

Australian Standard™

**Communication networks and systems
in substations
Part 7.1: Basic communication structure
for substation and feeder equipment—
Principles and models**



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Australian Electrical and Electronic Manufacturers Association
Commerce Queensland
Energy Networks Association
Engineers Australia

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PREFACE

This Standard was prepared by the Standards Australia Committee EL-050, Power System Control and Communication.

The objective of this Standard is to provide users and manufacturers of substation automation equipment with assistance to understand the basic modelling concepts and description methods for—

- (a) substation-specific information models for substation automation systems;
- (b) device functions used for substation automation purposes; and
- (c) communication systems to provide interoperability within substations.

This Standard is identical with, and has been reproduced from IEC/TR 61850-7-1, Ed.1 (2003), *Communication networks and systems in substations – Part 7-1: Basic communication structure for substation and feeder equipment—Principles and models*.

This Standard is Part of *Communication networks and systems in substations*. The series consists of the following:

- Part 1: Introduction and overview
- Part 2: Glossary
- Part 3: General requirements
- Part 4: System and project management
- Part 5: Communication requirements for functions and device models
- Part 6: Configuration description language for communication in electrical substations related to IEDs
- Part 7.1: Basic communication structure for substation and feeder equipment—Principles and models (this Standard)
- Part 7.2: Basic communication structure for substation and feeder equipment—Abstract communication service interface (ACSI)
- Part 7.3: Basic communication structure for substation and feeder equipment—Common data classes
- Part 7.4: Basic communication structure for substation and feeder equipment—Compatible logical node classes and data classes
- Part 8.1: Specific communication service mapping (SCSM)—Mappings to MMS (ISO/IEC 9506-1 and ISO/IEC 9506-2) and to ISO/IEC 8802-3
- Part 9.1: Specific communication service mapping (SCSM)—Sampled values over serial unidirectional multidrop point to point link
- Part 9.2: Specific communication service mapping (SCSM)—Sampled values over ISO/IEC 8802-3

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- (i) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (ii) In the source text 'IEC/TR 61850-7-1' should read 'AS 61850.7.1'.
- (iii) A full point should be substituted for a comma when referring to a decimal marker.
- (iv) Any French text on figures should be ignored.

The terms 'normative' and 'informative' are used to define the application of the annex to which they apply. A normative annex is an integral part of a standard, whereas an informative annex is only for information and guidance.

CONTENTS

	<i>Page</i>
1	Scope 1
2	Normative references 1
3	Terms and definitions 2
4	Abbreviated terms 3
5	Overview of concepts the IEC 61850 series 3
5.1	Objective 3
5.2	Topology and communication functions of substation automation systems 4
5.3	The information models of substation automation systems 5
5.4	Applications modelled by logical nodes defined in IEC 61850-7-4 7
5.5	The semantic is attached to data 10
5.6	The services to exchange information 12
5.7	Services mapped to concrete communication protocols 13
5.8	The configuration of a substation 14
5.9	Summary 15
6	Modelling approach of the IEC 61850 series 16
6.1	Decomposition of application functions and information 16
6.2	Creating information models by stepwise composition 17
6.3	Example of an IED composition 20
6.4	Information exchange models 21
6.4.1	Introduction 21
6.4.2	Output model 22
6.4.3	Input model 25
7	Application view 36
7.1	Introduction 36
7.2	First modelling step – Logical nodes and data 37
8	Device view 40
8.1	Introduction 40
8.2	Second modelling step – logical device model 41
9	Communication view 43
9.1	The service models of the IEC 61850 series 43
9.2	The virtualisation 46
9.3	Basic information exchange mechanisms 47
9.4	The client-server building blocks 49
9.4.1	Server 49
9.4.2	Client-server 49
9.4.3	Client-server roles 50
9.5	Interfaces inside and between devices 52
10	Where physical devices, application models and communication meet 53
11	Relationships between IEC 61850-7-2, IEC 61850-7-3 and IEC 61850-7-4 54
11.1	Refinements of class definitions 54
11.2	Example 1 – Logical node and data class 55
11.3	Example 2 – Relationship of IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4 57
12	Mapping the ACSI to real communication systems 59

	<i>Page</i>
12.1 Introduction.....	59
12.2 Mapping example (IEC 61850-8-1).....	61
13 Formal specification method	67
13.1 Notation of ACSI classes	67
13.2 Class modelling	68
13.2.1 Overview.....	68
13.2.2 Common data class.....	69
13.2.3 Logical node class	72
13.3 Service tables.....	73
13.4 Referencing instances	74
14 Name spaces	77
14.1 General.....	77
14.2 Name spaces defined in IEC 61850-7-x	78
14.3 Specification of name spaces.....	81
14.3.1 General	81
14.3.2 Definition of logical node name space	82
14.3.3 Definition of data name space	83
14.3.4 Definition of common data class name space	83
14.4 Attributes for references to name spaces	84
14.4.1 General	84
14.4.2 Attribute for logical device name space (ldNs).....	85
14.4.3 Attribute for logical node name space (lnNs)	85
14.4.4 Attribute for data name space (dataNs).....	85
14.4.5 Attribute for common data class name space (cdcNs)	86
14.5 Common rules for extensions of name spaces	86
15 Approaches for the definition of a new semantic	88
15.1 General.....	88
15.2 Semantic for new definition.....	88
15.3 Approach 1 (fixed semantic).....	88
15.4 Approach 2 (flexible semantic).....	89
15.5 Approach 3 (reusable flexible semantic).....	89
Annex A (informative) Overview of IEC 61850-7-x, IEC 61850-8-x, and IEC 61850-9-x.....	90
Annex B (informative) Allocation of data to logical nodes.....	93
Annex C (informative) Use of the substation configuration language (SCL).....	96
Annex D (informative) Applying the LN concept to options for future extensions	98
Annex E (informative) Relation between logical nodes and PICOMs	103
Annex F (informative) Relation between IEC 61850-7-x (IEC 61850-8-x) and UCA 2.0®	104
Bibliography	105

INTRODUCTION

This part of the IEC 61850 series provides an overview of the architecture for communication and interactions between substation devices such as protection devices, breakers, transformers, substation hosts etc.

This document is part of a set of specifications which details a layered substation communication architecture. This architecture has been chosen to provide abstract definitions of classes (representing hierarchical information models) and services such that the specifications are independent of specific protocol stacks, implementations, and operating systems.

The goal of the IEC 61850 series is to provide interoperability between the IEDs from different suppliers or, more precisely, between functions to be performed in a substation but residing in equipment (physical devices) from different suppliers. Interoperable functions may be those functions that represent interfaces to the process (for example, circuit breaker) or substation automation functions such as protection functions. This part of the IEC 61850 series uses simple examples of functions to describe the concepts and methods applied in the IEC 61850 series.

This part of the IEC 61850 series describes the relationships between other parts of the IEC 61850 series. Finally this part defines how inter-operability is reached.

NOTE Interchangeability, i.e. the ability to replace a device from the same vendor, or from different vendors, utilising the same communication interface and as a minimum, providing the same functionality, and with no impact on the rest of the system. If differences in functionality are accepted, the exchange may require some changes somewhere in the system also. Interchangeability implies a standardisation of functions and, in a strong sense, of devices which are both outside the scope of this standard. Interchangeability is outside the scope, but it will be supported following this standard for interoperability.

Table 1 – Guide for the reader

User		IEC 61850-1 (Introduction and overview)	IEC 61850-5 (Requirements)	IEC 61850-7-1 (Principles)	IEC 61850-7-4 (Logical nodes and data classes)	IEC 61850-7-3 (Common data classes)	IEC 61850-7-2 (Information exchange)	IEC 61850-6 ^a (Configuration language)	IEC 61850-8-x IEC 61850-9-x ^a (Concrete communication stack)
Utility	Manager	x	–	Clause 5	–	–	–	–	–
	Engineer	x	x	x	x	x	In extracts	x	–
Vendor	Application engineer	x	x	x	x	x	In extracts	x	In extracts
	Communication engineer	x	x	x	–	–	x	–	x
	Product manager	x	x	x	x	In extracts	In extracts	In extracts	–
	Marketing	x	x	Clause 5	In extracts	In extracts	In extracts	In extracts	–
Consultant	Application engineer	x	x	x	x	x	–	x	–
	Communication engineer	x	–	x	–	–	x	x	x
All others		x	x	x	–	–	–	–	–
<p>The “x” means that this part of the IEC 61850 series should be read.</p> <p>The “in extracts” means that extracts of this part of the IEC 61850 series should be read to understand the conceptual approach used.</p> <p>The “–” means that this part of the IEC 61850 series may be read.</p>									
^a These documents are under consideration.									

This part of the IEC 61850 series is intended for all stakeholders of standardised communication and standardised systems in the utility industry. It provides an overview of and an introduction to IEC 61850-7-4, IEC 61850-7-3, IEC 61850-7-2, IEC 61850-6, and IEC 61850-8-1.

Table 1 provides a simplified guide as to which parts of the IEC 61850 series should be read by various stakeholders. Four groups are shown: utility, vendor, various consultants, and others.

STANDARDS AUSTRALIA

Australian Standard**Communication networks and systems in substations
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equipment—Principles and models**

1 Scope

This part of the IEC 61850 series introduces the modelling methods, communication principles, and information models that are used in the parts of IEC 61850-7-x. The purpose of this part of the IEC 61850 series is to provide – from a conceptual point of view – assistance to understand the basic modelling concepts and description methods for:

- substation-specific information models for substation automation systems,
- device functions used for substation automation purposes, and
- communication systems to provide interoperability within substations.

Furthermore, this part of the IEC 61850 series provides explanations and provides detailed requirements relating to the relation between IEC 61850-7-4, IEC 61850-7-3, IEC 61850-7-2 and IEC 61850-5. This part explains how the abstract services and models of IEC 61850-7-x are mapped to concrete communication protocols as defined in IEC 61850-8-1.

The concepts and models provided in this part of the IEC 61850 series may also be applied to describe information models and functions for:

- substation to substation information exchange,
- substation to control centre information exchange,
- information exchange for distributed automation,
- information exchange for metering,
- condition monitoring and diagnosis, and
- information exchange with engineering systems for device configuration.

NOTE 1 This part of IEC 61850 uses examples and excerpts from other parts of the IEC 61850 series. These excerpts are used to explain concepts and methods. These examples and excerpts are informative in this part of IEC 61850.

NOTE 2 Examples in this part use names of classes (e.g. XCBR for a class of a logical node) defined in IEC 61850-7-4, IEC 61850-7-3, and service names defined in IEC 61850-7-2. The normative names are defined in IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2 only.

NOTE 3 This part of IEC 61850 does not provide a comprehensive tutorial. It is recommended that this part be read first – in conjunction with IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2. In addition, it is recommended that IEC 61850-1 and IEC 61850-5 also be read.

NOTE 4 This part of IEC 61850 does not discuss implementation issues.

2 Normative references

The following referenced documents are indispensable for the application 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 61850-2, Communication networks and systems in substations – Part 2: Glossary~~