
IEC-61850 MMS OPC Device Driver

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Overview

IEC-61850 is a Substation Automation design standard - part of the IEC reference architecture for electric power systems.

Three core components of IEC-61850

- Object model: abstract definitions of services, data and Common Data Class, independent of underlying protocols
- Communication Specification: defines a communication between the IEDs of the substation automation system, maps services to actual protocols
- Configuration language: facilitates configuration information exchange

Advantages of using IEC-61850 standard protocol

- Utilization of a comprehensive set of substation functions, strong functional support for substation communication
- Easy Integration
- Interoperability
- Straightforward for design, specification, configuration, setup, and maintenance meaning lower cost of installation, configuration and maintenance
- Intuitive hierarchical and structured device and data modeling and naming, standardized naming conventions, self-describing devices, automatic object discovery
- Configuration file formats eliminate device dependencies and tag mapping and enable exchange of device configuration
- Fast communication, higher performance multi-cast messaging

ReLab IEC-61850 MMS OPC Device Driver

ReLab OPC Server has an advanced architecture with ability to plug-in multiple drivers supporting multiple protocols into one instance of the OPC Server.

ReLab's IEC-61850 OPC device driver fully addresses the need of collecting, processing and analyzing IEC-61850 (MMS) data.

This manual will assist you in configuring communications between IEC-61850 compliant devices (IED's) and ReLab's IEC-61850 MMS OPC Device Driver.

Operating System and Hardware Requirements

Operating System (OS)

- Windows® 7
- Windows® 8.1
- Windows® Server 2003

- Windows® Server 2008, 2008 R2

Hardware

- CPU – 1GHz (minimum)
- Memory – 500MB (minimum)
- Hard Drive Storage – 500MB (minimum)

Configuring RL61850 Device Driver

Follow these steps to configure the IEC-61850 MMS OPC Device Driver (RL61850):

1. Open ReLab OPC Console and navigate to the main menu item **Configure | Load Driver**

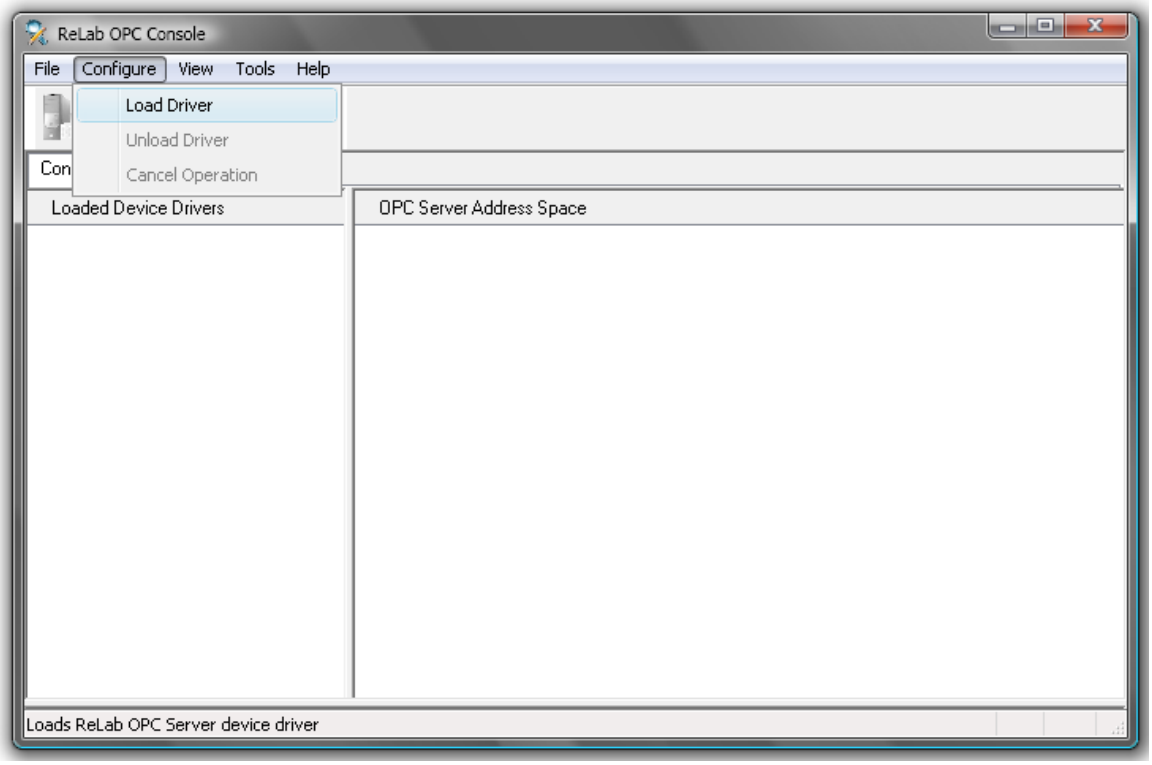

Figure 1

2. Select IEC-61850 Device Driver

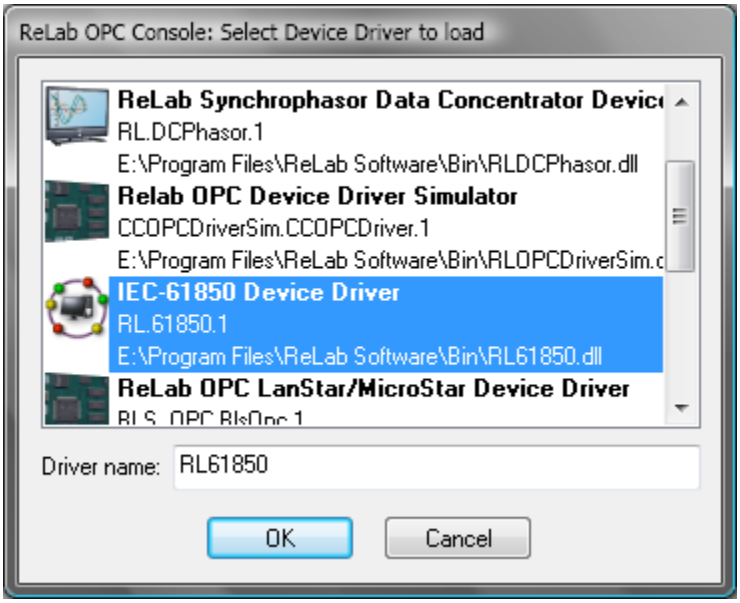

Figure 2

3. Specify **Driver name** and click **OK**
4. The **IEC-61850 Driver Configuration** dialog will appear

Main Tab

XML based IEC 61850 Substation Configuration Language (SCL) describes the configuration of IE- 61850 based systems. The SCL file comprises of:

- **SSD** - System Specification Description - XML description of the entire system
- **SCD** - Substation Configuration Description - XML description of a substation
- **ICD** - IED Capability Description - XML description of items supported by IED
- **CID** - Configured IED Description - XML configuration for a specific IED

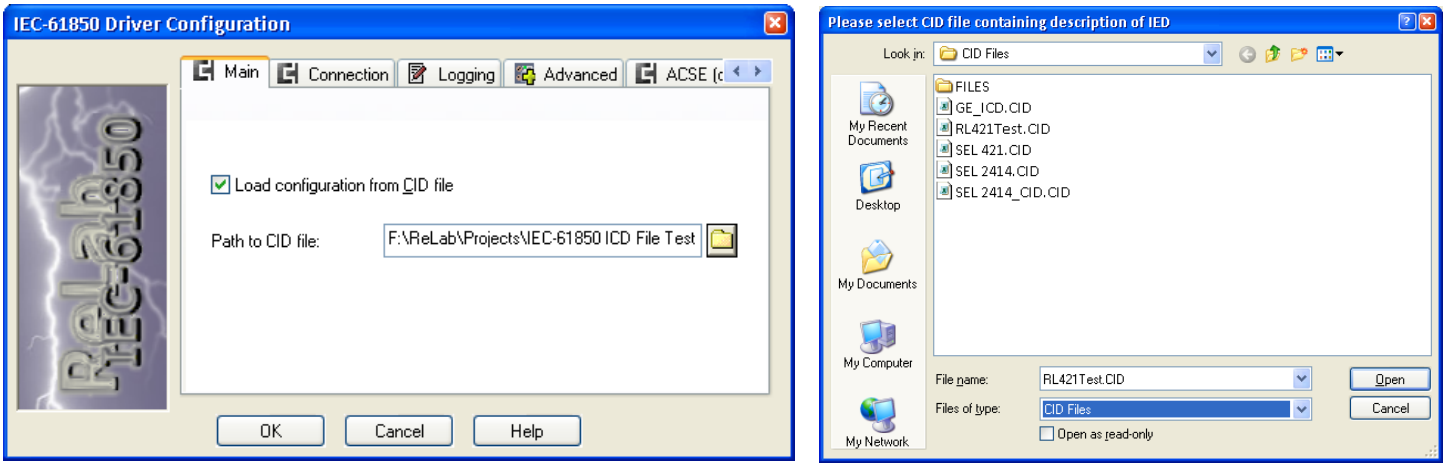

Figure 3

Description	Type	Default
Enables/Disables **[Load configuration from CID* file]**	Boolean Checkbox	False
Specifies **[Path to CID* File]**	String Edit Control	Empty

* CID - Configured IED Description

Connection Tab

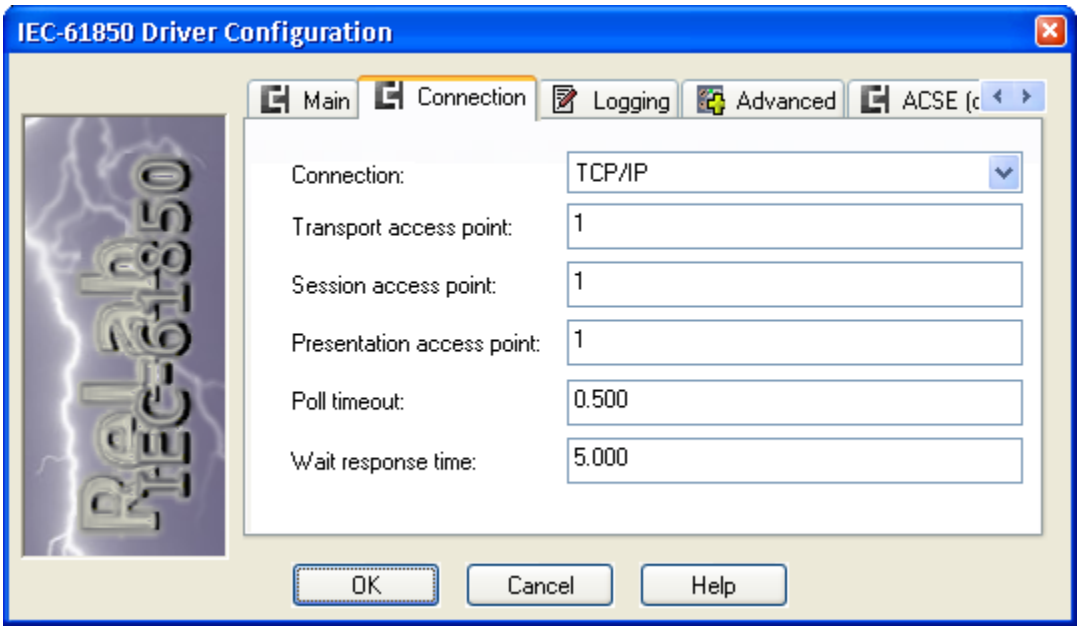

Figure 4

Description	Type	Default
Specifies **[Connection]**	Enumeration Dropdown	TCP/IP
Specifies **[Transport access point]** as defined by the transport service definition ITU-T Rec. X.214 I ISO/IEC 8072	Integer Edit Control	1
Specifies **[Session access point]** as defined by the transport service definition ITU-T Rec. X.214 I ISO/IEC 8072	Integer Edit Control	1
Specifies **[Presentation access point]** as defined by the transport service definition ITU-T Rec. X.214 I ISO/IEC 8072	Integer Edit Control	1
Specifies **[Poll timeout]** in fraction of the second (2.500 equals to 2500 milliseconds, 0.500 seconds equals to 500 milliseconds)	Double Edit Control	0.500

Specifies **[Wait response time]** in fraction of the second (2.500 equals to 2500 milliseconds, 0.500 seconds equals to 500 milliseconds)	Double Edit Control	5.000

Polling Tab

Depending on the options specified on this tab the driver can read tags either by reading entire logical nodes or by reading tags grouped by Functional Constraints (FC).

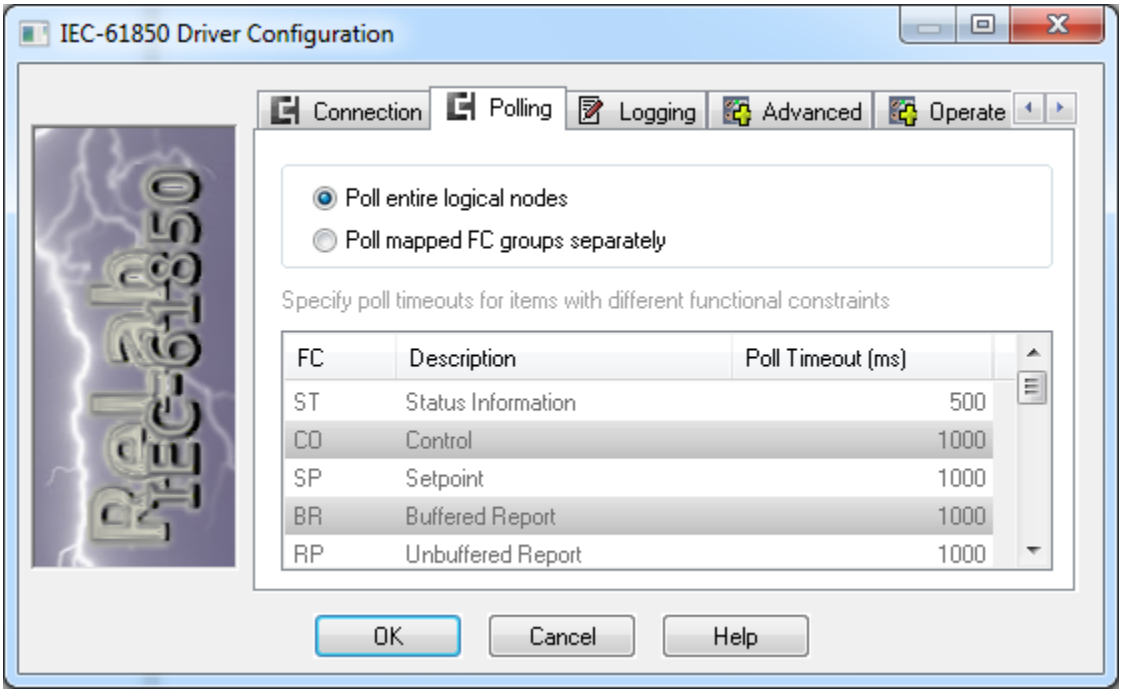

Figure 5

Option	Description	Type	Default
Poll entire logical node	If checked, the driver will send read requests for a whole logical node	Radio button	Checked
Poll mapped FC groups separately	If checked, the driver will send read requests individually for each Functional Constraint according to Poll Timeouts	Radio button	Unchecked
Poll Timeouts	Specifies Polling Timeouts for items with different Functional Constraints in milliseconds	List View	Various, per FC

Logging TAB

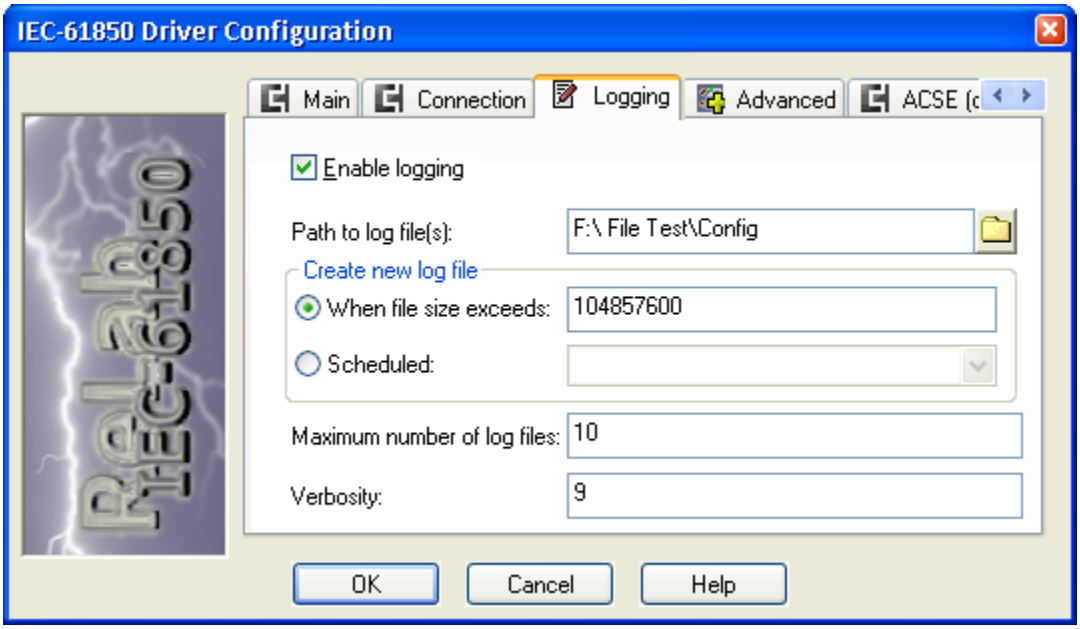

Figure 6

Description	Type	Default
[Enable logging] – Enables or disables driver logging	Boolean Checkbox	False
[Path to log file(s)] – Specifies location of the log file(s)	String Textbox	Empty
[When file size exceeds] – Specifies when the new file will be created based on file size entered (in bytes)	Long Textbox	1048576
[Scheduled] – Specifies when the new file will be created based on user selectable schedule |Daily (every 24 hours) | Every 12 hours | Every 8 hours | Every 6 hours | Every 4 hours | Every 2 hours | Hourly |	Enumeration Dropdown	Empty
[Maximum number of log files] – Specifies maximum number of log files before the files are overwritten	Integer Textbox	10
[Verbosity] – Specifies verbosity level of the log files (Valid entry is 1 – 9)	Integer Textbox	1

Advanced TAB

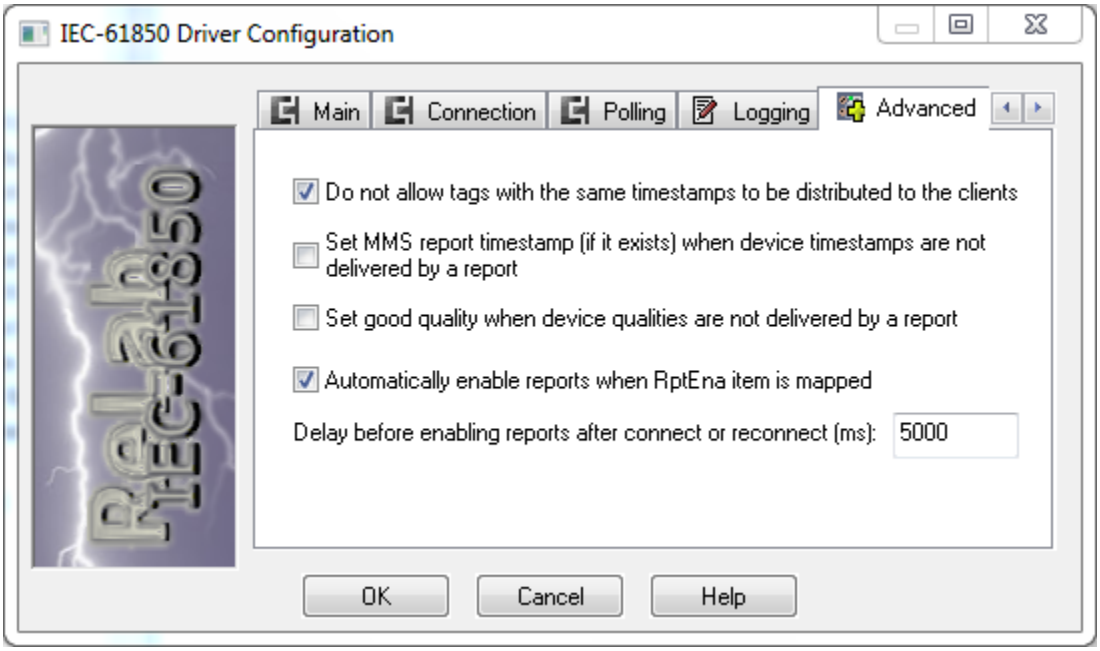

Figure 7

Option	Description	Type	Default
Do not allow tags with the same timestamp to be distributed to the clients	Significant amount of data exposed by typical IED through IEC 61850 is static (descriptions, predefined settings, etc.). With this setting “on” the RL61850 driver filters out these static data from the regular notifications sent to OPC clients. In many cases it will reduce traffic between OPC Server and its clients, CPU time and memory consumed by OPC Server and clients.	Boolean Checkbox	True
Set MMS report timestamp (if it exists) when the device timestamps are not delivered by report	Properly formed report data usually contains individual timestamps for all data fields delivered by the report. Sometimes due to various reasons (reports are not well formed or IED is not properly configured or IED firmware contains an error) the individual timestamps are absent. In such cases user can enable this option and RL61850 driver will use MMS report timestamp when individual timestamp is unavailable.	Boolean Checkbox	False

Set good quality when device quality are not delivered by a report	Properly formed report data usually contains individual qualities for all data fields delivered by report. Sometimes due to various reasons (reports are not well formed or IED is not properly configured or IED firmware contains an error) the individual qualities are absent. In such cases user can enable this option and RL61850 driver will use GOOD quality value when individual quality is unavailable.	Boolean Checkbox	False
Automatically enable reports when RptEna item is mapped	If this option is checked and the RptEna item(s) are mapped the driver will set RptEna items to True on every connection or reconnection to an IED	Boolean Checkbox	True
Delay before enabling reports after connect or reconnect (ms)	Specifies delay before enabling reports after connection or reconnection to an IED in milliseconds. Works only if **Automatically enable reports when RptEna item is mapped** is checked.	Integer Textbox	5000

ACSE (called party) TAB

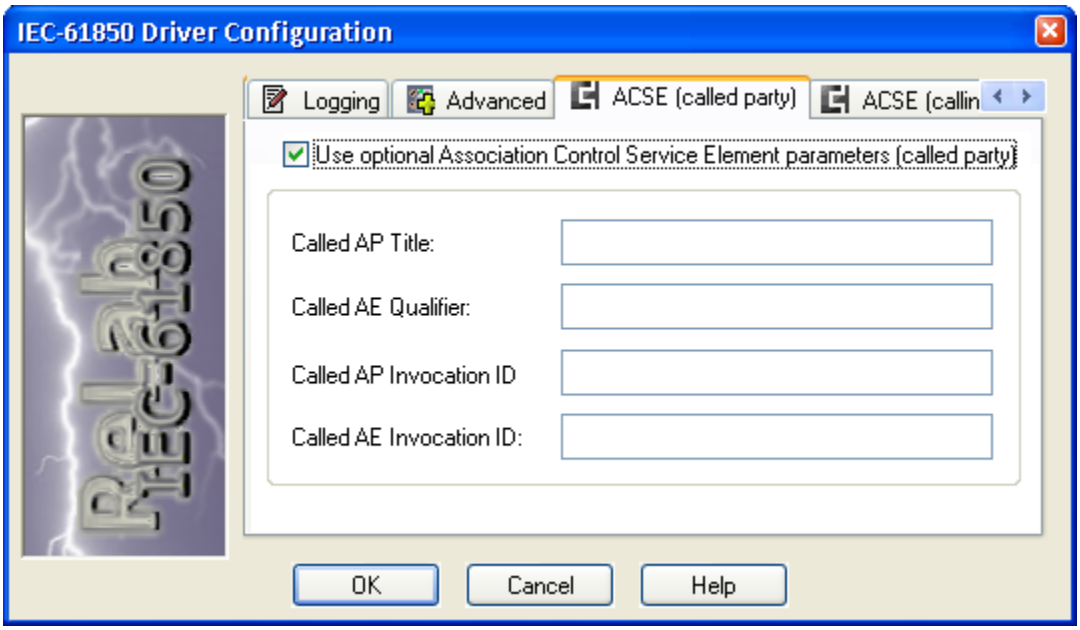

Figure 8

Description	Type	Default
Enables **[Use optional Association Control Services Element Parameters (called party)]**	Boolean Checkbox	False
Specifies **[Called IE Qualifier]**	String Edit Control	Empty
Specifies **[Called AE Qualifier]**	String Edit Control	Empty
Specifies **[Called AP Invocation ID]**	String Edit Control	Empty
Specifies **[Called AE Invocation ID]**	String Edit Control	Empty

NOTE: Please refer to ISO/IEC 8649 “Information technology - Open Systems Interconnection - Service definition for the Association Control Service Element” standards for more information. ACSE Called Party parameters are optional and their use is strictly application-specific. The use of these parameters is not required for most of all IEC 61850 MMS compatible devices and therefore if not necessary the use of these parameters is not recommended.

ACSE (Calling party) TAB

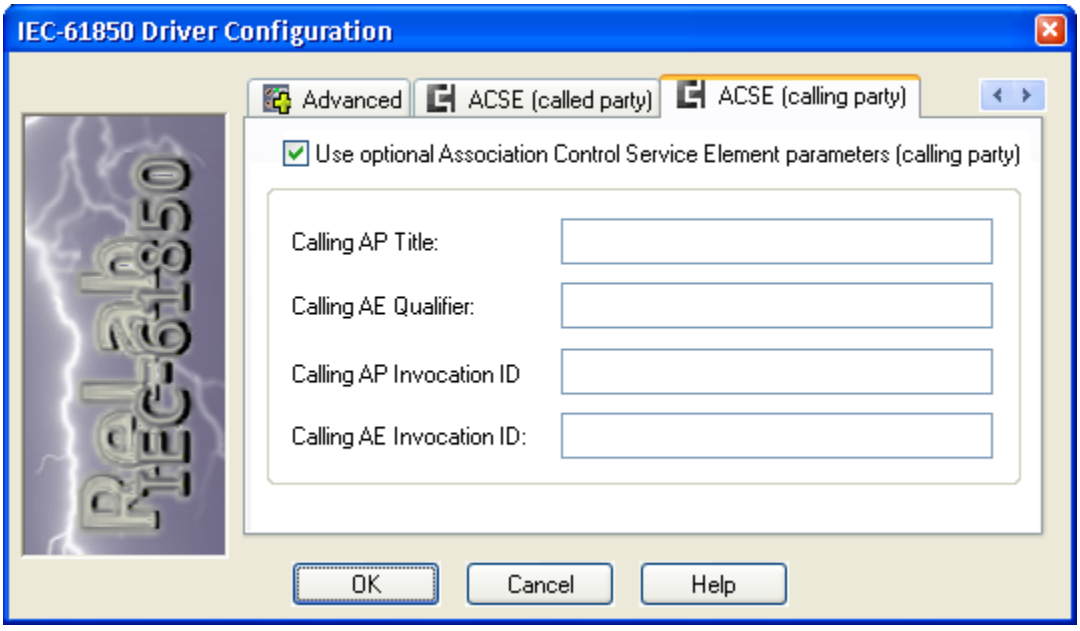

Figure 9

Description	Type	Default
Enables **[Use optional Association Control Services Element Parameters (calling party)]**	Boolean Checkbox	False
Specifies **[Calling IE Qualifier]**	String Edit Control	Empty
Specifies **[Calling AE Qualifier]**	String Edit Control	Empty
Specifies **[Calling AP Invocation ID]**	String Edit Control	Empty
Specifies **[Calling AE Invocation ID]**	String Edit Control	Empty

NOTE: Please refer to ISO/IEC 8649 "Information technology - Open Systems Interconnection - Service definition for the Association Control Service Element" standards for more information. ACSE Called Party parameters are optional and their use is strictly application-specific. The use of these parameters is not required for most of all IEC 61850 MMS compatible devices and therefore if not necessary the use of these parameters is not recommended.

1. Click "OK", - the **ReLab TCP/IP Configuration** dialog will appear

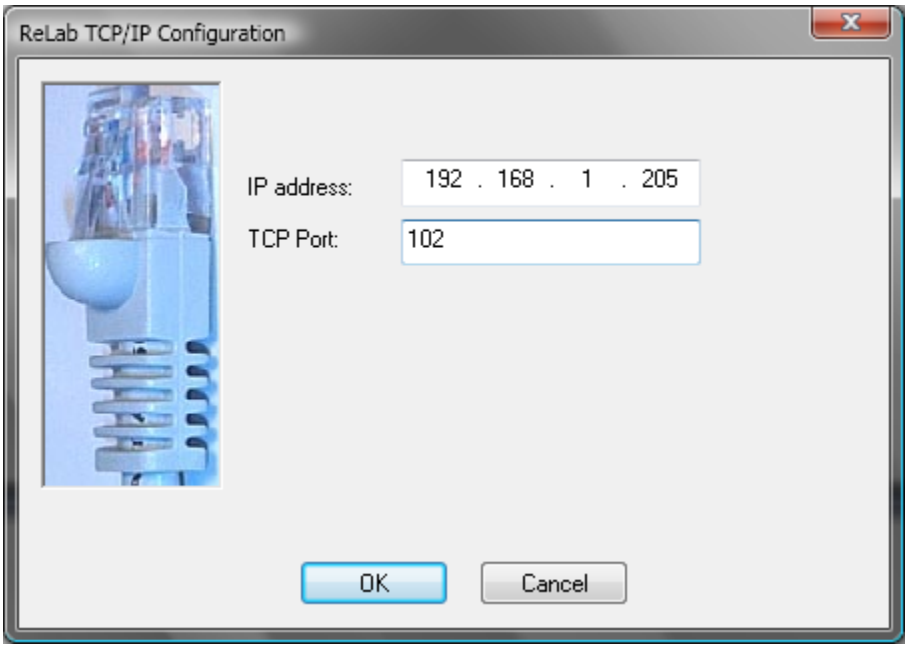

Figure 10

2. Specify **IP address** of your device (IED) and TCP Port if it's different from default port

Mapping RL61850 Registers (Items) to ReLab OPC Server

The IEC- 61850 is self-subscribing protocol. RL61850 OPC Driver will read the entire connected device configuration and populate “Loaded Device Drivers” view with retrieved configuration.

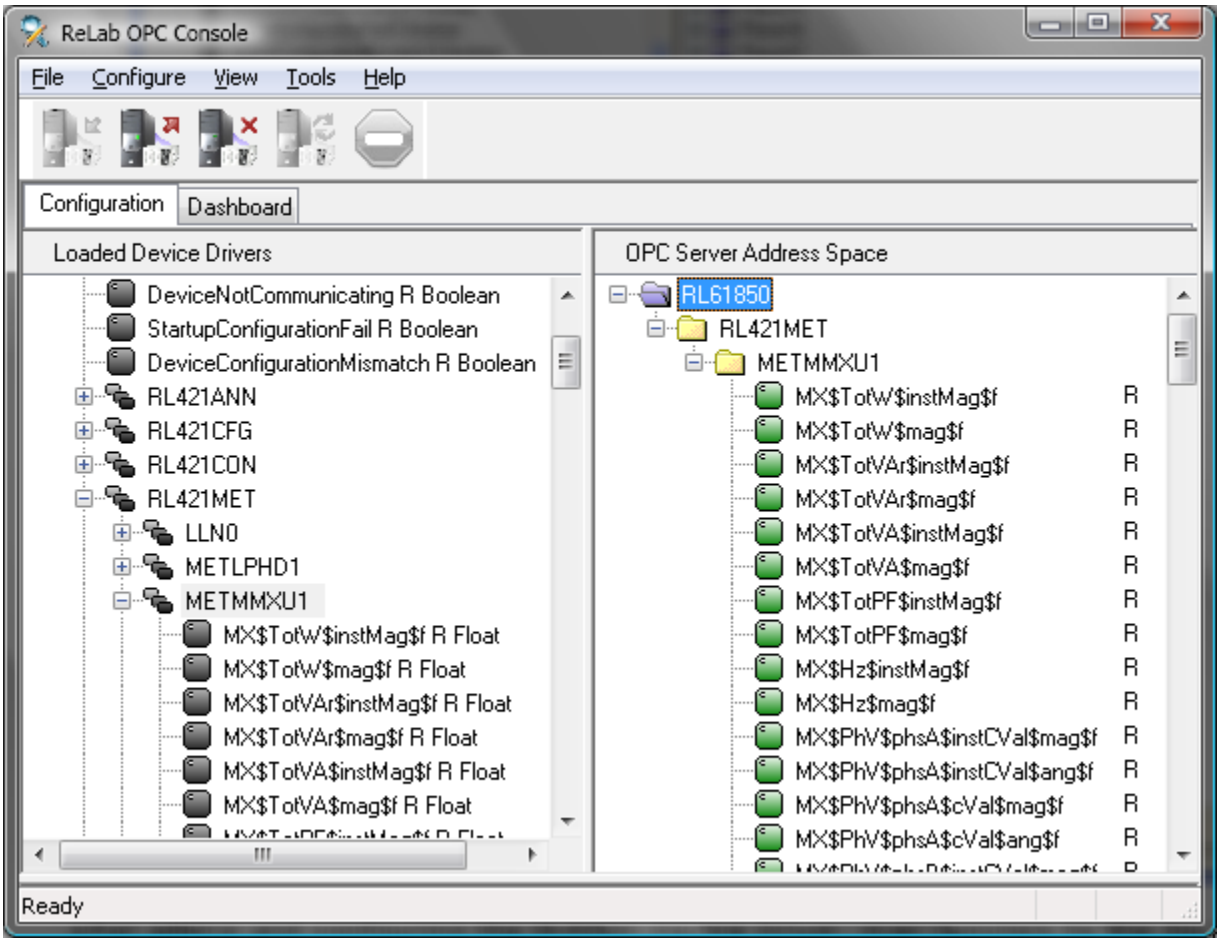

Figure 11

After adding and configuring the RL61850 Device Driver, map registers to the ReLab OPC Server by following the steps below.

3. Create an OPC Group by right-clicking on the **OPC Server Address Space** and clicking **Create Group**
4. Type a descriptive name for the Group you created
5. Right-click on the data you want to map to the Group, then click **Map Register(s) to…**
6. Find the range of registers you want to map to the Group
7. Select the desired registers, select the Group and then click **Map**. The registers are automatically mapped to the selected Group
8. Click the **Dashboard** tab to see the values in the registers

Note: For more details on mapping registers to ReLab OPC Server please refer to ReLab OPC Server manual.

Reloading RL61850 Driver

Driver **Reload** will erase previously created MMS static configuration file (.rlh) and will reread the configuration from IED. **Reload** is required each time the IED configuration is changed. After the **Reload** task completed the driver **Refresh** method must be executed.

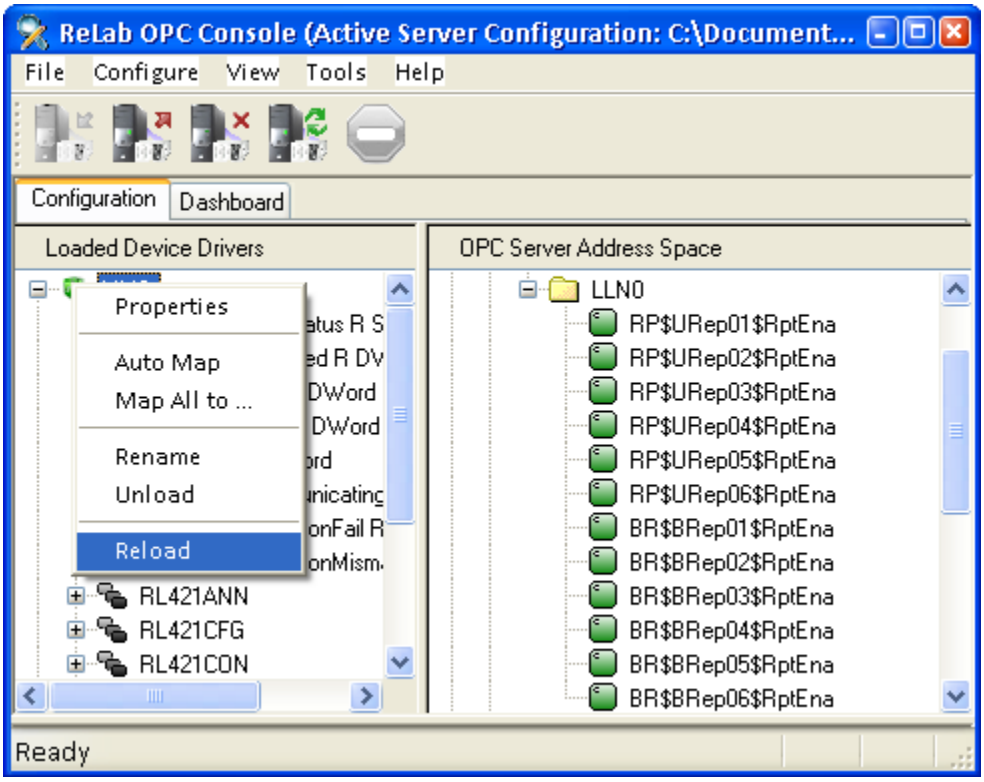

Figure 12

RL61850 Device Driver Functionality

OPC Items Description

RL61850 driver transparently exposes two root levels of IEC-61850 MMS namespace – in particular logical devices names and MMS names. The nested IEC-61850 levels (classes and data names) are exposed in accordance with IEC 61850-7-x and 61850-8-x standards for flattened names. “The names of the flattened MMS named variables shall be created through the concatenation of the MMS named variable component names separated by “$”.” The prefix of an item name is defined by ReLab OPC Server hierarchical address space as user creates it, the name of group and names of nested folders (in case of “Auto Map” the name consists of driver name, logical device name and MMS name), separated by dots. The tail of an item name is flattened MMS named variable.

The OPC items will receive a complex names specified by IEC 61850 with “$” symbol separator.

For example the item for instantaneous value of power factor will have the following string:

RL61850.RL421MET.METMMXU1.MX$TotPF$instMag$f	
Where:	
RL61850	Driver Name
RL421MET	Logical device (MMS domain) name
METMMXU1	Logical Node Name
MX$TotPF$instMag$f	Flattened MMS variable Name

MX	$	TotPF	$	TotPF	$	f
Component	Separator	Value Name	Separator	Structure name	Separator	Functional constraint

IEC 61850 OPC Item(s) Timestamp & Quality

MX	$	TotPF	$	TotPF	$	t (Timestamp)
Component	Separator	Value Name	Separator	Structure name	Separator	Functional constraint

MX	$	TotPF	$	TotPF	$	q (Quality)
Component	Separator	Value Name	Separator	Structure name	Separator	Functional constraint

Some of IEC-61850 structures along with values contain timestamp and quality components (as shown above). To leverage native OPC capabilities and simplify IEC-61850 deployment ReLab does not expose those component explicitly, but maps their values to OPC timestamp and quality respectively.

IEC 61850 OPC Item(s) Supported Data Types

Mapping of MMS data types to OPC data types:

MMS Data Type	OPC Data Type
Boolean	Boolean
Float	Float
Double	Double
Integer32	Integer
Integer16	Short
Integer8	Char (-128,…,127)
Uint32	DWord
Uint16	Word

Uint8	Byte
BitString	DWord
Enum	Integer
String	String (BSTR)
Octet String	String (BSTR)

IEC-61850 (MMS) OPC Item(s) Synchronous Read (Poll)

If **Poll entire logical node** is specified (see **Polling Tab** above) then the driver will poll the items using the timeout specified on the Connection Tab. At time the driver examines what logical nodes have to be read (based on the set of items currently mapped by all clients connected to OPC server) and caches requests in the internal queue. Driver submits read requests at the rate the IEC-61850 device constraints and incoming traffic allow. When all previously cached read requests are processed by the device and timeout exceeded the driver repeats the above procedure.

If **Poll mapped FC groups separately** is specified (see **Polling Tab** above) then the driver will poll the items using the timeout specified for each Functional Constraints group. At time the driver examines what Functional Constraints groups have to be read (based on the set of items currently mapped by all clients connected to OPC server) and caches requests in the internal queue. Driver submits read requests at the rate the IEC-61850 device constraints and incoming traffic allow. When all previously cached read requests are processed by the device and timeout exceeded the driver repeats the above procedure.

IEC 61850 OPC Item(s) Write

According to IEC 61850-8-x standard driver writes entire "…$Oper" structure whenever OPC Client writes "…$Oper$ctlVal" Boolean value. Nevertheless, all the fields (components) of structure except "ctlVal" itself are filled by ReLab IEC-61850 driver automatically.

"…$Oper$origin$orCat" – is set to "Remote Control" (3)

"…$Oper$origin$orIdent" – is set to "HOST\username" of the user who started the OPC Server.

"…$Oper$ctlNum" – is initially set to 0 and gets increased by one with each subsequent write.

"…$Oper$Test" – is set to FALSE

"…$Oper$Check" – is set to 00

"…$Oper$T" – is set to current UTC time.

All these values and the corresponding "…$stVal" values are updated either when read requests are issued and the corresponding responses are received from the device or when unsolicited message (Information Report) is received (assuming that items are added to a DataSet associated with enabled report).

IEC 61850 OPC Item(s) Enable, Read Buffered & Un-Buffered Reports

According to IEC 61850-8-x standard driver writes subset of "…RP$..." or "…BR$..." structure whenever an OPC Client writes "…$RptEna" Boolean value. The subset is defined by SetBRCBValues/SetURCBValues mapping rules described in IEC 61850-8-x standard.

All reports:

"…$RptID" – is set to Report Id provided by the device (May not be written when RptEna=TRUE).

"…$DatSet" – is set to DataSet name provided by the device (May not be written when RptEna=TRUE).

"…$ConfRev" – is set to the integer provided by the device (May not be written).

"…$OptFlds" – is set depending on set of SetBRCBValues or SetURCBValues parameters (May not be written when RptEna=TRUE).

"…$BufTm" – is set to the integer provided by the device (May not be written when RptEna=TRUE).

"…$SqNum" – is set to the integer provided by the device (May not be written).

"…$TrgOps" – is set to "data change"+"quality change"+"data update" (May not be written when RptEna=TRUE).

"…$IntgPd" – is set to the integer provided by the device (May not be written when RptEna=TRUE).

"…$GI" – is set to TRUE.

Unbuffered reports only:

"…$Resv" – is set to FALSE.

Buffered reports only:

"…$PurgeBuf" – is set to TRUE (May not be written when RptEna=TRUE).

"…$EntryID" – is set to the octet string provided by the device (May not be written when RptEna=TRUE).

"…$TimeofEntry" – is set to current binary time (May not be written).

RL61850 Device Driver System Tags (Items)

System Tag	System Tag Description	Data Type
CommunicationStatus R String	Device Connection status	String
MessagesReceived R DWord	Messages received from the device	DWord
MessagesSent R DWord	Messages sent to the device	DWord
TransportErrors R DWord	Transport errors received by the driver	DWord
TimeSpan R DWord	Time in seconds after driver initialization	DWord
DeviceNotCommunicating R Boolean	Device Connection loss	Boolean
StartupConfigurationFail R Boolean	**Reserved** for future Driver CID file configuration	Boolean
DeviceConfigurationMismatch R Boolean	**Reserved** for future Driver CID file configuration	Boolean

RL61850 Driver Configuration File (CVD)

DriverName,DriverCLSID,DriverProperties

RL61850,{B2FDF6C7-1800-4CB4-88EE-A36463D2124F},
Port=102;Host=192.168.1.205;Connection=TCP/IP;Log=Enable;LogPath=C:\Users\RaLab\Desktop\RL61850_TEST;
LHourly=0;LogSize=1048576;LogFiles=10;LogVerbosity=9; PollTimeout=0.500000;WRT=5.000000;TAP=1;SAP=1;PAP=1;
MMSM=2; FSTS=1;

Unmapped,,

Property Name	Property Description	Default Value
DriverName	Specifies configured driver name	N/A
DriverCLSID	Specifies driver class ID	N/A
Port	Specifies device TCP port	102
Connection	Specifies device TCP IP address	N/A
Log	Specifies if driver logging is enabled	Disable
LogPath	Specifies path (directory) of the log files	N/A
LHourly	Specifies if log files created on time intervals	0
LogSize	Specifies the maximum size of the log files	1048576
LogVerbosity	Specifies log level verbosity	1
LogFiles	Specifies number of log files	10
PollTimeout	Specifies driver poll time	0.500000
WRT	Specifies device disconnect timeout	5.000000
TAP	Specifies Transport access point	1
SAP	Specifies Session access point	1
PAP	Specifies Presentation access point	1
MMSM	User configurable unsigned values encoding property (see section below)	2

FSTS	User configurable to disable OPC updates when the item values are not changing (FSTS=1)	1
MsgTS	Flag to force OPC item timestamps for all GOOSE datasets to message timestamp (MsgTS=1)	0
FGQ	Flag to force OPC item quality for all datasets to GOOD OPC quality (FGQ=1)	0
OnErr	Flag to force reconnect on any received errors from IED (IEC 61850 MMS Server) – OnErr=1	0

Note: *Please be aware that forcing timestamps (MsgTS), quality (FGQ) or values (FSTS)* flags may result in unpredictable behavior (incorrect data reported by OPC Device Driver). Use these settings ONLY if IED is incapable of reporting the *correct values, timestamps or qualities for individual items.*

Appendix-A IEC 61850 Conformance Statement

IEC 61850 MMS OPC Device Driver (RL61850)

IEC 61850 GOOSE OPC Device Driver (RL61850GOOSE)

Conformance statement applicable to:

- MMS Client
- GOOSE Publisher
- GOOSE Subscriber

M – Mandatory

AP – shall be 'M' if applicable

O – Optional

N/A – Not Applicable

ABSTRACT COMMUNICATION SERVICE INTERFACE (ACSI) BASIC				
		Client Subscriber	**Server Publisher**	**Value comments**
DCA-server roles				
B11	**Server** side (of TWO-PARTY-APPLICATION-ASSOCIATION)	–	AP	**NO**
B12	**Client** side of (TWO-PARTY-APPLICATION-ASSOCIATION)	AP	–	**YES**
SCSMs supported				
B21	**SCSM**: IEC 61850-8-1 used	AP	AP	**YES**
B22	**SCSM**: IEC 61850-9-1 used	AP	AP	**YES**
B23	**SCSM**: IEC 61850-9-2 used	AP	AP	**YES**
B24	**SCSM**: other	AP	AP	**YES**
Generic substation event model (GSE)				
B31	**Publisher** side	–	AP	**NO**
B32	**Subscriber** side	O	AP	**NO**
Transmission of sampled value model (SVC)				
B41	**Publisher** side	–	AP	**NO**

B42	**Subscriber** side	O	AP	**NO**

ABSTRACT COMMUNICATION SERVICE INTERFACE (ACSI) MODELS				
		Client Subscriber	**Server Publisher**	**Value comments**
If Server side (B11) or DCA side (B12) supported				
M1	**Logical device**	AP	AP	**YES**
M2	**Logical node**	AP	AP	**YES**
M3	**Data**	AP	AP	**YES**
M4	**Data set**	AP	AP	**YES**
M5	**Substitution**	O	O	**NO**
M6	**Setting group control**	O	O	**NO**
Reporting				
M7	**Buffered report control**	O	O	**YES**
M7-1	sequence-number	–	–	**YES**
M7-2	report-time-stamp	–	–	**YES**
M7-3	reason-for-inclusion	–	–	**YES**
M7-4	data-set-name	–	–	**YES**
M7-5	data-reference	–	–	**YES**
M7-6	buffer-overflow	–	–	**YES**
M7-7	entryID	–	–	**YES**
M7-8	BufTm	–	–	**YES**
M7-9	IntgPd	–	–	**YES**
M7-10	GI	–	–	**YES**
M8	**Unbuffered report control**	O	O	**YES**
M8-1	sequence-number	–	–	**YES**
M8-2	report-time-stamp	–	–	**YES**
M8-3	reason-for-inclusion	–	–	**YES**
M8-4	data-set-name	–	–	**YES**
M8-5	data-reference	–	–	**YES**
M8-6	BufTm	–	–	**YES**

M8-7	IntgPd	–	–	**YES**
M8-8	GI	–	–	**YES**
Logging		O	O	**NO**
M9	**Log control**	O	O	**NO**
M9-1	IntgPd	–	–	**NO**
M10	**Log**	O	O	**NO**
M11	**Control**	M	M	**YES**

ABSTRACT COMMUNICATION SERVICE INTERFACE (ACSI) MODELS				
		Client Subscriber	**Server Publisher**	**Value comments**
If GSE (B31/B32) is supported				
GOOSE		O	O	**YES**
M12-1	entryID	–	–	**YES**
M12-2	DataRefInc	–	–	**NO**
M13	**GSSE**	O	O	**NO**
If SVC (B41/B42) is supported				
M14	Multicast SVC	O	O	**NO**
M15	Unicast SVC	O	O	**NO**
M16	**Time**	N/A	N/A	**NO**
M17	**File Transfer**	N/A	N/A	**NO**

ABSTRACT COMMUNICATION SERVICE INTERFACE (ACSI) SERVICES					
	Services	**AA: TP/MC**	**Client Subscriber**	**Server Publisher**	**Comment Value**
Server (Clause 6)					
S1	ServerDirectory	TP	–	M	**NO**
Application association (Clause 7)					
S2	Associate	–	M	M	**YES**
S3	Abort	–	M	M	**YES**

S4	Release	–	M	M	**YES**
Logical device (Clause 8)					
S5	LogicalDeviceDirectory	TP	M	M	**YES**
Logical node (Clause 9)					
S6	LogicalNodeDirectory	TP	M	M	**YES**
S7	GetAllDataValues	TP	O	M	**YES**
Data (Clause 10)					
S8	GetDataValues	TP	AP	M	**YES**
S9	SetDataValues	TP	O	O	**YES**
S10	GetDataDirectory	TP	O	M	**YES**
S11	GetDataDefinition	TP	O	M	**YES**
Data set (Clause 11)					
S12	GetDataSetValues	TP	AP	M	**YES**
S13	SetDataSetValues	TP	AP	O	**YES**
S14	CreateDataSet	TP	O	O	**NO**
S15	DeleteDataSet	TP	O	O	**NO**
S16	GetDataSetDirectory	TP	O	O	**YES**
Substitution (Clause 12)					
S17	SetDataValues	TP	AP	M	**YES**
Setting group control (Clause 13)					
S18	SelectActiveSG	TP	O	O	**NO**
S19	SelectEditSG	TP	O	O	**NO**
S20	SetSGValues	TP	O	O	**YES**
S21	ConfirmEditSGValues	TP	O	O	**NO**
S22	GetSGValues	TP	O	O	**NO**
S23	GetSGCBValues	TP	O	O	**NO**

ABSTRACT COMMUNICATION SERVICE INTERFACE (ACSI) SERVICES					
	Services	**AA: TP MC**	**Client Subscriber**	**Server Publisher**	**Comments Value**
Reporting (Clause 14)					
Buffered report control block (BRCB)					
S24	Report	TP	AP	AP	**YES**
S24-1	data-change (dchg)	–	–	–	**YES**
S24-2	qchg-change (qchg)	–	–	–	**YES**
S24-3	data-update (dupd)	–	–	–	**YES**
S25	GetBRCBValues	TP	AP	AP	**YES**
S26	SetBRCBValues	TP	AP	AP	**YES**
Unbuffered report control block (URCB)					
S27	Report	TP	AP	AP	**YES**
S27-1	data-change (dchg)	–	–	–	**YES**
S27-2	qchg-change (qchg)	–	–	–	**YES**
S27-3	data-update (dupd)	–	–	–	**YES**
S28	GetURCBValues	TP	AP	AP	**YES**
S29	SetURCBValues	TP	AP	AP	**YES**
Logging (Clause 14)					
Log control block					
S30	GetLCBValues	TP	M	M	**YES**
S31	SetLCBValues	TP	O	M	**YES**
Log					
S32	QueryLogByTime	TP	AP	M	**NO**
S33	QueryLogAfter	TP	AP	M	**NO**
S34	GetLogStatusValues	TP	M	M	**NO**

ABSTRACT COMMUNICATION SERVICE INTERFACE (ACSI) SERVICES					
	Services	**AA: TP/MC**	**Client Subscriber**	**Server Publisher**	**Comments Value**

Generic substation event model (GSE) (14.3.5.3.4)					
GOOSE-CONTROL-BLOCK					
S35	SendGOOSEMessage	MC	AP	AP	**YES**
S36	GetGoReference	TP	O	AP	**YES**
S37	GetGOOSEElementNumber	TP	O	AP	**YES**
S38	GetGoCBValues	TP	O	O	**YES**
S39	SetGoCBValues	TP	O	O	**YES**
GSSE-CONTROL-BLOCK					
S40	SendGSSEMessage	MC	AP	AP	**NO**
S41	GetGsReference	TP	O	AP	**NO**
S42	GetGSSEElementNumber	TP	O	AP	**NO**
S43	GetGsCBValues	TP	O	O	**NO**
S44	SetGsCBValues	TP	O	O	**NO**

ABSTRACT COMMUNICATION SERVICE INTERFACE (ACSI) SERVICES					
	Services	**AA: TP/MC**	**Client Subscriber**	**Server Publisher**	**Comments Value**
Transmission of sampled value model (SVC) (Clause 16)					
Multicast SVC					
S45	SendMSVMessage	MC	AP	AP	**NO**
S46	GetMSVCBValues	TP	O	O	**NO**
S47	SetMSVCBValues	TP	O	O	**NO**
Unicast SVC					
S48	SendUSVMessage	TP	AP	AP	**NO**
S49	GetUSVCBValues	TP	O	O	**NO**
S50	SetUSVCBValues	TP	O	O	**NO**
Control (17.5.1)					
S51	Select		M	O	**YES**
S52	SelectWithValue	TP	M	O	**YES**
S53	Cancel	TP	O	O	**YES**

S54	Operate	TP	M	M	**YES**
S55	Command- Termination	TP	M	O	**YES**
S56	TimeActivated-Operate	TP	AP	O	**YES**
File transfer (Clause 20)					
S57	GetFile	TP	O	M	**NO**
S58	SetFile	TP	O	O	**NO**
S59	DeleteFile	TP	O	O	**NO**
S60	GetFileAttributeValues	TP	O	M	**NO**

Appendix-B Registering RL61850 OPC Device Driver

1. In **ReLab OPC Console** navigate to **Tools | Register Driver**

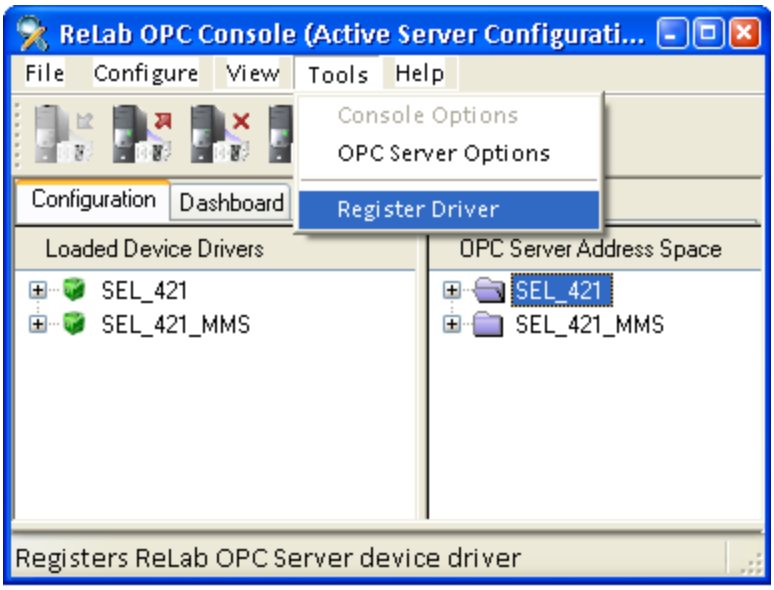

Figure 13

2. Select **IEC-61850 Device Driver**

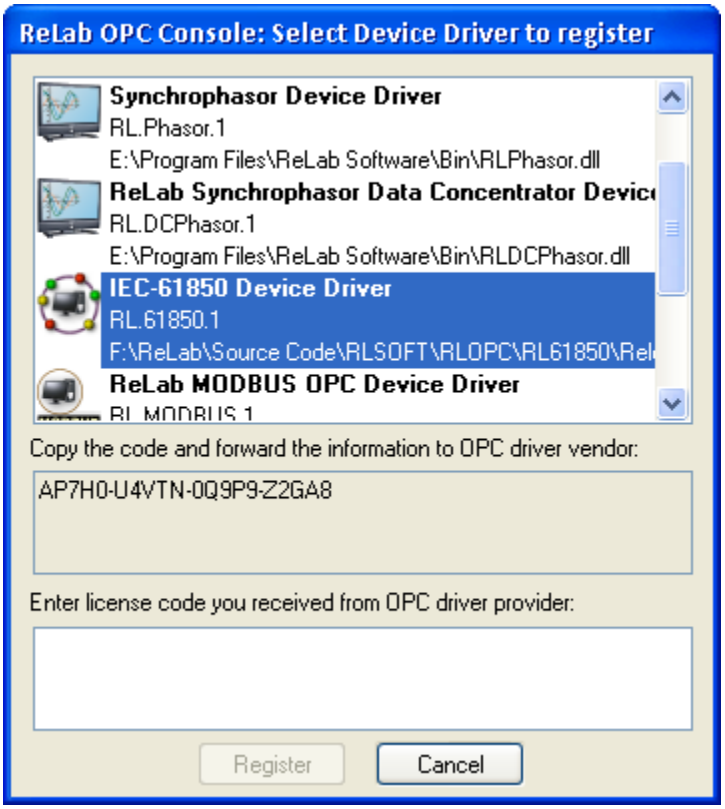

Figure 14

3. Copy the code from the textbox below

4. Navigate to ReLab web site http://www.relabsoft.com and navigate to **Support | License Registration** and enter the information required including the code generated on Step 3.
5. Within few minutes you will receive an email with registration acknowledgement and within few hours - the license code.
6. Enter the received license code and click **Register**.

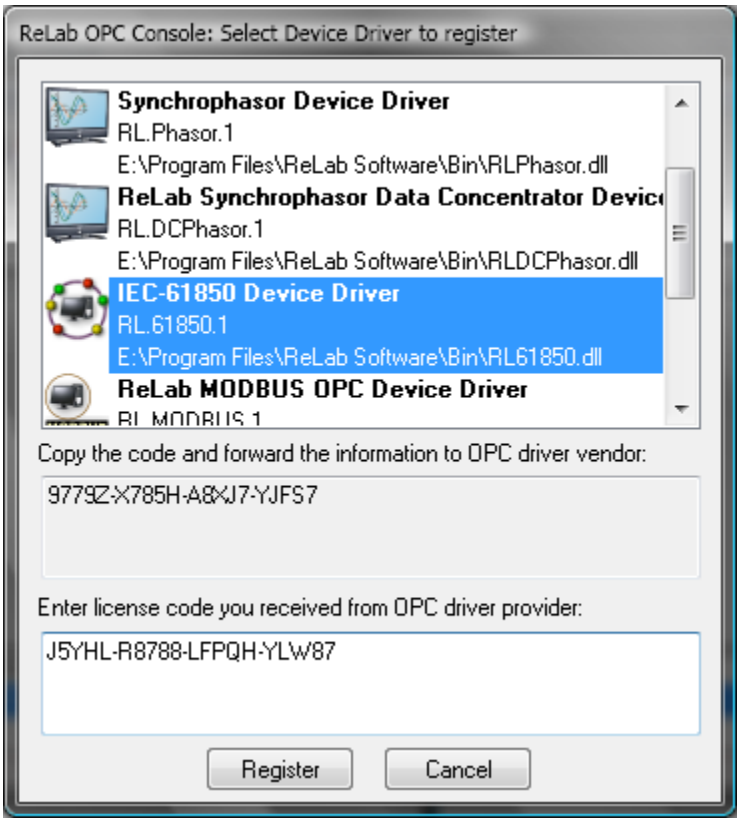

Figure 15

7. Click **Cancel** after successful registration

Appendix-D RL61850 IEC 61850 File Transfer

Overview

RL61850 MMS OPC Device Driver supports the following IEC-61850 File Transfer Services:

- GetFile
- SetFile
- DeleteFile
- GetFileAttributeValues

Description

The RL61850 driver allows the user to configure file transfer.

Tag Name	Tag Description	Data Type	Value	Client Access
LockFileTransfer	Locks specific client for file manipulation	Boolean	Lock = 1 Unlock = 0	RW
FilePattern	Specifies what type of files will be retrieved	String	“*.*” “*. “ “*.txt”	RW
DeviceFileName	Species which file would be retrieved and saved on the local hard-drive	String	Any file name or the one which is currently selected (enumeration)	RW
FileSize	Device selected file size	DWORD	In Bytes	R
FileTime	Device selected file creation date and time	Date		R
FileIndex	Device files enumeration	DWORD	From 0 to 4294967295	RW
NumberOfFiles	Current number of files on the device	DWORD	From 0 to 4294967295	R
LocalFolder	Local folder where retrieved file will be saved to	String	Drive letter C:\	RW
LocalFileName	New saved file name	String	Any string	RW
Action	Type of action required (get file from the device, copy file to the device or delete the file from the device)	DWORD	0 = No action 1 = Get File 2 = Set File	RW

			3 = Delete File	
LastError	Error number generated during operation (Action)	DWORD	See below Error Codes	R

Error codes

0 - None

1 - File operation is locked by another client

2 - Device directory is empty (no files)

3 - Specified index is out of range (> Number of files)

4 - Unrecognized action

5 - One or more parameters for an action is absent

7 - Cannot release lock because some actions are in progress

8 - Cannot access specified file

9 - MMS error - "Access denied"