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SIPROTEC 5 Application Note

SIP5-APN-007:
Interconnection of SIPROTEC 5 devices to SICAM PAS with IEC 61850

Answers for infrastructure and cities.

SIPROTEC 5 - Application: SIP5-APN-007 Interconnection of SIPROTEC 5 devices to SICAM PAS with IEC 61850

Content

Interconnection of SIPROTEC 5 devices to SICAM PAS with IEC 61850

1.1 Summary

This Application Note contains the description of a possible solution for establishing the communication between Substation Automation SICAM PAS V7 and protection devices SIPROTEC 5 using the IEC 61850 protocol. IEC 61850 is the communication and protection protocol based on TCP/IP used in the substation automation.

1.2 Application Introduction

The task can be divided in three parts:

- Configuration of a SIPROTEC 5 device for communication with IEC 61850.
- Configuration of a SICAM PAS V7 for IEC 61850 communication with the SIPROTEC 5 device.
- Test the communication by a fault record transmission.

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

- PC with installed SICAM PAS V7 and a PC with installed DIGSI 5 software
- SIPROTEC 5 device with a communication module applicable for IEC 61850
- Ethernet network which is connecting the components

1.3 Solution

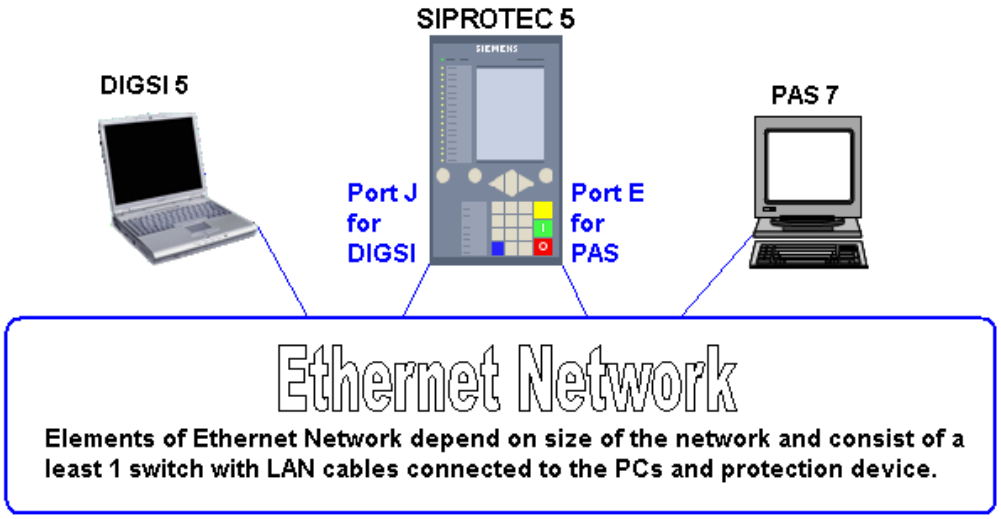

Figure 1: Overview about hard- and software used for the task solution

1.3.1 Configuration of a SIPROTEC 5 device for communication with IEC 61850

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.**

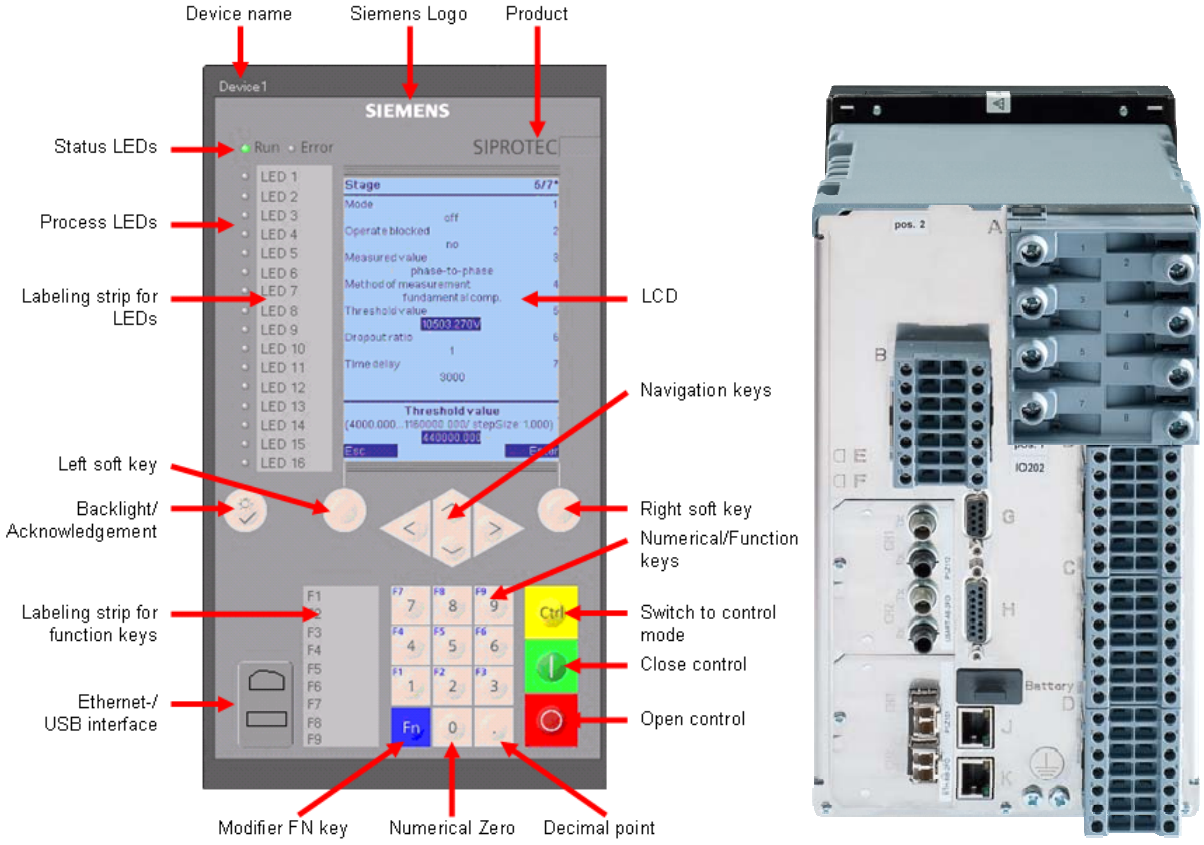

Figure 2: SIPROTEC 5 device front and rear view with optical port E (port J is always electrical)

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.

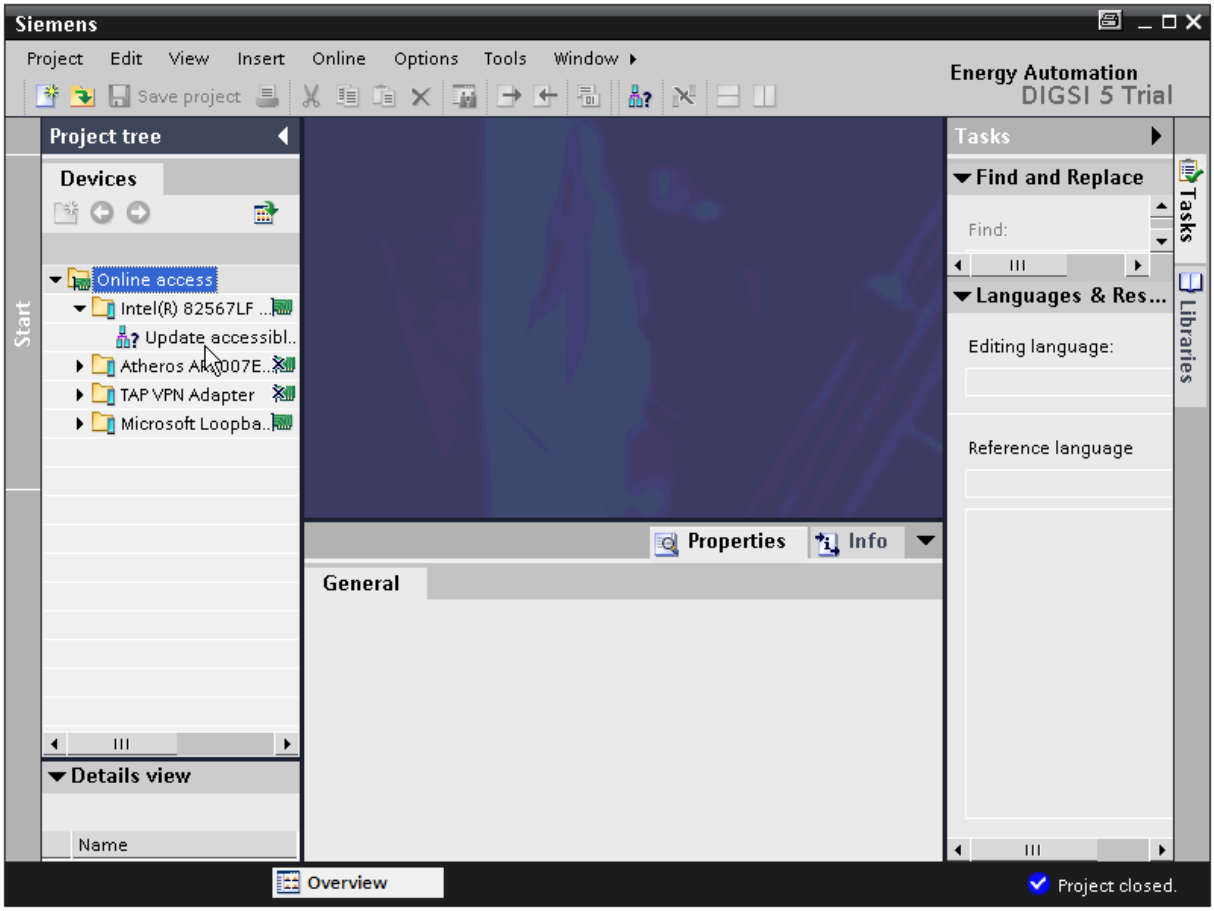

Figure 3: Find accessible devices in DIGSI 5

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 this 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.

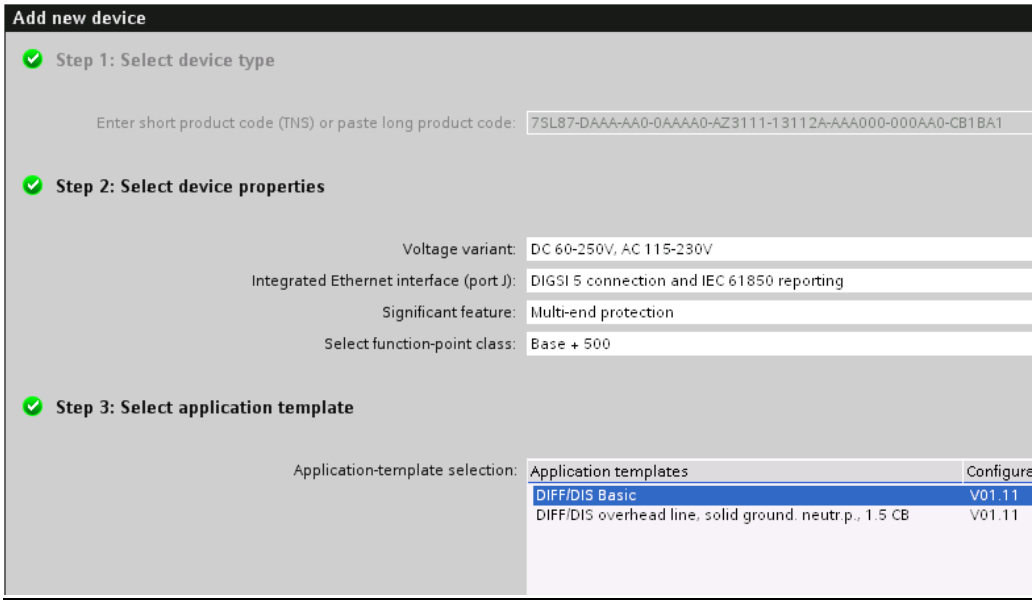

Figure 4: Add new device

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”.

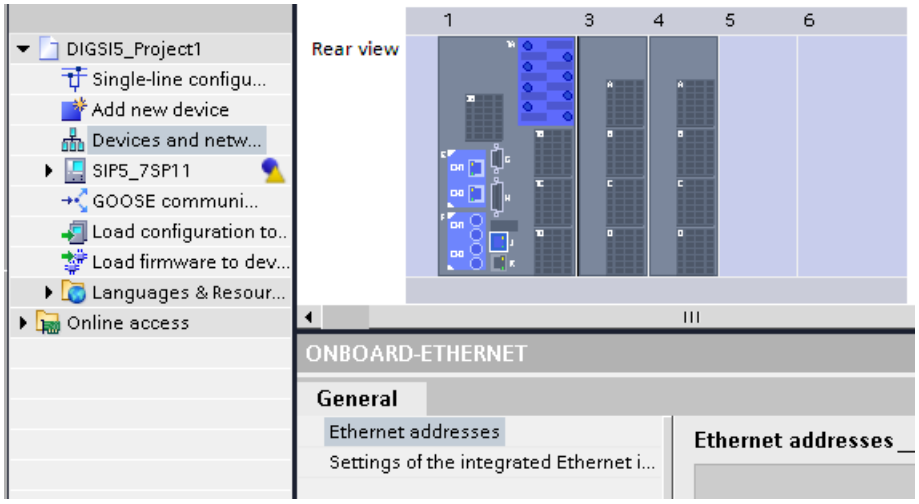

Figure 5: Port J for DIGSI communication

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.

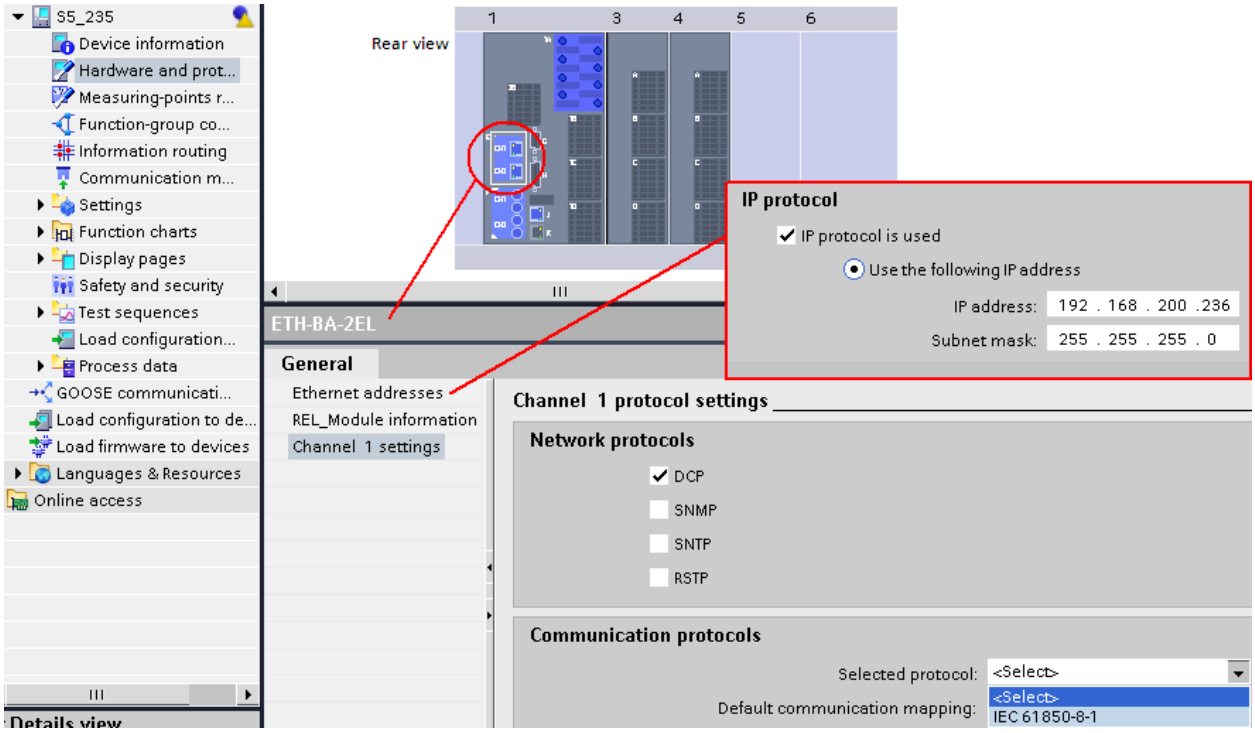

Figure 6: Port E for IEC 61850 (device is already renamed)

To check the fault record transmission a fault record must be initiated. This can be easily parameterized 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. Assign “Start record” of the Recording function block to a function key (here no. 3) as a source.

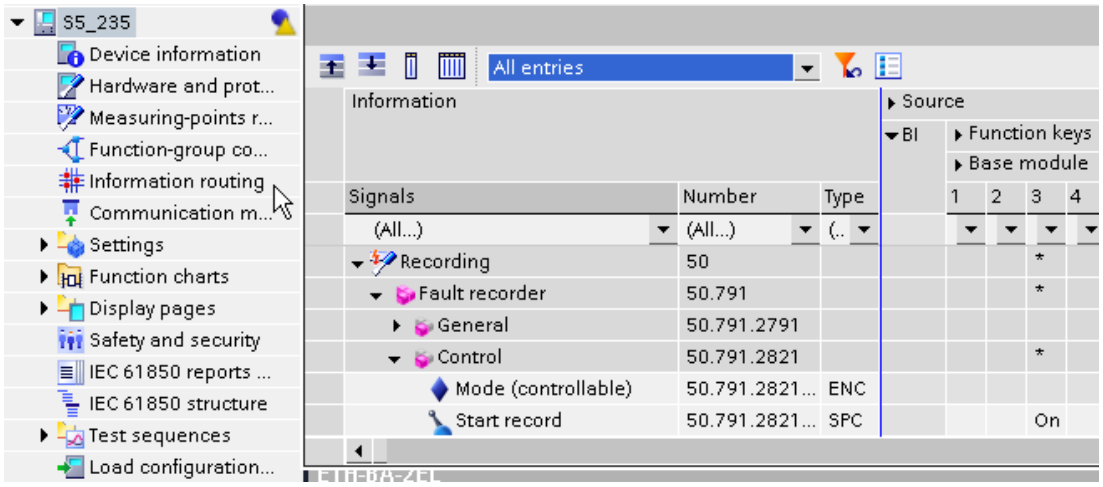

Figure 7: Information routing

The DIGSI project must be exported in the SCD-format. SCD = Substation Configuration Description.

The SCD file will be used in SICAM PAS V7 configuration in the next part.

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.

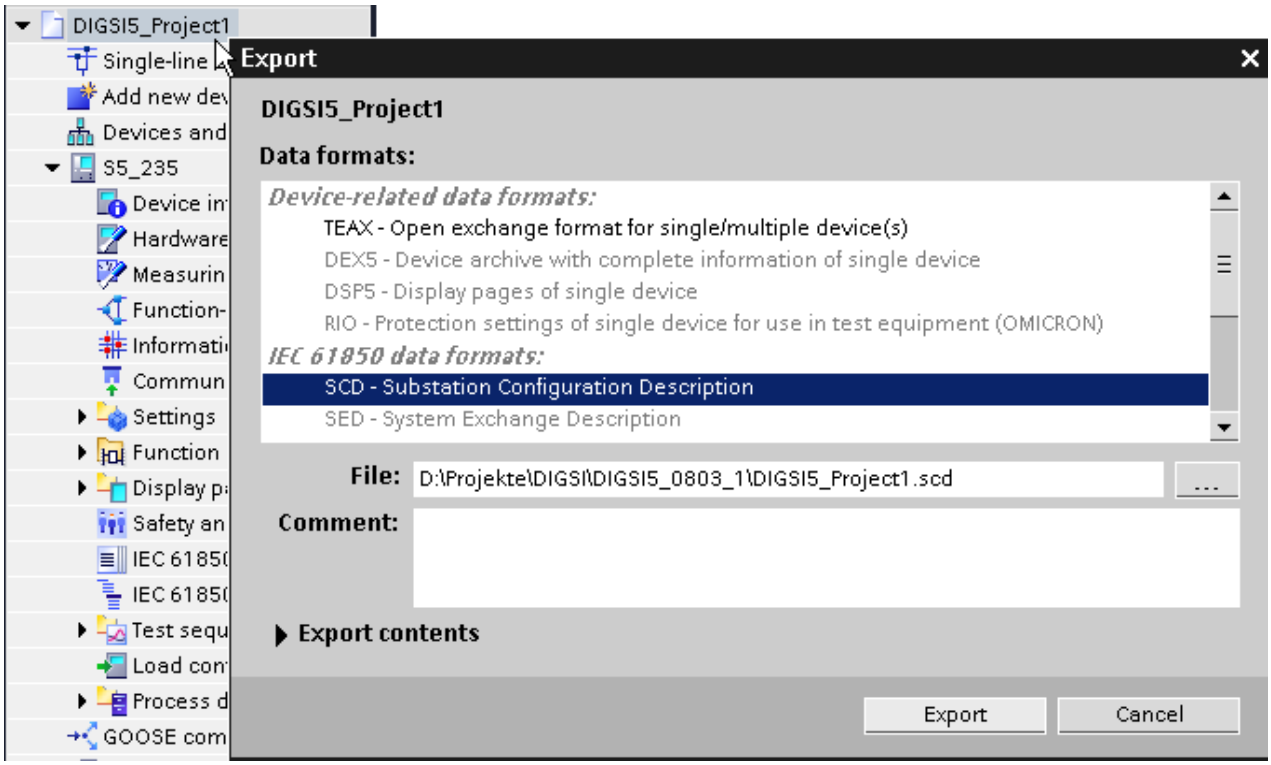

Figure 8: Project export

As the last step the configuration must be loaded to 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.

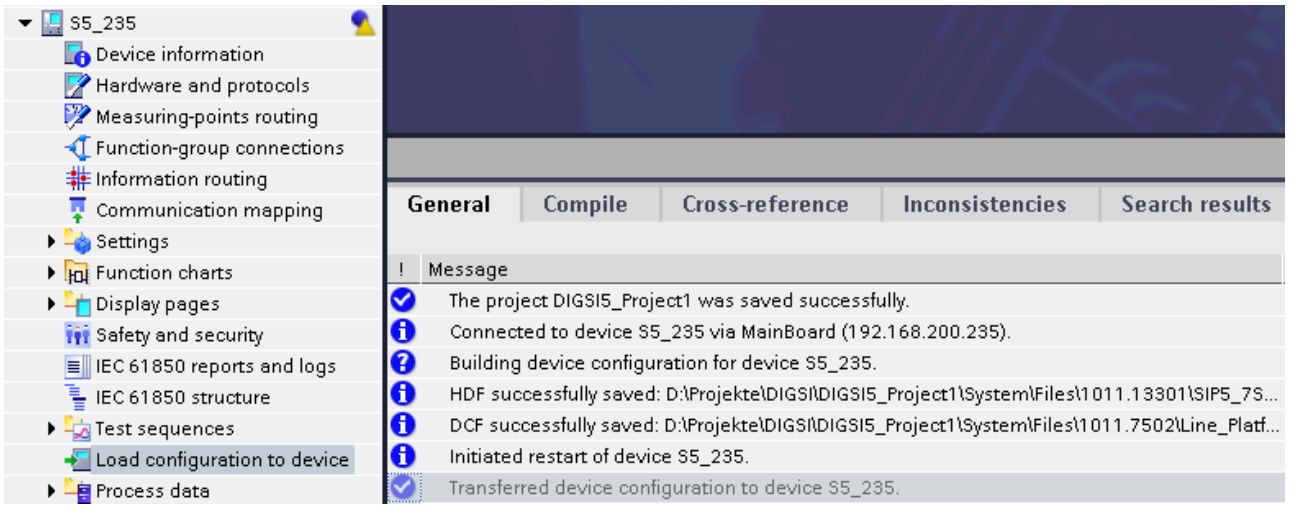

Figure 9: Load configuration to device

1.3.2 Configuration of a SICAM PAS V7 for IEC 61850 communication with SIPROTEC 5 device

Start SICAM PAS V7 **UI-Configuration** in the Siemens Energy folder of the Windows start menu. If it doesn't start check if all necessary features are installed with the Feature Enable in the same folder. At least following features must be installed: Configuration, Runtime and IEC 61850 Client.

Open the Configuration section, select the "SICAM PAS PQS"-folder in the left window and use the context menu (click with the right mouse button) to create System, Application and Interface. In our case the System is the PC, the Application is the IEC 61850 client and the Interface is the LAN port with the local IP-address of the PC.

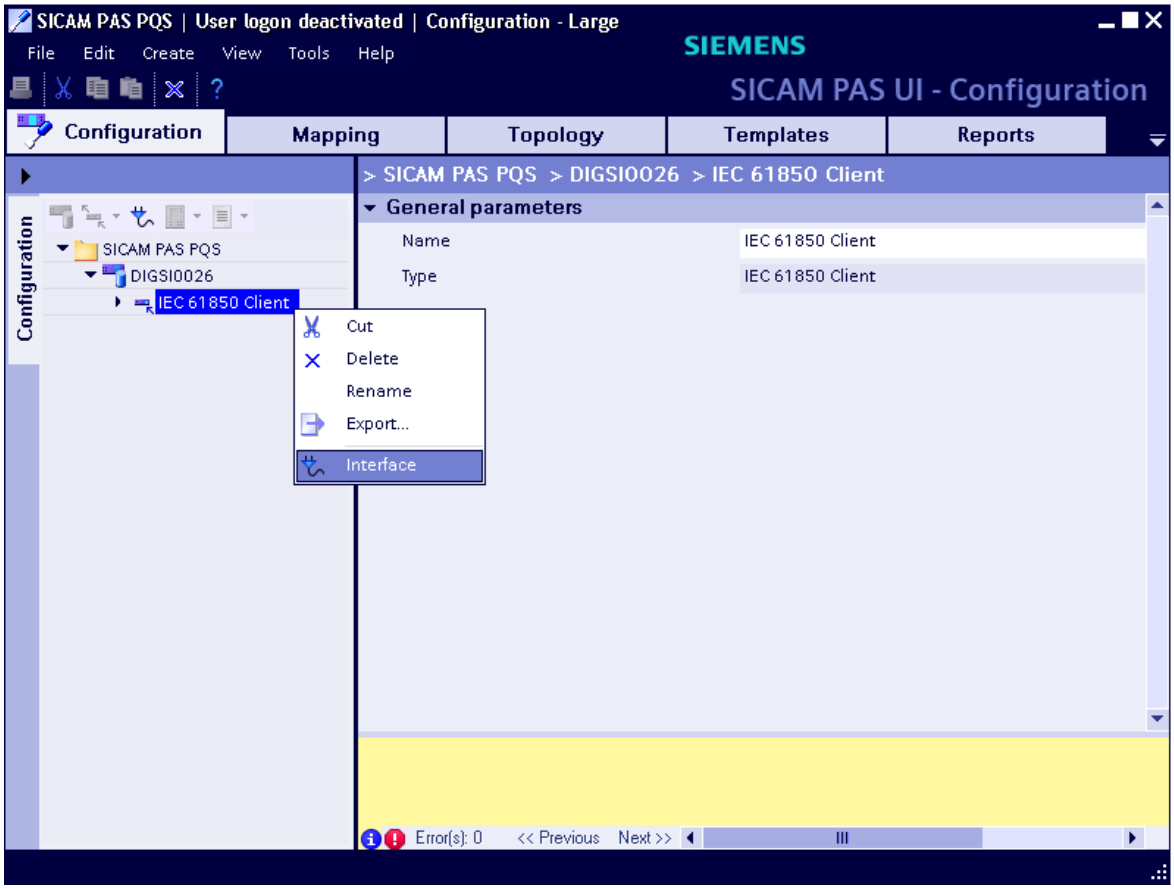

Figure 10: SICAM PAS UI-Configuration – IEC 61850 Client

Use the context menu of Interface to import the SCD-file which was created in part 1. The Import function opens a new window where the protection device is selected by default, click the "OK"-button.

After the import the device appears in the tree below the interface. It has the IP-address 192.168.200.236. This is the IEC 61850-interface of the device. No additional settings are required for our task.

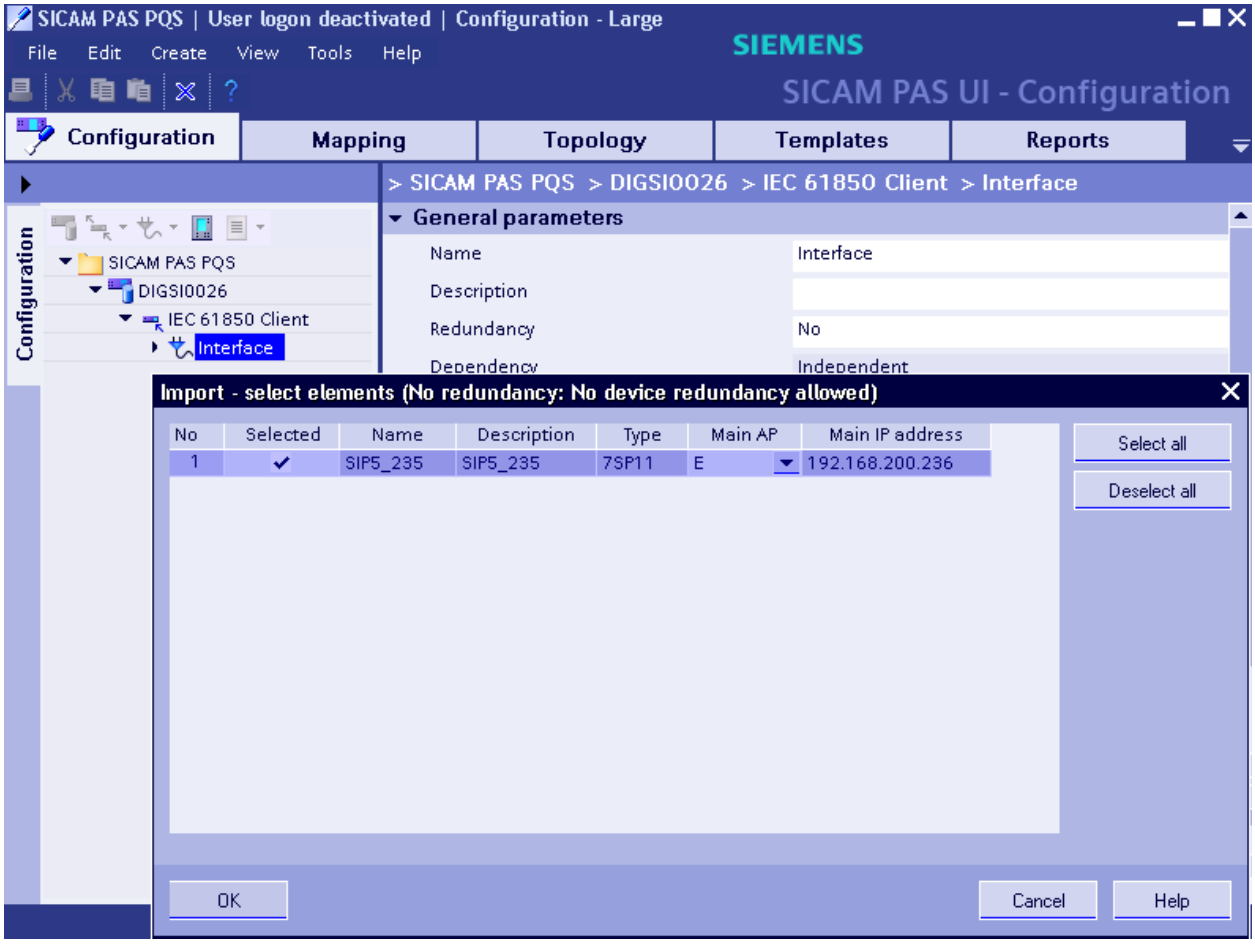

Figure 11: Import of a SIPROTEC 5 device

Open SICAM PAS V7 **UI-Operation** in the Siemens Energy folder of the Windows start menu.

Click on “Update system”-button. The update takes a few minutes. Then click on “Start”-button for all elements of the tree or use context menu to start all with one click.

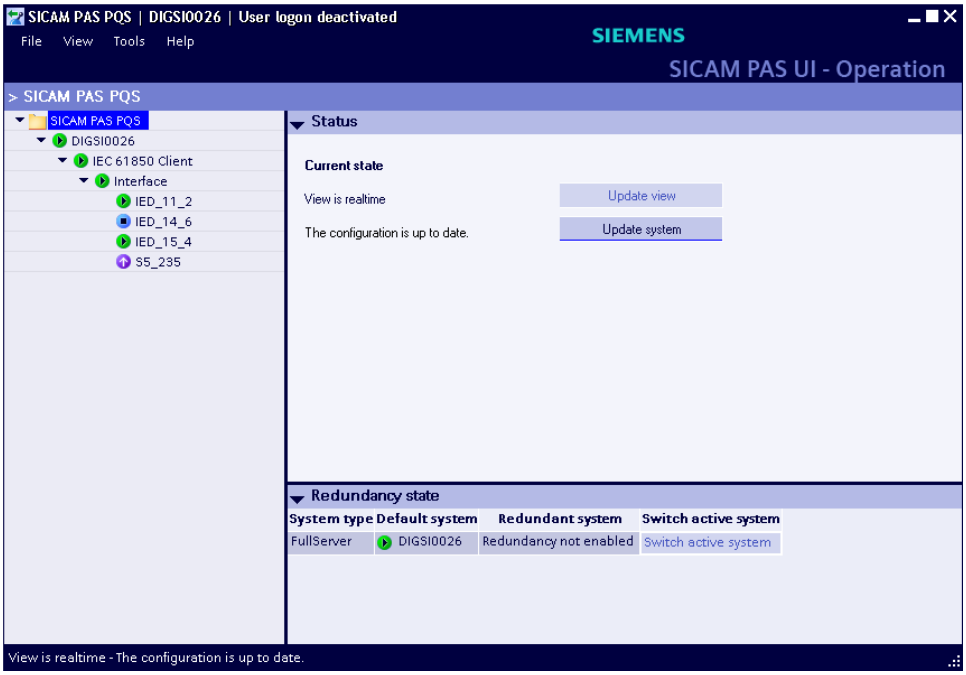

Figure 12: SICAM PAS UI-Operation

When the communication is successful each element of the tree has a green triangle (“play”-symbol) besides indicating proper operation.

For detailed view open SICAM PAS V7 **Value Viewer** where information received from device is displayed with time stamp, value and other properties.

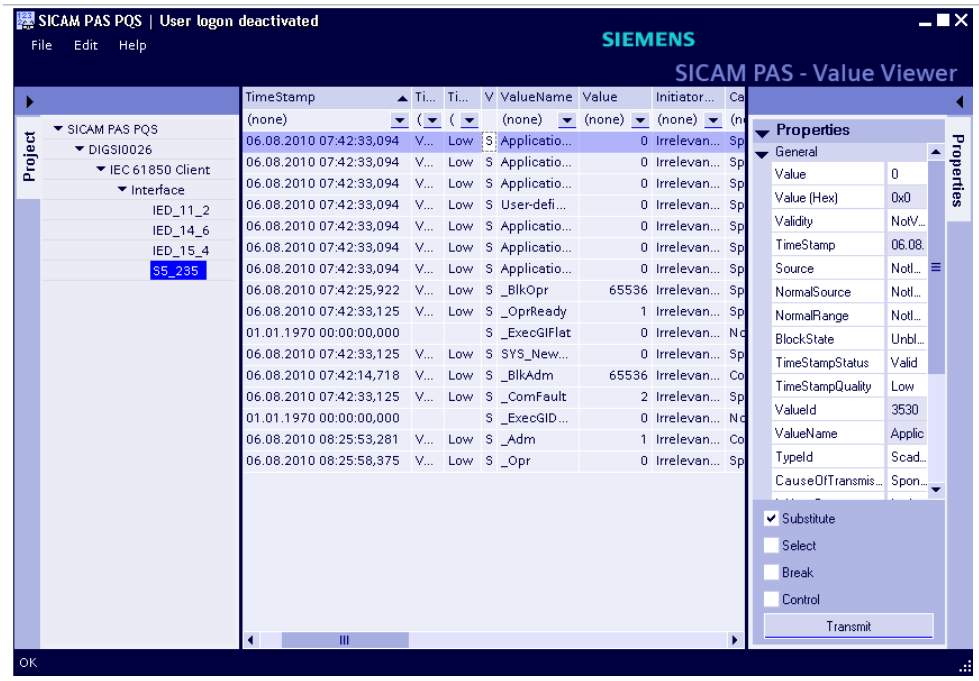

Figure 13: SICAM PAS Value Viewer

1.3.3 Test communication by a fault record transmission

One of the features of PAS V7 is an automatic fault record transmission. PAS V7 automatically retrieves new fault records in the selected time intervals. This time interval is defined in the properties of the IEC 61850 interface. Also the location of the fault records directory can be configured here.

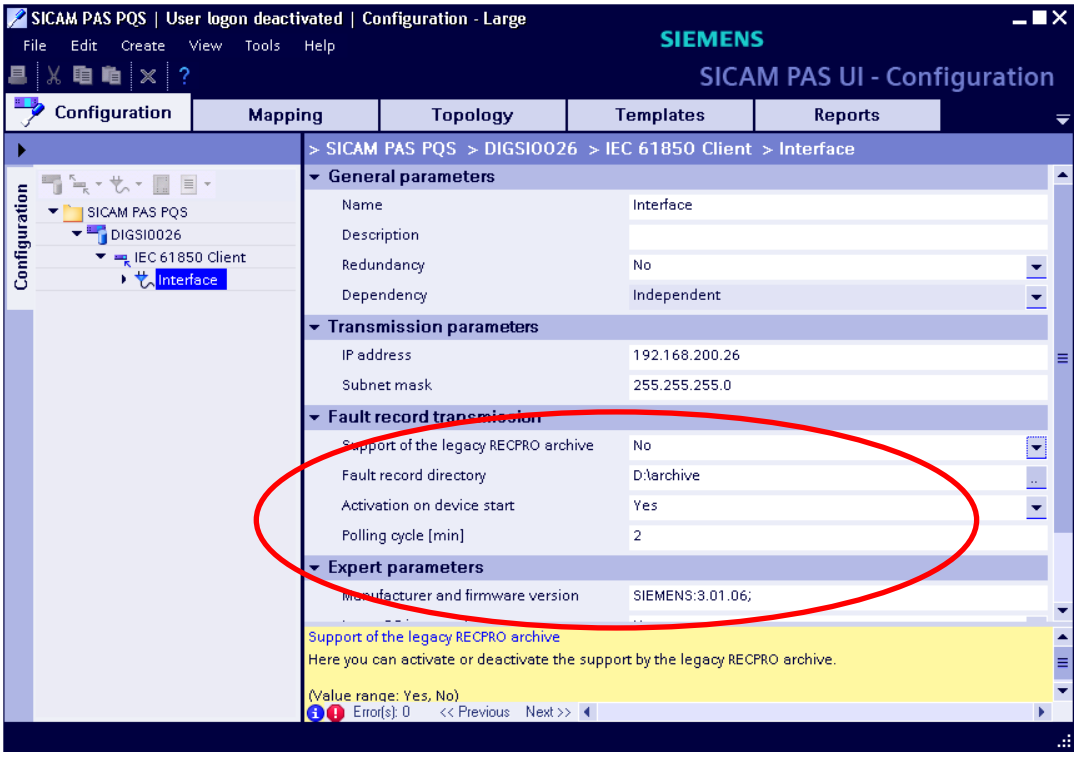

Figure 14: IEC 61850 settings for fault record transmission

Initiate a fault recording in the SIPROTEC 5 device by pressing “FN”-key, then “3” on the front panel of the device. Wait some time for the recording to be made and transferred. Then check the fault records directory. The fault record is available in the COMTRADE format and can be opened with SIGRA.

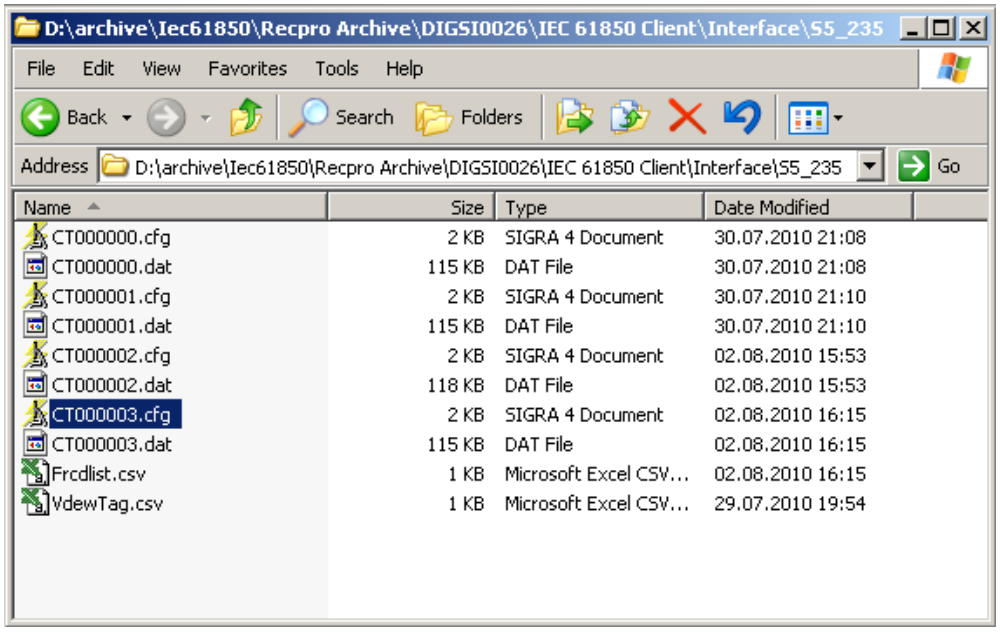

Figure 15: Fault record in the fault record directory

1.4 Conclusion

SICAM PAS V7 and SIPROTEC 5 can be configured in a few steps for the use of the IEC 61850 protocol for substation communication. Below the most important hints and steps:

- Use a SIPROTEC 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 DIGSI5 and export the SCD-file
- Send the parameters to SIPROTEC 5 to make the device ready for communication
- Create an IEC 61850 Client Application with interface and import the SCD-file in PAS UI-Configuration
- Update the system in PAS UI-Operation and start communication

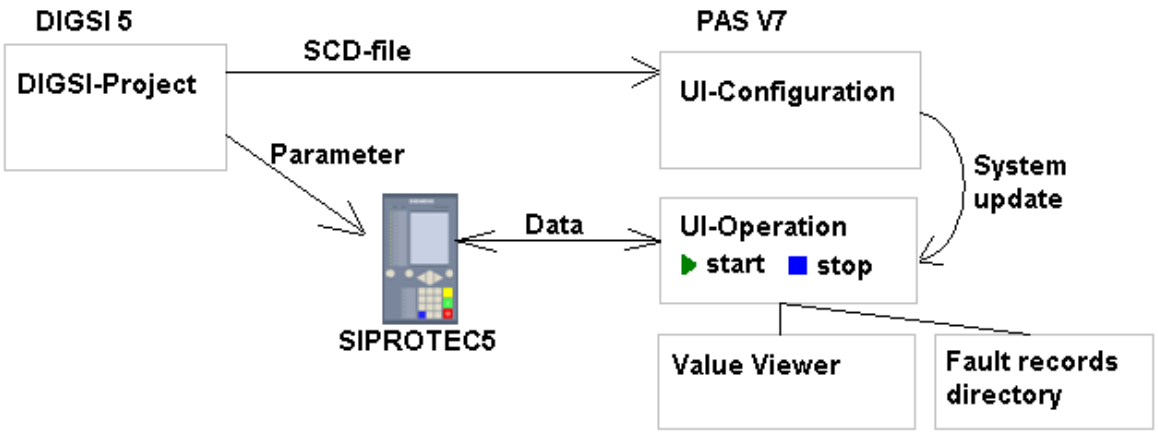

Figure 16: Workflow diagram

Additional information:

SICAM PAS V7 can also import SCD-files with SIPROTEC 4 devices created by DIGSI 4. The steps in SICAM PAS UI-Configuration are the same as for DIGSI 5 SCD-files.

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