Smart Substation Control and Protection

SSC600

Protocol Implementation Conformance Statement for the IEC 61850 interface in SSC600

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1 About this document

1.1 Read it first!

Before attempting any operation with SSC600, read carefully the device documentation first.

This document is addressed to anyone who needs to interact with SSC600 and its IEC 61850 features in more detail.

1.2 Document information

Revision History

Revision	Date	Note
A	27 Dec 2018	SSC600 v1.0
B	26 March 2020	FP1 added
C	9 Nov 2021	FP3 added

Applicability

This manual is applicable to all SSC600 Smart Substation Control and Protection device versions mentioned in document Revision History above or newer versions if document update is not required.

2 Safety Information

There are safety warnings and notes in the following text. They are in a different format to distinguish them from normal text.

Safety warning

The safety warnings should always be observed. Non-observance can result in death, personal injury or substantial damages to property. Guarantee claims might not be accepted when safety warnings are not respected. They look like below:

Do not make any changes to the SSC600 configuration unless you are familiar with the SSC600 and its configuration tool. This might result in disoperation and loss of warranty.

Note

A note contains additional information worth noting in the specific context, and looks like below:

The selection of this control mode requires caution, because operations are allowed both from the HMI and remotely.

3 Abbreviations, Definitions and Conventions

3.1 Abbreviations

HMI	**H**uman **M**achine **I**nterface
LCD	**L**iquid **C**rystal **D**isplay
SLD	**S**ingle **L**ine **D**iagram
LED	**L**ight **E**mitting **D**iode
GPS	**G**lobal **P**ositioning **S**ystem
SCADA	**S**upervision, **C**ontrol **a**nd **D**ata **A**cquisition
CT	**C**urrent **T**ransformer
VT	**V**oltage **T**ransformer
SI	**S**ensor **I**nput
Y	**Y**es
N	**N**o

3.2 Definitions

Operational State:	the unit is active and it is protecting and controlling the switch-gear.
Stand-alone:	the unit is not connected to a Scada system.
M/m:	mandatory support. The item shall be implemented.
C/c:	conditional support. The item shall be implemented if the stated condition exists.
O/o:	optional support. The implementation may decide to implement the item.
x:	excluded: The implementation shall not implement this item.
i:	out-of-scope: The implementation of the item is not within the scope of this product.
F/S:	Functional Standard. Should be applied.
Base:	Shall be applied in any application claiming conformance to this standard.

4 Reference Documents

Ref	Document id	Rev	Document title
[1]	61850-8-1 First edition 2004-05		Communication networks and systems in substations - Part 8-1: Specific communication service mapping (SCSM) – Map-pings to MMS (ISO/IEC 9506 Part 1 and Part 2) and to ISO/IEC 8802-3
[2]	61850-10 First edition 2005-05		Communication networks and systems in substations – part 10: Conformance testing
[3]	61850-7-2 First edition 2003-05		Communication networks and systems in substations – Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)
[4]	61850-6 First edition 2004-03		Communication networks and systems in substations - Part 6: Configuration description language for communication in electrical substations related to IEDs
[5]	61850-7-3 First edition 2003-05		Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes
[6]	61850-7-4 First Edition 2003-05		Communication networks and systems in substations – Part 7-4

5 Introduction

This document defines the compliance to IEC 61850 in terms of service, modeling and engineering interfaces. Also, exceptions and local adaptations are described.

The conformance statements and documents are referred as PICS (Protocol Implementation Conformance Statement), MICS (Model Implementation Conformace Statement) and local adaptations to be published are described in PIXIT (Protocol Implementation eXtra Information for Testing). ACSI conformance statement describes the abstract services interfaces, which are normally mapped to certain SCSM and therefore indirectly stated in PICS.

The purpose of the information in this document is to give a user, to a system integrator a detailed explanation of IEC 61850 capabilities of a product.

5.1 Scope of this statement

The scope of this document is one product/software module. This is identified as follows:

Product family / name:

Product designation: SSC600

Product version: See Document Revision History

Role(s) in two-party association (TP, c/s): Server

Role(s) in multicast association (MC, GOOSE, GSSE): GOOSE

Notes, exceptions: MMS conformance statement is not filled

6 ACSI conformance statement

6.1 General

These tables are according to 7-2. [3]

6.2 ASCI basic conformance statement

Table 6-1– Basic conformance statement

		Client/ Subscriber	Server/ Publisher	Value/Comments
Client-Server roles				
B11	**Server** side (of TWO-PARTY-APPLICATION-ASSOCIATION)	—	Y	
B12	**Client** side of (TWO-PARTY-APPLICATION-ASSOCIATION)	N	—	
SCSMs supported				
B21	**SCSM**: IEC 61850-8-1 used	N	Y	
B22	**SCSM**: IEC 61850-9-1 used	N	N	
B23	**SCSM**: IEC 61850-9-2 used	Y	N	
B24	**SCSM**: other			
Generic substation event model (GSE)				
B31	**Publisher** side	—	Y	
B32	**Subscriber** side	Y	—	
Transmission of sampled value model (SVC)				
B41	**Publisher** side	—	N	
B42	**Subscriber** side	Y	—	

6.3 ACSI models conformance statement

Table 6-2– ACSI models conformance statement

		Client/ Subscriber	Server/ Publisher	Value/Comments
If **Server** side (B1) supported				
M1	**Logical device**	N	Y	
M2	**Logical node**	N	Y	
M3	**Data**	N	Y	
M4	**DATA-SET**	N	Y	
M5	**Substitution**	N	N	
M6	**Setting group control**	N	Y	
	Reporting			
M7	**Buffered report control**	N	Y	
M7-1	OptFlds.sequence-number	N	Y	
M7-2	OptFlds.report-time-stamp	N	Y	
M7-3	OptFlds.reason-for-inclusion	N	Y	
M7-4	OptFlds.data-set-name	N	Y	
M7-5	OptFlds.data-reference	N	Y	
M7-6	OptFlds.buffer-overflow	N	Y	
M7-7	OptFlds.entryID	N	Y	
M7-8	BufTim	N	Y	
M7-9	IntgPd	N	Y	
M7-10	GI	N	Y	
M7-11	OptFlds.conf-revision	N	Y	
M8	**Unbuffered report control**	N	Y	
M8-1	OptFlds.sequence-number	N	Y	
M8-2	OptFlds.report-time-stamp	N	Y	
M8-3	OptFlds.reason-for-inclusion	N	Y	
M8-4	OptFlds.data-set-name	N	Y	
M8-5	OptFlds.data-reference	N	Y	
M8-6	BufTim	N	Y	
M8-7	IntgPd	N	Y	
M8-8	GI	N	Y	
M8-9	OptFlds.conf-revision	N	Y	
	Logging	N	N	
M9	**Log control**	N	N	
M9-1	IntgPd			
M10	**Log**	N	N	
M11	**Control**	N	Y	
If **GSE** (B31/32) is supported				
M12	**GOOSE**	Y	Y	
M13	**GSSE**	N	N	
If **SVC** (41/42) is supported				

		Client/ Subscriber	Server/ Publisher	Value/Comments
M14	Multicast SVC	Y	N	
M15	Unicast SVC	N	N	
M16	**Time**	Y	N	SNTP and IEEE 1588 (PTP)
M17	**File Transfer**	N	Y	
M18	**Application association**	N	Y	
M19	**GOOSE Control Block**	N	Y	
M20	**Sampled Value Control Block**	N	N	

6.4 ACSI service conformance statement

The ACSI service conformance statement shall be as defined in Table 6-3 (depending on the statements in Table 6-2).

Table 6-3 – ACSI service Conformance statement

	Services	AA: TP/MC	Client (C)	Server (S)	Comments
Server					
S1	GetServerDirectory	TP	N	Y	
Application association					
S21	Associate_Request		N	Y	
S22	Associate_Response		N	Y	
S31	Abort_Request		N	Y	
S32	Abort_Response		N	Y	
S41	Release_Request		N	Y	
S42	Release_Response		N	Y	
Logical device					
S5	GetLogicalDeviceDirectory	TP	N	Y	
Logical node					
S6	GetLogicalNodeDirectory	TP	N	Y	
S7	GetAllDataValues	TP	N	Y	
Data					
S8	GetDataValues	TP	N	Y	
S9	SetDataValues	TP	N	Y	
S10	GetDataDirectory	TP	N	Y	
S11	GetDataDefinition	TP	N	Y	
Data set					
S12	GetDataSetValues	TP	N	Y	
S13	SetDataSetValues	TP	N	N	
S14	CreateDataSet	TP	N	N	
S15	DeleteDataSet	TP	N	N	

	Services	AA: TP/MC	Client (C)	Server (S)	Comments
S16	GetDataSetDirectory	TP	N	Y	
Substitution					
S17	SetDataValues	TP	N	N	
Setting group control					
S18	SelectActiveSG	TP	N	Y	
S19	SelectEditSG	TP	N	Y	
S20	SetSGValues	TP	N	Y	
S21	ConfirmEditSGValues	TP	N	Y	
S22	GetSGValues	TP	N	Y	
S23	GetSGCBValues	TP	N	Y	
Reporting					
Buffered report control block (BRCB)					
S24	Report	TP	N	Y	
S24-1	data-change (dchg)		N	Y	
S24-2	quality-change (qchg)		N	Y	
S24-3	data-update (dupd)		N	N	
S25	GetBRCBValues	TP	N	Y	
S26	SetBRCBValues	TP	N	Y	
Unbuffered report control block (URCB)					
S27	Report	TP	N	Y	
S27-1	data-change (dchg)		N	Y	
S27-2	quality-change (qchg)		N	Y	
S27-3	data-update (dupd)		N	N	
S28	GetURCBValues	TP	N	Y	
S29	SetURCBValues	TP	N	Y	
Logging					
Log control block					
S30	GetLCBValues	TP	N	N	
S31	SetLCBValues	TP	N	N	
Log					
S32	QueryLogByTime	TP	N	N	
S33	QueryLogAfter	TP	N	N	
S34	GetLogStatusValues	TP	N	N	
Generic substation event model (GSE)					
GOOSE					
S35	SendGOOSEMessage	MC	Y	Y	
GOOSE Control Block					
S36	GetReference	TP	N	N	
S37	GetGOOSEElementNumber	TP	N	N	
S38	GetGoCBValues	TP	N	Y	
S39	SetGoCBValues	TP	N	Y	
GSSE					
S40	SendGSSEMessage	MC	N	N	

	Services	AA: TP/MC	Client (C)	Server (S)	Comments
GSSE Control Block					
S41	GetGsReference	TP	N	N	
S42	GetGSSEElementNumber	TP	N	N	
S43	GetGsCBValues	TP	N	N	
S44	SetGsCBValues	TP	N	N	

Transmission of sampled value model (SVC)					
Multicast SVC					
S45	SendMSVMessage	MC	Y	N	
Multicast Sampled Value Control Block					
S46	GetMSVCBValues	TP	N	N	
S47	SetMSVCBValues	TP	N	N	
S62	GetMSVReference	TP	N	N	
S63	GetMSVElementNumber	TP	N	N	
Unicast SVC					
S48	SendUSVMessage	TP	N	N	
Unicast Sampled Value Control Block					
S49	GetUSVCBValues	TP	N	N	
S50	SetUSVCBValues	TP	N	N	

Control					
S51	Select		N	N	
S52	SelectWithValue	TP	N	Y	
S53	Cancel	TP	N	Y	
S54	Operate	TP	N	Y	
S55	CommandTermination	TP	N	Y	
S56	TimeActivatedOperate	TP	N	N	

File transfer					
S57	GetFile	TP	N	Y	
S58	SetFile	TP	N	N	
S59	DeleteFile	TP	N	Y	
S60	GetFileAttributeValues	TP	N	Y	
S61	GetServerDirectory	TP	N	Y	

Time					
T1	Time resolution of internal clock			2^{-10} *(1ms)*	nearest negative power of 2 in seconds
T2	Time accuracy of internal clock			T1	T0 (10ms) T1 (1ms) T2 (100µs) T3 (25µs) T4 (4µs) T5 (1µs)
T3	supported TimeStamp resolution	-		2^{-10} *(1ms)*	nearest negative power of 2 in seconds according to IEC61850-7-2, paragraph 5.5.3.7.3.3

7 SCL conformance statement

Defines several degrees of conformance for which implementations may declare support of the substation configuration language. [1]

Table 7-1 – SCL conformance degrees

	SCL Conformance	Client-CR			Server-CR		
		Base	F/S	Value/Range	Base	F/S	Value/Range
SCL.1	SCL File for Implementation Available (offline)				m	m	*Supported, SCL file export from tool*
SCL.2	SCL File available from implementation online	O	o		o	o	*Not Supported,*
SCL.3	SCL implementation reconfiguration supported online	O	o		o	o	*Not Supported*

8 PICS – Protocol conformance statement

8.1 Profile conformance

Table 8-1 and Table 8-2 define the basic conformance statement.

Table 8-1 – PICS for A-Profile support

	Profile Description	**Client**		**Server**		**Value/Comment**
		F/S		F/S		
A1	Client/Server A-Profile		N		Y	
A2	GOOSE/GSE Management A-Profle		Y		Y	
A3	GSSE A-Profile		N		N	
A4	TimeSync A-Profile		Y		N	
A5	Security for Client/server A-Profile		N		N	
A6	Security for GOOSE /GSE management services A-Profile		N		N	
A7	SV / SV management services A-Profile		N		Y	
A8	Security for SV / SV management services A-Profile		N		N	
Tm1	Simple Network Time Protocol		Y		N	
Tm2	PTP Profile for Power Utility Automation		Y		N	

Table 8-2 – PICS for T-Profile support

		Client		Server		Value/Comment
		F/S		F/S		
T1	TCP/IP T-Profile		N		Y	
T2	OSI T-Profile		N		N	
T3	GOOSE/GSE management services T-Profile		Y		Y	
T4	GSSE T-Profile		N		N	
T5	TimeSync T-Profile		Y		N	
T6	SV / SV management services T-Profile		N		Y	
T7	Security for TCP/IP T-Profile		N		N	
T8	Routable GOOSE T-Profile		Y		Y	*Security not supported*
T9	Routable SV T-Profile		N		N	

8.2 MMS Conformance

MMS conformance quaranteed by MMS stack vendor, ie. Sisco Inc.

All needed services supporting the ACSI services stated to be supported in paragraph 2. are supported by the MMS stack used.

9 PIXIT

In this chapter, the essentials for device communication configuration and integration are described. PIXIT is given as a separate document.

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PICS 758924 C 2021

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