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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

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

EESTI STANDARDIKESKUS

EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN 61850-8-1:2004 sisaldab Euroopa standardi EN 61850-8-1:2004 ingliskeelset teksti. Käesolev dokument on jõustatud 22.07.2004 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 61850-8-1:2004 consists of the English text of the European standard EN 61850-8-1:2004. This document is endorsed on 22.07.2004 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: 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.	**Scope:** 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.

ICS 33.200

Võtmesõnad:

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Eesti Standardikeskusele kuulub standardite reprodutseerimis- ja levitamisõigus

EUROPEAN STANDARD **EN 61850-8-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM June 2004

ICS 33.200

English version

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

(IEC 61850-8-1:2004)

Réseaux et systèmes de communication dans les postes
Partie 8-1: Implémentation spécifique des services de communication (SCSM) - Cartographie avec MMS (ISO 9506-1 et ISO 9506-2) et l'ISO/CEI 8802-3
(CEI 61850-8-1:2004)

Kommunikationsnetze und -systeme in Stationen
Teil 8-1: Spezifische Abbildung von Kommunikationsdiensten (SCSM) - Abbildungen auf MMS (nach ISO 9506-1 und ISO 9506-2) und ISO/IEC 8802-3
(IEC 61850-8-1:2004)

This European Standard was approved by CENELEC on 2004-04-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 57/692/FDIS, future edition 1 of IEC 61850-8-1, prepared by IEC TC 57, Power systems management and associated information exchange, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61850-8-1 on 2004-04-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-03-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2007-04-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61850-8-1:2004 was approved by CENELEC as a European Standard without any modification.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE Where an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
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	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	Part 10-3: Detail specification for fibre optic adaptor type BFOC/2,5 for single and multimode fibre	-	-
IEC/TS 61850-2	- [1)]	Communication networks and systems in substations Part 2: Glossary	-	-
IEC 61850-5	- [1)]	Part 5: Communication requirements for functions and device models	EN 61850-5	2003 [2)]
IEC 61850-7-1	- [1)]	Part 7-1: Basic communication structure for substation and feeder equipment - Principles and models	EN 61850-7-1	2003 [2)]
IEC 61850-7-2	- [1)]	Part 7-2: Basic communication structure for substation and feeder equipment - Abstract communication service interface (ACSI)	EN 61850-7-2	2003 [2)]
IEC 61850-7-3	- [1)]	Part 7-3: Basic communication structure for substation and feeder equipment - Common data classes	EN 61850-7-3	2003 [2)]
IEC 61850-7-4	- [1)]	Part 7-4: Basic communication structure for substation and feeder equipment - Compatible logical node classes and data classes	EN 61850-7-4	2003 [2)]

1) Undated reference.

2) Valid edition at date of issue.

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Publication	Year	Title	EN/HD	Year
IEC 61850-9-1	- [1)]	Part 9-1: Specific Communication Service Mapping (SCSM) - Sampled values over serial unidirectional multidrop point to point link	EN 61850-9-1	2003 [2)]
IEC 61850-9-2	- [1)]	Part 9-2: Specific Communication Service Mapping (SCSM) - Sampled values over ISO/IEC 8802-3	EN 61850-9-2	2004 [2)]
ISO/IEC 7498-1	1994	Information technology - Open systems interconnection - Basic reference model Part 1: The basic model	EN ISO 7498-1	1995
ISO/IEC 7498-3	1997	Part 3: Naming and addressing	-	-
ISO/IEC 8072	1996	Information technology - Open systems interconnection - Transport service definition	-	-
ISO/IEC 8073	1997	Information technology - Open Systems Interconnection - Protocol for providing the connection-mode transport service	-	-
ISO/IEC 8326	1996	Information technology - Open systems Interconnection - Session service definition	-	-
ISO/IEC 8327-1	1997	Information technology - Open Systems Interconnection - Connection-oriented Session protocol: 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	-	-
ISO/IEC 8473-2	1996	Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork	-	-
ISO/IEC 8602	1995	Information technology - Protocol for providing the OSI connectionless-mode transport service	-	-
ISO/IEC 8649	1996	Information technology - Open systems Interconnection - Service definition for the Association Control Service Element (ACSE)	-	-
ISO/IEC/TR2 8650-1	1996	Information technology - Open systems Interconnection - Connection-oriented protocol for the Association Control Service Element: Protocol specification	-	-

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Publication	Year	Title	EN/HD	Year
ISO/IEC 8802-2	1998	Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements Part 2: Logical link control	-	-
ISO/IEC 8802-3	2001	Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications	-	-
ISO/IEC 8822	1994	Information technology - Open Systems Interconnection - Presentation service definition	-	-
ISO/IEC 8823-1	1994	Information technology - Open Systems Interconnexion - Connection-oriented presentation protocol: Protocol specification	-	-
ISO/IEC 8824-1	2000	Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation	-	-
A1	2000		-	-
A2	2000		-	-
ISO/IEC 8825-1	2000	Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)	-	-
ISO/IEC 8877	1992	Information technology - Telecommunications and information exchange between systems - Interface connector and contact assignments for ISDN Basic Access Interface located at reference points S and T	EN 28877	1993
ISO/IEC 9542	1988	Information processing systems - Telecommunications and information exchange between systems - End system to intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)	-	-
ISO/IEC 9548-1	1996	Information technology - Open Systems Interconnection - Connectionless Session protocol: Protocol specification	-	-
ISO/IEC 9576-1	1995	Information technology - Open Systems Interconnection - Connectionless Presentation protocol: Protocol specification	-	-

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Publication	Year	Title	EN/HD	Year
ISO/IEC 10035-1	1995	Information technology - Open Systems Interconnection - Connectionless protocol for the Association Control Service Element: Protocol specification	-	-
A1	1998		-	-
ISO/IEC ISP 10608-1	1992	Information technology - International Standardized Profile TAnnnn - Connection-mode Transport Service over Connectionless-mode Network Service Part 1: General overview and subnetwork-independent requirements	EN ISP 10608-1	1994
ISO/IEC ISP 10608-2	1992	Part 2: TA51 profile including subnetwork-dependent requirements for CSMA/CD Local Area Networks (LANs)	EN ISP 10608-2	1994
ISO/IEC ISP 11188-1	1995	Information technology - International Standardized Profile - Common upper layer requirements Part 1: Basic connection oriented requirements	EN ISP 11188-1	1996
ISO/IEC ISP 11188-3	1996	Part 3: Minimal OSI upper layer facilities	-	-
ISO 9506-1	2003	Industrial automation systems - Manufacturing Message Specification Part 1: Service definition	-	-
ISO 9506-2	2003	Part 2: Protocol specification	-	-
ISO/ISP 14226-1	1996	Industrial automation systems - International Standardized Profile AMM11: MMS General Applications Base Profile Part 1: Specification of ACSE, Presentation and Session protocols for the use by MMS	-	-
ISO/ISP 14226-2	1996	Part 2: Common MMS requirements	-	-
ISO/ISP 14226-3	1996	Part 3: Specific MMS requirements	-	-
IEEE C37.111	1999	IEEE Standard for Common Format for Transient Data Exchange (COMTRADE) for Power Systems	-	-
IEEE 754	1985	Standard for Binary Floating-Point Arithmetic	-	-
IEEE 802.1Q	1998	IEEE Standards for Local and Metropolitan Networks: Virtual Bridged Local Area Networks	-	-
RFC 542	- [1)]	File Transfer Protocol for the ARPA Network	-	-

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Publication	Year	Title	EN/HD	Year
RFC 768	- [1)]	User Datagram Protocol	-	-
RFC 791	- [1)]	Internet Protocol - DARPA Internet Program Protocol Specification	-	-
RFC 792	- [1)]	Internet Control Message Protocol - DARPA Internet Program Protocol Specification	-	-
RFC 793	- [1)]	Transmission Control Protocol - DARPA Internet Program Protocol Specification	-	-
RFC 826	- [1)]	Ethernet Address Resolution Protocol: Or converting network protocol addresses to 48.bit Ethernet address for Transmission on Ethernet hardware	-	-
RFC 894	- [1)]	Standard for the Transmission of IP datagrams over Ethernet Networks	-	-
RFC 919	- [1)]	Broadcasting Internet Datagrams	-	-
RFC 922	- [1)]	Broadcasting Internet Datagrams in the presence of subnets	-	-
RFC 950	- [1)]	Internet Standard Subnetting Procedure	-	-
RFC 959	- [1)]	File Transfer Protocol (FTP)	-	-
RFC 1006	- [1)]	ISO transport services on top of TCP: Version 3	-	-
RFC 1112	- [1)]	Host Extensions for IP Multicasting	-	-
RFC 1122	- [1)]	Requirements for Internet Hosts - Communication Layers	-	-
RFC 1123	- [1)]	Requirements for Internet Hosts - Application and Support	-	-
RFC 2030	- [1)]	Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI	-	-

Undated reference.

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INTERNATIONAL STANDARD

IEC 61850-8-1

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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

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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

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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 cervices 43
13 Data class model 44
13.1 Data class 44
13.2 Data class services 45

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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

This document is a preview generated by EVS

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

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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

This document is a preview generated by EVS

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 LastApplError 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 – GetNameList 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

This document is a preview generated by EVS

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 – ctlVal 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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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

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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.

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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.

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[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.

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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

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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*

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ISO/IEC 8473-2:1996, *Information technology – Protocol for providing the connectionless-mode network service – Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork*

ISO/IEC 8602:1995, *Information technology – Protocol for providing the OSI connectionless-mode transport service*

ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection – Service definition for the Associated Control Service Element*

ISO/IEC 8650-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented protocol for the Association Control Service Element: Protocol specification*

ISO/IEC 8802-2:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical link control*

ISO/IEC 8802-3:2001, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 8822:1994, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8823-1:1994, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification*

ISO/IEC 8824-1:1999, Information technology – Abstract Syntax Notation One (ASN. 1): Specification of basic notation
Amendment 1 (2000)
Amendment 2 (2000)

ISO/IEC 8825-1:2000, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 8877:1992, *Information technology – Telecommunications and information exchange between systems – Interface connector and contact assignments for ISDN Basic Access Interface located at reference points S and T*

ISO/IEC 9542:1988, *Information processing systems – Telecommunications and information exchange between systems – End system to Intermediate system routeing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)*

ISO/IEC 9548-1:1996, *Information technology – Open Systems Interconnection – Connectionless Session protocol: Protocol specification*

ISO/IEC 9576-1:1995, *Information technology – Open Systems Interconnection – Connectionless Presentation protocol: Protocol specification*

ISO/IEC 10035-1:1995, *Information technology – Open Systems Interconnection – Connectionless protocol for the Association Control Service Element: Protocol specification*
Amendment 1 (1998)

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ISO/IEC ISP 10608-1:1992, *Information technology – International Standardized Profile TAnnnn – Connection-mode Transport Service over Connectionless-mode Network Service – Part 1: General overview and subnetwork-independent requirements*

ISO/IEC ISP 10608-2:1992, *Information technology – International Standardized Profile TAnnnn – Connection-mode Transport Service over Connectionless-mode Network Service – Part 2: TA51 profile including subnetwork-dependent requirements for CSMA/CD Local Area Networks (LANs)*

ISO/IEC ISP 11188-1:1995, *Information technology – International Standardized Profile – Common upper layer requirements – Part 1: Basic connection oriented requirements*

ISO/IEC ISP 11188-3:1996, *Information technology – International Standardized Profile – Common upper layer requirements – Part 3: Minimal OSI upper layer facilities*

ISO 9506-1:2003, *Industrial automation systems – Manufacturing Message Specification – Part 1: Service definition*

ISO 9506-2:2003, *Industrial automation systems – Manufacturing Message Specification – Part 2: Protocol specification*

ISO/ISP 14226-1:1996, *Industrial automation systems – International Standardized Profile AMM11: MMS General Applications Base Profile – Part 1: Specification of ACSE, Presentation and Session protocols for use by MMS*

ISO/ISP 14226-2:1996, *Industrial automation systems – International Standardized Profile AMM11: MMS General Applications Base Profile – Part 2: Common MMS requirements*

ISO/ISP 14226-3:1996, *Industrial automation systems – International Standardized Profile AMM11: MMS General Applications Base Profile – Part 3: Specific MMS requirements*

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

IEEE 754:1985, *IEEE Standard for Binary Floating-Point Arithmetic*

IEEE 802.1Q:1998, *IEEE Standards for Local and Metropolitan Networks: Virtual Bridged Local Area Networks*

RFC 542, *File Transfer Protocol for the ARPA Network, IETF, available at <http://www.ietf.org>*

RFC 768, *User Datagram Protocol, IETF, available at <http://www.ietf.org>*

RFC 791, *Internet Protocol – DARPA Internet Program Protocol Specification, IETF, available at <http://www.ietf.org>*

RFC 792, *Internet Control Message Protocol – DARPA Internet Program Protocol Specification, IETF, available at <http://www.ietf.org>*

RFC 793, *Transmission Control Procedure – DARPA Internet Program Protocol Specification, IETF, available at <http://www.ietf.org>*

RFC 826, *An Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware, IETF, available at <http://www.ietf.org>*

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RFC 894, *A Standard for the Transmission of IP datagrams over Ethernet Networks, IETF, available at <http://www.ietf.org>*

RFC 919, *Broadcasting Internet Datagrams, IETF, available at <http://www.ietf.org>*

RFC 922 *Broadcasting Internet Datagrams in the presence of subnets, IETF, available at <http://www.ietf.org>*

RFC 950, *Internet Standard Subnetting Procedure, IETF, available at* <http://www.ietf.org>

RFC 959, *File Transfer Protocol (FTP), IETF, available at* <http://www.ietf.org>

RFC 1006 *ISO transport services on top of TCP: Version 3, IETF, available at <http://www.ietf.org>*

RFC 1112, *Host Extensions for IP Multicasting, IETF, available at <http://www.ietf.org>*

RFC 1122, *Requirements for Internet Hosts – Communication Layers, IETF, available at <http://www.ietf.org>*

RFC 1123, *Requirements for Internet Hosts – Application and Support, IETF, available at <http://www.ietf.org>*

RFC 2030, *Simple Network Time Protocol (SNTP) Version 4, IETF, available at <http://www.ietf.org>*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61850-2 as well as the following apply.

3.1
(*n*)-layer
any specific layer

[ISO/IEC 7498-1, 3.1]

3.2
(*n*)-protocol data unit
unit of data specified in an (n)-protocol and consisting of (n)-protocol-control-information and possibly (n)-user-data

[ISO/IEC 7498-1, 5.6.1.3]

3.3
(*n*)-protocol
set of rules and formats (semantic and syntactic) which determines the communication behavior of (N)-entities in the performance of (n)-functions

[ISO/IEC 7498-1, 5.2.1.9]

3.4
class
description of a set of objects that share the same attributes, services, relationships, and semantics

[IEC 61850-7-2, 3.1]

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