Our solutions

Complete Life Cycle of IEC 61850 Automation Systems Development and Implementation

This service integrates from the perspective of substation engineering. It represents the evolution of engineering as traditionally known, reaching a **higher, more efficient, and notably more robust stage than what has been used thus far**. New electrical infrastructures with IEC 61850 are characterized by **interoperability and digitalization.** In this new technological landscape, CIRCE offers all services related to this innovative operational approach.

RTDS (Real Time Digital Simulator)

The RTDS laboratory provides the capability **to conduct real-time laboratory tests for the study of the interaction between intelligent equipment and the electrical grid.** These tests yield information about the behavior of intelligent equipment and its interaction with the grid, aiding in its development, debugging, and validation prior to commercialization.

The laboratory is equipped with 2 racks and 10 PB5 processor cards, along with multiple digital and analog inputs and outputs. We operate with communication protocols such as IEC 61850 (SV and GOOSE), IEC-103, DNP-3, C37.118-PMU, and voltage and current amplification equipment from DOUBLE ENGINEERING.

Smart Grid virtualization

As new trends in virtualization of Smart Grid functions emerge given the availability of cloud and computing resources, **CIRCE has leaded the development of several virtual modules for control and protection of substations of the spanish TSO.** Data acquisition, IEC 61850 services and ANSI 21 and 87 protection modules have been developed. The obtained MVP is able to manage up to 10 transport bays in a single general-purpose hardware. Open-source and linux real time resources are integrated into these high-performance applications.

Cybersecurity Applied to the Power Network

Smart Grid and SAS cybersecurity testbed based on open-source tools and docker containers to **easily evaluate response measures against cyberattacks on critical infrastructures without affecting their availability.** This testbed has been validated several DER and SAS use cases, where different assets and substation IEDs have been tested against the specifications of the final users or bests practises based on standards.

Dedicated resources to this laboratory section in CIRCE i**nclude 90+ cores, GPU and industrial communication devices.**

circe
TECHNOLOGY CENTRE

We are a technology centre founded in 1993 that works every day to **improve the competitiveness of the business fabric** through the **transfer of technological solutions** in the field of **energy** and **sustainability**.

Our solutions

IEC 61850 Automated Testing Tool

CIRCE has developed an **automated testing tool that interprets received IEC 61850 signaling**. This tool is used for a **more efficient execution of validation tests** and has the following capabilities:

- Connection and Discovery of IEC 61850 with substation IEDs.
- Capture and visualization of IEC 61850 protocol messages from the network.
- Interpretation of data according to a signal dictionary.
- Verification of received signaling against expected values in tests.
- Sending of GOOSE messages.
- Execution of MMS commands.
- Assisted tests based on standardized validation protocols.
- Free-form execution tests.
- Results logging.

The development not only reads IEC 61850 information but interprets it according to the company's criteria. The association of received signaling with a standardized signal dictionary enables **automatic result evaluation through the integration of well-defined test protocols in the solution**.

IEC 61850 Software Development

Development of proprietary software tools for equipment validation and FAT/SAT testing:

- C libraries for customized, SCL-based, GOOSE and SV publication and subscription.
- Graphic tools for reading and emulation of GOOSE messages with complete flexibility.
- IEC 61850 IED interface testing
- Client/Server MMS for firmware development
- Automatic tests according to standardized protocols with result interpretation