

CIGRE Study committee B5

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG B5.87

NAME OF THE CONVENOR

ZHAO Xicai (CHINA)

TITLE

Digital Transformation of Protection, Automation and Control Systems: expanding the Application of IEC 61850

THE WG APPLIES TO DISTRIBUTION NETWORKS: YES

ENERGY TRANSITION

3 / Digitalization

POTENTIAL BENEFIT OF WG WORK

- 1 / commercial, business, social, economic benefits
- 2 / potential interest from a wide range of stakeholders
- 3 / likely to contribute to new or revised industry standards
- 4 / state-of-the-art or innovative solutions or directions

STRATEGIC DIRECTION

- 1 / The electrical power system of the future reinforcing the End-to-End nature of CIGRE: respond to speed of changes in the industry by preparing and disseminating state-of-the-art technological advances
- 2 / Making the best use of the existing systems

SUSTAINABLE DEVELOPMENT GOAL

9 / Industry, innovation and infrastructure

BACKGROUND :

Digital transformation of utilities concerns utilization of digital technology across all areas of its organization. It contributes to evaluate and modernize the organization's processes, products, operations and technology stack to enable continual, rapid, innovation.

Digital transformation cannot be realized without adequate tools, data management (including data modelling) and communication.

The System Configuration Tool (SCT) and the IED Configuration Tool (ICT) of the different components of a Protection, Automation, and Control system (PACS) are employed throughout its life cycle, from planning, development, type test, customer certification test, manufacturing, project engineering, installation, configuration, commissioning, asset management and maintenance. All these tools may be interfaced with various digital applications for substation and HV equipment.

IEC 61850 is a standard series published by IEC describing the devices inside a substation from a functional point of view and allowing the exchange and use of this information for both design / configuration (through using the dedicated XML files) and runtime (through mapping to communication protocols).

Common Information Model (CIM) in the IEC 61970 and IEC 61968 series provide a standardized representation of the topology of electrical networks and substations, and of other network elements and features. This model can be used as input for the protection setting calculation and management, as well as asset management.

Building Information Modeling (BIM), originally for building engineering and construction, is now expanding into substation projects. Digital Twins are recently introduced into PACS area.

Information contained in CIM or BIM can be used as input for the SCT or ICT. To get high efficiency and high quality over the life cycle of PACS, all these models and PACS configuration tools need to be harmonized.

For this TOR, the digital transformation of PACS covers all aspects of PACS impacted by the digital transformation of the utility. With digital transformation of PACS, more and more applications will be implemented, not only for real-time operational control but also for post-event analysis and non-operational supervision. In this context, the existing modelling method are likely to not satisfy the requirements. For example, single line diagram is crucial not only for configuration tools, but also for HMI in SAS. The way to unify modelling and diagram to mapping the data on the diagram automatically is important to system integration and configuration efficiency.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :

The aim of the Technical Brochure developed by the Working Group is:

- to investigate state-of-art of PACS configuration tools (SCT and ICT), their interface with other tools or files used in the PACS or substation lifecycle, and associated models;
- to investigate opportunities for the harmonization of the interface of different configuration tools and models used during different phases over entire lifecycle of PACS in digital transformation;
- and, to give recommendations about further developments of PACS configuration tools, models, and standardization activities.

SCOPE :

The Technical Brochure produced by the working group will cover the following items:

- Survey and review on current PACS configuration tools (ICT SCT, IED Specification Tools (IST), System Specification Tools (SST)).
- Review of tools, standard files or models that are used for PACS over its lifecycle, including:
 - CIM or other formats for substation modelling, including busbar and feeder topology and consistency;
 - BIM or other tools for substation engineering;
 - Life cycle management tools or databases;
 - Protection and function settings;
 - High-level tools for the description of substation and bay-level functions.
- Standard framework for interfaces enabling the modelling of the complete lifecycle of PACS, including engineering process of the substation.
 - Definition
 - Constraints and approaches for revision management
 - Constraints and approaches compatibility verification
- Establish a list of information to be exchanged between PACS configuration tools and other tools and possible data formats for this exchange, including:
 - Busbar and feeder topologies;
 - Information for asset management;
 - Engineering information;
 - Information related to substation building and yard management.
- Developments or evolutions of PACS configuration tools and their functions enabling to interface with tools or files used in the of digital transformation of substations.
- Examples of digital transformation of PACS including description of business cases for expanding all these tools and making them to work together.

Remarks:

There is an overlap with WG B5.86 - Protection Automation and Control System interfaced asset management and condition monitoring using innovative technologies, WG B5.84 - Recommendations and constraints for development and interfacing of virtual Intelligent Electronic Device implemented in Protection, Automation and Control Systems, WG B5.68 - Optimisation of the IEC 61850 Protection, Automation and Control Systems (PACS) engineering process and tools, WG B5.63 - Protection, Automation and Control System Asset Management, and WG B5.51 - Requirements and Use of Remotely Accessed Information for SAS, which shall be minimized.

The interface of models or data with PACS configuration tools, that is identified by WG B5.86 shall be considered by this new WG.

Link between virtual IEDs, and the Digital Twin concept, which are in the scope of WG B5.84, is of interest for this new WG.

The scope is related to SC D2 activity. SC D2 is welcome to nominate a liaison member to WG B5.87.

Out of scope:

Runtime data exchange and associated protocols by the following working groups are out of scope:

- Use and specific aspects of Virtual IED (covered by WG B5.84 - Recommendations and constraints for development and interfacing of virtual Intelligent Electronic Device implemented in Protection, Automation and Control Systems);
- Aspects related to IT-OT convergence (covered by WG B5.77 - Requirements for Information Technologies (IT) and Operational Technology (OT) managed of Protection, Automation and Control Systems (PACS));
- Documentation and version handling (covered by WG B5.75 - Documentation and version handling related to Protection, Automation and Control functions).

DELIVERABLES AND EVENTS

Deliverables Types

Time schedule

Q2 2025 Kick-off

Q3 2028 Final Draft of Technical Brochure

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannveig S. J. Løken
February 03rd, 2025