

Protocol conversions

- Comlynx to Modbus TCP protocol conversion
- DLMS Serial to IEC104 protocol conversion
- DLMS TCP to DNP3 protocol conversion
- Modbus RTU to IEC104 protocol conversion
- Modbus RTU to DNP3 protocol conversion
- DLMS Serial to IEC61850-server protocol conversion (Wcc Lite FW: 1.7.0)
- DLMS Serial to IEC61850-server protocol conversion (WCC Lite FW: 1.10.0 or newer)

Comlynx to Modbus TCP protocol conversion

Description

This article describes WCC Lite configuration steps to enable Comlynx protocol conversion to Modbus TCP



<https://www.youtube.com/embed/mTSQG8vIQCA>

First steps

Before you begin, make sure you have completed all physical installation work according to the manufacturer's installation instructions.

Set up your computer and connect Ethernet cable to WCC Lite ETH0 port. Login with default credentials and setup basic required settings (name, network, users, etc.). You can find configuration tutorials in **How to** articles.

After setup, download configuration template from device (Protocol Hub → Configuration → Template configuration Download)

Or download configuration example from this article **Files**.

To prepare configuration fill information in both - **Devices** and **Signals** sheets:

Configure devices

Add connected inverter with ComLynx protocol required information:

name	device_alias	enable	protocol	timeout_ms	device	baudrate	databits	stopbits	parity	flowcontrol
Inverter	Danfoss_INV_1	1	ComLynx	2000000	PORT1	19200	8	1	none	none

scan_rate_ms	retry_count	network	subnet	address
--------------	-------------	---------	--------	---------

60000	3	3	2	163
-------	---	---	---	-----

Add Modbus Slave required information:

name	device_alias	enable	protocol	timeout_ms	bind_address
Modbus Slave	Modbus_slave	1	Modbus TCP Slave	500000	0.0.0.0

host	port	mode
192.168.1.1	502	tcp

You can find more options and descriptions of the settings in [Device configuration](#) article.

Configure signals

Add connected inverter signals information. Use inverter manual for information and addresses (**tag_job_todo**).

signal_name	device_alias	signal_alias	enable	tag_type	units	multiply	job_todo	job_todo	number_type
Total energy production	Danfoss_INV_1	Danfoss_1	1	Normal	kWh	0,001	08 01 02	NA	UNSIGNED16
...									

Where in **job_todo** 08 is "module id", 01 - "Index", 02 - "SubIndex" of measurements.

number_type can be found in manual as Data type id converted to data type as follow:

```
0x0: Not defined- Not supported
0x1: Boolean
0x2: Signed 8
0x3: Signed 16
0x4: Signed 32
0x5: Unsigned 8
0x6: Unsigned 16
0x7: Unsigned 32
0x8: Float
0x9: Visible string - Not supported
0xA: Packed bytes - Not supported
0xB: Packed words - Not supported
0xC - 0xF: Reserved- Not supported
```

Add Modbus slave signals information

signal_name	device_aliases	signal_alias	source_device_alias	source_signal_alias	enable	tag_type	units	multiply
Total energy production	Modbus_slave	Modbus_1	Danfoss_INV_1	Danfoss_1	1	Normal	kWh	1.0

common_address	function	info_address	number_type	size
1	3	1	UNSIGNED16	1

Use measurements from inverter as a source to be forwarded.

You can find more options and descriptions of the settings in [Signals sheet](#) article.

Upload configuration

After configuring all devices and signals, follow these steps to check and upload configuration using WCC Excel Utility:

1. **Download** and run WCC Excel Utility;
2. Select Excel file from your computer and click *Convert*;
3. Check if no events in red color occur. If so, edit Excel file according to event text and repeat Step 2;

4. Enter Host and credentials of WCC Lite and click*Upload configuration.*

Another method to upload the configuration is via the web interface:

1. Access the WCC Lite interface via your browser:

Authorization Required

Please enter your username and password.

Username

Password

Login

Reset

2. Upload the Excel configuration:

PROTOCOL HUB

STATUS

SYSTEM

SERVICES

NETWORK

USERS

LOGOUT (ROOT)

CONFIGURATION

IMPORTED SIGNALS

EVENT LOG

PROTOCOL CONNECTIONS

PROTOCOL LOGGER

SCRIPT-RUNNER

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file:

Choose File

No file chosen

Import configuration

PLC (IEC-61499) Boot file:

Choose File

No file chosen

Import FBOOT file

IEC61850 Client model file:

Choose File

No file chosen

Import client model file

IEC61850 Server model file:

Choose File

No file chosen

Import server model file

3. After a successful upload, the configuration will appear under the**DOWNLOAD CONFIGURATION** tab:

DOWNLOAD CONFIGURATION

Current configuration (config-elseta-wcc-Comlynx.xlsx):
Last changed: 2024-11-10 01:44:14

Download

Template configurations:

Download

4. If any errors occur during the upload, follow the error messages, fix them along Excel utility guidelines.

Files

- 1. Danfoss inverter manual - Accessing Inverter Parameters via RS485 using the ComLynx protocolDownload
- 2. WCC Excel Utility Download
- 3. Example of configuration fileDownload

DLMS Serial to IEC104 protocol conversion

Description

The article describes WCC Lite configuration steps to enable DLMS Serial protocol conversion to IEC 60870-5-104.



Fig 1.

First steps

Before you begin, make sure you have completed all physical installation work according to the manufacturer's installation instructions.

Set up your computer and connect Ethernet cable to WCC Lite ETH0 port. Login with default credentials and setup basic required settings (name, network, users, etc.). You can find configuration tutorials in **How to** articles.

To prepare configuration fill information in both -Devices and Signals sheets:

Configure devices

Add connected Gama meter with **DLMS Serial** protocol required information:

name	description	device_alias	enable	protocol	serial_number	device	databits	stopbits
From Gama Meter	Elgama Gama 300	GAMA300	1	DLMS	2250259	PORT1	8	1

baudrate	parity	flowcontrol	logical_address	address_size	client_address	type
4800	none	none	1	2	32	SN

mode	auth
DLMS-HDLC	LOW

More information concerning DLMS protocol configuration is provided in [DLMS/COSEM](#) article.

Add SCADA working on **IEC104** protocol required information:

name	device_alias	enable	protocol	bind_address	host	port
To SCADA	IEC104_SCADA	1	IEC 60870-5-104 slave	0.0.0.0	192.168.1.10 192.168.71.1	2404

asdu_size	cot_size	ioa_size	rwt	swt	t1	t2	t3
2	2	3	8	12	45	30	200


time_sync	message_size	cache_size
1	249	100

More information concerning IEC104 protocol configuration is provided in [IEC 60870-5-104 Slave](#) article.

Configure signals

Add connected meter measurements information.

signal_name	device_alias	signal_alias	obis_job
Voltage	GAMA300	L3_U	1.0.72.7.0.255
Frequency	GAMA300	F	1.0.14.7.0.255

 **obis_job** - Objects are identified with the help of OBIS (Object Identification System) codes.

1. The first number of OBIS code defines the media (energy type) to which the metering is related. Nonmedia related information is handled as abstract data. For example both obis_jobs in the table above starts with numbers 1 which stands for "Electricity related objects".
2. The second number defines the channel number, i.e. the number of the input of a metering equipment having

several inputs for the measurement of energy of the same or different types (e.g. in data concentrators, registration units). Data from different sources can thus be identified. The definitions for this value group are independent from the value of the first number. In both obis_jobs from the table above second number is set to zero which means that no channel is specified.

3. The third number defines the abstract or physical data items related to the information source concerned, for example current, voltage, power, volume, temperature. The definitions depend on the value of the first number. For example in obis_jobs from the table above number 72 means voltage L3 and number 14 means frequency.
4. The forth number defines types, or the result of the processing of physical quantities identified with the numbers 1 and 3, according to various specific algorithms. The algorithms can deliver energy and demand quantities as well as other physical quantities. In both obis_jobs from the table above forth number is set to 7 which stands for "Instantaneous value".
5. The value of the fifth number defines further processing or classification of quantities identified by numbers 1 to 4. In case of the first obis_job number 0 means that all harmonics of the signal along with its fundamental frequency are going to be taken into consideration.
6. The value of the sixth number defines the storage of data, identified by numbers 1 to 5, according to different billing periods. Where this is not relevant, this value group can be used for further classification. In both obis_jobs from the table above last number is set to 255 which means that data is not used.

Add **IEC104 Slave** signals information:

signal_name	device_alias	signal_alias	source_device_alias	source_signal_alias	enable
IEC104 SCADA V	IEC104_SCADA	IEC104_SCADA_V_L3_N	GAMA300	L3_U	1
IEC104 SCADA F	IEC104_SCADA	IEC104_SCADA_Freq	GAMA300	F	1

log	gi	common_address	info_address	data_type
1	1	1	101	36
1	1	1	104	36

For more detailed DLMS protocol communication analysis Gurux DLMS Director application can be used.

Upload configuration

After configuring all devices and signals, follow these steps to check and upload configuration using WCC Excel Utility:

1. Download and run WCC Excel Utility;
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3. Check if no events in red color occur. If so, edit Excel file according to event text and repeat Step 2;
4. Enter Host and credentials of WCC Lite and click *Upload configuration*.

Another method to upload the configuration is via the web interface:

1. Access the WCC Lite interface via your browser:

Authorization Required

Please enter your username and password.

Username

Password

Login

Reset

2. Upload the Excel configuration:

PROTOCOL HUB	STATUS	SYSTEM	SERVICES	NETWORK	USERS	LOGOUT (ROOT)
CONFIGURATION	IMPORTED SIGNALS	EVENT LOG	PROTOCOL CONNECTIONS	PROTOCOL LOGGER	SCRIPT-RUNNER	

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file: No file chosen

PLC (IEC-61499) Boot file: No file chosen

IEC61850 Client model file: No file chosen

IEC61850 Server model file: No file chosen

3. After a successful upload, the configuration will appear under the **DOWNLOAD CONFIGURATION** tab:

DOWNLOAD CONFIGURATION

Current configuration (config-elseta-wcc-Comlynx.xlsx):
Last changed: 2024-11-10 01:44:14

Template configurations:

4. If any errors occur during the upload, follow the error messages, fix them along Excel utility guidelines.

Files

1. WCC Excel Utility Download
2. Example of configuration file Download

DLMS TCP to DNP3 protocol conversion

Setup

The article describes WCC Lite configuration steps to enable DLMS tcp protocol conversion to DNP3.



Fig 1. Connection scheme.

Before you begin, make sure you have completed all physical installation work according to the manufacturer's installation instructions.

Set up your computer and connect the Ethernet cable to the WCC Lite ETH0 port. Log in with default credentials and set up basic required settings (name, network, users, etc.). You can find configuration tutorials in [How to](#) articles.

To prepare the configuration, fill information in both the [Devices](#) and [Signals](#) sheets:

Configuring Devices

Add a connected Gama meter with the **DLMS TCP** protocol required information:

name	description	device_alias	enable	protocol	serial_number	port
From Gama Meter	Elgama Gama 300	GAMA300	1	DLMS	2393020	4059

ip	logical_addresses	address_size	client_addresses	type	mode	auth	password
192.168.1.2	1	2	32	LN	DLMS-WRAPPER	LOW	00000002

More information concerning DLMS protocol configuration is provided in the [DLMS/COSEM](#) article.

Add the SCADA working on the **DNP3** protocol required information:

name	device_alias	enable	protocol	mode	host	bind_address
DNP3 SCADA system	DNP3_SCADA	1	DNP3 TCP slave	TCP	192.168.1.215	0.0.0.0


port	destination_address	source_address	unsol_classes
20000	10	1	1,2,3

More information concerning DNP3 protocol configuration is provided in the [DNP 3.0 Slave](#) article.

Configuring Signals

Add connected meter measurements information.

signal_name	device_alias	signal_alias	obis_job
Voltage L3-N	GAMA300	L3_U	1.0.72.7.0.255
Frequency	GAMA300	F	1.0.14.7.0.255
Current L3	GAMA300	L3-I	1.0.71.7.0.255
Absolute active instantaneous power	GAMA300	P	1.0.15.7.0.255

 **Obis_job** - Objects are identified with the help of OBIS (Object Identification System) codes.

1. The first number of the OBIS code defines the media (energy type) to which the metering is related. Non-media-related information is handled as abstract data. For example, both obis_jobs in the table above start with number 1, which stands for "Electricity related objects".
2. The second number defines the channel number, i.e. the number of the input of a metering equipment having

several inputs for the measurement of energy of the same or different types (e.g. in data concentrators, registration units). Data from different sources can thus be identified. The definitions for this value group are independent of the value of the first number. In both obis_jobs from the table above second number is set to zero, which means that no channel is specified.

3. The third number defines the abstract or physical data items related to the information source concerned, for example, current, voltage, power, volume, temperature. The definitions depend on the value of the first number. For example, in obis_jobs from the table above, the number 72 means voltage L3, and the number 14 means frequency.
4. The fourth number defines types, or the result of the processing of physical quantities identified with the numbers 1 and 3, according to various specific algorithms. The algorithms can deliver energy and demand quantities as well as other physical quantities. In both obis_jobs from the table above fourth number is set to 7, which stands for "Instantaneous value".
5. The value of the fifth number defines further processing or classification of quantities identified by numbers 1 to 4. In case of the first obis_job number 0 means that all harmonics of the signal along with its fundamental frequency are going to be taken into consideration.
6. The value of the sixth number defines the storage of data, identified by numbers 1 to 5, according to different billing periods. Where this is not relevant, this value group can be used for further classification. In both obis_jobs from the table above last number is set to 255, which means that the data is not used.

Add **DNP3 Slave** signals information:

signal_name	device_alias	signal_alias	source_device_alias	source_signal_alias	enable
DNP3 SCADA V	DNP3_SCADA	DNP3_SCADA_V_L3_N	GAMA300	L3_U	1
DNP3 SCADA F	DNP3_SCADA	DNP3_SCADA_Freq	GAMA300	F	1
DNP3 SCADA A	DNP3_SCADA	DNP3_SCADA_A_L3	GAMA300	L3_I	1
DNP3 SCADA KW	DNP3_SCADA	DNP3_SCADA_P	GAMA300	P	1

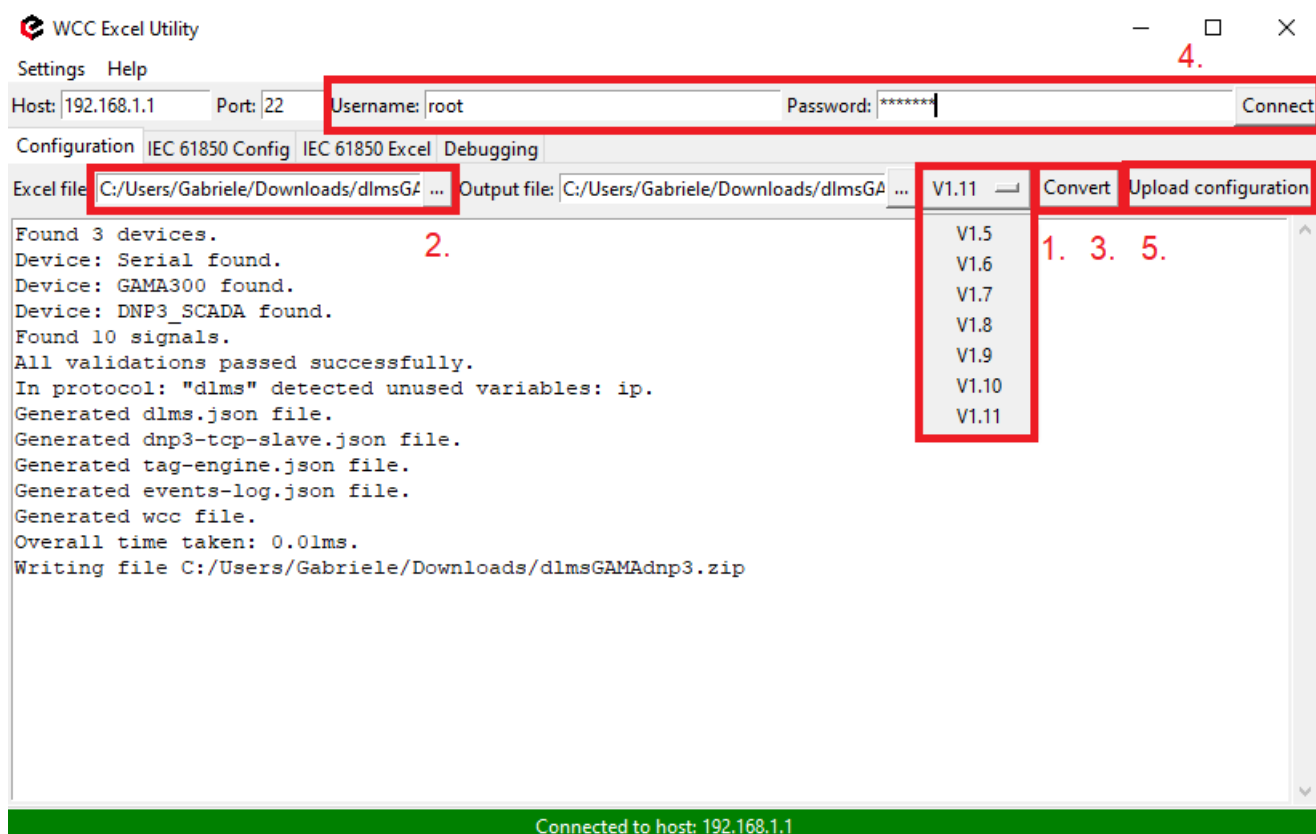
index	signal_type	static_variation	event_variation	class_num
1	analog	1	3	2
2	analog	1	3	2
3	analog	1	3	2
4	analog	1	3	2

For more detailed DLMS protocol communication analysis Gurux DLMS Director application can be used.

Uploading the Configuration

After configuring all devices and signals, follow these steps to check and upload the configuration using the WCC Excel Utility:

1. **Download** and run WCC Excel Utility.
2. Select the firmware version from the drop-down menu.
3. Select the Excel file from your computer and click *Convert*.
4. Check if no events in red color occur. If so, edit the Excel file according to the event text and repeat Step 2.
5. Enter the Host and credentials of WCC Lite, click connect and then *Upload configuration*.



Another method to upload the configuration is via the web interface:

1. Access the WCC Lite interface via your browser. The default IP address is 192.168.1.1. Enter credentials:

Authorization Required

Please enter your username and password.

Username

Password

Login

Reset

2. Upload the Excel configuration:

PROTOCOL HUB

STATUS

SYSTEM

SERVICES

NETWORK

USERS

LOGOUT (ROOT)

CONFIGURATION

IMPORTED SIGNALS

EVENT LOG

PROTOCOL CONNECTIONS

PROTOCOL LOGGER

SCRIPT-RUNNER

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file:

Choose File No file chosen

Import configuration

PLC (IEC-61499) Boot file:

Choose File No file chosen

Import FBOOT file

IEC61850 Client model file:

Choose File No file chosen

Import client model file

IEC61850 Server model file:

Choose File No file chosen

Import server model file

3. After a successful upload, the configuration will appear under the **DOWNLOAD CONFIGURATION** tab:

DOWNLOAD CONFIGURATION

Current configuration (config-elseta-wcc-Comlynx.xlsx):
Last changed: 2024-11-10 01:44:14

Download

Template configurations:

Download

4. If any errors occur during the upload, follow the error messages, fix them according to Excel utility guidelines.

Files

1. WCC Excel Utility **Download**
2. Example of configuration file **Download**

Modbus RTU to IEC104 protocol conversion

Setup

This article describes WCC Lite configuration steps to enable Modbus TCP protocol conversion to IEC 104.



Before you begin, make sure you have completed all physical installation work according to the manufacturer's installation instructions.

Set up your computer and connect the Ethernet cable to the WCC Lite ETH0 port. Log in with default credentials and set up basic required settings (name, network, users, etc.). You can find configuration tutorials in **How to** articles.

After setup, download the configuration template from the device (Protocol Hub → Configuration → Template configuration Download)
Or download the configuration example from this article.

To prepare the configuration, fill in the information in both the **Devices** and **Signals** sheets:

Configuring Devices

Add a connected ABB meter with the Modbus RTU protocol required information:

name	description	device_alias	enable	protocol	id	device	baudrate	databits
From ABB Meter	ABB B21	B21	1	Modbus RTU	1	PORT2	9600	8

stopbits	parity	flowcontrol	scan_rate_ms	serial_delay	retry_count
1	none	none	5000	200	3

Add SCADA working on IEC104 protocol required information:

name	description	device_alias	enable	protocol	bind_address	host	port
To SCADA		iec104	1	IEC 60870-5-104 slave	0.0.0.0	192.168.1.10 192.168.71.1	2404


asdu_size	cot_size	ioa_size	rwt	swt	t1	t2	t3	time_sync	message_size	cache_size
2	2	3	8	12	45	30	200	1	249	100


You can find more options and descriptions of the settings in theDevice configuration article.

Configuring Signals

Add connected meter measurements information. Use the meter manual for information and addresses (**tag_job_todo**).

signal_name	device_alias	signal_alias	enable	multiply	log	job_todo	tag_job_todo	number_type
Voltage	B21	U	1	0.1	1	3;23296;2	3;23296;2	UNSIGNED32
Current	B21	I	1	0.01	1	3;23308;2	3;23308;2	UNSIGNED32
Active power	B21	P	1	0.00001	1	3;23316;2	3;23316;2	SIGNED32
Frequency	B21	F	1	0.01	1	3;23340;1	3;23340;1	UNSIGNED16
Power factor	B21	Cos	1	0.001	1	3;23354;1	3;23354;1	SIGNED16
Active import	B21	E	1	0.01	1	3;20480;4	3;20480;4	FLOAT

 **job_todo** -Request to send according to Modbus specification without device address and checksum;

 **tag_job_todo** - a subset of the**job_todo** field, exact address of measurement (tag)


Add **IEC104** master signals information:

signal_name	device_alias	signal_alias	source_device_alias	source_signal_alias
Voltage	iec104	tag-iec104-1001	B21	U
Current	iec104	tag-iec104-1002	B21	I
Active power	iec104	tag-iec104-1003	B21	P
Frequency	iec104	tag-iec104-1004	B21	F

Power factor	iec104	tag-iec104-1005	B21	Cos
Active import	iec104	tag-iec104-1006	B21	E

enable	log	units	multiply	gi	common_address	info_address	data_type
1	1	V	1.0	1	1	1001	13
1	1	A	1.0	1	1	1002	13
1	1	kW	1.0	1	1	1003	13
1	1	Hz	1.0	1	1	1004	13
1	1		1.0	1	1	1005	13
1	1	kWh	1.0	1	1	1006	13

Other examples with the Rail350 meter

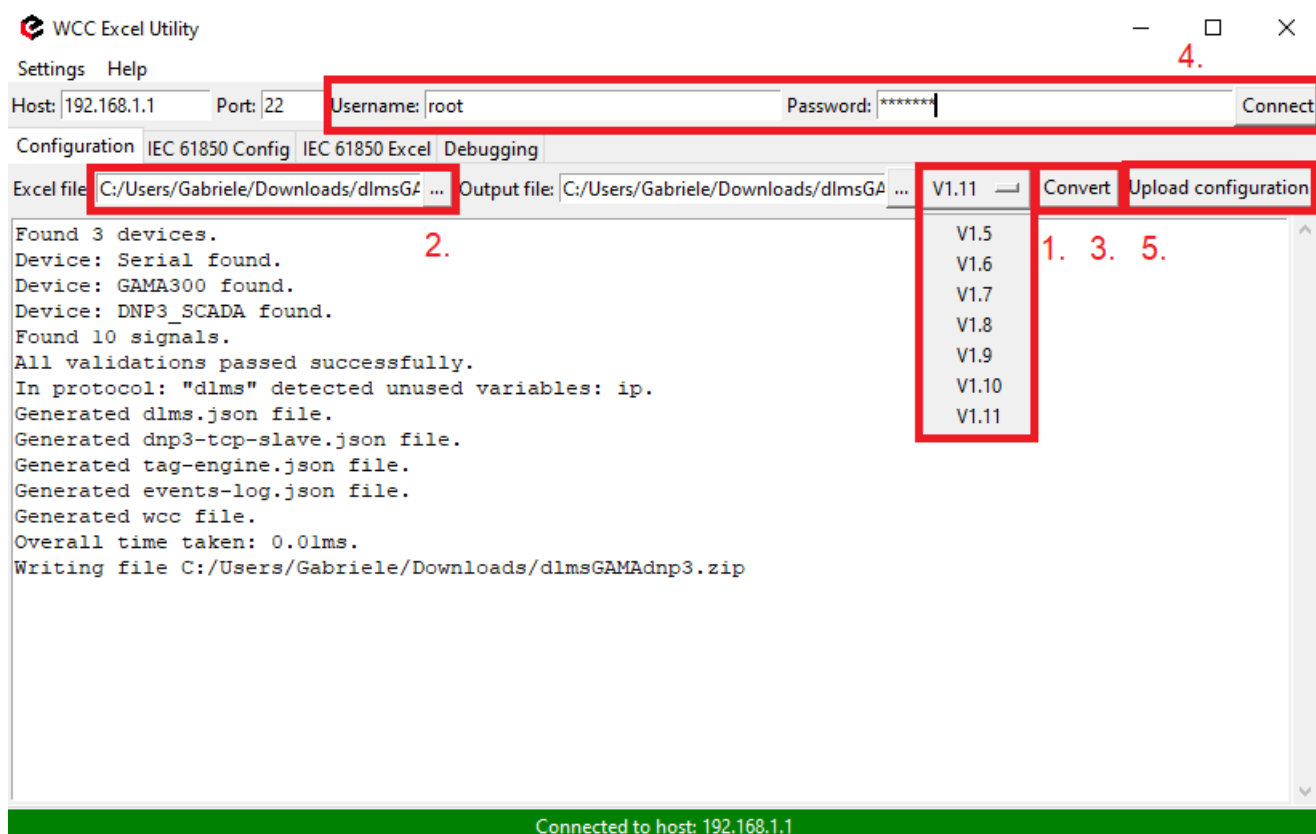
 The video covers only 1.5 firmware version.

<https://www.youtube.com/embed/FdeyXs79Vww>

Uploading the Configuration

After configuring all devices and signals, follow these steps to check and upload the configuration using the WCC Excel Utility:

1. **Download** and run WCC Excel Utility.
2. Select the firmware version from the drop-down menu.
3. Select the Excel file from your computer and click *Convert*.
4. Check if no events in red color occur. If so, edit the Excel file according to the event text and repeat Step 2.
5. Enter the Host and credentials of WCC Lite, click connect and then *Upload configuration*.



Another method to upload the configuration is via the web interface:

1. Access the WCC Lite interface via your browser. The default IP address is 192.168.1.1. Enter credentials:

Authorization Required

Please enter your username and password.

Username

Password

Login

Reset

2. Upload the Excel configuration:

PROTOCOL HUB

STATUS

SYSTEM

SERVICES

NETWORK

USERS

LOGOUT (ROOT)

CONFIGURATION

IMPORTED SIGNALS

EVENT LOG

PROTOCOL CONNECTIONS

PROTOCOL LOGGER

SCRIPT-RUNNER

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file:

Choose File No file chosen

Import configuration

PLC (IEC-61499) Boot file:

Choose File No file chosen

Import FBOOT file

IEC61850 Client model file:

Choose File No file chosen

Import client model file

IEC61850 Server model file:

Choose File No file chosen

Import server model file

3. After a successful upload, the configuration will appear under the **DOWNLOAD CONFIGURATION** tab:

DOWNLOAD CONFIGURATION

Current configuration (config-elseta-wcc-Comlynx.xlsx):
Last changed: 2024-11-10 01:44:14

Download

Template configurations:

Download

4. If any errors occur during the upload, follow the error messages, fix them according to Excel utility guidelines.

Files

1. ABB meter manual [Download](#)
2. WCC Excel Utility [Download](#)
3. Example of configuration file [Download](#)

Modbus RTU to DNP3 protocol conversion

Setup

The article describes WCC Lite configuration steps to enable Modbus RTU protocol conversion to DNP3 serial.



Before you begin, make sure you have completed all physical installation work according to the manufacturer's installation instructions.

Set up your computer and connect the Ethernet cable to the WCC Lite ETH0 port. Log in with default credentials and set up basic required settings (name, network, users, etc.). You can find configuration tutorials in [How to](#) articles.

To prepare the configuration, fill in the information in both the [Devices](#) and [Signals](#) sheets:

Configuring Devices

Add a connected ABB meter with the Modbus RTU protocol required information:

name	description	device_alias	enable	protocol	id	device	baudrate	databits
From ABB Meter	ABB B21	B21	1	Modbus RTU	1	PORT1	9600	8

stopbits	parity	flowcontrol	scan_rate_ms	serial_delay	retry_count
1	none	none	5000	200	3

Add the SCADA working on the DNP3 protocol required information:

name	device_alias	enable	protocol	mode	bind_address
DNP3	DNP3_SCADA	1	DNP3 TCP slave	TCP	0.0.0.0

host	port	source_address	unsol_classes
192.168.1.1	20000	1	1,2,3

You can find more options and descriptions of the settings in the [Device configuration](#) article.

Configuring Signals

Add connected meter measurements information. Use the meter manual for information and addresses (**tag_job_todo**).

signal_name	device_alias	signal_alias	enable	multiply	log	job_todo	tag_job_todo	number_type
Voltage	B21	U	1	0.1	1	3;23296;2	3;23296;2	UNSIGNED32
Current	B21	I	1	0.01	1	3;23308;2	3;23308;2	UNSIGNED32
Active power	B21	P	1	0.00001	1	3;23316;2	3;23316;2	SIGNED32
Frequency	B21	F	1	0.01	1	3;23340;1	3;23340;1	UNSIGNED16
Power factor	B21	Cos	1	0.001	1	3;23354;1	3;23354;1	SIGNED16
Active import	B21	E	1	0.01	1	3;20480;4	3;20480;4	FLOAT

 **job_todo** -Request to send according to Modbus specification without device address and checksum;

 **tag_job_todo** - a subset of the **job_todo** field, exact address of measurement (tag)

Add **DNP3** master signals information:

signal_name	device_alias	signal_alias	source_device_alias	source_signal_alias
Voltage	dnp3	dnp3_1001	B21	U
Current	dnp3	dnp3_1002	B21	I
Active power	dnp3	dnp3_1003	B21	P
Frequency	dnp3	dnp3_1004	B21	F

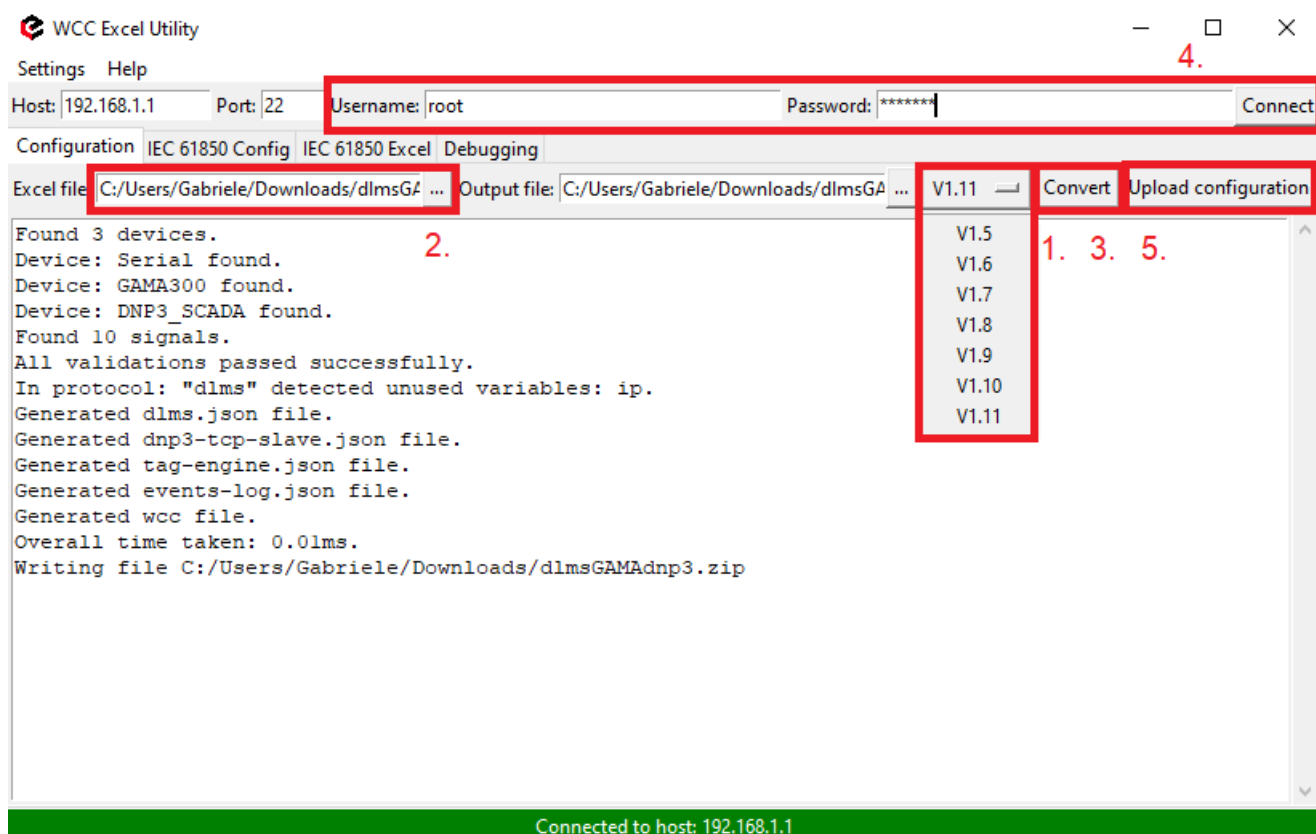
Power factor	dnp3	dnp3_1005	B21	Cos
Active import	dnp3	dnp3_1006	B21	E

enable	log	index	signal_type	static_variation	event_variation	class_num
1	1	1	analog	1	1	13
1	1	2	analog	1	1	13
1	1	3	analog	1	1	13
1	1	4	analog	1	1	13
1	1	5	analog	1	1	13
1	1	6	analog	1	1	13

Uploading the Configuration

After configuring all devices and signals, follow these steps to check and upload the configuration using the WCC Excel Utility:

1. **Download** and run WCC Excel Utility.
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5. Enter the Host and credentials of WCC Lite, click connect and then *Upload configuration*.



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2. Upload the Excel configuration:

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PROTOCOL CONNECTIONS

PROTOCOL LOGGER

SCRIPT-RUNNER

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file:

Choose File No file chosen

Import configuration

PLC (IEC-61499) Boot file:

Choose File No file chosen

Import FBOOT file

IEC61850 Client model file:

Choose File No file chosen

Import client model file

IEC61850 Server model file:

Choose File No file chosen

Import server model file

3. After a successful upload, the configuration will appear under the **DOWNLOAD CONFIGURATION** tab:

DOWNLOAD CONFIGURATION

Current configuration (config-elseta-wcc-Comlynx.xlsx):
Last changed: 2024-11-10 01:44:14

Download

Template configurations:

Download

4. If any errors occur during the upload, follow the error messages and fix them according to Excel utility guidelines.

Files

1. WCC Excel Utility Download
2. Example configuration file Download
3. ABB meter manual Download

DLMS Serial to IEC61850-server protocol conversion (Wcc Lite FW: 1.7.0)

Description

The article describes WCC Lite configuration steps to enable DLMS Serial protocol conversion to IEC 61850-server.



Fig 1. Connecting Meter with DLMS serial protocol to Wcc Lite and IEC61850 server

First steps

Before you begin, make sure you have completed all physical installation work according to the manufacturer's installation instructions.

Set up your computer and connect Ethernet cable to WCC Lite ETH0 port. Login with default credentials and setup basic required settings (name, network, users, etc.). You can find configuration tutorials in **How to** articles.

To prepare configuration fill information in both -**Devices** and **Signals** sheets:

Configure devices (excel "Devices" sheet)

Add required information for connected Gama meter with **DLMS Serial** protocol:

name	description	device_alias	protocol	serial_number	device	databits	stopbits	baudrate	parity
DLMS Serial	DLMS Serial	DLMS_Meter	DLMS	2250259	PORT1	8	1	4800	none

flowcontrol	enable	auth	logical_addresses	address_size	client_addresses	type	mode
none	1	LOW	1	2	32	SN	DLMS-HDLC

More information concerning DLMS protocol configuration is provided in [DLMS/COSEM](#) article.

Add **IEC 61850 server** protocol required information:

name	description	device_alias	protocol	bind_address
IEC 61850 Server	IEC 61850 Server	iec_61850_server	iec 61850 server	0.0.0.0

ied_name	access_point	port	auth	host	model_filename
WCCLITE	LD0	102	NONE	192.168.1.2	WCC


More information concerning IEC 61850 server protocol configuration is provided in [IEC 61850 server](#) article.

Configure signals (Excel "Signals" sheet)

The signals for all devices can be separated to different excel sheets for different device or listed in one excel sheet. In this case signals will be separated to **SignalsDLMS** and **SignalsIEC61850** excel sheets. Make sure that these excel sheet names for different device signals always must start with word **Signals**. The example template for this case is added at the end of this article.

Add signals information for connected meter with DLMS Serial protocol (Excel **SignalsDLMS** sheet):

signal_name	device_alias	signal_alias	obis_job
Voltage L1-N	DLMS_Meter	Voltage_L1-N	1.0.32.7.0.255
Voltage L2-N	DLMS_Meter	Voltage_L2-N	1.0.52.7.0.255
Voltage L3-N	DLMS_Meter	Voltage_L3-N	1.0.72.7.0.255
Frequency	DLMS_Meter	Frequency	1.0.14.7.0.255
Current L3	DLMS_Meter	Current_L3	1.0.71.7.0.255

 **obis_job** - Objects are identified with the help of OBIS (Object Identification System) codes.

1. The first number of OBIS code defines the media (energy type) to which the metering is related. Nonmedia related information is handled as abstract data. For example all obis_jobs in the table above starts with numbers 1 which stands for "Electricity related objects".
2. The second number defines the channel number, i.e. the number of the input of a metering equipment having several inputs for the measurement of energy of the same or different types (e.g. in data concentrators, registration units). Data from different sources can thus be

identified. The definitions for this value group are independent from the value of the first number. In all obis_jobs from the table above second number is set to zero which means that no channel is specified.

3. The third number defines the abstract or physical data items related to the information source concerned, for example current, voltage, power, volume, temperature. The definitions depend on the value of the first number. For example in obis_jobs from the table above number 72 means voltage L3 and number 14 means frequency.
4. The forth number defines types, or the result of the processing of physical quantities identified with the numbers 1 and 3, according to various specific algorithms. The algorithms can deliver energy and demand quantities as well as other physical quantities. In all obis_jobs from the table above forth number is set to 7 which stands for "Instantaneous value".
5. The value of the fifth number defines further processing or classification of quantities identified by numbers 1 to 4. In case of the first obis_job number 0 means that all harmonics of the signal along with its fundamental frequency are going to be taken into consideration.
6. The value of the sixth number defines the storage of data, identified by numbers 1 to 5, according to different billing periods. Where this is not relevant, this value group can be used for further classification. In all obis_jobs from the table above last number is set to 255 which means that data is not used.

Add signals information for IEC 61850 server (Excel SignalsIEC61850 sheet):

signal_name	device_alias	signal_alias	source_device_alias	source_signal_alias
LD0_GGIO_5_AnIn1_mag.f	iec_61850_server	LD0_GGIO_5_AnIn1_mag.f	DLMS_Meter	Voltage_L1-N
LD0_GGIO_5_AnIn2_mag.f	iec_61850_server	LD0_GGIO_5_AnIn2_mag.f	DLMS_Meter	Voltage_L2-N
LD0_GGIO_5_AnIn3_mag.f	iec_61850_server	LD0_GGIO_5_AnIn3_mag.f	DLMS_Meter	Voltage_L3-N
LD0_GGIO_5_AnIn4_mag.f	iec_61850_server	LD0_GGIO_5_AnIn4_mag.f	DLMS_Meter	Frequency
LD0_GGIO_5_AnIn5_mag.f	iec_61850_server	LD0_GGIO_5_AnIn5_mag.f	DLMS_Meter	Current_L3

Id_instance	In_class	In_instance	cdc	data_object	da_fc	number_type	da_value	Log
LD0	GGIO	5	MV	AnIn1	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn2	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn3	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn4	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn5	MX	FLOAT32	mag.f	1

From the table above it can be seen that IEC 61850 server signals has **source_device_alias** and **source_signal_alias** in which device_alias and signal_alias of DLMS meter signals are described. That is how DLMS meter signals are linked to IEC61850 server signals, so the measurements of the DLMS meter could be transported to IEC 61850 server.

For more detailed DLMS protocol communication analysis Gurux DLMS Director application can be used.

ICD file for IEC 61850 server

IED Capability Description (ICD) files are a specific type of Substation Configuration Language (SCL) file, containing a generic description of the whole capability range of a given device, including the functions and objects it can support. These ICD files can be found on internet, edited and adapted for current project. In this case the ICD file with 2 analog signals was edited, so it could have 5 analog signals for DLMS measurements. For that purpose, 3 additional signals was described in ICD file, so 5 analog signals could be linked with signals from DLMS. The ICD file and added signals are shown in Fig. 2. If it is needed to have more analog or other type of signals, the ICD file must be analyzed and signals added to the correct place of the file.

```
WCC.icd
1 <?xml version="1.0" encoding="UTF-8"?>
2 <SCL xmlns="http://www.iec.ch/61850/2003/SCL">
3   <Header id="ID" version="2003" revision="A" nameStructure="IEDName" />
4   <Communication>
5     <SubNetwork name="WA1" desc="Subnetwork" type="8-MMS">
6       <ConnectedAP iedName="WCC LITE" apName="LD0">
7       </ConnectedAP>
8     </SubNetwork>
9   </Communication>
10
11   <IED name="WCC LITE" desc="RTU" type="WCC LITE" manufacturer="Elseta" configVersion="001">
12     <Services>
13       <DynAssociation />
14       <GetDirectory />
15       <GetDataObjectDefinition />
16       <GetDataSetValue />
17       <DataSetDirectory />
18       <ReadWrite />
19       <GetCBValues />
20       <ConfLnS fixPrefix="true" fixLnInst="true" />
21     </Services>
22
23     <AccessPoint name="LD0">
24       <Server>
25         <Authentication />
26         <LDevice desc="Gateway" inst="LD0">
27           <LN0 lnClass="LLN0" lnType="LLN01" inst="">
28             <DataSet name="Events_SP1" desc="Events_SP1">
29               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="1" doName="SPS1"/>
30               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="1" doName="SPS2"/>
31               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="2" doName="SPC1"/>
32               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="2" doName="SPC2"/>
33             </DataSet>
34             <DataSet name="Events_SP2" desc="Events_SP2">
35               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="3" doName="DPS1"/>
36               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="3" doName="DPS2"/>
37               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="4" doName="DPC1"/>
38               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="ST" lnInst="4" doName="DPC2"/>
39             </DataSet>
40
41             <DataSet name="AnalogValues" desc="analog values">
42               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="MX" lnInst="5" doName="AnIn1" />
43               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="MX" lnInst="5" doName="AnIn2" />
44               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="MX" lnInst="5" doName="AnIn3" />
45               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="MX" lnInst="5" doName="AnIn4" />
46               <FCDA ldInst="LD0" prefix="" lnClass="GGIO" fc="MX" lnInst="5" doName="AnIn5" />
47             </DataSet>
48
49             <ReportControl name="Events_SP1_RCB" confRev="1" dataSet="Events_SP1" rptID="Events_SP1" buffered="true" intgPd="1000" bufTime="100">
50               <TrgOps dchg="true" qchg="true" />
51               <OptFields seqNum="true" timeStamp="true" dataSet="true" reasonCode="true" configRef="true" />
52               <RptEnabled max="4" />
53             </ReportControl>
54           </LN0>
55         </LDevice>
56       </Server>
57     </AccessPoint>
58   </IED>
59
60   <DataTypeTemplates>
61     <LNodeType id="LLN01" lnClass="LLN0">
62       <DO name="Mod" type="INS_1_Mod" />
63       <DO name="Beh" type="INS_1_Beh" />
64       <DO name="Health" type="INS_1_Beh" />
65       <DO name="NamPit" type="LPL_1_NamPit" />
66     </LNodeType>
67
68     <LNodeType id="LPHD1" lnClass="LPHD">
69       <DO name="PhyNam" type="DPL_1_PhyNam" />
70       <DO name="PhyHealth" type="INS_1_Beh" />
71       <DO name="Proxy" type="SPS_1_Proxy" />
72     </LNodeType>
73
74     <LNodeType id="GGIO1" lnClass="GGIO">
75       <DO name="SPS1" type="SPS_1_SPSS01" />
76       <DO name="SPS2" type="SPS_1_SPSS01" />
77     </LNodeType>
78
79     <LNodeType id="GGIO2" lnClass="GGIO">
80       <DO name="SPC1" type="SPC_1_SPCS04" />
81       <DO name="SPC2" type="SPC_1_SPCS04" />
82     </LNodeType>
83
84     <LNodeType id="GGIO3" lnClass="GGIO">
85       <DO name="DPS1" type="DPS_1_DPSS01" />
86       <DO name="DPS2" type="DPS_1_DPSS01" />
87     </LNodeType>
88
89     <LNodeType id="GGIO4" lnClass="GGIO">
90       <DO name="DPC1" type="DPC_1_DPCS01" />
91       <DO name="DPC2" type="DPC_1_DPCS01" />
92     </LNodeType>
93
94     <LNodeType id="GGIO5" lnClass="GGIO">
95       <DO name="AnIn1" type="MV_1_AnIn1" />
96       <DO name="AnIn2" type="MV_1_AnIn1" />
97       <DO name="AnIn3" type="MV_1_AnIn1" />
98       <DO name="AnIn4" type="MV_1_AnIn1" />
99       <DO name="AnIn5" type="MV_1_AnIn1" />
100    </LNodeType>
101  </DataTypeTemplates>
102</SCL>
```

Fig. 2 Editing the ICD file

This ICD file will be used for creating the IEC 61850 server model file, which later will be uploaded to Wcc Lite. Also the ICD file will be uploaded to IEDscout app, for simulating the client. Other apps for simulation of client can be used as well.

Generating Server Model file for Wcc Lite

For this step, Wcc Excel Utility app will be used. Firstly open Wcc Excel Utility app and choose **version 1.7** in "Configuration" tab.

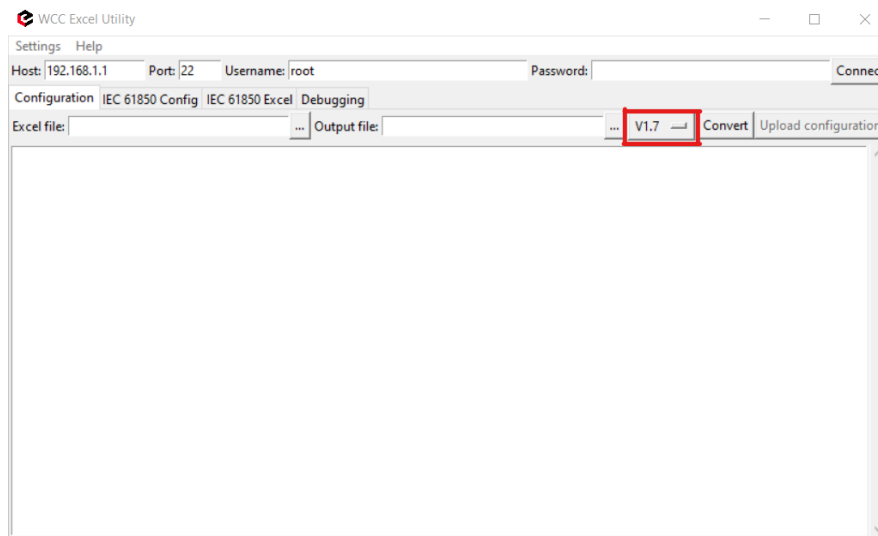


Fig. 3 Choosing the right version

Second step is to go to IEC61850 Config tab, choose the ICD file that is needed and Output file directory of Server Model file. The name of output file should be the same as the name specified in the Excel configuration "Devices" tab "**model_filename**" for IEC 61850 server. The extension of Server Model file using **Wcc Lite 1.7.0** firmware should be **.cfg** but using newer version of Wcc Excel Utility the extension **.server** can be created by default. This can be changed by editing the Server Model file name. Now "convert" button needs to be pressed and the Server Model file will be generated (Fig. 4). After that, this Server Model file needs to be uploaded to Wcc Lite WEB (Fig. 5).

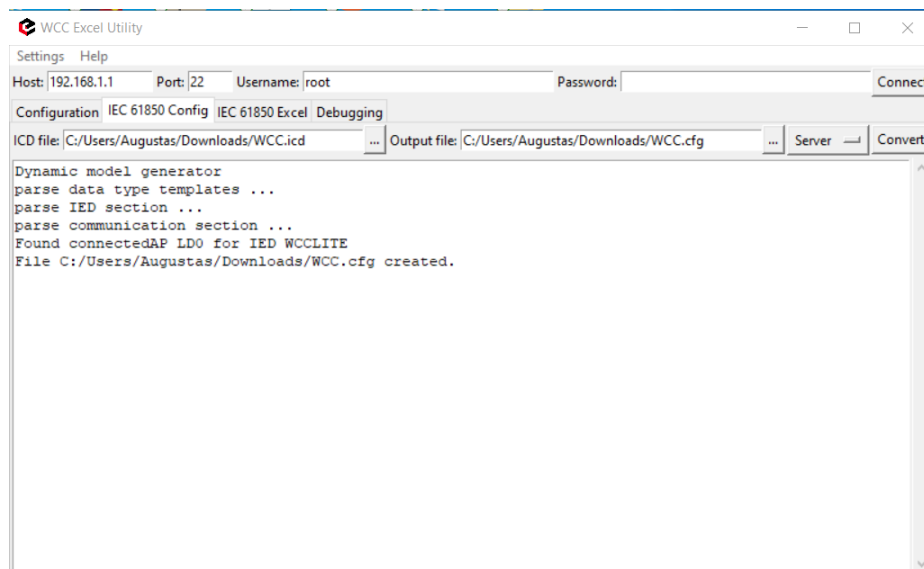


Fig. 4 Generating Server Model file

PROTOCOL HUB	STATUS	SYSTEM	SERVICES	NETWORK	USERS	LOGOUT (ROOT)
--------------	--------	--------	----------	---------	-------	---------------

CONFIGURATION

IMPORTED SIGNALS

EVENT LOG

PROTOCOL CONNECTIONS

SCRIPT-RUNNER

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file:

Choose File

 No file chosen

Import configuration

PLC (IEC-61499) Boot file:

Choose File

 No file chosen

Import FBOOT file

IEC61850 Server model file:

Choose File

 No file chosen

Import server model file

DOWNLOAD CONFIGURATION

Current configuration (WCC_full.xlsx):

Download

Template configurations:

Download

Current IEC 61850 Server model file (WCC.cfg):

Download

Delete

Fig. 5 Uploading IEC 61850 Server Model file to Wcc Lite WEB

Uploading Wcc Lite configuration

After the Server Model file is uploaded, and made sure that Server Model file name matches the one specified in excel configuration we are now able to upload excel configuration to Wcc Lite. One more thing to notice, in Excel configuration "Devices" sheet "host" parameter for IEC61850 server is 192.168.1.2. This IP should match the PC Ethernet IP, to which Wcc Lite ETH0 port is connected via ETH cable and can be set manually. This is shown in Fig. 6.

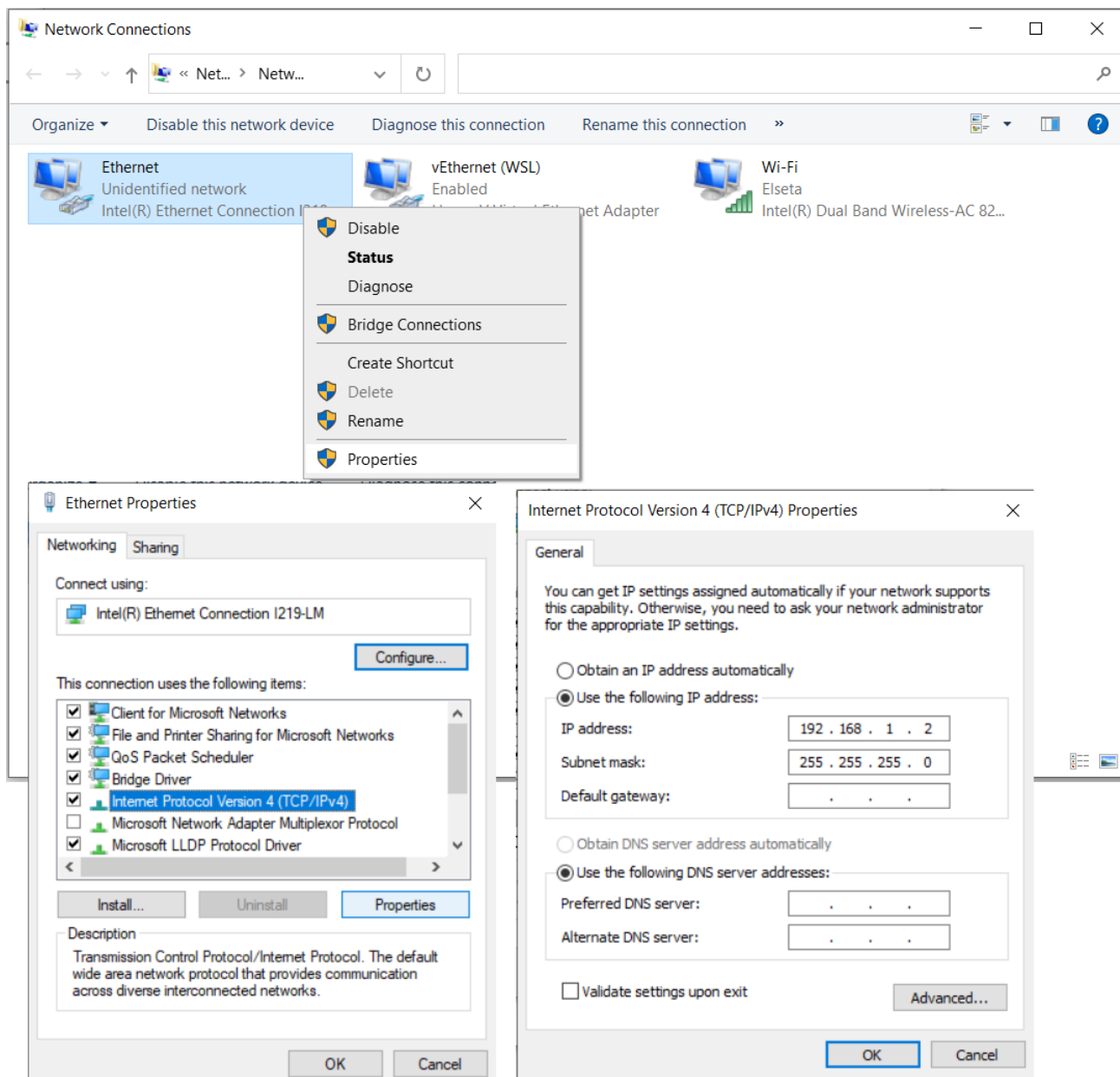


Fig. 6 Changing PC IP (TCP/IPv4) to match the Host IP in configuration

When all parameter described earlier matches the ones specified in configuration, we can upload the configuration to Wcc Lite WEB. It is shown in Fig. 7. Simply choose the Excel configuration and press "import configuration". The upload may take several minutes.

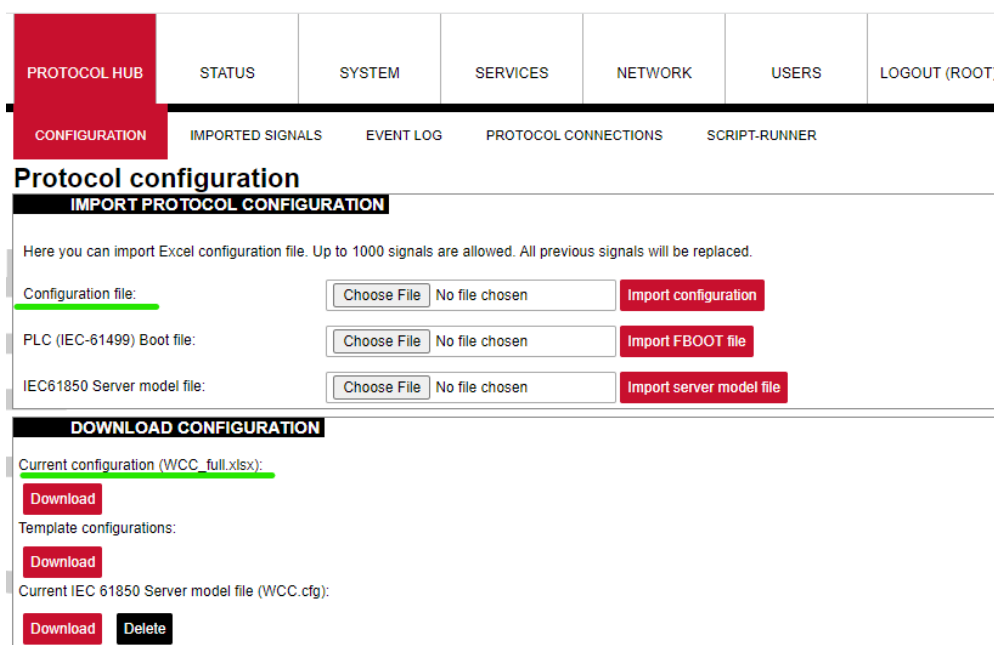


Fig. 7 Uploading Excel configuration to Wcc Lite.

Starting IEC 61850 server

Now, when needed files were uploaded to Wcc Lite, we can start IEC61850 server. For this step the debugger interface will be needed. We prefer using terminal window with installed linux subsystem or other debugger interfaces like PuTTY app. These apps can be found and downloaded on the internet. Firstly we need to connect to Wcc Lite through SSH (using PuTTY, SSH connection type should be chosen and Wcc Lite IP 192.168.1.1 entered). Following commands should be entered in the debugger window:

1. Connecting to Wcc Lite:**ssh root@192.168.1.1**
2. Login: **root** Password: **your Wcc Lite pasword**
3. Stopping the IEC 61850 service: **/etc/init.d/iec61850-server stop**
4. Starting IEC61850 server in debugger mode: **iec61850-server -c /etc/iec61850-server/iec61850-server.json -d7**

After these commands are executed, the IEC 61850 server is started, it is shown in Fig. 8.

```
augustas@DESKTOP-JLLQHCN X + v  
The list of available updates is more than a week old.  
To check for new updates run: sudo apt update  
  
This message is shown once a day. To disable it please create the  
/home/augustas/.hushlogin file.  
augustas@DESKTOP~JLLQHCN:~$ ssh root@192.168.1.1  
root@192.168.1.1's password:  
  
BusyBox v1.24.2 () built-in shell (ash)  
  
      _/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_  
    /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
   /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
  /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
 /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
-----  
WCC Lite 1.7.0-rtu  
DUID: 317100011  
Hardware: WCCLite v1.1  
-----  
root@wcc-lite:~# /etc/init.d/iec61850-server stop  
root@wcc-lite:~# iec61850-server -c /etc/iec61850-server/iec61850-server.json -d7  
Version: 1.0.7 Library version: 1.4.2  
  
          _/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_  
        /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
       /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
      /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
     /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
    /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
   /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
  /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
 /_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
/_/_/_/_/_/_/_/_/_/_/_/_/_/_/_/  
-----  
Jul 26 08:22:35.175 [NOTICE] IEC61850-SERVER: Server "WCCLTE" started at 0.0.0.0:102
```

Fig. 8 Connecting to Wcc Lite through SSH and starting IEC61850 server

Connecting to Wcc Lite (server) on IEDscout (client)

For this step, IEDscout will be needed. IEDScout is an ideal tool for protection and substation automation engineers working with IEC 61850 devices. It provides access to the IEDs (Intelligent Electronic Devices) and performs numerous useful functions when working with them. The software can simulate entire Ed. Also any different but similar functionality software can be used as well. Following steps are done using IEDscout software.

1. Open IEDscout software, then choose and open ICD file that is needed.
2. In opened IEDscout Browser window click "Discover IED", then in opened window enter Wcc Lite IP (192.168.1.1) and press "discover" (Fig. 9).
3. If the Wcc Lite did not connect when "discover" was pressed, then it is needed to press "Online". The indication, that IEC61850 server and Meter with DLMS serial protocol are connected correctly can be seen in Wcc Lite WEB "protocol connections" tab (Fig. 10).

Now Wcc Lite IEC61850 server and IEC61850 client on IEDscout are connected and after few moments we should see measurement from the Meter in the debugger window. When measurements from the Meter appears in debugger window (Fig. 11), press "Read" on IEDscout to update values (Fig. 12).

All these measurements are also represented in Wcc Lite WEB. There you can see that it has DLMS serial Meter signals and IEC 61850 server signals all in one place in "Imported signals" tab (Fig. 13).

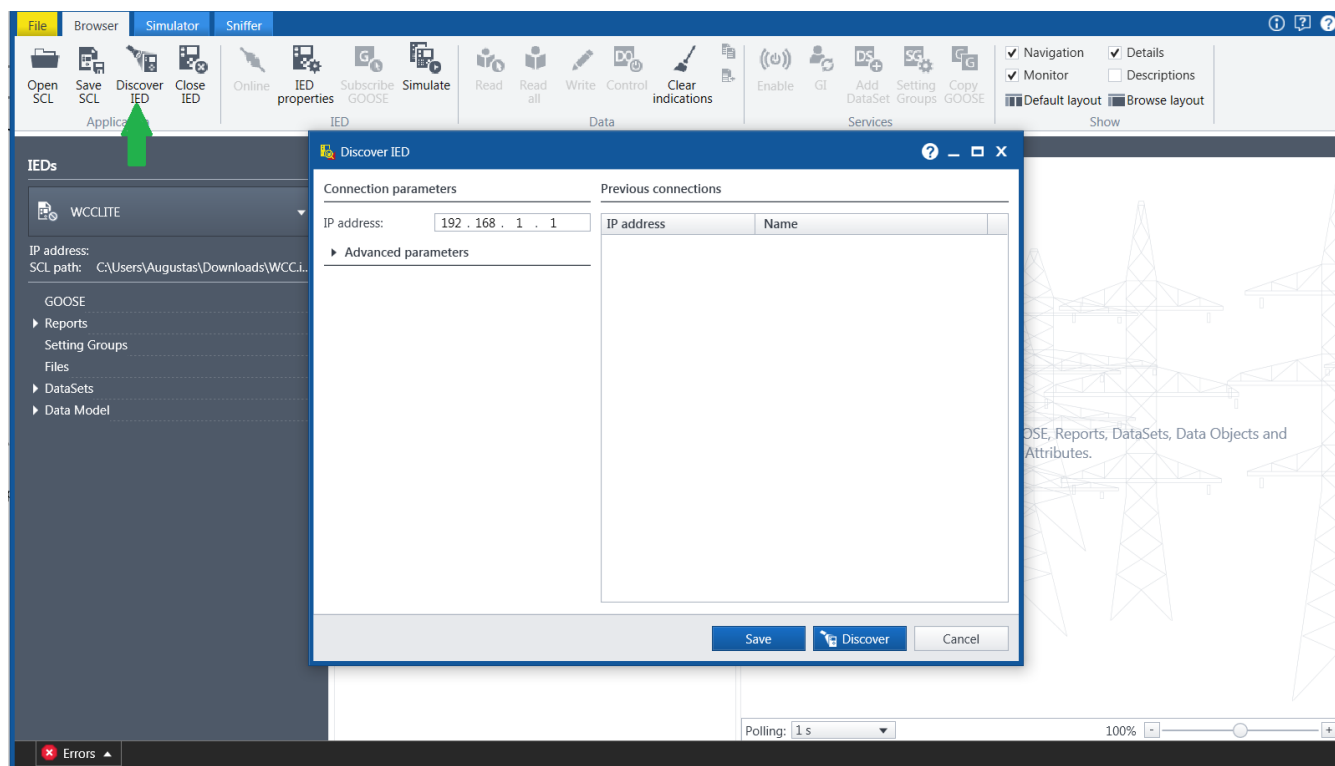


Fig. 9 Starting IED on IEDscout

<div> <div>PROTOCOL HUB</div> <div>STATUS</div> <div>SYSTEM</div> <div>SERVICES</div> <div>NETWORK</div> <div>USERS</div> <div>LOGOUT (ROOT)</div> <div>WCC LITE</div> </div>						
<div> <div>CONFIGURATION</div> <div>IMPORTED SIGNALS</div> <div>EVENT LOG</div> <div>PROTOCOL CONNECTIONS</div> <div>SCRIPT-RUNNER</div> </div>						
PROTOCOL CONNECTIONS						
Device	Protocol	Host	Status	Timestamp		
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>		
DLMS_Meter	DLMS Serial	PORT1	Connected	2023-07-26 11:42:13		
iec_61850_server	IEC 61850 Server	192.168.1.2	Connected	2023-07-26 11:39:18		

Fig. 10 Protocol connections

```

JUL 26 08:22:35.175 [NOTICE] IEC61850-SERVER: Server "WCCLITE" started at 0.0.0.0:102
JUL 26 08:39:18.270 [INFO] IEC61850-SERVER: Client 192.168.1.2:55323 connected
JUL 26 08:43:53.613 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361032760" for signal "LD0__GGIO_5_AnIn1_mag.f"
JUL 26 08:43:53.632 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361032968" for signal "LD0__GGIO_5_AnIn2_mag.f"
JUL 26 08:43:53.646 [DEBUG] IEC61850-SERVER: Event "235.930000,1690361033176" for signal "LD0__GGIO_5_AnIn3_mag.f"
JUL 26 08:43:53.662 [DEBUG] IEC61850-SERVER: Event "50.010000,1690361033383" for signal "LD0__GGIO_5_AnIn4_mag.f"
JUL 26 08:43:53.676 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361033591" for signal "LD0__GGIO_5_AnIn5_mag.f"
JUL 26 08:44:04.664 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361043806" for signal "LD0__GGIO_5_AnIn1_mag.f"
JUL 26 08:44:04.693 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361044014" for signal "LD0__GGIO_5_AnIn2_mag.f"
JUL 26 08:44:04.715 [DEBUG] IEC61850-SERVER: Event "236.770000,1690361044222" for signal "LD0__GGIO_5_AnIn3_mag.f"
JUL 26 08:44:04.737 [DEBUG] IEC61850-SERVER: Event "50.010000,1690361044429" for signal "LD0__GGIO_5_AnIn4_mag.f"
JUL 26 08:44:04.761 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361044643" for signal "LD0__GGIO_5_AnIn5_mag.f"
JUL 26 08:44:15.716 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361054860" for signal "LD0__GGIO_5_AnIn1_mag.f"
JUL 26 08:44:15.733 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361055070" for signal "LD0__GGIO_5_AnIn2_mag.f"
JUL 26 08:44:15.752 [DEBUG] IEC61850-SERVER: Event "236.700000,1690361055278" for signal "LD0__GGIO_5_AnIn3_mag.f"
JUL 26 08:44:15.779 [DEBUG] IEC61850-SERVER: Event "49.980000,1690361055486" for signal "LD0__GGIO_5_AnIn4_mag.f"
JUL 26 08:44:15.798 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361055694" for signal "LD0__GGIO_5_AnIn5_mag.f"
JUL 26 08:44:26.754 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361065903" for signal "LD0__GGIO_5_AnIn1_mag.f"
JUL 26 08:44:26.776 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361066111" for signal "LD0__GGIO_5_AnIn2_mag.f"
JUL 26 08:44:26.792 [DEBUG] IEC61850-SERVER: Event "236.380000,1690361066319" for signal "LD0__GGIO_5_AnIn3_mag.f"
JUL 26 08:44:26.808 [DEBUG] IEC61850-SERVER: Event "50.020000,1690361066533" for signal "LD0__GGIO_5_AnIn4_mag.f"
JUL 26 08:44:26.822 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361066741" for signal "LD0__GGIO_5_AnIn5_mag.f"
JUL 26 08:44:37.810 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361076952" for signal "LD0__GGIO_5_AnIn1_mag.f"
JUL 26 08:44:37.825 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361077160" for signal "LD0__GGIO_5_AnIn2_mag.f"
JUL 26 08:44:37.841 [DEBUG] IEC61850-SERVER: Event "236.320000,1690361077373" for signal "LD0__GGIO_5_AnIn3_mag.f"
JUL 26 08:44:37.856 [DEBUG] IEC61850-SERVER: Event "50.000000,1690361077581" for signal "LD0__GGIO_5_AnIn4_mag.f"
JUL 26 08:44:37.871 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361077789" for signal "LD0__GGIO_5_AnIn5_mag.f"

```

Fig. 11 Measurements from Meter linked to IEC61850 server signals

The screenshot shows the IEDScout software interface. The top menu bar includes File, Browser, Simulator, and Sniffer. Below the menu is a toolbar with icons for Open SCL, Save SCL, Discover IED, Close IED, Online, IED properties, Subscribe GOOSE, Simulate, Read, Read all, Write, Control, and Clear indications. The main window is divided into two panes. The left pane, titled 'IEDs', shows a tree view with 'WCCLITE' selected. The right pane, titled 'WCCLITE • Data Model • LD0 • GGIO5', displays a table of measurements for the 'LD0__GGIO_5_AnIn' signals.

Name	Value
DO AnIn1	0
DO AnIn2	0
DO AnIn3	237,33
DO AnIn4	50,02
DO AnIn5	0

Fig. 12 Measurements appeared in IEDscout software

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IMPORTED SIGNALS

Device	Signal	Value	Units	State	Attributes	Time
<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
IEC 61850 Server	LD0__GGIO_5_AnIn1_mag.f	0				2023-07-26 13:06:06.86
IEC 61850 Server	LD0__GGIO_5_AnIn2_mag.f	0				2023-07-26 13:06:07.72
IEC 61850 Server	LD0__GGIO_5_AnIn3_mag.f	237.49				2023-07-26 13:06:07.29
IEC 61850 Server	LD0__GGIO_5_AnIn4_mag.f	50				2023-07-26 13:06:07.50
IEC 61850 Server	LD0__GGIO_5_AnIn5_mag.f	0				2023-07-26 13:06:07.72
DLMS Serial	Voltage L1-N	0				2023-07-26 13:06:06.86
DLMS Serial	Voltage L2-N	0				2023-07-26 13:06:07.72
DLMS Serial	Voltage L3-N	237.49				2023-07-26 13:06:07.29
DLMS Serial	Frequency	50				2023-07-26 13:06:07.50
DLMS Serial	Current L3	0				2023-07-26 13:06:07.72

Fig. 13 Measurements represented in Wcc Lite WEB "Imported signals" tab.

Files used in this article:

1. ICD file: WCC.icd
2. Server Model file: WCC.cfg
3. Excel configuration file: WCC_full.xlsx
4. Excel Utility software: Excel Utility
5. Wcc Lite firmware: Wcc 1.7.0 RTU

DLMS Serial to IEC61850-server protocol conversion (WCC Lite FW: 1.10.0 or newer)

Description

This article explains how to configure the WCC Lite to convert data from a DLMS Serial protocol meter to an IEC 61850 server. The process includes device setup, signal mapping, server model creation, configuration upload, and validation through IEDscout.



Fig 1. Connecting Meter with DLMS serial protocol to WCC Lite and IEC61850 server

Preparation

To begin, ensure that the WCC Lite is physically installed according to manufacturer's instructions. Connect your computer to the WCC Lite using an Ethernet cable via the ETH0 port. Log in using the default credentials and perform basic setup, including system name, network parameters, and user management. You can find additional assistance in related [How to](#) articles.

Excel configuration

Configuration is done using an Excel file containing two main sheets: Devices and Signals. In the Devices sheet, add a row for the DLMS meter. Specify its communication settings, including serial port parameters, protocol (DLMS), and authentication details. The serial number should also match the connected device.

Add required information for the connected Gama meter with **DLMS Serial** protocol:

name	description	device_alias	protocol	serial_number	device	databits	stopbits	baudrate	parity
DLMS Serial	DLMS Serial	DLMS_Meter	DLMS	2250259	PORT1	8	1	4800	none

flowcontrol	enable	auth	logical_addresses	address_size	client_addresses	type	mode
none	1	LOW	1	2	32	SN	DLMS-HDLC

More information about DLMS protocol configuration is provided in [DLMS/COSEM](#) article.

Next, define a second row for the IEC 61850 server. Assign an alias and bind it to the 0.0.0.0 address. **The model filename you enter here will later be matched to the server model file you generate.** Define the IED name, logical device, access point, and port settings.

Add **IEC 61850 server** protocol required information:

name	description	device_alias	protocol	bind_address
IEC 61850 Server	IEC 61850 Server	iec_61850_server	iec 61850 server	0.0.0.0

ied_name	access_point	port	auth	host	model_filename
WCCLITE	LD0	102	NONE	192.168.1.2	WCC_test

More information about IEC 61850 server protocol configuration is provided in [IEC 61850 server](#) article.


Configure signals (Excel "Signals_DLMS" sheet)

Move to the Signals sheets. You can split the signal definitions into separate sheets (e.g., [SignalsDLMS](#) and [SignalsIEC61850](#)) or place them all in a single one. For DLMS signals, enter OBIS codes that define what data to collect, such as voltages, frequency, and current. OBIS codes break down into six segments, each representing a specific aspect of the measured data—like media type, channel, physical quantity, and instantaneous value. In this example, voltage and frequency measurements are mapped using OBIS codes starting with 1, indicating electricity.

In the IEC 61850 signal sheet, link each IEC signal to its source signal from the DLMS device. This is done by referencing the alias of the source device and signal. You also need to define logical device instance, logical node class and instance, common data class, and data attributes. This mapping ensures that IEC 61850 server outputs correspond to the actual readings from the DLMS meter.

Add signal information for the connected meter with DLMS Serial protocol (Excel **SignalsDLMS** sheet):

signal_name	device_alias	signal_alias	obis_job
Voltage L1-N	DLMS_Meter	Voltage_L1-N	1.0.32.7.0.255
Voltage L2-N	DLMS_Meter	Voltage_L2-N	1.0.52.7.0.255
Voltage L3-N	DLMS_Meter	Voltage_L3-N	1.0.72.7.0.255
Frequency	DLMS_Meter	Frequency	1.0.14.7.0.255
Current L3	DLMS_Meter	Current_L3	1.0.71.7.0.255

 **obis_job** - Objects are identified with the help of OBIS (Object Identification System) codes.

1. The first number of OBIS code defines the media (energy type) to which the metering is related. Nonmedia related information is handled as abstract data. For example all obis_jobs in the table above starts with numbers 1 which stands for "Electricity related objects".
2. The second number defines the channel number, i.e. the number of the input of a metering equipment having several inputs for the measurement of energy of the same or different types (e.g. in data concentrators, registration units). Data from different sources can thus be identified. The definitions for this value group are independent from the value of the first number. In all obis_jobs from the table above second number is set to zero which means that no channel is specified.
3. The third number defines the abstract or physical data items related to the information source concerned, for example current, voltage, power, volume, temperature. The definitions depend on the value of the first number. For example in obis_jobs from the table above number 72 means voltage L3 and number 14 means frequency.
4. The forth number defines types, or the result of the processing of physical quantities identified with the numbers 1 and 3, according to various specific algorithms. The algorithms can deliver energy and demand quantities as well as other physical quantities. In all obis_jobs from the table above forth number is set to 7 which stands for "Instantaneous value".
5. The value of the fifth number defines further processing or classification of quantities identified by numbers 1

to 4. In case of the first obis_job number 0 means that all harmonics of the signal along with its fundamental frequency are going to be taken into consideration.

6. The value of the sixth number defines the storage of data, identified by numbers 1 to 5, according to different billing periods. Where this is not relevant, this value group can be used for further classification. In all obis_jobs from the table above last number is set to 255 which means that data is not used.

Add signals information for **IEC 61850 server** (Excel Signals_IEC61850 sheet):

signal_name	device_alias	signal_alias	source_device_alias	source_signal_alias
LD0__GGIO_5_AnIn1_mag.f	iec_61850_server	LD0__GGIO_5_AnIn1_mag.f	DLMS_Meter	Voltage_L1-N
LD0__GGIO_5_AnIn2_mag.f	iec_61850_server	LD0__GGIO_5_AnIn2_mag.f	DLMS_Meter	Voltage_L2-N
LD0__GGIO_5_AnIn3_mag.f	iec_61850_server	LD0__GGIO_5_AnIn3_mag.f	DLMS_Meter	Voltage_L3-N
LD0__GGIO_5_AnIn4_mag.f	iec_61850_server	LD0__GGIO_5_AnIn4_mag.f	DLMS_Meter	Frequency
LD0__GGIO_5_AnIn5_mag.f	iec_61850_server	LD0__GGIO_5_AnIn5_mag.f	DLMS_Meter	Current_L3

Id_instance	In_class	In_instance	cdc	data_object	da_fc	number_type	da_value	Log
LD0	GGIO	5	MV	AnIn1	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn2	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn3	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn4	MX	FLOAT32	mag.f	1
LD0	GGIO	5	MV	AnIn5	MX	FLOAT32	mag.f	1

From the table above it can be seen that IEC 61850 server signals has **source_device_alias** and **source_signal_alias** in which device_alias and signal_alias of DLMS meter signals are described. That is how DLMS meter signals are linked to IEC61850 server signals, so the measurements of the DLMS meter could be transported to IEC 61850 server.

For more detailed DLMS protocol communication analysis Gurux DLMS Director application can be used.

Generating Server Model file for WCC Lite

For the IEC 61850 server to function, a model file is required. This file is based on an ICD file, which describes the server's capability. The ICD file serves both for generating the server model and simulating client behavior with tools like IEDscout.

Open the WCC Excel Utility and choose the appropriate version from a drop-down menu in the Configuration tab (Fig. 3).

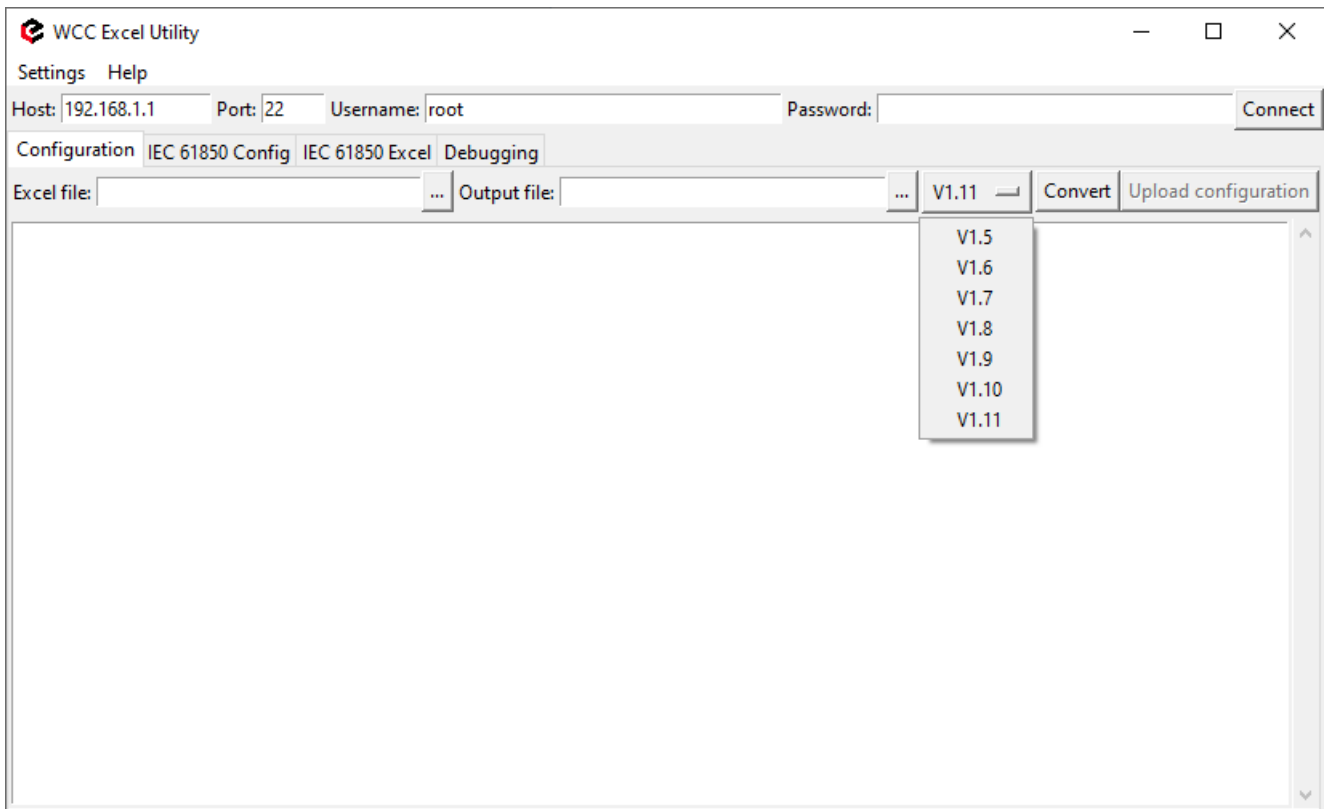


Fig. 3 Choosing the right version

Navigate to the IEC61850 Config tab, select the ICD file, and define the output directory for the server model file (Fig. 4). Ensure the filename matches the one specified in the Devices sheet. Press Convert to generate the model file. Then upload this file to the WCC Lite via the web interface (Fig. 5).

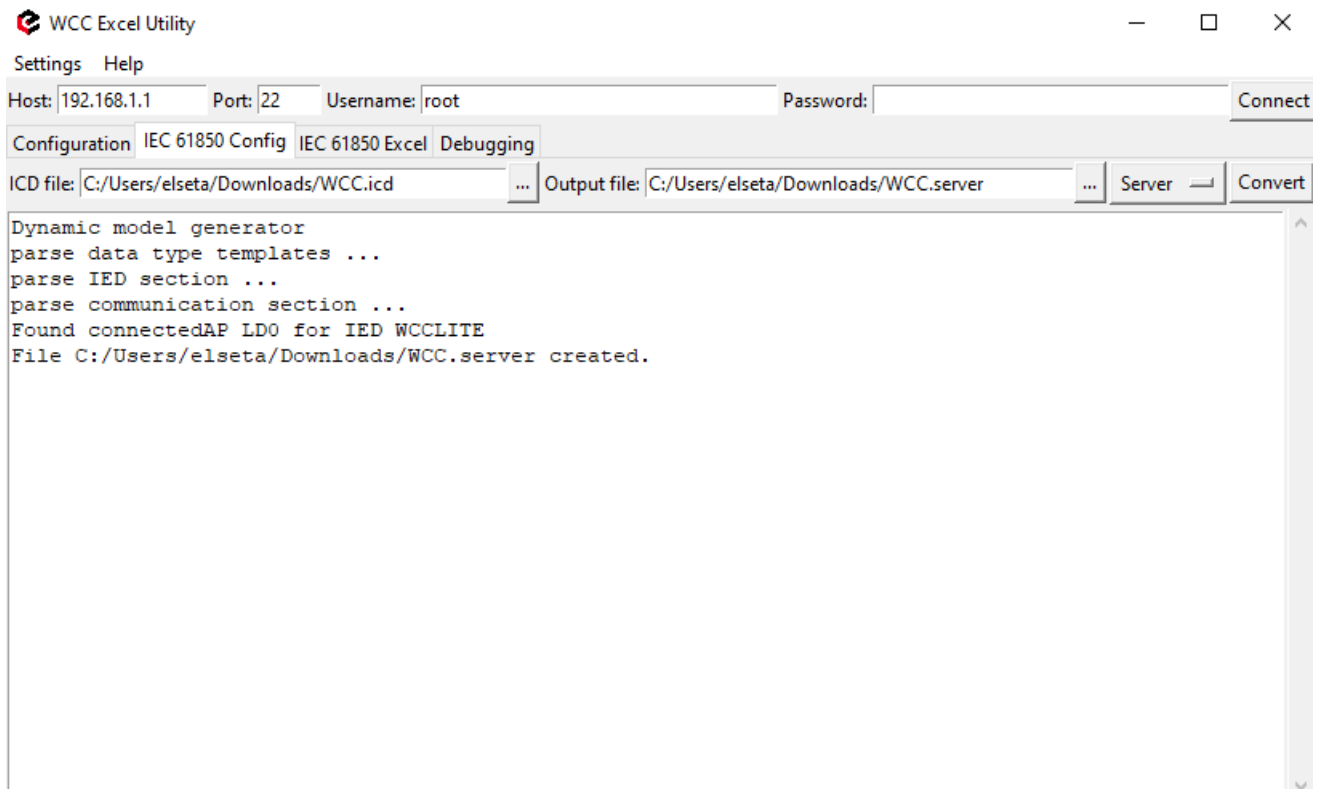


Fig. 4 Generating Server Model file

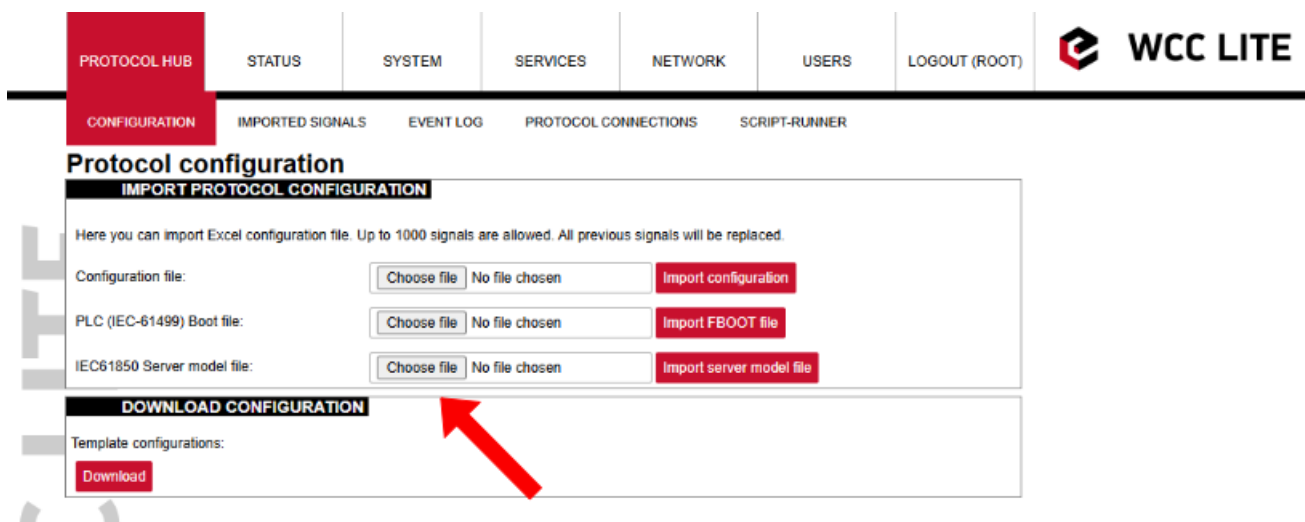


Fig. 5 Uploading IEC 61850 Server Model file to Wcc Lite WEB

Uploading Wcc Lite configuration

With the server model uploaded, confirm that the host IP address defined for the IEC 61850 server in the Excel file matches your computer's IP address. You can set this manually in the network adapter settings to ensure proper communication.. This is shown in Fig. 6.

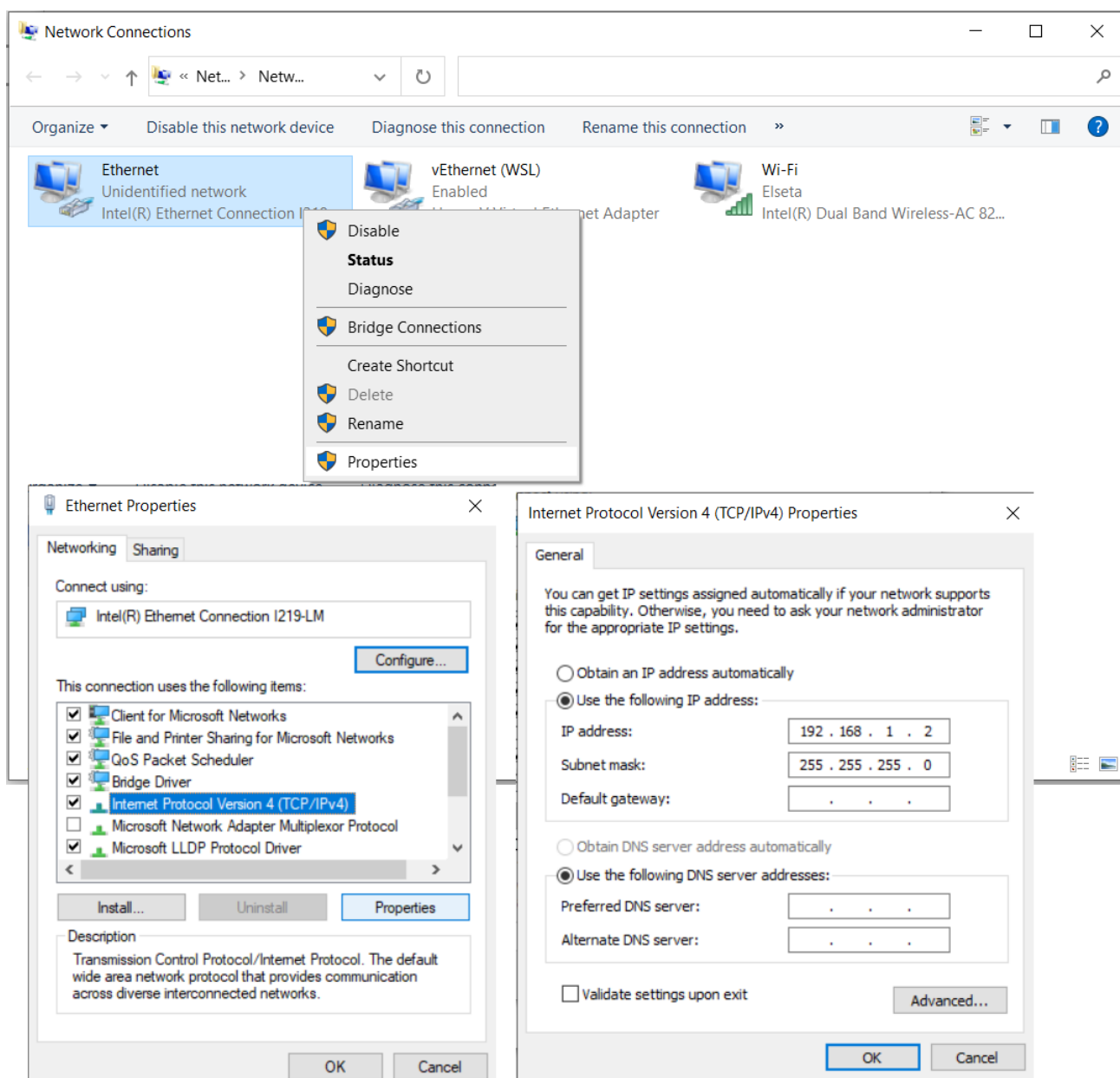


Fig. 6 Changing PC IP (TCP/IPv4) to match the Host IP in configuration

Return to the WCC Lite web interface and upload the Excel configuration file. Select the file and click "Import configuration" (Fig. 7) The import process may take a few minutes to complete.

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CONFIGURATION IMPORTED SIGNALS EVENT LOG PROTOCOL CONNECTIONS PROTOCOL LOGGER SCRIPT-RUNNER

Protocol configuration

IMPORT PROTOCOL CONFIGURATION

Here you can import Excel configuration file. Up to 1000 signals are allowed. All previous signals will be replaced.

Configuration file: No file chosen

PLC (IEC-61499) Boot file: No file chosen

IEC61850 Client model file: No file chosen

IEC61850 Server model file: No file chosen

DOWNLOAD CONFIGURATION

Current configuration (WCC.xlsx):
Last changed: 2022-03-18 10:50:14

Template configurations:

Current IEC 61850 Server model file (WCC.server):

Fig. 7 Uploading Excel configuration to Wcc Lite.

Starting IEC 61850 server

To start the IEC 61850 server in debug mode, use a terminal emulator like PuTTY or a Linux subsystem terminal. This launches the service in debug mode, which outputs live data and connection logs. Following commands should be entered in the terminal window:

1. Connecting to Wcc Lite:

```
ssh root@192.168.1.1
```

2. Login: root Password: your Wcc Lite password

3. Stopping the IEC 61850 service:

```
/etc/init.d/iec61850-server stop
```

4. Starting IEC61850 server in debugger mode:

```
iec61850-server -d7 -c /etc/iec61850-server/iec61850-server.json
```

After these commands are executed, the IEC 61850 server is started, it is shown in Fig. 8.

| | / / _ _ _ _ / / () / _
| / / / / / / / / / / -)
| / | ^ _ ^ _ / _ _ / ^ ^ _

```
Hardware: WCCLite v1.1
```

```
Version: 1.2.3  Library version: 1.4.2
```

Fig. 8 Connecting to Wcc Lite through SSH and starting IEC61850 server

To verify the system, open IEDscout or another IEC 61850 client simulator. Load the ICD file, discover the IED using the WCC Lite's IP address, and if needed, press "Online" in IEDscout to establish the connection (Fig. 9). In the WCC Lite's web interface, navigate to the protocol connections tab to confirm both DLMS and IEC 61850 are connected (Fig. 10). As measurements appear in the debugger terminal (Fig. 11), return to IEDscout and click "Read" to refresh the values (Fig. 12).

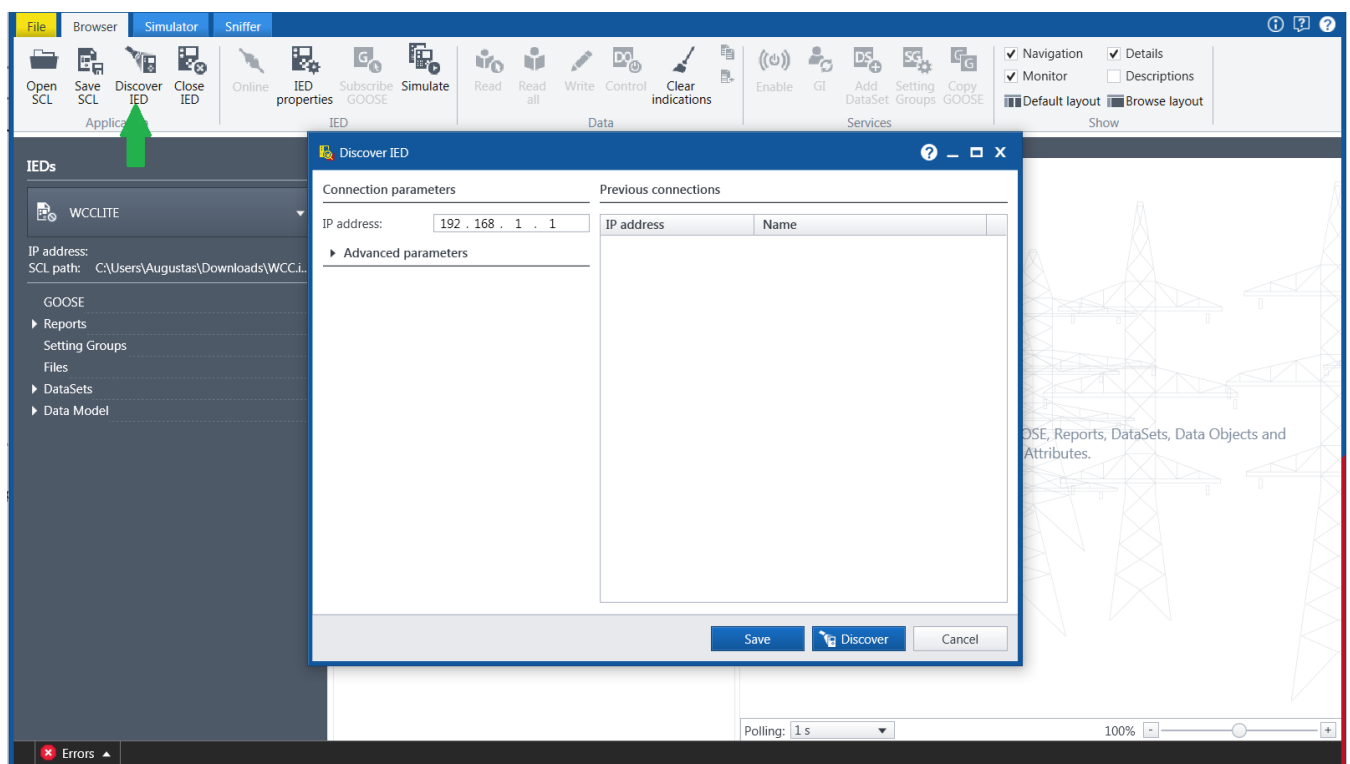


Fig. 9 Starting IED on IEDscout

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PROTOCOL CONNECTIONS

Device	Protocol	Host	Status	Timestamp
<div>DLMS_Meter</div>	<div>DLMS Serial</div>	<div>PORT1</div>	<div>Connected</div>	<div>2023-07-26 11:42:13</div>
<div>iec_61850_server</div>	<div>IEC 61850 Server</div>	<div>192.168.1.2</div>	<div>Connected</div>	<div>2023-07-26 11:39:18</div>

Fig. 10 Protocol connections

```

Jul 26 08:22:35.175 [NOTICE] IEC61850-SERVER: Server "WCC LITE" started at 0.0.0.0:102
Jul 26 08:39:18.270 [INFO] IEC61850-SERVER: Client 192.168.1.2:55323 connected
Jul 26 08:43:53.613 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361032760" for signal "LD0__GGIO_5_AnIn1_mag.f"
Jul 26 08:43:53.632 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361032968" for signal "LD0__GGIO_5_AnIn2_mag.f"
Jul 26 08:43:53.646 [DEBUG] IEC61850-SERVER: Event "235.930000,1690361033176" for signal "LD0__GGIO_5_AnIn3_mag.f"
Jul 26 08:43:53.662 [DEBUG] IEC61850-SERVER: Event "50.010000,1690361033383" for signal "LD0__GGIO_5_AnIn4_mag.f"
Jul 26 08:43:53.676 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361033591" for signal "LD0__GGIO_5_AnIn5_mag.f"
Jul 26 08:44:04.664 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361043806" for signal "LD0__GGIO_5_AnIn1_mag.f"
Jul 26 08:44:04.693 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361044014" for signal "LD0__GGIO_5_AnIn2_mag.f"
Jul 26 08:44:04.715 [DEBUG] IEC61850-SERVER: Event "236.770000,1690361044222" for signal "LD0__GGIO_5_AnIn3_mag.f"
Jul 26 08:44:04.737 [DEBUG] IEC61850-SERVER: Event "50.010000,1690361044429" for signal "LD0__GGIO_5_AnIn4_mag.f"
Jul 26 08:44:04.761 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361044643" for signal "LD0__GGIO_5_AnIn5_mag.f"
Jul 26 08:44:15.716 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361054860" for signal "LD0__GGIO_5_AnIn1_mag.f"
Jul 26 08:44:15.733 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361055070" for signal "LD0__GGIO_5_AnIn2_mag.f"
Jul 26 08:44:15.752 [DEBUG] IEC61850-SERVER: Event "236.700000,1690361055278" for signal "LD0__GGIO_5_AnIn3_mag.f"
Jul 26 08:44:15.779 [DEBUG] IEC61850-SERVER: Event "49.980000,1690361055486" for signal "LD0__GGIO_5_AnIn4_mag.f"
Jul 26 08:44:15.798 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361055694" for signal "LD0__GGIO_5_AnIn5_mag.f"
Jul 26 08:44:26.754 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361065903" for signal "LD0__GGIO_5_AnIn1_mag.f"
Jul 26 08:44:26.776 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361066111" for signal "LD0__GGIO_5_AnIn2_mag.f"
Jul 26 08:44:26.792 [DEBUG] IEC61850-SERVER: Event "236.380000,1690361066319" for signal "LD0__GGIO_5_AnIn3_mag.f"
Jul 26 08:44:26.808 [DEBUG] IEC61850-SERVER: Event "50.020000,1690361066533" for signal "LD0__GGIO_5_AnIn4_mag.f"
Jul 26 08:44:26.822 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361066741" for signal "LD0__GGIO_5_AnIn5_mag.f"
Jul 26 08:44:37.810 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361076952" for signal "LD0__GGIO_5_AnIn1_mag.f"
Jul 26 08:44:37.825 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361077160" for signal "LD0__GGIO_5_AnIn2_mag.f"
Jul 26 08:44:37.841 [DEBUG] IEC61850-SERVER: Event "236.320000,1690361077373" for signal "LD0__GGIO_5_AnIn3_mag.f"
Jul 26 08:44:37.856 [DEBUG] IEC61850-SERVER: Event "50.000000,1690361077581" for signal "LD0__GGIO_5_AnIn4_mag.f"
Jul 26 08:44:37.871 [DEBUG] IEC61850-SERVER: Event "0.000000,1690361077789" for signal "LD0__GGIO_5_AnIn5_mag.f"

```

Fig. 11 Measurements from Meter linked to IEC61850 server signals

The screenshot shows the IEDScout Trial Version interface. The 'Sniffer' tab is active, displaying a list of IEDs with 'WCC LITE' selected. The IP address is 192.168.1.1. The 'Data Model' section shows a tree structure with 'LD0' expanded, listing 'LN' objects: LLN0, GGIO1, GGIO2, GGIO3, GGIO4, GGIO5 (highlighted), and LPHD1. The right pane shows the 'WCC LITE • Data Model • LD0 • GGIO5' configuration, displaying a table of signal values:

Name	Value
DO AnIn1	0
DO AnIn2	0
DO AnIn3	237,33
DO AnIn4	50,02
DO AnIn5	0

Fig. 12 Measurements appeared in IEDscout software

Finally, you can view all collected and converted data on the WCC Lite web interface under the *Imported Signals* tab. This confirms that your DLMS meter data is now available through the IEC 61850 server (Fig. 13)

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 WCC LITE

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SCRIPT-RUNNER

IMPORTED SIGNALS

Device	Signal	Value	Units	State	Attributes	Time
<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
IEC 61850 Server	LD0__GGIO_5_AnIn1_mag.f	0				2023-07-26 13:06:06.86
IEC 61850 Server	LD0__GGIO_5_AnIn2_mag.f	0				2023-07-26 13:06:07.72
IEC 61850 Server	LD0__GGIO_5_AnIn3_mag.f	237.49				2023-07-26 13:06:07.29
IEC 61850 Server	LD0__GGIO_5_AnIn4_mag.f	50				2023-07-26 13:06:07.50
IEC 61850 Server	LD0__GGIO_5_AnIn5_mag.f	0				2023-07-26 13:06:07.72
DLMS Serial	Voltage L1-N	0				2023-07-26 13:06:06.86
DLMS Serial	Voltage L2-N	0				2023-07-26 13:06:07.72
DLMS Serial	Voltage L3-N	237.49				2023-07-26 13:06:07.29
DLMS Serial	Frequency	50				2023-07-26 13:06:07.50
DLMS Serial	Current L3	0				2023-07-26 13:06:07.72

Fig. 13 Measurements represented in WCC Lite WEB *Imported signals* tab.

Files used in this article:

1. ICD file: **WCC.icd**
2. Server Model file: **WCC.server**
3. Excel configuration file: **WCC.xlsx**
4. Excel Utility software and firmware : **Download**