FreyrSCADA Embedded Solution

Software Document

IEC 60870-5-101 Server Simulator User Manual

Stack Version: 21.04.001

Document version: 16.07.26

Online

Check the latest version

IEC 60870-5-101 Product

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1. Introduction

FreyrSCADA IEC 60870-5-101 Server 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

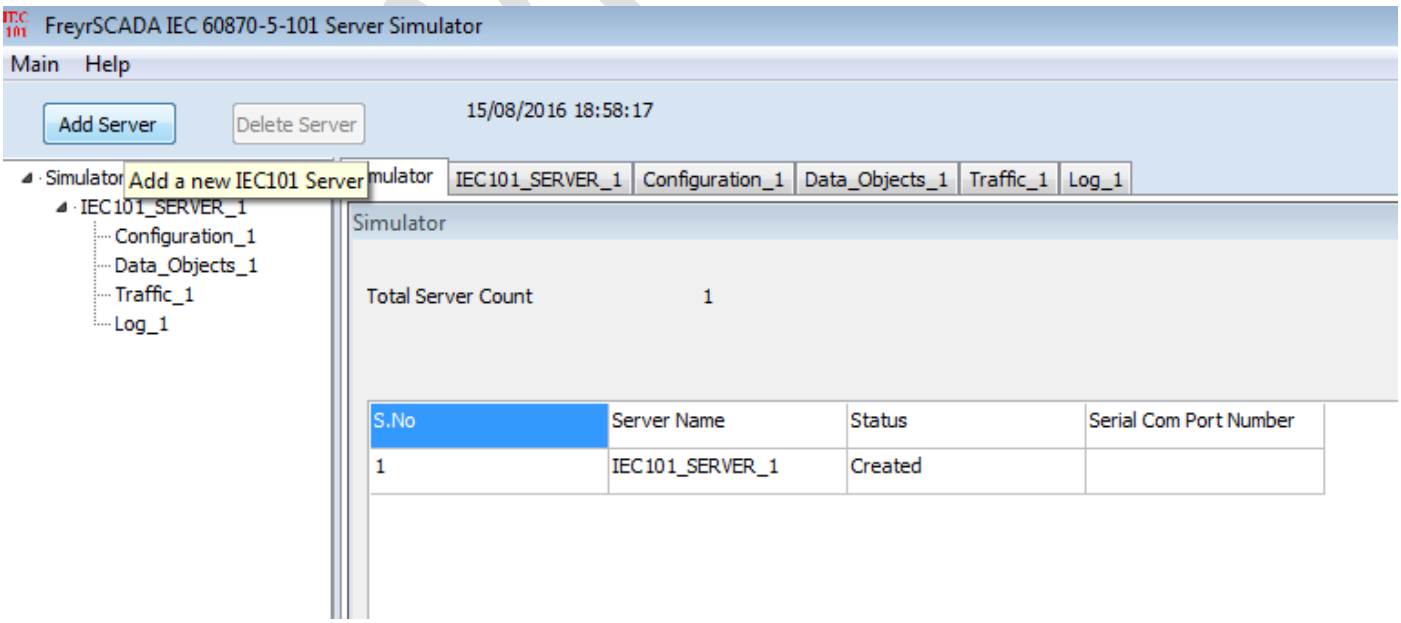
Thanks

Management- FreyrSCADA Embedded Solution

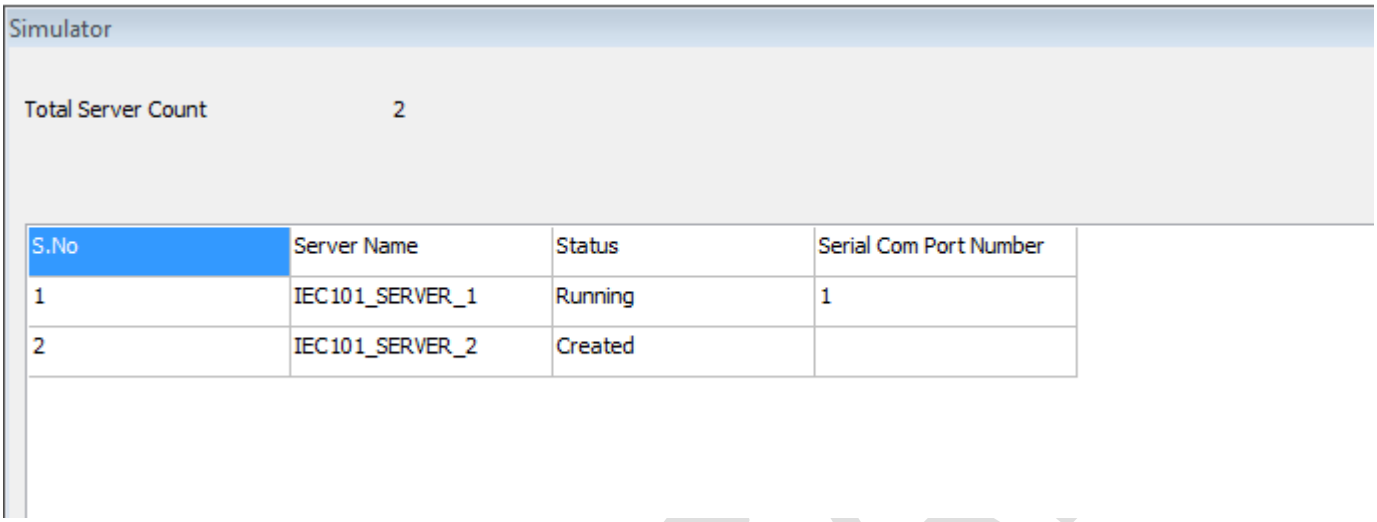
2. Add and Delete Server

We can add upto 50 server node in the simulator. Every server node will work independently.

And also we can delete the server.

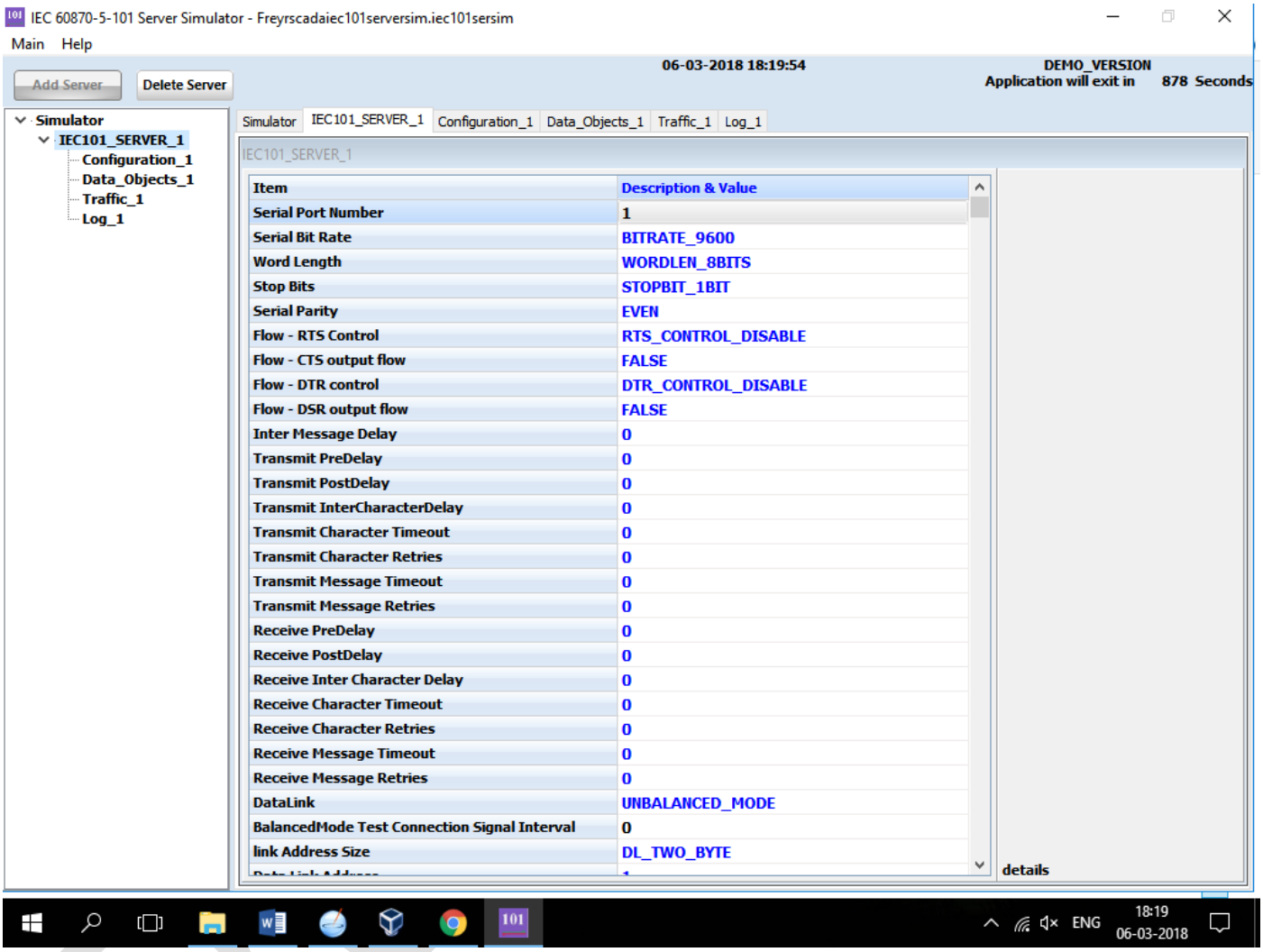


Simulator window shows the status & connected Serial com Port Number.



3. Server Configuration

Server Protocol Configuration window shows the actual protocol settings.



Configuration Parameters as follows:

1. **Serial Port Number –** Serial COM port number
2. **Serial Bit Rate -** Serial Bit/Baud Rate
3. **Word Length -** Serial Word Length
4. **Stop Bits -** Serial Stop Bits
5. **Serial Parity -** Serial Parity

6. **Flow Control -** Flow Control
7. **Inter Message Delay -** Time between sending and receiving of message only applies after transmitting the message
8. **Transmit PreDelay -** Transmit Delay before send
9. **Transmit PostDelay -** Delay after send
10. **Transmit InterCharacterDelay -** Delay between characters during send
11. **Transmit Character Timeout -** Timeout if the character is not being sent
12. **Transmit Character Retries -** Number of retries to send
13. **Transmit Message Timeout -** Message Timeout if entire message is not sent
14. **Transmit Message Retries -** Transmit - Message Retries to retry the entire message
15. **Receive PreDelay -** Delay before receive
16. **Receive PostDelay -** Delay after receive
17. **Receive Inter Character Delay -** Delay between characters during receive
18. **Receive Character Timeout -** Timeout if the character is not being received
19. **Receive Character Retries -** Number of retries to receive a character
20. **Receive Message Timeout** - Message Timeout if entire message is not received
21. **Receive Message Retries** - Receive - Message Retries to retry the entire message
22. **DataLink** - Data link transmission - Unbalanced mode , Balanced mode
23. **BalancedMode Test Connection Signal Interval** - in seconds, in balanced mode , nothing received, after this interval, server will send the test link function to master 60 seconds to 3600 seconds
24. **link Address Size** - Data Link address size
25. **Data Link Address** - Data link address
26. **COT Size** - Cause of Transmission Size
27. **IOA Size** - Information Object Address Size
28. **Common Address Size** - Common Address Size
29. **Positve ACK** - Positve ACK Format
30. **Negative ACK** - Negative ACK Format
31. **Class 1 Event Buffer Size** - High Priority - Class 1 Event Buffer Size
32. **Class 2 Event Buffer Size -** Class 2 Event Buffer Size
33. **Class 1 Buffer OverFlow Percentage -** High Priority - Class 1 Buffer OverFlow Percentage
34. **Class 2 Buffer OverFlow Percentage** - Class 2 Buffer OverFlow Percentage
35. **Maximum APDU Size -** Monitoring Information - Maximum APDU Size

36. **Clock Sync Period -** in milliseconds. If 0 than Clock Synchronisation command is not expected from Master. If the time elapsed, and did not receive the time sync command , in the events, cp56time21 time stamp, the invalid bit will set.

37. **Short Pulse Time -** in milliseconds default 5000. For Certain Command points have Pulse Duration, so after actconform, the actterm signal will be trigged according to this pulse time

38. **Long Pulse Time -** in milliseconds 10000, For Certain Command points have Pulse Duration, so after actconform, the actterm signal will be trigged according to this pulse time.

39. **Generate ACTTERM Respond -** if Yes , Generate ACTTERM responses for operate commands.

40. **Enable Double Transmission** - enable double transmission.

41. **Total number of stations** - In a single physical device/ server, we can run many stations – Total nmuber of stations in iec104 server ,according to common address (1-5).

42. **Station Address - 1 (CommonAddress 1) -** station address 1- Common Address 1 , 1-65534 , 65535 = global address (only master can use this).

43. **Station Address - 2(CommonAddress 2) - station address 2**- Common Address 2 , 1-65534 , 65535 = global address (only master can use this).

44. **Station Address - 3 (CommonAddress 3) -** station address 3- Common Address 3 , 1-65534 , 65535 = global address (only master can use this).

45. **Station Address - 4 (CommonAddress 4) -** station address 4- Common Address 4 , 1-65534 , 65535 = global address (only master can use this).

46. **Station Address - 5(CommonAddress 5) -** station address 5- Common Address 5 , 1-65534 , 65535 = global address (only master can use this).

47. **Enable File Transfer** - Enable FILE transmission.- in demo version, file transfer disabled

48. **File Transfer Directory Path** - File Transfer Directory Path – location of file to list in directory command & transfer to iec104 master.

49. **Max Files In Directory** - Maximum Number of Files in Directory (default 25).

50. **Transmit Spontaneous Measured Value** - transmit M_ME measured values as COT – spont ,spontanous message.

51. **Transmit Measured Values in Interrogation** - Transmit M_ME measured values in General interrogation.

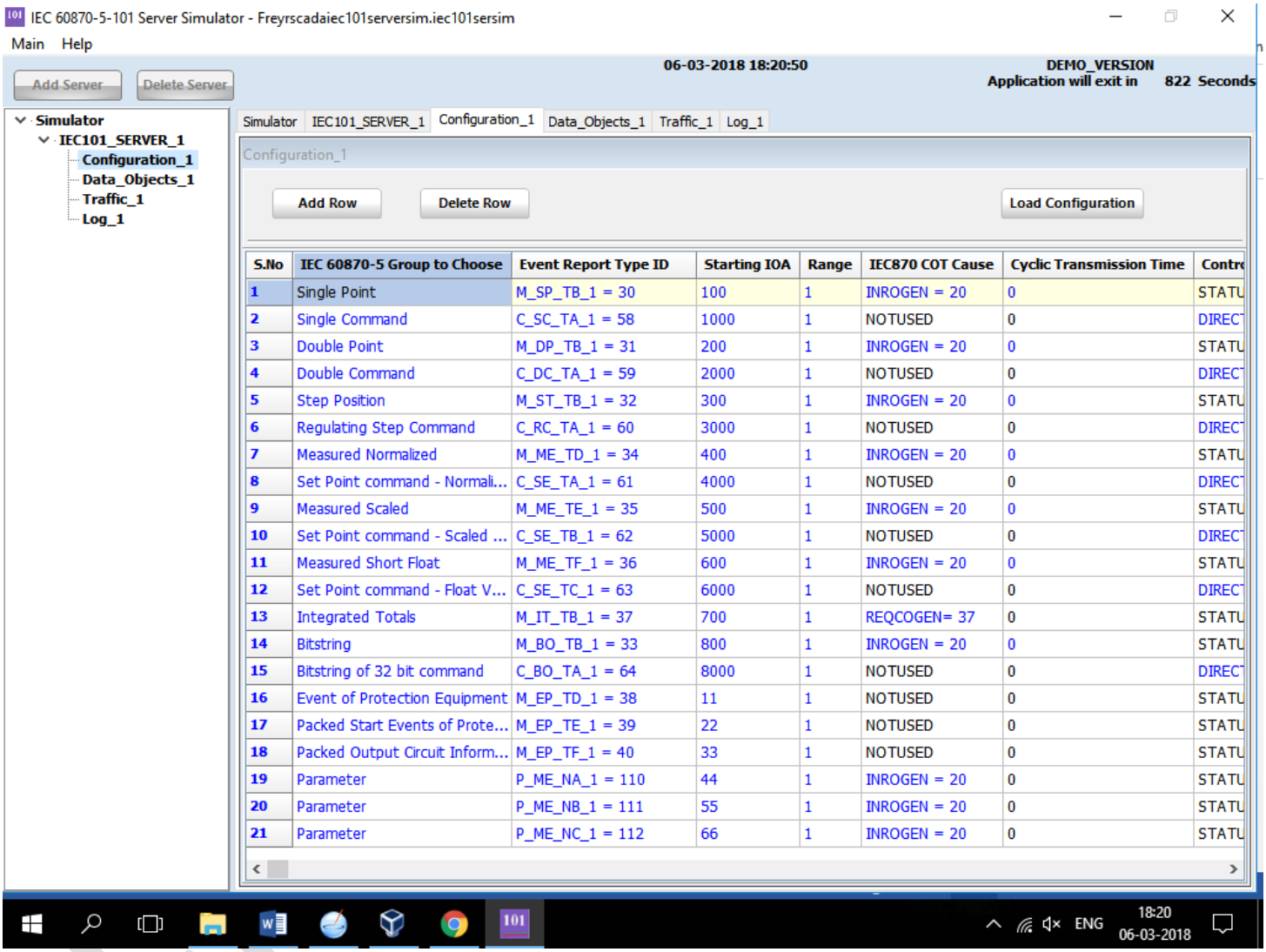
52. **Transmit Measured Values in Background scan -** transmit M_ME measured values in background Scan message.

53. **Enable UTC** - Enable UTC time / local time for update the monitoring information & initial database time initilization.

54. **Update Check Timestamp** - if it is true ,the timestamp change also generate event during the iec101update for Monitoring information.

4. Server Data Configuration

Server 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

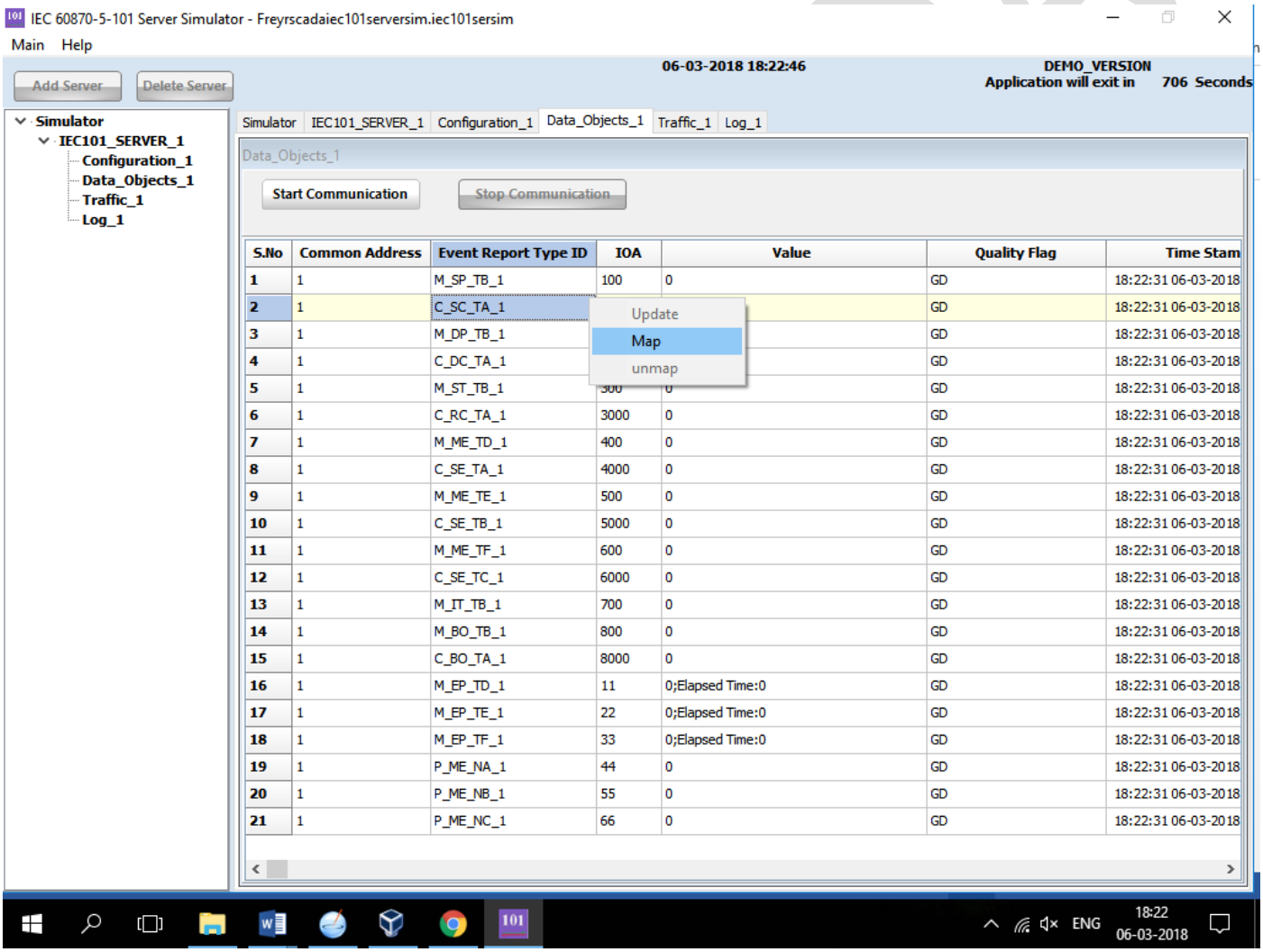
	Monitoring information	**Control / Command Point**	**Parameter Value**
IEC 60870-5 Group to Choose	Single Point	Single Command	Parameter
Event Report Type Id	M_SP_NA_1 = 1	C_SC_NA_1 = 45	P_ME_NA_1 = 110
Starting IOA	**10**	**100**	**2000**
Range	**5**	**5**	**5**
IEC870 COT Cause	INROGEN = 20	NOTUSED	INROGEN = 20
Cyclic Transmission time	**0**	**0**	**0**
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**
Background Scan time	**0**	**0**	**0**
Event Class to Report	**IEC_CLASS1**	**IEC_NO_CLASS**	**IEC_NO_CLASS**

5. Map controling point to Monitoring Point

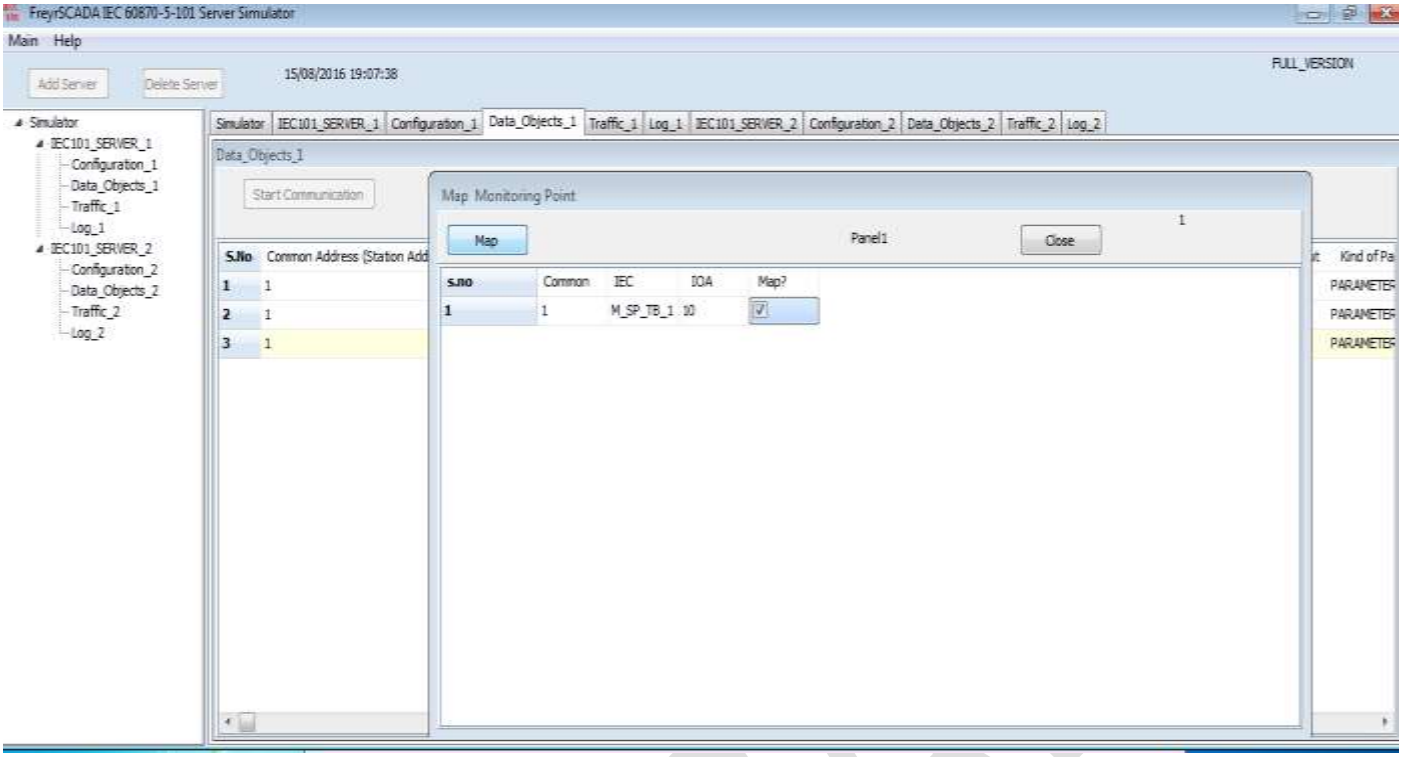
In the simulator, Data object window, We can map the controlling point to a monitoring point individually,

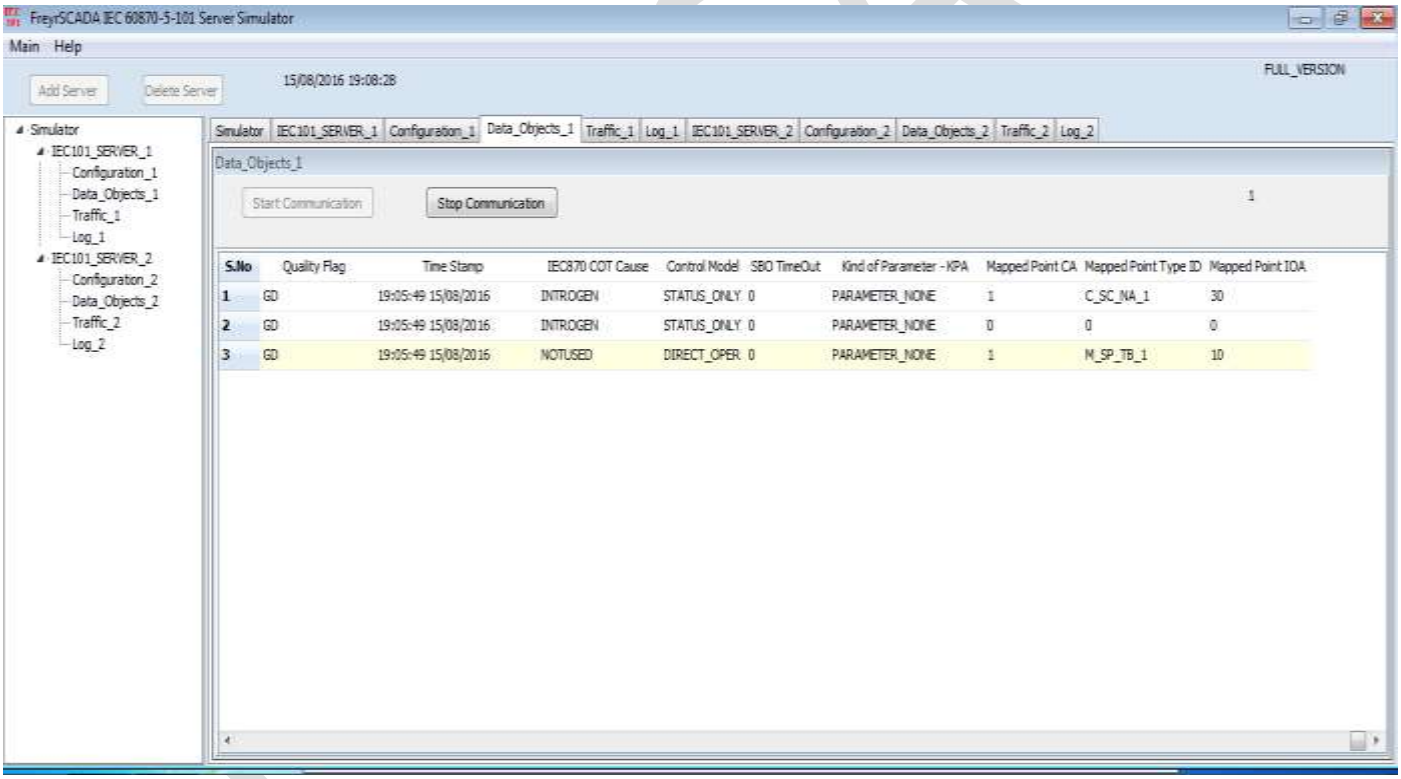
Consider a point (C_SC, IOA 1), can map to a monitoring information point (M_SP, IOA 1),

Right click the command point-> map, a new window will show the available monitoring point, and select the point and map it. If a control point receive the command, the command value will reflect in the monitoring point



S.No	Common Address	Event Report Type ID	IOA	Value	Quality Flag	Time Stam
1	1	M_SP_TB_1	100	0	GD	18:22:31 06-03-2018
2	1	C_SC_TA_1			GD	18:22:31 06-03-2018
3	1	M_DP_TB_1			GD	18:22:31 06-03-2018
4	1	C_DC_TA_1			GD	18:22:31 06-03-2018
5	1	M_ST_TB_1			GD	18:22:31 06-03-2018
6	1	C_RC_TA_1	3000	0	GD	18:22:31 06-03-2018
7	1	M_ME_TD_1	400	0	GD	18:22:31 06-03-2018
8	1	C_SE_TA_1	4000	0	GD	18:22:31 06-03-2018
9	1	M_ME_TE_1	500	0	GD	18:22:31 06-03-2018
10	1	C_SE_TB_1	5000	0	GD	18:22:31 06-03-2018
11	1	M_ME_TF_1	600	0	GD	18:22:31 06-03-2018
12	1	C_SE_TC_1	6000	0	GD	18:22:31 06-03-2018
13	1	M_IT_TB_1	700	0	GD	18:22:31 06-03-2018
14	1	M_BO_TB_1	800	0	GD	18:22:31 06-03-2018
15	1	C_BO_TA_1	8000	0	GD	18:22:31 06-03-2018
16	1	M_EP_TD_1	11	0;Elapsed Time:0	GD	18:22:31 06-03-2018
17	1	M_EP_TE_1	22	0;Elapsed Time:0	GD	18:22:31 06-03-2018
18	1	M_EP_TF_1	33	0;Elapsed Time:0	GD	18:22:31 06-03-2018
19	1	P_ME_NA_1	44	0	GD	18:22:31 06-03-2018
20	1	P_ME_NB_1	55	0	GD	18:22:31 06-03-2018
21	1	P_ME_NC_1	66	0	GD	18:22:31 06-03-2018

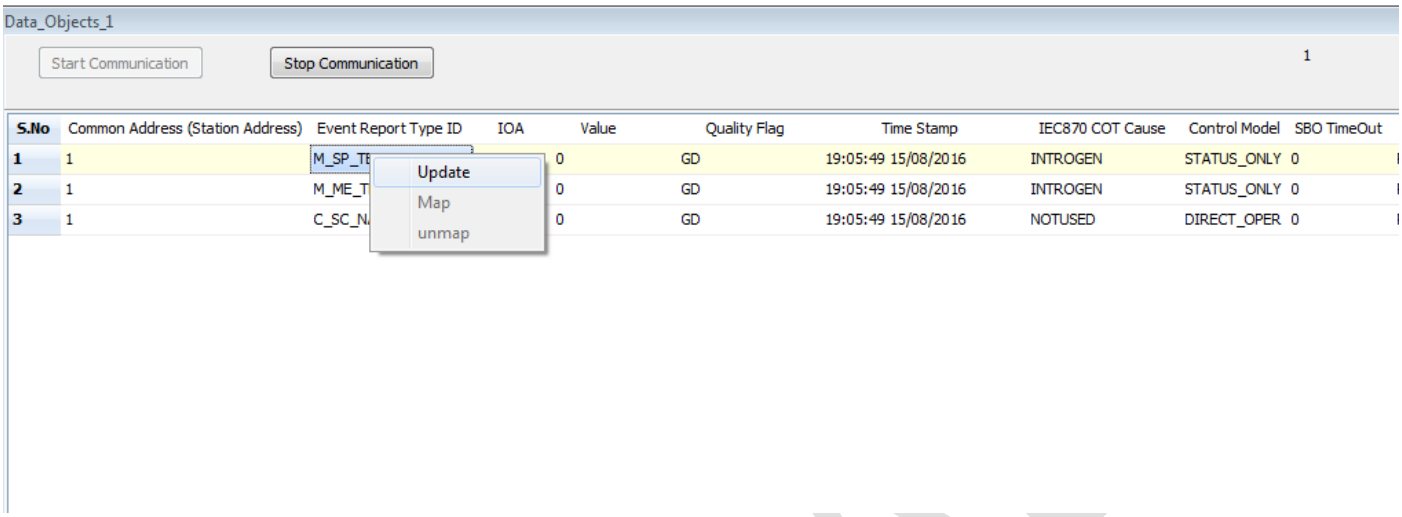

FreyrSCADA IEC 60870-5-101 Server Simulator
Main Help
Add Server
Delete Server
15/08/2016 19:07:38
FULL_VERSION
Simulator
IEC101_SERVER_1
Configuration_1
Data_Objects_1
Traffic_1
Log_1
IEC101_SERVER_2
Configuration_2
Data_Objects_2
Traffic_2
Log_2
Start Communication
Map Monitoring Point
Map
Panel1
Close
S.No
Common Address (Station Add
s.no
Common
IEC
IOA
Map?
M_SP_TB_1
Kind of Pa
PARAMETER

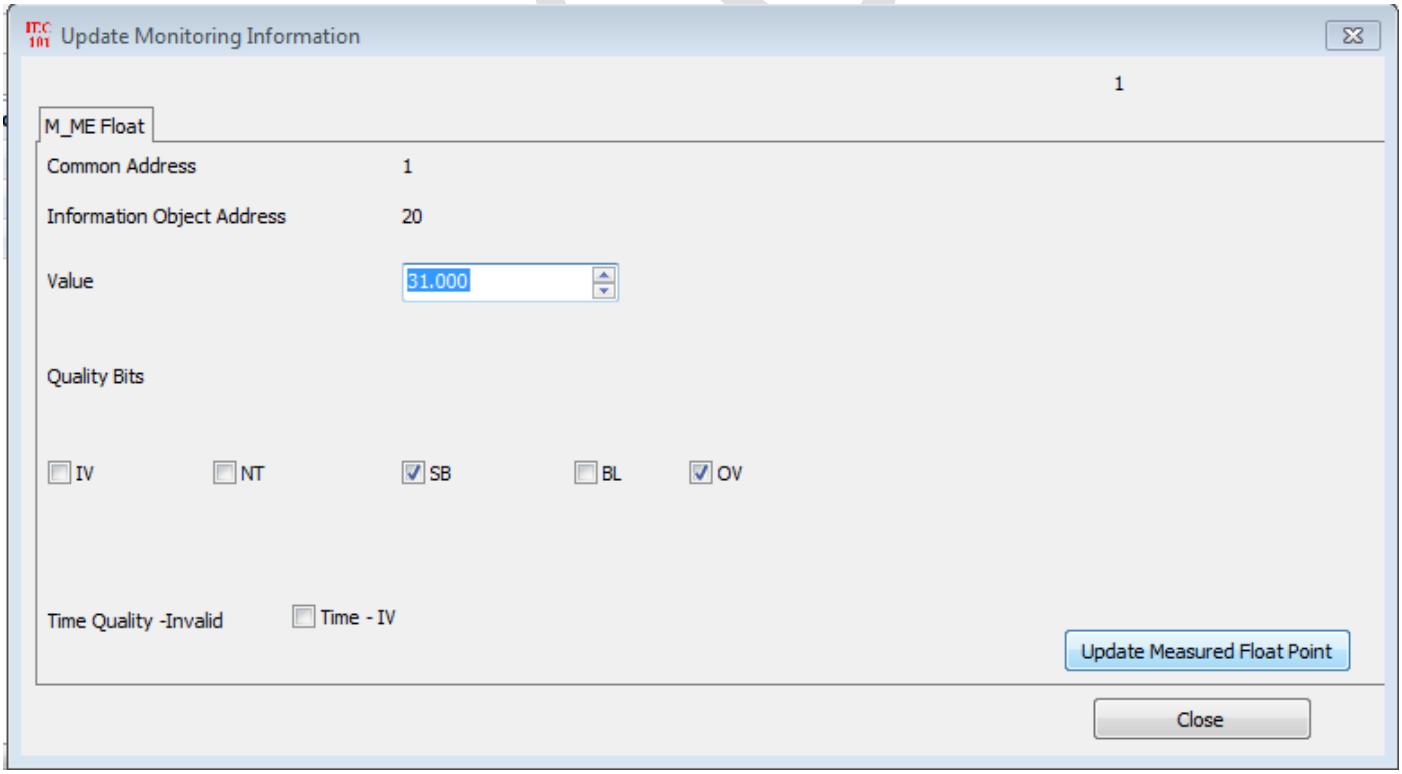

FreyrSCADA IEC 60870-5-101 Server Simulator
Main Help
Add Server
Delete Server
15/08/2016 19:08:28
FULL_VERSION
Simulator
IEC101_SERVER_1
Configuration_1
Data_Objects_1
Traffic_1
Log_1
IEC101_SERVER_2
Configuration_2
Data_Objects_2
Traffic_2
Log_2
Start Communication
Stop Communication
S.No
Quality Flag
Time Stamp
IEC870 COT Cause
Control Model
SBO TimeOut
Kind of Parameter - KPA
Mapped Point CA
Mapped Point Type ID
Mapped Point IOA
1 GD 19:05:49 15/08/2016 INTROGEN STATUS_ONLY 0 PARAMETER_NONE 1 C_SC_NA_1 30
2 GD 19:05:49 15/08/2016 INTROGEN STATUS_ONLY 0 PARAMETER_NONE 0 0 0
3 GD 19:05:49 15/08/2016 NOTUSED DIRECT_OPER 0 PARAMETER_NONE 1 M_SP_TB_1 10

6. Update Monitoring Information

The user can update the monitoring Point information .The following parameters can change

Value, quality bits and according to event report typeid , the change reported to end client system by spontaneous.

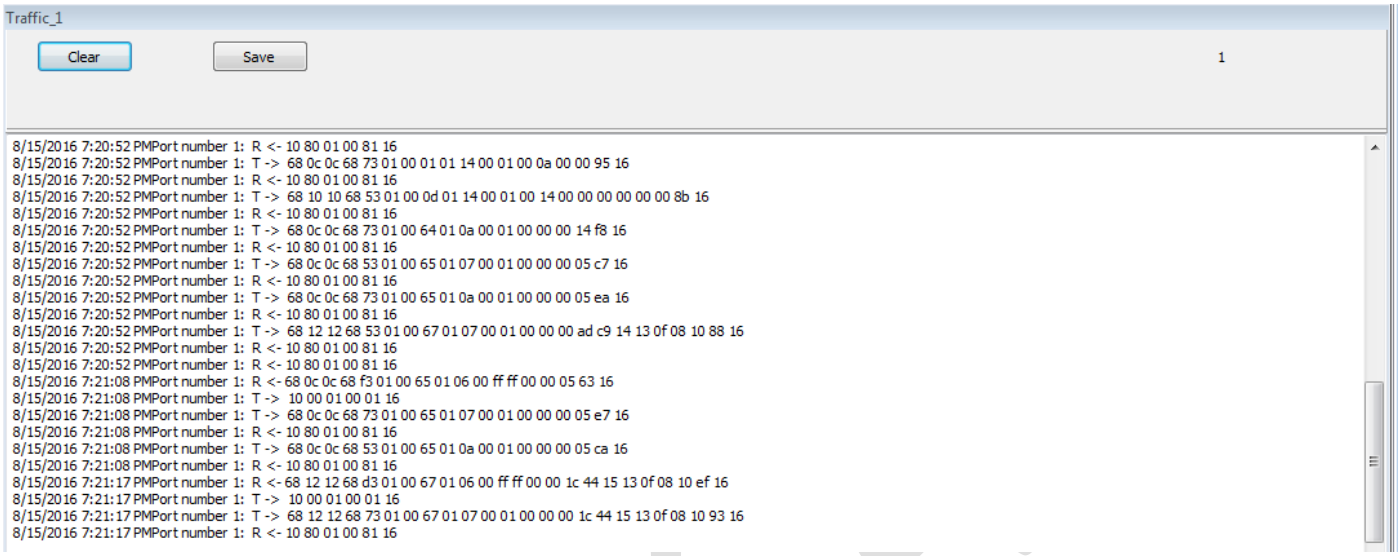




7. Traffic window

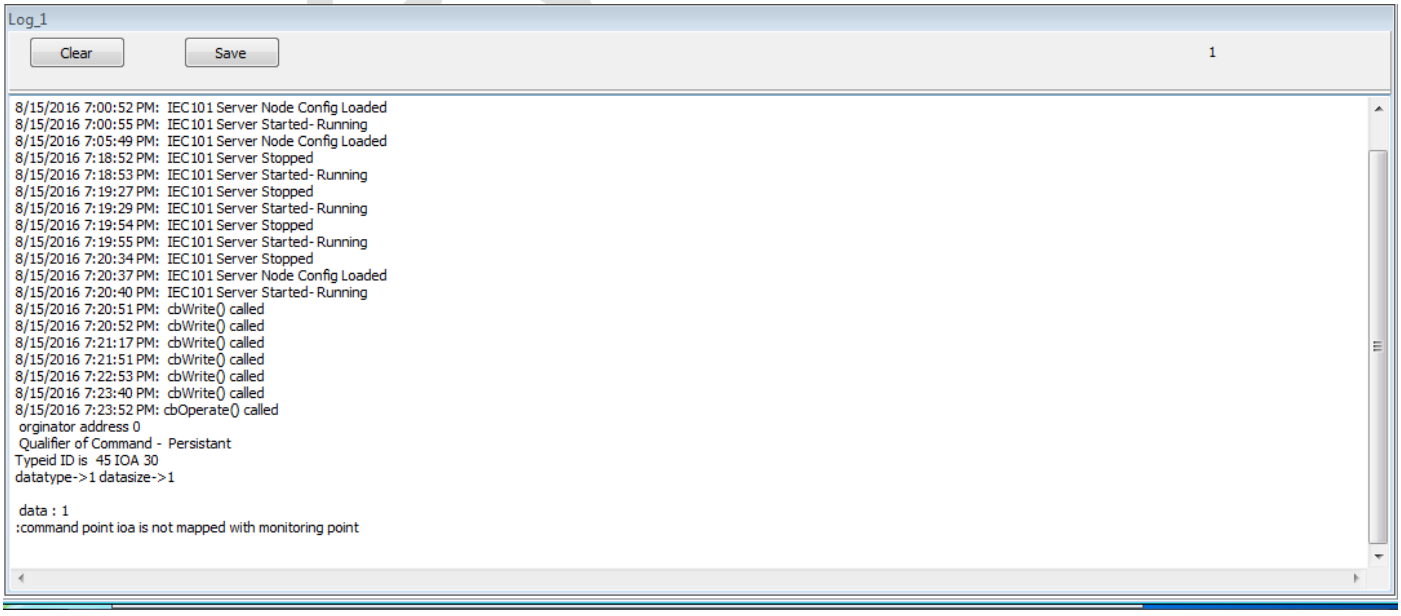
In this we can monitor the traffic of iec104 communication.

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