

HiOS IEC61850 Protocol Implementation eXtra Information for Testing

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1. History

Version	Date	Status	Author	Changes
0v1	17.06.2015		Dragos Ionut GALALAE	Document created Added tables with initial values
0v2	03.08.2015		Bernhard Wiegel	Document review
0v3	18.08.2015		Dragos Ionut GALALAE	Incorporated document review by Bernhard Wiegel
1v0	28.08.2015	Final	Bernhard Wiegel	Review and finalize document

2. Scope

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface implemented in HiOS.

Together with the PICS and the MICS the PIXIT forms the basis for a conformance test according to IEC 61850-10. The PIXIT entries contain information which is not available in the PICS, MICS, TICS documents or SCL file.

3. PIXIT tables

Each table specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The "Ed" column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2.

3.1. Association model

ID	Ed	Description	Value / Clarification
As1	1,2	Maximum number of clients that can set-up an association simultaneously	15
As2	1,2	TCP_KEEPALIVE value. The recommended range is 1..20s	10 seconds
As3	1,2	Lost connection detection time	TCP_KEEPIDLE = 10 s TCP_KEEPCNT = 9 TCP_KEEPIINIT = 10 s TCP_KEEPIINTVL = 1s 10S AFTER ASSOCIATION START TO BEGIN SENDING KEEPALIVE, AND 9S (9 * 1S) TO DETECT LOST CONNECTION.
As4	-	Authentication is not supported yet	
As5	1,2	What association parameters are necessary for successful association	Transport selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N

ID	Ed	Description	Value / Clarification
As6	1,2	If association parameters are necessary for association, describe the correct values e.g.	Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title n/a AE Qualifier n/a
As7	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size 32000 bytes Min MMS PDU size 1024 bytes
As8	1,2	What is the maximum start up time after a power supply interrupt	Hardware dependant / 180 seconds

3.2. Server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Which analogue value (MX) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable Y Overflow Y OutofRange N BadReference N Oscillatory N Failure Y OldData N Inconsistent N Inaccurate Source: Y Process Y Substituted Y Test Y OperatorBlocked See Remark 1.
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable N BadReference N Oscillatory N Failure Y OldData N Inconsistent

ID	Ed	Description	Value / Clarification
			N Inaccurate Source: Y Process Y Substituted Y Test Y OperatorBlocked See Remark 1.
Sr3	-	What is the maximum number of data object references in one GetDataValues request	Deprecated
Sr4	-	What is the maximum number of data object references in one SetDataValues request	Deprecated
Sr5	1,2	Which Mode values are supported ¹	On Y [On-]Blocked Y Test Y Test/Blocked Y Off Y Note 1: LD0/LLN0 (Root LD) accepts the values On, Blocked, Test and Test/Blocked but not Off for Mod. Only values ON and Off are accepted by the individual LNs for Mod. Other values results in negative response. Note2: If the PST setting "RemoteModControl" is set to "Off" (default), all writes to Mod will be rejected.

Remark 1: Writes to the data attribute subQ accepts the values Invalid, Good, Test, Questionable + OperatorBlocked and Invalid + OperatorBlocked

3.3. Data set model

ID	Ed	Description	Value / Clarification
Ds1	1,2	What is the maximum number of data elements in one data set (compare ICD setting)	maxAttributes = 330 maximum FCDAs = 150 -> whatever limit is reached first.
Ds2	1,2	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)	No online creation

¹ IEC 61850-6:2009 clause 9.5.6 states that if only a subrange of the enumeration value set is supported, this shall be indicated within an ICD file by an enumeration type, where the unsupported values are missing

Ds3	1,2	How many non-persistent data sets can be created by one or more clients	No online creation
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3.4. Substitution model

ID	Ed	Description	Value / Clarification
Sb1	1,2	Are substituted values stored in volatile memory	N

3.5. Setting group control model

ID	Ed	Description	Value / Clarification
Sg1	1,2	What is the number of supported setting groups for each logical device	Maximum 6, default value = 1 The amount of setting groups is set in the configuration. There is only one setting group control block, it is defined in the Root LD.
Sg2	1,2	What is the effect of when and how the non-volatile storage is updated (compare IEC 61850-8-1 §16.2.4)	Editing of setting group is not supported using IEC 61850
Sg3	1,2	Can multiple clients edit the same setting group	Editing of setting group is not supported using IEC 61850
Sg4	1,2	What happens if the association is lost while editing a setting group	Editing of setting group is not supported using IEC 61850
Sg5	1,2	Is EditSG value 0 allowed	Editing of setting group is not supported using IEC 61850
Sg6	1,2	When ResvTms is not present how long is an edit setting group locked	Editing of setting group is not supported using IEC 61850

3.6. Reporting model

ID	Ed	Description	Value / Clarification
Rp1	1,2	The supported trigger conditions are (compare PICS)	integrity Y data change Y quality change Y data update Y general interrogation Y
Rp2	1,2	The supported optional fields are	sequence-number Y report-time-stamp Y reason-for-inclusion Y data-set-name Y data-reference Y buffer-overflow Y entryID Y conf-rev Y segmentation Y
Rp3	1,2	Can the server send segmented reports	Y

ID	Ed	Description	Value / Clarification
Rp4	1,2	Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 §14.2.2.9)	Send report immediately
Rp5	1,2	Multi client URCB approach (compare IEC 61850-7-2:2003 §14.2.1)	URCB not supported
Rp6	-	What is the format of EntryID	Deprecated
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered	50000 bytes for each used BRCB (max. 100 BRCB instances)
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL report settings	Deprecated
Rp9	1,2	May the reported data set contain: - structured data objects - data attributes	Y Y
Rp10	1,2	What is the scan cycle for binary events Is this fixed, configurable	5 ms Fixed
Rp11	1,2	Does the device support to pre-assign a RCB to a specific client in the SCL	Not supported
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	Restored from original configuration

(*) In case of unbuffered reporting the Resv attribute will be set to 'true' for pre-assigned URCBs. However the device will not block other clients from connecting the RCBs. Client has to utilize the pre-assign information from SCL to enable the correct RCB instance.

3.7. Logging model

ID	Ed	Description	Value / Clarification
Lg1	1,2	What is the default value of LogEna (Compare IEC 61850-8-1 §17.3.3.2.1, the default value should be FALSE)	N/A
Lg2	-	What is the format of EntryID	Deprecated
Lg3	1,2	Are there are multiple Log Control Blocks that specify the Journaling of the same MMS NamedVariable and TrgOps and the Event Condition (Compare IEC 61850-8-1 §17.3.3.3.2)	N/A
Lg4	1	Pre-configured LCB attributes that cannot be changed online	N/A

3.8. Time synchronization model

ID	Ed	Description	Value / Clarification
Tm1	1,2	What time quality bits are supported (may be set by the IED)	N LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized

ID	Ed	Description	Value / Clarification
Tm2	1,2	Describe the behaviour when the time server(s) ceases to respond What is the time server lost detection time	The HiOS can have several configured SNTP Servers. If the first fails, the second is taken into use. There is an automatic switch 'back' if an erroneous one comes operable. If all SNTP servers are off-line the event timestamps get ClockNotSynchronized status. The time to detect error and change to 2nd server is 2 seconds. If no backup server is defined, there is a timeout of 5 minutes. 2 seconds
Tm3	1,2	How long does it take to take over the new time from time server	2 seconds
Tm4	1,2	When is the time quality bit "ClockFailure" set	Since HiOS devices run an internal system clock always the bit ClockFailue is never set. In case the internal clock is not synchronized with an external source the bit ClockNotSynchronized is set.
Tm5	1,2	When is the time quality bit "Clock not Synchronized" set	When connection to all time servers is lost (see PIXIT-Tm2)
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle	Deprecated
Tm7	1,2	Does the device support time zone and daylight saving	Y
Tm8	1,2	Which attributes of the SNTP response packet are validated	Y Leap indicator not equal to 3 N Mode is equal to SERVER Y OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 and/or 4 N other (describe)
Tm9	1,2	Do the COMTRADE files have local time or UTC time and is this configurable	The file attribute is in UTC. The START Time inside the COMTRADE file is in local time. No not configurable.

4. Review

Version	Date	Reviewed by	Remarks
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	dd.mm.yyyy	Lead Engineer / Specialist	
0v2	03.08.2015	Bernhard Wiegel	
1v0	28.08.2015	Bernhard Wiegel	

5. References / Standards

See IEC 61850-10 for more info.