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TECHNICAL REPORT

Communication networks and systems for power utility automation – Part 90-30: IEC 61850 Function Modelling in SCL

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IEC TR 61850 has been prepared by subcommittee 10: Guidelines for IEC 61850 Function Modelling in SCL, of IEC technical committee TC 57: WG10. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
57/2693/DTR	57/2734/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

NOTE The following print types are used:

- *SCL attributes and elements: in italic type.*

This IEC technical report 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.

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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- withdrawn, or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.

INTRODUCTION

The notion of Function is omnipresent in IEC 61850. Here are some examples:

- IEC 61850-1 introduces Functions on page 16 together with Logical Nodes and physical devices as core elements of the IEC 61850 reference architecture.
- IEC 61850-5 contains a comprehensive list of Functions in the Substation Domain and their relationship to Logical Nodes and PICOMs.
- IEC 61850-7-500 describes the use of the information model for devices and Functions of IEC 61850 in applications in substation automation systems.
- Functions play a central role in Logic Modelling.
- Basic Application Profiles (BAP) (IEC TR 61850-7-6) defines "Application Functions" as the chosen context for defining a profile.

The Function element requires an appropriate embedding in the formal SCL model and additional Guidelines on how to use it for the formalized, SCL based specification and description of power automation systems.

In Edition 1 of IEC 61850-6 the SCL element Function was limited to the Station Level and intended to be a container for information outside the immediate substation control & protection domain. E.g. "Door Alarm".

Since Edition 2 of IEC 61850-6, Functions are essential elements of the Substation and or Process Section. They serve as containers for Logical Nodes and can have internal structures (SubFunctions).

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-30: IEC 61850 Function Modelling in SCL

1 Scope

1.1 General

This part of IEC 61850, which is a Technical Report, describes extensions of the SCL Substation/Process Section allowing the creation of a comprehensive, IED and hardware independent specification of an IEC 61850 based power system.

It addresses how to:

- decompose functions in SCL
- show function classifications in SCL
- relate functions with the SCL Substation and Process Section
- relate functions to Logical Nodes and IEDs/Specification IEDs
- present information flow between functions in a hardware/implementation independent way
- position Functions in relation to "Application Schemes", "Distributed Functions", "Protection Schemes"
- consider the relationship to Basic Application Profiles (BAP) defined in IEC TR 61850-7-6

The document addresses the engineering process as far as it is related to the specification of Functions and their instantiation in IEC 61850 based power system. This includes the impact on the SCL Process Section during system configuration.

The engineering process related to the definition of Applications and their instantiation is addressed in the Basic Application Profile Document (BAP) in IEC TR 61850-7-6.

The System Configuration process is described in IEC 61850-6.

Modifications and extensions of SCL are done in a way to guarantee backwards compatibility.

In addition, this document introduces:

- Some further elements to SCL that improve the content and usefulness of SSD files and facilitate the handling of SCL files for engineering purposes,
- New variants of SCL files: ISD (IED Specification Description) and FSD (Function Specification Description),
- Evolution of the engineering rights management, to first improve the usage of SED and add a new concept of System Configuration Collaboration (SCC file) which allows collaboration on the same project with different engineers.

1.2 Published versions of this standard and related namespace name

This technical report defines an SCL namespace extension. This allows adding these extensions to existing SCL files without requiring a new SCL schema release. They will be included in a future SCL release.

This technical report also defines SSD examples of files showing the possibilities offered by this new document. The content of the examples is defined in IEC_61850-90-30.SSD.2024A2.Full.

The SCL namespace extension is defined under IEC 61850-6-100 identifier which is a common extension between this document and IEC TR 61850-7-6:2024 (Edition 2).

The SCL namespace extension is proposed in two versions based on:

– IEC 61850-6:2018 edition 2 amendment 1 which has already been used by some experimentation
– IEC 61850-6:2024 edition 2 amendment 2 which defines UUID (Universal Unique IDentifier) used in some proposed extension in this document.

The differences and the management of the two versions is described in Annex C.

Table 1 provides an overview of the references between the published versions of this standard and the related namespace name.

Table 1 – Reference between published versions of the standard and related namespace name

Edition	Publication date	Webstore	Namespace
Edition 1.0	2024-03	IEC 61850-90-30:2023	IEC 61850-6-100:2019B9 for SCL 2.1
Edition 1.0	2024-03	IEC 61850-90-30:2023	IEC 61850-6-100:2019C1 for SCL 2.2

1.3 Identification of the Code Components

1.3.1 IEC 61850-6-100 XML namespace compliant with IEC 61850-6:2018 edition 2 amendment 1

The example associated with this document is an SCL file (SSD) example based on IEC 61850-6-100 2019C1 and IEC 61850-6 2007C5. The content of these examples is defined in Annex D. The parameters which identify the namespace are provided in Table 2:

Table 2 – Attributes of the IEC 61850-6-100:2019B9 XML namespace

Attribute	Content
Namespace nameplate	
Namespace Identifier (xmlns)	http://www.iec.ch/61850/2019/SCL/6-100
Version	2019
Revision	B
Release	9
XSD version header attribute	2019B9
Recommended reference name	eIEC61850-6-100
Code Component Name	IEC_61850-6-100.XSD.2019B9.Full
Namespace dependencies	
includes	http://www.iec.ch/61850/2003/SCL version: 2007 revision: B release: 4

1.3.2 IEC 61850-6-100 XML namespace compliant with IEC 61850-6:2024 edition 2 amendment 2

The namespace associated with this document is an XML schema (XSD) for an extension to the System Configuration Language (SCL) as defined in IEC 61850-6. The parameters which identify the namespace are provided in Table 3:

Table 3 – Attributes of the IEC 61850-6-100:2019C1 XML namespace

Attribute	Content
Namespace nameplate	
Namespace Identifier (xmlns)	http://www.iec.ch/61850/2019/SCL/6-100
Version	2019
Revision	C
Release	1
XSD version header attribute	2019C1
Recommended reference name	eIEC61850-6-100
CodeComponentName	IEC_61850-6-100.XSD.2019C1.Full
Namespace dependencies	
includes	http://www.iec.ch/61850/2003/SCL version: 2007 revision: C release: 5

1.3.3 IEC/TR 61850-90-30 SSD example

The example associated with this document is an SCL file (SSD) example based on IEC 61850-6-100 2019C1 and IEC 61850-6 2007C5. The parameters which identify the namespace are provided in Table 4:

Table 4 – Attributes of the IEC TR 61850-90-30 SSD example

Attribute	Content
Example nameplate	
Version	2024
Revision	A
Release	1
Code Component Name	IEC_61850-90-30.SSD.2024A1.Full
Example dependencies	
includes	http://www.iec.ch/61850/2003/SCL version: 2007 revision: C release: 5
includes	http://www.iec.ch/61850/2019/SCL/6-100 version: 2019 revision: C release: 1

1.4 Code Component Distribution

1.4.1 General

This document is associated with code components.

Each Code Component is a ZIP package containing at least the electronic representation of the Code Component itself and 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) allows publication of Code Component in case of urgent fixes of InterOp Tissues, thus without need to publish an amendment.

Consequently, new release(s) of the Code Component may be released, which supersede(s) the previous release, and will be distributed through the IEC TC 57 web site at:

http://www.iec.ch/tc57/supportingdocuments

1.4.2 SCL extension namespace code component

The latest version/release of the document will be found by selecting the file for the code component with the highest value for VersionStateInfo, e.g. IEC_61850-6-100.XSD.{VersionStateInfo}.full.zip.

The SCL extension namespace is available in two version, for compatibility with SCL edition 2.1 or SCL edition 2.2. The VersionStateInfo will differ for both version:

– The version compatible with SCL edition 2.1 will be following 2019Bx where x is the latest release,
– The version compatible with SCL edition 2.2 will be following 2019Cx where x is the latest release.

The Code Component associated with this document is reflecting the XML schema specified in this document formatted in XSD files. It also contains example of IEC 618580-6-100 usage in the context of IEC TR 61850-90-30 and IEC TR 61850-7-6. The list of examples is detailed in the IECManifest.xml file.

The full version is freely accessible on the IEC website for download at http://www.iec.ch/tc57/supportingdocuments but the usage remains under the licensing conditions.

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

1.4.3 SSD example code component

The latest version/release of the SSD examples will be found by selecting the file for the code component with the highest value for VersionStateInfo, e.g. IEC_61850-90-30.SSD.{VersionStateInfo}.full.zip.

The code component associated to this TR is a list of examples packages as ZIP file used as informative. It is available as a full version only. It is freely accessible on the IEC website for download at http://www.iec.ch/tc57/supportdocuments, but the usage remains under the licensing conditions.

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 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 61850-6:2009/AMD2:2024

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*
IEC 61850-7-2:2010/AMD1:2020

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61850-7-4:2010/AMD1:2020

IEC TR 61850-7-6:2024, *Communication networks and systems for power utility automation – Part 7-6: Guideline for definition of Basic Application Profiles (BAPs) using IEC 61850*

IEC TR 61850-7-500, *Communication networks and systems for power utility automation – Part 7-500: Basic information and communication structure – Use of logical nodes for modeling application functions and related concepts and guidelines for substations*

IEC 61131 (all parts), *Programmable controllers*