IEC TS 61850-80-4

Edition 1.0 2016-03

TECHNICAL SPECIFICATION

colour inside

Communication networks and systems for power utility automation – Part 80-4: Translation from the COSEM object model (IEC 62056) to the IEC 61850 data model

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC TS 61850-80-4, which is a technical specification, 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
57/1602/DTS	57/1659/RVC

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 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.

A list of all parts of the IEC 61850 series, published under the general title *Communication networks and systems for power utility automation*, 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 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,
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- replaced by a revised edition, or
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INTRODUCTION

IEC 61850 defines communication networks and systems for power utility automation, and more specifically the communication architecture for subsystems such as substation automation systems, feeder automation systems and SCADA for distributed energy resources. In essence, IEC 61850 is a description of the communication architecture for the overall power system management when the combined total of the above mentioned subsystems are considered.

The devices in the electricity grid are becoming more intelligent with an increasing number of elements and increasing complexity of data to be processed in a distributed environment. Introduction of comprehensive data models simplifies the handling and management of the data drastically since the models can be re-used once standardized. By defining a number of standardized hierarchical names, it can drastically reduce errors in the field. The names in the standard can be directly used for the configuration of devices and the communication between devices.

This part of IEC 61850, which is a technical specification, defines the one-to-one relationship of IEC 62056 OBIS codes to IEC 61850 Logical Nodes. The purpose is to increase the availability of revenue meter information to other applications defined within the IEC 61850 framework. This increased visibility will contribute to information available for smart grid applications.

The other benefit of defining these relationships is in regards to the design of protocol converters. With a clear specification, test cases can be developed as well as end user understanding of the quantities is unambiguous. Finally, end user configuration is simplified by limiting the options for translation.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 80-4: Translation from the COSEM object model (IEC 62056) to the IEC 61850 data model

1 Scope

Included within the IEC 61850 power utility automation architecture are its concepts, data models, communication protocols and the mapping data exchanges on the substation network. This extends beyond just IEDs to other IEC 61850 enabled devices like meters, system applications and remote access gateways.

This part of IEC 61850, which is a technical specification, considers the requirements of power utility automation applications; i.e. the scope is limited by the use cases relevant for meter data exchange in HV/MV substations and MV/LV substations. Only use cases that require the data exchange involving a revenue meter are considered. Applications not covered by the existing standards listed in Clause 2 are out of scope.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 61850-7-2, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

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 62056-6-1:2015, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object Identification System (OBIS)*

IEC 62056-6-2:2016, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 61850-2 and IEC 61850-7-2 apply. In addition, the terms and definitions given in IEC 62056-6-1 and IEC 62056-6-2 apply.

Due to the fact that the same or similar terminology exist from the two standards areas and may have different meanings, the terminology to be used in this document is explicitly defined in Table 1 and Table 2. In addition, in some cases, the terms are elaborated to provide more insight on the application for users who are not experts in the standards area.

Table 1 – IEC 62056 terminology

Term	Description
COSEM	Companion Specification for Energy Metering according to IEC 62056-6-2.
OBIS Code	Object Identification System according to IEC 62056-6-1, uniquely identifying data objects within COSEM compliant metering equipment.
COSEM Interface Class (IC)	The Interface Class (IC) defines the common characteristics (by means of attributes and methods) of a set data objects. The interface class specifies the characteristics of the objects encountered at the interface through which a system interacts with the objects. Implementation issues are not considered. An IC consists of several attributes and methods. The first attribute is always the “logical name”. The set of standardised Interface Classes are defined in IEC 62056-6-2.
COSEM object	An Interface class is instantiated by assigning a specific OBIS code to the logical name of the IC. The result of the instantiation of an IC is a specific data object. The instantiation of an Interface Class may be part of the meter configuration or part of the production process. A meter operating in the field contains a set of objects. Data is exchanged by accessing these objects. Example: the IC “Register” defines the generic data structure for any metering register containing 3 attributes (logical name, measured value and the unit). By assigning the logical name “total electrical energy A+” to the IC “Register” we have formed a specific data object providing information on the totally energy consumption. The set of standardised OBIS codes are defined in IEC 62056-6-1.
Class ID(CID)	The Class ID identifies a specific class of the set of standardised Interface Classes. For example, Class_ID of 3 identifies the class type “Register”.
Physical Device	A physical device is a subsystem which has a physical connection to a communication medium and which can be addressed by a physical address. The behaviour of the physical device is modelled with a set of logical devices. A physical device must contain a “management logical device”.
Logical Device	A logical device is an abstract entity within a physical device. A logical device is addressed via its Service Access Point (SAP) provided by the communication layer below the application layer. The behaviour of the logical device is modelled with a set of COSEM objects.
Logical Name	The logical name contains an OBIS identifier; it is the first attribute of any object. By assigning a specific OBIS code to the logical name the IC is instantiated. The OBIS code, the Class ID and the version of the Interface Class uniquely identifies a data object.
COSEM Attribute	A numbered set of attributes form (together with the methods) an interface class. The first attribute is always the logical name. The nature of the value is described by the logic name using OBIS identification system. For example, a register may contain the instantaneous voltage on phase 1. This would correspond to a specific OBIS code stored in the logical name attribute. The second attribute is a value with a choice of representation among which is integer and floating point representation. The third attribute is the scaler and unit. The first method of class register is a method to reset the register.
Common Data Types	Common Data Types are made of simple and complex data types used to describe the attributes of the IC. The typical simple data types include integer and floating point numbers. Complex data types include array and structures. CHOICE is a data type that allows one of many representations for an attribute. (see IEC 62056-6-2). The data types are described in ASN1.
Metering Equipment	A physical device which may contain multiple logical devices to measure energy usage of different media. Equivalent to a Physical Meter.
+A and –A	Common abbreviation for Active Energy import and Active Energy export respectively.
+R and –R	Common abbreviation for Reactive Energy import and Reactive Energy export respectively.

Table 2 – IEC 61850 terminology

Term	Description
Logical Node Group	The group defines Logical Nodes Classes with similar functions. For example, Group M contains classes related to Metering and Measurement. (See IEC 61850-7-4).
Logical Node Class	Aggregation of data, data sets, report controls, logs, log controls, etc. They represent typical functions of a substation system. For example, Metering for commercial purposes of a 3 phase system (MMTR) is one Logical Node Class. An instance of a Logical Node Class is a Logical Node and the smallest part of a function that exchanges data. (See IEC 61850-5).
Data Object Name	This is a meaning and representation that is part of a Logical Node Class. For example, "Net reactive energy" is one of many instances of the BCR Common Data Class of the MMTR Logical Node. (see IEC 61850-7-4).
Common Data Class (CDC)	This class (See IEC 61850-7-3) is composed of Constructed Attribute Classes, other common data classes or types defined in IEC 61850-7-2 (Basic Data Types and Common ACSI Types).
Constructed Attribute Class (CAC)	These classes are defined in IEC 61850-7-3:2010, Clause 6.
DataAttribute Type	This class (see IEC 61850-7-3) is composed of relatively simply data structures that are commonly used. Examples include analog values, timestamps and Quality.
Common ACSI Types	This class is composed of types related primarily with communications and includes ObjectName, Physical Communication Address and Trigger Conditions.
Basic Data Types	This class is composed of the most fundamental types and include BOOLEAN, INT8, INT16, FLOAT32, etc. (see IEC 61850-7-2).
Physical Device	Equivalent to an Intelligent Electronic Device (IED). These devices contain processors and IO and are capable of communicating with an external device for the purpose of gather data or control.
Logical Connections	Communication link between logical nodes.
Physical connections	Communication link between physical devices.

4 Data modelling hierarchy

4.1 General

Figure 1 provides an overview of the data model hierarchy in both DLMS/COSEM (on the left) and IEC 61850-7-3 and IEC 61850-7-4 (on the right).

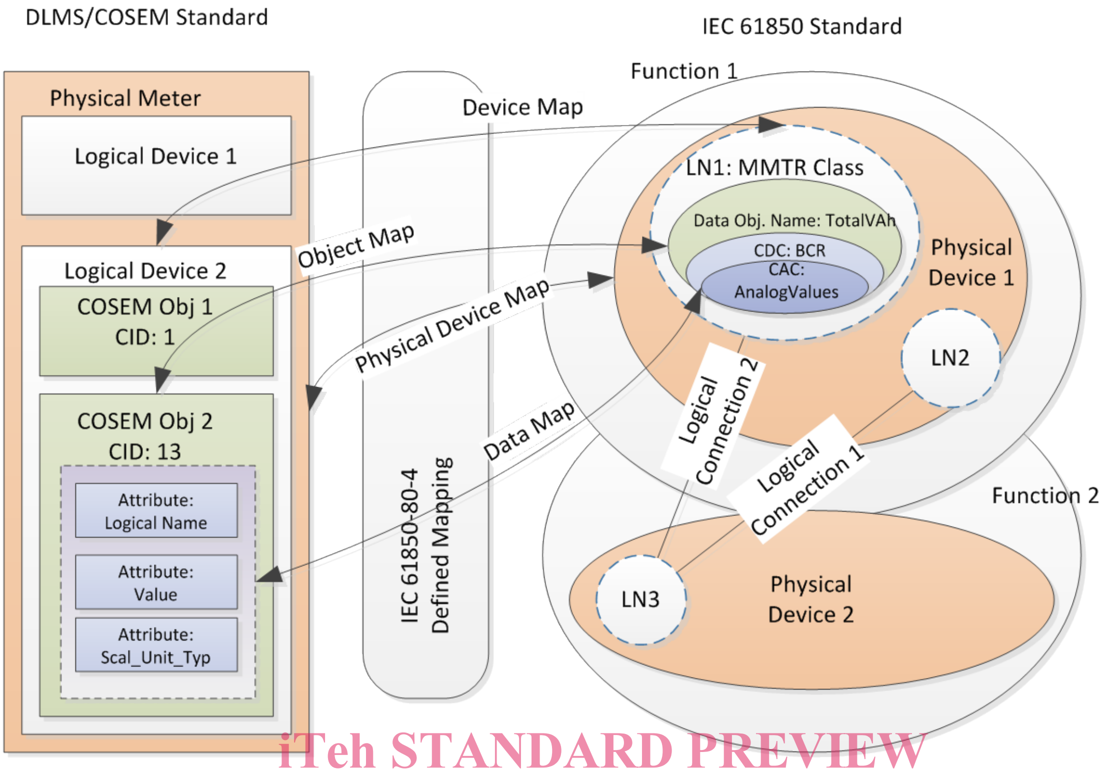

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Figure 1 – Overview of relationship between data models

4.2 IEC 62056 principles

The DLMS/COSEM standards framework as defined in IEC 62056-1-0 is based on a common data model and application layer supported by several media specific communication profiles. The principle is shown in Figure 2.

The COSEM data model defines the functionality of the COSEM device as seen on the communication interface by means of data objects. OBIS codes are used to identify the semantics of the objects.

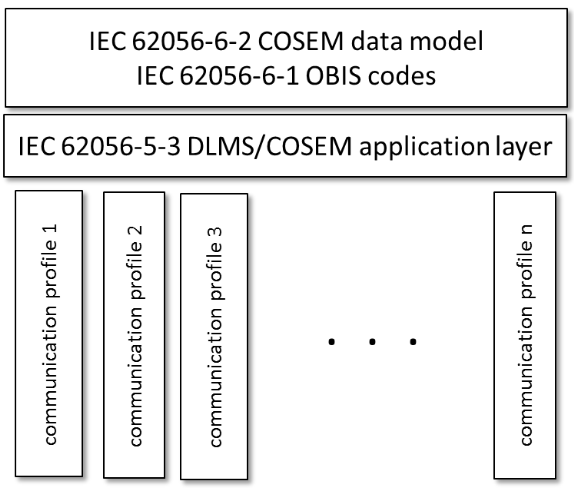

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Figure 2 – The IEC 62056 framework