

INTERNATIONAL STANDARD

IEC 61850-8-1

First edition
2004-05

Communication networks and systems in substations –

Part 8-1: Specific Communication Service Mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3

(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai> IEC 61850-8-1:2004

<https://standards.iteh.ai/catalog/standards/iec/755dc6808-95a5-4b80-af84-bc0d62928d10/iec-61850-8-1-2004>



Reference number
IEC 61850-8-1:2004(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.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** (www.iec.ch)

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

This summary of recently issued publications (www.iec.ch/online_news/justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: custserv@iec.ch
Tel: +41 22 919 02 11
Fax: +41 22 919 03 00

<https://standards.iteh.ai/catalog/standards/iec/75-d6808-95a5-4b80-af84-bc0d62928d10/iec-61850-8-1-2004>

INTERNATIONAL STANDARD

IEC 61850-8-1

First edition
2004-05

Communication networks and systems in substations –

Part 8-1: Specific Communication Service Mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3

(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai> IEC 61850-8-1:2004

<https://standards.iteh.ai/catalog/standards/iec/755d6808-95a5-4b80-af84-bc0d62928d10/iec-61850-8-1-2004>

© IEC 2004 — Copyright - all rights reserved

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 the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

XF

For price, see current catalogue

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references	11
3 Terms and definitions	15
4 Abbreviations	17
5 Overview	18
5.1 General	18
5.2 IEC 61850 server object	20
5.3 MMS communication profiles	20
5.4 Non-MMS communication profiles	20
5.5 MMS objects being used	20
6 Communication stack	21
6.1 Overview of the protocol usage	21
6.2 Client/server services and communication profiles	22
6.3 GSE management and GOOSE services communication profiles.....	25
6.4 GSSE Service and communication profile.....	27
6.5 Time sync.....	29
7 Objects of IEC 61850	30
7.1 Server	30
7.2 Logical device (LD)	30
7.3 Logical node (LN).....	30
8 Mapping of IEC 61850-7-2 and IEC 61850-7-3 data attributes	33
8.1 Mapping of Attributes specified in IEC 61850-7-2	33
8.2 Mapping of quality common data attribute type specified in IEC 61850-7-3.....	36
9 Server class model.....	37
9.1 Server mapping.....	37
9.2 Server class attributes.....	37
9.3 Server class service GetServerDirectory	38
10 Association model	40
10.1 Association relation to communication profiles	40
10.2 Two party association model for client/server communication profile	40
10.3 Two party association model for GSE management communication profile	41
10.4 Two party association model for time sync	41
10.5 Multicast association model.....	42
11 Logical device model.....	42
12 Logical node model	42
12.1 Logical node class.....	42
12.2 Logical node class attributes	42
12.3 Logical node class services	43
13 Data class model.....	44
13.1 Data class	44
13.2 Data class services	45

14	Data set class model	46
14.1	Data set class	46
14.2	Data set attributes	46
14.3	Data set services	47
15	Substitution model	50
16	Setting group control class model	50
16.1	Setting group control class definition	50
16.2	Setting group control class services	50
17	Reporting and logging class model	51
17.1	Report model	51
17.2	Reporting services	53
17.3	Log model	56
18	Mapping of the generic substation event model (GSE)	62
18.1	Generic object oriented substation event (GOOSE)	62
18.2	Generic Substation State Event (GSSE)	71
19	Transmission of sampled values class model	81
20	Control class model	81
20.1	Control service parameters	81
20.2	Mapping of control objects	81
20.3	Mapping of control services	83
20.4	Select	84
20.5	SelectwithValue	84
20.6	Cancel	85
20.7	Operate	85
20.8	AdditionalCauseDiagnosis in negative control service responses	87
20.9	CommandTermination	89
21	Time and time synchronization model	89
22	Naming conventions	89
23	File transfer	89
23.1	File transfer model	89
23.2	File services	91
24	Conformance	94
24.1	Notation	94
24.2	PICS	94
24.3	PICS Statement	107
25	Substation Configuration Language (SCL)	109
25.1	SCL file and SCL extensions	109
Annex A (normative) Application protocol specification for GOOSE and GSE management		111
Annex B (informative) Multicast address selection		113
Annex C (normative) Overview of ISO/IEC 8802-3 frame structure for GSE management and GOOSE		114
Annex D (informative) SCL conformance		117
Annex E (normative) Specialized CDCs for control service mapping		121
Annex F (informative) Time scales and epochs		128
Annex G (normative) Type extensions to ISO 9506-1 (2003) and ISO 9506-2 (2003)		131

Figure 1 – Overview of functionality and profiles	19
Figure 2 – OSI reference model and profiles	21
Figure 3 – Recommended ordered list of functional constraints.....	31
Figure 4 – Relationship of LCB attributes to IEC 61850-7-2 log definitions.....	56
Figure 5 – GetGoReference service primitives	63
Figure 6 – GetGOOSEElementNumber service primitives	66
Figure 7 – Transmission time for events	68
Figure 8 – SendGooseMessage message service primitives	68
Figure 9 – Client state machine for GOOSE service.....	69
Figure 10 – Server state machine for GOOSE service.....	69
Figure 11 – GetGsReference service primitives	74
Figure 12 – GetGSSEDataOffset service primitives.....	76
Figure 13 – GSSE service primitives.....	78
Figure 14 – Client state machine for GSSE service.....	78
Figure 15 – Server state machine for GSSE service.....	79
Figure 16 – Mapping of ACSI GetFile to MMS FileOpen, FileRead, FileClose	91
Figure 17 – Mapping of ACSI SetFile service.....	92
Figure C.1 – ISO/IEC 8802-3 frame format	114
Figure C.2 – Virtual LAN tag	115
Table 1 – MMS objects and services in use within this SCSM	21
Table 2 – Services requiring client/server Communication Profile	22
Table 3 – Service and protocols for client/server communication A-Profile.....	23
Table 4 – Service and protocols for client/server TCP/IP T-Profile	24
Table 5 – Service and protocols for client/server OSI T-Profile	25
Table 6 – Services requiring GSE Management and GOOSE communication profile.....	26
Table 7 – Service and protocols for GSE Management and GOOSE communication A-Profile	26
Table 8 – GOOSE/GSE T-Profile	26
Table 9 – Service requiring GSSE communication profile.....	27
Table 10 – Service and protocols for GSSE communication A-Profile.....	27
Table 11 – GSSE management T-Profile.....	28
Table 12 – Time sync A-Profile	29
Table 13 – Time sync T-Profile	29
Table 14 – Mapping of ACSI data types	33
Table 15 – Encoding of IEC 61850-7-2 TimeQuality	36
Table 16 – Encoding of IEC 61850-7-3 quality	37
Table 17 – ServiceError mapping for GetServerDirectory for non-files	39
Table 18 – ServiceErrors mapping of ACSI GetServerDirectory for files.....	39
Table 19 – Association model versus communication profiles	40
Table 20 – Associate service error mappings.....	41
Table 21 – Release service error mappings	41
Table 22 – GetNamedList classes for GetLogicalNodeDirectory service.....	43

Table 23 – MMS AccessResult mapping to ASCI ServiceError	44
Table 24 – Mapping of GetDataValues service parameters	45
Table 25 – Mapping of SetDataValues service parameters	45
Table 26 – Mapping of GetDataDirectory service parameters	46
Table 27 – ServiceError Mappings for GetDataDirectory service	46
Table 28 – Mapping of GetDataSetValues service parameters	47
Table 29 – Mapping of SetDataSetValues service parameters	47
Table 30 – Mapping of CreateDataSet service parameters	48
Table 31 – ServiceError mapping for CreateDataSet	48
Table 32 – Mapping of DeleteDataSet service parameters	48
Table 33 – ServiceError mapping for DeleteDataSet	49
Table 34 – Mapping of GetDataSetDirectory service parameters	49
Table 35 – ServiceError mapping for GetDataSetDirectory	49
Table 36 – Mapping of ACSI ServiceError for SelectActiveSG	50
Table 37 – Mapping of BRCB to MMS type definition	51
Table 38 – Mapping of OptFlds within Bitstring	52
Table 39 – Mapping of URCB to MMS type definition	52
Table 40 – Order of AccessResults for variableListName report	53
Table 41 – Definition of an MMS log control block	57
Table 42 – Mapping of values for LogEna	57
Table 43 – Mapping of ACSI LogEntries	58
Table 44 – General mappings of ACSI log model services	60
Table 45 – Mapping of QueryLogByTime request parameters	61
Table 46 – Mapping of response parameters	61
Table 47 – ServiceError mappings for Log services	61
Table 48 – Mapping of QueryLogAfter request parameters	61
Table 49 – Log conformance requirements	62
Table 50 – MMS TypeDescription definition for GCB MMS structure	62
Table 51 – DstAddress structure	63
Table 52 – Mapping of GetGoReference service	64
Table 53 – GetGoReference	64
Table 54 – Mapping of GetGOOSEElementNumber service	66
Table 55 – GetGOOSEElementNumber	67
Table 56 – GOOSE service parameter mapping	70
Table 57 – MMS TypeDescription Definition for GSSE control block MMS structure	71
Table 58 – Mapping of LSentData	72
Table 59 – Definition of integer values of PhsID	73
Table 60 – Definition of double-bit GSSE values	73
Table 61 – Mapping of GetGsReference service	74
Table 62 – GetGsReference	75
Table 63 – Mapping of GetGOOSEElementNumber service	76
Table 64 – GetGSSEDataOffset	77
Table 65 – GSSE service	79

Table 66 – Mapping of test values to bit-pair values.....	80
Table 67 – Control service parameters.....	81
Table 68 – Mapping of IEC 61850-7-2 control model to MMS control components.....	82
Table 69 – Mapping of control services.....	83
Table 70 – Select service parameter mapping.....	84
Table 71 – SelectwithValue service parameter mapping.....	84
Table 72 – Select, Oper and Cancel AccessResult specification.....	85
Table 73 – Cancel service parameter mapping.....	85
Table 74 – Operate service parameter mapping.....	86
Table 75 – Control with TimeActivation service parameter mapping.....	86
Table 76 – Definition of LastAppError variable structure.....	87
Table 77 – Mapping of ACSI AddCause values.....	88
Table 78 – Mapping of ACSI file class to MMS file object.....	89
Table 79 – Reserved file suffixes.....	90
Table 80 – Mapping of ACSI GetFile service parameters.....	92
Table 81 – Mapping of ACSI SetFile parameters.....	93
Table 82 – Mapping of ACSI DeleteFile service.....	93
Table 83 – Mapping of ACSI GetFileAttributeValues parameters.....	94
Table 84 – Mapping of ACSI ListOfDirectoryEntry.....	94
Table 85 – PICS for A-Profile support.....	95
Table 86 – PICS for T-Profile support.....	95
Table 87 – MMS InitiateRequest general parameters.....	96
Table 88 – MMS InitiateResponse general parameters.....	96
Table 89 – MMS service supported conformance table.....	97
Table 90 – MMS Parameter CBB.....	100
Table 91 – GetNamedList conformance statement.....	100
Table 92 – AlternateAccessSelection conformance statement.....	101
Table 93 – VariableAccessSpecification conformance statement.....	101
Table 94 – VariableSpecification conformance statement.....	102
Table 95 – Read conformance statement.....	102
Table 96 – Write conformance statement.....	102
Table 97 – InformationReport conformance statement.....	103
Table 98 – GetVariableAccessAttributes conformance statement.....	103
Table 99 – DefineNamedVariableList conformance statement.....	103
Table 100 – GetNamedVariableListAttributes conformance statement.....	104
Table 101 – DeleteNamedVariableList conformance statement.....	104
Table 102 – ReadJournal conformance statement.....	105
Table 103 – JournalEntry conformance statement.....	105
Table 104 – InitializeJournal conformance statement.....	106
Table 105 – FileDirectory conformance statement.....	106
Table 106 – FileOpen conformance statement.....	106
Table 107 – FileRead conformance statement.....	107
Table 108 – FileClose conformance statement.....	107

Table 109 – GOOSE conformance statement.....	108
Table 110 – GSSE conformance statement.....	108
Table 111 – Allowed P-Type definitions for client/server addressing	109
Table 112 – Definitions for GSE SCL	110
Table B.1 – Recommended multicast addressing example	113
Table C.1 – Default virtual LAN IDs and priorities	115
Table C.2 – Assigned Ethertype values.....	116
Table D.1 – SCL conformance degrees.....	117
Table D.2 – Supported ACSI services for SCL.2 and SCL.3	117
Table D.3 – Additional MMS services for SCL.2 and SCL.3.....	118
Table D.4 – Definition of SCL control block.....	118
Table E.1 – Name space attributes	121
Table E.2 – Extended common data class controllable single point.....	122
Table E.3 – Extended common data class controllable double point.....	122
Table E.4 – Extended common data class controllable integer status.....	123
Table E.5 – Extended common data class binary controlled step position information.....	123
Table E.6 – Extended common data class integer controlled step position information.....	124
Table E.7 – Extended common data class controllable analogue set point information.....	124
Table E.8 – SBOw	125
Table E.9 – Oper	125
Table E.10 – Cancel	126
Table E.11 – ctIVal	126
Table E.12 – Conditions for attribute inclusion.....	126
Table E.13 – Semantics of data attributes	127
Table F.1 – Relationships between timescales.....	129
Table F.2 – Examples of timescale correspondence.....	130

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

**Part 8-1: Specific Communication Service Mapping (SCSM) –
Mappings to MMS (ISO 9506-1 and ISO 9506-2)
and to ISO/IEC 8802-3**

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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.

International Standard IEC 61850-8-1 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

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

FDIS	Report on voting
57/692/FDIS	57/712/RVD

Full information on the voting for the approval of this standard 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
- 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 9506-1 and ISO 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
- Part 10: Conformance testing ¹

This document specifies in Annex E specialized CDCs (Common Data Classes) based on CDCs defined in IEC 61850-7-3:2003.

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

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

A bilingual version of this document may be issued at a later date.

¹ Under consideration.

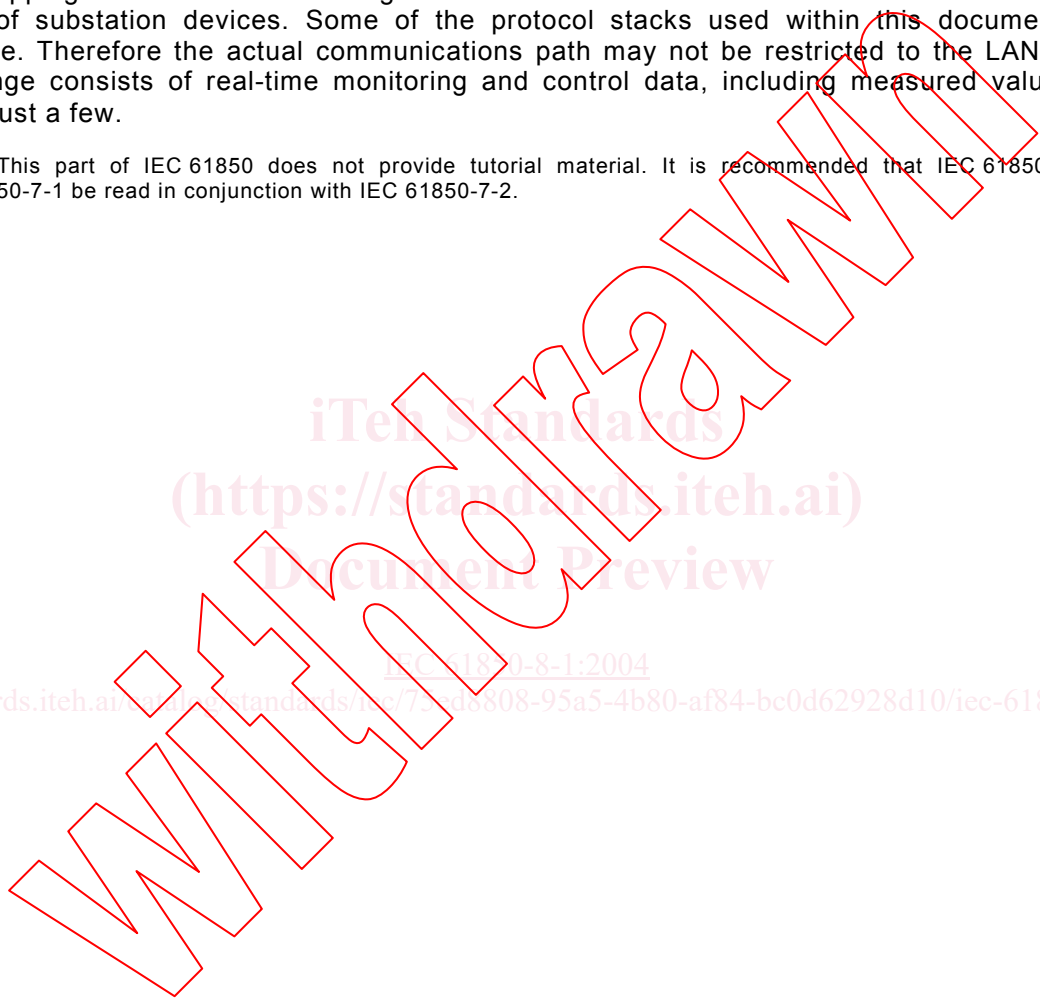
INTRODUCTION

This document is part of a set of specifications which details layered substation communication architecture.

This part of IEC 61850 is intended to provide inter-device operation of a variety of substation and feeder devices to achieve interoperability providing detailed information on how to create and exchange concrete communication messages that implement abstract services and models specified in IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2.

The mapping allows for data exchange over ISO/IEC 8802-3 Local Area Networks between all kinds of substation devices. Some of the protocol stacks used within this document are routable. Therefore the actual communications path may not be restricted to the LAN. Data exchange consists of real-time monitoring and control data, including measured values, to name just a few.

NOTE This part of IEC 61850 does not provide tutorial material. It is recommended that IEC 61850-5 and IEC 61850-7-1 be read in conjunction with IEC 61850-7-2.



iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai/standards/iec/755d6808-95a5-4b80-af84-bc0d62928d10/iec-61850-8-1-2004>

<https://standards.iteh.ai/standards/iec/755d6808-95a5-4b80-af84-bc0d62928d10/iec-61850-8-1-2004>

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

Part 8-1: Specific Communication Service Mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3

1 Scope

This part of IEC 61850 specifies a method of exchanging time-critical and non-time-critical data through local-area networks by mapping ACSI to MMS and ISO/IEC 8802-3 frames.

MMS services and protocol are specified to operate over full OSI and TCP compliant communications profiles. The use of MMS allows provisions for supporting both centralized and distributed architectures. This standard includes the exchange of real-time data indications, control operations, report notification.

This part of IEC 61850 specifies the mapping of the objects and services of the ACSI (Abstract Communication Service Interface, IEC 61850-7-2) to MMS (Manufacturing Message Specification, ISO 9506) and ISO/IEC 8802-3 frames.

This standard also specifies the mapping of time-critical information exchanges to non-MMS protocol. The protocol semantics are defined in IEC 61850-7-2. This standard contains the protocol syntax, definition, mapping to ISO/IEC 8802-3 frame formats, and any relevant procedures specific to the use of ISO/IEC 8802-3.

This mapping of ACSI to MMS defines how the concepts, objects, and services of the ACSI are to be implemented using MMS concepts, objects, and services. This mapping allows interoperability across functions implemented by different manufacturers.

This part of the standard defines a standardized method of using the ISO 9506 services to implement the exchange of data. For those ACSI services, defined in IEC 61850-7-2 that are not mapped to MMS, this part defines additional protocols. This standard describes real substation devices with respect to their external visible data and behaviour using an object oriented approach. The objects are abstract in nature and may be used to a wide variety of applications. The use of this mapping goes far beyond the application in the substation communications.

This part of IEC 61850 provides mappings for the services and objects specified within IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4.

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 60874-10-1:1997, *Connectors for optical fibres and cables – Part 10-1: Detail specification for fibre optic connector type BFOC/2,5 terminated to multimode fibre type A1*

IEC 60874-10-2:1997, *Connectors for optical fibres and cables – Part 10-2: Detail specification for fibre optic connector type BFOC/2,5 terminated to single-mode fibre type B1*

IEC 60874-10-3:1997, *Connectors for optical fibres and cables – Part 10-3: Detail specification for fibre optic connector type BFOC/2,5 for single and multimode fibre*

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, *Communication networks and systems in substations – Part 7-1: Basic communication structure for substation and feeder equipment – Part 7-1: Principles and models*

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

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

IEC 61850-7-4, *Communication networks and systems in substations – Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes*

IEC 61850-9-1, *Communication networks and systems in substations – Part 9-1: Specific Communication Service Mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link*

IEC 61850-9-2, *Communication networks and systems in substations – Part 9-2: Specific Communication Service Mapping (SCSM) – Sampled values over ISO/IEC 8802-3*

ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

ISO/IEC 7498-3:1997, *Information technology – Open Systems Interconnection – Basic Reference Model: Naming and addressing*

ISO/IEC 8072:1996, *Information technology – Open systems interconnection – Transport service*

ISO/IEC 8073:1997, *Information technology – Open Systems Interconnection – Protocol for providing the connection-mode transport service definition*

ISO/IEC 8326:1996, *Information processing system – Open Systems Interconnection – Session service definition*

ISO/IEC 8327-1:1997, *Information technology – Open Systems Interconnection – Connection-oriented session protocols: Protocol specification*

ISO/IEC 8348:2002, *Information technology – Open Systems Interconnection – Network service definition*

ISO/IEC 8473-1:1998, *Information technology – Protocol for providing the connectionless-mode network service: Protocol specification*