OTITOS

Open Test Implementation for IEC 61850-90-5-based Transmission of Synchrophasor Information

CHALLENGE

Due to many changes in the energy sector and the high demands on power supply, one of the focal points lies on the work of energy networks for the future in the structure of geographically distributed measurement systems for real time monitoring and protection of power grids. With such a system, based on so-called "synchrophasor" measurements, the dynamics of the grid are monitored in real time. They try to identify weaknesses early on and to procure appropriate countermeasures in time. A standard for transmitting the measured values based on the IEC 61850 standard was published in May 2012.

GOALS

The focus of the project lies in the development of test procedures according to that standard, the implementation of tests based on TTCN-3 with the aim to evaluate its applicability for energy protocols, the implementation of a prototypical protocol stack and a comprehensive performance and security evaluation in a state-of-the-art testbed.
The first goal (Z1) is the development of test procedures to verify the interoperability, performance, and security of implementations according to the standard IEC 61850-90-5. These procedures are to be developed according to the guidelines of the UCAIug testing group. The approach is carried out synergistically in order to eliminate duplication. The project is expected to produce very good test procedures. It is explicitly not the aim to produce a complete test suite that covers all the possible tests, and to continue right up to the completed product that would already be certifiable.
The second goal (Z2) is the mapping of the developed test procedures for the test language TTCN-3. The international ETSI standard that has been successfully used in the telecommunications industry for about 15 years has so far been largely ignored in the energy sector and should be implemented extensively in this project for the first time.
The third goal (Z3) is the prototypical implementation of an IEC 61850-90-5 protocol stack. This will subsequently be linked in part to the HMI/SCADA

system by COPA-DATA and be used as a basis for a TTCN-3 test adapter development.
The fourth goal (Z4) is to build a testbed in which the developed components are integrated and that is suitable for execution of the created TTCN-3 test suites. A real Phasor Measurement Unit (PMU), which is installed at a power company and connected to the remote network will be integrated into the testbed. The testbed will contain all necessary components of a state-of-the-art transmission of phasor measurements.
The fifth goal (Z5) is the execution of TTCN-3 test suites in the testbed. Above all aspects of performance, quality and security are investigated.

EXPECTED RESULTS

▶ Open and proven test procedures for IEC 61850-90-5.
▶ A first executable TTCN-3 test suite for these test procedures.
▶ A first tested prototype IEC 61850-90-5 implementation for COPA-DATA.
▶ A first worldwide study on the applicability of TTCN-3 test standards for IEC 61850-90-5 (and also in extrapolation for other energy protocols).
▶ Initial implementation of current testing protocols for energy EANTC.
▶ Use experience values to open questions on the mapping of VLAN priorities on IP QoS classes.
▶ Use experience on questions of performance. In particular, the possibility of fulfilling the stringent time requirements using current WAN technology, and how security features must therefore be deactivated.