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

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FOREWORD

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International Standard IEC 61850-7-4 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The major technical changes with regard to the previous edition are as follows:

- corrections and clarifications according to information letter "IEC 61850-technical issues by the IEC TC 57" (see document 57/963/INF, 2008-07-18);
- extensions for new logical nodes for the power quality domain;

- extensions for the model for statistical and historical statistical data;
- extensions regarding IEC 61850-90-1 (substation-substation communication);
- extensions for new logical nodes for monitoring functions according to IEC 62271;
- new logical nodes from IEC 61850-7-410 and IEC 61850-7-420 of general interest.

The text of this standard is based on the following documents:

FDIS	Report on voting
57/1045/FDIS	57/1051/RVD

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

The content of this part of IEC 61850 is based on existing or emerging standards and applications. In particular the definitions are based upon:

- the specific data objects types defined in IEC 60870-5-101 and IEC 60870-5-103;
- the common class definitions from the Utility Communication Architecture 2.0: Generic Object Models for Substation and Feeder Equipment (GOMSFE) (IEEE TR 1550);
- CIGRE Report 34-03, Communication requirements in terms of data flow within substations, December 1996.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- 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

This part of IEC 61850 is part of a set of standards, the IEC 61850 series. IEC 61850 defines communication networks and systems for power utility automation, and more specially the communication architecture for subsystems such as substation automation systems. The sum of all subsystems may result also in the description of the communication architecture for the overall power system management. The defined architecture provided in specific parts of IEC 61850-7-x gives both a power utility specific data model and a substation domain specific data model with abstract definitions of data objects classes and services independently from the specific protocol stacks, implementations, and operating systems. The mapping of these abstract classes and services to communication stacks is outside the scope of IEC 61850-7-x and may be found in IEC 61850-8-x and in IEC 61850-9-x.

IEC 61850-7-1 gives an overview of the basic communication architecture to be used for all applications in the power system domain. IEC 61850-7-3 defines common attribute types and common data classes related to all applications in the power system domain. The attributes of the common data classes may be accessed using services defined in IEC 61850-7-2. These common data classes are used in this part to define the compatible data object classes.

To reach interoperability, all data objects in the data model need a strong definition with regard to syntax and semantics. The semantics of the data objects is mainly provided by names assigned to common logical nodes defined in this part and the data objects they contain, as defined in this basic part, and dedicated logical nodes defined in domain specific parts such as for hydro power control systems. Interoperability is easiest if as much as possible of the data objects are defined as mandatory. Because of different approaches and technical features, some data objects, especially settings, were declared as optional in this edition of the standard. There are also data objects which were declared as conditional, i.e. they will become mandatory under some well-defined conditions. After some experience has been gained with this standard, this decision may be reviewed in the next edition of this part.

It should be noted that data objects with full semantics are only one of the elements required to achieve interoperability. The standardized access to the data objects is defined in compatible, power utility and domain specific services (see IEC 61850-7-2). Since data objects and services are hosted by devices (IED), a proper device model is also needed. To describe both the device capabilities and the interaction of the devices in the related system, a configuration language is also needed, as defined in IEC 61850-6 by the substation configuration description language (SCL).

The compatible logical node name and data object name definitions found in this part and the associated semantics are fixed. The syntax of the type definitions of all data objects classes is governed by abstract definitions provided in IEC 61850-7-2 and IEC 61850-7-3. Not all features of logical nodes are listed in this part; for example, data sets and logs are covered in IEC 61850-7-2.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-4: Basic communication structure – Compatible logical node classes and data object classes

1 Scope

This part of IEC 61850 specifies the information model of devices and functions generally related to common use regarding applications in systems for power utility automation. It also contains the information model of devices and function-related applications in substations. In particular, it specifies the compatible logical node names and data object names for communication between intelligent electronic devices (IED). This includes the relationship between logical nodes and data objects.

The logical node names and data object names defined in this document are part of the class model introduced in IEC 61850-7-1 and defined in IEC 61850-7-2. The names defined in this document are used to build the hierarchical object references applied for communicating with IEDs in systems for power utility automation and, especially, with IEDs in substations and on distribution feeders. The naming conventions of IEC 61850-7-2 are applied in this part.

To avoid private, incompatible extensions, this part specifies normative naming rules for multiple instances and private, compatible extensions of logical node (LN) classes and data object names. Any definition is based on IEC 61850 or on referenced well identified public documents.

This part does not provide tutorial material. It is recommended to read parts IEC 61850-5 and IEC 61850-7-1 first, in conjunction with IEC 61850-7-3, and IEC 61850-7-2.

This standard is applicable to describe device models and functions of substation and feeder equipment. The concepts defined in this standard are also applied to describe device models and functions for:

- substation-to-substation information exchange,
- substation-to-control centre information exchange,
- power plant-to-control centre information exchange,
- information exchange for distributed generation,
- information exchange for distributed automation, or
- information exchange for metering.

Figure 1 provides a general overview of this standard. The groups of logical nodes defined in this standard are shown in Figure 1, ordered according to some semantic meaning, for instance different control levels such as plant level, unit level, etc. For convenience, the logical nodes are defined below in alphabetical order.

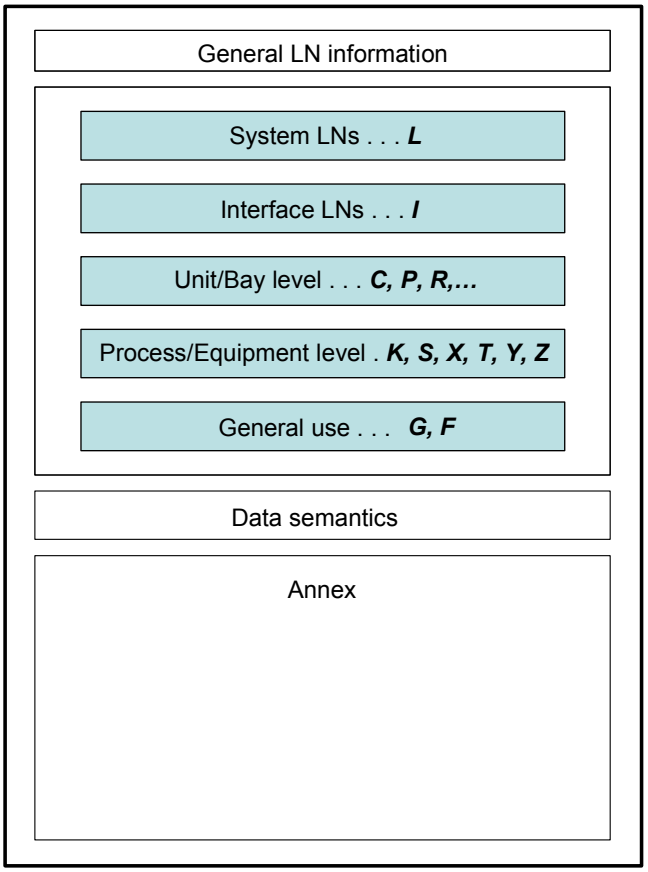

Figure 1 – Overview of this standard

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 60270:2000, *High-voltage test techniques – Partial discharge measurements*

IEC 61000-4-7:2002, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

IEC 61000-4-15, *Electromagnetic compatibility (EMC) – Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications*

IEC 61850-2, *Communication networks and systems in substations – Part 2: Glossary*

IEC 61850-5, *Communication networks and systems in substations – Part 5: Communication requirements for functions and device models*

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

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1 To be published.

IEC 61850-7-2:___ [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:___ [3], *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

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*

IEEE C37.111:1999, *IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems*

IEEE 519:1992, *IEEE Recommended Practises and Requirements for Harmonic Control in Electrical Power Systems*

IEEE C37.2:1996, *Electrical Power System Device Function Numbers and Contact Designation*

IEEE 1459:2000, *IEEE Trial-Use Standard Definitions for the Measurement of Electric Power Quantities Under Sinusoidal, Nonsinusoidal, Balanced, or Unbalanced Conditions*

IEEE 1588, *Precision clock synchronization protocol for networked measurement and control systems*

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2 To be published.

3 To be published.