SIEMENS

SIPROTEC 5 Application Note

SIP5-APN-014:
Mixed configurations of SIPROTEC 4 and SIPROTEC 5

Answers for infrastructure and cities.

SIPROTEC 5 - Application:
SIP5-APN-014
Mixed configurations of SIPROTEC 4 and
SIPROTEC 5

Content

1 Application: Mixed configurations of SIPROTEC 4 and SIPROTEC 5

1.1 Summary

This Application Note contains the description of a possible solution for establishing the GOOSE communication between protection devices SIPROTEC 4 and 5. GOOSE stands for Generic Object Oriented Substation Events, a protocol defined in the IEC 61850 standard. It is used for device-to-device(s) communication instead of hardwired connections. IEC 61850 is the communication and protection protocol based on TCP/IP used in the substation automation.

1.2 Application Introduction

SIPROTEC 4 and 5 devices should exchange information and indicate the sending and receiving with LED indication. If the information is initiated by V4 device then LED 4 should light otherwise LED5.

The task can be divided in four parts:

- Configuration of a SIPROTEC 5 device for GOOSE communication and export
- Configuration of a SIPROTEC 4 device for GOOSE communication
- GOOSE configuration in DIGSI 4 for SIPROTEC 4 device together with imported SIPROTEC 5 device
- Loading of parameters to the SIPROTEC 4 and SIPROTEC 5 devices and test of the communication

For the solution of the above mentioned task following hard- and software is used:

- PC with installed DIGSI 4 and DIGSI 5 software
- SIPROTEC 4 and 5 device with a communication module applicable for IEC 61850
- Ethernet network which is connecting the components

1.3 Solution
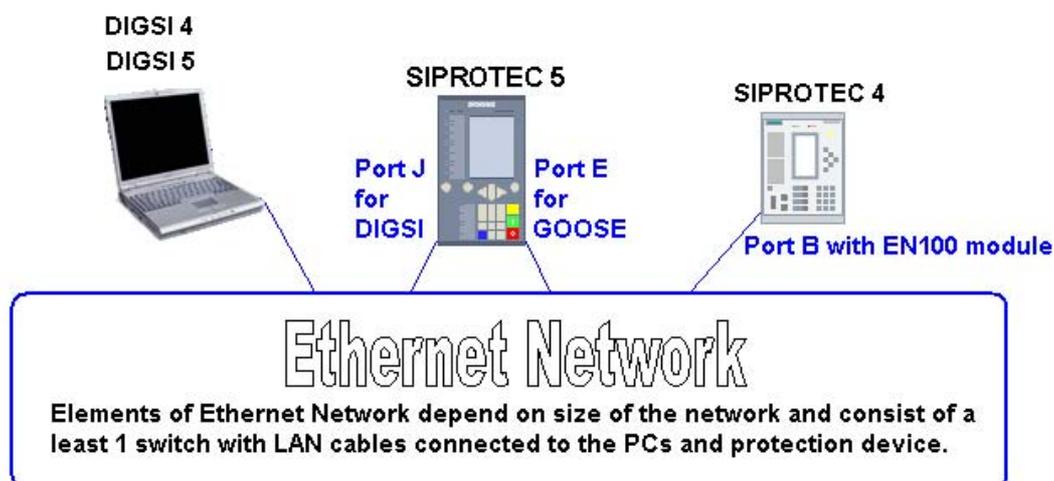
Figure 1: Overview about hard- and software used for the task solution

SIPROTEC 5 Application

Mixed configurations of SIPROTEC 4 and SIPROTEC 5

1.3.1 Configuration of a SIPROTEC 5 device for GOOSE communication and export

The used SIPROTEC 5 device has a front panel with a display. The port *J* on the backside is for DIGSI communication. The configuration of a local IP-address (port J) with the display menu is self-explaining:

- Press the right soft key under "Menu" in the initial view, select Communication with the navigation keys then the first communication module.

- Check in the general parameters of the module that this is port J. The IP-address can be changed in the "comm. channel / IP-settings"-section. The password for changing the parameters is *222222*.
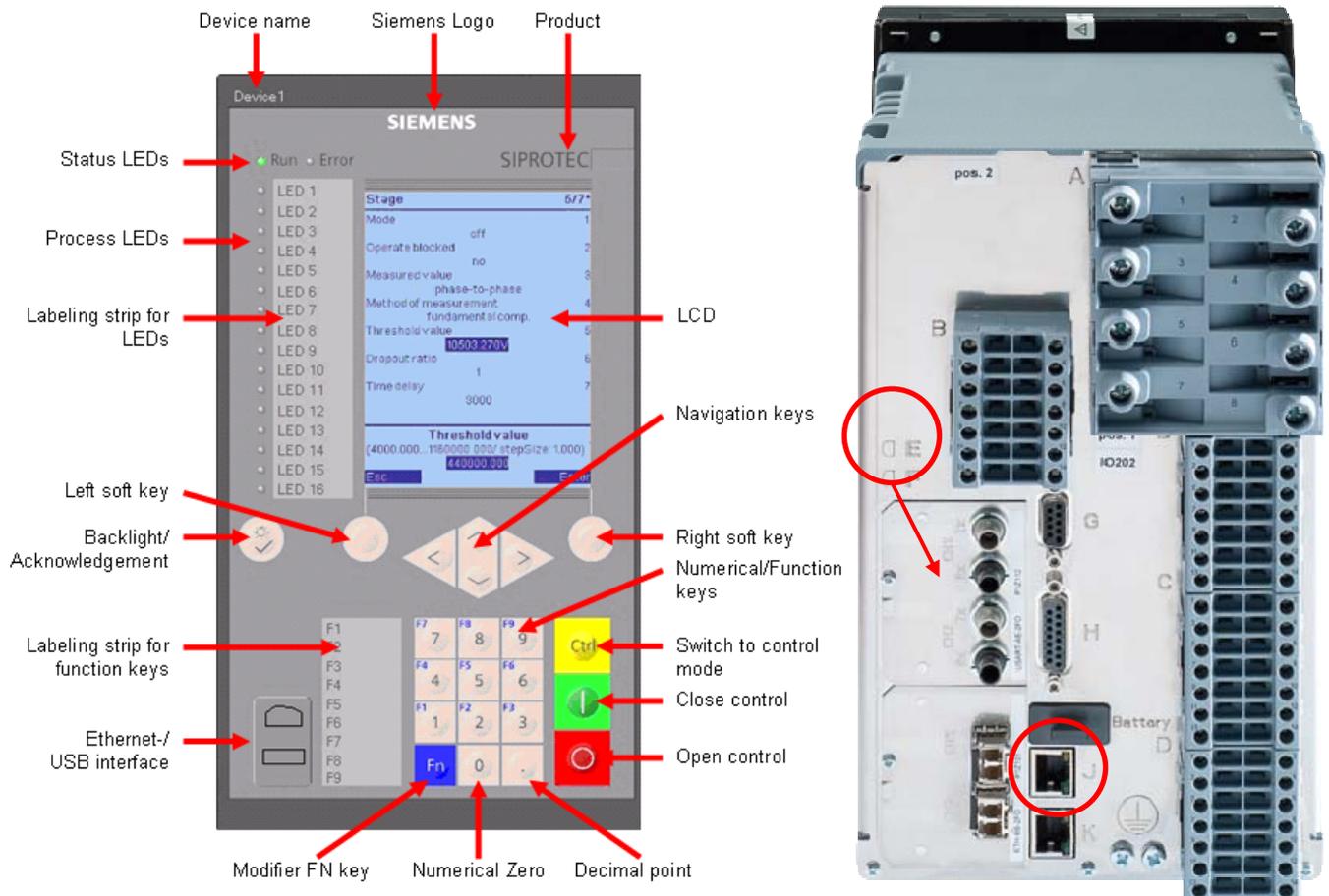
Figure 2: SIPROTEC 5 device front and rear view with optical port E (port J is always electrical)

An unassigned IP-address, in this case 192.168.200.235 with subnet mask 255.255.255.0, is to be configured for the device. After accepting of the IP-address the device restarts.

The device is connected via port J to the Ethernet network. Also the PC with the DIGSI 5 software is connected to this network. One of the features of DIGSI 5 is the automatic finding of accessible devices. There is no need to connect to each device separately as all SIPROTEC 5 devices can be found in the network.

Start DIGSI 5 in the Siemens Energy folder of the Windows start menu. Even without a new or existing project "Online access"-section is available in the project tree. Open the physical network card which is connected to the network and double-click on "Update accessible devices". After a while all connected devices are found.
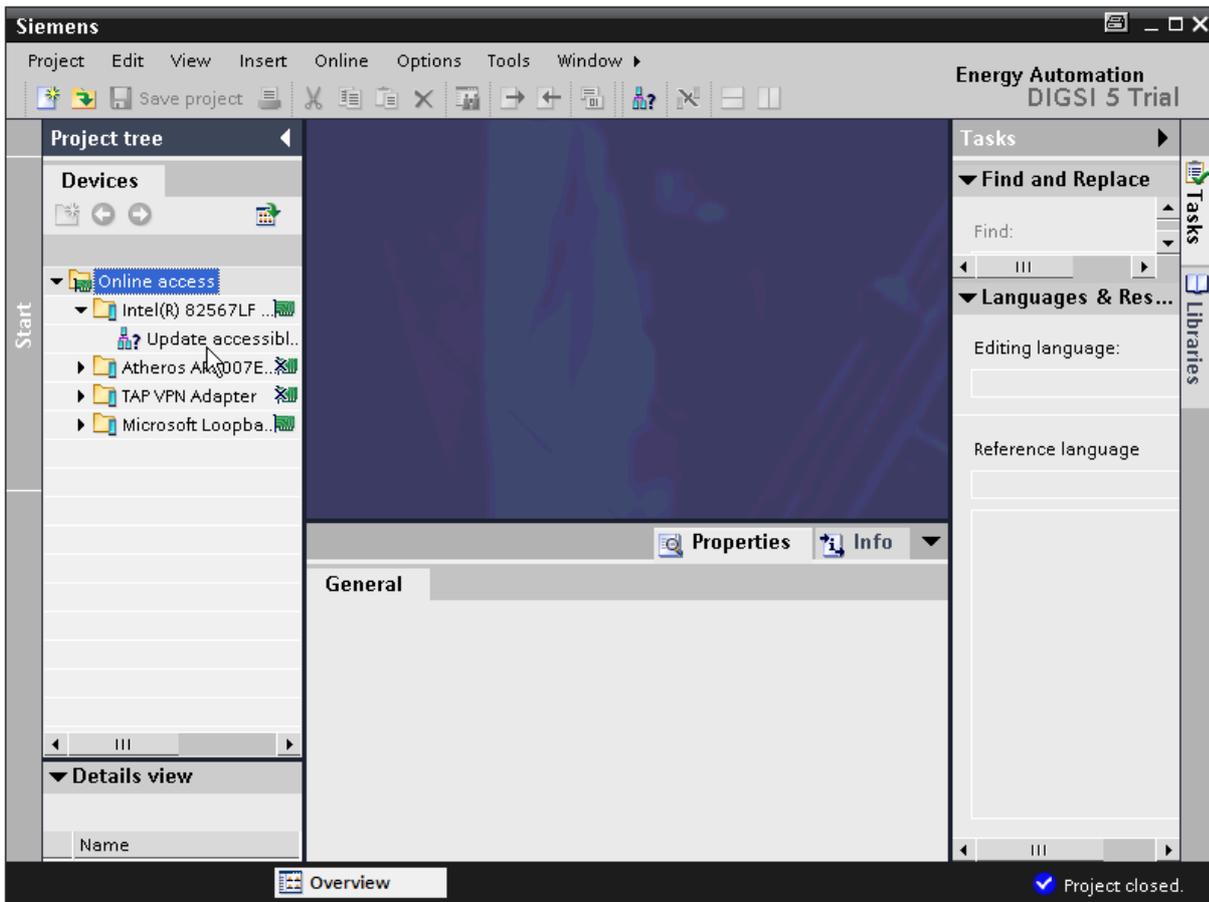
Figure 3: Find accessible devices in DIGSI 5

The next step is to create a new DIGSI 5 project. This can be done with the top menu Project/New.

After the selection of the project name and storage location the same will be created and a new tree appears above the "Online access"-section described above.

In order to add the online device to the DIGSI project, right-click on the device and choose "Add new device". The "Add new device"-dialog is opened with the pre-filled product code of the online device.

In Step 3 of the dialog an application template must be selected which defines pre-selected protection functions. Select the DIFF/DIS Basic option here. Then the device can be created.
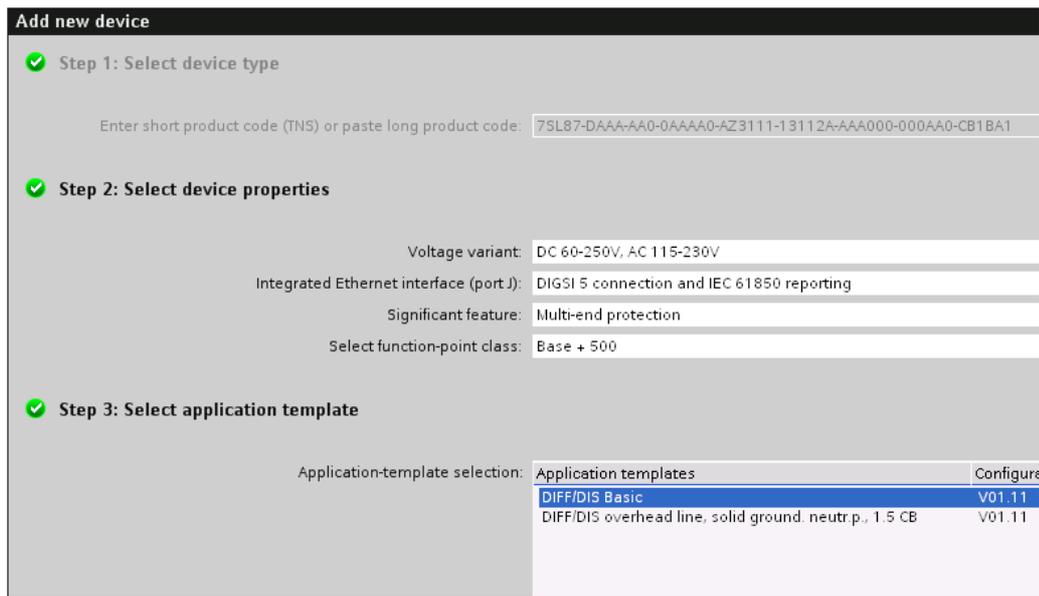
Figure 4: Add new device

In the "Device and networks"-section which will be opened by default after the creation (or when the manual configuration is selected) the communication settings must be made for the new device. This section consists of two views. In the device view the hardware can be configured, in the network view the devices can be connected to the networks.

The Device view consists of the rear and front view of the device. If the device is configured without a product code then the hardware catalogue on the right side must be used to drag and drop the components of the device to the available slots. In our case just click on port J in the rear view and enter the corresponding IP-address in the lower property section. Click on "Add new subnet".
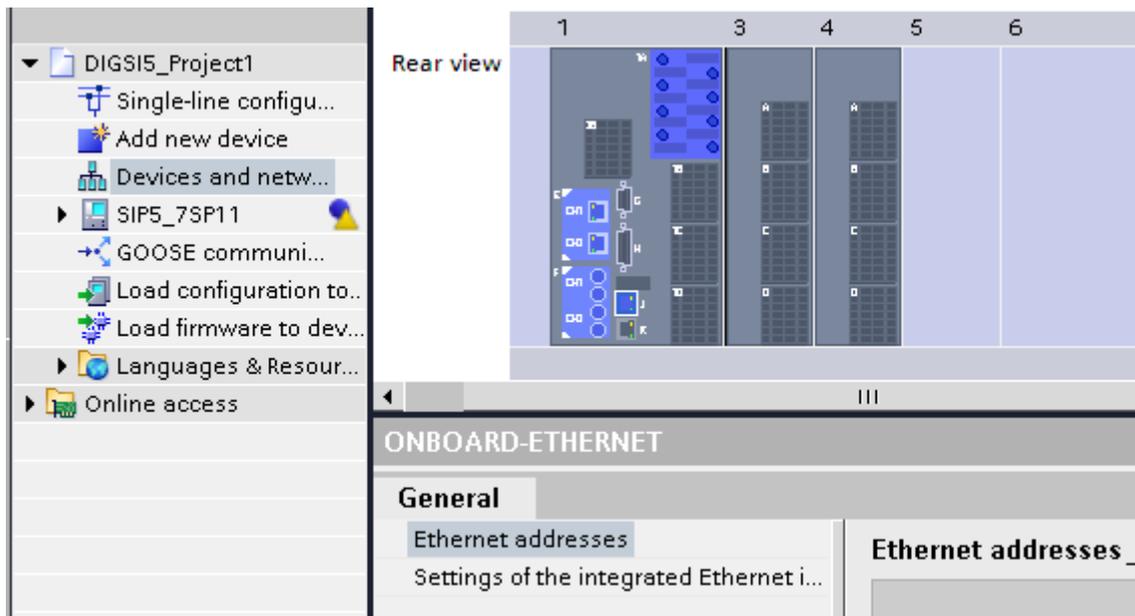
Figure 5: Port J for DIGSI communication

Then click on Port E which is electrical redundant Ethernet port in our case and select the IEC 61850-8-1 protocol in the property view. Enter for this port an own IP-address, 192.168.200.236 in our case. Click also on "Add new subnet" to assign a name for the subnet.
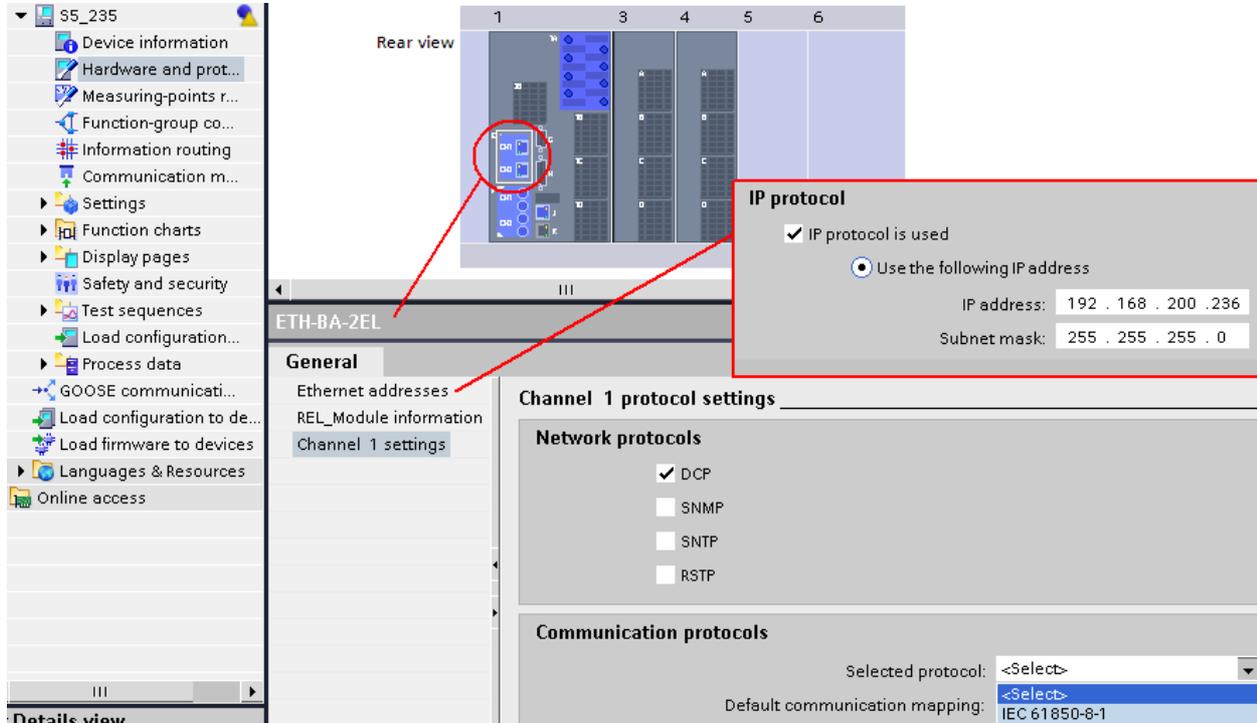
Figure 6: Port E for IEC 61850 (device is already renamed)

To check GOOSE create user-defined messages for sending. This can be easily done with the Information routing of the device. Click on expand button left of the device and double click on information routing. A matrix containing all device information assignable to sources and destinations opens. Create a user-defined GOOSE OUT with LED 5 indication by using of drag&drop-technique with the elements from the catalogue and "L" for assignment of the LEDs.
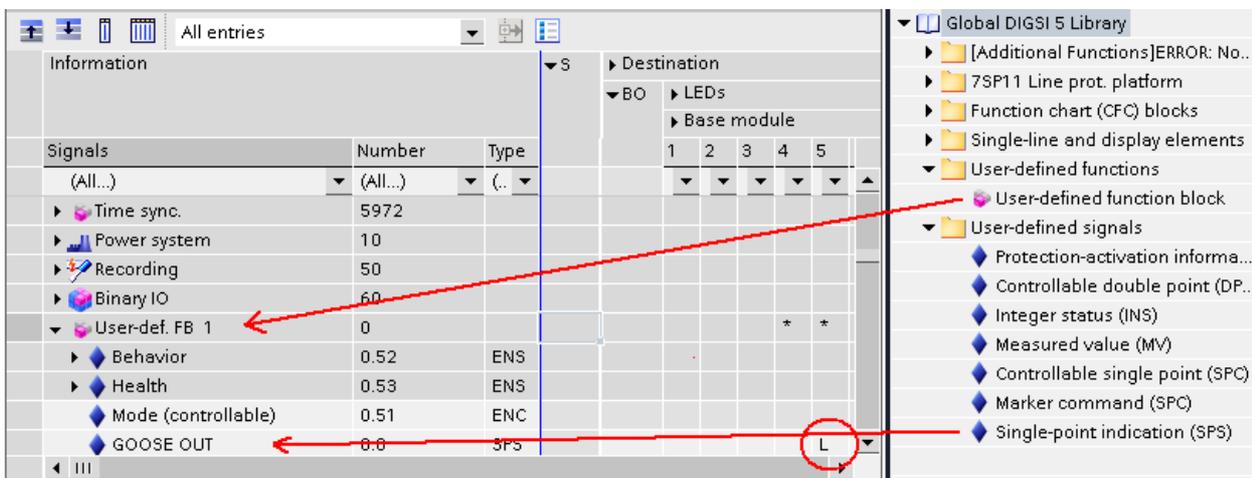
Figure 7: GOOSE IN and OUT in DIGSI 5

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In SIPROTEC 5 device GOOSE OUT will switch on LED 5 in SIPROTEC 4 and SIPROTEC 5. Corresponding to it GOOSE IN will come from V4 device and switch on LED 4. Activation of the OUT-messages can be done with function keys.

For compatibility reasons with DIGSI 4 switch DIGSI 5 to the IEC 61850 Edition 1 or Edition 2 in project properties. Both shall have the same version.
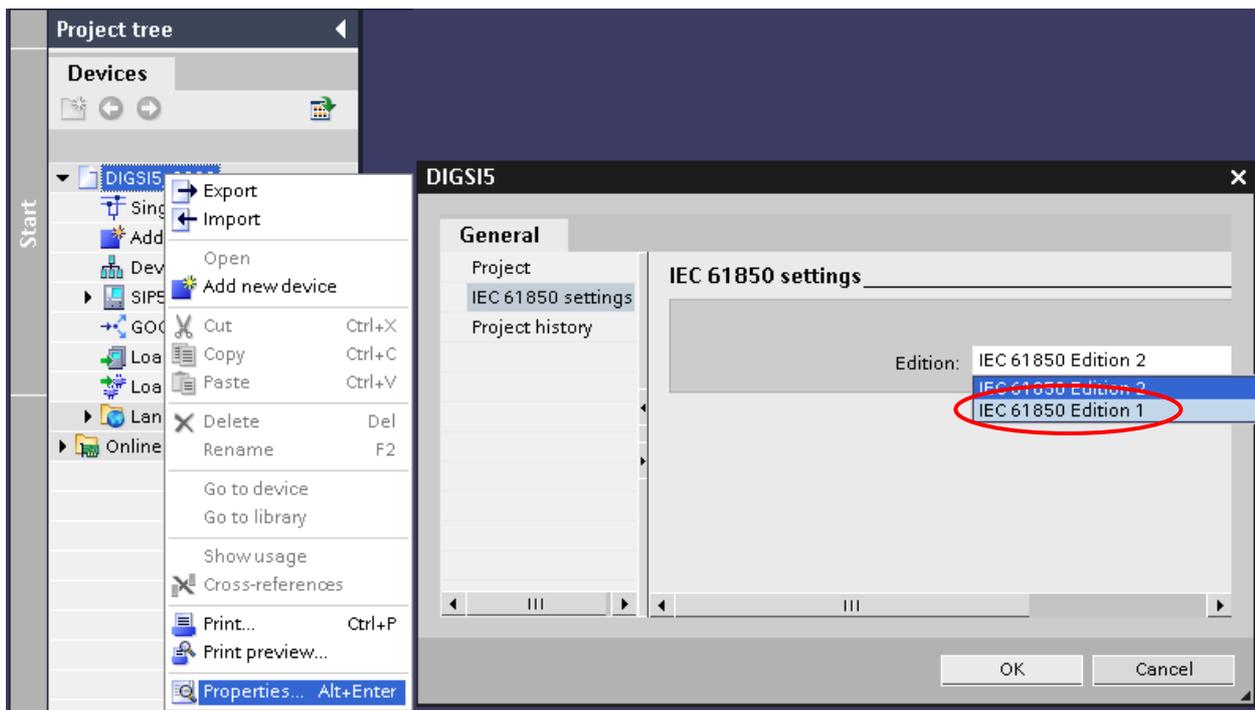
Figure 8: Selection of Edition 1 or 2

The devices shall be exported in the SCD - format. This format is the preferred export / import file from the IEC 61850 standard.

Click with the right mouse button on the project name and select Export. Select SCD - format in the next window and press the Export-button.
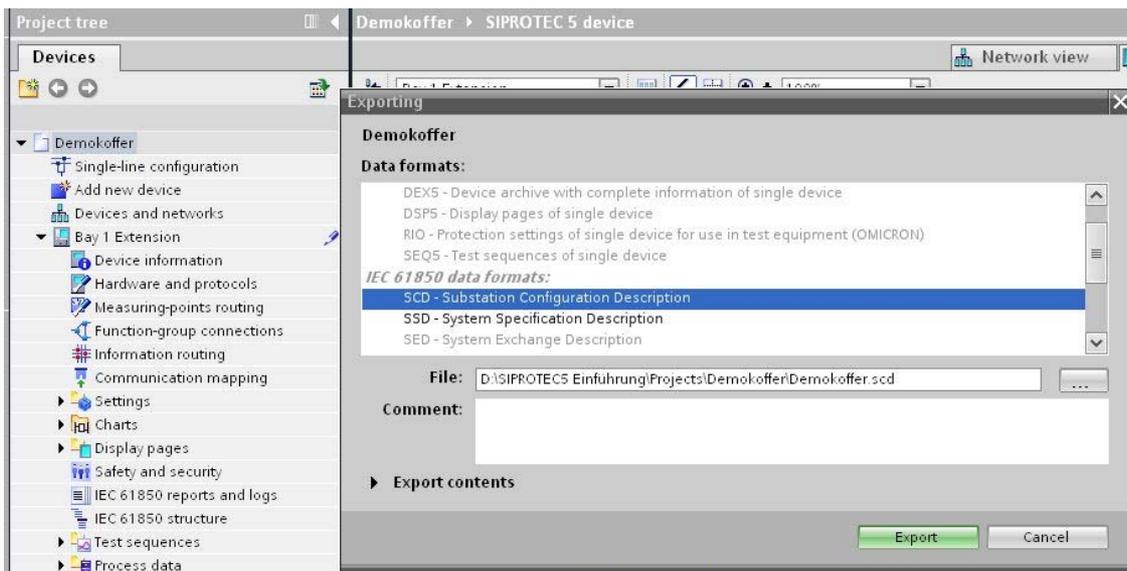
Figure 9: IEC 61850 export file formats. Select SCD format.

1.3.2 Configuration of a SIPROTEC 4 device for GOOSE communication

Start DIGSI 4 and create a SIPROTEC 4 device with the ordering number (MLFB) of the device. MLFB number can be found in the physical device by the use of navigation keys in menu Settings -> Setup/Extras. For IEC 61850 the device must be equipped with EN100 module in port B and the protocol must be selected also. Create two user-defined information for send ("OUT", Type: SP) and receive ("IN", Type: ExSP) of GOOSE messages. Assign these messages to LEDs and S(ystem)-interfaces: "OUT" to LED 4 and S from Destination, "IN" to LED 5 and S from Source. State of "OUT" is influenced by a CFC chart RS-Flip-flop with "LED on" and "LED off" controlled by function keys 1 and 2.
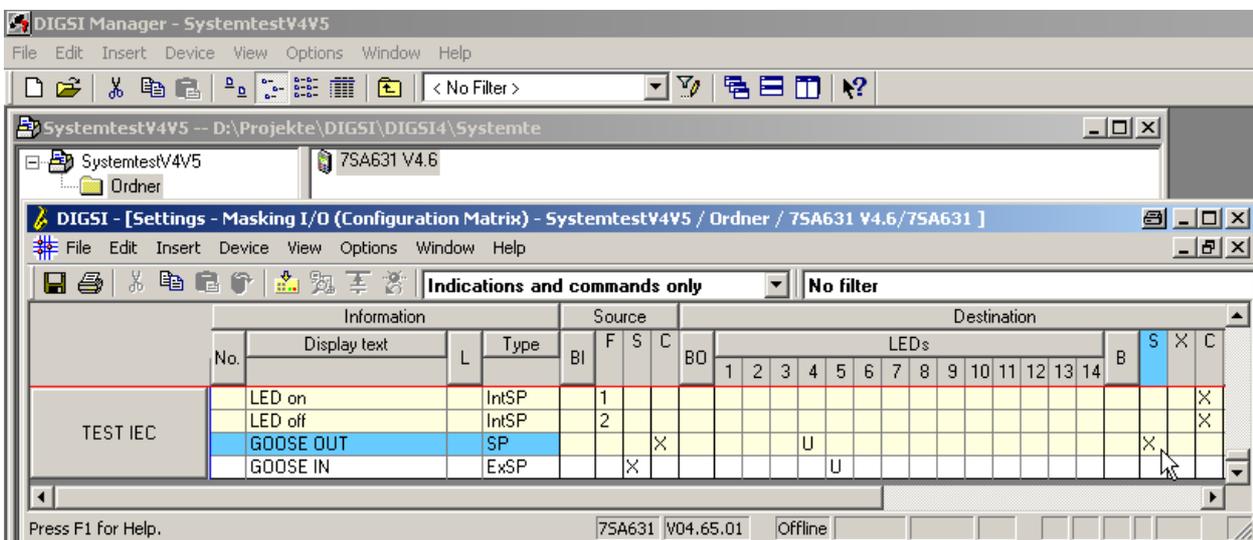
Figure 10: SIPROTEC 4 device

1.3.3 GOOSE configuration in DIGSI 4 for SIPROTEC 4 device together with imported SIPROTEC 5 device

Import the SCD - file of SIPROTEC 5 by the context menu -> "Insert New Object" -> "Other IEC 61850 communicator" in the project folder. Create also an IEC 61850 Station here. Open the context menu of IEC 61850 Station and add the V4 and 5 devices to the station.
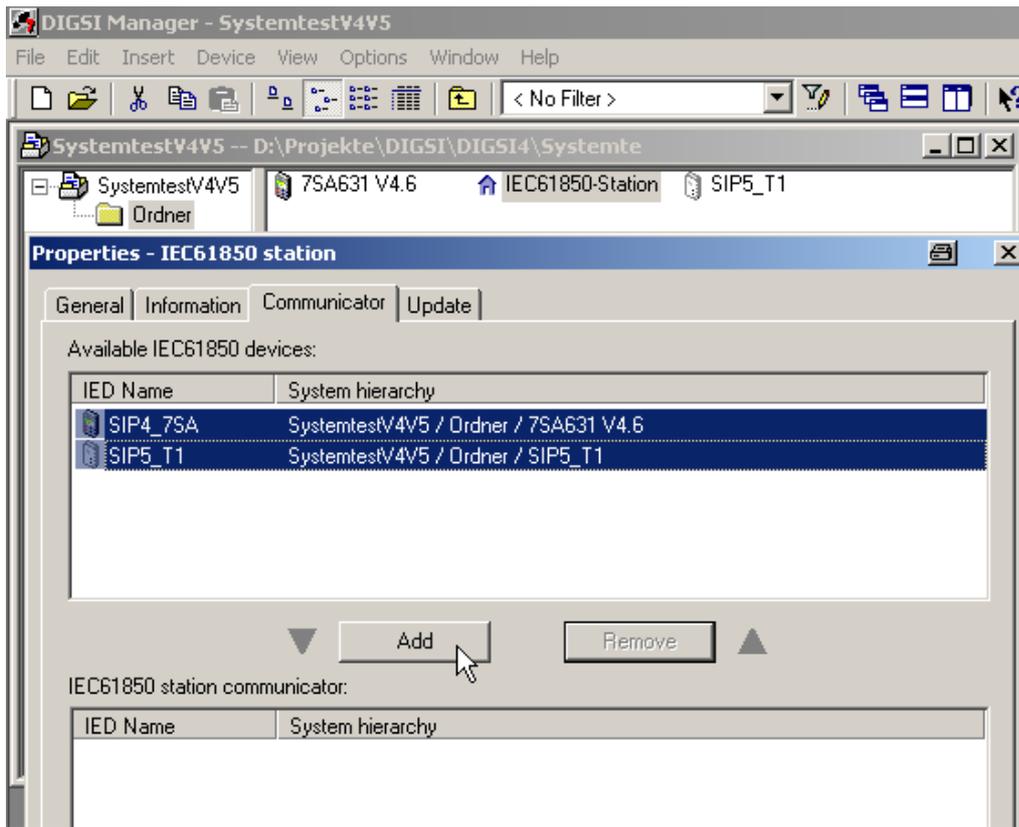
Figure 11: IEC 61850 Station

Open the IEC 61850 Station, make sure both devices are in the same network and create two GOOSE applications for send and receive the GOOSE messages by drag and drop. For SIPROTEC 5 device only a Logical Node can be assigned as destination. The SIPROTEC 4 device indication will be created automatically in the DIGSI 5 I/O-Matrix as a Data Object of the FB.
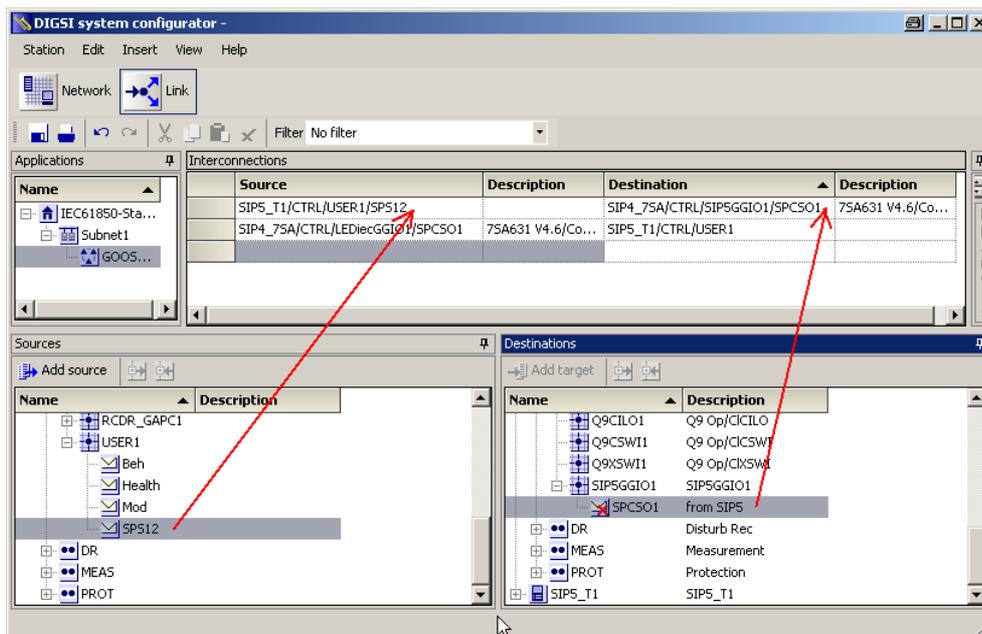
Figure 12: GOOSE editor in DIGSI 4

The final routing for SIPROTEC 4 device will be done in DIGSI 5. After finishing export the SCD - file for the use in DIGSI 5.

1.3.4   Loading of parameters to the SIPROTEC 4 and 5 devices and test of the communication

In DIGSI 4 load the configuration of SIPROTEC 4 to device. The password is 000000.

In DIGSI 5 import the SCD - file.
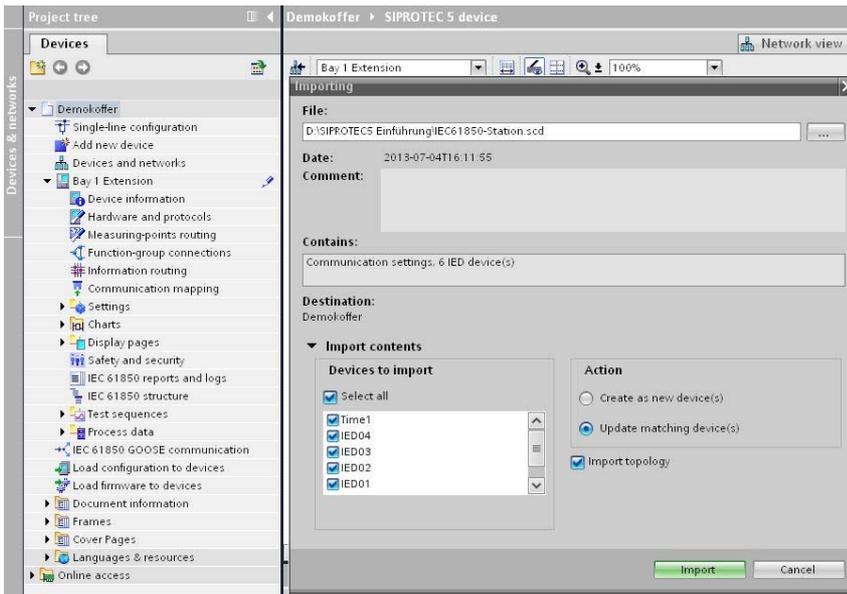
Figure 13: Import

The information from SIPROTEC 4 is now available in the Logical Node USER1 of SIPROTEC 5 device. Assign the SIPROTEC 4 device information to LED 4 in the information routing of SIPROTEC 5 device
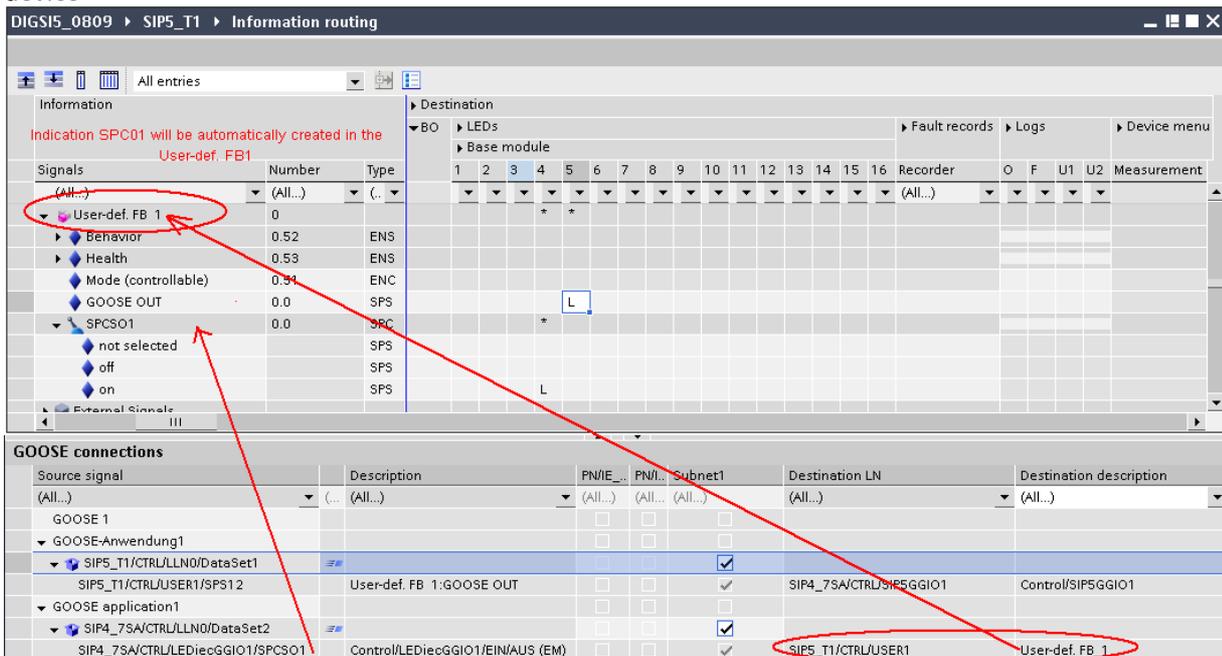
Figure 14: DIGSI 5 GOOSE settings

As the last step the configuration must be loaded to SIPROTEC 5 device. Double click on "Load configuration to device" in the device level. The confirmation ID to be entered is the same 222222 as in the device itself. Confirm loading in case of warnings. The parameters will be loaded to the device.
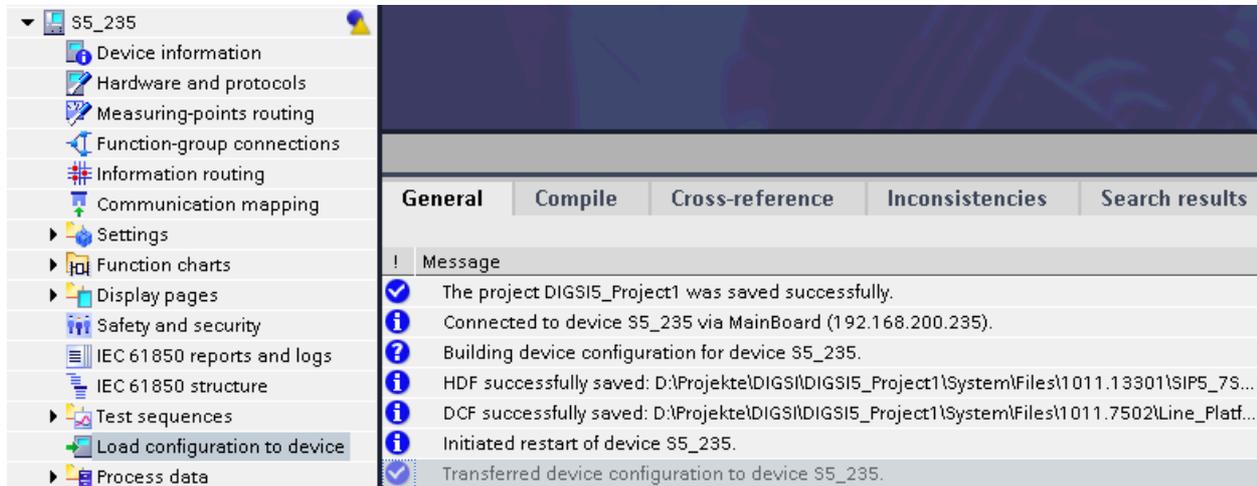
Figure 15: Load configuration to device

1.4   Conclusion

Below the most important hints and steps for GOOSE communication between SIPROTEC V4 and 5:

▪ Use a SIPROTEC 4 and 5 device with an IEC 61850 capable interface

▪ Connect the equipment to an Ethernet network and configure unique local IP-addresses

▪ Configure the IEC 61850 IP-address of the device with DIGSI 5 and export the SCD - file

▪ Configure GOOSE for SIPROTEC 4 and imported SIPROTEC 5 device in DIGSI 4 and export the SCD - file

▪ Import SCD - file in DIGSI 5 and assign the incoming information from DIGSI 4

▪ Load parameters of SIPROTEC 4 with DIGSI 4 and SIPROTEC 5 with DIGSI 5
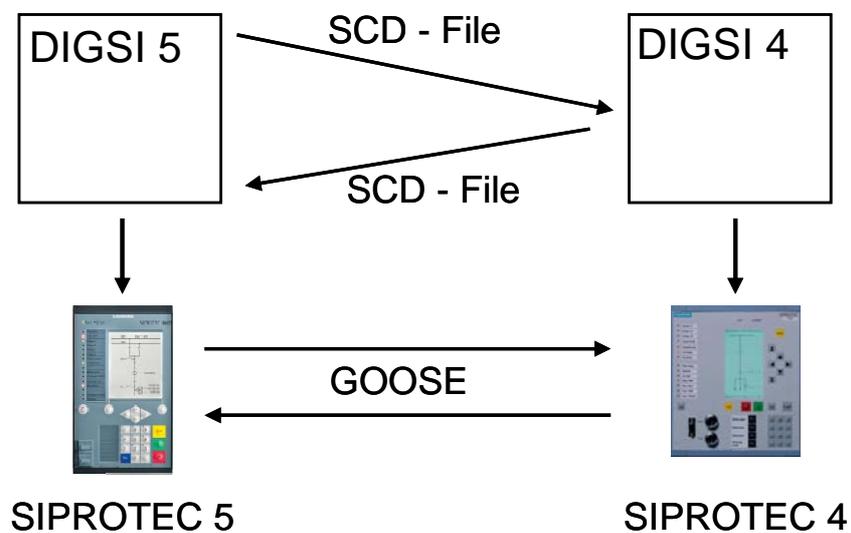
Figure 16: Workflow diagram

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