

TECHNICAL SPECIFICATION



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



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-5454-7

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CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	10
2 Normative references	11
3 Terms, definitions and abbreviated terms	11
3.1 Terms and definitions.....	12
3.2 Abbreviated terms.....	12
4 Use case summary	13
4.1 General.....	13
4.2 SCADA/EMS/DMS configuration from IEC 61850 SCL	13
4.3 Importing SCADA/EMS/DMS requirements into IEC 61850 SCL.....	14
4.3.1 General	14
4.3.2 Recommendation for harmonization: SCL Process/Substation/Line section.....	14
4.4 SCADA commissioning use case	14
4.5 Volt Var control use case	15
4.6 Wide Area Monitoring, Protection and Control (WAMPAC) for transient stability	16
5 Mapping SCL to SCADA/EMS/DMS relevant CIM	16
5.1 Business requirements.....	16
5.2 Profiles	17
5.3 IEC 61850 modelling principles	17
5.3.1 Introduction	17
5.3.2 System Configuration description Language (SCL)	17
5.3.3 Logical Devices and Logical Nodes	17
5.3.4 SCL sections	18
5.4 Mapping overview	18
5.4.1 SCL Document Types	18
5.4.2 General mapping principles	19
5.5 SCL Substation section mapping.....	22
5.5.1 Overview	22
5.5.2 SCL elements and CIM classes mapping	26
5.6 Equipment types and codes	29
5.6.1 General	29
5.6.2 Equipment type code mapping.....	29
5.6.3 Recommendation for harmonization: SCL Equipment Type codes.....	31
5.6.4 Recommendation for harmonization: SCL PSRType	33
5.6.5 Recommendation for harmonization: CIM BusbarSection and Junction	34
5.6.6 Recommendation for harmonization: CIM Fan, Motor, Batteries and charging systems.....	34
5.7 Naming and identification mapping	34
5.7.1 General	34
5.7.2 Naming and identification example	35
5.7.3 Recommendation for harmonization: SCL naming and identification	36
5.7.4 Recommendation for harmonization: CIM naming and identification:.....	36
5.8 Voltage mapping.....	36
5.8.1 General	36

5.8.2	Voltage mapping example.....	37
5.8.3	Voltage level additional attributes	37
5.9	Connectivity modelling	37
5.9.1	SCL Connectivity (single line diagram) modelling.....	37
5.9.2	Recommendation for harmonization: SCL unconnected terminals	39
5.9.3	Connectivity and Terminal example	39
5.9.4	Transformation of current transformer models.....	42
5.10	Phase modelling	42
5.10.1	General	42
5.10.2	Phase mapping example.....	44
5.10.3	Recommendation for harmonization: SCL Phase modeling	47
5.10.4	Recommendation for harmonization: CIM SinglePhaseKind	47
6	Extension syntax for drawing layout coordinates.....	47
6.1	General.....	47
6.2	Recommendation for harmonization: Drawing layout syntax	47
7	Logical Node mapping	48
7.1	Logical Node containers.....	48
7.2	CIM Measurement associations	48
7.2.1	General	48
7.2.2	Recommendation for harmonization: CIM SCADA package.....	49
7.3	Logical Node classes relevant to CIM	50
8	Measurement mapping	53
8.1	General.....	53
8.2	CIM Measurement Types – Logical Node and Data Object mapping.....	53
8.2.1	General	53
8.2.2	Recommendation for harmonization: CIM Measurement types	55
8.3	Measurement associations.....	56
8.4	CSWI or XSWI/XCBR as source of switch position information.....	56
8.5	Direction of positive flow	56
8.5.1	General	56
8.5.2	Recommendation for harmonization: SCL power flow direction	57
8.5.3	Recommendation for harmonization: CIM power flow direction.....	57
8.6	CIM Extensions for Distribution – Metering Model and Reading Types	57
9	Real time data exchange mapping	58
9.1	Measurement identification	58
9.2	Common Data Class mapping	58
9.3	Common Data Class mapping to IEC 60870 and CIM Measurements	59
9.4	Common Data Class mapping to IEEE1815 and CIM.....	62
9.5	Data Attribute mapping	62
9.5.1	General	62
9.5.2	Quality flag mapping	63
9.5.3	Non-real time measurement attribute mapping.....	64
9.5.4	Recommendation for harmonization: CIM measurement classes	64
10	Control Model	64
10.1	CIM Control Modelling.....	64
10.1.1	General	64
10.1.2	Recommendation for harmonization: CIM control model	65
10.1.3	Recommendation for harmonization: CIM CONTROL TYPES.....	66

10.2	Automated control sequences	66
11	Protection modelling	66
12	Communication model	68
13	Settings and attributes	68
Annex A	(informative) Use case details	80
A.1	SCADA/EMS/DMS configuration from IEC 61850 SCL – Description	80
A.1.1	Name of use case	80
A.1.2	Scope and objectives of use case	80
A.1.3	Narrative of use case	80
A.1.4	General remarks	82
A.2	Use case diagrams	82
A.3	Technical details	86
A.3.1	Actors: People, systems, applications, databases, the power system, and other stakeholders	86
A.3.2	Preconditions, assumptions, post condition, events	89
A.3.3	References / Issues	89
A.3.4	Further Information on the use case for classification / mapping	90
A.4	Step by step analysis of use case	90
A.4.1	Pre-conditions	90
A.4.2	Steps – Normal	91
A.4.3	Steps – Alternative, error management, and/or maintenance/backup scenario	93
A.5	Information exchanged	94
A.6	Common terms and definitions	94
Annex B	(informative) Use case details	95
B.1	Wide Area Monitoring, Protection and Control system (WAMPAC) for Transient stability	95
B.1.1	Name of Use Case	95
B.1.2	Scope and objectives of use case	96
B.1.3	Narrative of use case	103
B.2	Use case diagrams	105
B.3	Technical details	106
B.3.1	Actors: People, systems, applications, databases, the power system, and other stakeholders	106
B.3.2	Preconditions, assumptions, post condition, event	107
B.3.3	References / issues	107
B.3.4	Further information on the use case for classification / mapping	108
B.4	Step by step analysis of use case	108
B.4.1	Overview of scenarios	108
B.4.2	Steps – Alternative, error management, and/or maintenance/backup scenario	109
B.5	Information exchanged	111
Annex C	(informative) Recommendations	115
C.1	Recommendations for IEC 61850	115
C.2	Recommendations for CIM based standards, particularly IEC 61970-301	116
C.3	Recommendations for joint working groups	117
Bibliography	118

Figure 1 – IEC 61850 and CIM data flows	15
Figure 2 – Mapping for Wide Area Monitoring Protection and Control.....	16
Figure 3 – Equipment mapping	21
Figure 4 – Example of equipment and status measurement mapping	22
Figure 5 – UML class diagram of SCL entities showing inheritance.....	24
Figure 6 – UML class diagram of SCL entities showing inheritance and containment	25
Figure 7 – UML class diagram of SCL equipment connectivity and phase information	26
Figure 8 – Composite Switch example.	33
Figure 9 – Substation section connectivity example	40
Figure 10 – Three-phase (left) and single-phase control (right)	43
Figure 11 – Unbalanced phase switching example	45
Figure 12 – Current CIM SCADA package.....	49
Figure 13 – Revised SCADA package	50
Figure 14 – Signal identification as defined in IEC 61850-7-2	58
Figure 15 – UML model of MV, DEL and WYE data classes	59
Figure 16 – Current CIM Control Model.....	65
Figure 17 – Proposal for revised CIM Control Model	66
Figure 18 – Present IEC 61970 Protection Model.....	67
Figure A.1 – Activity diagram part 1 – Create and review system specification description	83
Figure A.2 – Activity diagram part 2 – Create and review system configuration description	84
Figure A.3 – Sequence diagram	85
Table 1 – Overview of SCL and CIM counterparts	19
Table 2 – Mapping between SCL data types and CIM classes.....	27
Table 3 – Equipment type codes	29
Table 4 – Equipment type codes – proposed modified descriptions.....	32
Table 5 – Equipment type codes – proposed additional codes	33
Table 6 – Name mapping	35
Table 7 – Proposed CIM NameType class naming conventions.....	36
Table 8 – Base voltage mapping	37
Table 9 – Attributes for terminal.....	38
Table 10 – Attributes for ConnectivityNode	39
Table 11 – Comparison of IEC 61850 and CIM Phase values.....	44
Table 12 – Breaker mapping scenarios	44
Table 13 – Mapping IEC 61850 Logical Nodes to CIM classes	51
Table 14 – IEC 61850 DataObjects vs Current CIM measurement types	54
Table 15 – IEC 61850 DataObjects for non-three phase measurements.....	55
Table 16 – IEC 61850 DataObjects for CIM control types.....	55
Table 17 – Mapping IEC 61850 Common Data Classes to IEC 60870 information objects and CIM classes	60

Table 18 – Mapping IEEE1815 data point types to CIM classes	62
Table 19 – Mapping IEC 61850 real time data attributes to CIM classes/attributes	63
Table 20 – Mapping IEC 61850 Non-real time data attributes to CIM classes/attributes	64
Table 21 – Mapping SCL Communication elements.....	68
Table 22 – Mapping IEC 61850 settings to CIM attributes	70

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POWER SYSTEMS MANAGEMENT AND ASSOCIATED INFORMATION
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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.

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- *Associations: in italic type.*

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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.