IEC 60870-5-101 Protocol Client Master Simulator User Manual

Stack Version: 21.05.008

IEC 60870-5-101 Protocol

FreyrSCADA Embedded Solution

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1. Introduction

IEC 60870-5-101 (IEC101) is a standard for power system monitoring, control & associated communications for telecontrol, tele protection, and associated telecommunications for electric power systems. This is completely compatible with IEC 60870-5-1 to IEC 60870-5-5 standards and uses standard asynchronous serial tele-control channel interface between DTE and DCE. The standard is suitable for multiple configurations like point-to-point, star, multidrop etc.

Features

- Supports unbalanced (only master initiated message) & balanced (can be master/slave initiated) modes of data transfer.
- Link address and ASDU (Application Service Data Unit) addresses are provided for classifying the end station and different segments under the same.
- Data is classified into different information objects and each information object is provided with a specific address.
- Facility to classify the data into high priority (class-1) and low priority (class-2) and transfer the same using separate mechanisms.
- Possibility of classifying the data into different groups (1-16) to get the data according to the group by issuing specific group interrogation commands from the master & obtaining data under all the groups by issuing a general interrogation.
- Cyclic & Spontaneous data updating schemes are provided.
- Facility for time synchronization
- Schemes for transfer of files- Example: IED's will store disturbance recorder file in the memory, when electrical disturbance is occurred in the field. This file can be retrieved through IEC103 protocol for fault analysis

FreyrSCADA IEC 60870-5-101 Client Simulator was originally developed to test the IEC 60870-5-101 stack.

We developed the stack to run multiple hardware platform (windows, Linux, RTLinux, qnx..). So we had to test multiple platform. At that time, our engineers, developed the test simulation application.

We tested this simulator with multiple test software available in the market.

The interoperability list focused only for our Stack. If you have any specific requirement to implement new Type id ASDU, Please contact to us.

Our support team has young, dynamic and professional team of engineers. And they will provide the quick and accurate solution as per customer requirement.

support@freyrscada.com

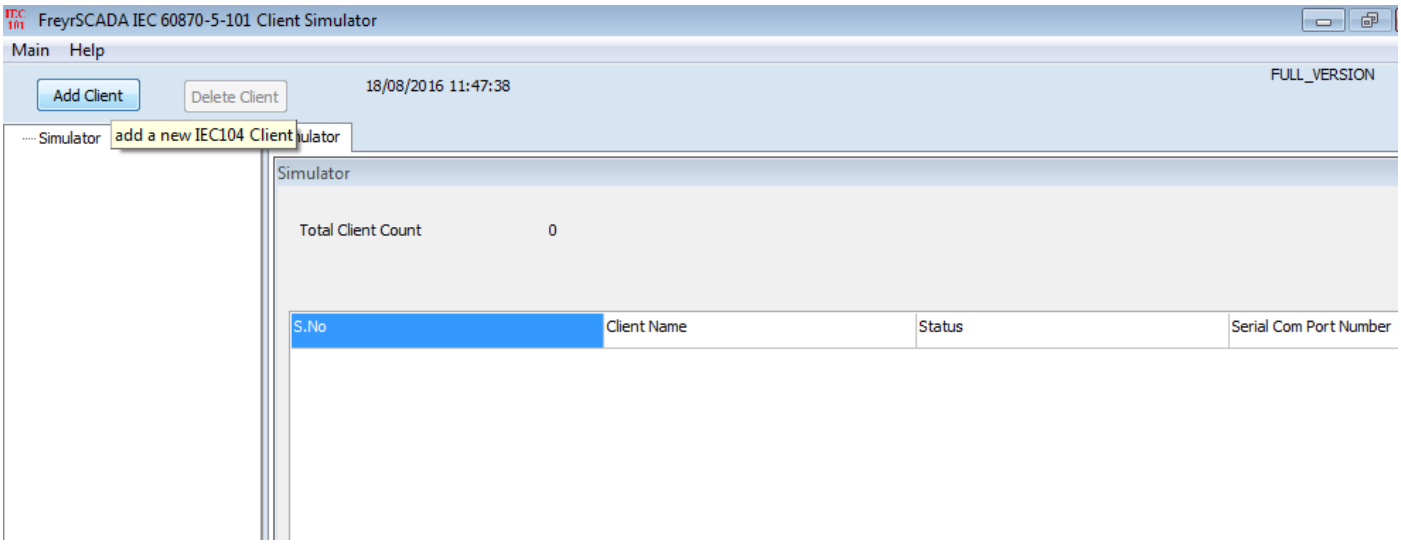
Thanks

Management- FreyrSCADA Embedded Solution

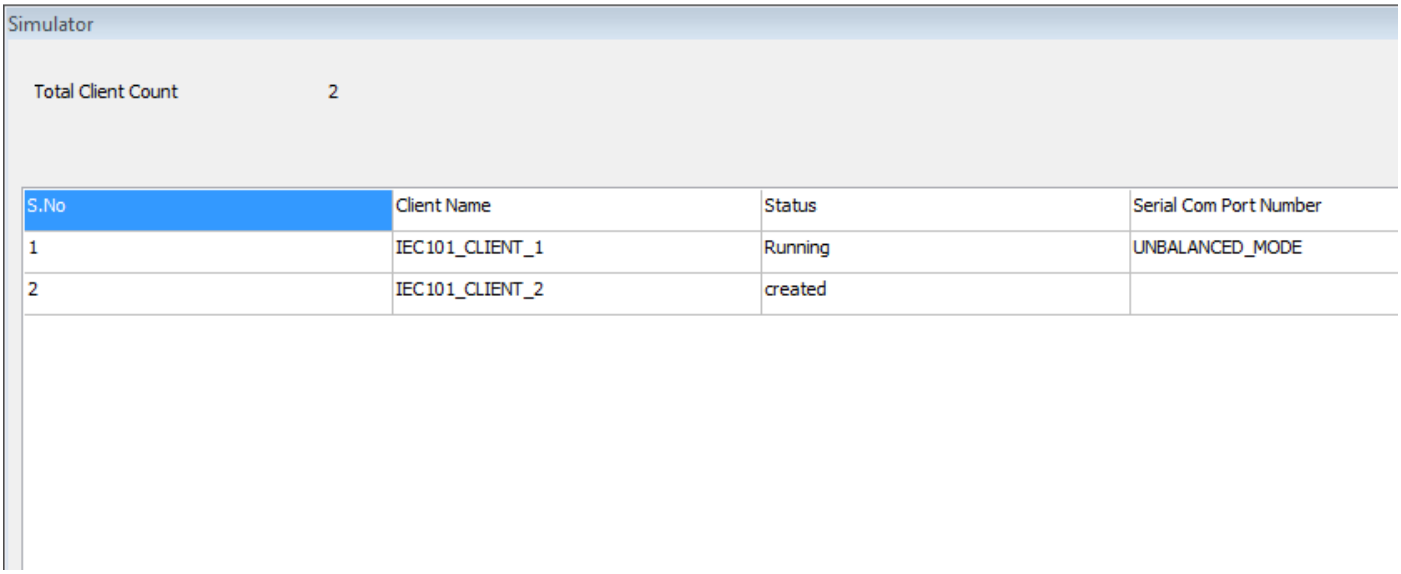
2. Add and Delete Client Node

We can add up to 50 Client node in the simulator. Every Client node will work independently.

And also we can delete the Client.

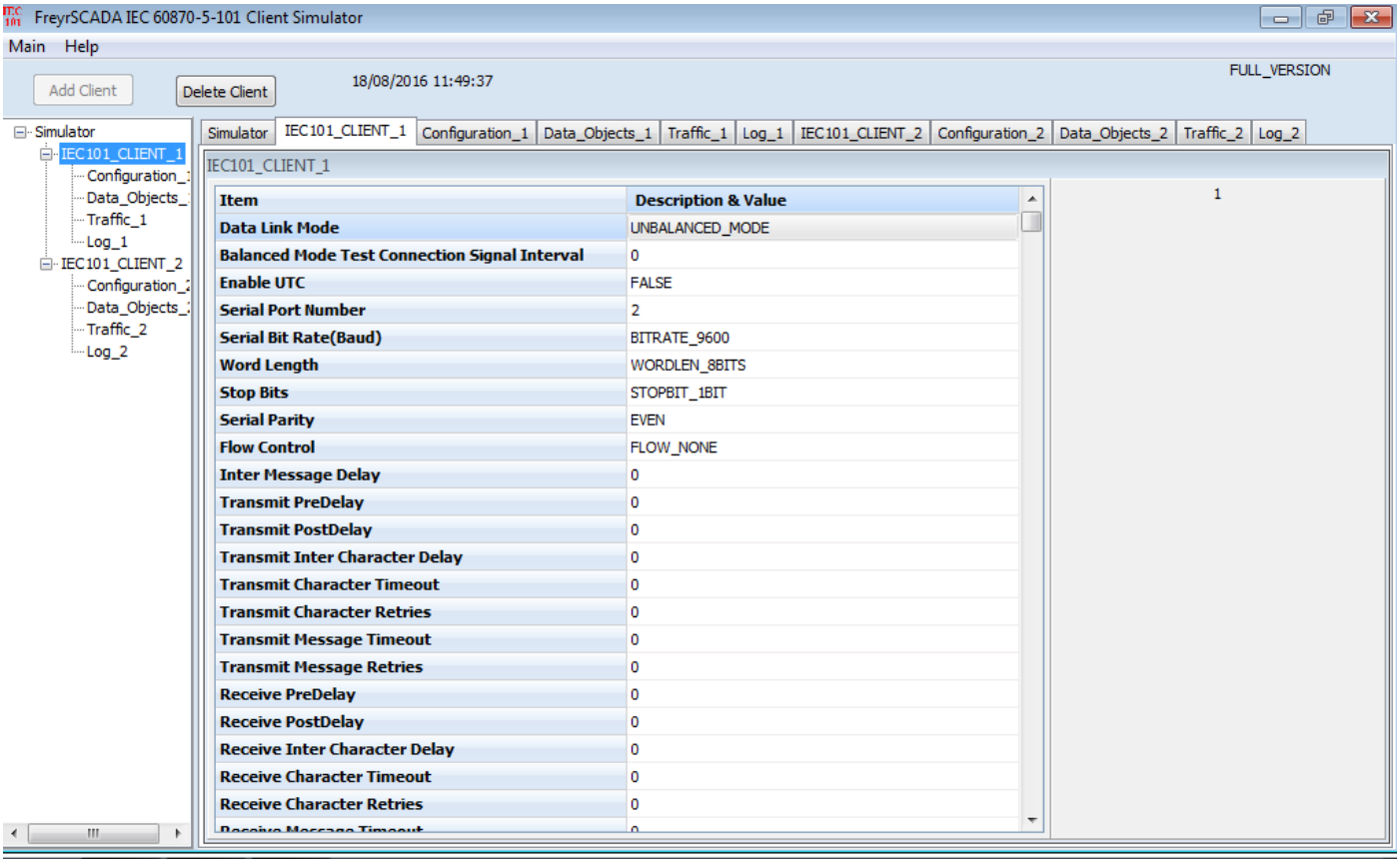


Simulator window shows the status & connected Serial com Port Number.



3. Client Configuration

Client Protocol Configuration window shows the actual protocol settings.



Configuration Parameters as follows:

1. **Data Link Mode -** Data link transmission - Unbalanced mode - 0, Balanced mode -1
2. **Balanced Mode Test Connection Signal Interval -** Data link transmission - Unbalanced mode - 0, Balanced mode -1
3. **Enable UTC -** Enable UTC time / local time for update the monitoring information & initial database time initialization
4. **Serial Port Number -** Serial COM port number
5. **Serial Bit Rate(Baud) -** Serial Bit/Baud Rate
6. **Word Length -** Serial Word Length
7. **Stop Bits -** Serial Stop Bits
8. **Serial Parity -** Serial Parity
9. **Flow Control -** Flow Control
10. **Inter Message Delay -** Time between sending and receiving of message only applies after transmitting the message
11. **Transmit PreDelay -** Transmit Delay before send

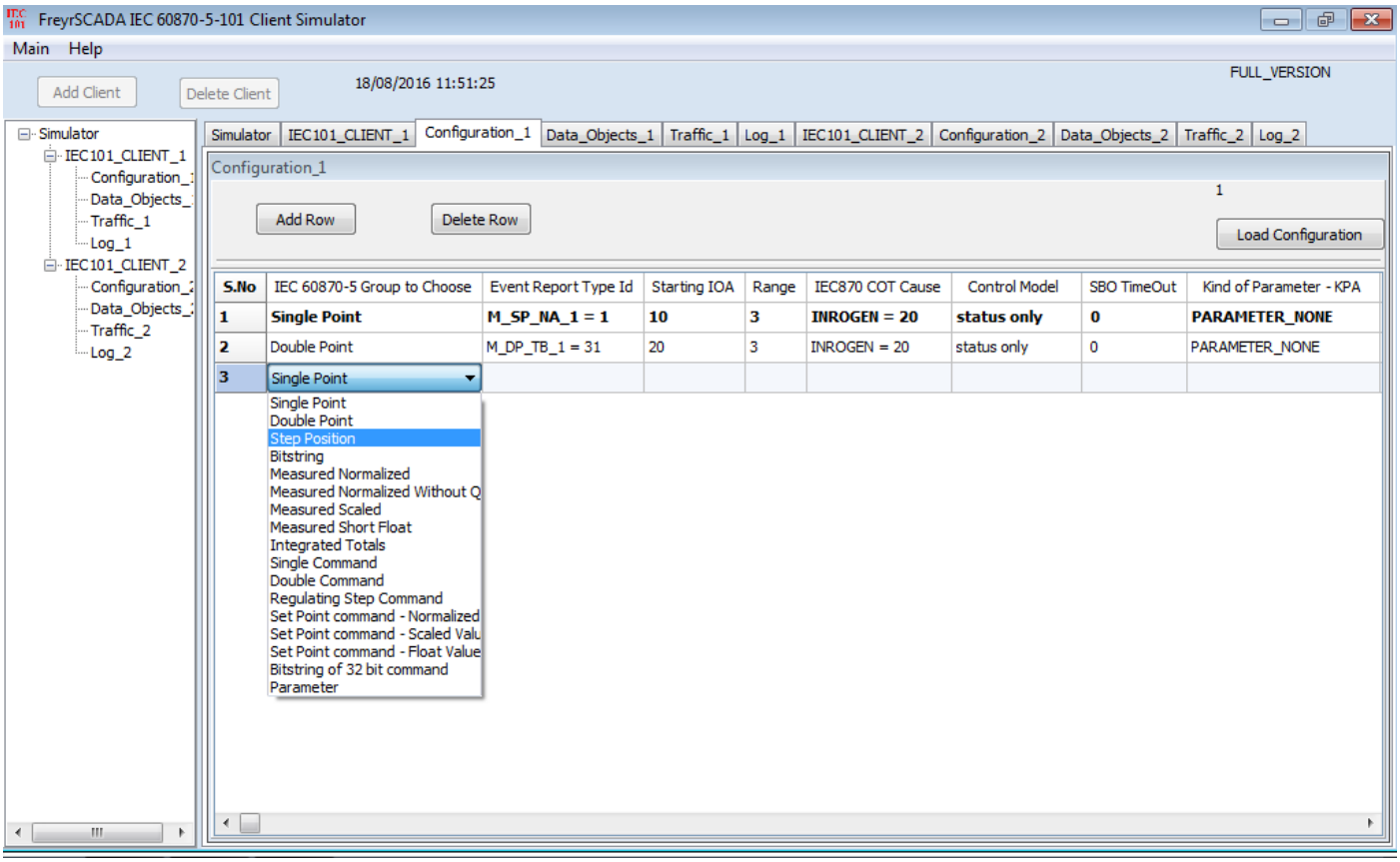
12. **Transmit PostDelay -** Delay after send
13. **Transmit Inter Character Delay -** Delay between characters during send
14. **Transmit Character Timeout -** Timeout if the character is not being sent
15. **Transmit Character Retries -** Number of retries to send
16. **Transmit Message Timeout -** Message Timeout if entire message is not sent
17. **Transmit Message Retries -** Transmit - Message Retries to retry the entire message
18. **Receive PreDelay -** Delay before receive
19. **Receive PostDelay -** Delay after receive
20. **Receive Inter Character Delay -** Delay between characters during receive
21. **Receive Character Timeout -** Timeout if the character is not being received
22. **Receive Character Retries -** Number of retries to receive a character
23. **Receive Message Timeout -** Message Timeout if entire message is not received
24. **Receive Message Retries -** Receive - Message Retries to retry the entire message
25. **Link Address Size -** Data link address size
26. **Data Link Address -** Data link address
27. **COT Size -** Cause of transmission size
28. **IOA Size -** Information object address size
29. **CA Size -** Common Address Size , one octect, two octect
30. **Total Number of Stations(Common Address) -** Total number of stations - in a single physical device/ server, we can run many stations - number of stations in our server ,according to common address (1-5)
31. **Station Address - 1 (Common Address 1) -** CA 0 station address 1- Common Address 1 , 1-65534 , 65535 = global address (only master can use this)
32. **Station Address - 2 (Common Address 2) -** CA 1 station address 2- Common Address 2 , 1-65534 , 65535 = global address (only master can use this)
33. **Station Address - 3 (Common Address 3) -** CA 2 station address 3- Common Address 3 , 1-65534 , 65535 = global address (only master can use this)
34. **Station Address - 4 (Common Address 4) -** CA 3 station address 4- Common Address 4 , 1-65534 , 65535 = global address (only master can use this)
35. **Station Address - 5 (Common Address 5) -** CA 4 station address 5- Common Address 5 , 1-65534 , 65535 = global address (only master can use this)
36. **Originator Address -** if cot size is 2 octect, we need to set originator address, default 0
37. **Link Layer Timeout -** Link Layer timeout in milliseconds
38. **Poll Interval -** poll interval in milliseconds

39. **General Interrogation Interval -** In Sec if 0 , General Interrogation will not send in particular interval, else in particular seconds GI will send to server
40. **Group 1 Interrogation Interval -** in sec if 0 , group 1 interrogation will not send in particular interval, else in particular seconds group 1 interrogation will send to server
41. **Group 2 Interrogation Interval -** in sec if 0 , group 2 interrogation will not send in particular interval, else in particular seconds group 2 interrogation will send to server
42. **Group 3 Interrogation Interval -** in sec if 0 , group 3 interrogation will not send in particular interval, else in particular seconds group 3 interrogation will send to server
43. **Group 4 Interrogation Interval -** in sec if 0 , group 4 interrogation will not send in particular interval, else in particular seconds group 4 interrogation will send to server
44. **Group 5 Interrogation Interval -** in sec if 0 , group 5 interrogation will not send in particular interval, else in particular seconds group 5 interrogation will send to server
45. **Group 6 Interrogation Interval -** in sec if 0 , group 6 interrogation will not send in particular interval, else in particular seconds group 6 interrogation will send to server
46. **Group 7 Interrogation Interval -** in sec if 0 , group 7 interrogation will not send in particular interval, else in particular seconds group 7 interrogation will send to server
47. **Group 8 Interrogation Interval -** in sec if 0 , group 8 interrogation will not send in particular interval, else in particular seconds group 8 interrogation will send to server
48. **Group 9 Interrogation Interval -** in sec if 0 , group 9 interrogation will not send in particular interval, else in particular seconds group 9 interrogation will send to server
49. **Group 10 Interrogation Interval -** in sec if 0 , group 10 interrogation will not send in particular interval, else in particular seconds group 10 interrogation will send to server
50. **Group 11 Interrogation Interval -** in sec if 0 , group 11 interrogation will not send in particular interval, else in particular seconds group 11 interrogation will send to server
51. **Group 12 Interrogation Interval -** in sec if 0 , group 12 interrogation will not send in particular interval, else in particular seconds group 12 interrogation will send to server
52. **Group 13 Interrogation Interval -** in sec if 0 , group 13 interrogation will not send in particular interval, else in particular seconds group 13 interrogation will send to server
53. **Group 14 Interrogation Interval -** in sec if 0 , group 14 interrogation will not send in particular interval, else in particular seconds group 14 interrogation will send to server
54. **Group 15 Interrogation Interval -** in sec if 0 , group 15 interrogation will not send in particular interval, else in particular seconds group 15 interrogation will send to server
55. **Group 16 Interrogation Interval -** in sec if 0 , group 16 interrogation will not send in particular interval, else in particular seconds group 16 interrogation will send to server
56. **General Counter Interrogation Interval -** In Sec if 0 , General Counter Interrogation will not send in particular interval, else in particular seconds GCI will send to server
57. **Group 1 Counter Interrogation Interval -** in sec if 0 , group 1 Counter interrogation will not send in particular interval, else in particular seconds group 1 counter interrogation will send to server

58. **Group 2 Counter Interrogation Interval -** in sec if 0 , group 2 Counter interrogation will not send in particular interval, else in particular seconds group 2 counter interrogation will send to server
59. **Group 3 Counter Interrogation Interval -** in sec if 0 , group 3 Counter interrogation will not send in particular interval, else in particular seconds group 3 counter interrogation will send to server
60. **Group 4 Counter Interrogation Interval -** in sec if 0 , group 4 Counter interrogation will not send in particular interval, else in particular seconds group 4 counter interrogation will send to server
61. **Clock Sync Period -** in sec if 0 , clock synchronisation will not send in particular interval, else in particular seconds clock synchronization will send to server
62. **Command Time out -** Command Timeout (command ack timeout) in Mille Second
63. **Server Generate ACTTERM response Signal -** if server Generate ACTTERM in command respond
64. **File Transfer Enable -** Enable File Transmission
65. **File Transfer Directory Path -** File transmission folder path, File Transfer Directory Path
66. **File Transfer Timeout -** File transmission timeout
67. **Update Callback Check Timestamp -** if true, even the timestamp change will cause the update callback, else only the data & quality field change will cause the update callback

4. Client Data Configuration

Client Data Configuration window shows the point list configuration.



IEC 60870-5 Group & Typeid to choose

1) Single Point - Single-point information

M_SP_NA_1 = 1

M_SP_TA_1 = 2

M_SP_TB_1 = 30

2) Double Point - Double-point information

M_DP_NA_1 = 3

M_DP_TA_1 = 4

M_DP_TB_1 = 31

3) Step Position - Step position information

M_ST_NA_1 = 5

M_ST_TA_1 = 6

M_ST_TB_1 = 32

4) Bitstring - Bit string of 32 bit

M_BO_NA_1 = 7

M_BO_TA_1 = 8

M_BO_TB_1 = 33

5) Measured Normalized - Measured normalized value

M_ME_NA_1 = 9

M_ME_TA_1 = 10

M_ME_TD_1 = 34

6) Measured Normalized Without Quality - Measured normalized value without quality descriptor

M_ME_ND_1 = 21

7) Measured Scaled - Measured scaled value

M_ME_NB_1 = 11

M_ME_TB_1 = 12

M_ME_TE_1 = 35

8) Measured Short Float - Measured value, normalized value

M_ME_NC_1 = 13

M_ME_TC_1 = 14

M_ME_TF_1 = 36

9) Integrated Totals - Integrated totals

M_IT_NA_1 = 15

M_IT_TA_1 = 16

M_IT_TB_1 = 37

10) Event of Protection Equipment - Event of protection equipment with time tag CP56Time2a

M_EP_TD_1 = 38, Event of protection equipment with time tag CP56Time2a

11) Packed Start Events of Protection Equipment - Packed start events of protection equipment with time tag CP56Time2a

M_EP_TE_1 = 39, Packed start events of protection equipment with time tag CP56Time2a

12) Packed Output Circuit Information of Protection Equipment - Packed output circuit information of protection equipment with time tag CP56Time2a

M_EP_TF_1 = 40, Packed output circuit information of protection equipment with time tag CP56Time2a

13) Single Command - Single command

C_SC_NA_1 = 45

C_SC_TA_1 = 58

14) Double Command - Double command

C_DC_NA_1 = 46

C_DC_TA_1 = 59

15) Regulating Step Command - Regulating step command

C_RC_NA_1 = 47

C_RC_TA_1 = 60

16) Set Point command - Normalized Value - Set point command, normalized value

C_SE_NA_1 = 48

C_SE_TA_1 = 61

17) Set Point command - Scaled Value - Set point command, scaled value

C_SE_NB_1 = 49

C_SE_TB_1 = 62

18) Set Point command - Float Value - Set point command, short floating point value

C_SE_NC_1 = 50

C_SE_TC_1 = 63

19) Bitstring of 32 bit command - Bitstring of 32 bit command

C_BO_NA_1 = 51

C_BO_TA_1 = 64

20) Parameter - Parameter

P_ME_NA_1 = 110

P_ME_NB_1 = 111

P_ME_NC_1 = 112

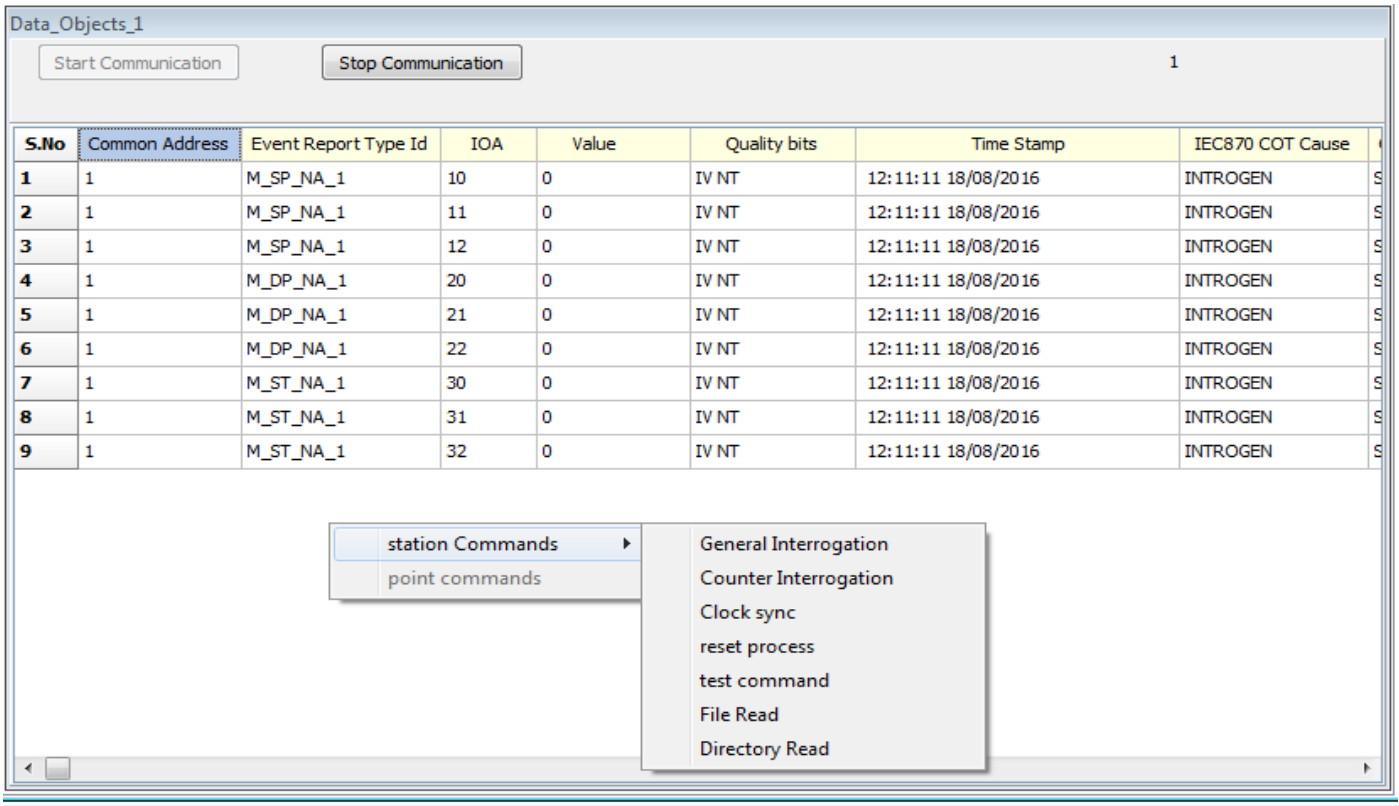
The selection of following parameters based on the typeid selection.

Consider for the following items

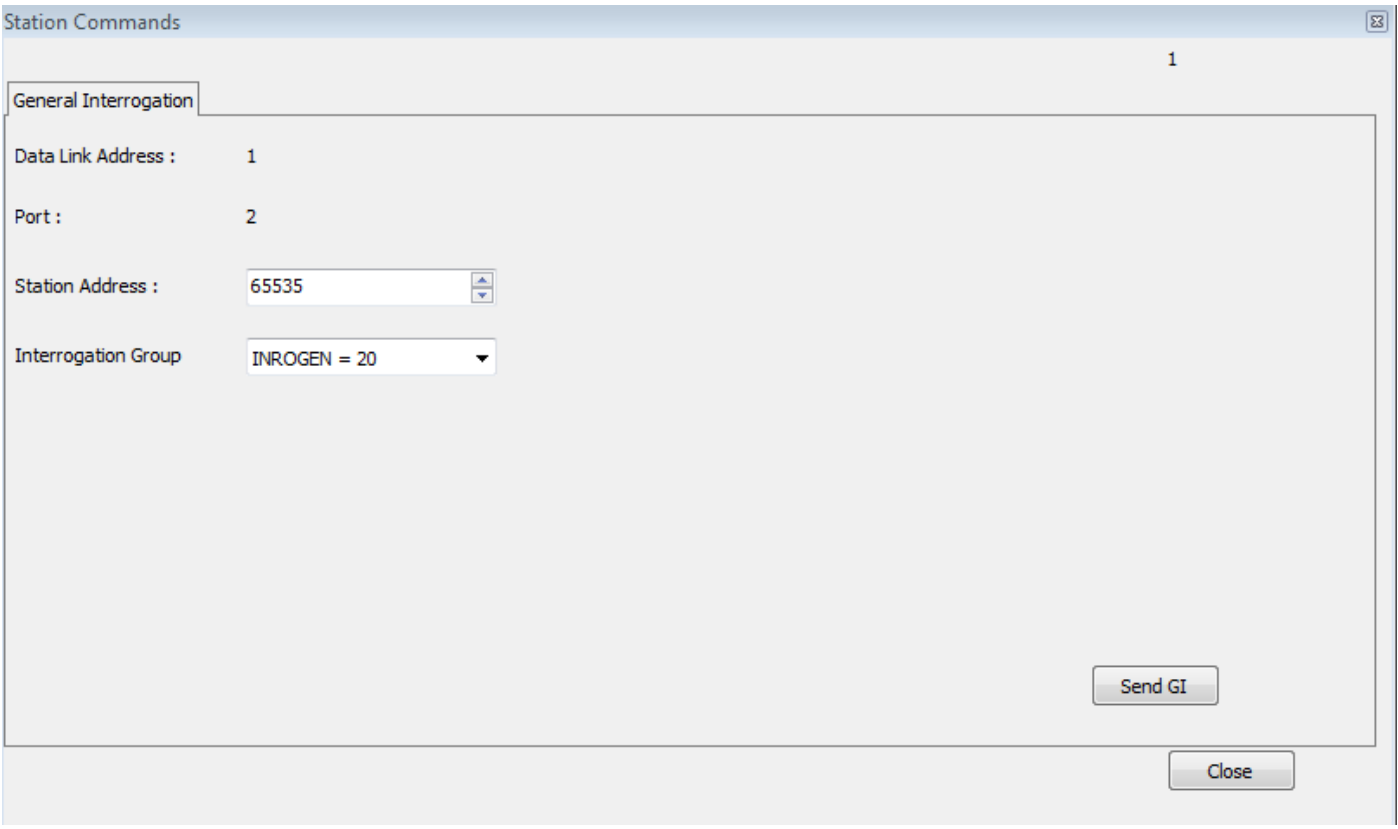
	Monitoring information	**Control / Command Point**	**Parameter Value**
IEC 60870-5 Group to Choose	Single Point	Single Command	Parameter
Event Report Type Id	M_SP_NA_1 = 1	C_SC_NA_1 = 45	P_ME_NA_1 = 110
Starting IOA	**10**	**100**	**2000**
Range	**5**	**5**	**5**
IEC870 COT Cause	INROGEN = 20	NOTUSED	INROGEN = 20
Control Model Configuration	status only	direct operate	status only
SBO TimeOut	**0**	**0**	**0**
Kind of Parameter - KPA	PARAMETER_NONE	PARAMETER_NONE	PARAMETER_THRESHOLDVALUE
Common Address	**1**	**1**	**1**

5. Station Commands

In the Data object window, plain space, just right click , the station command window will open,



All the station commands can support broadcast address or individual station address,

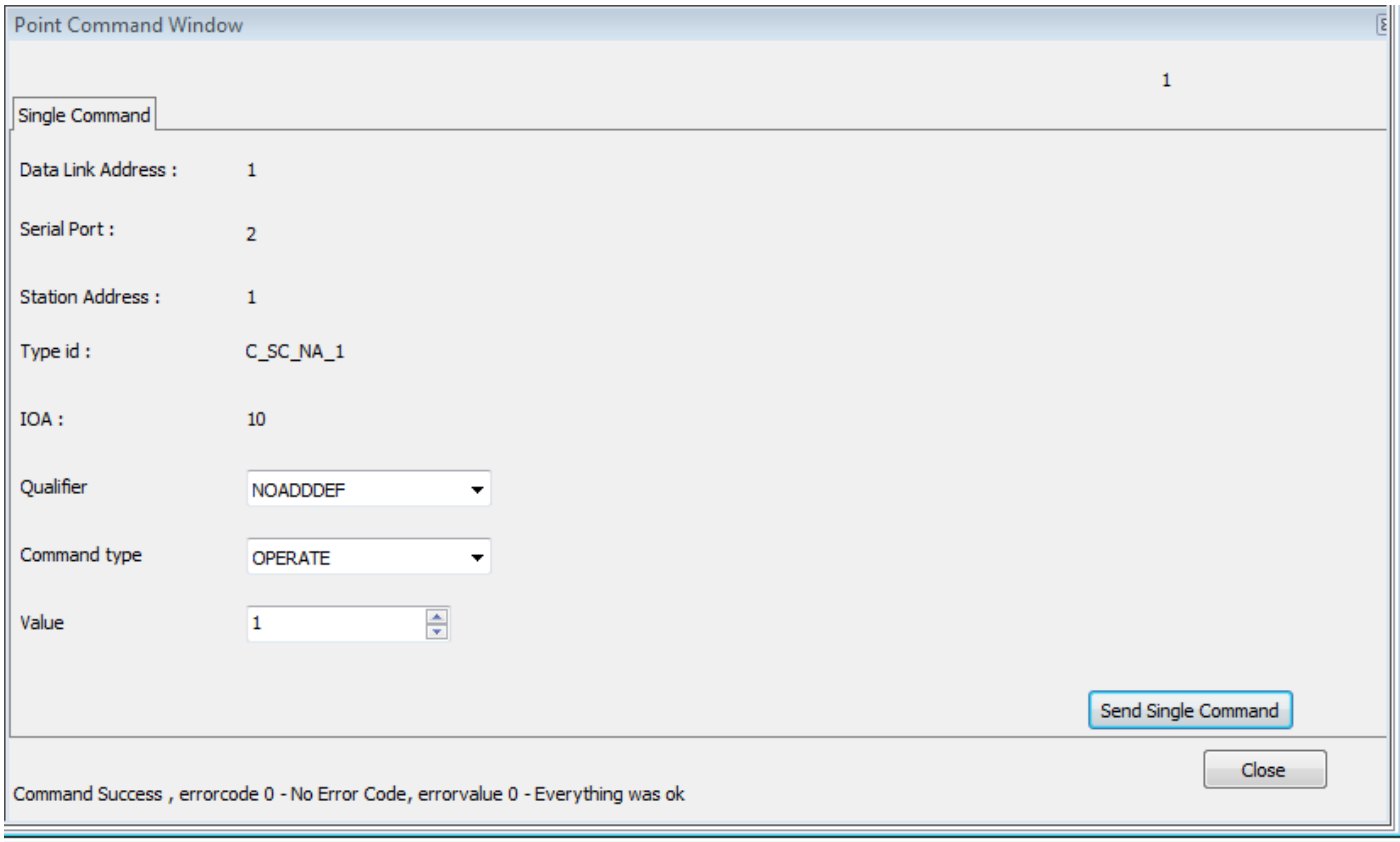


The command window will show the result also, the send command success or fail.

6. Point Command

The individual command has point command.

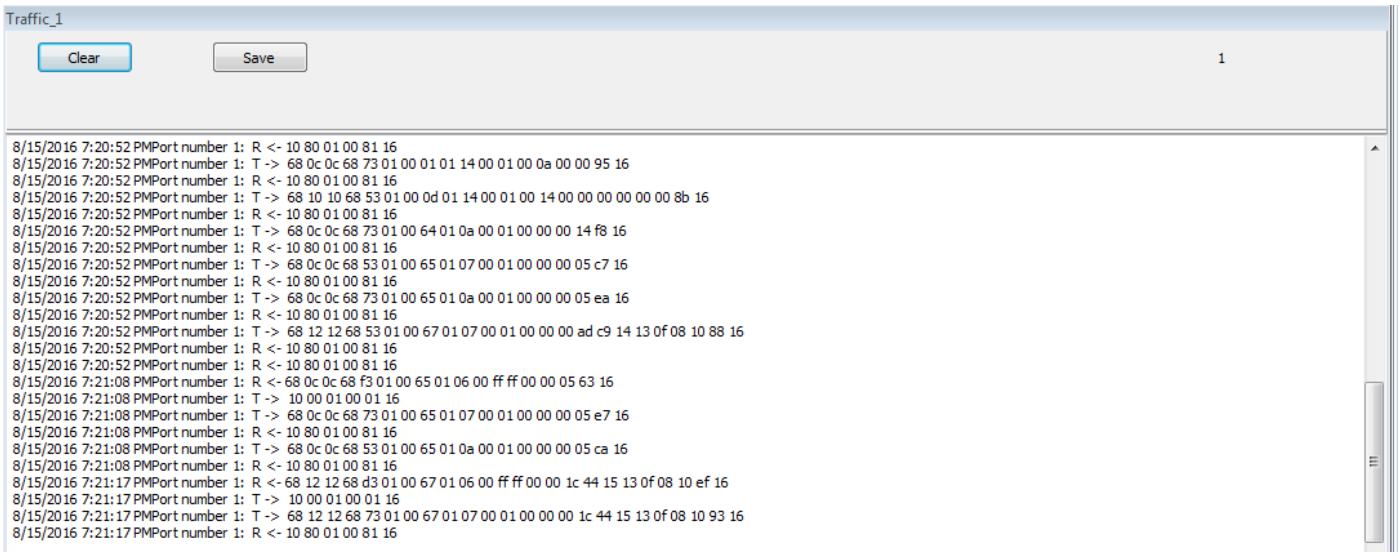
Just right click the command point in the data object window,



7. Traffic window

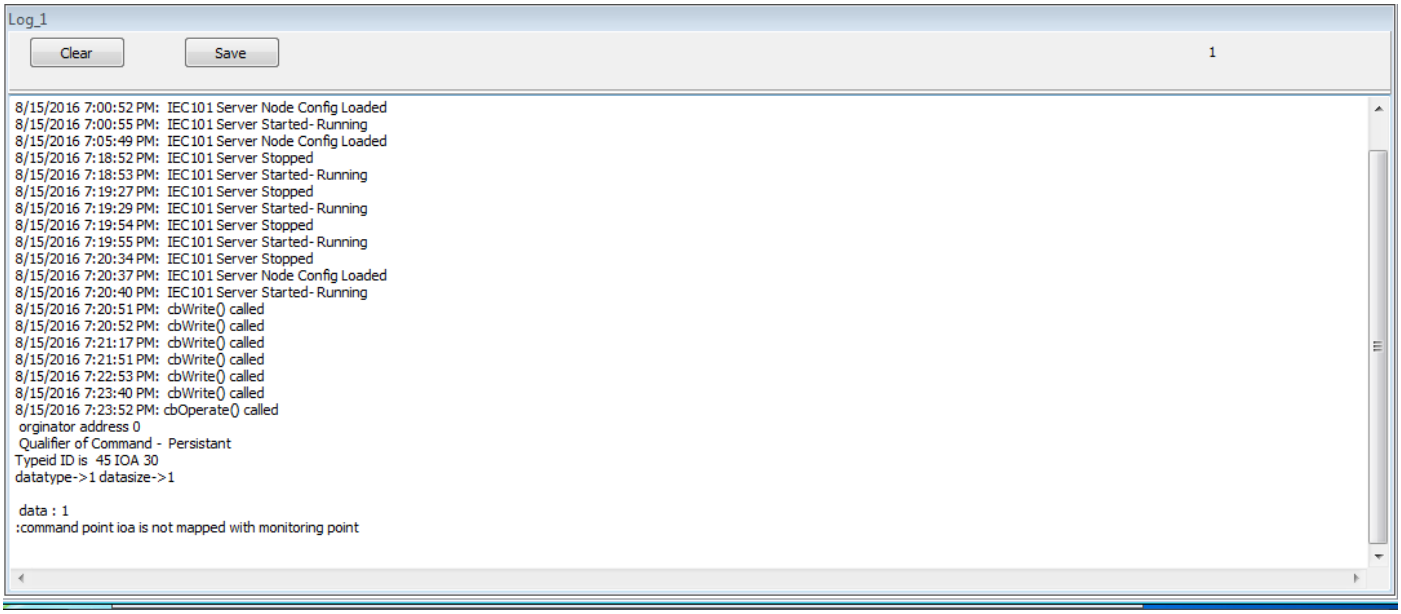
In this we can monitor the traffic of iec104 communication.

In this we can save the traffic, and clear the traffic



8. Log Window

Log window for internal reference



In the log, we can monitor the command exchange between server & master, and there is an option to save the log & clear log.

For more information, just drop a mail to support@freyrscada.com