

TECHNICAL SPECIFICATION

IEC TS 61850-2

First edition
2003-08

Communication networks and systems in substations –

Part 2: Glossary

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Reference number
IEC/TS 61850-2:2003(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND SYSTEMS
IN SUBSTATIONS –****Part 2: Glossary**

FOREWORD

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 61850-2, which is a technical specification, has been prepared by IEC technical committee 57: Power system control and associated communications.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
57/615/DTS	57/645/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.

IEC 61850 consists of the following parts, under the general title *Communication networks and systems in substations*.

- 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 ¹
- Part 7-1: Basic communication structure for substation and feeder equipment – Principles and models
- 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) over ISO/IEC 8802-3 ¹
- 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 ¹
- Part 10: Conformance testing ¹

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be either

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

¹ Under consideration.

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS -

Part 2: Glossary

1 Scope

This part of the IEC 61850 series applies to Substation Automation Systems (SAS). It defines the communication between intelligent electronic devices (IEDs) in the substation and the related system requirements.

This part of the IEC 61850 series contains the glossary of specific terminology and definitions used in the context of Substation Automation Systems within the various parts of the standard.

2 Terms and definitions

The following terms and definitions apply to all parts of the IEC 61850 series².

2.1

abstract communication service interface

virtual interface to an IED providing abstract information modelling methods for logical devices, logical nodes, data, and data attributes, and communication services for example connection, variable access, unsolicited data transfer, device control and file transfer services, independent of the actual communication stack and profiles used

[IEC 61850-1]

2.2

access point

communication access point to an IED. This may be a serial port, an Ethernet connection, or a client or server address dependent on the stack being used. Each access point of an IED to a communication bus is uniquely identified. Each server has only one, logical, access point

[IEC 61850-6]

2.3

application layer

layer 7 in the OSI reference model for Open Systems Interconnection comprising the interface between the OSI environment and the IED's or user's application

[ISO/IEC 7498-1]

2.4

association

conveyance path established between a client and a server for the exchange of messages

[IEC 61850-7-1]

² References to other standards given below certain definitions indicate that the term is either described or used in the cited standard. All references are listed in the bibliography.

2.5

attribute

named element of data and of a specific type

[IEC 61850-8-1]

2.6

bay

a substation consists of closely connected sub parts with some common functionality. Examples are the switchgear between an incoming or outgoing line, and the busbar, the bus coupler with its circuit breaker and related isolators and earthing switches, the transformer with its related switchgear between the two busbars representing the two voltage levels. The bay concept may be applied to 1½ breaker and ring bus substation arrangements by grouping the primary circuit breakers and associated equipment into a virtual bay. These bays comprise a power system subset to be protected, for example a transformer or a line end, and the control of its switchgear that has some common restrictions such as mutual interlocking or well-defined operation sequences. The identification of such subparts is important for maintenance purposes (what parts may be switched off at the same time with minimum impact on the rest of the substation) or for extension plans (what has to be added if a new line is to be linked in). These subparts are called 'bays' and may be managed by devices with the generic name 'bay controller' and have protection systems called 'bay protection'.

The concept of a bay is not commonly used in North America. The bay level represents an additional control level below the overall station level.

[IEC 61850-1]

2.7

bay level functions

functions that use mainly the data of one bay and act mainly on the primary equipment of that bay. Bay level functions communicate via logical interface 3 within the bay level and via the logical interfaces 4 and 5 to the process level, i.e. with any kind of remote input/output or with intelligent sensors and actuators.

EXAMPLES Feeder or transformer, protection, control and interlocking.

[IEC 61850-5]

2.8

broadcast

message placed onto a communication network intended to be read and acted on, as appropriate, by any IED. A broadcast message will typically contain the sender's address and a global recipient address

EXAMPLE Time synchronising.

[IEC 61850-7-2]

2.9

bus

communication system connection between IEDs with communication facilities

[IEC 61850-1]

2.10

class

description of a set of objects that share the same attributes, services, relationships and semantics

[IEC 61850-7-1]

**2.11
client**

entity that requests a service from a server, or which receives unsolicited data from a server

[IEC 61850-7-1]

**2.12
communication connection**

connection which utilises the communication mapping function of one or more resources for the conveyance of information

[IEC 61850-10]

**2.13
communication stack**

multi-layer stack. In the 7 layer OSI reference model for Open Systems Interconnection, each layer performs specific functions related to Open Systems Interconnection communication

[ISO/IEC 7498-1]

**2.14
configuration (of a system or device)**

step in system design for example selecting functional units, assigning their locations and defining their interconnections

[IEV 351]

**2.15
configuration list**

overview of all compatible hardware and software versions of components and IEDs, including the software versions of relevant supporting tools, operating together in a SAS product family. Additionally, the configuration list details the supported transmission protocols for communication with IEDs of other manufacturers

[IEC 61850-4]

**2.16
conformance test**

check of data flow on communication channels in accordance with the standard conditions concerning access organization, formats and bit sequences, time synchronization, timing, signal form and level and reaction to errors. The conformance test can be carried out and certified to the standard or to specifically described parts of the standard. The conformance test should be carried out by an ISO 9001 certified organisation or system integrator

[IEC 61850-4]

**2.17
connection**

association established between functional units for conveying information. A connection is established between two IEDs prior to any data exchange. A connection may be of short duration or long term

[IEC 61850-3]

**2.18
connectivity node**

an identifiable, named, common connection point between terminals of primary devices whose only function is to connect them electrically with minimum resistance; for example a bus bar as a connectivity node connects bus bar disconnectors. The connection to a device is done at a device terminal. A connectivity node can connect an arbitrary number of terminals (devices)

[IEC 61850-6]

2.19
Cyclic Redundancy Check
CRC

this is calculated and included in each frame transmitted by the sending device, the receiving device recalculates the CRC for that frame, as received, as a check for any transit damage in that frame

[IEC 61850-9-1]

2.20
data

meaningful, structured, information of applications, located in an IED, which can be read or written

[IEC 61850-8-1]

2.21
data attribute

defines the name (semantic), format, range of possible values, and representation of values while being communicated

[IEC 61850-7-2]

2.22
data class

class that aggregates data classes or data attributes. Specific data classes carry the semantic within a logical node

[IEC 61850-7-2]

2.23
data link layer

layer 2 of the OSI reference model for Open Systems Interconnection, responsible for the transmission of data over a physical medium. After establishment of a link, layer 2 performs data rate control, error detection, contention/collision detection, quality of service monitoring and error recovery

[ISO/IEC 7498-1]

2.24
data object

part of a logical node object representing specific information for example status or measurement. From an object-oriented point of view, a data object is an instance of a data class

[IEC 61850-1]

2.25
data set class

named list of ordered references to one or more Functionally Constrained Data (FCD) or Functionally Constrained Data Attributes (FCDA). Used to group commonly used data objects for easy retrieval

[IEC 61850-7-2]

2.26**device**

element or assembly of elements performing a required function

NOTE A device may form part of a larger device.

[IEV 151]

mechanism or piece of equipment designed to serve a purpose or perform a function for example, circuit breaker, relay or substation computer

[IEEE Std. 100–1996, IEEE dictionary of electrical and electronic terms]

in the context of a switchyard, a device is a physical plant item for example transformer or circuit breaker; in the context of substation automation a device is an IED

[IEC 61850-1]

2.27**diameter**

refers to a 1½ breaker arrangement and comprises the complete switchgear between the two busbars, i.e. the 2 lines and the 3 circuit breakers with all related isolators, earthing switches, CT's and VT's. It has some common functionality and relationship both for operation, maintenance and extensions

[IEC 61850-5]

2.28**distributed function**

when two, or more, logical nodes, that are located in different physical devices, together perform a function. Since all functions communicate in some way, the definition of a local or distributed function is not unique but depends on the definition of the functional steps to be performed until the function is completed. In the case of loss of one LN or one included communication link, the function may be blocked completely or show a graceful degradation, as applicable

[IEC 61850-5]

2.29**distribution**

with reference to a power system, distribution refers to that part of the power system operating at voltages typically up to 69 kV

[IEC 61850-4]

2.30**electronic current transducer**

transducer in the primary plant measuring system current and providing low level analogue and/or digital data output(s)

2.31**electronic voltage transducer**

transducer in the primary plant measuring system voltage(s) and providing low level analogue and/or digital output(s)

2.32**engineering**

first phase of a project i.e. detail design

**2.33
engineering tools**

these support the creation and documentation of the conditions for adapting the SAS to the specific substation and customer requirements. The engineering tools are divided into project management, parameterization and documentation tools

[IEC 61850-4]

**2.34
equipment**

entity that performs an energy transport function for example transformer, circuit breaker, line. It may be stand alone or interfaced to an automation system via an integral device or associated external device

[IEC 61850-7-2]

**2.35
expandability**

criterion for the fast and efficient extension of an SAS (both hardware and software) by use of the engineering tools

[IEC 61850-4]

**2.36
factory acceptance test**

customer agreed functional tests of the specifically manufactured SAS installation or its parts, using the parameter set for the planned application. This test should be carried out in the factory of the system integrator by use of process simulating test equipment

[IEC 61850-4]

**2.37
flexibility**

criterion for the fast and efficient implementation of functional changes, including hardware adaptation, in an SAS by use of the engineering tools

[IEC 61850-4]

**2.38
freeze**

associated typically with measurands and counters. To freeze a value is to lock and hold the value at that instant

**2.39
function(s)**

task(s) performed by the substation automation system i.e. by application functions. Generally, functions exchange data with other functions. Details are dependant on the functions involved. Functions are performed by IEDs (physical devices). A function may be split into parts residing in different IEDs but communicating with each other (distributed function) and with parts of other functions. These communicating parts are called logical nodes.

In the context of this standard, the decomposition of functions or their granularity is ruled by the communication behaviour only. Therefore, all functions considered consist of logical nodes that exchange data. Functions without an explicit reference to logical nodes mean only that in the actual context, the logical node modelling of these functions is of no importance to the standard

[IEC 61850-1]