

## BUSMASTER © - FlexRay Overview

### ❖ Introduction

BUSMASTER add-on for FlexRay can be used to monitor, analyse and simulate FlexRay bus

### ❖ Features Supported

- Controller Configuration
- ASAM FIBEX standard v2.0.0, v3.0.0 and v4.0.0
- Frame Transmission and Monitoring
- Network Statistics
- Filters
- Logging
- Signal watch
- Node Simulation

### ❖ Installation

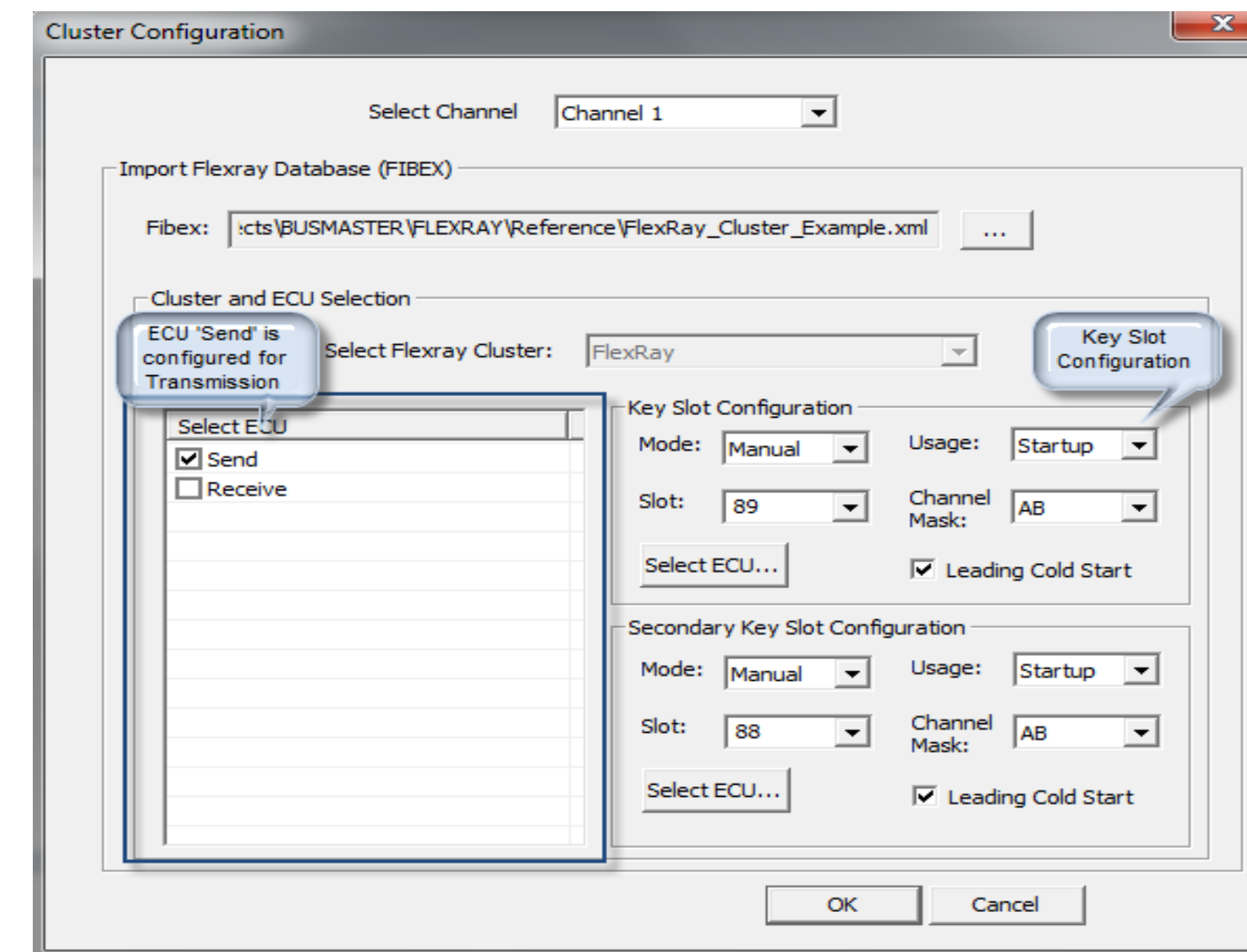
FlexRay support in BusMaster is available as a Commercial Add-On  
FlexRay Add-On can be installed on top of BusMaster Open Source v3.1.0

For further details, please contact E-mail: [BUSMASTER@in.bosch.com](mailto:BUSMASTER@in.bosch.com)

## BUSMASTER © - FlexRay Features

### ❖ Channel Configuration

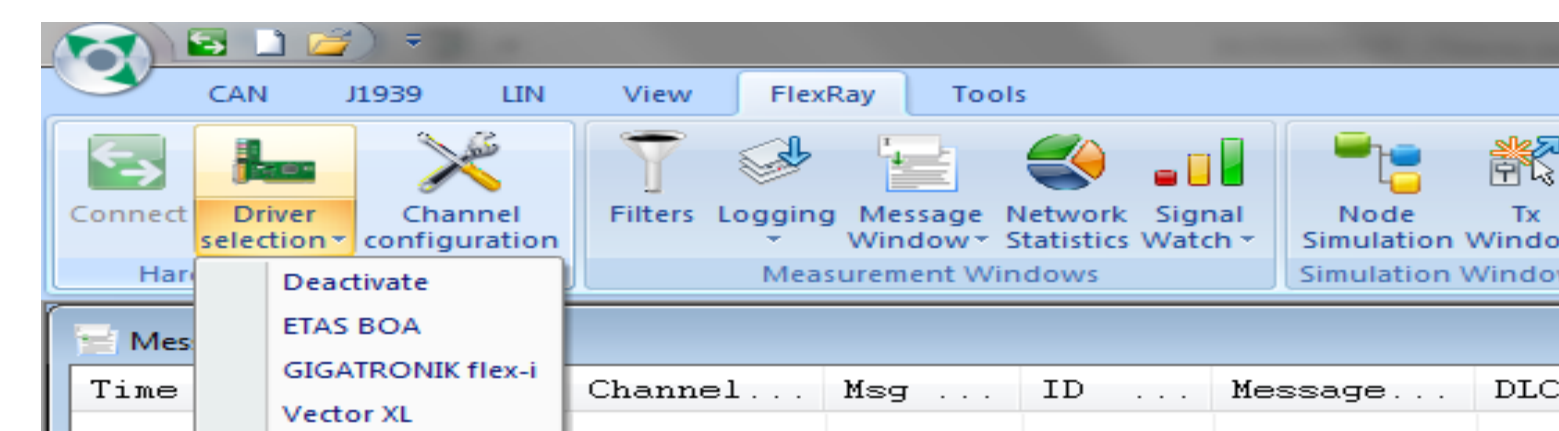
Cluster configuration is used to associate FIBEX file to a FlexRay channel



### ❖ Controller Configuration

BUSMASTER can be connected to FlexRay physical channel using FlexRay Controller

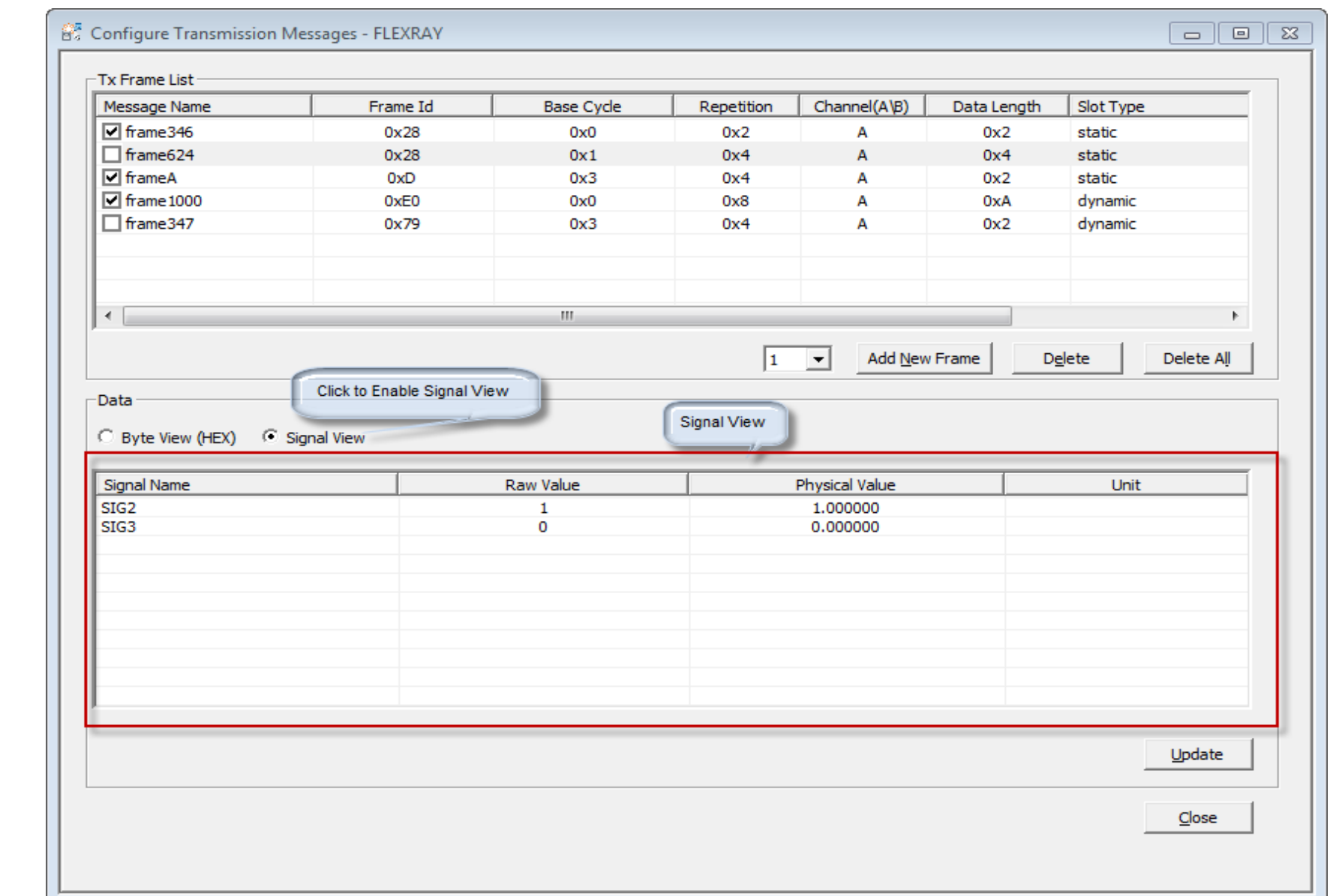
- Following FlexRay controllers are supported:
  1. ETAS BOA
  2. Vector XL



## BUSMASTER © - FlexRay Features

### ❖ Transmission of Messages

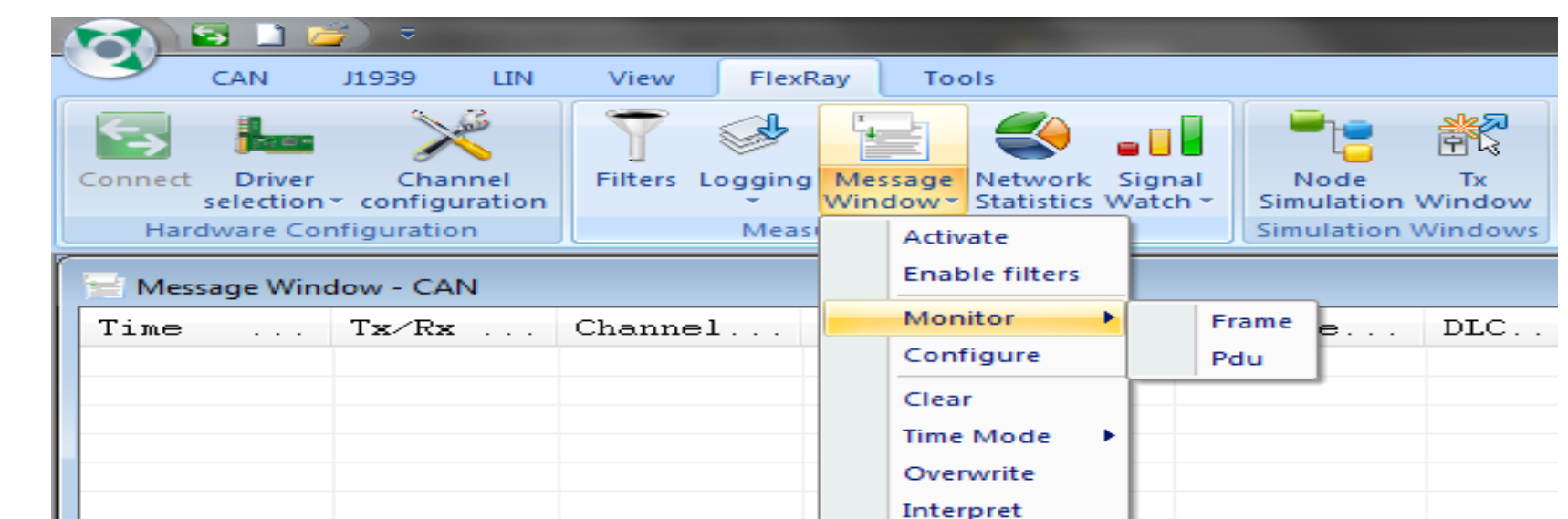
Configure FlexRay messages for transmission



### ❖ Monitoring Messages

On-line FlexRay Network Monitoring can be done using FlexRay Message window

- Frame Monitoring
- PDU Monitoring
- Frame and PDU Monitoring



BUSMASTER © - FlexRay FlexRay

❖ Frame Monitoring

| Message Window - FLEXRAY |               |       |             |       |             |           |             |          |        |      |               |
|--------------------------|---------------|-------|-------------|-------|-------------|-----------|-------------|----------|--------|------|---------------|
|                          | Time          | Tx... | Id          | Type  | Frame Ty... | Slot T... | Description | Cycle... | Cha... | D... | Data Byte(s)  |
| +                        | 15:50:28:2907 | Tx    | 0001 [0, 1] | Frame | Data        | static    | New_Frame_1 | 51       | A      | 16   | 000 000 000 0 |
| +                        | 15:50:28:2907 | Tx    | 0002 [0, 1] | Frame | Data        | static    | New_Frame_2 | 51       | A      | 16   | 000 000 000 0 |
|                          | 15:50:28:2907 | Tx    | 0003 [0, 1] | Frame | Data        | static    | New_Frame_3 | 51       | A      | 16   | 000 000 000 0 |
| +                        | 15:50:28:2907 | Tx    | 0004 [0, 1] | Frame | Data        | static    | New_Frame_4 | 51       | A      | 16   | 000 000 000 0 |
|                          | 15:50:28:2907 | Tx    | 0005 [0, 1] | Frame | Data        | static    | New_Frame_5 | 51       | A      | 16   | 000 000 000 0 |
|                          | 15:50:28:2907 | Tx    | 0006 [0, 1] | Frame | Data        | static    | New_Frame_6 | 51       | A      | 16   | 000 000 000 0 |
|                          | 15:50:28:2907 | Tx    | 0007 [0, 1] | Frame | Data        | static    | New_Frame_7 | 51       | A      | 16   | 000 000 000 0 |

❖ PDU Monitoring

| Message Window - FLEXRAY |               |       |      |      |             |           |             |          |        |      |           |
|--------------------------|---------------|-------|------|------|-------------|-----------|-------------|----------|--------|------|-----------|
|                          | Time          | Tx... | Id   | Type | Frame Ty... | Slot T... | Description | Cycle... | Cha... | D... | Data B... |
| +                        | 15:49:40:5771 | Tx    | 0001 | PDU  |             |           | New_PDU_2   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0001 | PDU  |             |           | New_PDU_1   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0002 | PDU  |             |           | New_PDU_3   | 18       | A      | 1    | 000       |
| +                        | 15:49:40:5771 | Tx    | 0002 | PDU  |             |           | New_PDU_1   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0003 | PDU  |             |           | New_PDU_2   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0004 | PDU  |             |           | New_PDU_2   | 18       | A      | 1    | 000       |
| +                        | 15:49:40:5771 | Tx    | 0004 | PDU  |             |           | New_PDU_1   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0004 | PDU  |             |           | New_PDU_5   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0004 | PDU  |             |           | New_PDU_4   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0007 | PDU  |             |           | New_PDU_6   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0007 | PDU  |             |           | New_PDU_7   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0007 | PDU  |             |           | New_PDU_8   | 18       | A      | 1    | 000       |
|                          | 15:49:40:5771 | Tx    | 0007 | PDU  |             |           | New_PDU_9   | 18       | A      | 1    | 000       |

❖ Frame and PDU Monitoring

| Message Window - FLEXRAY |               |       |             |       |             |           |             |          |        |      |              |
|--------------------------|---------------|-------|-------------|-------|-------------|-----------|-------------|----------|--------|------|--------------|
|                          | Time          | Tx... | Id          | Type  | Frame Ty... | Slot T... | Description | Cycle... | Cha... | D... | Data Byte... |
| +                        | 15:43:54:3590 | Tx    | 0001 [0, 1] | Frame | Data        | static    | New_Frame_1 | 29       | A      | 16   | 000 000      |
|                          | 15:43:54:3590 | Tx    | 0001        | PDU   |             |           | New_PDU_2   | 29       | A      | 1    | 000          |
| +                        | 15:43:54:3590 | Tx    | 0001        | PDU   |             |           | New_PDU_1   | 29       | A      | 1    | 000          |
| +                        | 15:43:54:3590 | Tx    | 0002 [0, 1] | Frame | Data        | static    | New_Frame_2 | 29       | A      | 16   | 000 000      |
|                          | 15:43:54:3590 | Tx    | 0002        | PDU   |             |           | New_PDU_3   | 29       | A      | 1    | 000          |
| +                        | 15:43:54:3590 | Tx    | 0002        | PDU   |             |           | New_PDU_1   | 29       | A      | 1    | 000          |
|                          | 15:43:54:3590 | Tx    | 0003 [0, 1] | Frame | Data        | static    | New_Frame_3 | 29       | A      | 16   | 000 000      |
|                          | 15:43:54:3590 | Tx    | 0003        | PDU   |             |           | New_PDU_2   | 29       | A      | 1    | 000          |
| +                        | 15:43:54:3590 | Tx    | 0004 [0, 1] | Frame | Data        | static    | New_Frame_4 | 29       | A      | 16   | 000 000      |
|                          | 15:43:54:3590 | Tx    | 0004        | PDU   |             |           | New_PDU_2   | 29       | A      | 1    | 000          |
| +                        | 15:43:54:3590 | Tx    | 0004        | PDU   |             |           | New_PDU_1   | 29       | A      | 1    | 000          |
|                          | 15:43:54:3590 | Tx    | 0004        | PDU   |             |           | New_PDU_5   | 29       | A      | 1    | 000          |
|                          | 15:43:54:3590 | Tx    | 0004        | PDU   |             |           | New_PDU_4   | 29       | A      | 1    | 000          |
|                          | 15:43:54:3590 | Tx    | 0005 [0, 1] | Frame | Data        | static    | New_Frame_5 | 29       | A      | 16   | 000 000      |
|                          | 15:43:54:3590 | Tx    | 0006 [0, 1] | Frame | Data        | static    | New_Frame_6 | 29       | A      | 16   | 000 000      |
|                          | 15:43:54:3590 | Tx    | 0007 [0, 1] | Frame | Data        | static    | New_Frame_7 | 29       | A      | 16   | 000 000      |
|                          | 15:43:54:3590 | Tx    | 0007        | PDU   |             |           | New_PDU_6   | 29       | A      | 1    | 000          |
|                          | 15:43:54:3590 | Tx    | 0007        | PDU   |             |           | New_PDU_7   | 29       | A      | 1    | 000          |
|                          | 15:43:54:3590 | Tx    | 0007        | PDU   |             |           | New_PDU_8   | 29       | A      | 1    | 000          |
|                          | 15:43:54:3590 | Tx    | 0007        | PDU   |             |           | New_PDU_9   | 29       | A      | 1    | 000          |

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❖ Network Statistics

Displays FlexRay bus statistics like number of frames, PDU’s transmitted and received, error frames, static segment load etc.,

| Network Statistics             |           |           |
|--------------------------------|-----------|-----------|
| CAN FlexRay LIN                |           |           |
| Parameters                     | Channel A | Channel B |
| Frames Total                   | 1113667   | 0         |
| Frames [fr/s]                  | 4245      | 0         |
| Null Frames Total              | 434017    | 0         |
| Null Frames [fr/s]             | 1662      | 0         |
| PDU Total                      | 1305261   | 0         |
| PDU [pdus/s]                   | 4970      | 0         |
| Errors Total                   | 0         | 0         |
| Errors [fr/s]                  | 0         | 0         |
| Static Segment Load(Data+Null) | 49.784314 | 0.000000  |
| Transmitted                    |           |           |
| Frames Total                   | 0         | 0         |
| Frames [fr/s]                  | 0         | 0         |
| Null Frames Total              | 0         | 0         |
| Null Frames [fr/s]             | 0         | 0         |
| PDU Total                      | 0         | 0         |
| PDU [pdus/s]                   | 0         | 0         |
| Errors Total                   |           |           |
| Errors [fr/s]                  | 0         | 0         |
| Received                       |           |           |
| Frames Total                   | 1113667   | 0         |
| Frames [fr/s]                  | 4245      | 0         |
| Null Frames Total              | 434017    | 0         |
| Null Frames [fr/s]             | 1662      | 0         |
| PDU Total                      | 1305261   | 0         |
| PDU [pdus/s]                   | 4970      | 0         |
| Errors Total                   |           |           |
| Errors [fr/s]                  | 0         | 0         |

❖ Filters

Configure Stop or Pass filters for FlexRay Frame’s/PDU’s

❖ Logging

Configure log files to log FlexRay Frame’s/PDU’s transmitted or received on the FlexRay bus

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❖ Signal Watch

Analyze selected signal’s Raw and Physical values

| Message  | Signal    | Physical Value | Raw Value |
|----------|-----------|----------------|-----------|
| frame_25 | signal_25 | 2312.000000    | 2312      |
| frame397 | SIG1      | 34952.000000   | 34952     |
| frame397 | SIG10     | 34952.000000   | 34952     |
| frameAB  | signalA   | 0.000000       | 0         |

❖ Node Simulation

FlexRay Node functionality can be simulated with following handlers

- Bus Events
  - Message Handlers
  - PDU Handlers
  - POC Handlers
- Start Cycle Handlers
  - Timer Handlers
  - Key Handlers
  - DLL Handlers

```
ECU1.cpp
D:\Demo\ECU1.cpp
Include Headers
#include <Windows.h>
#include <FlexRayIncludes.h>
Bus Events
void OnBus_Connect()
Message Handlers
void OnMsgCh1_1_0_1(STFLX_MSG RxMsg)
PDU Handlers
void OnPDUName_New_PDU_1(New_PDU_1 RxPDU)
POC Handlers
void OnPOCState(STFLX_POCSTATUS stcPOCStatus)
Start Cycle Handlers
void OnStartCycle_0_1(STFLX_STARTCYCLE stcStartCycle)
Timer Handlers
void OnTimer_T1_1()
Key Handlers
void OnKey_a(unsigned char KeyValue)
DLL Handlers
void OnDLL_Load()
Utility Functions
Global Variables

37: {
38:  /* TODO */
39: } /* End FlexRay generated function - OnBus_Connect */
40: /* Start FlexRay generated function - OnMsgCh1_1_0_1 */
41: void OnMsgCh1_1_0_1(STFLX_MSG RxMsg)
42: {
43:  /* TODO */
44: } /* End FlexRay generated function - OnMsgCh1_1_0_1 */
45: /* Start FlexRay generated function - OnPDUName_New_PDU_1 */
46: void OnPDUName_New_PDU_1(New_PDU_1 RxPDU)
47: {
48:  /* TODO */
49: } /* End FlexRay generated function - OnPDUName_New_PDU_1 */
50: /* Start FlexRay generated function - OnPOCState */
51: void OnPOCState(STFLX_POCSTATUS stcPOCStatus)
52: {
53:  /* TODO */
54: } /* End FlexRay generated function - OnPOCState */
55: /* Start FlexRay generated function - OnStartCycle_0_1 */
56: void OnStartCycle_0_1(STFLX_STARTCYCLE stcStartCycle)
57: {
58:  /* TODO */
59: } /* End FlexRay generated function - OnStartCycle_0_1 */
60: /* Start FlexRay generated function - OnTimer_T1_1 */
61: void OnTimer_T1_1()
62: {
63:  /* TODO */
64: } /* End FlexRay generated function - OnTimer_T1_1 */
65: /* Start FlexRay generated function - OnKey_a */
66: void OnKey_a(unsigned char KeyValue)
67: {
68:  /* TODO */
69: } /* End FlexRay generated function - OnKey_a */
70: /* Start FlexRay generated function - OnDLL_Load */
71: void OnDLL_Load()
72: {
73:  /* TODO */
74: }
```