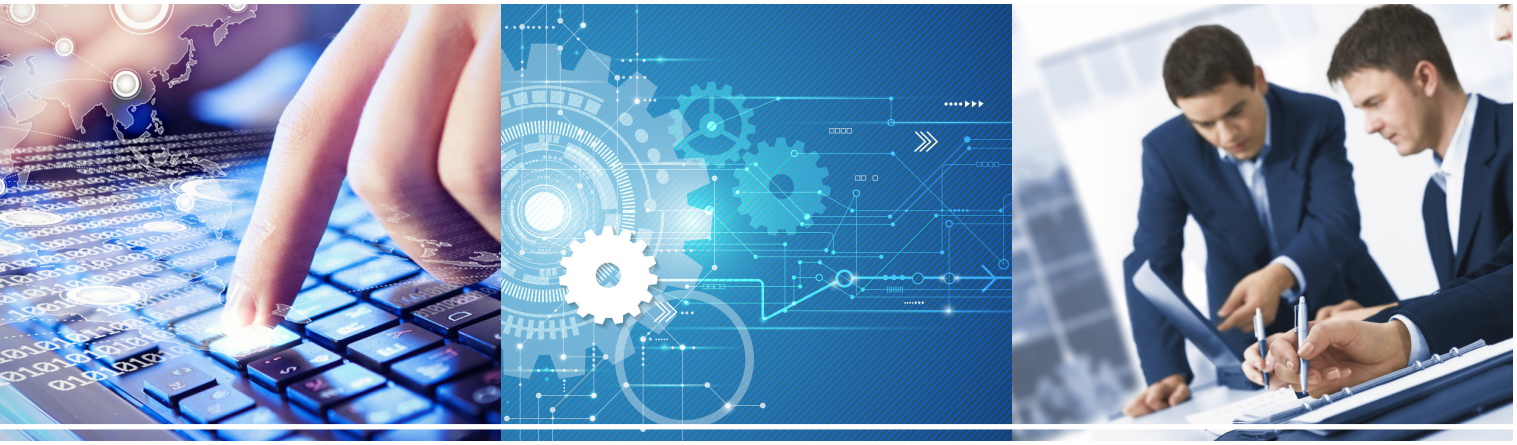
SAFER, SMARTER, GREENER

DNV·GL



ENERGY

DNV GL IEC 60870-5 TEST SUITE

What if your equipment appears to be non-interoperable?

IEC 60870-5 is one of the most common standards used for data communication in power systems. The protocol series is an efficient and widely used standardized solution for supervisory control and data acquisition over wide area networks, and exchange of protection data in local networks. Now also with Security.

By using standardized protocols, equipment from different suppliers can be made interoperable. Although IEC 60870-5 is an international standard, non-interoperability is a present risk. To prevent problems, it is necessary to investigate interoperability before going live.

To help you with all your IEC 60870-5 testing, DNV GL offers the IEC 60870-5 Test Suite. The Test Suite is in use by satisfied users worldwide, including device manufacturers and utilities.

The IEC 60870-5 Test Suite supports 101, 103 and 104 Companion Standards with the following products:

- UniGrid Telecontrol Simulator (101 and 104)
- UniGrid Telecontrol 101 Analyser
- UniGrid Telecontrol 104 Analyser
- UnIECim (103 Simulator) and UnIECom (103 Analyser)

The Test Suite is part of a super set of test tools covering a large variety of communication protocols used in power systems.

UniGrid Telecontrol Simulator

Do you have a solution for all-round testing of your IEC 60870-5 (secure) 101 or 104 implementation? To have a perfectly functioning and reliable communication environment, it is very important to have tested all devices before actual integration. Also, during operation it is necessary to check and tune your environment to create a maximized availability.

DNV GL has experienced that testing is very important to keep everything up and running. Besides that, we think testing should be easy. That is why we developed UniGrid Telecontrol Simulator.
Our simulators enable you to:

- Test and analyse devices or even our whole environment on data link errors, interoperability and operational issues
- Develop and implement the IEC 60870-5 Protocol including transport layer security in compliance with IEC 62351-3 and application layer security in compliance to IEC 62351-5 and IEC 60870-5-7
- Test the conformance of your product to the last versions of the official IEC 60870-5 test procedures: IEC 60870-5-601, 604 and IEC 62351-100-1
- Develop your own customized test plan and implement specific test cases

UniGrid Telecontrol Simulator enables you to send, receive, analyse and store IEC 60870-5-101 and 104 communication, either manually or automatically by script blocks. Next to conformance testing, UniGrid Telecontrol Simulator is the tool for troubleshooting, protocol development, active testing, factory and site acceptance testing. Furthermore, the well-designed GUI and in-build protocol intelligence makes UniGrid Telecontrol Simulator user-friendly. Configuring UniGrid Telecontrol Simulator with the required ASDUs, COTs & options has never been so easy: the configuration tasks are drastically simple and the inexperienced user is guided through configuration steps. UniGrid Telecontrol Simulator is essential to achieve your interoperability ambitions.

TECHNICAL SPECIFICATIONS

- IEC 60870-5 master/controlling and slave/controlled simulation
- Possibility to setup scripts to execute test cases from the official IEC 60870-5-601 and 604 conformance test plans
- Display of communication in layers
- Smart translation of captured frames to readable text, characterized by error display, for more and less experienced users
- Support for all basic application functions
- Define all available ASDU types in IEC 60870-5-101 and 104 (e.g. single points, double points, short floating points)
- Support of complex communication including:
  - redundant links
  - reversed direction communication
  - multiple common addresses
- Simple view and visualization of your desired level of detail
- The data view feature keeps track of the process image related to configured data point
- IEC 62351-3 (TLS profile)
- IEC 62351-5 and IEC 60870-5-7 (authentication for 101 and 104)
- Negative testing
- Trace export

UniGrid Telecontrol 101 and 104 Analysers

What if your IEC 60870-5 environment is not working properly? The first step to take is analysing exchanged data between the connected devices. Using UniGrid Telecontrol Analysers allows to easily display the relevant data.
The clever UniGrid Telecontrol 101 and 104 Analyser detect and mark errors: troubleshooting has never been this easy! They can be connected to any network, and it captures all relevant data automatically.

TECHNICAL SPECIFICATIONS

- HMI functions
- Detection and marking of errors in communication
- Easy customization of displaying data
- Time stamped frames
- Smart translation of captured frames to readable text, for more and less experienced users
- Display of communication in layers: from application to TCP/IP or serial
- Simple view and visualization of your desired level of detail
- HMI functions
- Trace export
- Wireshark compatibility

OUR TEST SUITE COMES WITH SIX MONTHS OF FREE SERVICES

- Expert opinion on test results – you can ask your expert opinion about your test results
- If you have issues you would like to discuss, we will help you to analyse your loggings
- Helpdesk – the helpdesk is run by specialists of DNV GL and guarantees fast response times. The helpdesk is also the place to submit change requests.
- Updates – all available software updates via e-mail or Internet.

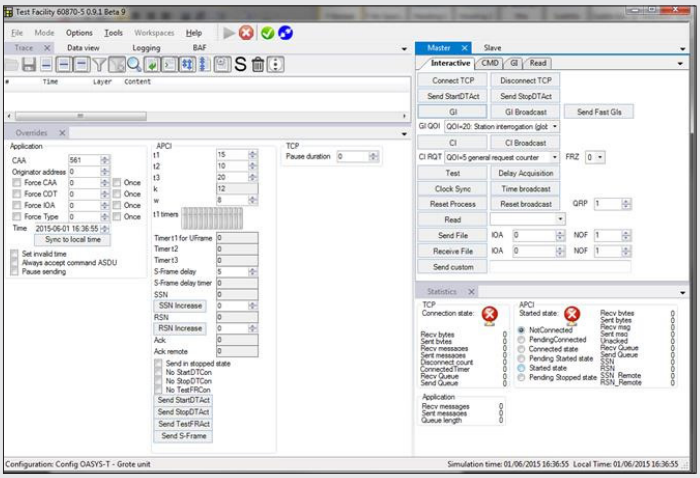


Figure 1 - UniGrid Telecontrol Simulator: renewed dynamic, graphical working environment

IP	Source: RTU
	Destination: Gateway2 to WAN
TCP	Source Port: 2404
	Destination Port: 43637
	Flags: 0x18 (PSH, ACK)
APCI	L=21 Information Frame, Send Sequence Nr: 28202, Receive Sequence Nr: 1
ASDU	<30> single-point information with CP56Time2a
	SQ=0 Number of elements=1
	Cause of transmission: <3> spontaneous
	Originator address: 0
	Common address: 33739: Production Unit 1 to TSO
	IOA=124: UVRP ----- UP2 TEST RUNNING
	SIQ : (SPI=<1> RUNNING BL=<0> SB=<0> NT=<0> IV=<0>)
	Time: <0> valid, <0> standard, Day of week: <0> not used 22-07-2015 09:26:

Figure 2 - UniGrid Telecontrol (all): completely customizable trace view with HMI function to translate values and addresses

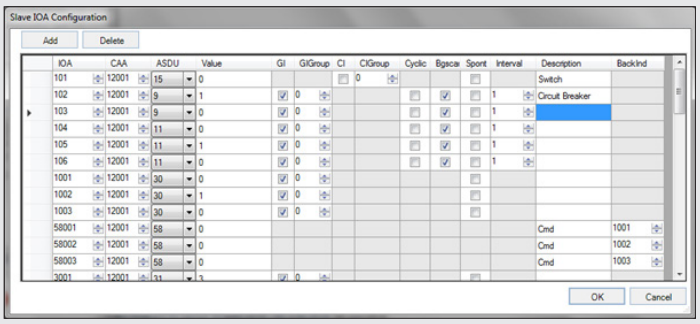


Figure 3 - UniGrid Telecontrol Simulator: configuration editor

CAA	IOA	ASDU	COT	IV	NT	SB	BL	OV	CA	CY	T	ASDU Time	Rec Time	Value	SQ	Filter
12001	101	1	20										17:02:52.384	Off		
12001	103	3	20										17:02:52.420	Indeterminat...		
12001	105	5	20										17:02:52.421	0		
12001	107	7	20										17:02:52.421	0000000000...		
12001	109	9	20										17:02:52.421	0.0000		
12001	111	11	20										17:02:52.438	0		
12001	113	13	20										17:02:52.456	0		

Figure 4 - UniGrid Telecontrol (all): data view to see in real time the state of all the local and remote-transmitted information in a glance

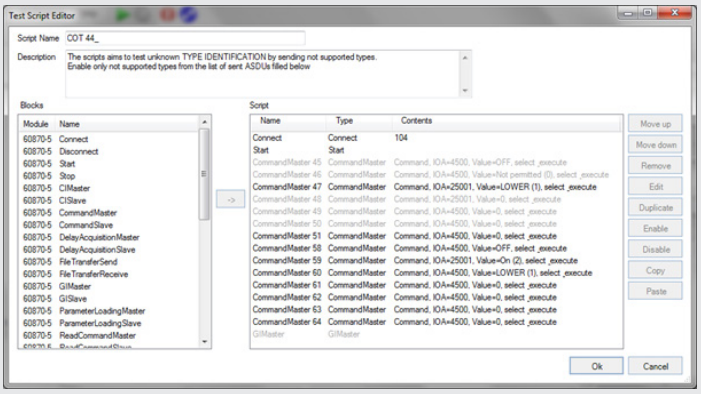


Figure 5 - UniGrid Telecontrol Simulator: Test Script Editor by sequential blocks

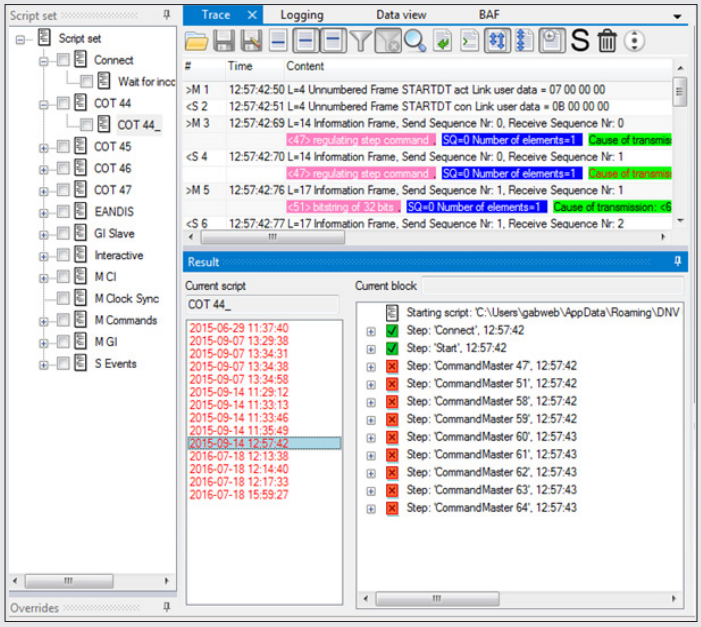


Figure 6 - UniGrid Telecontrol Simulator: script execution and results

2015-06-01 18:03:17.850	InfoVe...	DataLinkTCP	T3 expired, send TestFRAct
2015-06-01 18:03:17.850	InfoVe...	TCP	Received variable length frame
2015-06-01 18:03:17.852	InfoVe...	TCP	Received variable length frame
2015-06-01 18:03:17.852	InfoVe...	DataLinkTCP	TestFRAct received, send TestFRCon
2015-06-01 18:03:17.853	InfoVe...	DataLinkTCP	TestFRCon received, reset t1
2015-06-01 18:03:28.043	InfoVe...	TCP	Received variable length frame
2015-06-01 18:03:28.043	InfoVe...	DataLinkTCP	Received I-Frame with SSN: 16 RSN: 1
2015-06-01 18:03:28.043	InfoVe...	App	ReceiveMessage: add to queue
2015-06-01 18:03:28.124	Error	Parser	Frame 34: Error: Invalid cause of transmission for this ASDU type in monitor directi
2015-06-01 18:03:28.352	InfoVe...	TCP	Received variable length frame
2015-06-01 18:03:28.352	InfoVe...	DataLinkTCP	Received I-Frame with SSN: 17 RSN: 1

Figure 7 - UniGrid Telecontrol Simulator: logging information embedded in traces

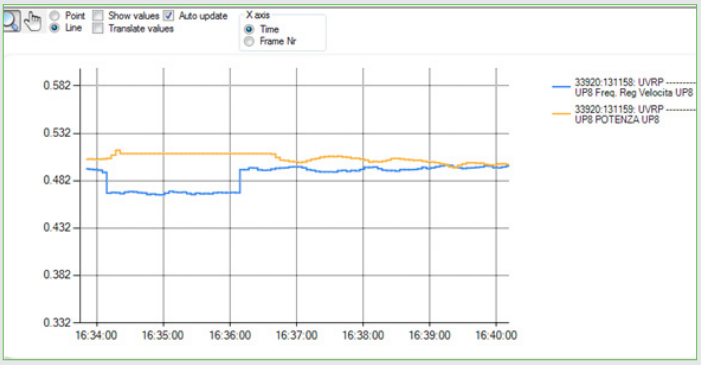


Figure 8 - UniGrid Telecontrol 101 and 104 Analyser: extended HMI functionality - chart

About DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas and energy industries. We also provide certification services to customers across a wide range of industries. Combining leading technical and operational expertise, risk methodology and in-depth industry knowledge, we empower our customers' decisions and actions with trust and confidence. We continuously invest in research and collaborative innovation to provide customers and society with operational and technological foresight.
With origins stretching back to 1864, DNV GL's reach today is global. Operating in more than 100 countries, our professionals are dedicated to helping customers make the world safer, smarter and greener.

In the energy industry our 2,500 energy experts deliver world-renowned testing and advisory services to the energy value chain including renewables and energy efficiency. Our expertise spans onshore and offshore wind power, solar, conventional generation, transmission and distribution, smart grids, and sustainable energy use, as well as energy markets and regulations.

For more commercial information please contact: pc.helpdesk@dnvgl.com