

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Communication networks and systems for power utility automation –
Part 8-2: Specific Communication Service Mapping (SCSM) – Mapping to
Extensible Messaging Presence Protocol (XMPP)**

**Réseaux et systèmes de communication pour l'automatisation des systèmes
électriques –
Partie 8-2: Mapping des services de communication spécifiques (SCSM) –
Mapping avec le protocole XMPP (Extensible Messaging Presence Protocol)**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2018 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
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.

IEC publications search - webstore.iec.ch/advsearchform

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 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.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 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 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: sales@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 21 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Communication networks and systems for power utility automation –
Part 8-2: Specific Communication Service Mapping (SCSM) – Mapping to
Extensible Messaging Presence Protocol (XMPP)**

**Réseaux et systèmes de communication pour l'automatisation des systèmes
électriques –
Partie 8-2: Mapping des services de communication spécifiques (SCSM) –
Mapping avec le protocole XMPP (Extensible Messaging Presence Protocol)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.200

ISBN 978-2-8322-6158-3

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	13
INTRODUCTION.....	15
1 Scope.....	16
1.1 General.....	16
1.2 Namespace name and version.....	16
1.3 Code Component distribution.....	17
2 Normative references.....	17
3 Terms and definitions.....	19
4 Abbreviated terms.....	21
5 Overview.....	22
5.1 General.....	22
5.2 Mapping of client/server services.....	23
5.2.1 General.....	23
5.2.2 XML payloads.....	24
5.2.3 Implementation agreements.....	25
5.2.4 XMPP.....	25
5.3 Time sync services.....	26
6 Usage of XMPP.....	26
6.1 Principles.....	26
6.2 Connection establishment.....	26
6.2.1 General.....	26
6.2.2 Usage of TLS and SASL.....	26
6.2.3 Stream Compression.....	27
6.3 Mapping of ACSI services.....	27
6.4 Usage of XMPP presence.....	28
6.5 Usage of the Roster.....	28
6.6 XMPP extensions.....	28
6.6.1 Usage of XMPP PING – XEP 0199.....	28
6.6.2 Usage of Stream Management – XEP 0198.....	28
6.7 Implementation agreements – XMPP PING – XEP 0199.....	28
7 End-to-end security.....	29
8 Payload description.....	29
8.1 XSD overview.....	29
8.2 Contents of IEC 61850.....	29
8.2.1 General.....	29
8.2.2 Logical Node (LN).....	30
8.2.3 Mapping of references of Logical Nodes to VariableAccessSpecifications.....	33
8.2.4 Mapping of DataObjects reference to VariableAccessSpecifications.....	34
8.2.5 Mapping of DataAttributes (DataAttr) reference to VariableAccessSpecifications.....	35
8.2.6 Usage of alternate access for DataObjects and DataAttributes references.....	35
8.3 Mapping of IEC 61850-7-2 data attributes.....	40
8.3.1 BasicTypes.....	40
8.3.2 Additional definitions of BasicType.....	41
8.3.3 Common ACSITypes.....	43

8.3.4	Mapping of quality common data attribute type specified in IEC 61850-7-2	54
8.4	General mapping of data values within XML payloads	55
8.5	Extended behaviour for optimization of bandwidth	56
9	Server class model	56
9.1	General	56
9.2	GetServerDirectory	57
9.2.1	General	57
10	Association model	60
10.1	Association relation to communication profiles	60
10.2	Two party association model for client/server communication profile	61
10.2.1	Establishment of a secured end-to-end association	61
10.2.2	Association services	61
11	Logical device model	66
11.1	General	66
11.2	Response-	68
11.3	Extended behaviour	69
12	Logical Node model	70
12.1	General	70
12.2	GetLogicalNodeDirectory	71
12.2.1	General	71
12.2.2	Response-	73
12.2.3	Extended behaviour	73
12.3	GetAllDataValues	76
12.3.1	General	76
13	DataObject, DataAttribute, SubDataAttribute model	79
13.1	General	79
13.2	GetDataValues	79
13.3	SetDataValues	81
13.4	GetDataDirectory	82
13.4.1	General	82
13.4.2	Response-	84
13.4.3	Extended behaviour	85
13.5	GetDataDefinition	87
14	Data set class model	87
14.1	General	87
14.2	GetDataSetValues	88
14.2.1	General	88
14.2.2	Response-	90
14.3	SetDataSetValues	91
14.3.1	General	91
14.3.2	Response-	92
14.4	CreateDataSet	93
14.4.1	General	93
14.4.2	Response-	95
14.5	DeleteDataSet	96
14.5.1	General	96
14.5.2	Errors	97
14.6	GetDataSetDirectory	98

14.6.1	General	98
14.6.2	Response-	100
15	ServiceTracking model	101
16	Setting group control class model	104
16.1	Setting group control block definition	104
16.2	Setting group control class services	104
16.2.1	SelectActiveSG	104
16.2.2	SelectEditSG	106
16.2.3	SetEditSGValue	106
16.2.4	ConfirmEditSGValues	107
16.2.5	GetEditSGValue	107
16.2.6	GetSGCBValues	109
17	Reporting and logging class model	110
17.1	Report model – Report control blocks	110
17.1.1	Buffered report control block	110
17.1.2	Unbuffered report control block	112
17.2	Reporting services	113
17.2.1	Report service	113
17.2.2	GetBRCBValues	116
17.2.3	SetBRCBValues	119
17.2.4	GetURCBValues	122
17.2.5	SetURCBValues	122
17.3	Log model	122
17.3.1	Overview	122
17.3.2	Description of LCB attributes	124
17.3.3	Mapping of log and log control services	124
17.3.4	Conformance	130
18	Mapping of the generic substation event model (GSE) – Generic object oriented substation event (GOOSE)	130
18.1	GOOSE control definition	130
18.2	Specialization for Layer 2 GoCB	131
18.3	Specialization for Routable GOOSE	131
18.4	GOOSE services	131
18.4.1	General	131
18.4.2	GetGoCBValues	131
18.4.3	SetGoCBValues	131
19	Transmission of sampled values class model	131
19.1	Sampled value control block	131
19.1.1	General	131
19.1.2	Specialization for Layer 2 Sampled value	131
19.1.3	Specialization for Routable Sampled value	132
19.1.4	Specialization for Unicast Sampled value	132
19.2	Sampled value services	132
19.2.1	General	132
19.2.2	GetMSVCBValues	132
19.2.3	SetMSVCBValues	132
20	Control class model	132
20.1	General	132

20.2	Overview of control services mapping	134
20.3	Select	134
20.4	SelectWithValue	136
20.4.1	SelectWithValue service parameter mapping	136
20.4.2	General mapping of the SelectWithValue service	136
20.4.3	SelectWithValue response–	139
20.5	Cancel	139
20.5.1	Cancel service parameter mapping	139
20.5.2	General mapping of the Cancel service	140
20.5.3	Cancel response–	141
20.6	Operate	142
20.6.1	Operate service parameter mapping	142
20.6.2	General mapping of the Operate service	142
20.6.3	Operate response–	144
20.6.4	CommandTermination service parameter mapping	144
20.6.5	General mapping of the CommandTermination service	144
20.7	TimeActivatedOperate	148
20.7.1	TimeActivatedOperate service parameter mapping	148
20.7.2	Mapping of the TimeActivatedOperate service	148
20.8	TimeActivatedOperateTermination service	148
20.9	AdditionalCauseDiagnosis in negative control service responses	149
20.10	Tracking of control services	152
20.10.1	General	152
20.10.2	Mapping of the Control service tracking (CTS)	152
21	Time and time synchronization model	153
22	Naming conventions	153
23	File transfer	153
23.1	File transfer model	153
23.2	File services	155
23.2.1	GetFile	155
23.2.2	SetFile	161
23.2.3	DeleteFile	163
23.2.4	GetFileAttributeValues	164
24	Conformance	166
24.1	Notation	166
24.2	PICS	166
24.2.1	Profile conformance	166
24.2.2	XML Payload conformance	168
24.3	PICS Statement	189
24.3.1	General	189
24.3.2	Substation configuration language	189
25	Substation Configuration Language (SCL)	189
Annex A (normative)	Communication stack	190
A.1	Overview	190
A.1.1	General	190
A.1.2	XMPP communication profiles	191
A.1.3	Non-XMPP communication profiles	191
A.2	Communication stack	192

A.2.1	Overview of the protocol usage.....	192
A.2.2	Client/server services and communication profiles.....	192
A.2.3	Time sync.....	194
Annex B (informative)	Deployment of XMPP infrastructure.....	196
B.1	General.....	196
B.2	Deployment of XMPP within one XMPP domain.....	196
B.2.1	Use case facility.....	196
B.2.2	Use case hierarchy within a facility.....	197
B.3	Deployment of XMPP while interconnecting more than one XMPP domain.....	198
B.3.1	Interconnection of XMPP Domain.....	198
B.3.2	Definition of a federation communication between XMPP domains.....	204
B.3.3	Interconnection of Domain with federation.....	205
B.4	Communication path outage and recovery.....	209
Annex C (informative)	Security for DER integration based on XMPP.....	210
C.1	General.....	210
C.2	Assumptions and boundary conditions.....	211
C.3	Derivation of security requirements.....	211
C.4	Mapping of security options to XMPP based integration of DER.....	212
C.5	Sequence diagrams.....	213
C.5.1	General.....	213
C.5.2	XMPP and Stream opening.....	213
C.5.3	Stream establishment, ROSTER and presence.....	214
C.5.4	Communication outage.....	215
C.5.5	Request Response (Clear Transfer).....	218
Annex D (normative)	Mapping of services and errors over XMPP stanzas.....	220
Annex E (informative)	Intentional deviations from IEC 61850-8-1 SCSM.....	223
Annex F (informative)	SCL conformance.....	224
Annex G (normative)	XML schema definitions for the XML payload.....	225
G.1	General.....	225
G.2	XML schema of the virtual API for IEC 61850-8-2.....	225
G.3	XML schema of the applicative payload for IEC 61850-8-2.....	225
G.4	Extension of IEC 62351-4 when E2E security is turned off.....	252
Bibliography.....		253
Figure 1 – Overview of functionality and profiles.....		22
Figure 2 – Example of XML Payload.....		25
Figure 3 – Generic structure of client/server ACSI services.....		27
Figure 4 – Algorithm for logical node mapping.....		30
Figure 5 – Ordered list of functional constraints.....		31
Figure 6 – Example of Logical Node type description.....		32
Figure 7 – List of the flattened Named Variables corresponding to an LN.....		33
Figure 8 – XML mapping of a LNReference with direct access.....		34
Figure 9 – XML mapping of a LNReference with alternate access.....		34
Figure 10 – Direct XML mapping of a FCD.....		35
Figure 11 – Direct XML mapping of a FCDA.....		35
Figure 12 – Alternate access without array element.....		36

Figure 13 – Alternate access with array element	38
Figure 14 – Alternate access with flattened variable and array element	39
Figure 15 – XML structure of GetServerDirectory-Request (LD)	58
Figure 16 – XML structure of GetServerDirectory-Response (LD)	58
Figure 17 – XML structure of GetServerDirectory-Request (FILE)	60
Figure 18 – XML structure of GetServerDirectory-Response (FILE).....	60
Figure 19 – XML structure of Associate-Request.....	63
Figure 20 – XML structure of Associate-Response	63
Figure 21 – XML structure of GetLogicalDeviceDirectory-Request	68
Figure 22 – XML structure of GetLogicalDeviceDirectory-Response	68
Figure 23 – XML structure of extended GetLogicalDeviceDirectory-Request	70
Figure 24 – XML structure of extended GetLogicalDeviceDirectory-Response.....	70
Figure 25 – XML structure of GetLogicalNodeDirectory-Request.....	72
Figure 26 – XML structure of GetLogicalNodeDirectory-Response	73
Figure 27 – XML structure of extended GetLogicalNodeDirectory-Request (step 1).....	75
Figure 28 – XML structure of extended GetLogicalNodeDirectory-Response (step 1).....	75
Figure 29 – XML structure of extended GetLogicalNodeDirectory-Request (step 2).....	75
Figure 30 – XML structure of extended GetLogicalNodeDirectory-Response (step 2).....	76
Figure 31 – XML structure of GetAllDataValues-Request	78
Figure 32 – XML structure of GetAllDataValues-Response	79
Figure 33 – XML structure of GetDataValues-Request	80
Figure 34 – XML structure of GetDataValues-Response.....	81
Figure 35 – XML structure of SetDataValues-Request.....	82
Figure 36 – XML structure of SetDataValues-Response	82
Figure 37 – XML structure of GetDataDirectory-Request.....	83
Figure 38 – XML structure of GetDataDirectory-Response	84
Figure 39 – XML structure of extended GetDataDirectory-Request.....	86
Figure 40 – XML structure of extended GetDataDirectory-Response	87
Figure 41 – Mapping of reference to persistent data set within logical device.....	87
Figure 42 – Mapping of reference to persistent data set outside logical device	88
Figure 43 – Mapping of reference to non-persistent data set.....	88
Figure 44 – XML structure of GetDataSetValues-Request	89
Figure 45 – XML structure of GetDataSetValues-Response	90
Figure 46 – XML structure of SetDataSetValues-Request	92
Figure 47 – XML structure of SetDataSetValues-Response.....	92
Figure 48 – XML structure of CreateDataSet-Request.....	94
Figure 49 – XML structure of CreateDataSet-Response	95
Figure 50 – XML structure of DeleteDataSet-Request	97
Figure 51 – XML structure of DeleteDataSet-Response	97
Figure 52 – XML structure of GetDataSetDirectory-Request.....	99
Figure 53 – XML structure of GetDataSetDirectory-Response	100
Figure 54 – XML structure of SelectActiveSG-Request.....	105
Figure 55 – XML structure of SelectActiveSG-Response+	105

Figure 56 – XML structure of SelectActiveSG-Response	105
Figure 57 – XML structure of SelectEditSG-Request	106
Figure 58 – XML structure of SetEditSGValue-Request	107
Figure 59 – XML structure of ConfirmEditSGValues	108
Figure 60 – XML structure of GetEditSGValue-Request	108
Figure 61 – XML structure of GetEditSGValue-Response	109
Figure 62 – XML structure of GetSGCBValues-Request	109
Figure 63 – XML structure of GetSGCBValues-Response	110
Figure 64 – XML structure of Report	115
Figure 65 – XML structure of GetBRCBValues-Request	117
Figure 66 – XML structure of GetBRCBValues-Response	119
Figure 67 – XML structure of SetBRCBValues-Request	121
Figure 68 – XML structure of SetBRCBValues-Response	122
Figure 69 – Relationship of LCB attributes to IEC 61850-7-2 log definitions	123
Figure 70 – XML structure of QueryLogByTime-Request	126
Figure 71 – XML structure of QueryLogByTime-Response	127
Figure 72 – XML structure of QueryLogAfter-Request	129
Figure 73 – XML structure of Select-Request	135
Figure 74 – XML structure of Select-Response	136
Figure 75 – XML structure of SelectWithValue-Request	138
Figure 76 – XML structure of SelectWithValue-Response	139
Figure 77 – XML structure of SelectWithValue-Response	139
Figure 78 – XML structure of CommandTermination Request+	146
Figure 79 – XML structure of CommandTermination Request-	148
Figure 80 – XML structure of Information Report with AdditionalCauseDiagnosis	150
Figure 81 – Mapping of ACSI GetFile to FileOpen, FileRead, FileClose	156
Figure 82 – XML example of FileOpen Request	158
Figure 83 – XML example of FileOpen Response+	158
Figure 84 – XML example of FileRead Request (first)	158
Figure 85 – XML example of FileRead Response+ (first)	159
Figure 86 – XML example of FileRead Request (second)	159
Figure 87 – XML example of FileRead Response+ (second)	159
Figure 88 – XML example of FileClose Request	159
Figure 89 – XML example of FileClose Response	159
Figure 90 – Mapping of ACSI SetFile service	161
Figure 91 – XML example of ObtainFile Request	162
Figure 92 – XML example of ObtainFile Response	162
Figure 93 – XML example of DeleteFile Request	164
Figure 94 – XML example of DeleteFile Response	164
Figure 95 – XML example of GetFileAttributeValues Request	165
Figure 96 – XML example of GetFileAttributeValues Response	166
Figure 97 – VariableSpecification for LDevice/MHA11.HA.phsAHar(7).cVal.mag.f	178

Figure 98 – Shorter VariableSpecification for LDevice/MHAI1.HA.phsAHar(7).cVal.mag.f	179
Figure 99 – Non conformant VariableSpecification I	180
Figure 100 – Non conformant VariableSpecification II	181
Figure 101 – VariableSpecification for LDevice/MHAI1.HA.phsAHar(7) [MX]	182
Figure 102 – Shorter VariableSpecification for LDevice/MHAI1.HA.phsAHar(7) [MX].....	183
Figure A.1 – Overview of functionality and profiles	191
Figure A.2 – OSI reference model and profiles	192
Figure B.1 – Facility domain.....	196
Figure B.2 – Hierarchical Aggregation at facility	197
Figure B.3 – DER Management System at facility	198
Figure B.4 – Facility Management integration at DSO	199
Figure B.5 – Multiple facilities at DSO	200
Figure B.6 – VPP and contracted DERs	201
Figure B.7 – indirect control using VPP JIDs	202
Figure B.8 – VPP direct control using VPP JIDs	202
Figure B.9 – VPP direct control using DSO JIDs	203
Figure B.10 – DSO Indirect control with VPP JIDs	203
Figure B.11 – DSO direct control	204
Figure B.12 – Concept of federation in XMPP	205
Figure B.13 – Federation DSO – Facility	206
Figure B.14 – Use of federation with VPP	206
Figure B.15 – communication with VPP JIDs – indirect control	207
Figure B.16 – VPP communication with VPP JIDs – direct control	207
Figure B.17 – VPP communication with DSO JIDs	208
Figure B.18 – DSO Communication with VPP JIDs.....	209
Figure C.1 – Base system for discussion of IT security requirements	210
Figure C.2 – XMPP Stream establishment – IEC 61850 Server to the XMPP Server	214
Figure C.3 – XMPP Stream establishment – IEC 61850 Client to the XMPP Server.....	214
Figure C.4 – Stream establishment, roster and presence	215
Figure C.5 – Communication outage – Loss of link.....	216
Figure C.6 – Communication outage – Presence unavailable	217
Figure C.7 – Request response.....	218
Figure C.8 – Request – Abort.....	219
Table 1 – Services requiring client/server Communication Profile	23
Table 2 – Mapping of ACSI classes on MMS concepts	30
Table 3 – Mapping of ACSI BasicTypes	40
Table 4 – PhyComAddr structure for Layer 2 communication	44
Table 5 – PhyComAddr for UPD/IP communication	45
Table 6 – GetNameList conflicting IEC 61850 objectClass and objectScope	47
Table 7 – Service error mappings for ACSI services using GetNameList	47
Table 8 – Read service error mappings	48

Table 9 – Write service error mappings	49
Table 10 – GetFileAttributeValues service error mappings	50
Table 11 – Encoding of IEC 61850-7-2 TimeQuality	51
Table 12 – Encoding of the TriggerConditions	52
Table 13 – Encoding of the ReasonForInclusionInReport	52
Table 14 – Encoding of the ReasonForInclusionInLog	53
Table 15 – Encoding of the RCBReportOptions	53
Table 16 – Encoding of the SVMMessageOptions	53
Table 17 – Encoding of the CheckConditions	54
Table 18 – Encoding of IEC 61850-7-2 quality	55
Table 19 – Examples of data values encoding	56
Table 20 – Mapping of ACSI GetServerDirectory (LOGICAL DEVICE).....	57
Table 21 – Mapping of ACSI GetServerDirectory (FILE).....	59
Table 22 – Association model versus communication profiles	60
Table 23 – Mapping of ACSI Associate service	62
Table 24 – Description of Associate request elements	62
Table 25 – Description of Associate response elements.....	63
Table 26 – Associate ACSI service error mappings	64
Table 27 – Mapping of ACSI Release service	66
Table 28 – Release service error mappings	66
Table 29 – Mapping of ACSI GetLogicalDeviceDirectory	67
Table 30 – Extended mapping of ACSI GeLogicalDeviceDirectory.....	69
Table 31 – Objectclasses for GetLogicalNodeDirectory service.....	70
Table 32 – Mapping of ACSI GetLogicalNodeDirectory	72
Table 33 – Extended mapping of ACSI GeLogicalNodeDirectory	74
Table 34 – Mapping of ACSI GetAllDataValues	77
Table 35 – Mapping of GetDataValues service parameters	80
Table 36 – Mapping of SetDataValues service parameters.....	81
Table 37 – Mapping of GetDataDirectory service parameters	83
Table 38 – GetDataDirectory service error mappings	85
Table 39 – Extended mapping of ACSI GetDataDirectory	86
Table 40 – Mapping of GetDataSetValues service parameters	88
Table 41 – GetDataSetValues error mappings	91
Table 42 – Mapping of SetDataSetValues service parameters	91
Table 43 – SetDataSetValues error mappings.....	93
Table 44 – Mapping of CreateDataSet service parameters	94
Table 45 – CreateDataSet service error mappings	96
Table 46 – Mapping of DeleteDataSet service parameters	96
Table 47 – DeleteDataSet service error mappings	98
Table 48 – Mapping of GetDataSetDirectory service parameters.....	99
Table 49 – GetDataSetDirectory service error mappings	101
Table 50 – Mapping of ACSI ServiceType values	101
Table 51 – Mapping of ACSI errorCode values.....	103

Table 52 – Mapping of CDC LTS.....	103
Table 53 – Mapping of CDC GTS.....	104
Table 54 – Mapping of SGCB.....	104
Table 55 – BRCB structure.....	111
Table 56 – URCB structure.....	112
Table 57 – Order of AccessResults for Report.....	113
Table 58 – Mapping of GetBRCBValues service parameters.....	116
Table 59 – Mapping of SetBRCBValues service parameters.....	120
Table 60 – LCB structure.....	123
Table 61 – Mapping of QueryLogByTime service parameters.....	125
Table 62 – ServiceError mappings for Log services.....	129
Table 63 – Mapping of QueryLogAfter-Request parameters.....	129
Table 64 – Log conformance requirements.....	130
Table 65 –TypeDescription definition for GoCB structure.....	130
Table 66 – Controllable service parameters.....	133
Table 67 – Mapping of IEC 61850-7-2 control model to control components.....	133
Table 68 – Mapping of control services.....	134
Table 69 – Mapping of Select parameters.....	135
Table 70 – SelectWithValue service parameter mapping.....	136
Table 71 – Mapping of SelectWithValue parameters.....	137
Table 72 – SelectWithValue, Oper and Cancel DataAccessError specification.....	139
Table 73 – Cancel service parameter mapping.....	140
Table 74 – Mapping of the Cancel service.....	141
Table 75 – Operate service parameter mapping.....	142
Table 76 – Mapping of the Operate service.....	143
Table 77 – Mapping of the CommandTermination service.....	145
Table 78 – Definition of LastApplError variable structure.....	149
Table 79 – Mapping of ACSI AddCause values.....	152
Table 80 – Mapping of CDC CTS.....	153
Table 81 – Mapping of ACSI file class to MMS file object.....	153
Table 82 – Reserved file suffixes.....	154
Table 83 – Mapping of ACSI GetFile service.....	157
Table 84 – GetFile service error mappings.....	158
Table 85 – Mappings of ACSI ServiceErrors to FileOpen Service Errors.....	160
Table 86 – Mappings of ACSI ServiceErrors to FileRead Service Errors.....	160
Table 87 – Mappings of ACSI ServiceErrors to FileClose Service Errors.....	161
Table 88 – Mapping of ACSI SetFile parameters.....	162
Table 89 – Mappings of ACSI ServiceErrors to ObtainFile Service Errors.....	163
Table 90 – Mapping of ACSI DeleteFile service.....	163
Table 91 – Mappings of ACSI ServiceErrors to DeleteFile Service Errors.....	164
Table 92 – Mapping of ACSI GetFileAttributeValues parameters.....	165
Table 93 – PICS for A-Profile support.....	167
Table 94 – PICS for Time Sync A-Profile support.....	167

Table 95 – PICS for T-Profile support	168
Table 96 – MMS InitiateRequest general parameters	168
Table 97 – MMS InitiateResponse general parameters	169
Table 98 – MMS service supported conformance table	169
Table 99 – MMS Parameter CBB	172
Table 100 – GetNameList conformance statement	173
Table 101 – GetCapabilityList conformance statement	173
Table 102 – GetDomainAttributes conformance statement	174
Table 103 – Status conformance statement	174
Table 104 – Cancel conformance statement	175
Table 105 – Identify conformance statement	175
Table 106 – AlternateAccess conformance statement	176
Table 107 – AlternateAccessSelection conformance statement	176
Table 108 – VariableAccessSpecification conformance statement	183
Table 109 – VariableSpecification conformance statement	184
Table 110 – Read conformance statement	184
Table 111 – Write conformance statement	184
Table 112 – InformationReport conformance statement	185
Table 113 – GetVariableAccessAttributes conformance statement	185
Table 114 – DefineNamedVariableList conformance statement	185
Table 115 – GetNamedVariableListAttributes conformance statement	186
Table 116 – DeleteNamedVariableList conformance statement	186
Table 117 – ReadJournal conformance statement	186
Table 118 – EntryContent conformance statement	187
Table 119 – FileDirectory conformance statement	188
Table 120 – FileOpen conformance statement	188
Table 121 – FileRead conformance statement	188
Table 122 – FileClose conformance statement	189
Table 123 – Allowed P-Type definitions for client/server addressing	189
Table A.1 – Service and protocols for client/server communication A-Profile	193
Table A.2 – Service and protocols for client/server XMPP T-Profile	193
Table A.3 – Time sync A-Profile	194
Table A.4 – Time sync T-Profile	195
Table D.1 – ACSI services mapping over XMPP stanzas	220
Table D.2 – Error mapping over XMPP stanzas	222
Table F.1 – SCL conformance degrees	224
Table F.2 – Supported ACSI services for SCL.2	224

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND
SYSTEMS FOR POWER UTILITY AUTOMATION –**
**Part 8-2: Specific Communication Service Mapping (SCSM) –
Mapping to Extensible Messaging Presence Protocol (XMPP)**

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.

International Standard IEC 61850-8-2 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
57/2020/FDIS	57/2039/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This IEC standard includes Code Components i.e components that are intended to be directly processed by a computer. Such content is any text found between the markers <CODE BEGINS> and <CODE ENDS>, or otherwise is clearly labeled in this standard as a Code Component.

The purchase of this IEC standard carries a copyright license for the purchaser to sell software containing Code Components from this standard to end users either directly or via distributors, subject to IEC software licensing conditions, which can be found at: www.iec.ch/CCv1 .

A list of all parts in 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

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.

INTRODUCTION

This part of IEC 61850 is part of a set of specifications which details layered utility communication architecture.

The usage of the IEC 61850 communication standard is largely spreading over all the domains connected to the smart grid, pushing the usage of technologies adapted to the connection of a very large number of applications and devices across the intra/inter-net. The involved domains use already well established protocols typically for exchanging data with IT level applications like resource planning, asset and maintenance management, etc. Therefore, it becomes imperative to provide an integration strategy that allows the integration of IEC 61850 into these various disparate protocols and information.

In this context, this part of IEC 61850 describes a specific communication service mapping (SCSM) over the Extensible Messaging and Presence Protocol (XMPP), 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.

This mapping is intended to be utilized between all kinds of utility Distributed Energy Resource devices and their related management systems, in particular over public networks.

NOTE This part of IEC 61850 does not provide tutorial material. For this purpose, IEC 61850-5 and IEC 61850-7-1 can be read in conjunction with IEC 61850-7-2.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 8-2: Specific Communication Service Mapping (SCSM) – Mapping to Extensible Messaging Presence Protocol (XMPP)

1 Scope

1.1 General

This part of IEC 61850 specifies a method of exchanging data through any kinds of network, including public networks. Among the various kinds of services specified in IEC 61850-7-2, only the client/server and time synchronization services are considered so far.

NOTE Client/server services of GOOSE and SMV models are mapped as well (see Table 1).

For the client/server services, the principle is to map the objects and services of the ACSI (Abstract Communication Service Interface defined in IEC 61850-7-2) to XML messages transported over XMPP. The mapping description includes mainly three aspects:

- The usage of the XMPP protocol itself, describing in details which features are really used and how they are used by the mapping (see Clause 6).
- How to achieve end-to-end secured communications (see Clause 7).
- The description of the XML payloads corresponding to each ACSI service thanks in particular to the XML Schema and XML message examples (starting at Clause 9).

NOTE 1 This document does not address the detailed usage of the XMPP protocol.

NOTE 2 This document does not address system management services.

NOTE 3 For the information of people familiar with the mapping defined in IEC 61850-8-1, the XML messages defined in the present document are derived from those defined in IEC 61850-8-1 but with an XML encoding instead of a binary one. In this way implementing gateways between IEC 61850-8-1 and IEC 61850-8-2 is very straightforward in both directions. However reading IEC 61850-8-1 is not necessary to understand the present document except when it is used in conjunction with one of the GOOSE mappings described in IEC 61850-8-1.

1.2 Namespace name and version

This new section is mandatory for any IEC 61850 namespace (as defined by IEC 61850-7-1).

The parameters which identify this release of the SCSM_8_2 namespace xmlns="http://www.iec.ch/61850/2018/SCSM_8_2" are:

- Namespace Version: 2018
- Namespace Revision: A
- Namespace Release: 1
- Namespace release date: 2018-12

Edition	Publication date	Webstore	Namespace
Edition 1.0	2018-12	IEC 61850-8-2:2018	IEC 61850-8-2:2018