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Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in power utility automation systems related to IEDs

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 6: Configuration description language for communication in power utility automation systems related to IEDs

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This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.

IEC 61850-6 edition 2.2 contains the second edition (2009-12) [documents 57/1025/FDIS and 57/1041/RVD], its amendment 1 (2018-06) [documents 57/1918/FDIS and 57/1940/RVD] and its amendment 2 (2024-11) [documents 57/2711/FDIS and 57/2733/RVD].

International Standard IEC 61850-6 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second amendment constitutes a technical revision.

The main changes with respect to IEC 61850-6:2009+AMD1:2018 are as follows:

a) functional extensions concerning the engineering processto improve files exchange followup, SCL elements identification and control configuration handling, added;
b) provision of clarifications and corrections. Issues that require clarification are published in a database available at https://iec61850.tissue-db.com/. Arising incompatibilities are listed in 8.2.3.

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

A list of all the parts in the IEC 61850 series, under the general title *Communication networks and systems for power utility automation*, can be found on the IEC website.

This IEC standard includes Code Components i.e. components that are intended to be directly processed by a computer. Such content is any text found between the markers <CODE BEGINS> and <CODE ENDS>, or otherwise is clearly labelled in this standard as a Code Component. In the current version of this document, such indication is made at the beginning of Annex A which identifies the list of XSD files and refers to the code component definition in Subclause 1.3.

The purchase of this IEC standard carries a copyright license for the purchaser to sell software containing Code Components from this standard directly to end users and to end users via distributors, subject to IEC software licensing conditions, which can be found at: http://www.iec.ch/CCv1.

This consolidated edition brings two distinct sets of changes:

1) Resolved Interop Issues (covered by the table below) which have already followed the technical issues (Tissues) process as described in IEC 61850-1 and have reached the green "status".
2) Resolved Editorial Tissues which may have led to interoperability issues.

The resolutions of these issues which lead to these changes are described in greater detail in the Tissue database hosted at https://iec61850.tissue-db.com/.

The only new features compared to the previous IEC 61850-6:2009+AMD1:2018 are the introduction of the UUID to identify elements and files, the modelling of controls binding from a client perspective, and the definition of translated labels for elements which may be represented in any user interface. Apart from this, this consolidated edition strictly respects the scope of the original edition.

Technical issues summary

N°, Subject, Clause and Paragraph are as they appear on the Tissue database hosted at https://iec61850.tissue-db.com/ where all technical issues have been stored from the origin of IEC 61850.

"Subject" defines very briefly the topic under focus.

The Tissues which have been considered are:

N°	Subject	Clause	Paragraph
1590	RCB: Offline changes increment ConfRev by 10000?	9.3.8	Table 23
1647	SDO@count definition inconsistent	9.5.3	Table 44
1648	DA@count definition needs restriction	9.5.4.1	Table 47
1669	Incorrect example of header	9.1	1
1672	Allow connection Server and ServerAt to the same SCL.Subnetwork	9.3.2	Below Table 50
1674	Harmonization with 62351-6	9.3.2	Services Element
1675	SCSM support capability - Harmonization with 62351-6	9.3.2	Services
1683	ICD file for IED functionality spanning for multiple VL and BAY	9.2.1	The name value is also a global identification of
1708	Presence of Sample Mode field not controllable through SmvOpts	9.3.11	Smv Options element
1729	Incorrect SCL example in (informative) Annex	D.2	2
1734	Improved schema validation	A.5	1
1740	Exceptions of enumeration types for IEC 61850-7-4	9.5.6	last in 9.5.6
1745	Definition of type and id in DataTypeTemplates not consistent	9.5.6	Table 49
1768	Server associate-request has no SCL parameters	9.3.2	Table 11
1771	SCL Services ReportControl max vs. Indexed	9.3.8	8
1774	Missing description of KDC	9.3.2	4
1786	Downgrade of SCD Exports not Mandatory	Annex G	Table G.2
1787	There is no clear mapping of all 7-2 ACSI type to SCL basic types	9.5.4.2	1
1808	Please clarify if ix first index is 0 or 1	9.3.6 Data object (DOI) definition	Table 19 and Table 20
1813	Typo "Valkind"	9.5.4.1	Table 46
1816	Add SICS statement for xsi:type usage in P elements	9.4.3 Annex G	7 Table G.1 and G.2
1818	Clarification of ExtRef attributes usage	9.3.13	Table 51
1823	Clarify iedType attribute usage in DataTypeTemplates	9.5.1	2
1831	ldInst reference should concretized	9.3.7	Table 22
1832	SICS I45 not clear enough	Annex G	Table G.1
1833	Service SettingGroups.ConfSG clarification	9.3.2	Table 11
1834	SICS I211 text not inline with Service section	Annex G	Table G.1
1839	Not clear definition of lnInst to LN0 type elements	9.3.5	5
1843	SCT handle different OriginalSclXxx and SCL version/revision/release	9.3.2 I.4.3.3	G.1
1854	SupSubscription	9.3.2	Table 11
1885	sAddr length	I.5.3.5	1
1886	Part 6 - Typo in Abbreviation	4	ICT

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

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This part of IEC 61850 specifies a description language for the configuration of power utility IEDs. This language is called System Configuration description Language (SCL). It is used to describe IED configurations and communication systems according to IEC 61850-5 and IEC 61850-7-x. It allows the formal description of the relations between the utility automation system and the process (substation, switch yard). At the application level, the switch yard topology itself and the relation of the switch yard structure to the SAS functions (logical nodes) configured on the IEDs can be described.

While this part describes the language to describe the configuration of IEC 61850 systems, other parts of the standard describe how to configure the system and possible restrictions. Therefore implementations claiming conformance to this standard shall take into account constraints from the other normative references. Some references to the other parts have been included for the purpose of clarification but these references are not all inclusive.

NOTE The process description, which is in this standard restricted to switch yards and general process functions, will be enhanced by appropriate add-ons for wind mills, hydro plants and distributed energy resources (DER).

SCL allows the description of an IED configuration to be passed to a communication and application system engineering tool, and to pass back the whole system configuration description to the IED configuration tool in a compatible way. Its main purpose is to allow the interoperable exchange of communication system configuration data between an IED configuration tool and a system configuration tool from different manufacturers.

IEC 61850-8-x and IEC 61850-9-x, which concern the mapping of IEC 61850-7-x to specific communication stacks, may extend these definitions according to their need with additional parts, or simply by restrictions on the way the values of objects have to be used.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 6: Configuration description language for communication in power utility automation systems related to IEDs

1 Scope

1.1 General

This part of IEC 61850 specifies a file format for describing communication-related IED (Intelligent Electronic Device) configurations and IED parameters, communication system configurations, switch yard (function) structures, and the relations between them. The main purpose of this format is to exchange IED capability descriptions, and SA system descriptions between IED engineering tools and the system engineering tool(s) of different manufacturers in a compatible way.

The defined language is called System Configuration description Language (SCL). The IED and communication system model in SCL is according to IEC 61850-5 and IEC 61850-7-x. SCSM specific extensions or usage rules may be required in the appropriate parts.

The configuration language is based on the Extensible Markup Language (XML) version 1.0 (see XML references in Clause 2).

This standard does not specify individual implementations or products using the language, nor does it constrain the implementation of entities and interfaces within a computer system. This part of the standard does not specify the download format of configuration data to an IED, although it could be used for part of the configuration data.

1.2 Published versions of the standard and related namespace names

The table below provides a reference between all published editions, amendments or corrigenda of this document and the full name of the namespace.

Edition	Publication date	Webstore	Namespace
Edition 1.0	2004-03	IEC 61850-6:2004	IEC 61850-6:2003
Edition 2.0	2009-12	IEC 61850-6:2009	IEC 61850-6:2007B
Amendment 1 of Edition 2.0	2018	IEC 61850-6:2009/AMD1:2018	IEC 61850-6:2007B4
Edition 2.1	2018	IEC 61850-6:2009+AMD1:2018 CSV	IEC 61850-6:2007B4
Amendment 2 of Edition 2.0	2024	IEC 61850-6:2009/AMD2:2023	IEC 61850-6:2007C5
Edition 2.2	2024	IEC 61850-6:2009+AMD2:2023 CSV	IEC 61850-6:2007C5

1.3 Identification of the namespace

The namespace associated with this document is an XML schema (XSD) for the System Configuration Language (SCL). The parameters which are identifying the namespace are provided in Table 53:

Table 53 – Attributes of the IEC 61850-6 XML namespace

Attribute	Content
Namespace nameplate	
Namespace Identifier (xmlns)	http://www.iec.ch/61850/2003/SCL
Version	2007
Revision	C
Release	5
XSD version header attribute	2007C5
Code Component Name	IEC_61850-6.SCL.2007C5.Full

1.4 Code Component distribution

Each Code Component is a ZIP package containing the electronic representation of the Code Component itself, with a file describing the content of the package (IECManifest.xml).

The life cycle of a code component is not restricted to the life cycle of the related publication. The publication life cycle goes through two stages, Version (corresponding to an edition) and Revision (corresponding to an amendment). A third publication stage (Release) allow publication of Code Component in case of urgent fixes of InterOp Tissues, thus without need to publish an amendment.

Consequently, new releases of the Code Component may be released, which supersedes the previous release, and will be distributed through the IEC TC57 web site at:

https://www.iec.ch/tc57/supportdocuments

The latest version/release of the code component will be found by selecting the file for the code component with the highest value for VersionStateInfo, e.g. IEC_61850-6.SCL.{VersionStateInfo}.full.zip.

The code component associated to this document is an XML schema file (XSD). It is available as a full version only. It is freely accessible on the IEC website for download at https://www.iec.ch/tc57/supportdocuments, but the usage remains under the licensing conditions.

In case of any differences between the downloadable code component and the IEC pdf published content, the downloadable code component is the valid one; it may be subject to updates. See included history files.

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 61850-4, *Communication networks and systems for power utility automation – Part 4: System and project management*

IEC 61850-5, *Communication networks and systems for power utility automation – Part 5: Communication requirements for functions and device models*

IEC 61850-7-1:2011, *Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Principles and models*

IEC 61850-7-2, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*

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 61850-8-1, *Communication networks and systems for power utility automation – Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3*

IEC 61850-9-2, *Communication networks and systems for power utility automation – Part 9-2: Specific communication service mapping (SCSM) – Sampled values over ISO/IEC 8802-3*

IEC IEEE 61850-9-3, *Communication networks and systems for power utility automation – Part 9-3: Precision time protocol profile for power utility automation*

IEC 62351-4*, Power systems management and associated information exchange – Data and communications security – Part 4: Profiles including MMS and derivatives*

IEC 62351-6*, Power systems management and associated information exchange – Data and communications security – Part 6: Security for IEC 61850*

IEC 62351-9*, Power systems management and associated information exchange – Data and communications security – Part 9: Cyber security key management for power system equipment*

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

ISO/IEC 8859-1, *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

ISO/IEC 9834-8, *Information technology – Procedures for the operation of object identifier registration authorities – Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers*

RFC 1952, GZIP *file format specification version 4.3,* RFC, available at <http://www.ietf.org/rfc/rfc1952.txt>

RFC 2045, *Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies*, RFC, available at <http://www.ietf.org/rfc/rfc2045.txt>

Extensible Markup Language (XML) 1.0, W3C, available at <http://www.w3.org/TR/2000/REC-xml-20001006>

XML Schema Part 1: Structures, W3C, available at <http://www.w3.org/TR/2001/REC-xmlschema-1-20010502>

XML Schema Part 2: Datatypes, W3C, available at <http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/>