IEC 61850 MMS Client Driver

© 2025 PTC Inc. All Rights Reserved.

Table of Contents

Welcome to the IEC 61850 MMS Client Driver Help Center

This help center is the user documentation for Kepware IEC 61850 MMS Client Driver. This help center is updated regularly to reflect the latest functionality and information.

Overview
What is the IEC 61850 MMS Client Driver?

Setup
How do I configure devices for use with this driver?

Data Types Description
What data types does the IEC 61850 MMS Client Driver support?

Address Descriptions
How do I address a data location on a device?

Event Log Messages
What messages are produced by the IEC 61850 MMS Client Driver?

Additional Resources

- Search the Technical Support knowledge base to find known answers to technical questions and issues (login required).
- For links to Help Centers for all PTC products, including Help Centers for other releases of this product, see the PTC Help Centers.
- For a collaborative approach to development and troubleshooting, post questions or solutions in the Community forum.

We Want Your Feedback

We are interested in your feedback on the content of this Help Center.

- Click ✉ in the upper right corner of any page to send feedback about that page.
- Email documentation@ptc.com to provide suggestions or comments about the Help Center.

Version 1.050
© 2025 PTC Inc. All Rights Reserved.

Overview

IEC 61850 is a modern electrical substation communication protocol designed with the goal of decreasing data management effort. It uses symbolic addresses to reduce the time-intensive data mapping of numerically-addressed protocols, supports several self-description services for online data configuration and validation, and supports meta data in addition to real, measured data.

The IEC 61850 MMS Client Driver supports the following:

- Solicited data access through Manufacturing Message Specification (MMS) Read and Write requests.
- Unsolicited data through MMS Information Reports.
- Special handling of Reads and Writes as they relate to IEC 61850 control operations.

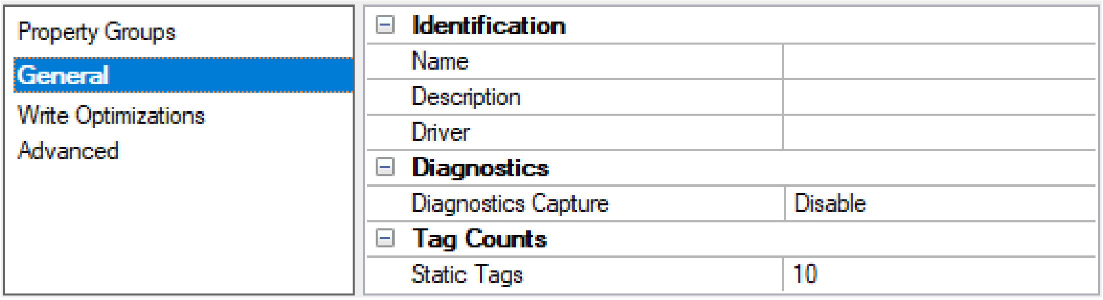
Setup

Channel and Device Limits

The maximum number of channels supported by this driver is 256. The maximum number of devices supported by this driver is 256 per channel.

Channel Properties – General

This server supports the use of multiple simultaneous communications drivers. Each protocol or driver used in a server project is called a channel. A server project may consist of many channels with the same communications driver or with unique communications drivers. A channel acts as the basic building block of an OPC link. This group is used to specify general channel properties, such as the identification attributes and operating mode.



Property Groups
- General
- Write Optimizations
- Advanced

⊟ **Identification**	
Name	
Description	
Driver	
⊟ **Diagnostics**	
Diagnostics Capture	Disable
⊟ **Tag Counts**	
Static Tags	10

Identification

Name: Specify the user-defined identity of this channel. In each server project, each channel name must be unique. Although names can be up to 256 characters, some client applications have a limited display window when browsing the OPC server's tag space. The channel name is part of the OPC browser information. The property is required for creating a channel.
For information on reserved characters, refer to "How To... Properly Name a Channel, Device, Tag, and Tag Group" in the server help.

Description: Specify user-defined information about this channel.
Many of these properties, including Description, have an associated system tag.

Driver: Specify the protocol / driver for this channel. Specify the device driver that was selected during channel creation. It is a disabled setting in the channel properties. The property is required for creating a channel.
Note: With the server's online full-time operation, these properties can be changed at any time. This includes changing the channel name to prevent clients from registering data with the server. If a client has already acquired an item from the server before the channel name is changed, the items are unaffected. If, after the channel name has been changed, the client application releases the item and attempts to re-acquire using the old channel name, the item is not accepted. Changes to the properties should not be made once a large client application has been developed. Utilize proper user role and privilege management to prevent operators from changing properties or accessing server features.

Diagnostics

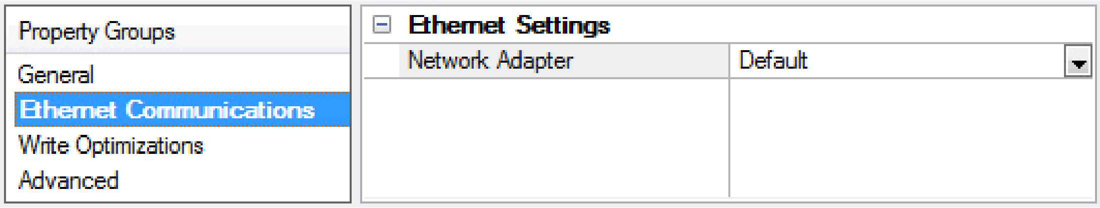
Diagnostics Capture: When enabled, this option makes the channel's diagnostic information available to OPC applications. Because the server's diagnostic features require a minimal amount of overhead processing, it is recommended that they be utilized when needed and disabled when not. The default is disabled.
Note: This property is not available if the driver or operating system does not support diagnostics.
For more information, refer to Communication Diagnostics and Statistics Tags in server help.

Tag Counts

Static Tags: Provides the total number of defined static tags at this level (device or channel). This information can be helpful in troubleshooting and load balancing.

Channel Properties – Ethernet Communications

Ethernet Communication can be used to communicate with devices.



Property Groups
- General
- Ethernet Communications
- Write Optimizations
- Advanced

⊟ Ethernet Settings

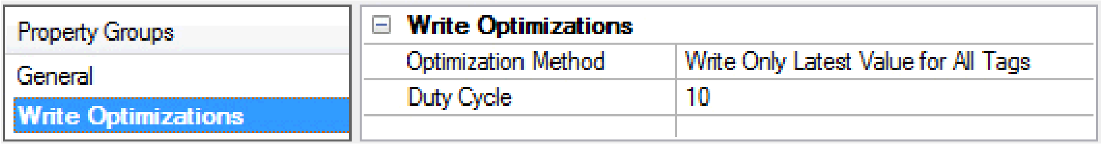
Network Adapter	Default

Ethernet Settings

Network Adapter: Specify the network adapter to bind. When left blank or Default is selected, the operating system selects the default adapter.

Channel Properties – Write Optimizations

The server must ensure that the data written from the client application gets to the device on time. Given this goal, the server provides optimization properties to meet specific needs or improve application responsiveness.



Property Groups
- General
- Write Optimizations

⊟ Write Optimizations

Optimization Method	Write Only Latest Value for All Tags
Duty Cycle	10

Write Optimizations

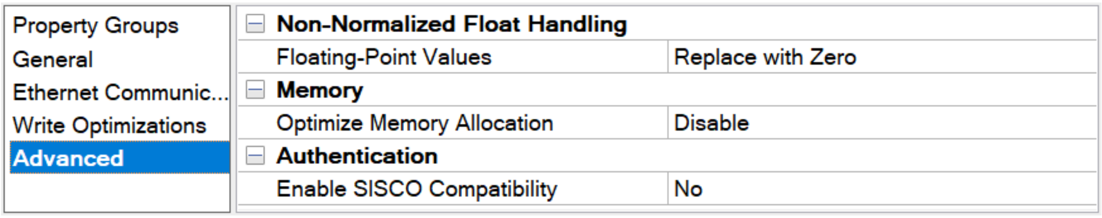
Optimization Method: Controls how write data is passed to the underlying communications driver. The options are:

- **Write All Values for All Tags**: This option forces the server to attempt to write every value to the controller. In this mode, the server continues to gather write requests and add them to the server's internal write queue. The server processes the write queue and attempts to empty it by writing data to the device as quickly as possible. This mode ensures that everything written from the client applications is sent to the target device. This mode should be selected if the write operation order or the write item's content must uniquely be seen at the target device.
- **Write Only Latest Value for Non-Boolean Tags**: Many consecutive writes to the same value can accumulate in the write queue due to the time required to actually send the data to the device. If the server updates a write value that has already been placed in the write queue, far fewer writes are needed to reach the same final output value. In this way, no extra writes accumulate in the server's queue. When the user stops moving the slide switch, the value in the device is at the correct value at virtually the same time. As the mode states, any value that is not a Boolean value is updated in the server's internal write queue and sent to the device at the next possible opportunity. This can greatly improve the application performance.
  Note: This option does not attempt to optimize writes to Boolean values. It allows users to optimize the operation of HMI data without causing problems with Boolean operations, such as a momentary push button.
- **Write Only Latest Value for All Tags**: This option takes the theory behind the second optimization mode and applies it to all tags. It is especially useful if the application only needs to send the latest value to the device. This mode optimizes all writes by updating the tags currently in the write queue before they are sent. This is the default mode.

Duty Cycle: is used to control the ratio of write to read operations. The ratio is always based on one read for every one to ten writes. The duty cycle is set to ten by default, meaning that ten writes occur for each read operation. Although the application is performing a large number of continuous writes, it must be ensured that read data is still given time to process. A setting of one results in one read operation for every write operation. If there are no write operations to perform, reads are processed continuously. This allows optimization for applications with continuous writes versus a more balanced back and forth data flow.
Note: It is recommended that the application be characterized for compatibility with the write optimization enhancements before being used in a production environment.

Channel Properties — Advanced

This group is used to specify advanced channel properties. Not all drivers support all properties; so the Advanced group does not appear for those devices.



⊟ **Non-Normalized Float Handling**
Floating-Point Values: Replace with Zero
⊟ **Memory**
Optimize Memory Allocation: Disable
⊟ **Authentication**
Enable SISCO Compatibility: No

Non-Normalized Float Handling

Floating-Point Values: A non-normalized value is defined as Infinity, Not-a-Number (NaN), or as a Denormalized Number. The default is Replace with Zero. Drivers that have native float handling may default to Unmodified. Non-normalized float handling allows users to specify how a driver handles non-normalized IEEE-754 floating point data. Descriptions of the options are as follows:

- **Replace with Zero**: This option allows a driver to replace non-normalized IEEE-754 floating point values with zero before being transferred to clients.
- **Unmodified**: This option allows a driver to transfer IEEE-754 denormalized, normalized, non-number, and infinity values to clients without any conversion or changes.

Note: This property is not available if the driver does not support floating point values or if it only supports the option that is displayed. According to the channel's float normalization setting, only real-time driver tags (such as values and arrays) are subject to float normalization. For example, EFM data is not affected by this setting.

For more information on the floating-point values, refer to "How To ... Work with Non-Normalized Floating Point Values" in the server help.

Memory

Optimize Memory Allocation: When a channel is created, the mechanism for communication with the devices allocates space for 256 devices. This allows creation of devices without needing to reinitialize the connection. For projects with many channels, this can consume too much memory. If enabled, memory is only allocated for the current number of devices created under the channel.

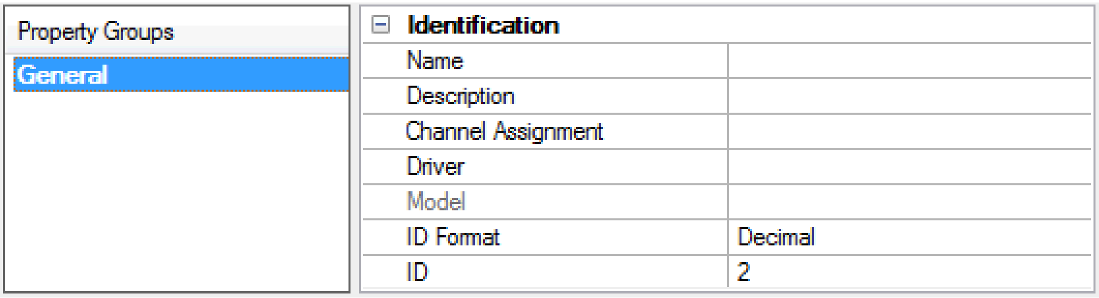
CAUTION: The disadvantage of enabling this property is that the connection for every device created under the channel is lost while a new connection is built. This can lead to data loss during that time period. That time period is small, expected to be under 500 ms. For that reason, only enable this setting once the project has been configured.

Authentication

SISCO Compatibility: If enabled, signs the hash of the message. If disabled, signs the entire message including the hash. This is named SISCO Compatibility because many SISCO devices require this signature implementation. This property will apply to all devices on this channel that are configured to use Certificate Authentication.

Device Properties – General

A device represents a single target on a communications channel. If the driver supports multiple controllers, users must enter a device ID for each controller.



Property Groups

General

⊟ Identification	
Name	
Description	
Channel Assignment	
Driver	
Model	
ID Format	Decimal
ID	2

Identification

Name: Specify the name of the device. It is a logical user-defined name that can be up to 256 characters long and may be used on multiple channels.

Note: Although descriptive names are generally a good idea, some OPC client applications may have a limited display window when browsing the OPC server's tag space. The device name and channel name become part of the browse tree information as well. Within an OPC client, the combination of channel name and device name would appear as "ChannelName.DeviceName".
For more information, refer to "How To... Properly Name a Channel, Device, Tag, and Tag Group" in server help.

Description: Specify the user-defined information about this device.
Many of these properties, including Description, have an associated system tag.

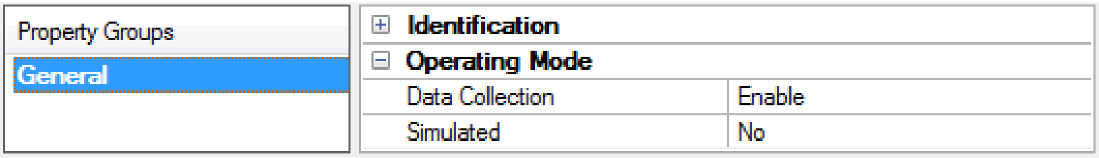
Channel Assignment: Specify the user-defined name of the channel to which this device currently belongs.

Driver: Selected protocol driver for this device.

Model: Specify the type of device that is associated with this ID. The contents of the drop-down menu depend on the type of communications driver being used. Models that are not supported by a driver are disabled. If the communications driver supports multiple device models, the model selection can only be changed when there are no client applications connected to the device.
Note: If the communication driver supports multiple models, users should try to match the model selection to the physical device. If the device is not represented in the drop-down menu, select a model that conforms closest to the target device. Some drivers support a model selection called "Open," which allows users to communicate without knowing the specific details of the target device. *For more information, refer to the driver documentation.*

ID: Specify the device's driver-specific station or node. The type of ID entered depends on the communications driver being used. For many communication drivers, the ID is a numeric value. Drivers that support a Numeric ID provide users with the option to enter a numeric value whose format can be changed to suit the needs of the application or the characteristics of the selected communications driver. The format is set by the driver by default. Options include Decimal, Octal, and Hexadecimal.
Note: If the driver is Ethernet-based or supports an unconventional station or node name, the device's TCP/IP address may be used as the device ID. TCP/IP addresses consist of four values that are separated by periods, with each value in the range of 0 to 255. Some device IDs are string based. There may be additional properties to configure within the ID field, depending on the driver.

Operating Mode



Property Groups

General

⊞ Identification	
⊟ Operating Mode	
Data Collection	Enable
Simulated	No

Data Collection: This property controls the device's active state. Although device communications are enabled by default, this property can be used to disable a physical device. Communications are not attempted when a device is disabled. From a client standpoint, the data is marked as invalid and write operations are not accepted. This property can be changed at any time through this property or the device system tags.

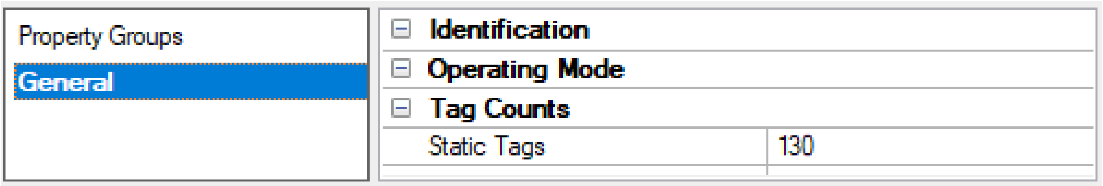
Simulated: Place the device into or out of Simulation Mode. In this mode, the driver does not attempt to communicate with the physical device, but the server continues to return valid OPC data. Simulated stops physical communications with the device, but allows OPC data to be returned to the OPC client as valid data. While in Simulation Mode, the server treats all device data as reflective: whatever is written to the simulated device is read back and each OPC item is treated individually. The data is not saved if the server removes the item (such as when the server is reinitialized). The default is No.

Notes:

1. Updates are not applied until clients disconnect and reconnect.
2. The System tag (_Simulated) is read only and cannot be written to for runtime protection. The System tag allows this property to be monitored from the client.
3. In Simulation mode, the item's memory map is based on client update rate(s) (Group Update Rate for OPC clients or Scan Rate for native and DDE interfaces). This means that two clients that reference the same item with different update rates return different data.
4. When a device is simulated, updates may not appear faster than one (1) second in the client.

Simulation Mode is for test and simulation purposes only. It should never be used in a production environment.

Tag Counts

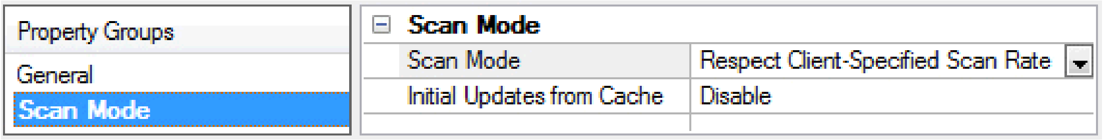


Static Tags 130

Static Tags: Provides the total number of defined static tags at this level (device or channel). This information can be helpful in troubleshooting and load balancing.

Device Properties – Scan Mode

The Scan Mode specifies the subscribed-client requested scan rate for tags that require device communications. Synchronous and asynchronous device reads and writes are processed as soon as possible; unaffected by the Scan Mode properties.



Scan Mode Respect Client-Specified Scan Rate

Initial Updates from Cache Disable

Scan Mode: Specify how tags in the device are scanned for updates sent to subscribing clients. Descriptions of the options are:

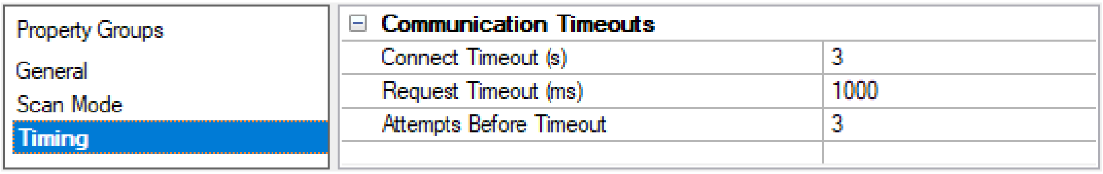
- **Respect Client-Specified Scan Rate**: This mode uses the scan rate requested by the client.
- **Request Data No Faster than Scan Rate**: This mode specifies the value set as the maximum scan rate. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.
  Note: When the server has an active client and items for the device and the scan rate value is increased, the changes take effect immediately. When the scan rate value is decreased, the changes do not take effect until all client applications have been disconnected.
- **Request All Data at Scan Rate**: This mode forces tags to be scanned at the specified rate for subscribed clients. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.

- **Do Not Scan, Demand Poll Only**: This mode does not periodically poll tags that belong to the device nor perform a read to get an item's initial value once it becomes active. It is the OPC client's responsibility to poll for updates, either by writing to the _DemandPoll tag or by issuing explicit device reads for individual items. *For more information, refer to "Device Demand Poll" in server help.*
- **Respect Tag-Specified Scan Rate**: This mode forces static tags to be scanned at the rate specified in their static configuration tag properties. Dynamic tags are scanned at the client-specified scan rate.

Initial Updates from Cache: When enabled, this option allows the server to provide the first updates for newly activated tag references from stored (cached) data. Cache updates can only be provided when the new item reference shares the same address, scan rate, data type, client access, and scaling properties. A device read is used for the initial update for the first client reference only. The default is disabled; any time a client activates a tag reference the server attempts to read the initial value from the device.

Device Properties – Timing

The device Timing properties allow the driver's response to error conditions to be tailored to fit the application's needs. In many cases, the environment requires changes to these properties for optimum performance. Factors such as electrically generated noise, modem delays, and poor physical connections can influence how many errors or timeouts a communications driver encounters. Timing properties are specific to each configured device.



Communication Timeouts	
Connect Timeout (s)	3
Request Timeout (ms)	1000
Attempts Before Timeout	3

Communications Timeouts

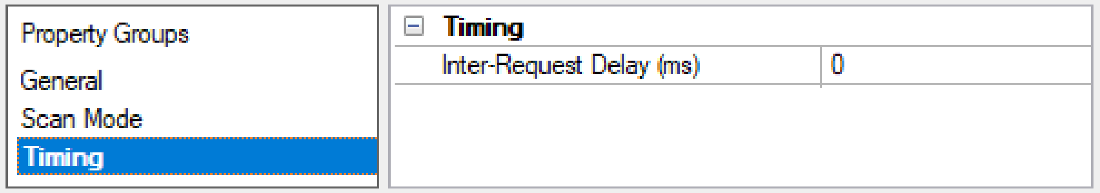
Connect Timeout: This property (which is used primarily by Ethernet based drivers) controls the amount of time required to establish a socket connection to a remote device. The device's connection time often takes longer than normal communications requests to that same device. The valid range is 1 to 30 seconds. The default is typically 3 seconds, but can vary depending on the driver's specific nature. If this setting is not supported by the driver, it is disabled.
Note: Due to the nature of UDP connections, the connection timeout setting is not applicable when communicating via UDP.

Request Timeout: Specify an interval used by all drivers to determine how long the driver waits for a response from the target device to complete. The valid range is 50 to 9999999 milliseconds (167 minutes). The default is usually 1000 milliseconds, but can vary depending on the driver. The default timeout for most serial drivers is based on a baud rate of 9600 baud or better. When using a driver at lower baud rates, increase the timeout to compensate for the increased time required to acquire data.

Attempts Before Timeout: Specify how many times the driver issues a communications request before considering the request to have failed and the device to be in error. The valid range is 1 to 10. The default is typically 3, but can vary depending on the driver's specific nature. The number of attempts configured for an application depends largely on the communications environment. This property applies to both connection attempts and request attempts.

Timing

Inter-Request Delay: Specify how long the driver waits before sending the next request to the target device after receiving the response to the previous request. It overrides the normal polling frequency of tags associated with the device, as well as one-time reads and writes. This delay can be useful when dealing with devices with slow turnaround times and in cases where network load is a concern. Configuring a delay for a device affects communications with all other devices on the channel. It is recommended that users separate any device that requires an inter-request delay to a separate channel if possible. Other communications properties (such as communication serialization) can extend this delay. The valid range is 0 to 300,000 milliseconds; however, some drivers may limit the maximum value due to a function of their particular design. The default is 0, which indicates no delay between requests with the target device.
Note: Not all drivers support Inter-Request Delay. This setting does not appear if it is not available.

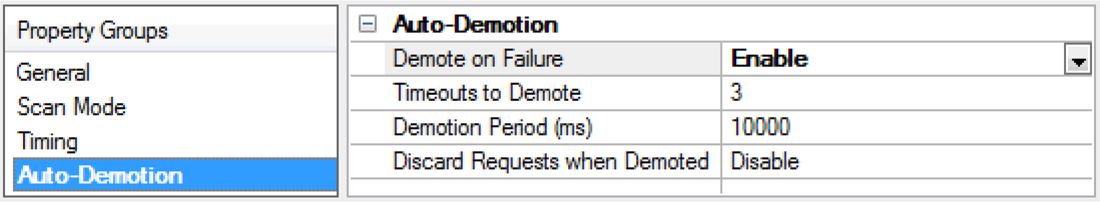


Timing

Inter-Request Delay (ms) 0

Device Properties – Auto-Demotion

The Auto-Demotion properties can temporarily place a device off-scan in the event that a device is not responding. By placing a non-responsive device offline for a specific time period, the driver can continue to optimize its communications with other devices on the same channel. After the time period has been reached, the driver re-attempts to communicate with the non-responsive device. If the device is responsive, the device is placed on-scan; otherwise, it restarts its off-scan time period.



Auto-Demotion

Demote on Failure	Enable
Timeouts to Demote	3
Demotion Period (ms)	10000
Discard Requests when Demoted	Disable

Demote on Failure: When enabled, the device is automatically taken off-scan until it is responding again.
● **Tip**: Determine when a device is off-scan by monitoring its demoted state using the _AutoDemoted system tag.

Timeouts to Demote: Specify how many successive cycles of request timeouts and retries occur before the device is placed off-scan. The valid range is 1 to 30 successive failures. The default is 3.

Demotion Period: Indicate how long the device should be placed off-scan when the timeouts value is reached. During this period, no read requests are sent to the device and all data associated with the read requests are set to bad quality. When this period expires, the driver places the device on-scan and allows for another attempt at communications. The valid range is 100 to 3600000 milliseconds. The default is 10000 milliseconds.

Discard Requests when Demoted: Select whether or not write requests should be attempted during the off-scan period. Disable to always send write requests regardless of the demotion period. Enable to discard writes; the server automatically fails any write request received from a client and does not post a message to the Event Log.

Device Properties – Tag Generation

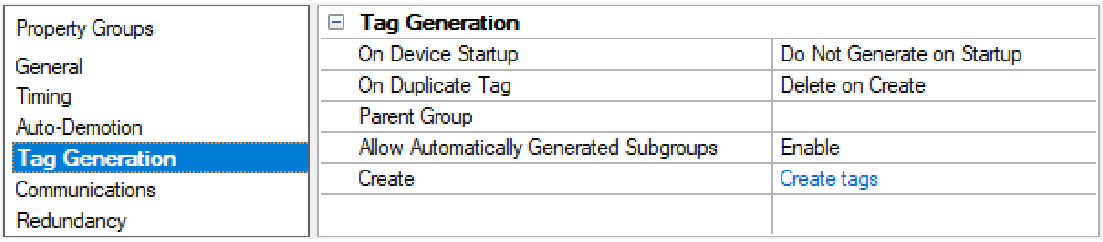
The automatic tag database generation features make setting up an application a plug-and-play operation. Select communications drivers can be configured to automatically build a list of tags that correspond to device-specific data. These automatically generated tags (which depend on the nature of the supporting driver) can be browsed from the clients.

● *Not all devices and drivers support full automatic tag database generation and not all support the same data types. Consult the data types descriptions or the supported data type lists for each driver for specifics.*

If the target device supports its own local tag database, the driver reads the device's tag information and uses the data to generate tags within the server. If the device does not natively support named tags, the driver creates a list of tags based on driver-specific information. An example of these two conditions is as follows:

1. If a data acquisition system supports its own local tag database, the communications driver uses the tag names found in the device to build the server's tags.
2. If an Ethernet I/O system supports detection of its own available I/O module types, the communications driver automatically generates tags in the server that are based on the types of I/O modules plugged into the Ethernet I/O rack.

● **Note**: Automatic tag database generation's mode of operation is completely configurable. *For more information, refer to the property descriptions below.*



⊟ Tag Generation	
On Device Startup	Do Not Generate on Startup
On Duplicate Tag	Delete on Create
Parent Group	
Allow Automatically Generated Subgroups	Enable
Create	Create tags

On Property Change: If the device supports automatic tag generation when certain properties change, the **On Property Change** option is shown. It is set to **Yes** by default, but it can be set to **No** to control over when tag generation is performed. In this case, the Create tags action must be manually invoked to perform tag generation.

On Device Startup: Specify when OPC tags are automatically generated. Descriptions of the options are as follows:

- **Do Not Generate on Startup**: This option prevents the driver from adding any OPC tags to the tag space of the server. This is the default setting.
- **Always Generate on Startup**: This option causes the driver to evaluate the device for tag information. It also adds tags to the tag space of the server every time the server is launched.
- **Generate on First Startup**: This option causes the driver to evaluate the target device for tag information the first time the project is run. It also adds any OPC tags to the server tag space as needed.

Note: When the option to automatically generate OPC tags is selected, any tags that are added to the server's tag space must be saved with the project. Users can configure the project to automatically save from the **Tools** | **Options** menu.

On Duplicate Tag: When automatic tag database generation is enabled, the server needs to know what to do with the tags that it may have previously added or with tags that have been added or modified after the communications driver since their original creation. This setting controls how the server handles OPC tags that were automatically generated and currently exist in the project. It also prevents automatically generated tags from accumulating in the server.

For example, if a user changes the I/O modules in the rack with the server configured to **Always Generate on Startup**, new tags would be added to the server every time the communications driver detected a new I/O module. If the old tags were not removed, many unused tags could accumulate in the server's tag space. The options are:

- **Delete on Create**: This option deletes any tags that were previously added to the tag space before any new tags are added. This is the default setting.
- **Overwrite as Necessary**: This option instructs the server to only remove the tags that the communications driver is replacing with new tags. Any tags that are not being overwritten remain in the server's tag space.
- **Do not Overwrite**: This option prevents the server from removing any tags that were previously generated or already existed in the server. The communications driver can only add tags that are completely new.
- **Do not Overwrite, Log Error**: This option has the same effect as the prior option and also posts an error message to the server's Event Log when a tag overwrite would have occurred.

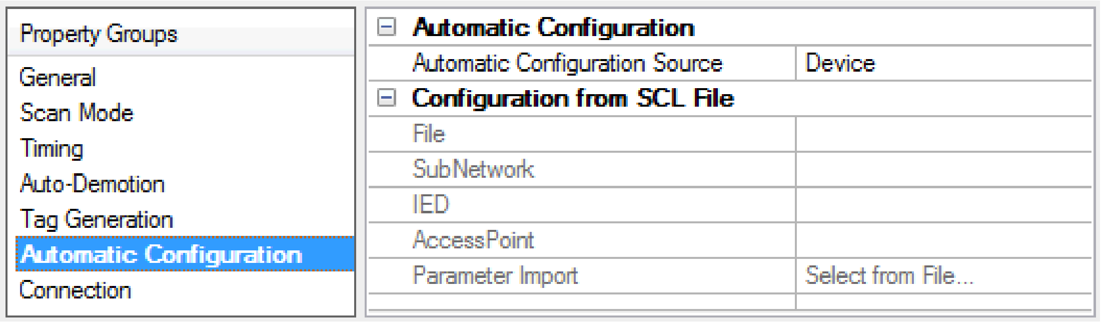
Note: Removing OPC tags affects tags that have been automatically generated by the communications driver as well as any tags that have been added using names that match generated tags. Users should avoid adding tags to the server using names that may match tags that are automatically generated by the driver.

Parent Group: This property keeps automatically generated tags from mixing with tags that have been entered manually by specifying a group to be used for automatically generated tags. The name of the group can be up to 256 characters. This parent group provides a root branch to which all automatically generated tags are added.

Allow Automatically Generated Subgroups: This property controls whether the server automatically creates subgroups for the automatically generated tags. This is the default setting. If disabled, the server generates the device's tags in a flat list without any grouping. In the server project, the resulting tags are named with the address value. For example, the tag names are not retained during the generation process.
Note: If, as the server is generating tags, a tag is assigned the same name as an existing tag, the system automatically increments to the next highest number so that the tag name is not duplicated. For example, if the generation process creates a tag named "AI22" that already exists, it creates the tag as "AI23" instead.

Create: Initiates the creation of automatically generated OPC tags. If the device's configuration has been modified, **Create tags** forces the driver to reevaluate the device for possible tag changes. Its ability to be accessed from the System tags allows a client application to initiate tag database creation.
Note: **Create tags** is disabled if the Configuration edits a project offline.

Device Properties – Automatic Configuration



Property Groups
- General
- Scan Mode
- Timing
- Auto-Demotion
- Tag Generation
- Automatic Configuration
- Connection

⊟ **Automatic Configuration**	
Automatic Configuration Source	Device
⊟ **Configuration from SCL File**	
File	
SubNetwork	
IED	
AccessPoint	
Parameter Import	Select from File...

Automatic Configuration Source: This field specifies the source for automatic device configuration. Options include Device and SCL File. When Device is selected, tags will be created using the online device self-description services. When SCL File is selected, tags will be created from the configured SCL file, and the Connection properties will be imported. The default setting is Device.
Note: For more information on the Connection properties, refer to Connection.

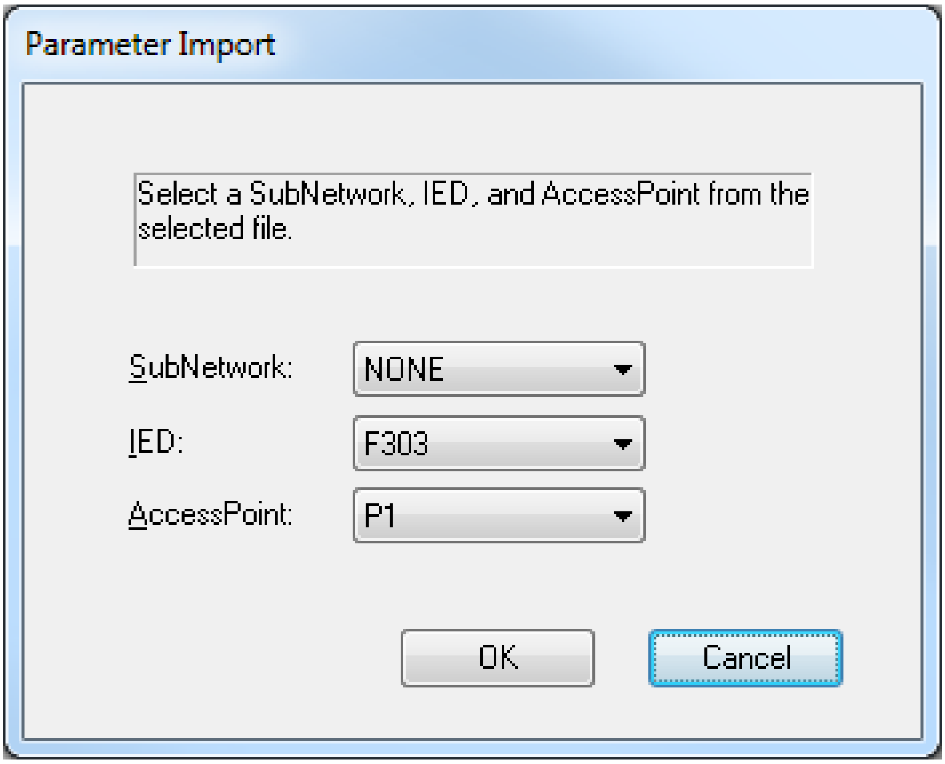
File: This property is set automatically after the configuration file is specified. To locate the file, click the browse (...) button. The selected file can have an .icd, .cid, or .scd extension. This property is only available when the Automatic Configuration Source is set to **SCL File**.

SubNetwork: This property is be set automatically after the SubNetwork is confirmed in SCL Parameter Import (below). It is only available when the Automatic Configuration Source is set to **SCL File**. If multiple SubNetworks exist in the file, the first one encountered is selected by default.

IED: This property is set automatically after the Intelligent Electronic Device (IED) is confirmed in SCL Parameter Import (below). It is only available when the Automatic Configuration Source is set to SCL File. If multiple IEDs exist in the file, the first one encountered is selected by default.

AccessPoint: This property is set automatically after the AccessPoint is confirmed in Parameter Import (below). It is only available when the Automatic Configuration Source is set to SCL File. If multiple AccessPoints exist in the file, the first one encountered is selected by default.

Parameter Import: When **Select from FIle...** is clicked, it launches the Parameter Import dialog, where the SubNetworks, IEDs, and AccessPoints are specified through the **SCL File** file is imported.



Parameter Import

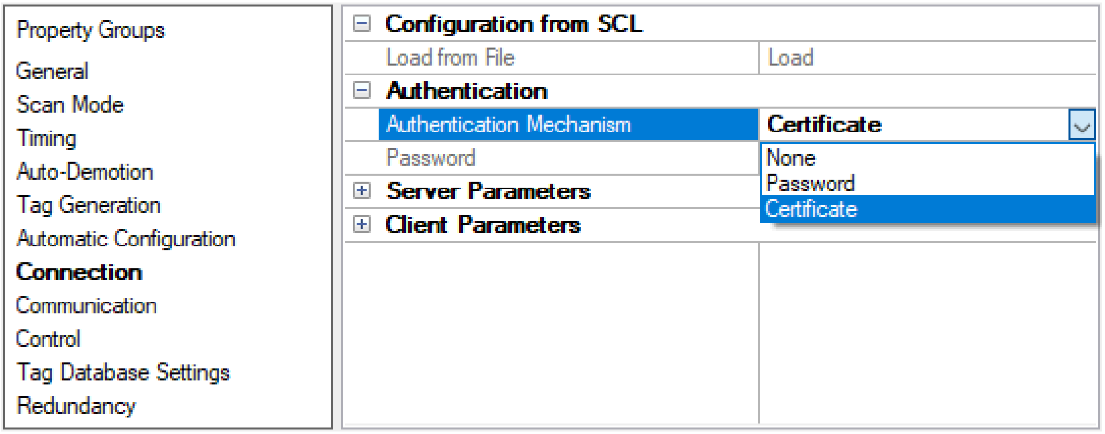
Select a SubNetwork, IED, and AccessPoint from the selected file.

SubNetwork: NONE

IED: F303

AccessPoint: P1

Device Properties – Connection



Configuration from SCL	
Load from File	Load
Authentication	
Authentication Mechanism	**Certificate**
Password	
Server Parameters	
Client Parameters	

Configuration from SCL

Load from File: When enabled, the properties of the selected file are used to populate the properties listed beneath the Authentication and Server Parameters sections. This option is only available if the specified Automatic Configuration Source is **SCL File** (and all properties have been configured).

● If multiple authentication mechanisms are enabled in the SCL file, the driver configures the device to use the most secure enabled mechanism.

● *For more information, refer to Automatic Configuration.*

Authentication

Authentication Mechanism: Specify **Password** or **Certificate** authentication. The default is **None**.

Notes:

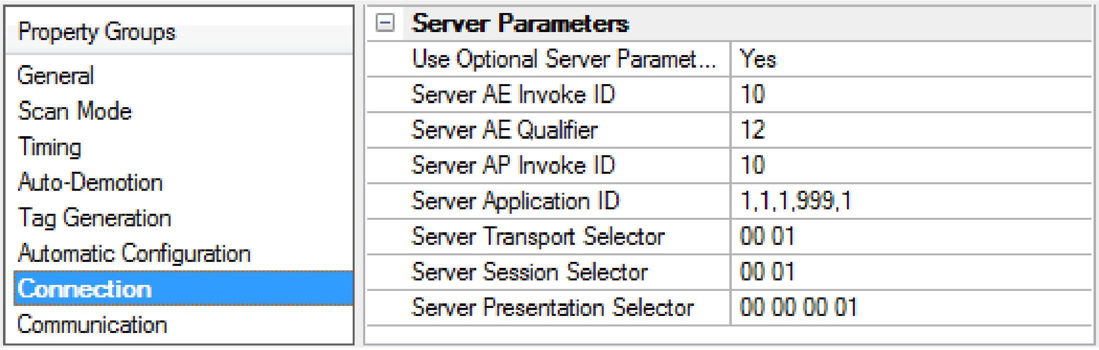
● If **Password** is selected, configure a password to use Association Control Service Element (ACSE) authentication.

● **Certificate** authentication, which encrypts all information, is recommended for stronger security.

- If **Certificate** is selected, a certificate authority or self-signed certificate for the IED must be manually imported into the IEC 61850 MMS Client Trust Store. Additionally, instance certificates for MMS / ACSE and TLS must be manually imported.
- If **Certificate** is selected, **SISCO Compatibility** can also be enabled to change the validation implementation (*see the Sisco Compatibility setting for more details).*
- **See Also**: *Certificate Store*
- To manually import and configure certificates, use the Certificate Store tab in the Server Administration tool using the IEC 61850 MMS Client feature.
- *For more details, see server help **Administration | Settings | Certificate Store**.*
- The server runtime must be restarted when a new certificate is imported.

Password: Specify the password. This property is only available if the Authentication Mechanism is configured for **Password** authentication.

Server Parameters



Use Optional Server Paramet...	Yes
Server AE Invoke ID	10
Server AE Qualifier	12
Server AP Invoke ID	10
Server Application ID	1,1,1,999,1
Server Transport Selector	00 01
Server Session Selector	00 01
Server Presentation Selector	00 00 00 01

Use Optional Server Parameters: When enabled, the Server Parameters will be available for editing and will be included when initiating a connection with a device. The default setting is Yes.

Server AE Invoke ID: This property specifies the ACSE AE Invoke ID. The valid range is 0 to 65535. The default setting is 10.

Server AE Qualifier: This property specifies the ACSE AE Qualifier. The valid range is 0 to 65535. The default setting is 12.

Server AP Invoke ID: This property specifies the ACSE AP Invoke ID. The valid range is 0 to 65535. The default setting is 10.

Server Application ID: This property specifies the ACSE Application ID. It must be between 3 and 10 integers (inclusive), delimited by commas. The default setting is "1,1,1,999,1".

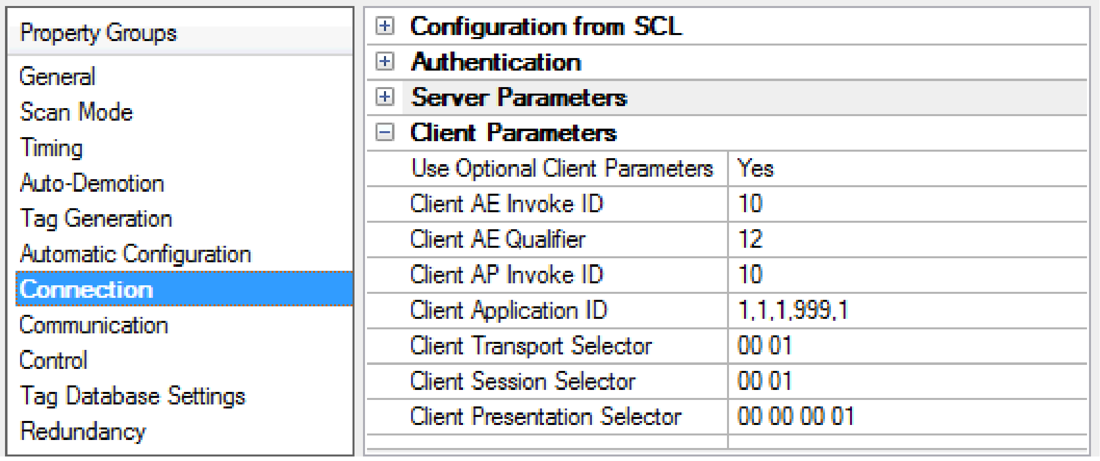
- **Note**; The first integer must be 53687091 or less; the second integer must be 39 or less. The first two integers added together must equal 53687091 or less; the last 8 integer values must each be 2147483647 or less.

Server Transport Selector: This property configures the server OSI-TSEL and is used in establishing a remote server connection. It specifies a byte array, which is expressed as pairs of hexadecimal digits separated by zero or more spaces. The maximum size is 50 bytes (or 100 hex chars). The default setting is "00 01".

Server Session Selector: This property configures the server OSI-SSEL and is used in establishing a remote server connection. It specifies a byte array, which is expressed as pairs of hexadecimal digits separated by zero or more spaces. The maximum size is 50 bytes (or 100 hex chars). The default setting is "00 01".

Server Presentation Selector: This property configures the server OSI-PSEL and is used in establishing a remote server connection. It specifies a byte array, which is expressed as pairs of hexadecimal digits separated by zero or more spaces. The maximum size is 50 bytes (or 100 hex chars). The default setting is "00 00 00 01".

Client Parameters



Property Groups
General
Scan Mode
Timing
Auto-Demotion
Tag Generation
Automatic Configuration
Connection
Communication
Control
Tag Database Settings
Redundancy

⊞ **Configuration from SCL**	
⊞ **Authentication**	
⊞ **Server Parameters**	
⊟ **Client Parameters**	
Use Optional Client Parameters	Yes
Client AE Invoke ID	10
Client AE Qualifier	12
Client AP Invoke ID	10
Client Application ID	1,1,1,999,1
Client Transport Selector	00 01
Client Session Selector	00 01
Client Presentation Selector	00 00 00 01

Use Optional Client Parameters: When enabled, the Client Parameters will be available for editing and will be included when initiating a connection with a device. The default setting is Yes.

Client AE Invoke ID: This property specifies the ACSE AE Invoke ID. The valid range is 0 to 65535. The default setting is 10.

Client AE Qualifier: This property specifies the ACSE AE Qualifier. The valid range is 0 to 65535. The default setting is 12.

Client AP Invoke ID: This property specifies the ACSE AP Invoke ID. The valid range is 0 to 65535. The default setting is 10.

Client Application ID: This property specifies the ACSE Application ID. It must be between 3 and 10 integers (inclusive), delimited by commas. The default setting is "1,1,1,999,1".

Note; The first integer must be 53687091 or less; the second integer must be 39 or less. The first two integers added together must equal 53687091 or less; the last 8 integer values must each be 2147483647 or less.

Client Transport Selector: This property configures the server OSI-TSEL and is used in establishing a remote server connection. It specifies a byte array, which is expressed as pairs of hexadecimal digits separated by zero or more spaces. The maximum size is 50 bytes (or 100 hex chars). The default setting is "00 01".

Client Session Selector: This property configures the server OSI-SSEL and is used in establishing a remote server connection. It specifies a byte array, which is expressed as pairs of hexadecimal digits separated by zero or more spaces. The maximum size is 50 bytes (or 100 hex chars). The default setting is "00 01".

Client Presentation Selector: This property configures the server OSI-PSEL and is used in establishing a remote server connection. It specifies a byte array, which is expressed as pairs of hexadecimal digits separated by zero or more spaces. The maximum size is 50 bytes (or 100 hex chars). The default setting is "00 00 00 01".

Certificate Store

The Certificate Store is within the Kepware server administration and is used to configure certificates for features that communicate securely using certificates.

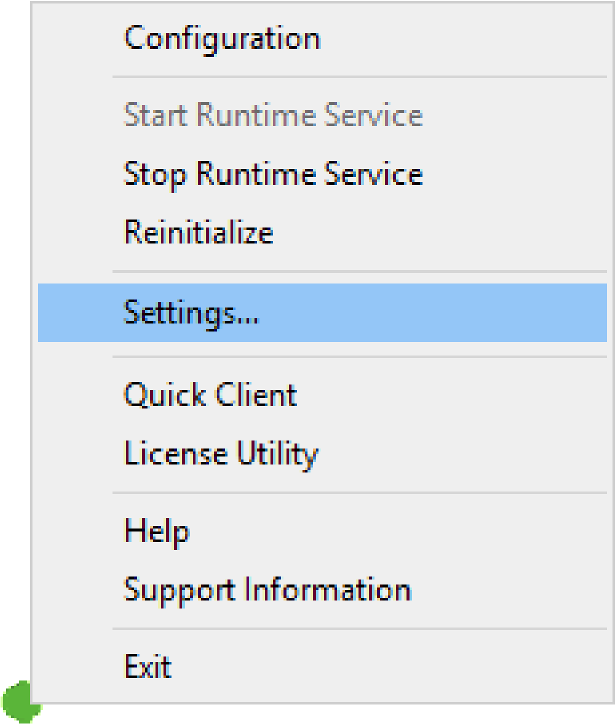
The IEC 61850 MMS Client Driver allows importing MMS and TLS instance certificates, separately. It also supports certificates using RSA schemes signed by a Certificate Authority recognized by the peer systems.

To allow secure communications using Transport Layer Security (TLS), the driver requires the following certificates:

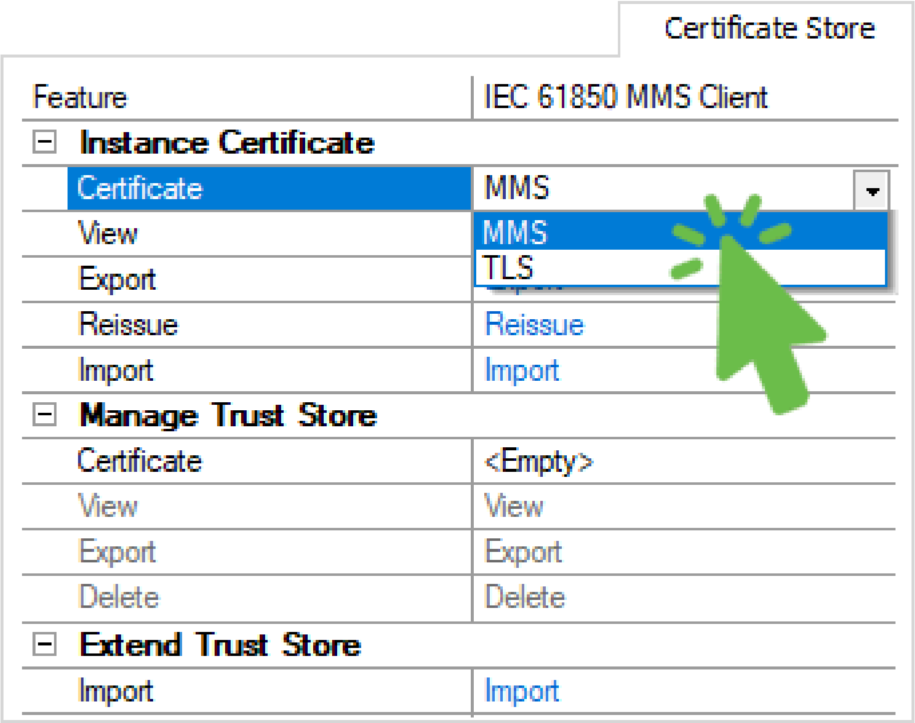
- instance certificate for MMS/ ACSE authentication
- instance certificate for TLS
- Certificate Authority certificate

To access the Certificate Store:

1. Right-click on the Kepware Administration icon located in the System Tray.
2. Left-click on **Settings...**.



3. Select the **Certificate Store** tab.
4. Verify the Feature is IEC 61850 MMS Client.
5. Under the **Instance Certificate** group, click the drop-down menu for **Certificate**.
6. Select **MMS** or **TLS**.



Feature	IEC 61850 MMS Client
Instance Certificate	
Certificate	MMS
View	
Export	
Reissue	Reissue
Import	Import
Manage Trust Store	
Certificate	<Empty>
View	View
Export	Export
Delete	Delete
Extend Trust Store	
Import	Import

7. Click **Import**.

8. Locate the certificate file.

9. Click **Open** to import the certificate.

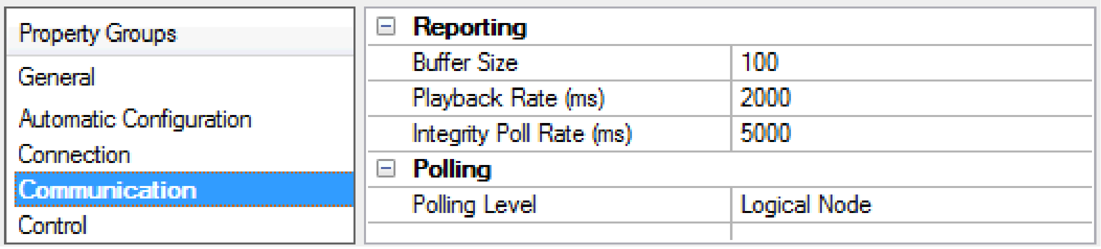
10. Click **OK** to close the **Settings** dialog.

Tip: If necessary, import the public master Certificate Authority certificate(s) using the **Extend Trust Store** group **Import** option.

Note: The server runtime must be restarted when a new certificate is imported.

See Also: *Server help section: Settings – Certificate Store*

Device Properties – Communication



Property Groups
- General
- Automatic Configuration
- Connection
- Communication
- Control

⊟ **Reporting**	
Buffer Size	100
Playback Rate (ms)	2000
Integrity Poll Rate (ms)	5000
⊟ **Polling**	
Polling Level	Logical Node

Buffer Size: Specify the data buffer size. If the length of the data buffer exceeds the maximum, the oldest value on the buffer is discarded. The valid range is 1 to 10000. The default setting is 100.

Playback Rate (ms): Specify the amount of time before a value is removed from the data buffer after it is assigned to a tag. The valid range is 50 to 999999999 milliseconds. The default setting is 2000 milliseconds.
Tip: This functionality can also be referred to as Event Playback or Sequence of Events (SOE).
Notes:

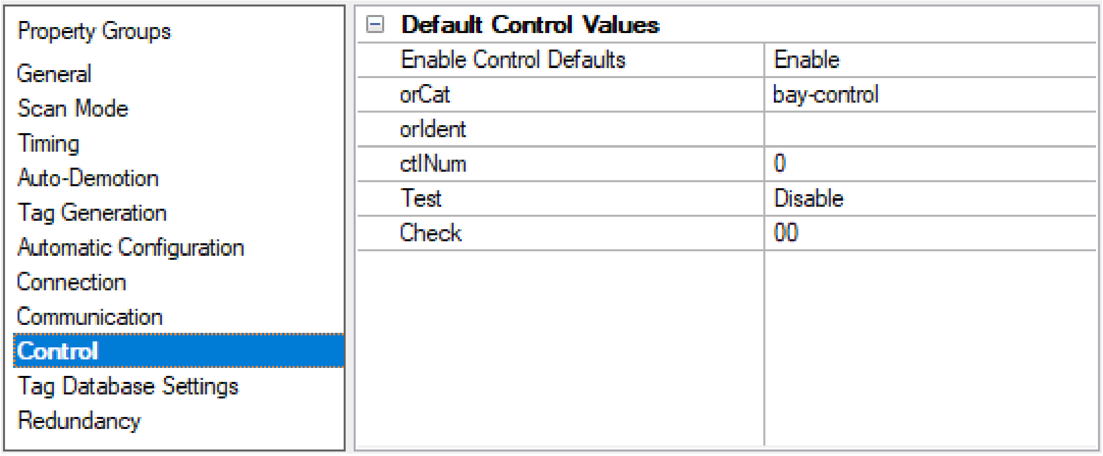
1. If multiple clients reference the same buffered data, the playback rate should be greater than the longest scan rate. If only one client references the buffered data, a playback rate of 0 is sufficient.

2. Enabling the OPC DA setting **Return initial updates for items in a single callback** may result in loss of buffered data when using drivers that support Event Playback for unsolicited device protocols. The compliance setting should be disabled if loss of buffered data is a concern.

Integrity Poll Rate (ms): An integrity poll is used to verify connectivity to the IED at a minimum of every *x* milliseconds. It is recommended when the IED is only sending reports as a way to know that connectivity is lost. It can also be used to verify connectivity faster than the poll rate when polling the IED slowly (such as in minutes). This property specifies the amount of time that can elapse between either receiving a report or receiving a solicited response before the driver must check the integrity of its connection with the IED. The valid range is 0 to 999999999 milliseconds. The default setting is 5000 milliseconds. To disable integrity polling, specify a value of 0 milliseconds.
Note: When the integrity poll rate has elapsed without any communication, the channel sends a read for an RCB attribute to the IED. If the read fails, the connection to the IED is considered lost. At that point, the device is placed into an error state and all tags are set to bad quality. If the read succeeds, no action is taken.

Polling Level: Specify the level at which data is grouped and polled. Options include Logical Node, Functional Constraint, Data Object, and Attribute. The default setting is Logical Node.
Note: The default setting of **Logical Node** polls for every attribute within the Logical Node(s) at once. If an attribute read fails within the Logical Node, the entire Logical Node read fails and all of its tags are set to Bad quality. If this is the case, the setting should be changed to **Attribute**, which causes the valid tags for that particular Logical Node to transition to Good quality,

Device Properties – Control



Default Control Values	
Enable Control Defaults	Enable
orCat	bay-control
orIdent	
ctlNum	0
Test	Disable
Check	00

Enable Control Defaults: Setting this property to Disable disables all the Control Default settings. When disabled, new controls are not populated with the defaults. The default is Enabled (which does populate new controls with the defaults).

orCat: This property specifies the value of orCat when making a structured write to a control object. The default setting is bay-control. Options include the following:

- not-supported
- bay-control
- station-control
- remote-control
- automatic-bay
- automatic-station
- automatic-remote
- maintenance
- process

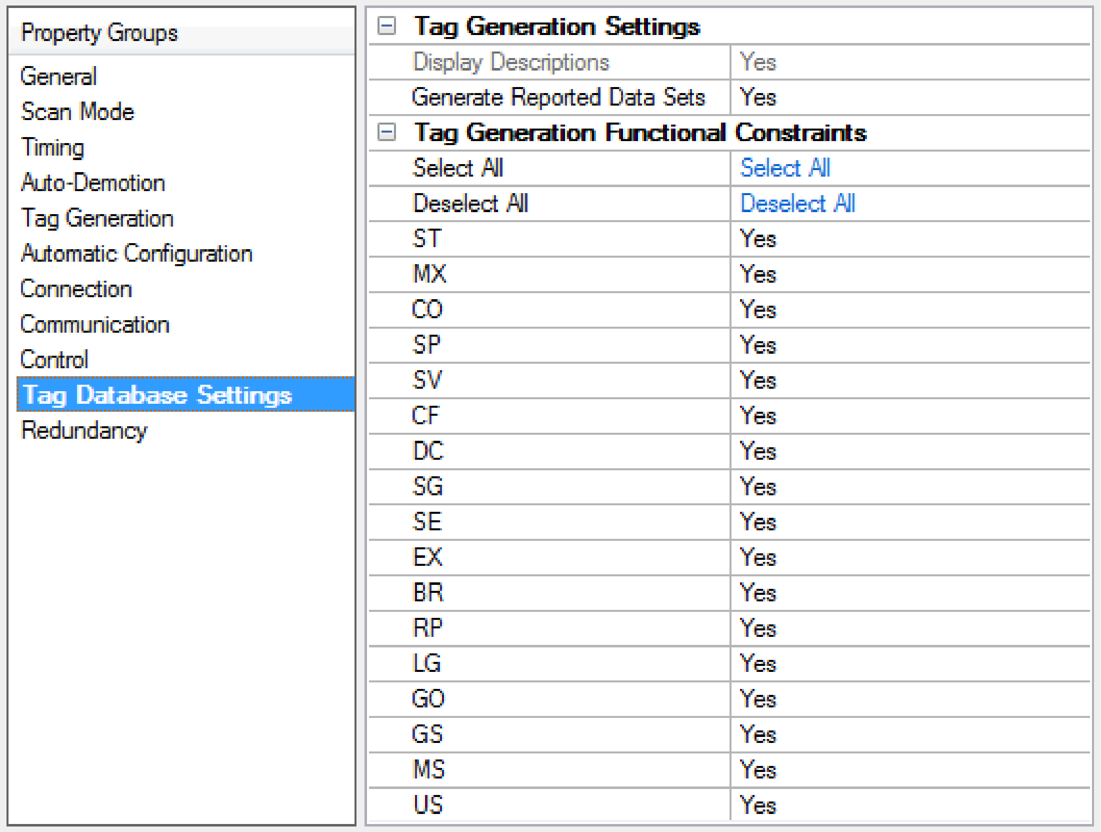
orIdent: This property specifies the value of the _orIdent Tag. The value must be a hex byte array (such as "01 7A F0"). It is blank by default.

ctlNum: This property specifies the value of the _ctlNum Tag. The value must be an 8-bit unsigned integer. The default is 0.

Test: This property specifies the Boolean value assigned to the _Test Tag. When enabled, the value is 1. When disabled, the value is 0. The default is disabled.

Check: This property specifies the value of the _Check Tag. The value must be a 2-bit string. The default is 00.

Device Properties – Tag Database Settings



⊟ Tag Generation Settings	
Display Descriptions	Yes
Generate Reported Data Sets	Yes
⊟ Tag Generation Functional Constraints	
Select All	Select All
Deselect All	Deselect All
ST	Yes
MX	Yes
CO	Yes
SP	Yes
SV	Yes
CF	Yes
DC	Yes
SG	Yes
SE	Yes
EX	Yes
BR	Yes
RP	Yes
LG	Yes
GO	Yes
GS	Yes
MS	Yes
US	Yes

Tag Generation Settings

Display Descriptions: If enabled, this option will apply the SCL file data attribute descriptions to the tag descriptions. It is only available when tags are created from SCL. The default is Yes.

Generate Reported Data Sets: If enabled, this option generates tags for data sets referenced by report control blocks. The default is Yes.

Tag Generation Functional Constraints

Select All: When clicked, this option will select all Functional Constraints.

Deselect All: When clicked, this option will deselect all Functional Constraints.

ST: If enabled, this option generates tags with the ST Functional Constraint. The default is Yes.

MX: If enabled, this option generates tags with the MX Functional Constraint. The default is Yes.

CO: If enabled, this option generates tags with the CO Functional Constraint. The default is Yes.

SP: If enabled, this option generates tags with the SP Functional Constraint. The default is Yes.

SV: If enabled, this option generates tags with the SV Functional Constraint. The default is Yes.

CF: If enabled, this option generates tags with the CF Functional Constraint. The default is Yes.

DC: If enabled, this option generates tags with the DC Functional Constraint. The default is Yes.

SG: If enabled, this option generates tags with the SG Functional Constraint. The default is Yes.

SE: If enabled, this option generates tags with the SE Functional Constraint. The default is Yes.

EX: If enabled, this option generates tags with the EX Functional Constraint. The default is Yes.

BR: If enabled, this option generates tags with the BR Functional Constraint. The default is Yes.

RP: If enabled, this option generates tags with the RP Functional Constraint. The default is Yes.

LG: If enabled, this option generates tags with the LG Functional Constraint. The default is Yes.

GO: If enabled, this option generates tags with the GO Functional Constraint. The default is Yes.

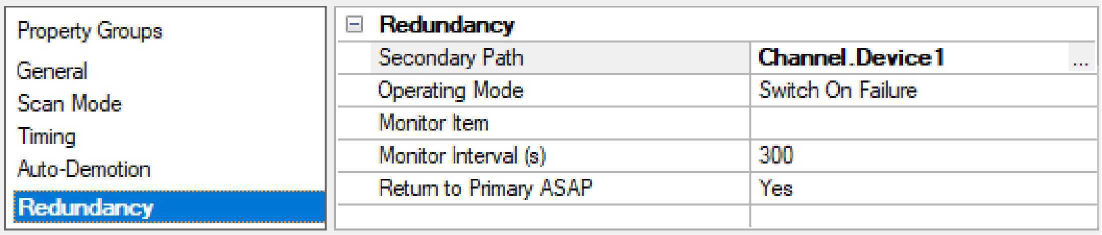
GS: If enabled, this option generates tags with the GS Functional Constraint. The default is Yes.

MS: If enabled, this option generates tags with the MS Functional Constraint. The default is Yes.

US: If enabled, this option generates tags with the US Functional Constraint. The default is Yes.

⬢ *For more information, refer to Supported Functional Constraints.*

Device Properties – Redundancy



⊟ **Redundancy**

Secondary Path	**Channel.Device1** ...
Operating Mode	Switch On Failure
Monitor Item	
Monitor Interval (s)	300
Return to Primary ASAP	Yes

Redundancy is available with the Media-Level Redundancy Plug-In.
⬢ *Consult the website, a sales representative, or the user manual for more information.*

Data Types Description

OPC Data Type	MMS Data Type	Description
Bool	Boolean	Single bit
Char	Integer (8 bit)	Signed 8-bit value
Byte	Unsigned Integer (8 bit)	Unsigned 8-bit value
Short	Integer (16 bit)	Signed 16-bit value
Word	Unsigned Integer (16 bit)	Unsigned 16-bit value
Long	Integer (32 bit)	Signed 32-bit value
DWord	Unsigned Integer (32 bit)	Unsigned 32-bit value
Float	Floating-point (32 bit)	32-bit floating point value
Byte	Bit string (length <= 8)	*
Word	Bit string (8 < length <= 16)	*
DWord	Bit string (16 < length <= 32)	*
String	Bit string (length > 32)	*
String	Octet-string	An array of bytes (octets).
String	Visible-string	ANSI characters up to 255 characters in length.
String	MMS String	UTF-8 encoded string up to 255 characters in length.
Date	Binary Time	6 byte structure containing days since Jan 1, 1984 and milliseconds since midnight. It uses the format "MM/DD/YYYY_HH:MM:SS.mmm".
Date	UTC Time	8 byte structure containing seconds of the century, a fraction of a second, and a time quality. It uses the format "MM/DD/YYYY_HH:MM:SS.mmm".

*MMS supports bit strings up to 256 bits in length. Bit strings less than 32 bits long can be assigned to unsigned integers, whereas larger bit strings can only be applied to strings. They will be assigned to unsigned integers with the first bit in the bit string corresponding to the integer's lowest order bit.

Address Descriptions

Polled Tag Addressing

The IEC 61850 MMS Client Driver syntax for Polled Tag Addressing is *LDName/LNName$FC$DataName$DataAttrName[$DataAttrComponent[$ …]]*, where:

- *LDName* indicates the Logical Device Name. It is limited to 32 characters.
- *LNName$FC$DataName$DataAttrName[$DataAttrComponent[$ …]]* indicates the Object Name. It is limited to 64 characters.
- *[$]* indicates an option.
- *[$ …]* indicates additional names of recursively nested definitions.
- *FC* indicates the Functional Constraint (FC) that describes the services that can be performed on the data.
- *$* is a separator.

Examples of the address syntax include "Rly1/LLN0$ST$Mod$stVal" and "Rly2/LLN0$BR$brcb1$RptEna".

Note: A primitive Data Attribute's object reference syntax is *LDName/LNName.DataName.DataAttrName[.DataAttrComponent[. …]]*. The '.' separator used in IEC 61850-7-2 is replaced by '$' in MMS addressing.

Reported Tag Addressing

The IEC 61850 MMS Client Driver syntax for Reported Tag Addressing is *LDName/LNName$FC$RCBName:LDName/LNName$FC$DataName$DataAttrName[$DataAttrComponent[$ …]]*, where:

- *LDName/LNName$FC$RCBName* indicates the Report Control Block (RCB) name. It is limited to 64 characters.
- *:* is a separator between the RCB name and the name of the reported object.
- *LNName$FC$DataName$DataAttrName[$DataAttrComponent[$ …]]* indicates the Object Name. It is limited to 64 characters.

An example of the address syntax is "Rly1/LLN0$BR$brcb1:Rly1/LLN0$ST$Mod$stVal". Valid functional constraints for the RCB name include BR (which indicates a buffered report control block) and RP (which indicates an unbuffered report control block). The Object Name must indicate a primitive attribute that is included in a data set member referenced by the RCB.

Automatic Subscription

For reported tags like "Rly1/LLN0$BR$brcb1:Rly1/LLN0$ST$Mod$stVal," the driver writes a value of '1' to "Rly1/LLN0$BR$brcb1$RptEna" on each scan of the tag until the Report Control Block is enabled. Attempts to enable the RCB fail if it is already enabled by another client. If all tags referencing the RCB "Rly1/LLN0$BR$brcb1" are removed, the driver writes a value of '0' to "RptEna" to unsubscribe from receiving reports.

Initial Update

Once a Report Control Block has been successfully enabled, the driver must request an initial value for the data monitored by the RCB. How the driver accomplishes this depends on the services that are supported by the RCB. If the driver supports general interrogation, it writes a value of '1' to the RCB's GI attribute to request a general interrogation report. Support is indicated by the general interrogation bit of the RCB's TrgOps attribute.

- If an unbuffered RCB does not support general interrogation, the driver reads the data set referenced by the RCB's DataSet attribute for an initial update.
- If a buffered RCB does not support general interrogation, the initial update logic depends on whether the RCB supports including EntryID values in reports. Support is indicated by the EntryID bit of the RCB's OptFlds attribute.

    - An EntryID bit of '0' indicates that it is not supported. In this case, the driver gives the device one scan period to send all buffered reports that it may contain. If values have not been reported for all members of the RCB's referenced data set after that time, the driver reads the referenced data set.
    - An EntryID bit of '1' indicates that it is supported. In this case, the driver gives the device as many scan periods as necessary for the EntryID of the last received report to equal the current value of the RCB's EntryID attribute. When these two values are equal (or if zero buffered reports are received within one scan period), the implication is that all buffered data has been sent to the

driver. If values have not been reported for all members of the RCB's referenced data set at this time, the driver reads the referenced data set.

Supported Functional Constraints

Each Data Attribute and object reference are associated with a Functional Constraint. It must be included to fully describe a Data Attribute. The IEC 61850 MMS Client Driver inserts an FC NamedVariable object between the logical node level and the data level so that Data Attributes can be described by their address only. For more information on the supported Functional Constraints, refer to the table below.

Constraint	Definition	Description	Access
ST	Status Information	This represents a status information whose value can be read, substituted, reported, and logged but not written.	Read Only
MX	Measurands (Analog Values)	This represents a measurand information whose value can be read, substituted, reported, and logged but not written.	Read Only
CO	Control	This represents a control information whose value may be operated and read.	Read/Write
SP	Set Point	This represents a set point information whose value may be controlled and read. Values that are controlled become effective immediately.	Read/Write
SV	Substitution	This represents a substitution information whose value can be written to substitute the value attribute and read.	Read/Write
CF	Configuration	This represents a configuration information whose value may be written and read. Values that are controlled become effective immediately or are deferred.	Read/Write
DC	Description	This represents a description information whose value can be written and read.	Read/Write
SG	Setting Group	Logical Devices that implement the SGCB class maintain multiple grouped values of all instances of DataAttributes with the Functional Constraint SG. Each group contains one value for each DataAttribute with Functional Constraint SG, which will be the current active value. Values of the DataAttribute with FC=SG cannot be written.	Read Only
SE	Setting Group Editable	This represents a DataAttribute that can be edited by SGCB services.	Read/Write
EX	Extended Definition	This represents an extension information that provides a reference to a name space. Extensions are used in conjunction with extended definitions of LNs, DATA, and DataAttributes. Values of the DataAttribute with FC=EX cannot be written.	Read Only
BR	Buffered Report	This represents a report control information of a BRCB that can be written and read.	Read/Write
RP	Unbuffered Report	This represents a report control information of a URCB that can be written and read.	Read/Write
LG	Logging	This represents a log control information of a LCB that can be written and read.	Read/Write
GO	Goose Control*	This represents a goose control information of a GoCB that can be written and read.	Read/Write
GS	Gsse Control*	This represents a goose control information of a GsCB that can be written and read.	Read/Write
MS	Multi-cast Sampled Value Control	This represents a sampled value control information of an MSVCB that can be written and read.	Read/Write
US	Uni-cast	This represents a sampled value control information of an instance	Read/Write

Constraint	Definition	Description	Access
	Sampled Value Control	of a UNICAST-SVC that can be written and read.	

* Reserved for control classes.

Event Log Messages

The following information concerns messages posted to the Event Log pane in the main user interface. Consult the OPC server help on filtering and sorting the Event Log detail view. Server help contains many common messages, so should also be searched. Generally, the type of message (informational, warning) and troubleshooting information is provided whenever possible.

Tip: Messages that originate from a data source (such as third-party software, including databases) are presented through the Event Log. Troubleshooting steps should include researching those messages online and in vendor documentation.

A device was added to channel <channel name> that has been set to Optimize. Since the channel has been set to optimize memory allocation, a brief loss of data may have occurred.

Error Type:

Warning

Possible Cause:

A new device was created on a channel that has the **Optimize Memory Allocation** property set to enable.

Solution:

This message informs the user that data loss might have occurred during the reallocation of memory. This time period during which data could be lost is small, expected to be under 500 ms for most machines. To not receive this message, disable the **Optimize Memory Allocation** property before adding new devices to a channel.

See Also: *Channel Properties, Advanced Group*

Error: Device <device name>, Cannot write to structured data attribute <MMS address>.

Error Type:

Warning

Possible Cause:

A tag has been configured with the address of a structured data attribute.

Solution:

Verify that all tags only refer to data attributes with primitive types.

Note:

Tags must refer to data attributes with primitive types.

<Channel name> | Channel initialized with insecure configuration. Devices configured with the Certificate Authentication mechanism cannot connect.

Error Type:

Security

Possible Cause:

A certificate in the Server Administration Certificate Store is invalid.

Solution:

Import valid certificates into the Server Administration Certificate Store. This includes the Trust Store, MMS Instance Certificate, and TLS Instance Certificate.

See Also: Possible Solutions for related event log messages

<Channel name> | <MMS security error occurred. | Reason = <reason>.

Error Type:
Security

Possible Cause:

1. The MMS instance certificate / private key failed to load.
2. The trust store certificate(s) failed to load.

Solution:
Verify the MMS instance certificate and the trust store certificate(s) in the server administration Certificate Store. Restart the server for any changes to take effect. Refer to the reason in the event log message for more information.

<Channel name> | TLS Instance Certificate information. | Valid = Yes/No, Expired = Yes/No, Invalid signature = Yes/No, Unspecified error = Yes/No, Self-signed = Yes/No.

Error Type:
Security

This informational message about the TLS instance certificate is posted on channel initialization:

- **Valid**: TLS certificate is valid or invalid.
- **Expired**: TLS certificate is expired or not expired.
- **Invalid signature**: TLS certificate has an invalid or valid signature.
- **Unspecified error**: TLS certificate has a non-specific error or not.
- **Self-signed**: TLS certificate is self-signed or CA-signed.

Solution:
Replace an invalid TLS certificate with a certificate that has not expired and has a valid signature. Restart the server for the changes to take effect.

<Channel name> | <TLS security error occurred. | Reason = <reason>.

Error Type:
Security

Possible Cause:

1. The TLS instance certificate / private key failed to load.
2. The trust store certificate(s) failed to load.

Solution:
Verify the TLS instance certificate and the trust store certificate(s) in the server administration Certificate Store. Restart the server for any changes to take effect. Refer to the reason in the event log message for more information.

<Channel name> | Trust store certificate counts. | Total = <count>, Valid = <count>, Expired = <count>, Invalid signature = <count>, Unspecified error = <count>, Self-signed = <count>.

Error Type:
Security

Possible Cause:

This informational message about the trust store is posted on channel initialization:

- **Total**: Total number of certificates in the trust store.
- **Valid**: Number of certificates in the trust store that are valid.
- **Expired**: Number of certificates in the trust store that have expired.
- **Invalid signature**: Number of certificates in the trust store that have invalid signatures.
- **Unspecified error**: Number of certificates in the trust store that have a non-specific error.
- **Self-signed**: Number of certificates in the trust store that are self-signed.

Note: Total is not the sum of the other counts; a certificate can be self-signed, expired, and have an invalid signature.

Solution:
Replace invalid certificates with certificates that have not expired and have valid signatures. Restart the server for the changes to take effect.

<Channel name.Device name> | <MMS security error occurred. | Reason = <reason>.

Error Type:
Security

Possible Cause:

1. The MMS instance certificate / private key failed to authenticate with the device.
2. The trust store certificate(s) failed to authenticate with the device.

Solution:
Verify the MMS instance certificate and the trust store certificate(s) in the device as well as in the server administration Certificate Store. Restart the server for any changes to take effect. Refer to the reason in the event log message for more information.

<Channel name.Device name> | <TLS security error occurred. | Reason = <reason>.

Error Type:
Security

Possible Cause:

1. The TLS instance certificate / private key failed to authenticate with the device.
2. The trust store certificate(s) failed to authenticate with the device.

Solution:
Verify the TLS instance certificate and the trust store certificate(s) in the device as well as in the server administration Certificate Store. Restart the server for any changes to take effect. Refer to the reason in the event log message for more information.

Duplicate address <tag address> produced from SCL file. Tag will not be created.

Error Type:
Warning

Possible Cause:

1. A structured data object in the selected SCL file has two file attributes with the same name.
2. Two control blocks are configured with the same name.

Solution:
Verify that all data object and control block names are unique.

<Channel name> | Empty trust store encountered. Channel initialized with insecure configuration. Devices configured with the Certificate Authentication Mechanism cannot connect.

Error Type:
Security

Possible Cause:
No certificates loaded in the Server Administration Trust Store.

Solution:
Import valid certificate(s) into the Server Administration Trust Store.

Error: Report control block attribute <attribute-dataset> does not reference a valid data set.

Error Type:
Warning

Possible Cause:
The tag references an invalid address.

Solution:
Verify the address is correct and matches a configured RCB.

Failed to open SCL file <file path>.

Error Type:
Warning

Possible Cause:
The selected SCL File is not a valid UNC path.

Solution:
Verify that the selected SCL file path is valid.

Invalid address <tag address> produced from SCL file. Tag will not be created.

Error Type:
Warning

Possible Cause:
A data object in the specified SCL File has a character that is not valid for IEC 61850 addresses.

Solution:
Verify that the DataTypeTemplates section of the specified SCL File only includes valid characters.

Error: Device <device name>, Address <MMS address>, Invalid bit string data <bit string>. Please enter a string of characters '0' and '1'.

Error Type:
Warning

Possible Cause:
Data that was written to a tag representing an MMS bit string includes a character besides '0' or '1'.

Solution:

Verify that the data being written to bit string tags only includes the '0' and '1' characters. For example, "001101".

Error: Device <device name>, Address <MMS address>, Invalid data type <data type> for data attribute.

Error Type:

Warning

Possible Cause:

The tag's data type is not valid for the data attribute referenced by the tag's address.

Solution:

Verify that the tag has an appropriate data type for the data attribute to which it refers.

Note:

For more information on the OPC data types' corresponding MMS data types, refer to Data Types Description.

Error: Device <device name>, Address <MMS address>, Invalid octet string data <octet string>. Please enter an even number of hexadecimal digits (for example, "00 01 C3").

Error Type:

Warning

Possible Cause:

Data was written to a tag representing an MMS octet string that is not an even number of hexadecimal digits.

Solution:

Verify that the data written being to octet string tags includes an even number of hexadecimal digits. For example, "00 01 C3".

Error: Device <device name>, Invalid object <MMS address>.

Error Type:

Warning

Possible Cause:

A tag has been configured with an address that is not valid for the connected device.

Solution:

Verify that the tags (including the given address) are configured correctly.

Error: Device <device name>, Invalid report control block address <MMS address>.

Error Type:

Warning

Possible Cause:

A report control block tag is configured with an address that is not valid for the connected device.

Solution:

Verify that the report control block exists on the connected device and/or correct the address.

<Channel name> | MMS Instance Certificate information. | Valid = Yes/No, Expired = Yes/No, Invalid signature = Yes/No, Unspecified error = Yes/No, Self-signed = Yes/No.

Error Type:
Security

This informational message about the MMS instance certificate is posted on channel initialization:

- **Valid**: MMS certificate is valid or invalid.
- **Expired**: MMS certificate is expired or not expired.
- **Invalid signature**: MMS certificate has an invalid or valid signature.
- **Unspecified error**: MMS certificate has a non-specific error or not.
- **Self-signed**: MMS certificate is self-signed or CA-signed.

Solution:
Replace an invalid MMS certificate with a certificate that has not expired and has a valid signature. Restart the server for the changes to take effect.

No ConnectedAP of SubNetwork <SubNetwork> with IED <IED> and AccessPoint <AccessPoint> found in file <file path>.

Error Type:
Warning

Possible Cause:
The SubNetwork and IED selected in the Automatic Configuration group (located in **Device Properties**) do not form a ConnectedAP in the selected SCL file.

Solution:
Verify that the selected SubNetwork, IED, and SCL File paths are valid.

<Channel name > | Non-RSA private key encountered. Channel initialized with insecure configuration. Devices configured with the Certificate Authentication Mechanism cannot connect.

Error Type:
Security

Possible Cause:
An RSA certificate / private key is required for the MMS and TLS Instance Certificates.

Solution:
Import an RSA certificate / private key for the MMS and TLS Instance Certificates in the Server Administration Certificate Store.

Selected AccessPoint <AccessPoint > not found in file <file path>.

Error Type:
Warning

Possible Cause:
The AccessPoint property is not present in the file as specified in the SCL File field (located in the **Automatic Configuration** group of **Device Properties**).

Solution:
Verify that both the AccessPoint and SCL file properties are configured correctly.

Selected IED <IED name> not found in file <file path>.

Error Type:
Warning

Possible Cause:
The IED is not present in the file as specified in the SCL File field (located in the **Automatic Configuration** group of **Device Properties**).

Solution:
Verify that both the IED and SCL File properties are configured correctly.

Selected SubNetwork <SubNetwork> not found in file <file path>.

Error Type:
Warning

Possible Cause:
The SubNetwork property is not present in the file as specified in the SCL File field (located in the **Automatic Configuration** group of **Device Properties**).

Solution:
Verify that both the SubNetwork and SCL File properties are configured correctly.

Error: Device <device name>, Structured data attribute <MMS address> cannot be applied to tag.

Error Type:
Warning

Possible Cause:
A tag has been configured with the address of a structured data attribute.

Solution:
Verify that all tags only refer to data attributes with primitive types.

Note:
Tags must refer to data attributes with primitive types.

<Channel name.Device name> | Unable to connect. Channel is not initialized with certificates. | IP address = <IP address>.

Error Type:
Security

Possible Cause:

1. Certificate Authentication Mechanism configured on device with insecure channel configuration.
2. No certificates loaded in the certificate store.
3. A certificate in the certificate store is invalid.

Solution:
Import valid trust store, MMS instance, and TLS instance certificates. Restart the server for the changes to take effect.

<channel name.device name> | Unable to write to address on device. | Address = <MMS address>.

Error Type:
Warning

Possible Cause:
The control has already been selected.

Solution:
Deselect the address using the Cancel form of the MMS address.

Index