IEC 61850 Server

Datasheet

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Content

1. IEC 61850 SERVER & GOOSE 4

1.1. What are the advantages of IEC 61850? 4

1.2. IEC 61850 4

2. REQUIREMENTS 5

3. DETAILED LIST OF NEW FEATURES 6

4. FUNCTIONAL RANGE 7

5. PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT 8

5.1. Table A.1 – Basic conformance statement 8

5.2. Table A.2 - ACSI models conformance statement 9

5.3. Table A.3 – ACSI service Conformance statement 11

1. IEC 61850 Server & GOOSE

IEC 61850 is a new worldwide accepted standard that defines the communication between electrical switchgear, control equipment in substation automation and the related system requirements.

1.1. What are the advantages of IEC 61850?

Because many different communication protocols are being used in substation automation, protocol converters are commonplace. Equipment vendors are facing significant challenges interfacing communications, leading to higher development costs for hardware vendors and increased integration and maintenance costs for network operators.

IEC 61850 has been devised to send messages between sender and receiver in an optimal way, making communication as direct as possible to avoid losses in performance and functionality. IEC 61850 standard provides a consistent standard unifying substation automation and distributed power generation equipment, from the switchgear right up to supervisory control and monitoring functions.

1.2. IEC 61850

The Energy and Water industries require more and more complex protocols and control applications to meet the growing demands for more information, more often. COPA-DATA is developing a range of components for its customers to facilitate the integration of industry-standard protocols and applications and is simplifying the configuration process by providing the end customer with easy-to-use graphical tools. The IEC61850 is one new component that comes in addition to the existing ones like IEC60870-101 slave, IEC60870-104 server and DNP3 slave protocols.

CP_R1_005_B

2. Requirements

The integration of IEC61850 requires some tools from STRATON AUTOMATION.

Product:

- straton Runtime Development Kit: Necessary for the integration of the straton runtime on the required platforms.
- straton Driver Development Kit: Interface to integrate new protocols to the straton runtime.
- straton IEC61850 Server Tool Kit

Requirement:

- GCC 4.8.1 (2011 C++ standard)
- TLS library (option)
- NTP Server
- RAM > 2G
- Flash > 2G
- CPU at least 1GHz

Tested devices:

- X86 / Linux / Debian 3.16
- Arm / Linux / Raspbian

CP_R1_005_B

3. Detailed list of new features

The IEC61850 server protocol stack includes the source code and the configuration tool for straton.

- Integration in the straton runtime
- Portable stack (C++ compiler required)
- Features supported:
    - Multiple connections by IEC 61850 clients by TCP/IP
    - Browse the data model (Logical Devices, Logical Nodes, Data Objects and Data Attributes)
    - Read and write of Data values
    - Read and write of Data Set values
    - Create and delete dynamically Data Sets
    - Control Model (all models)
    - Reporting (buffered and unbuffered)
    - File transfer
- Configuration tool provided with the straton development tool (IDE).
- License for product including straton runtime

4. Functional Range

The IEC 61850 Slave driver for straton currently supports the following features (as defined in the standard IEC 61850):

- Multiple connections by IEC 61850 clients by TCP/IP
- Browse the data model (Logical Devices, Logical Nodes, Data Objects and Data Attributes)
- Read and write of Data values
- Read and write of Data Set values
- Create and delete dynamically Data Sets
- Control Model (all models)
- Reporting (buffered and unbuffered)
- File transfer

For a full list of supported services see section ASCI conformance statement.

Additionally, the driver supports the features listed below to control the driver using straton:

- Read an ICD (IED Capability Description) file to build the data model
- Display and change of values at runtime

5. Protocol Implementation Conformance Statement

5.1. Table A.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 6185-8-1 used	Y	Y	
B22	**SCSM**: IEC 6185-9-1 used	N	N	
B23	**SCSM**: IEC 6185-9-2 used	N	N	
B24	**SCSM**: other	N	N	
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	N	—	
– Y = supported N or empty = not supported				

CP_R1_005_B

5.2. Table A.2 - ACSI models conformance statement

		Client/ Subscriber	Server/ Publisher	Value/ Comments
If Server or Client side (B11/12) supported				
M1	Logical device		Y	
M2	Logical node		Y	
M3	Data		Y	
M4	Data set		Y	
M5	Substitution		Y	
M6	Setting group control		N	
	Reporting			
M7	Buffered report control		Y	
M7-1	sequence-number		Y	
M7-2	report-time-stamp		Y	
M7-3	reason-for-inclusion		Y	
M7-4	data-set-name		Y	
M7-5	data-reference		Y	
M7-6	buffer-overflow		Y	
M7-7	entryID		Y	
M7-8	BufTm		Y	
M7-9	IntgPd		Y	
M7-10	GI		Y	
M8	Unbuffered report control		Y	
M8-1	sequence-number		Y	

CP_R1_005_B

M8-2	report-time-stamp		Y	
M8-3	reason-for-inclusion		Y	
M8-4	data-set-name		Y	
M8-5	data-reference		Y	
M8-6	BufTm		Y	
M8-7	IntgPd		Y	
M8-8	GI		Y	
	Logging		N	
M9	Log control		N	
M9-1	IntgPd		N	
M10	Log		N	
M11	Control		N	
If GSE (B31/32) is supported				
M12	GOOSE	Y	Y	
M13	GSSE	N	N	
If SVC (41/42) is supported				
M14	Multicast SVC	N	N	
M15	Unicast SVC	N	N	
If Server or Client side (B11/12) supported				
M16	Time		N	
M17	File Transfer	N	Y	
– Y = supported N or empty = not supported				

CP_R1_005_B

5.3. Table A.3 – ACSI service Conformance statement

	Services	AA: TP/MC	Client (C)	Server (S)	Comments
Server					
S1	GetServerDirectory	TP	N	Y	
Application association					
S2	Associate		N	Y	
S3	Abort		N	Y	
S4	Release		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					

CP_R1_005_B

S12	GetDataSetValues	TP		Y	
S13	SetDataSetValues	TP		Y	
S14	CreateDataSet	TP		Y	
S15	DeleteDataSet	TP		Y	
S16	GetDataSetDirectory	TP		Y	
Substitution					
S17	SetDataValues	TP	N	N	
Setting group control					
S18	SelectActiveSG	TP	N	N	
S19	SelectEditSG	TP	N	N	
S20	SetSGValues	TP	N	N	
S21	ConfirmEditSGValues	TP	N	N	
S22	GetSGValues	TP	N	N	
S23	GetSGCBValues	TP	N	N	
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	Y	
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	Y	
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-CONTROL-BLOCK					
S35	SendGOOSEMessage	MC	Y	Y	
S36	GetGoReference	TP	N	N	

S37	GetGOOSEElementNumber	TP	N	N	
S38	GetGoCBValues	TP	N	N	
S39	SetGoCBValues	TP	N	N	
GSSE-CONTROL-BLOCK					
S40	SendGSSEMessage	MC	N	N	
S41	GetGsReference	TP	N	N	
S42	GetGSSEDataOffset	TP	N	N	
S43	GetGsCBValues	TP	N	N	
S44	SetGsCBValues	TP	N	N	
Transmission of sampled value model (SVC)					
Multicast SVC					
S45	SendMSVMessage	MC	N	N	
S46	GetMSVCBValues	TP	N	N	
S47	SetMSVCBValues	TP	N	N	
Unicast SVC					
S48	SendUSVMessage	TP	N	N	
S49	GetUSVCBValues	TP	N	N	
S50	SetUSVCBValues	TP	N	N	
Control					
S51	Select			Y	
S52	SelectWithValue	TP		Y	

S53	Cancel	TP		Y	
S54	Operate	TP		Y	
S55	CommandTermination	TP		Y	
S56	TimeActivatedOperate	TP		N	
File transfer					
S57	GetFile	TP		Y	
S58	SetFile	TP		Y	
S59	DeleteFile	TP		Y	
S60	GetFileAttributeValues	TP		Y	
Time					
T1	Time resolution of internal clock			1ms	nearest negative power of 2 in seconds
T2	Time accuracy of internal clock			1s	T0 (10ms) T1 (1ms) T2 (100µs) T3 (25µs) T4 (4µs) T5 (1µs)
T3	Supported TimeStamp resolution			1ms	nearest negative power of 2 in seconds

CP_R1_005_B