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TECHNICAL SPECIFICATION

colour inside

Power systems management and associated information exchange – Interoperability in the long term – Part 102: CIM – IEC 61850 harmonization

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62361-102, which is a technical specification, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
57/1706/DTS	57/1948/RVDTS

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62361 series, published under the general title *Power systems management and associated exchange – Interoperability in the long term*, can be found on the IEC website.

In this publication, the following print types are used:

– *Associations: in italic type.*

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

The IEC focuses primarily on specifying the payload of various functionally oriented messages or file exchanges. This concept includes configuration files like those developed in all IEC power systems management standards. The different smart grid initiatives in the USA, Europe and Asia have all recognized the necessity to establish solid standards for communicating between all the "smart" devices. For interoperability purposes, it has been recognized, at an early stage, that widely shared semantics would be necessary. Unfortunately, the semantic models used by the technical groups have differed from the start due to the different needs for information exchange within substations and information exchange within control centres. This has led to some gaps between the models within different standards, even though they reflected the same power system entities. Various institutions have requested that we narrow the gaps:

- NIST has recommended harmonization as a mechanism to decrease cost of integration in the Smart Grid.
- CEN/CENELEC/ETSI Smart Grid Coordination Group report states: "Harmonized electronic data model and description language are missing” and strongly recommends the study of “Harmonized glossary, semantic & modelling between CIM and IEC 61850”.
- ENTSO-E letter states: "There is also a need to perform a harmonization between IEC 61850 and IEC CIM (Common Information Model) Standards [...] There are applications which use both set of standards and significant improvements on interoperability and data exchange between the applications should take place."

A number of studies and reports have already been produced on the subject of Harmonization as listed in the Bibliography.

POWER SYSTEMS MANAGEMENT AND ASSOCIATED INFORMATION EXCHANGE – INTEROPERABILITY IN THE LONG TERM –

Part 102: CIM – IEC 61850 harmonization

1 Scope

This part of IEC 62361, which is a Technical Specification, outlines a technical approach for achieving effective information exchange between power system installations governed by IEC 61850 and business systems integrated with IEC CIM standard data exchanges, based on a selected specific set of use cases, but also with the goal of creating a framework that will extend successfully to other use cases in the future. This document includes proposals to 'harmonize' the two standards by adapting or extending existing information models and/or defining new models, where such changes will enable more effective communication. Both current and future directions of models will be considered. The report will take into account existing standards for semantics, services, protocols, system configuration language, and architecture.

It was intended to be coordinated with IEC 61850 and all affiliated subgroups as well as IEC 61968 and IEC 61970. This edition of the document was prepared based on Edition 2 of IEC 61850-6 (2009), IEC 61850-7-3 and IEC 61850-7-4 and has been updated to match the forthcoming Edition 2.1. Mapping to other parts of IEC 61850 is incomplete. Mapping has been considered for the CIM classes defined in IEC 61970-301. The mapping to CIM classes defined in IEC 61968-11 and other standards is incomplete.

This document suggests a technical approach by which two of the leading standards for software interoperability that serve the electric utility industry (the Common Information Model, CIM, and the IEC 61850 model) can cooperate in order to enable effective data exchanges between the domains covered by these standards. Both of these standards are maintained by the International Electrotechnical Committee (IEC).

A number of studies and reports have already been produced on the subject of harmonization as listed in the Bibliography.

The work leading to this Technical Specification has considered how exchanges required by commonly understood use cases might be mapped between the standard models in order to determine the harmonizing changes suggested for the relevant models. The report references any papers, reports or other documents that provided data for this harmonization.

The approach is to define a transformation of the data governed by IEC 61850 SCL XSD to data governed by CIM UML. The transformations in this document are defined based on the use cases presented in this document. Only SCL data relevant to these use cases is transformed.

The aim is to allow the development of tools that perform automatic transformation from an SCL instance file into a CIM based instance model that can then be exported using existing standards such as IEC 61970-552: CIMXML Model exchange format.

These transformations will result in CIM-side processes that can distribute the information as needed for configuration of specific CIM applications. It is also presumed that the result of this exchange will be to enable creation of real-time CIM-side clients for IEC 61850 system data.

The heart of the SCL to CIM transformation specification defined in this document is a mapping between the two information models. Wherever this mapping has been judged to be unnecessarily complex, changes have been recommended to the existing information models.

A major objective, however, has been to define a solution that does not change either SCL or CIM UML without a mechanism to supply backward compatibility.

The transformation specification is only for structural modelling. IEC 61970-301 states “CIM entities have no behaviour.” IEC 61850-5 states “the behaviour of the functions itself are ... outside the scope of this standard”.

This document is a Technical Specification – not a standard. Paragraphs introduced by the word Recommendation are recommendations for revisions to some of the IEC 61850 and CIM standards. It is anticipated that if these recommendations are accepted, then this report can be revised and elevated to a standard.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TS 61850-2, *Communication networks and systems in substations – Part 2: Glossary*

IEC 61850-6:2009, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in electrical substations related to IEDs*

IEC 61850-7-3, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

IEC 61850-7-4, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC TS 61850-80-1:2009, *Communication networks and systems for power utility automation – Part 80-1: Guideline to exchanging information from a CDC-based data model using IEC 60870-5-101 or IEC 60870-5-104*

IEC 61968-11, *Application integration at electric utilities – System interfaces for distribution management – Part 11: Common information model (CIM) extensions for distribution*

IEC TS 61970-2, *Energy management system application program interface (EMS-API) – Part 2: Glossary*

IEC 61970-301:2013, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

IEC 61970-452:2015, *Energy management system application program interface (EMS-API) – Part 452: CIM static transmission network model profiles*

IEC 81346-1, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC TS 61850-2, IEC 61850-6 and IEC TS 61970-2 and the following apply.