

TECHNICAL SPECIFICATION



Communication networks and systems for power utility automation –
Part 80-1: Guideline to exchanging information from a CDC-based data model
using IEC 60870-5-101 or IEC 60870-5-104

[IEC TS 61850-80-1:2016](https://standards.iteh.ai/catalog/standards/sist/c82eba5b-b947-448a-ae95-6771f31ef004/iec-ts-61850-80-1-2016)

<https://standards.iteh.ai/catalog/standards/sist/c82eba5b-b947-448a-ae95-6771f31ef004/iec-ts-61850-80-1-2016>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2016 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Glossary - std.iec.ch/glossary

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IEC STANDARD PREVIEW
(standards.iteh.ai)
IEC TS 61850-80-1:2016
https://standards.iteh.ai/catalog/standards/iec/61850-80-1-2016
677131ef004/iec-ts-61850-80-1-2016



TECHNICAL SPECIFICATION



**Communication networks and systems for power utility automation –
Part 80-1: Guideline to exchanging information from a CDC-based data model
using IEC 60870-5-101 or IEC 60870-5-104**

IEC TS 61850-80-1:2016

<https://standards.iteh.ai/catalog/standards/sist/c82eba5b-b947-448a-ac95-6771f31ef004/iec-ts-61850-80-1-2016>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-3535-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	8
1 Scope.....	10
2 Normative references.....	11
3 Abbreviated terms	11
4 The mapping architecture	12
5 Conceptual architectures and associated use cases	13
5.1 Conceptual architecture of a gateway device	13
5.1.1 General	13
5.1.2 Use case a) for a gateway device	14
5.1.3 Use case b) for a gateway device	15
5.1.4 Use case c) for a gateway device	16
5.2 Conceptual architecture of an IED directly connected to a WAN (optional).....	17
6 Mapping of a device-oriented information model to IEC 60870-5-104 or IEC 60870-5-101	18
6.1 General.....	18
6.2 Mapping of a device-oriented information model reference	18
6.3 Logical device class mapping	19
6.4 Logical node class mapping.....	19
7 Mapping of the common data classes (CDC).....	19
7.1 List of CDC, type Identifications and corresponding mappings for IEC 61850.....	19
7.2 CDC single point status (SPS).....	23
7.3 CDC double point status (DPS).....	23
7.4 CDC integer status (INS).....	24
7.5 CDC protection activated information (ACT).....	27
7.6 CDC directional protection activation information (ACD).....	29
7.7 CDC Security violation counting (SEC)	32
7.8 CDC binary counter reading (BCR).....	33
7.9 CDC measured value (MV).....	34
7.10 CDC complex measured value (CMV).....	36
7.11 CDC Phase to ground related measured values of a three-phase system (WYE).....	38
7.12 CDC phase to phase measured values of a three phase system (DEL).....	39
7.13 CDC sequence (SEQ)	40
7.14 CDC harmonic value (HMV).....	41
7.14.1 CDC HMV defined in IEC 61850-7-3:2003	41
7.14.2 CDC HMV defined in IEC 61850-7-3:2010	42
7.15 CDC harmonic value for WYE (HWYE)	42
7.15.1 CDC WYE (HWYE) defined in IEC 61850-7-3:2003	42
7.15.2 CDC WYE (HWYE) defined in IEC 61850-7-3:2010	43
7.16 CDC harmonic value for DEL (HDEL).....	44
7.16.1 CDC DEL (HDEL) defined in IEC 61850-7-3:2003	44
7.16.2 CDC DEL (HDEL) defined in IEC 61850-7-3:2010	44
7.17 CDC controllable single point (SPC)	45
7.18 CDC controllable double point (DPC).....	47
7.19 CDC controllable integer status (INC).....	48
7.20 CDC binary controlled step position information (BSC).....	50

7.21	CDC integer-controlled step position information (ISC).....	53
7.22	CDC controllable analogue set point information (APC).....	55
7.22.1	CDC APC defined in IEC 61850-7-3:2003	55
7.22.2	CDC APC defined in IEC 61850-7-3:2010	56
7.23	CDC Single point setting (SPG)	59
7.24	CDC integer status setting (ING)	60
7.25	CDC analogue settings (ASG)	61
7.26	CDC enumerated status (ENS)	61
7.27	CDC Histogramm (HST)	63
7.28	CDC controllable enumerated status (ENC)	64
7.29	CDC Enumerated status setting (ENG)	68
7.30	CDC Binary controlled analog process value (BAC)	68
7.31	CDC Curve shape setting (CSG).....	69
8	Mapping of services.....	70
8.1	List of service models and corresponding mappings.....	70
8.2	Server class mapping	72
8.3	Association class mapping	73
8.4	Logical node class mapping.....	73
8.5	Data class mapping.....	74
8.6	Setting group class mapping.....	75
8.7	Report control block class mapping	76
8.8	Control class mapping	77
8.8.1	General	77
8.8.2	Direct control with normal security (optional).....	79
8.8.3	Direct control with enhanced security	86
8.8.4	SBO control with enhanced security.....	91
9	Protocol stack selections for IEC 60870-5-101 and IEC 60870-5-104	100
9.1	General.....	100
9.2	Structure of application data	100
9.2.1	General	100
9.2.2	Structure of application data defined in IEC 60870-5-101	101
9.2.3	Structure of application data defined in IEC 60870-5-104	101
9.3	IEC 60870-5 interoperability	102
9.3.1	IEC 60870-5-101 interoperability	102
9.3.2	IEC 60870-5-104 interoperability	112
Annex A (informative) Use of SCL (substation configuration language) to include IEC 60870-5-101 or IEC 60870-5-104 information.....		
A.1	SCL information model hierarchy	126
A.1.1	General	126
A.1.2	Mapping of the common address of ASDU	127
A.1.3	Mapping of the IOA (information object address).....	127
A.1.4	Mapping of the type identifiers (TI)	127
A.2	Use of the SCL elements.....	127
A.2.1	General	127
A.2.2	IED.....	127
A.2.3	AccessPoint.....	127
A.2.4	Server	127
A.2.5	LDevice	127
A.2.6	LN	128

A.2.7	DOI.....	128
A.2.8	SDI.....	128
A.2.9	DAI.....	128
A.2.10	DA/BDA/SDO.....	128
A.2.11	Control model.....	129
A.3	IEC 60870-5-101 or IEC 60870-5-104 private section syntax.....	129
A.3.1	General.....	129
A.3.2	IEC 60870-5-101 private section schema.....	129
A.3.3	IEC 60870-5-104 Private section schema.....	130
A.3.4	Use of Private section examples.....	131
A.4	IEC 60870-5-101 communication parameters configuration using SCL.....	167
A.5	IEC 60870-5-104 communication parameters configuration using SCL.....	169
	Bibliography.....	173
	Figure 1 – Conceptual architecture of a gateway device.....	13
	Figure 2 – Use case a) for a gateway device.....	14
	Figure 3 – Use case b) for a gateway device.....	15
	Figure 4 – Use case c) for a gateway device.....	16
	Figure 5 – Conceptual architecture of an IED.....	17
	Figure 6 – Mapping architecture (conceptual).....	19
	Figure 7 – Direct control with normal security with status update – positive case applied to gateway device.....	79
	Figure 8 – Direct control with normal security with status update – positive case applied to IED.....	80
	Figure 9 – Direct control with normal security in general – negative case a) applied to gateway device.....	80
	Figure 10 – Direct control with normal security in general – negative case a) applied to IED.....	81
	Figure 11 – Direct control with normal security in general – negative case b) applied to gateway device.....	81
	Figure 12 – Direct control with normal security in general – negative case b) applied to IED.....	82
	Figure 13 – Direct control with normal security with status update – negative case c) applied to gateway device.....	82
	Figure 14 – Direct control with normal security with status update – negative case c) applied to IED.....	83
	Figure 15 – Direct control with normal security without status update – positive case applied to gateway device.....	83
	Figure 16 – Direct control with normal security without status update – positive case applied to IED.....	84
	Figure 17 – Direct control with enhanced security – positive case applied to gateway device.....	86
	Figure 18 – Direct control with enhanced security – positive case applied to IED.....	87
	Figure 19 – Direct control with enhanced security – negative case c) applied to gateway device.....	88
	Figure 20 – Direct control with enhanced security – negative case c) applied to IED.....	88
	Figure 21 – Direct control with enhanced security – negative case d) applied to gateway device.....	89
	Figure 22 – Direct control with enhanced security – negative case d) applied to IED.....	89
	Figure 23 – SBOw control – positive case applied to gateway device.....	91

Figure 24 – SBOw control – positive case applied to IED	91
Figure 25 – SBOw control – negative case a) applied to gateway device	92
Figure 26 – SBOw control – negative case a) applied to IED	92
Figure 27 – SBOw control – negative case b) applied to gateway device	93
Figure 28 – SBOw control – negative case b) applied to IED	93
Figure 29 – SBOw control – negative case c) applied to gateway device	94
Figure 30 – SBOw control – negative case c) applied to IED	94
Figure 31 – SBO with enhanced security – positive case applied to gateway device	95
Figure 32 – SBO with enhanced security – positive case applied to IED	96
Figure 33 – SBO with enhanced security – negative case a) applied to gateway device	96
Figure 34 – SBO with enhanced security – negative case a) applied to IED	97
Figure 35 – SBO with enhanced security – negative case b) applied to gateway device	97
Figure 36 – SBO with enhanced security – negative case b) applied to IED	98
Table 1 – Mapping structure CDC onto ASDU type	20
Table 2 – CDC: Single point status (SPS)	23
Table 3 – CDC: Single point status (SPS) mapping	23
Table 4 – CDC: Double point status (DPS)	24
Table 5 – CDC: Double point status (DPS) mapping	24
Table 6 – CDC: Integer status (INS)	25
Table 7 – CDC: Integer status (INS) mapping	26
Table 8 – CDC: Protection activated information (ACT)	27
Table 9 – CDC: Protection activated information (ACT) mapping	28
Table 10 – CDC: Protection activated information (ACD)	30
Table 11 – CDC: Directional protection activated information (ACD) mapping	31
Table 12 – CDC: Security violation counting (SEC)	33
Table 13 – CDC: Security violation counting (SEC) mapping	33
Table 14 – CDC: Binary counter reading (BCR)	33
Table 15 – CDC: Binary counter reading (BCR) mapping	34
Table 16 – CDC: Measured value (MV)	35
Table 17 – CDC: Measured value (MV) mapping	35
Table 18 – CDC: Complex measured value (CMV)	36
Table 19 – CDC: Complex measured value (CMV) mapping	37
Table 20 – CDC: Phase to ground related measured values of a three-phase system (WYE)	38
Table 21 – CDC: Phase to phase measured values of a three phase system (DEL)	39
Table 22 – CDC: Sequence (SEQ)	40
Table 23 – CDC: Harmonic value (HMV) Ed.1	41
Table 24 – CDC: Harmonic value (HMV) Ed.1 mapping	41
Table 25 – CDC: Harmonic value (HMV) Ed.2	42
Table 26 – CDC: Harmonic value for WYE (HWYE) Ed.1	43
Table 27 – CDC: Harmonic value for WYE (HWYE) Ed.2	43
Table 28 – CDC: Harmonic value for DEL (HDEL)	44

Table 29 – CDC: Harmonic value for DEL (HDEL) Ed.2.....	44
Table 30 – CDC: Controllable single point (SPC).....	45
Table 31 – CDC: Controllable single point (SPC) mapping	46
Table 32 – CDC: Controllable double point (DPC).....	47
Table 33 – CDC: Controllable double point (DPC) mapping.....	48
Table 34 – CDC: Controllable integer status (INC).....	49
Table 35 – CDC: Controllable integer status (INC) mapping	50
Table 36 – CDC: Binary controlled step position information (BSC).....	51
Table 37 – CDC: Binary controlled step position information (BSC) mapping of data attributes of the functional constraint ST.....	52
Table 38 – CDC: Binary controlled step position information (BSC) mapping of data attributes of the functional constraint CO	53
Table 39 – CDC: Integer-controlled step position information (ISC).....	54
Table 40 – CDC: Integer-controlled step position information (ISC) mapping	55
Table 41 – CDC: Controllable analogue set point information (APC) (Ed.1)	56
Table 42 – CDC: Controllable analogue set point information (APC) (Ed.2)	57
Table 43 – CDC: Controllable analogue set point information (APC) mapping of data attributes of the functional constraint MX.....	58
Table 44 – CDC: Controllable analogue set point information (APC) mapping of data attributes of the functional constraint SP	59
Table 45 – CDC: Single point setting (SPG).....	60
Table 46 – CDC: Integer status setting (ING).....	60
Table 47 – CDC: Analogue settings (ASG).....	61
Table 48 – CDC: Enumerated status (ENS).....	62
Table 49 – CDC: Enumerated status (ENS) mapping	63
Table 50 – CDC: Histogramm (HST).....	64
Table 51 – CDC: Controllable enumerated status (ENC)	65
Table 52 – CDC: Controllable enumerated status (ENC) mapping	66
Table 53 – CDC: Enumerated status setting (ENG).....	68
Table 54 – CDC Binary controlled analog process value (BAC).....	68
Table 55 – CDC: Binary controlled analog process value (BAC) mapping of data attributes of the functional constraint MX.....	69
Table 56 – CDC: Curve shape setting CSG	70
Table 57 – Services requiring client/server communication profile	71
Table 58 – Server services mapping.....	73
Table 59 – Association services mapping	73
Table 60 – Logical nodes services mapping.....	74
Table 61 – Data services mapping	75
Table 62 – Setting group services mapping	76
Table 63 – Report control block services mapping	77
Table 64 – Direct control with normal security services mapping	85
Table 65 – Direct control with enhanced security services mapping.....	90
Table 66 – SBO control with enhanced security services mapping.....	99
Table A.1 – Extension of the “P” element types to hold IEC 60870-5-101 information	167

Table A.2 – Extension of the “P” element types to hold IEC 60870-5-104 information	170
Table A.3 – Extension of the “P” element types using redundancy groups	171

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC TS 61850-80-1:2016](https://standards.iteh.ai/catalog/standards/sist/c82eba5b-b947-448a-ac95-6771f31ef004/iec-ts-61850-80-1-2016)

<https://standards.iteh.ai/catalog/standards/sist/c82eba5b-b947-448a-ac95-6771f31ef004/iec-ts-61850-80-1-2016>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND
SYSTEMS FOR POWER UTILITY AUTOMATION –****Part 80-1: Guideline to exchanging information from a CDC-based
data model using IEC 60870-5-101 or IEC 60870-5-104**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- 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 61850-80-1, which is a technical specification, 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 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) IEC TS 61850-80-1:2008 is based on the definitions of IEC 61850 Edition 1. After the publication of IEC TS 61850-80-1:2008 the standard series IEC 61850 was updated to Edition 2 (almost all parts);
- b) In particular, IEC 61850-7-3:2010 introduces new Common Data Classes (CDCs) which are currently not mapped to IEC 60870-5-101 or IEC 60870-5-104 in IEC 61850-80-1:2008. Those new CDCs are: ENS, HST, VSS, ENC, BAC, ENG, ORG, TSG, CUG, VSG, CSG. IEC 61400-25-4, which is currently being updated, makes reference to IEC TS 61850-80-1:2008 and therefore needs to be updated according to the definitions of this second edition of IEC 61850. The following CDCs are missing in the IEC 61850-80-1:2008 and have therefore been added to this new edition for IEC 61400-25-4 Edition 2: ENS, ENC, ENG, ORG.

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

Enquiry draft	Report on voting
57/1649/DTS	57/1726/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.

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

A bilingual edition of this document 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.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 80-1: Guideline to exchanging information from a CDC-based data model using IEC 60870-5-101 or IEC 60870-5-104

1 Scope

This part of IEC 61850, which is a technical specification, gives a guideline on how to exchange information from a CDC-based data model (for example IEC 61850) using IEC 60870-5-101 or IEC 60870-5-104 between substation(s) and control center(s). Mostly guidelines for functions needed in a substation gateway device are given.

The goal of this technical specification is to describe standardized mapping of device-oriented data models (for example IEC 61850) with already defined attributes of CDCs and services (for example IEC 61850-7) onto the already defined ASDUs and services of IEC 60870-5-104 or IEC 60870-5-101. It is not the goal of this technical specification to add any extensions to published standards (for example IEC 61850 or IEC 60870-5-104 or IEC 60870-5-101).

After an introduction giving a basic description of the mapping, the mapping of the information model with associated data classes, and the mapping of services are described. Clause 9 shows how the mapped data and services according to the IEC 60870-5-104 and IEC 60870-5-101 protocol are marked (selected) in the interoperability sheet.

The scope of this technical specification is to achieve real-time exchange of process information required for operational purposes between a substation using a CDC-based data model (for example IEC 61850) and (a) control center(s) using a communication link over a wide area network (WAN) compliant to the definitions of IEC 60870-5-101 or IEC 60870-5-104. The amount of real-time information provided by the substation-gateway device can vary dependent on the operational needs. Actors could be regional and nationwide control centers that receive real-time information in order to monitor and control geographically widespread processes. The described mapping can be used for several fields of application of power utilities, such as substations, hydro and wind power plants, and decentralized energy resources DER. The mapping is based on the definitions of the IEC 61850 series and IEC 60870-5-104:2006/IEC 60870-5-101:2003. The scope of the mapped IEC 60870-5-104 and IEC 60870-5-101 subset is given in Clause 9.

This technical specification focuses mainly on defining rules and functions of a gateway device as a part of the substation. However, the rules and functions are also valid when an IED may optionally be connected directly to a WAN compliant with IEC 60870-5-101 or IEC 60870-5-104 and therefore, the mapping has to be done inside the IED.

To enable an automated database management approach, which aims to ensure consistency between the databases of substations and control centers, the SCD file (substation configuration description) can be extended with IEC 60870-5-101/IEC 60870-5-104 specific information to configure the 61850 to 101/104 gateway. How the SCD file can be extended is described in Annex A.

The extended substation configuration description (SCD+) is recommended to be used to configure any gateway in a vendor independent format.

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 60870-5-3, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 3: General structure of application data*

IEC 60870-5-4:1993, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 4: Definition and coding of application information elements*

IEC 60870-5-5:1995, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section 5: Basic application functions*

IEC 60870-5-101, *Telecontrol equipment and systems – Part 5-101: Transmission protocols – Companion standard for basic telecontrol tasks*

IEC 60870-5-104:2006, *Telecontrol equipment and systems – Part 5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles*

IEC 61850 (all parts), *Communication networks and systems for power utility automation*

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 61850-7-2:2003, *Communication networks and systems in substations – Part 7-2: Basic information and communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)*

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)*

IEC 61850-7-3:2003, *Communication networks and systems in substations – Part 7-3: Basic communication structure – Common data classes*

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

IEEE 754:2008, *IEEE Standard for Binary Floating-Point Arithmetic*

RFC 2200, *Internet Official Protocol Standards, Request for Comments 2200 (June 1997)*

3 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

ACSI	Abstract communication service interface (defined for example in IEC 61850-7-2)
ASDU	Application service data unit

CASDU	Common address of ASDU
CDC	Common data class (defined for example in IEC 61850-7-3)
CI	Counter interrogation
COT	Cause of transmission
GI	General interrogation
GOOSE	Generic object oriented substation event
HMI	Human machine interface
IED	Intelligent electronic device
IOA	Information object address
LD	Logical device
LN	Logical node
PI	Process image
P/N	Positive/negative
QOI	Qualifier of interrogation
QDS	Quality descriptor
RFC	Request for comments
S/E	Select/execute
SCL	Substation configuration language (defined for example in IEC 61850-6)
TI	Type Identification
TISSUE	Technical issue as part of the maintenance process of IEC 61850
WAN	Wide area network
XML	Extensible mark-up language

4 The mapping architecture

The mapping architecture consists of five parts:

- 1) conceptual architecture of a gateway device and associated use cases;
- 2) conceptual architecture of an IED directly connected to a WAN (optional);
- 3) mapping of the information model;
- 4) mapping of the data (which is in fact part of the information model);
- 5) mapping of the services.

5 Conceptual architectures and associated use cases

5.1 Conceptual architecture of a gateway device

5.1.1 General

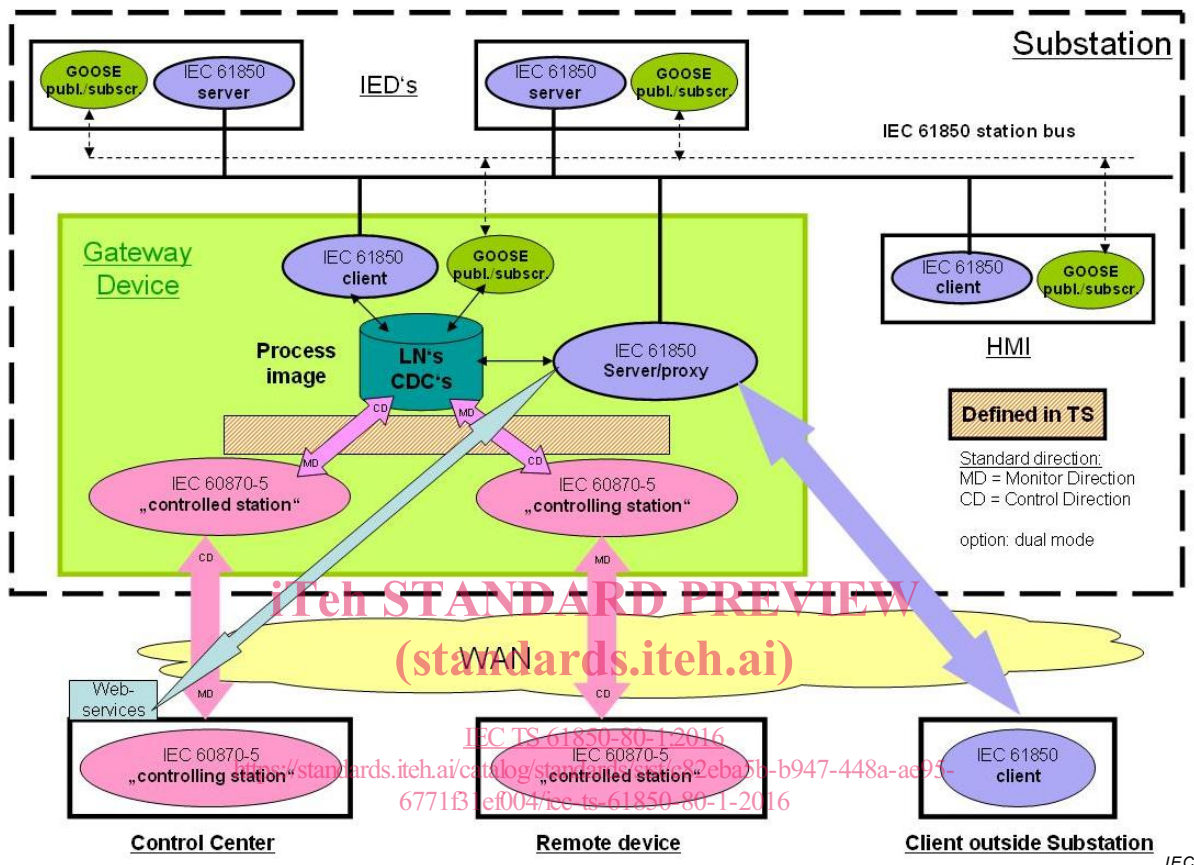


Figure 1 – Conceptual architecture of a gateway device

Figure 1 describes the conceptual architecture of a gateway device within a substation. The gateway device is decoupling the IEC 61850 station bus from the IEC 60870-5-101 or IEC 60870-5-104 WAN via a process image (PI). The advantage of this approach is that only services for control model interaction need to be mapped.

The PI is organized according the data model of IEC 61850 (LDs, LNs, CDCs).

The IEC 61850 client/GOOSE subscriber is used to update the PI with process data made available by the IEDs.

The IEC 61850 server/proxy is used to:

- make process data coming from remote devices available for IEDs inside the substation;
- retrieve the data model for:
 - IEC 61850 clients inside the substation (for example HMI);
 - IEC 61850 clients outside the substation (for example future control centers);
 - existing control centers using IEC 60870-5-101 or IEC 60870-5-104 for WAN communication by using additional services (for example SCL extensions or web services).