Protocol Implementation eXtra Information for Testing (PIXIT)

for the IEC 61850 Client interface in EKRASCADA

UCA International Users Group

Testing Sub Committee

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Introduction

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in the client system: EKRASCADA with product version 2.7.1.11801 and IEC 61850 client interface version 1.3, further referred to as "client".

Together with the PICS and the MICS the PIXIT forms the basis for a conformance test according to IEC 61850-10.

The following chapters specify the PIXIT for each applicable ACSI service model as structured in IEC 61850-10 and the "Conformance Test Procedures for Client System with IEC 61850-8-1 interface".

PIXIT for Configuration

ID	Ed	Description	Value / Clarification
Cf1	1,2	Describe how the client handles nameplate configuration revision mismatches	Writes the result of checking configuration versions to a log file
Cf2	1,2	Describe how the client handles report control block configuration revision mismatches	Writes the result of checking configuration versions to a log file

PIXIT for Association model

ID	Ed	Description	Value / Clarification
As1	1,2	Guaranteed number of servers that can set-up an association simultaneously (one association per server)	No restrictions in software, depends on OS resources
As2	1,2	Lost connection detection time range (default range of TCP_KEEPALIVE is 1 – 20 seconds)	Depends on configuration parameters and OS, about 10-16 seconds
As3	1,2	Describe the behavior when association fails	Retry after 1 second
As4	3	Is authentication supported	N
As5	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size 65536 bytes Min MMS PDU size 8192 bytes
As6	1,2	What is the typical startup time after a power supply interrupt	Depends on hardware parameters and OS type / version
As7	1,2	How does the client disconnect from the server?	Release

PIXIT for Server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Maximum object identification length	Unlimited, supports: 129 octets: <64>/<64>

Sr2	1,2	Does client support auto description	The MMS model is built, then the SCL model is created based on it
Sr3	1,2	Describe how to view data values	Configure device parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio"
Sr4	1,2	What analogue value (MX) quality bits are used in the client	Y Good, Y Invalid, Y Reserved, Y Questionable N Overflow Y OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Y Process Y Substituted Y Test Y OperatorBlocked
Sr5	1,2	Which status value (ST) quality bits are used in the client	Y Good, Y Invalid, Y Reserved, Y Questionable N Overflow Y OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Y Process Y Substituted Y Test Y OperatorBlocked
Sr6	1,2	Describe how to view/display quality values	Configure device parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio"

Sr7	1,2	Describe how to force a SetDataValues request	Configure device parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio"
Sr8	1,2	Describe how to force a GetDataValues request	Configure device polling parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio"
Sr9	1,2	Describe how to force a GetAllDataValues request	Add new device to project using search (online browsing), start operation using software "EKRASCADA Studio"
Sr10	1,2	Does the client support writing blkEna values?	Y
Sr11	1,2	Describe how the client behaves in case of: - GetDataDefinition response- - GetDataDefinition response+ with more or less attributes as expected - GetLogicalDeviceDirectory response- - GetAllDataValues response- - GetAllDataValues response+ with more or less attributes as expected - GetDataValues response- - GetDataValues response+ with more or less attributes as expected - SetDataValues response-	Operation will be completed with an error, client will work
Sr12	1,2	Which time quality attributes from the server are used in the client	Y Leap Second Known (displayed only "No" value), Y ClockFailure Y Clock not synchronized Y Accuracy
Sr13	1,2	Describe how to view time quality attributes	Use the "monitoring" or "events monitoring" components of "EKRASCADA Studio"

PIXIT for Data set model

ID	Ed	Description	Value / Clarification
Ds1	1,2	Describe how to force a GetDataSetValues request	Not supported
Ds2	1,2	Describe how to force a SetDataSetValues request	Not supported

Ds3	1,2	Describe how to force a DeleteDataSet request	Configure persistent dynamic dataset for device, update configuration, change any dataset item(s), update configuration
Ds4	1,2	Describe how the client handles following dataset mismatches between the SCL and the data sets exposed via MMS: (1) new dataset element (2) missing dataset element (3) Reordered dataset members in a dataset of a different data type (4) Reordered dataset members in a dataset of the same data type	Writes the result of checking dataset to a log file
Ds5	1,2	Describe how the client behaves in case of: - GetLogicalNodeDirectory(DATA-SET) response- - GetDataSetDirectory response- - GetDataSetValues response- - SetDataSetValues response-	-GetLogicalNodeDirectory(DATA-SET) response-: operation will be completed with an error, client will work; - GetDataSetDirectory response-: operation will be completed with an error, client will work; - GetDataSetValues response-: not supported; - SetDataSetValues response-: not supported;
Ds6	1,2	Maximum name length for dataset Maximum name length for dataset member, including LD and FC	Unlimited, supports: <64/16$32> <64/61+3>
Ds11	1,2	Describe how to force a CreateDataSet request - non-persistent - persistent	Configure non-persistent /persistent dynamic dataset for device, update configuration
Ds12	1,2	Describe how to force a DeleteDataSet request - non-persistent - persistent	- non-persistent: Not supported; - persistent: configure persistent dynamic dataset for device, update configuration, change any dataset item(s), update configuration;
Ds13	1,2	Describe how the client behaves in case of: - CreateDataSet response- - DeleteDataSet response-	Operation will be completed with an error, client will work

PIXIT for Substitution model

ID	Ed	Description	Value / Clarification

ID	Ed	Description	Value / Clarification
Sub1	1,2	Describe how to substitute a value	Configure device parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio"

PIXIT for Setting group control model

ID	Ed	Description	Value / Clarification
Sg1	1,2	How can the client be forced to send a GetLogicalNodeDirectory(SGCB) request	Use "device search" function in "EKRASCADA Studio"
Sg2	1,2	Describe how to change the active setting group	Configure device parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio"
Sg3	1,2	Describe how to get the actual setting group values	Not supported
Sg4	1,2	Describe how to edit setting group values	Not supported
Sg5	1,2	Describe how the client behaves in case of: - GetSGCBValues response- - SelectEditSG response- - SetEditSGValue response- - SelectActiveSG response- - ConfirmEditSGValues response- - The configured SG differs from the actual setting group	- GetSGCBValues response-: operation will be completed with an error, client will work; - SelectEditSG response-: not supported; - SetEditSGValue response-: not supported; - SelectActiveSG response-: operation will be completed with an error, client will work; - ConfirmEditSGValues response-: not supported; - The configured SG differs from the actual setting group: not supported;
Sg6		Does the client read the optional ResvTms value?	Y

PIXIT for Reporting model

ID	Ed	Description	Value / Clarification

Rp1	1,2	Does the client search for RCB in all logical nodes? If not, specify the logical nodes	All logical nodes
Rp2	1,2	Which dynamic RCB attributes are/can be configured by the client	Y RptID Y DataSet Y Optional fields Y Trigger conditions Y Buffer time Y Integrity period
Rp3	1,2	Does the client supports IED's with indexed and non-indexed report control blocks (RCB)	Y BRCB indexed Y BRCB not indexed Y URCB indexed Y UCB not indexed
Rp4	1,2	The supported trigger conditions are	Y integrity Y data change Y quality change Y data update Y general interrogation
Rp5	1,2	The minimum required optional fields are	N sequence-number N report-time-stamp N reason-for-inclusion N data-set-name N data-reference N buffer-overflow N entryID N confRev
Rp6	1,2	Does the client support segmented reports	Y
Rp7	1	Does the client support pre-assigned RCB	N
Rp8	1,2	Does the client support reported data set containing structured data objects or data attributes?	Y reporting of data objects Y reporting of data attributes
Rp9	1,2	Describe how the client does respond when an previously used URCB is reserved by another client for: • Indexed URCB with max>1 configured in SCL (static reporting) • Indexed URCB with max=1 configured in SCL (static reporting) • URCB not configured in SCL (dynamic reporting)	The client will search for a free URCB and configure it in all 3 cases
Rp10	1,2	Describe how the client does respond when an previously used BRCB is reserved by another client for: • Indexed BRCB with max>1 configured in SCL (static reporting) • Indexed BRCB with max=1 configured in SCL (static reporting) • BRCB not configured in SCL (dynamic reporting)	The client will search for a free BRCB and configure it in all 3 cases
Rp11	1,2	Describe how the client does respond on a SetBRCBValues(EntryID) respond-	Operation will be completed with an error, if subscription completes successfully and if GI configured then the client will send a GI

Rp12	1,2	Describe how the client does respond when a report has an unknown: dataset, RptID, unexpected number of dataset entries, and/or unexpected data type format entries	The client will verify: - the RCB reference; - the dataset name; - the dataset members references/types; - the configuration revision (ConfRev); Note: The client can process data from a report with a modified data set when: - parameter "OptFlds.DataRef" is enabled; - nodes with data references are present in the client model; - the data types in the report match the data types in the client model;
Rp13	1,2	Describe how the client detects reporting configuration changes (mismatches). Does it check the "configuration revision" attributes and/or does it check the dataset members? Is the dataset update done online or offline?	Y Check ConfRev Y Check dataset members Dataset update done offline
Rp14	1,2	Describe how to force the client to change the RCB buffer time	Configure RCB parameters for device, update configuration
Rp15	1,2	Does client set server TrgOps.GI prior to first issuance of GI command?	Y
Rp16	1,2	Describe how to force the client to send the GI request	Configure RCB parameters for device, update configuration
Rp17	1,2	Describe how to force the client to enable a RCB	Configure RCB parameters for device, update configuration

Rp18	1,2	Describe how the client does respond when a report control block is renamed or deleted - Does it prevent reading the deleted RCB - If it reads the missing RCB, how does it handle the GetURCBValues or GetBRCBValues response-	- Does it prevent reading the deleted RCB: N; - If it reads the missing RCB, how does it handle the GetURCBValues or GetBRCBValues response-: the client analyze result, if error returned then the client will search for a free RCB;
Rp19	1,2	Describe how the client behaves in case of: - SetURCBValues response- - Unsupported optional fields - Unsupported trigger condition(s)	- SetURCBValues response-: the client will search for a free RCB; - Unsupported optional fields: will be logged and ignored; - Unsupported trigger condition(s): will be logged and ignored;
Rp20	1,2	Describe how the client behaves in case of: - Buffer overflow	Information about buffer overflow will be logged
Rp21	1,2	Describe how to force the client to send SetBRCBValues request for - EntryID - PurgeBuf	Configure RCB parameters for device, update configuration
Rp22	1,2	Does the client support writing resvTms	Y
Rp23	1,2	Does the client support reading owner	Y
Rp24	2	Does the device function only as test equipment?	N

PIXIT for Logging model

ID	Ed	Description	Value / Clarification
Lg1	1,2	Does the client search for LCB in all logical nodes? when not specify the logical nodes	Not supported
Lg2	1,2	Describe how to change LCB attributes	Not supported
Lg3	1,2	Describe how to force the client to enable a LCB	Not supported
Lg4	1	Does the client support sending QueryLogByTime and/or QueryLogAfter	Not supported
Lg5	2	Describe how to force the client to change GLOG settings	Not supported
Lg6	1,2	Describe how the client behaves in case of: - Renamed LCB - Removed LCB - Renamed Logical Device - Renamed LOG	Not supported

ID	Ed	Description	Value / Clarification
Lg7	1,2	Describe how the client behaves in case of: - GetLCBValues response- - GetLogStatusValues response- - SetLCBValues response-	Not supported

PIXIT for GOOSE control block model

ID	Ed	Description	Value / Clarification

PIXIT for Control model

ID	Ed	Description	Value / Clarification
Ctl1	1,2	What control modes are supported	Y status-only Y direct-with-normal-security Y sbo-with-normal-security Y direct-with-enhanced-security Y sbo-with-enhanced-security
Ctl2	1,2	Is Time activated operate (operTm) supported	Y
Ctl3	1,2	Is "operate-many" supported	N
Ctl4	1,2	Can the client set the test flag?	Y
Ctl5	1,2	What check conditions can be set	Y synchrocheck Y interlock-check
Ctl6	1,2	Which originator categories are supported and what is the originator identification?	Which originator categories are supported: Y NotSupported Y BayControl Y StationControl Y RemoteControl Y AutomaticBay Y AutomaticStation Y AutomaticRemote Y Maintenance Y Process What is the originator identification: Name or IP-address of the host from which the command was sent
Ctl7	1,2	Describe if and how the client sets/increments the ctlNum	ctlNum parameter is saved for each node that supports control, the default value is 0, the value is incremented if necessary for requested control operation
Ctl8	1,2	What does the client when it receives a LastApplicationError and describe how to view the additional cause?	The client handles LastApplicationError as notification about the execution of the command (event), can be displayed in the UI, stored in the DB

Ctl9	1,2	What does the client when its receives a Select, SelectWithValue or Operate respond negative?	The client returns to the EKRASCADA system an error about the corresponding operation, which will be processed as the result of the command (event), can be displayed in the UI, stored in the DB
Ctl10	1,2	Can the client change the control model via online services?	Y
Ctl11	1	What does the client when the ctlModel is not initialized in the SCL?	The client always requests the ctlModel value from the server before executing the command
Ctl12	1,2	What does the client when the ctlModel in SCD and in SERVER SIMULATOR is different?	The client always requests the ctlModel value from the server before executing the command, if it differs from the value in SCD, then this information will be logged, the value received from the server will be used
Ctl13	1,2	Describe how to view a - CommandTermination request+ - CommandTermination request- - TimeActivatedOperateTermination request+ and request-	- CommandTermination request+: configure device parameters, update configuration, use the "monitoring"/"events monitoring" components of "EKRASCADA Studio"; - CommandTermination request-: configure device parameters, update configuration, use the "monitoring"/"events monitoring" components of "EKRASCADA Studio"; - TimeActivatedOperateTermination request+ and request-: configure device parameters, update configuration, use the "monitoring"/"events monitoring" components of "EKRASCADA Studio";

PIXIT for Time and time synchronization model

ID	Ed	Description	Value / Clarification
Tm1	1,2	Describe how to view the internal time & quality or how to expose the timestamp and timestamp quality via the IEC 61850 interface	- In the "monitoring" component of "EKRASCADA Studio"; - In "Select With Value", "Operate", "Cancel" requests;
Tm2	1,2	What time quality bits are supported	Y LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized

ID	Ed	Description	Value / Clarification
Tm3	1,2	What is the behavior when the time synchronization signal/messages are lost	ClockNotSynchronized bit set: - For timestamps with system (server) source for variables; - In "Select With Value", "Operate", "Cancel" requests for "T" attribute;
Tm4	1,2	When is the quality bit "Clock failure" set?	Not supported
Tm5	1	When is the quality bit "Clock not synchronized" set?	When connection to time server is lost

PIXIT for File transfer model

ID	Ed	Description	Value / Clarification
Ft1	1,2	Describe when or how to force the client to request GetServerDirectory(FILE) and what it does with the responded filenames	Configure device parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio"; The client downloads new files with certain extensions, for example: hdr cfg dat inf cff zip
Ft2	1,2	Does the client uses a wildcard in the GetServerDirectory(FILE) request	Y, used wildcards: "", "*", "\", "/"
Ft3	1,2	Does the client support IED's that include the path in the file name in the GetServerDirectory(FILE) respond?	Y path included Y path not included
Ft4	1,2	Does the client support IED's that use the file separator	Y "/" Y "\"
Ft5	1,2	What is the maximum file name size including path	Unlimited
Ft6	1,2	Can the client read a file with size 0	Y
Ft7	1,2	Are directory/file names case sensitive	Case sensitive
Ft8	1,2	Maximum file size	Unlimited
Ft9	1,2	Describe how the client behaves in case of: - GetFile response- - GetFileAttributes response- - SetFile response-	- GetFile response-: operation will be completed with an error, client will work; - GetFileAttributes response-: operation will be completed with an error, client will work; - SetFile response-: Not supported

PIXIT for Service Tracking Model

ID	Ed	Description	Value / Clarification
Tr1	2	Which tracking services are supported by the client: - BrcbTrk - UrcbTrk - LocbTrk - GocbTrk - MsvcbTrk - UsvcbTrk - SgcbTrk - SpcTrk - DpcTrk - IncTrk - EncTrk - ApcFTrk - ApcIntTrk - BscTrk - IscTrk - BacTrk - GenTrk	Y BrcbTrk Y UrcbTrk Y LocbTrk Y GocbTrk Y MsvcbTrk Y UsvcbTrk Y SgcbTrk Y SpcTrk Y DpcTrk Y IncTrk Y EncTrk Y ApcFTrk Y ApcIntTrk Y BscTrk Y IscTrk Y BacTrk Y GenTrk
Tr2	2	Describe how to view the tracking objects or their attributes	Configure device parameters, update configuration, use the "monitoring" component of "EKRASCADA Studio";