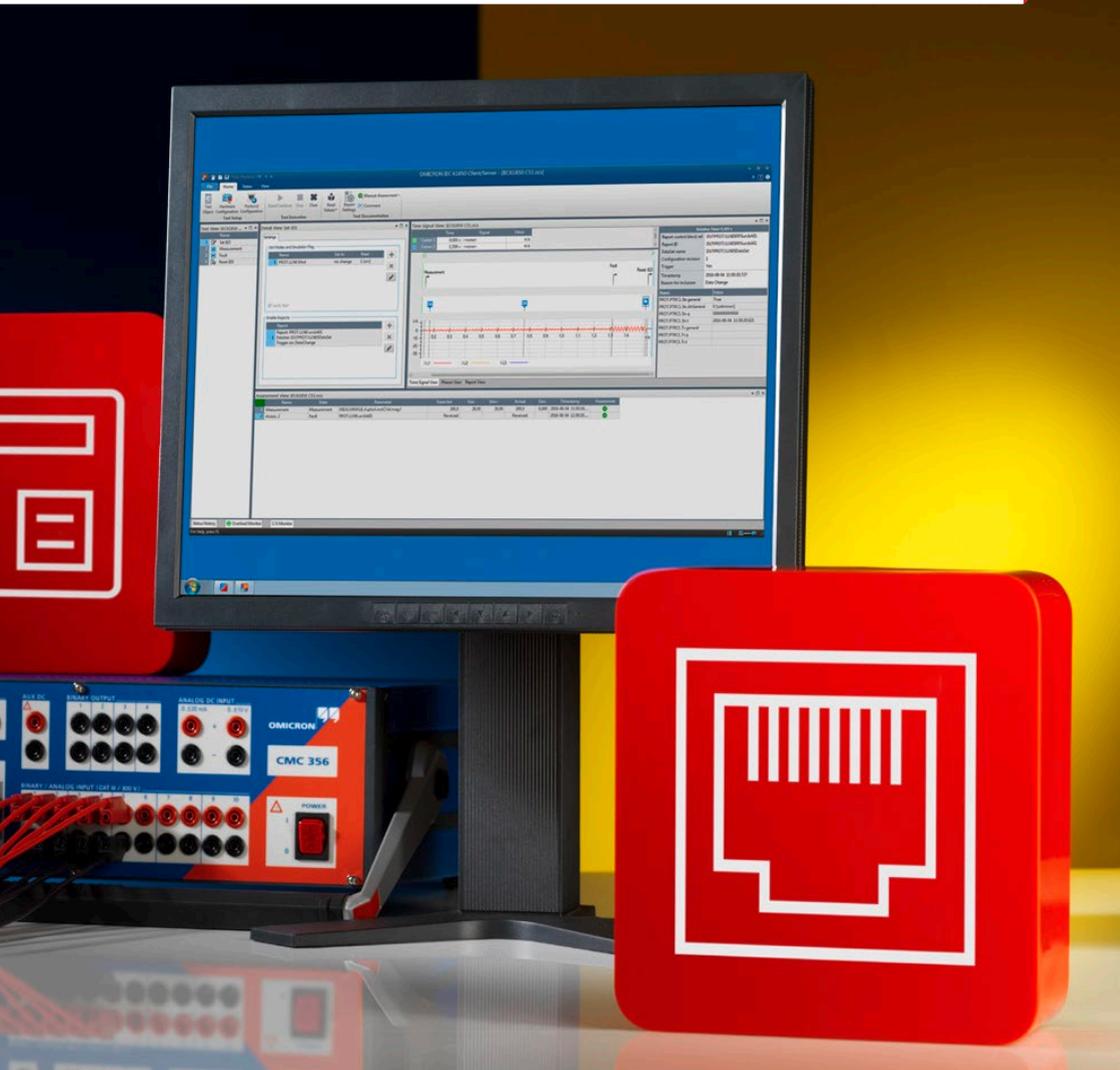# Test Universe 3.10
Module: IEC 61850 Client/Server

Efficient and reliable protection testing in IEC 61850 Substation Automation Systems

Content

1. Introduction

The most challenging question today is how to test operational IEDs. Edition 2 of the IEC 61850 standard describes the test requirements and possibilities comprehensively and these guidelines have to be put into practice. However, testing IEDs has become more and more complex due to the huge variety of possibilities defined in the standard.

The new test module „IEC 61850 Client/Server" tests the function of an IED and focuses on its communication. It is newly offered with Test Universe version 3.10 and reduces the testing complexity for correct testing of SCADA communication. This extension makes Test Universe 3.10 the best tool for protection testers working in IEC 61850 environments.

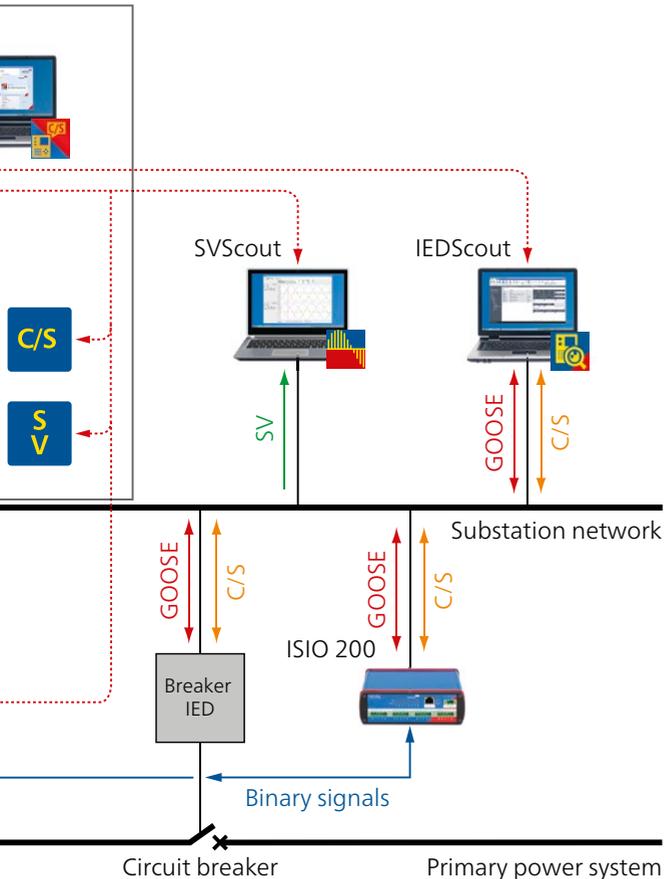The following new features are provided with the Client/Server module:
> Access each IED via Ethernet directly and securely
> Retrieve and store Reports from the IED
> Load the IED's data model and use it for protection testing
> Prepare the complete test and assessment procedure
> Execute automated protection testing with the focus on intended IED response
> Handle IED modes easily and clearly
> Reset the IED to its original operating mode after test
> Generate reports, assessment and documentation automatically
> Quick, automated, reliable and secure testing of IEDs and SCADA communication

2. Access and set IEDs automatically

The IEC 61850 Client/Server module offers many new and important testing possibilities. It makes the Test Universe software a client that directly communicates with the IEDs working as servers. Thus, Test Universe can access the entire data model of an IED and read it for protection testing. Testers can control the IED modes (test, test/blocked, off, on, on/blocked) very easily and prepare the IED for the testing procedure. Even the SCADA communication in IEC 61850 protection systems can be tested.
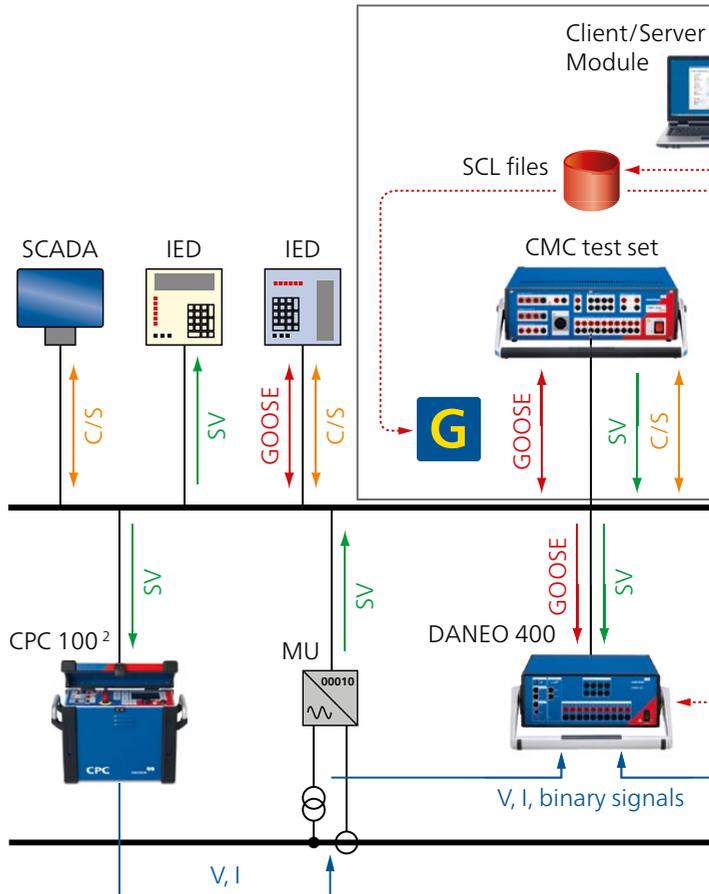
The module operates stand-alone and includes all functions necessary to access an IED and to test its communication. The functions of the module can be set according to particular testing requirements. Even different settings of the module can be embedded at the relevant place, and as often as needed, in OCC testing processes created and controlled by Test Universe. The module is always self-contained wherever it is placed within an OCC-document.

C/S

SV

SVScout

IEDScout

SV

GOOSE

C/S

Substation network

GOOSE

C/S

GOOSE

C/S

ISIO 200

Breaker
IED

Binary signals

Circuit breaker   Primary power system

2.1 Reports and control center communication

Each IED uses so called Reports to inform the control center about an occurring event. These Reports are triggered by pre-defined events and contain the relevant information about the event and the IED state.

Test Universe can now retrieve these Reports and use them for further protection testing or to verify the correct communication between the IED and SCADA, even without an active connection to the control center.
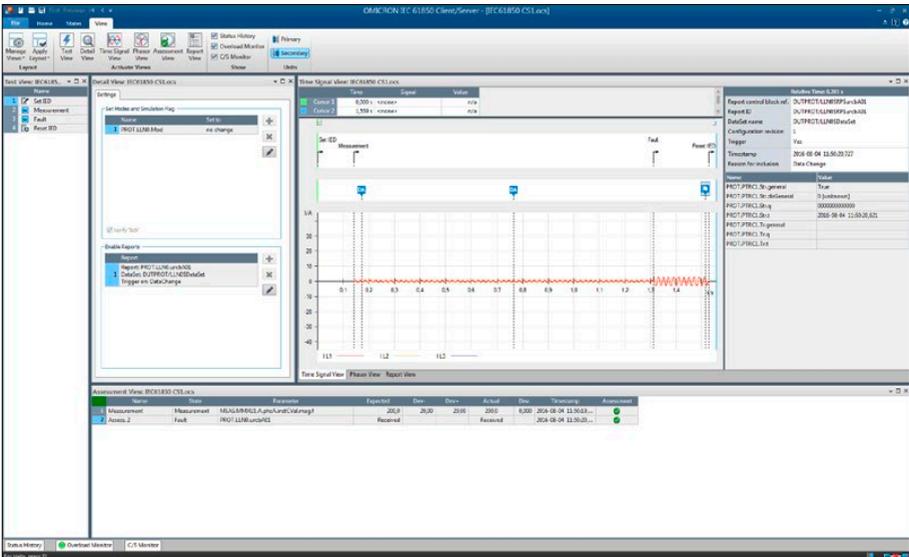
2.2 Access to the IEDs data model

The data model organizes the IED to logical nodes and logical devices with dedicated protection functions. It contains a tremendous amount of information, for example, protection function, status, settings, events, or measurements.

The IEC 61850 Client/Server module facilitates loading the IEC 61850 engineering files to Test Universe and to retrieve any values from it to assess the current state of the IED or the results of the test process. Even while the test is running the module can read out, for example, each excitation, directional information, ground fault message, or process measurement values fully automatically.
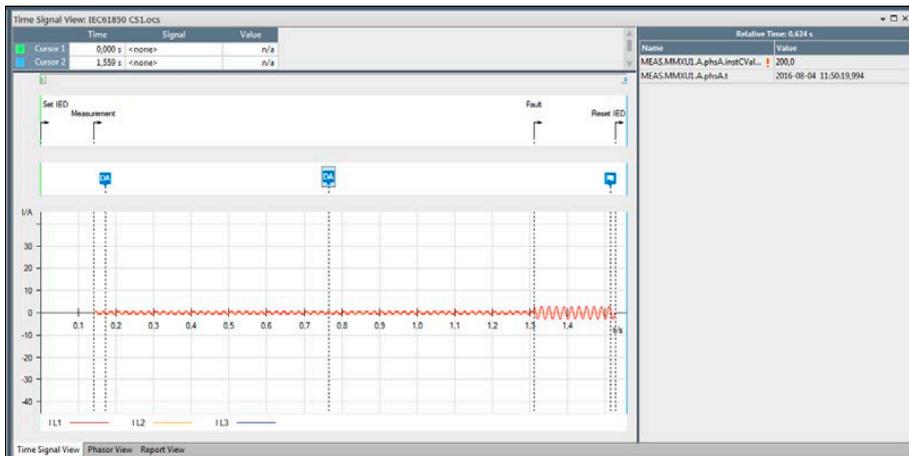
2.3 Setting specific IED modes

IEC 61850 describes several modes („on", „on-blocked", „test", „test/blocked", and „off") to control an IED that can be used for operation or testing. The IEC 61850 Client/Server module provides a new, easy and secure way to automatically set an IED to test mode and to reset it to its original state when the test is finished. Testers can use these modes for several single protection levels, entire protection functions, or the complete device.

The testing modes ensure that outputs will not be activated and that the tested device does not send any confusing information to the control center during the test process. The test module switches each setting value safely and ensures the IED is reset to its original condition after the test is finished. Finally it documents every single step of this process.

2.4 Automatic assessment

The IEC 61850 Client/Server module automates the complete assessment process. It reads all the output information and values from the IED and transfers it to the test protocol. Then, with its integrated automatic assessment function, the module compares the resulting values to the predetermined or expected values and verifies if they are within the acceptable deviations. It also verifies if each reaction of the IED was initiated correctly and shows all results in the Assessment View.

2.5 Time signal view

The time signal view visualizes the output signals (voltages and currents) and the information received from the IED.
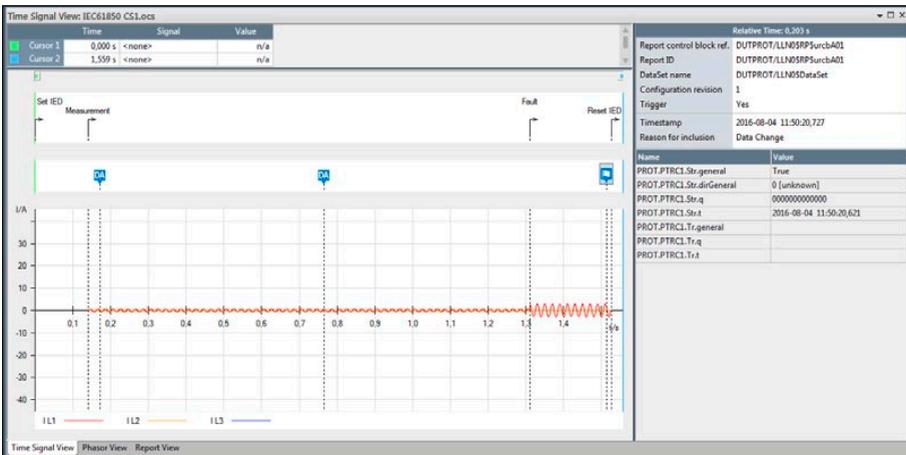
2.6 Documentation of each process step

The IEC 61850 Client/Server module logs each single step executed by the test process, as well as each IED response, automatically in the „C/S Monitor".

This data can be used in the report that is stored by the Test Universe software. This report validates the correct execution of the protection testing process, the settings and reactions of the IED and its state after the test is finished. It also contains the assessment results of the IED's response.

3. Benefits

> Makes Test Universe a client in IEC 61850 environments
> Working with IEC 61850 Reports for testing
> Testing the SCADA communication of IEC 61850 IEDs
> Accessing the data model of IEDs for protection testing
> Secure switching between operation, testing and simulation mode in IEDs
> Comprehensive documentation of all tests and evaluation of results

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