

# IEC 61850 GOOSE interface in VAMP relays configuration instruction

## 1 Overview

The purpose of this document is to present all steps of configuring IEC 61850 GOOSE communication in VAMP relays for exchanging information with other devices.

Typically, two configuration tool programs are provided by VAMP Ltd. to accomplish this process:

- VAMPSET – a relay setting tool,
- VAMP SCD Editor – a tool program designed for creating and editing SCD files for the purpose of building IEC 61850 communication network configurations.

The second tool, VAMP SCD Editor, is capable of building the complete system configuration but may be not available to some integrators and may be unable to process ICD files of devices from other vendors due to their proprietary features. In such cases the complete configuration of GOOSE communication in VAMP relays should be accomplished with VAMPSET tool only. This instruction describes how to do it.

Remember that GOOSE configuration in VAMP relay can be later verified with the following testing tools, run on PC with Microsoft® Windows 2000/XP/Vista operating system:

- VAMP 61850 Simple Tester (IEC 61850 client)
- INFO TECH 61850 Avenue (IEC 61850 client and GOOSE testing programs)

This guide assumes that the user is familiar with the basic concepts of IEC 61850 data modeling and communication.

### Abbreviations

The following abbreviations are used throughout this document:

- **DS**                      Data Set
- **GCB**                     GOOSE Control Block
- **GOOSE**                 Generic Object Oriented Substation Events
- **ICD**                     IED Capability Description
- **IED**                     Intelligent Electronic Device (usually a relay, IEC61850 server)
- **LD**                      Logical Device

- **LN** Logical Node
- **NI** Network Input
- **SCD** Substation Configuration Description

### GOOSE setup with VAMPSET

Connect the configuration PC with VAMP relay using VAMPSET cable (or using Ethernet) and run VAMPSET tool application. Establish the connection with the relay and download its complete configuration to the tool program. From now the configuration tasks can be started. Remember that after entering new parameter values you should enforce VAMPSET to write changes to the device by the pressing the proper button in the program menu. Some parameter changes may require rebooting of the device, after which the configuration process can proceed further.

## 2 Setup of GOOSE publishing parameters

VAMP relay supports 2 GOOSE Publisher functions represented by 2 GOOSE Control Blocks. In **GOOSE configuration** view the parameters of GCB1 and GCB2 can be set.

**Max retransmission timeout** parameter defines the final cycle of transmitting GOOSE messages by GCB when no data changes occur. This can be called GOOSE keep alive cycle and it is common for GCB1 and GCB2. No retransmission within this time allows GOOSE Subscribers to assume GOOSE Publisher failure. You can select the preferred parameter value from the drop down list.

**Enable** flag set to **Yes** allows activating GCB and start GOOSE message transmission immediately after the IEC61850 interface is initialized. When set to **No**, GCB has to be enabled in run time via network by some client performing write operation on this GCB attribute.

**GOOSE ID** parameter is a text string used as source identifier in transmitted GOOSE messages. Remember that VAMP relays as GOOSE Subscribers do not use this parameter for filtering the incoming messages. However, it may be required by other subscribers.

Instead, VAMP relay as GOOSE Subscriber relies on **Application ID** parameter – a number which can also be used as source identifier in GOOSE messages.

**Configuration Revision** parameter provides the version number of the data set related to GCB. It should be updated after each reconfiguration of the data set contents.

**Needs Commissioning** and **Test mode** flags can be set to **Yes** only when running system tests and verifying the configuration. Otherwise, their values should be set to **No**. Remember that if a GOOSE message with one of these fields set is received by VAMP relay, data values from this message will update Network Inputs only but their changed values will not be propagated to application matrices and the application.

**MAC Address** parameter defines Ethernet multicast address as a destination of GOOSE messages transmitted by GCB. Remember that VAMP relay as GOOSE Subscriber can accept only one such address of GOOSE messages to be processed. Therefore, all GOOSE Publishers transmitting data to VAMP relay must have the same MAC Address value set in their GCB configurations. The allowed value range for this multicast MAC Address parameter is from 01-0C-CD-01-00-00 to 01-0C-CD-01-FF-FF.

**VLAN Priority** and **VLAN ID** parameters shall be set in accordance with system specification. VLAN switches allow building sub networks in the system and limiting the message flow. **VLAN ID** must be then set the same value in GCB and in the switch ports for the relays receiving these GOOSE messages.

The screenshot displays the 'GOOSE configuration' window. On the left, a menu shows 'GOOSE configuration' selected under 'PROTOCOL CONFIGURATION + IEC 61850...'. The main area is divided into two sections:

- Publisher parameters:**
  - Max retransmission timeout: 40 s
- Publisher configuration GCB 1:**

Enable	Yes
GOOSE ID	VAMP1
Configuration Revision *	1
Needs Commissioning	No
Test mode	No
MAC Address	01-0C-CD-01-00-11
VLAN Priority	4
VLAN ID	0
Application ID *	3

\* Important for VAMP subscriber

### 3 Setup of data sets for GOOSE publishers

In the view **GOOSE GCB1: DATA POINTS** the drop down menu shows the binary data available for assignment to the data set related to GCB1. In a similar way the view **GOOSE GCB2: DATA POINTS** allows configuring the data set DSG2 related to GCB2.

The relay checks availability of all signals assigned to DSG1 and DSG2 and confirms this by **OK** value in **Status** column. If some required signal is not available, its **Status** will be set to **Not in use**, and it must be due to the fact that its LN is not marked as **In use** in the **IEC61850 data map**. After revising the **IEC61850 data map**, the configuration of DSG1 and DSG2 can be continued.

**GOOSE GCB1: DATA POINTS**

**DSG1 data configuration**

Index	IEC-61850 Variable	Signal	Status
0	VO1GGIO97.Ind.stVal(ST)	V01	OK
1	VO2GGIO98.Ind.stVal(ST)	V02	OK
2	VO3GGIO99.Ind.stVal(ST)	V03	OK
3	VO4GGIO100.Ind.stVal(ST)	V04	OK
4	VO5GGIO101.Ind.stVal(ST)	V05	OK
5	VO6GGIO102.Ind.stVal(ST)	▼	OK
6	None	V01	OK
7	None	V02	OK
		V03	
		V04	
		V05	
		V06	

Remember that GOOSE Publishers in VAMP relays can only transmit binary signal values (Boolean type, value only, no quality and time stamp).

## 4 Setup of GOOSE subscriber general parameters

If the configured relay should act in the system as GOOSE Subscriber then in **GOOSE configuration** view, in **Subscriber configuration** the **Enable** flag should be set to **Yes**.

It is also required to configure the destination **MAC Address** of the incoming GOOSE messages. Remember that VAMP relay can accept GOOSE messages with only one configured address, thus all GOOSE Publishers providing data to this GOOSE Subscriber must use the same destination address. Copy this destination address to **MAC Address** parameter.

PROTOCOL CONFIGURATION  
+ IEC 61850...

**GOOSE configuration**

GOOSE GCB1: DATA POINTS

GOOSE GCB2: DATA POINTS

GOOSE Subscriber: DATA POINTS

DIAGNOSIS

**Subscriber configuration**

**Enable** **Yes**

**MAC Address**

### NOTICE

Despite of using only one common MAC address in all GOOSE Publishers delivering data to GOOSE Subscriber in VAMP relay, you can still distinguish the source of publisher data by properly setting another GOOSE Publisher parameter, **Application ID (APPID)**, to different, publisher specific values.

## 5 Mapping data from incoming GOOSE messages to Network Inputs

VAMP relay enables to configure up to 64 Network Inputs named NI1.. NI64. Each of NIs is a binary signal that may receive its value from the incoming GOOSE messages. Network Input can provide this value to the relay application (matrices and logic). In this way the signal transfer between different relays can be established in the IEC61850 network.

Remember that GOOSE Publishers and GOOSE Subscribers in VAMP relays can only process binary signals (Boolean type, value only, no quality and time stamp). It does not mean that other GOOSE Publishers must transmit only binary data in GOOSE messages. GOOSE messages may contain data of other types, but only binary data from them can be mapped to VAMP Network Inputs.

Selected Network Input to be used for providing network data to VAMP relay application shall be at first configured by setting its **In use** flag to **Yes**. Further configuration parameters define GOOSE message filtering to obtain the required data value for the Network Input. **App ID** parameter of NI corresponds to Application ID parameter of GCB transmitting these GOOSE messages. **Conf Rev** parameter of NI corresponds to Configuration Revision parameter of GCB transmitting these GOOSE messages. **Data index** parameter represents the position of the data to be written into NI in the list of data values provided in the incoming GOOSE messages. The list index value is counted from 0 (and ending with 7 for messages from GOOSE Publishers in VAMP relays; the number of valid positions may be different in other relays).

**GOOSE Subscriber: DATA POINTS**

GOOSE Network Inputs Error 0

**Subscriber data configuration**

NI	App ID	Conf Rev	Data index	Value	Status	In use
1	1	1	0	0	NO DATA	Yes
2	2	1	0	0	NO DATA	Yes
3	1	2	2	0	NO DATA	Yes
4	1	2	3	0	NO DATA	<input type="checkbox"/>
5	1	1	4	0	NO DATA	No
6	1	1	5	0	NO DATA	Yes
7	1	1	6	0	NO DATA	No
8	1	1	7	0	NO DATA	No
9	1	1	8	0	NO DATA	No
10	1	1	9	0	NO DATA	No
11	1	1	10	0	NO DATA	No

**NOTICE**

This configuration task is not simple and requires detailed information on already configured GCBs in other relays.

Remember that in run time you can use this VAMPSET view to monitor GOOSE Subscriber performance. **GOOSE Network Inputs Error** tells whether there is some problem in the Subscriber configuration (if non-zero). In the NI table you can see incoming **Value** of NI and **Status**: OK (in case of correct performance), OLD (if Time-to-live is exceeded for the received data), and BAD TYPE (in case unmatching type – the publisher delivers other data than Boolean).

## 6 Review / update of Network Inputs processing

Network Inputs of GOOSE Subscriber are now configured to receive data from other devices. After this setup you can define how the Network Inputs updated by GOOSE messages shall be used in VAMP relay application. GOOSE NI signals can be used to trigger relay outputs, to block protection functions, to initiate auto-reclose operations, to block controlled objects. They can also be used in building application logic schemes.

You can configure OUTPUT MATRIX, BLOCK MATRIX, AUTO-RECLOSING MATRIX, and OBJECT BLOCK MATRIX by specifying how GOOSE NI signals should operate on other signals or functions. You can also use GOOSE NI signals in the defined LOGIC of VAMP application. Note that this task is going beyond the communication engineering and good knowledge of protection applications on the relay level and on the system level is required.

RELEASE OUTPUT MATRIX LATCHES

**OUTPUT MATRIX**

BLOCK MATRIX

AUTO-RECLOSING MATRIX

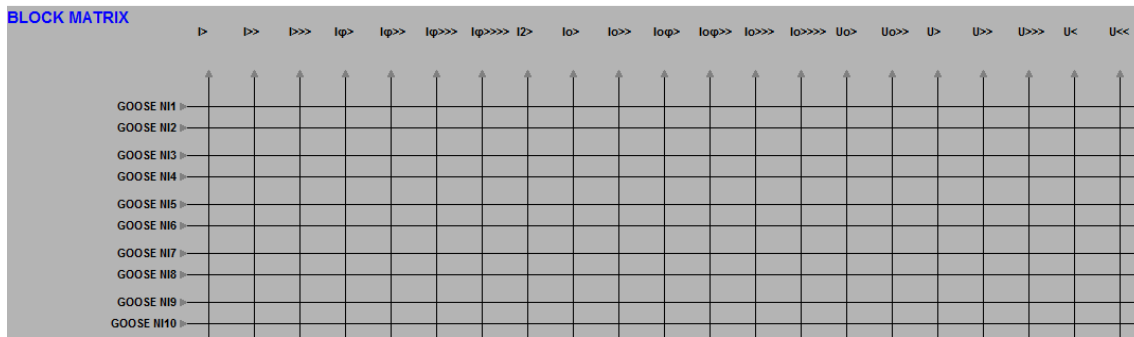
OBJECT BLOCK MATRIX

LOGIC

**OUTPUT MATRIX**

	T1	T2	T3	T4	A1	A2	A3	A4	A5	BO	AI	Tr	LA	LB	LC	DR	VO1	VO2	VO3	VO4	VO5	VO6
GOOSE NI1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
GOOSE NI2																						
GOOSE NI3					<input checked="" type="checkbox"/>																	
GOOSE NI4						<input checked="" type="checkbox"/>																
GOOSE NI5																						
GOOSE NI6																						
GOOSE NI7																						
GOOSE NI8																						
GOOSE NI9																						
GOOSE NI10																						



Besides GOOSE Network Inputs there is still another signal, **Error status**, which informs about GOOSE Subscriber failure (no data received from the network). This signal can also be applied in matrices and in the logic to prevent some actions derived from valid state of Network Inputs.

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Publishing: 4/2013