

Test Procedures Change List (TPCL) for
IEC 61850 server test procedures revision 2.3
Version 1.5

UCA International Users Group
Testing Sub Committee

Date: March 7, 2012

Introduction

Problems that are uncovered during conformance testing that impact the IEC 61850 Standard are taken back through the TISSUES Process. However, there are some problems that relate only to the content of the Test Procedures. The UCAiug is the owner of the Test Procedures and so has the responsibility for tracking changes. Given the long time lag between major versions, we have a need to track interim changes that may impact testing. This "Test Procedures Change List (TPCL)" document specifies such interim changes. The UCAiug test sub committee reviews and approves each change. Changes resulting in new test procedures shall be specified in the next revision of the test procedures.

This list:

- Contains changes to the most recent (server) test procedures
- Indicate if a change is:
 - Accepted, resulting in a clarified test procedure (included after the change list table)
 - Denied
 - Added to the next revision
- Shall be used by recognized/accredited test labs
- Should be referenced in the test report only
- Is available at the UCAiug sharepoint for test sub committee members

References

Conformance Test Procedures for Server Devices with IEC 61850-8-1 interface,
Revision 2.3, August 17, 2011

Approved Change List

ID	TEST CASE	CHANGE	FINAL PROPOSAL	RESULT
1	Mdl12	Define the use of name spaces for Ed2 LN used in Ed1 devices	See new test procedure Mdl12	
2	Srv6	The read/write ability may be indicated in the SCL using the valKind="Set" or "RO"	See new test procedure Srv6	
3	Certificate	Include a reference to the TPCL and reduce the text where possible	See new template	

ID	TEST CASE	CHANGE	FINAL PROPOSAL	RESULT
4	PIXIT	Update PIXIT template for: Rp7 (bytes or nr.of.reports), Go9 specify datatypes instead of CDC and Go10/Go11, Go13 Ft1: zip or COMTRADE supported Zip structure: all files in the same folder, in subfolders, etc. Add 2 entries: COMTRADE files zipped Y/N when yes the structure of the files in the zip. (I assume these are just the one xxxx.cfg and on xxxx.dat file, I don't see a need for structure in the zip)	Attached	
5	Rp2/Rp3 Br2/Br3	Move the expected result "sequence number increment" from Rp2 to Rp3	Attached	
6	RptID	An interoperability was reported caused by indexing an RptID.	Extend Rp4 to verify a non-null RptID, Attached	
7	Data model	Figure 3 in IEC 61850-8-1 states that the order of Functional Constraints is just a recommendation!	Verify only the order of data attributes with the FC	
8	Sg2	Changing all settings to a new value is very complicated and may result in issue for testing	Reduce "all" by several or one for each datatype of setting, Attached	
9	Ctl3	Select all control object or just multiple. The abstract test case and detailed test procedures are not consistent	Make consistent to multiple, attached	
10	DsetN6 DsetN7	The maximum number of datasets may be exceeded. Update the expected result	Update the expected result, attached	
11	TICS	TISSUE #60 is Ed2 and shall be removed from the template	Remove #60	
12	RpN5	Resv attribute is missing in the list of step 2	Add Resv, Attached	

List of denied and next revision changes

ID	TEST CASE	CHANGE	FINAL PROPOSAL	RESULT
1	-	The certificate template specifies the number of test per conformance blocks. We assumed the total number was incorrect	After second analysis the total numbers of test cases specified in the table on the front page of the certificate is correct	No change
2	Sg3, SgN1a	Sg3 is conditional as such SgN1a should be conditional as well	NO only part 2 of SgN1a is conditional part 1 and 3 are mandatory	No change
3	Gos	What is the expected result when a subscribed goose element has quality "test"? Its probably ignored just like "invalid"	This is related to application logic and less to firmware.	No change

Clarified Modelling Test Procedures (in alphabetical order)

Mdl10	<p>Check if the order of the data attributes with the same functional constraint of the Data Object type match with IEC 61850-7-3</p> <p>Passed when all data attributes are in matching order</p>	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
-------	---	---

Mdl12	Ed2 data model extensions in Ed1 device	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-1 clause 14		
IEC 61850-7-4 Ed2		

Expected result

The SCL file of the Ed1 device

- Shall use 7-3 Ed1 CDC's also for the Ed2 LN Data objects
- Shall use INS/INC/ING instead of ENS/ENC/ENG
- Shall NOT use 7-3 Ed2 specific CDC's as for example: VSS, VSG, TSG as ORG
- Shall only use the part 8-1 Ed1 basic data types (for example no INT64)

The use of name space is as follows:

- IdNs = IEC 61850-7-4:2003
- Ed1 LN don't need a InNs
- Ed2 LN shall have InNs = IEC 61850-7-4:2007

Presence and order of Data Objects (DO)

- Ed1 LN shall have the mandatory DO's according to Ed1
- Ed2 LN shall have the mandatory DO's according to Ed2
- Ed1 LN shall have the DO's in the same order as specified in Ed1
- The order of DO's for Ed2 LN is not required anymore and not verified

The use of dataNs is as follows

- A private DO in any Ed1/Ed2 LN shall have a private dataNs value
- A private DO in a private LN does not need a dataNs
- An Ed1 DO in a Ed1 LN does not need a dataNs
- An Ed2 DO in a Ed2 LN does not need a dataNs
- An Ed2 DO in an Ed1 LN shall have dataNs = IEC 61850-7-4:2007

Note: the presence of the name space attribute is not a valid criterion anymore. When a name space is not needed it means: either the name space is not present or the name space has the same value as the name space on the higher level

Test description

Scan SCL file for Ed2 logical nodes types and dataobjects

Comment

Ed2 LN types that have a mandatory DO with an Ed2 specific CDC are not allowed

Clarified Communication Test Procedures (in alphabetical order)

Ctl3	Select multiple SBO control objects and cancel them in opposite order
------	--

Ctl3	Select/Cancel multiple SBO control objects	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 17.2 IEC 61850-8-1 clause 20, Annex E PIXIT		
<u>Expected result</u> 1. DUT sends SelectWithValue response+ for non-interlocked objects and response- with AddCause "1-of-n control" for interlocked objects (PIXIT) 2. DUT sends Select response+ for non-interlocked objects and response- for interlocked objects (PIXIT) 3. DUT sends Cancel response+ for selected objects		
<u>Test description</u> 1. Client request SelectWithValue for multiple SBOes control objects 2. Client requests Select for multiple SBOs control objects 3. Client request Cancel for the selected control objects in reverse order		
<u>Comment</u>		

DsetN6	Create persistent data set with more than max. no of data members	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 11.1, 11.3.4 IEC 61850-8-1 clause 14.3.3 PIXIT?		
<u>Expected result</u> 1. The DUT responds with a CreateDataSet response- or response+ when resources are still available		
<u>Test description</u> 1. Client requests a persistent CreateDataSet with the maximum number + 1 of data members as supported by the DUT		
<u>Comment</u>		

DsetN7	Create non-persistent data set with more than max. no of data members	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 11.1, 11.3.4 IEC 61850-8-1 clause 14.3.3 PIXIT?		
<u>Expected result</u> 1. The DUT responds with a CreateDataSet response- or response+ when resources are still available		
<u>Test description</u> 1. Client requests a non-persistent CreateDataSet with the maximum number + 1 of data members as supported by the DUT		
<u>Comment</u>		

Note: The max is defined in the SCL services section. So no PIXIT entry is required.

Rp2	Reporting of optional fields for a URCB	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 14.2.2.8 IEC 61850-8-1 clause 17.1.1.1, 17.2.1, PIXIT		
<u>Expected result</u> 1. DUT sends SetURCBValues response+ for supported optional fields and response- when one of the optional fields isn't supported 2. DUT sends SetURCBValues response+ 3. DUT sends a correct report according to trigger condition and IEC 61850-8-1 table 40 with all data set members for reason integrity and otherwise only the changed members. The configured and reported optional fields should match <ul style="list-style-type: none"> - the sequence number is incremented and starts with 0 - the report time stamp is in UTC format and matches the trigger time - the reason for inclusion matches the trigger condition - the configured and reported data set name do match - the data-reference(s) match the data set member(s) - Configuration revision matches the URCB configuration - When segmentation is set the report includes sub sequence number and more segments follow 4. DUT sends SetURCBValues response+ and sends no reports anymore		

Rp3	Trigger conditions for a URCB	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 14.2.2.11 IEC 61850-8-1 clause 8.1.3.8, 17.1.1.1, 17.2.1, PIXIT		
<u>Expected result</u> 1. DUT sends SetURCBValues response+ for supported trigger conditions and response- when one of the trigger conditions isn't supported 2. DUT sends SetURCBValues response+ 3. DUT sends a report according to trigger condition <ul style="list-style-type: none"> - integrity reports should be transmitted immediately at timeout - data change reports are transmitted immediately when BufTm=0 - data change reports are transmitted after BufTm of first data change when BufTm>0 - the sequence number is incremented 4. The configured and reported optional fields should match 6. DUT does not sends reports		

Rp4	General interrogation URCB	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 14.2.2.13 IEC 61850-8-1 clause 8.1.3.8, 17.1.1.1, 17.2.1		
<u>Expected result</u> 3. DUT sends SetURCBValues() response+ and then sends GI report with the configured RptID 4. DUT sends GetURCBValues() response+ with GI attribute not set		
<u>Test description</u> 1. Client configures an available URCB with a valid non-null RptID value 2. Client enables the URCB 3. Client requests SetURCBValues() to set the GI report 4. Client requests GetURCBValues() 5. Client disables the URCB		
<u>Comment</u>		

RpN5	Exclusive use of URCB	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 14.2.1 IEC 61850-8-1 clause 17.1.1.2, Tissue #114		
<u>Expected result</u>		
2. DUT sends SetURCBValues() response- 4. DUT sends SetURCBValues() response+ 8. DUT sends SetURCBValues() response+		
<u>Test description</u>		
1. Client1 reserves an available URCB 2. Client2 configures the same URCB by requesting SetURCBValues() with one of the following attributes Resv, RptID, DatSet, OptFlds, BufTm, TrgOps, IntgPd 3. Client1 resets the reservation of the URCB 4. Client2 reserves and configures the URCB 5. Client2 resets the reservation of the URCB 6. Client1 reserves the URCB 7. Client1 aborts and re-establishes the association 8. Client1 configures the URCB 9. Client1 resets the reservation of the URCB		
<u>Comment</u>		

Sg2	SelectEditSG, SetSGValues, ConfirmEditSGValues	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 13.2, 13.3 IEC 61850-8-1 clause 16.2		
<u>Expected result</u>		
1. DUT sends SelectEditSG response+ 2. DUT sends SetSGValues [FC=SE] response+ 3. DUT sends GetSGValues [FC=SE] response+ 4. DUT sends ConfirmEditSGValues response+, the value of CnfEdit shall return to FALSE once the storage is completed.		
<u>Test description</u>		
1. Client requests SelectEditSG 2. Client requests SetSGValues [FC=SE] with at least one valid value for each data type in the group 3. Client requests GetSGValues [FC=SE] to verify the new values 4. Client requests ConfirmEditSGValues		
<u>Comment</u>		
Note: Sg3 must be executed after Sg2 to verify changed values are active		

Srv6	SetDataValues	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 clause 10.4.3 IEC 61850-8-1 clause 13.2.2 PIXT		
<u>Expected result</u> 1. DUT sends SetDataValues(FC= ST, MX, EX) response- 2. DUT sends SetDataValues(FC= CF,SP,SE,DC) response- for read-only data and response+ for write enabled data as specified in the ICD using valKind="RO" for read-only and "Set" for write eabled data attributes. In case the valKind is missing in the ICD the data attribute may be writable or read-only. 3. and 5. DUT sends SetDataValues response+ 4. and 6. DUT sends GetDataValues response+ with requested value, the value does match		
<u>Test description</u> 1. For each data object client sends a SetDataValues(FC=ST, MX,EX) with the current value 2. For each data object client sends a SetDataValues(FC=CF,SP,SE,DC) with the current value For the first write-enabled data object (if any) 3. Client sends a SetDataValues with a valid new value 4. Client sends a GetDataValues request and check the value does match 5. Client sends a SetDataValues with the original value 6. Client sends a GetDataValues request and check the value does match		
<u>Comment</u>		

Note: This test passes when the IED behaves as specified by the valKind in the SCL. If no valKind is present the data attribute **may** be writable.

In Ed2 of the server test procedures the valKind **shall** be mandatory in case a FC=CF/SP/SE/DC is read-only because the default value of valKind = "Set".

PIXIT template changes

Rp7	What is the buffer size for each BRCB or how many reports can approximately be buffered	<number of bytes or typical number of dataset members or reports>
-----	---	---

Go10	Published FCD supported common data classes / data types are	<list of common data classes / data types>
------	--	--

Go11	Subscribed FCD supported common data classes / data types are	<list of common data classes / data types>
------	---	--

Should all data types be supported as publisher? Discuss at the next WG10 meeting.

Go13	What is the minimum supported retransmission time? What is the maximum supported retransmission time? Is it fixed or configurable?	<minTime> <maxTime> Fixed / Configurable
------	--	--

Ft1	What is structure of files and directories? Where are the COMTRADE files stored? Are comtrade files zipped and what files are included in each zip file?	<Flat file system with pseudo folders or file system with folders> /COMTRADE/ or /LD/<IED+LD>/COMTRADE Not zipped and/or Zipped <Zip includes: .cfg and .dat>
-----	--	---

Certificate template changes

IEC 61850 Certificate Level A/B¹

No. << certificate number >>

Issued to:

<<TEST INITIATOR >>

<<FULL ADDRESS >>

For the product:

<<PRODUCT NAME >>

<<VERSION NUMBER >>

<<ADDITIONAL INFO >>

Issued by: <<test lab >>

The product has not shown to be non-conforming to: IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1 Communication networks and systems in substations

The conformance test has been performed according to IEC 61850-10, the UCA International Users Group Device Test Procedures version 2.3 with TPCL² version 1.x, the product's protocol, model and technical issue implementation conformance statements: "<<PICS >>", "<<MICS >>", "<<TICS >>" and the extra information for testing: "<<PIXIT >>".

The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases):

1 Basic Exchange (../24)	9a GOOSE Publish (../13)
2 Data Sets (../6)	9b GOOSE Subscribe (../11)
2+ Data Set Definition (../23)	12a Direct Control (../12)
3 Substitution (../4)	12b SBO Control (../14)
4 Setting Group Selection (../3)	12c Enhanced Direct Control (../13)
4+ Setting Group Definition (7/7)	12d Enhanced SBO Control (../19)
5 Unbuffered Reporting (../19)	13 Time Synchronization (../5)
6 Buffered Reporting (../21)	14 File Transfer (../7)

This Certificate includes a summary of the test results as carried out at <<CITY >> in <<COUNTRY >> with <<CLIENT SIMULATOR >> <<VERSION >> with test suite <<VERSION >> and <<ANALYZER >> <<VERSION >>. ~~The test is based on the UCA International Users Group Device Test Procedures version 2.3.~~ This document has been issued for information purposes only, and the original paper copy of the <<TESTLAB >> report: No. <<TESTREPORT NUMBER >> will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to <<TESTLAB >> by <<TEST INITIATOR >>. The manufacturer's production process has not been assessed. This certificate does not imply that <<TESTLAB >> has certified or approved any product other than the specimen tested.

<<CITY >>, <<DATE >>

<<Manager NAME >>

<<JOB TITLE >>

<<Tester NAME >>

<<JOB TITLE >>

1 Level A - Independent Test lab with certified ISO 9000 or ISO 17025 Quality System

1 Level B - Tester with ISO 9000 or ISO 17025 Quality System

2 TPCL - Test procedures change list

Applicable Test Procedures from the UCA International Users Group Device Test Procedures version 2.3 with TPCL version 1.x

Conformance Block	Mandatory	Conditional
1: Basic Exchange	Ass1, Ass2, Ass3, AssN2, AssN3, AssN4, AssN5 Srv1, Srv2, Srv3, Srv4, Srv5, SrvN1abcd, SrvN4	AssN6 Srv6, Srv7, Srv8, Srv9, Srv10, SrvN1e, SrvN1f, SrvN2, SrvN3
2: Data Sets	Dset1, Dset10a, DsetN1ae	Dset10b, DsetN1b, DsetN16
2+: Data Set Definition	Dset2, Dset3, Dset4, Dset5, Dset6, Dset7, Dset8, Dset9 DsetN1cd, DsetN2, DsetN3, DsetN4, DsetN5, DsetN6, DsetN7, DsetN8, DsetN9, DsetN10, DsetN11, DsetN12, DsetN13, DsetN14, DsetN15	
3: Substitution	Sub1, Sub2, Sub3, SubN1	
4: Setting Group Selection	Sg1, SgN1a	Sg3
4+: Setting Group Definition	Sg2, Sg4, SgN1b, SgN2, SgN3, SgN4, SgN5	
5: Unbuffered Reporting	Rp1, Rp2, Rp3, Rp4, Rp7, Rp10, Rp12 RpN1, RpN2, RpN3, RpN4	Rp5, Rp6, Rp8, Rp9, Rp11, RpN5, RpN6, RpN7
6: Buffered Reporting	Br1, Br2, Br3, Br4, Br7, Br8, Br9, Br12, Br14 BrN1, BrN2, BrN3, BrN4, BrN5	Br5, Br6, Br10, Br11, Br13, BrN6, BrN7
6+: Enhanced buffered reporting	BrE1, BrE2, BrE3, BrE6, BrE7, BrE8, BrE9, BrE10, BrE11	BrE4, BrE5, BrE12
9a: GOOSE publish	Gop2, Gop3, Gop4, Gop7, Gop10a	Gop1, Gop5, Gop6, Gop8, Gop9, Gop10b, GopN1, GopN2
9b: GOOSE subscribe	Gos1a, Gos2, Gos3, GosN1, GosN2, GosN3, GosN4, GosN5, GosN6	Gos1b, Gos4
12a: Direct control	CtlN3, CtlN8 DOns1, DOns3	Ctl2, Ctl4, Ctl7, CtlN10, CtlN11 DOns2, DOns4, DOns5
12b: SBO control	Ctl3, CtlN1, CtlN2, CtlN3, CtlN4, SBOns2	Ctl2, Ctl4, Ctl7, CtlN10, CtlN11 SBOns3, SBOns4, SBOns5
12c: Enhanced Direct Control	CtlN3, CtlN8 DOes2, DOes5	Ctl2, Ctl4, Ctl7, CtlN6, CtlN10, CtlN11 DOes1, DOes3, DOes4
12d: Enhanced SBO control	Ctl3, CtlN1, CtlN2, CtlN3, CtlN4, CtlN9 SBOes1, SBOes2, SBOes3	Ctl2, Ctl4, Ctl7, CtlN6, CtlN10, CtlN11 SBOes4, SBOes5, SBOes6, SBOes7
13: Time sync	Tm1, Tm2, TmN1	Tm3, TmN2
14: File transfer	Ft1, Ft2ab, Ft4, FtN1ab	Ft2c, Ft3, FtN1c

[All configuration file and data model tests have been successfully performed for the product variants using the same hardware and software version: <<Variant2>>, <<Variant3>>]

TPCL Revision History

Revision	Changes
1.0	Initial version
1.1	<ul style="list-style-type: none"> • Updated expected behavior in CtIN2 to allow reset of select timeout again. However the recommended behavior is a negative respond on the second select (and this behaviour will be mandatory in the next version of the server test procedures). • Update test FtN1 to test for both empty and invalid file names in a GetFileAttributeValues. • Updated Srv6, removed EX at step 2 because its already used in step 1
1.2	<ul style="list-style-type: none"> • Updated server test specification to version 2.3 and removed all TPCL elements • Removed text “This list: ...should be referenced in the test report only” (the TPCL is now referenced on the conformance certificate).
1.3	<ul style="list-style-type: none"> • Add verification of Ed2 LN in Ed1 devices = Mdl12
1.4	<ul style="list-style-type: none"> • note in the TPCL denied list that the number of test cases on the certificate template is correct
1.5	<ul style="list-style-type: none"> • Srv6 updated to use the SCL valKind and remove PIXIT reference • Update certificate template to reduce the references to TPCL (explain the abbreviations?) and to harmonize the format with the client certiiicate • Update PIXIT template entries: <ul style="list-style-type: none"> • Rp7 (bytes or nr.of.reports), • Go9 specify datatypes instead of CDC and • Go10/Go11, Go13 • Ft1: zip or COMTRADE supported Zip structure: all files in the same folder, in subfolders, etc. Add 2 entries: COMTRADE files zipped Y/N when yes the structure of the files in the zip. (I assume these are just the one xxxx.cfg and on xxxx.dat file, I don't see a need for structure in the zip) • Update Rp2/Br2 to move the sequence number increment expected result to Rp3/Br3 • Update Rp4 to verify non-null RptID in the RCB and Report • Sequence of data attribute in a data object is only applicable for the same functional constraints • Update the Sg2 testcase to verify "several" settings not all. • CtI3 – select all SBO objects or just multiple – the abstract and detailed testprocedure are not consistent • DSetN6/DSetN7 the maximum number of datasets may be exceeded – updated the expected result

	<ul style="list-style-type: none"> • When Sg3 is conditional SgN1a part 2 is also conditional. However part 1 and 3 are mandatory – no change • TISSUE Template for test procedure 2.3: tissue #60 (part 7-3) is only applicable for ed.2 therefore should be removed from TICS for test procedure 2.3 • Propose to add new Gos test case to verify the behavior when the quality in one of the dataset elements is set to "test" or invalid.(Denied this is application logic not firmware) • RpN5 include the Resv to the list of attributes at step 2
	<ul style="list-style-type: none"> •