IEC TS 61850-7-7

Edition 1.0   2018-03

TECHNICAL
SPECIFICATION

Communication networks and systems for power utility automation –
Part 7-7: Machine-processable format of IEC 61850-related data models for tools

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**COMMUNICATION NETWORKS AND
SYSTEMS FOR POWER UTILITY AUTOMATION –**

**Part 7-7: Machine-processable format
of IEC 61850-related data models for tools**

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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.

Technical Specification IEC TS 61850-7-7 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
57/1925/DTS	57/1956/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 61850 series, published 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 labeled in this standard as a Code Component.

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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• withdrawn,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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

Year after year the IEC 61850 data models are extended both in depth with hundreds of new data items, and in width with tens of new parts.

In order to foster an active tool market with good quality, and at the end to improve IEC 61850 interoperability, a machine-processable file, describing data model related parts of the standard as input, is needed. This is the purpose of the new language Name Space Definition (NSD) defined by this part of IEC 61850.

This will avoid the need for any engineering tool related to the IEC 61850 data models to get the content of the standard manually entered, with a high risk of mistakes. This will also help to easily spread any corrections to the data model, as requested to reach interoperability. Tool vendors will be able to integrate NSD in their tools to distribute the standard data models directly to end users.

COMMUNICATION NETWORKS AND
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Part 7-7: Machine-processable format
of IEC 61850-related data models for tools

1 Scope

1.1 General

This part of IEC 61850, which is a Technical Specification, specifies a way to model the code components of IEC 61850 data model (e.g., the tables describing logical nodes, common data classes, structured data attributes, and enumerations) in an XML format that can be imported and interpreted by tools. The following main use cases are supported:

- Generation of SCL data type templates for system specification or ICD files.

- Validation of SCL data type templates.

- Definition of private extensions by following the rules of the standard.

- Adapting rapidly the whole engineering chain as soon as a new version of IEC 61850 data model (an addendum, a corrigenda or a Tissue) affects the content of the standard.

- Provide tool-neutral textual help to users of tools on the data model contents.

- Supporting multi-language publication, i.e., enabling the expression of the data model in different languages, through a machine processable format.

The purpose of this proposal is limited to the publication of the XML format which should support the data model part of any IEC 61850 related standard. The publication of code components themselves will be part of the related IEC 61850 part.

1.2 Namespace name and version

The new namespace name and version section is mandatory for any IEC 61850 namespace (as defined by IEC 61850-7-1:2011).

The parameters which identify this new release of the NSD namespace xmlns:nsd="http://www.iec.ch/61850/2016/NSD" are:

- Namespace Version: 2017

- Namespace Revision: A

- Namespace Release: 1

- Namespace release date: 2017/08/28

Edition	Publication date	Webstore	Namespace
Edition 1.0	2017-??	IEC 61850-7-7:2017	IEC 61850-7-7:2017A

The namespace version relates to the edition of the standard: here namespace version 2017 refers to the first edition of this document.

Then, the revision relates to amendments if any: as for the current version of this document, revision A corresponds to the original edition, without amendment. For the first amendment, the revision will be B, etc.

Finally, namespace release indicates an update of the related code component (if any) without publication of a new version or revision of the current document. This could be used for internal release of the code component during development of a new version of the document, or to provide fixes of interoperability tissues without need to enter into a full document update process.

The namespace release date is used for information purpose, to indicate when the namespace has been created.

1.3   Code Component distribution

The Code Components included in this document are also available as electronic machine readable files at:
http://www.iec.ch/public/TC57/supportdocuments/IEC_61850-7-7.2017.NSD.2017A.full.zip

The Code Component(s) included in this document are potentially subject to maintenance works and the latest release is available in the repository located at:
http://www.iec.ch/TC57/supportdocuments

The latest version/release of the document will be found by selecting the file IEC_61850-7-7.2017.NSD.{VersionStateInfo}.full.zip with the filed VersionStateInfo of the highest value.

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 IECManifest contains different sections giving information on:

– The copyright notice

– The identification of the code component

– The publication related to the code component

– The list of the electronic files which compose the code component

– An optional list of history files to track changes during the evolution process of the code component

The IECManifest related to this publication is:

```
<IECManifest xmlns="http://www.iec.ch/CC/2017/IECManifest" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.iec.ch/CC/2017/IECManifest IECManifest.xsd">
        <Copyright>
                <Notice>
                        COPYRIGHT (c) IEC, 2017. This version of this XSD is part of IEC 61850-7-7:2017; see the IEC 61850-
7-7:2017 for full legal notices. In case of any differences between the here-below code and the IEC published content, the here-
below definition supersedes the IEC publication; it may contain updates. See history files. The whole document has to be taken
into account to have a full description of this code component.
                        See www.iec.ch/CCv1 for copyright details.
                </Notice>
                <License uri="www.iec.ch/CCv1">IEC License</License>
        </Copyright>
        <CodeComponent id="IEC_61850-7-7.2017A.NSD.XSD" name="NSD schema 2017A" content="full" date="2017-08-
09">
                <Publication name="IEC 61850-7-7.2017_ed1.0" comment="Machine-processable format of IEC 61850-related
data models for tools"/>
                <File name="NSD.xsd" category="normative" content="full" comment="Schema describing the namespace
files"/>
                <File name="IECCopyright.xsd" category="normative" content="full" comment="Schema included in NSD to
integrate management of IEC Copyright notice"/>
                <File name="NSD.Doc.HTML.zip" category="normative" content="full" comment="Zip archive containing the
HTML documentation of the NSD. Contains the 'NSD.html' file and all related pictures"/>
                <HistoryFile name="History.NSD.v1.0.txt" startingDate="2015-10-12" endingDate="2017-01-25"
startingVersion="NSD.XSD.v0.3" endingVersion="NSD.XSD.v1.0"/>
                <HistoryFile name="History.NSD.v1.1.txt" startingDate="2017-01-25" endingDate="2017-06-23"
startingVersion="NSD.XSD.v1.0" endingVersion="NSD.XSD.v1.1"/>
                <HistoryFile name="History.NSD.2017A.txt" startingDate="2017-06-23" endingDate="2017-08-09"
startingVersion="NSD.XSD.v1.1" endingVersion="NSD.XSD.2017A"/>
```

```
        </CodeComponent>
</IECManifest>
```

The package is identified using the following naming rule:

{RefStandard}.{CodeComponentName}.{VersionRevision}.{LightFull}{PublicationStage}.zip

For current publication, the Code Component package name is:

IEC_61850-7-7.2017.NSD.2017A.full.zip

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 without need to publish an amendment.

This is useful when InterOp Tissues need to be fixed. Then a new release of the Code Component will be released, which supersedes the previous release, and distributed through the IEC web site.

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

IEC 61850-7-1, *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*

ISO 639-1:2002, *Codes for the representation of names of languages – Part 1: Alpha-2 code*

3   Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/

- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
data model
hierarchical structure of data and the related services used to define functions and devices in IEC 61850

Note 1 to entry: The IEC 61850 standard series defines the core data model in IEC 61850-7-2, IEC 61850-7-3 and IEC 61850-7-4, which is also the data model related to Substations. Other domains (like DER, Hydro, Wind, etc.) could define their own data model based on IEC 61850 core data model to be able to use IEC 61850 core parts as a common layer.

3.2
namespace
identification of a data model of a specific part of the standard

Note 1 to entry: This definition will be used in this document when a specific data model has to be represented.

Note 2 to entry: The W3C consortium has also defined the concept of namespace for XML documents to identify the kind of elements which could be used in a file. This is typically the namespace used to identify an XML schema, as per IEC 61850-6 usage. This is not the definition used within this document.

4   Abbreviated terms

In general, the glossary and abbreviated terms defined in IEC 61850-2 apply. The following abbreviated terms are either exclusive to this document or particularly useful for understanding this document and are repeated here for convenience.

CDC   Common Data Class

DO   Data Object

DA   Data Attribute

LN   Logical Node

NSD   Name Space Definition

SCL   System Configuration description Language

UML   Unified Modeling Language

XML   Extensible Markup Language

XSD   XML Schema Definition

5   Use cases

5.1   Generation of SCL data type templates for system specification

5.1.1   Description of the use case

5.1.1.1   Name of use case

Use case identification		
ID	**Domain(s)**	**Name of use case**
	Administration	Use machine readable format to generate SCL data type templates for system specification

5.1.1.2   Narrative of use case

Narrative of use case
Short description – max 3 sentences
User take the namespace NSD corresponding to its needs and create data type templates based on it.
Complete description
This use case describes how a Machine Processable file user can take benefit of the NSD publication to create datatype templates from the standard description and allow creation of an SSD for the specification of the process. The Figure 1 presents the use case and the corresponding sequence diagram.

5.1.1.3   General remarks

| General remarks |
|---|
| The creation of a data model for a process specification shall follow rules from standard definitions of IEC 61850-7-2, IEC 61850-7-3, IEC 61850-7-4 or derived data models for other domains (like Wind farm with IEC 61400-25-2).

This creation is done manually by checking against the standard in paper format. This is source of errors.

Usage of NSD will allow for a tool to have the list of LNClass and CDCs available in a standard to allow user to use them as input to its definition. |

5.1.1.4   Diagrams of use case

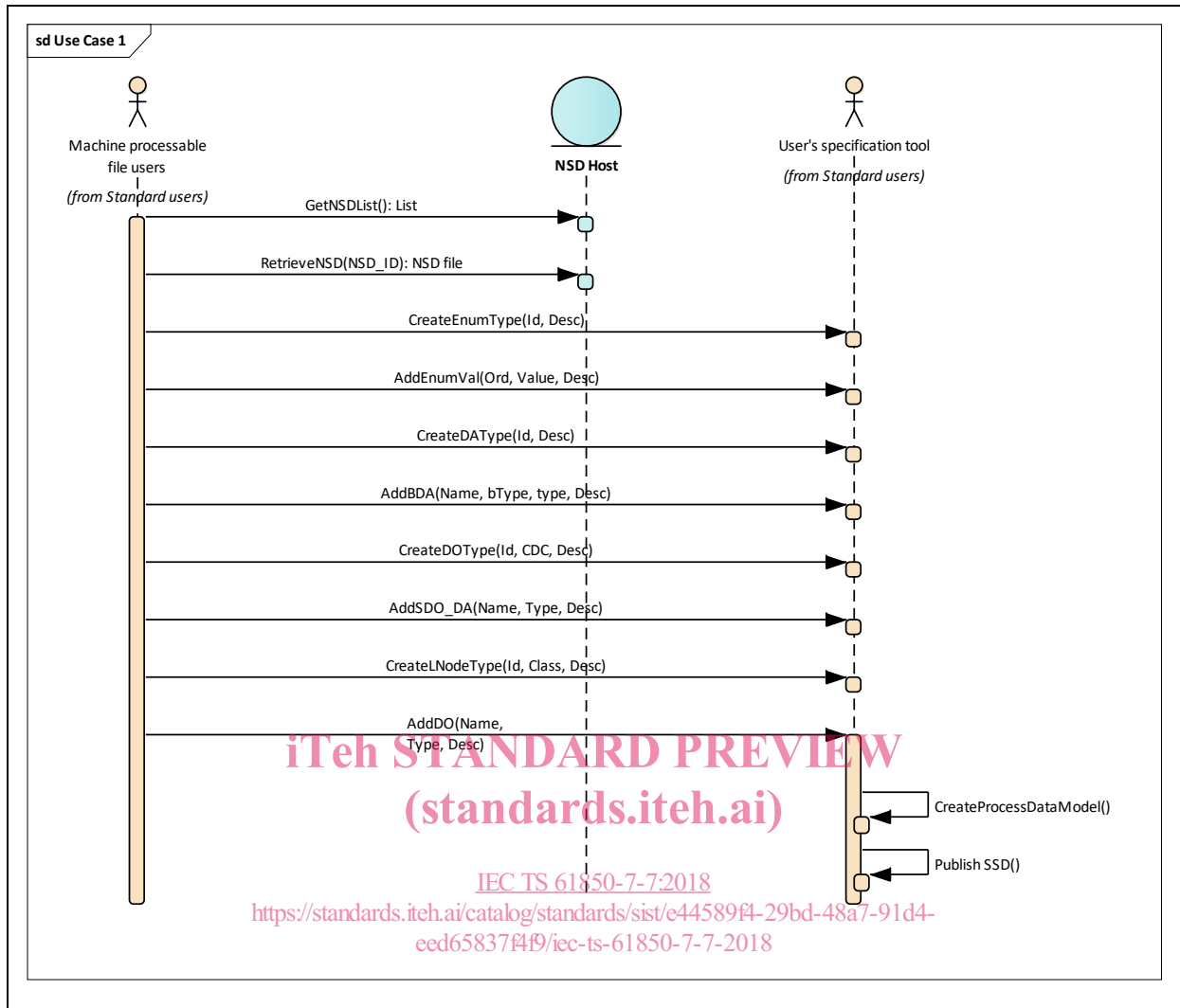| Diagram of use case |
|---|
| **The primary use case** |
| |
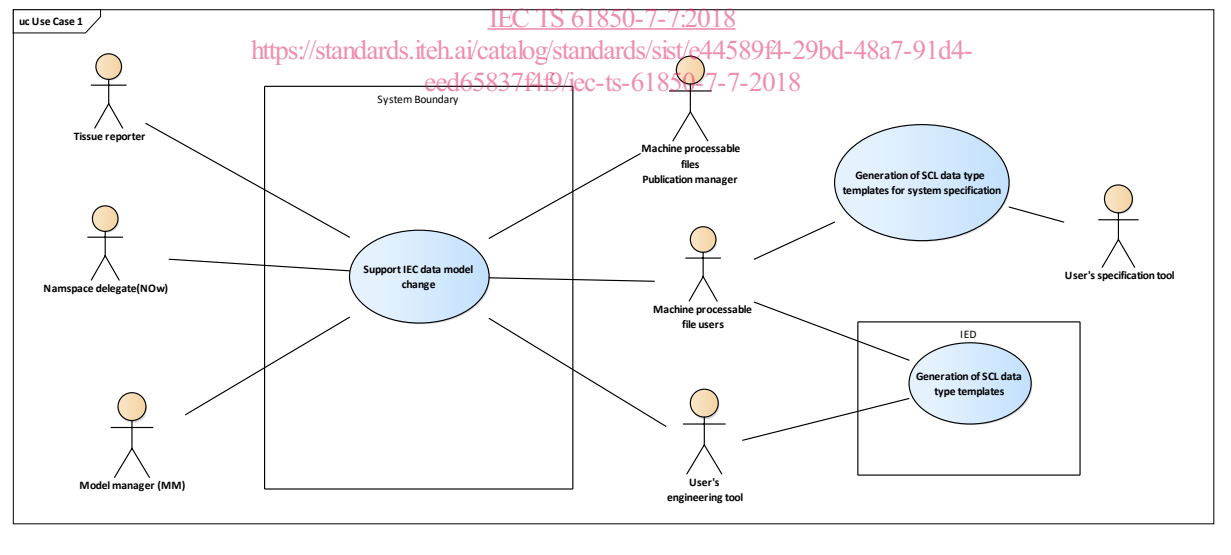
Figure 1 – Generation of SCL data type templates for system specification diagrams

5.1.2 Technical details

5.1.2.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

Actors			
Grouping (community)		**Group description**	
Actor name *see actor list*	**Actor type** *see actor list*	**Actor description** *see actor list*	**Further information specific to this use case**
Machine readable file users	people	user of machine readable file, involved in system engineering	
User's engineering system	system	engineering system of the Machine readable file users	IED specification tool

5.1.2.2   Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	Triggering event	Pre-conditions	Assumption
NSD Host			The latest NSD of the IEC 61850 namespaces are hosted on the NSD host.

5.1.3   Information exchanged

Information exchanged		
Name of information exchanged	Description of information exchanged	Requirements to information data R-ID
NSD_ID	Identifier of an NSD, based on the namespace identifier based on the publication number, version and revision	
NSD list	List of available NSD on the NSD Host with a description	
NSD file	The file representing a Namespace data model to be used by a tool	

5.2   Generation of SCL data type templates for ICD files

5.2.1   Description of the use case

5.2.1.1   Name of use case

Use case identification		
ID	Domain(s)	Name of use case
	Administration	Use machine readable format to generate SCL data type templates for ICD files

5.2.1.2   Narrative of use case

Narrative of use case
Short description – max 3 sentences
User take the namespace NSD corresponding to its needs and create data type templates based on it.
Complete description
This use case describes how a Machine Processable file user can take benefit of the NSD publication to create datatype templates from the standard description and allow creation of an ICD for a specific IED. The Figure 2 presents the use case and the corresponding sequence diagram.