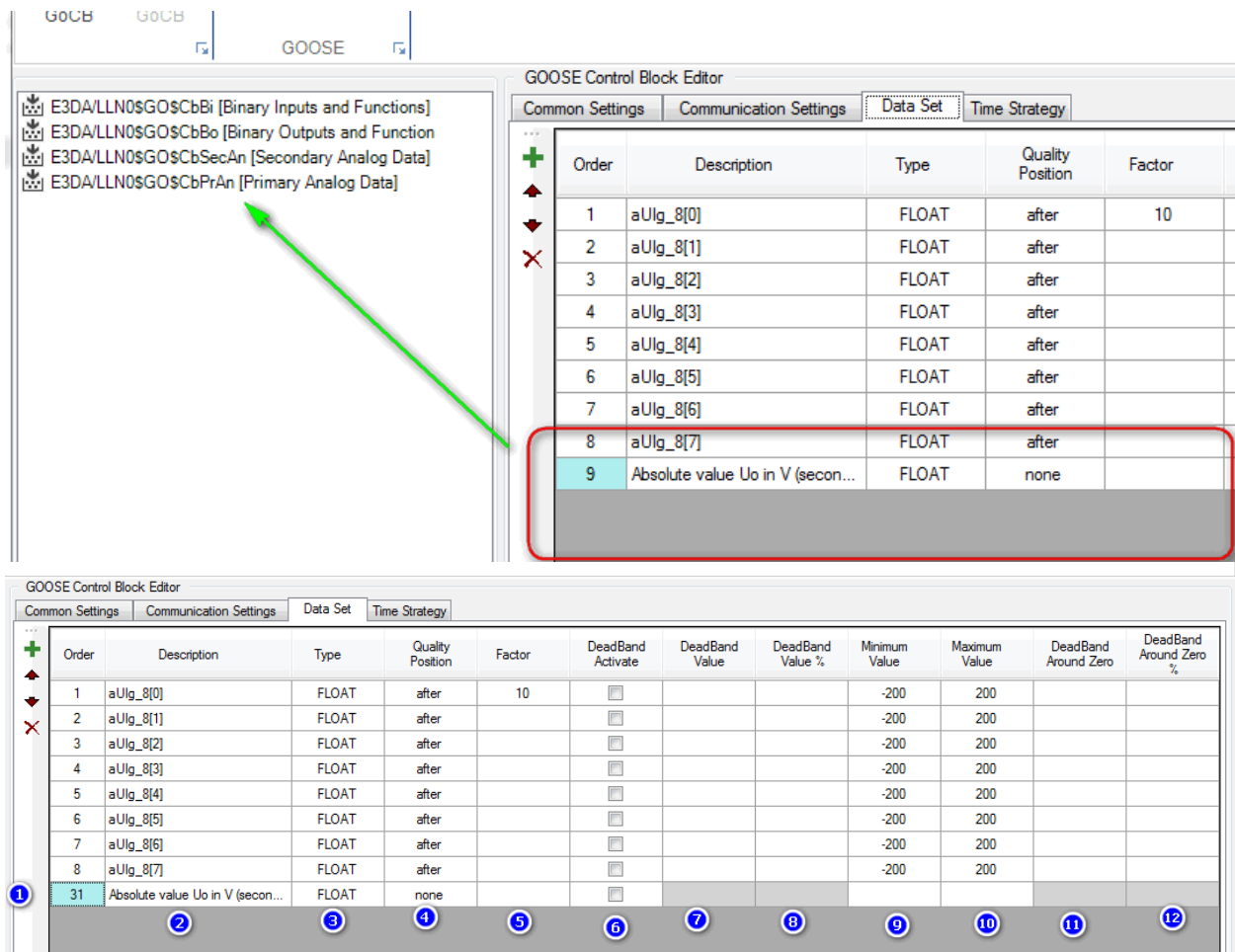


Picture 17: Incoming GOOSE

### 3.5.1 Adding a new member in incoming data set

A columns in data set member interface:

- 1) Order number command in incoming GOOSE
- 2) Description (any text)
- 3) Type of member (selected from list)
- 4) Quality position for the member (before, after or without quality)
- 5) Factor for incoming value in command;
- 6) Dead band activate for float set points
- 7) Dead band value for float set points
- 8) Dead band value as %
- 9) Minimum value for float set points
- 10) Maximum value for float set points
- 11) Dead band around zero
- 12) Dead band around zero as %

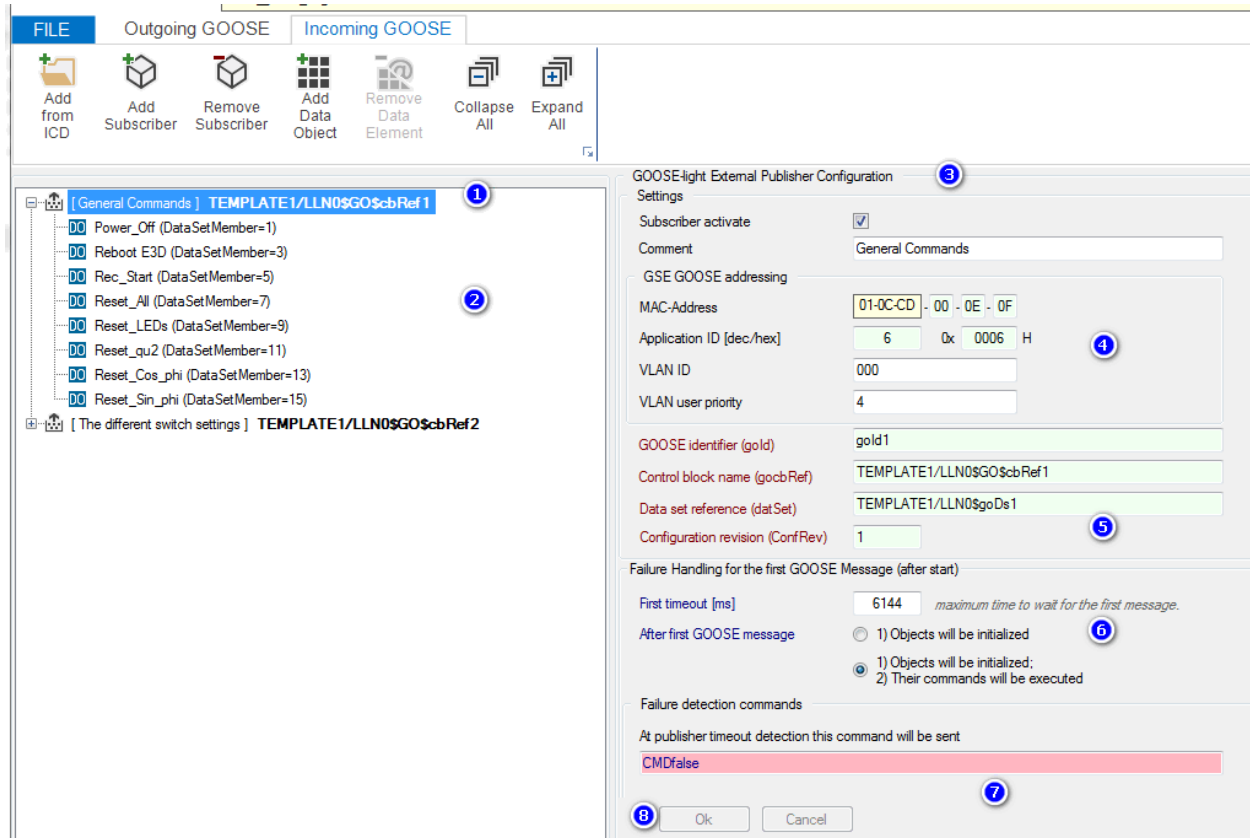


Order	Description	Type	Quality Position	Factor	DeadBand Activate	DeadBand Value	DeadBand Value %	Minimum Value	Maximum Value	DeadBand Around Zero	DeadBand Around Zero %
1	aUlg_8[0]	FLOAT	after	10	<input type="checkbox"/>			-200	200		
2	aUlg_8[1]	FLOAT	after		<input type="checkbox"/>			-200	200		
3	aUlg_8[2]	FLOAT	after		<input type="checkbox"/>			-200	200		
4	aUlg_8[3]	FLOAT	after		<input type="checkbox"/>			-200	200		
5	aUlg_8[4]	FLOAT	after		<input type="checkbox"/>			-200	200		
6	aUlg_8[5]	FLOAT	after		<input type="checkbox"/>			-200	200		
7	aUlg_8[6]	FLOAT	after		<input type="checkbox"/>			-200	200		
8	aUlg_8[7]	FLOAT	after		<input type="checkbox"/>			-200	200		
9	Absolute value Uo in V (secon...	FLOAT	none		<input type="checkbox"/>						

Picture 18: GOOSE incoming configuration

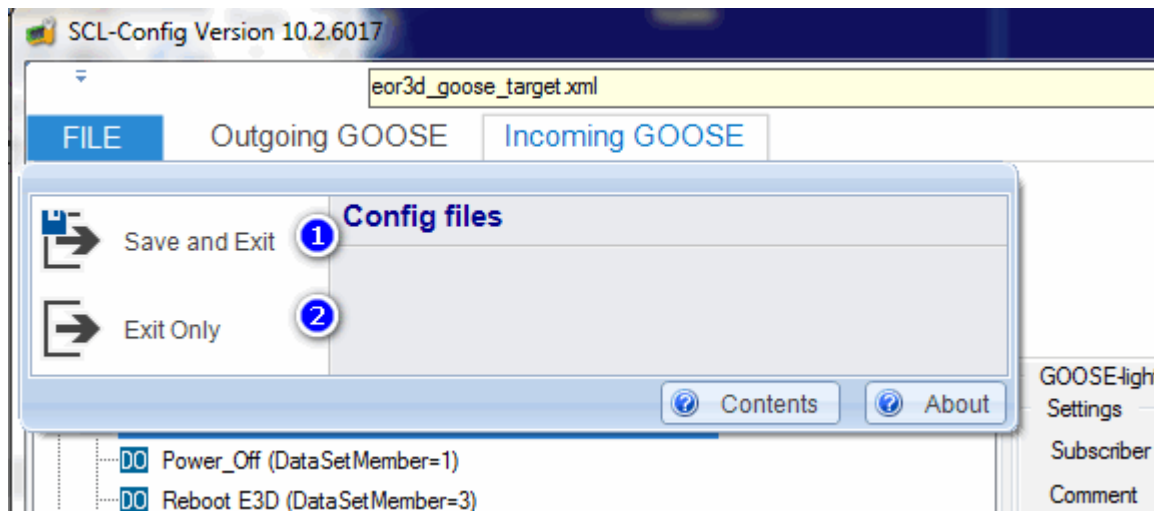


## 3.5.2 GOOSE incoming configuration



Picture 19: GOOSE incoming configuration

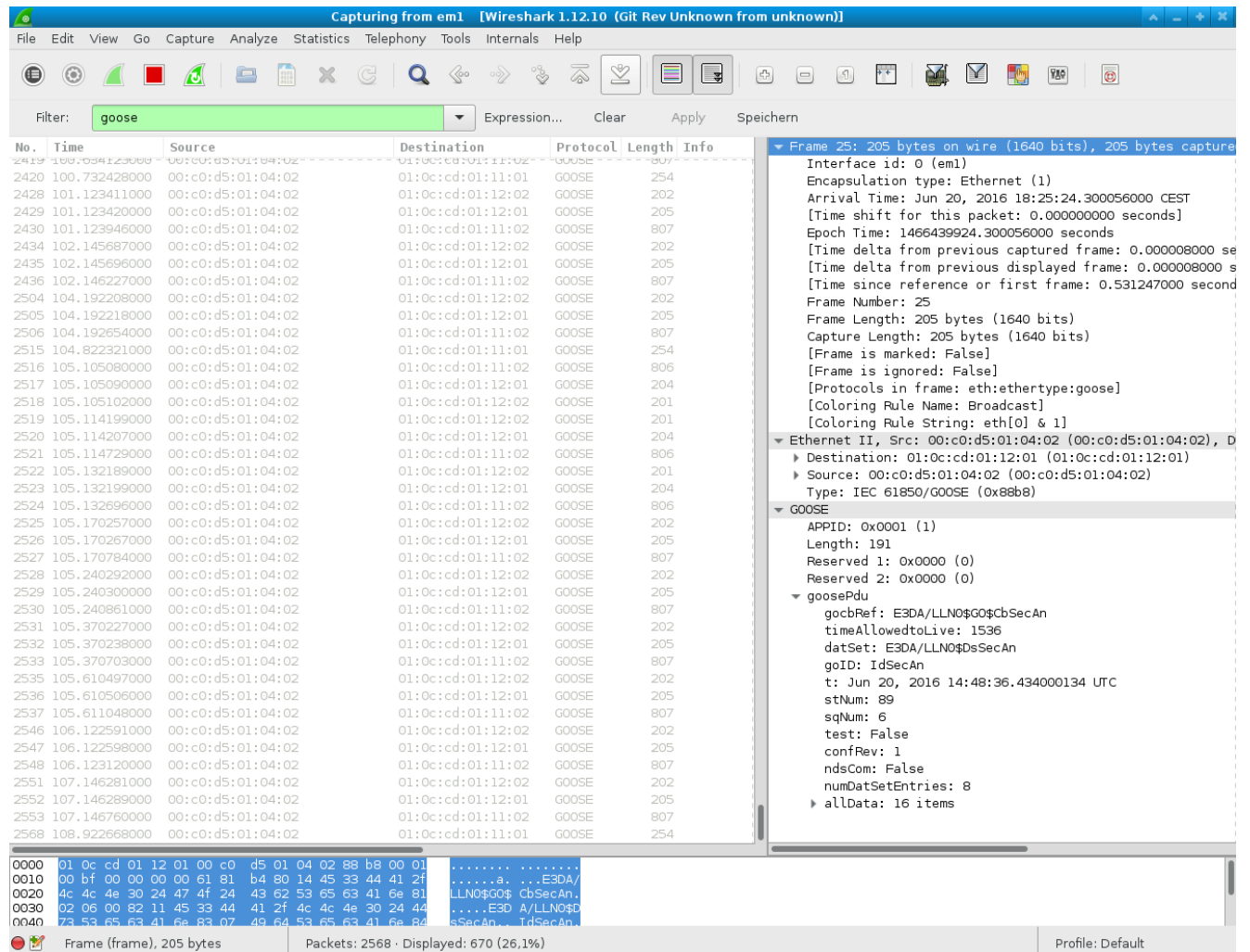
- 1) GOCb in list
- 2) Member, that are to be estimated in commands
- 3) Settings (external Publisher)
- 4) Goose addressing
- 5) GOOSE ID, Control Block, Data set reference, configuration number.
- 6) Optional: what is behavior in command estimation because of GOOSE timeout, or after first received message
- 7) Is not used now.
- 8) Okay – to save any changes



Picture 20: Save/Exit

## 4 IEC 61850 Goose Test with wireshark

The Network Analyzer wireshark has a goose filter, which can be used for testing.



The screenshot displays the Wireshark interface with the filter 'goose' applied. The packet list shows a series of GOOSE frames. The packet details pane for frame 25 shows the following structure:

- Frame 25: 205 bytes on wire (1640 bits), 205 bytes captured
- Interface id: 0 (em1)
- Encapsulation type: Ethernet (1)
- Arrival Time: Jun 20, 2016 18:25:24.300056000 CEST
- [Time shift for this packet: 0.000000000 seconds]
- Epoch Time: 1466439924.300056000 seconds
- [Time delta from previous captured frame: 0.000008000 s]
- [Time delta from previous displayed frame: 0.000008000 s]
- [Time since reference or first frame: 0.531247000 second]
- Frame Number: 25
- Frame Length: 205 bytes (1640 bits)
- Capture Length: 205 bytes (1640 bits)
- [Frame is marked: False]
- [Frame is ignored: False]
- [Protocols in frame: eth:ethertype:goose]
- [Coloring Rule Name: Broadcast]
- [Coloring Rule String: eth[0] & 1]
- Ethernet II, Src: 00:c0:d5:01:04:02 (00:c0:d5:01:04:02), D: 01:0c:cd:01:12:01 (01:0c:cd:01:12:01)
- Destination: 01:0c:cd:01:12:01 (01:0c:cd:01:12:01)
- Source: 00:c0:d5:01:04:02 (00:c0:d5:01:04:02)
- Type: IEC 61850/GOOSE (0x88b8)
- GOOSE
  - APPID: 0x0001 (1)
  - Length: 191
  - Reserved 1: 0x0000 (0)
  - Reserved 2: 0x0000 (0)
  - gosePdu
    - gcbRef: E3DA/LLN0\$GO\$CbSecAn
    - timeAllowedToLive: 1536
    - datSet: E3DA/LLN0\$DsSecAn
    - goID: IdSecAn
    - t: Jun 20, 2016 14:48:36.434000134 UTC
    - stNum: 89
    - sqNum: 6
    - test: False
    - confRev: 1
    - ndsCom: False
    - numDatSetEntries: 8
    - allData: 16 items

Picture 21: wireshark demo