

LIN Database Editor

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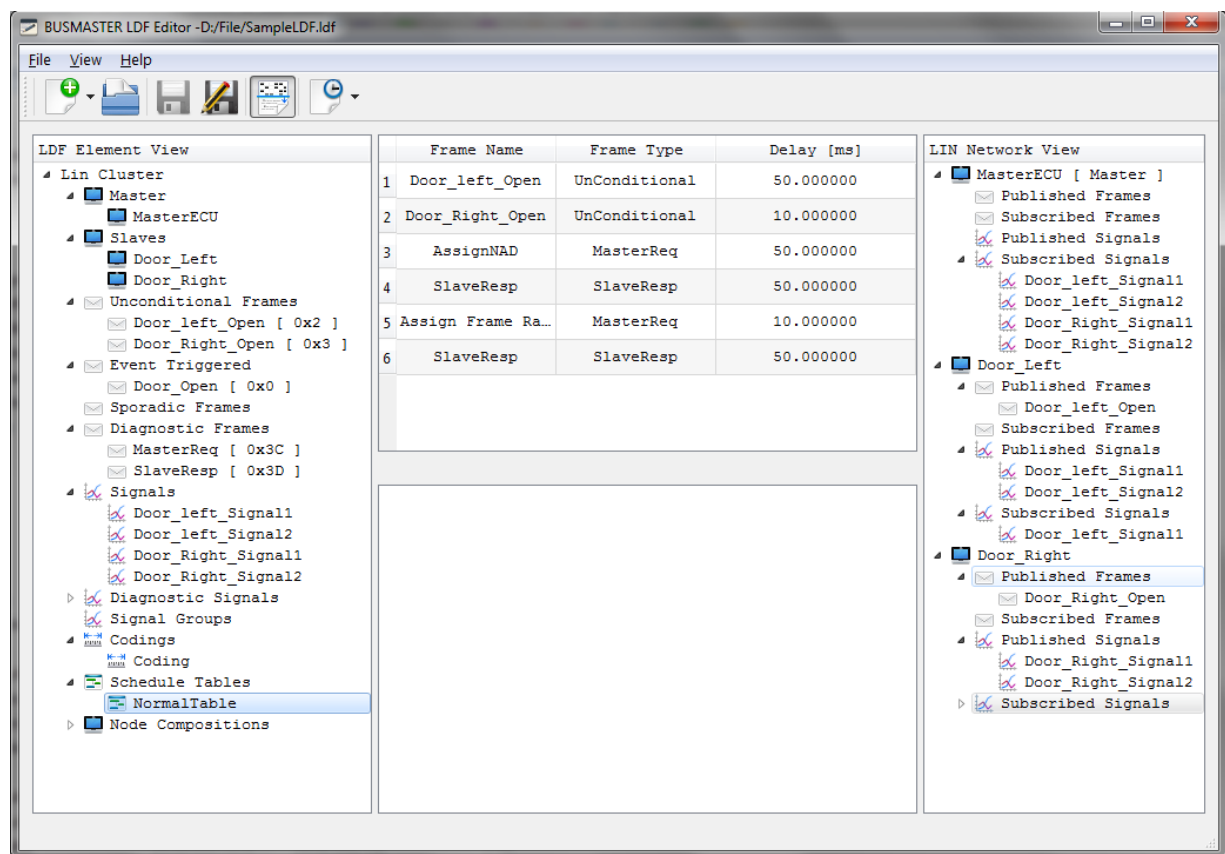
LIN Database Editor

Introduction

LIN Database Editor Overview

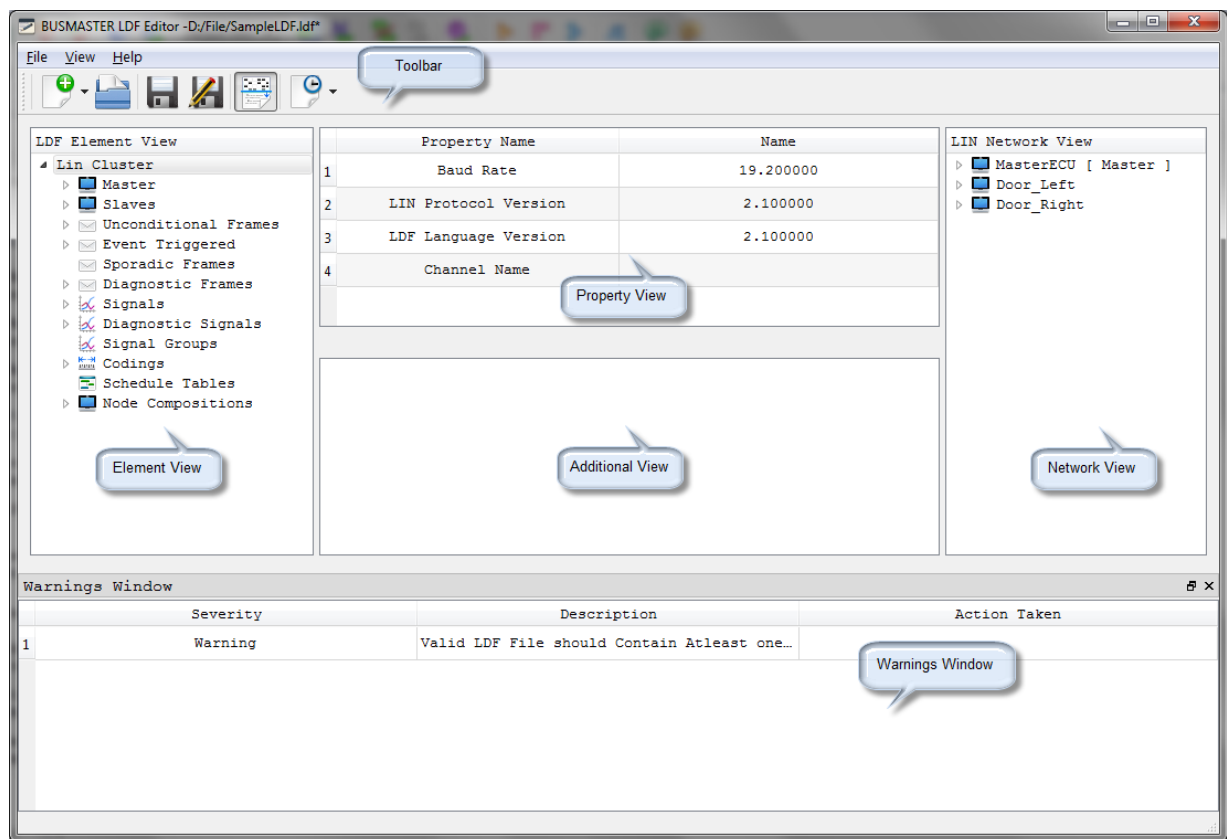
BUSMASTER LIN Database Editor is a user friendly tool to create, edit and view LIN Description Files(LDF). LIN Database Editor supports LDF versions 1.3, 2.0 and 2.1.

Using LIN Database Editor user can create LIN Description files with out knowing the details of LIN Description file format



Overview

LIN Database Editor main window is as shown below:



Menu bar:

- File Menu

1. File->New->LIN 1.3

Creates LIN 1.3 LDF file. Default elements will get created.

2. File->New->LIN 2.0

Creates LIN 2.0 LDF file. Default elements will get created.

3. File->New->LIN 2.1

Creates LIN 2.1 LDF file. Default elements will get created.

4. File->Open

To Open an existing LDF file of versions 1.3, 2.0 and 2.1.

5. File->Save

To Save the changes to the current loaded LDF file.

6. File->Save As

To Save changes to a new LDF file.

7. File->Recent Files

Displays 5 recently viewed LDF files. Click on the file to load the LDF file.

- View Menu

1. View->Hex

Select/DeSelect Hex to toggle between numeric modes Hex/Dec.

2. View->Preview LDF File

Opens the current LDF file in LDF file editor.

3. View->Warnings Window

Populates the Warning Window, which displays the list of warnings with description and action taken if any.

Toolbar:

Toolbar can be used for creating, loading, saving LDF files and also to set the numeric mode (hex/dec).



Element View:

Element view displays the LIN Cluster elements by which user can create or edit elements.

To Create a new element, right click on the element in the element view and select the pop up menu 'New'.

To Edit a element, right click on the element in the element view and select the pop up menu 'Edit'

To Delete a element, right click on the element in the element view and select the pop up menu 'Delete'. Confirmation message is displayed before deleting the element.

The following LIN Cluster elements are displayed in Element View.

- Lin Cluster Settings
- Master
- Slaves
- Unconditional Frames
- Event Triggered Frames
- Sporadic Frames (Displayed for LDF version 2.0 and 2.1)
- Diagnostic Frames
- Signals
- Diagnostic Signals
- Signal Groups
- Codings
- Schedule Tables
- Node Compositions (Displayed for LDF version 2.0 and 2.1)

On selecting an element in the element view, Property view and additional view will be updated with selected element properties.

Property View:

Property view displays the properties of the element selected in the element view. Properties are populated based on the type of element selected in the element view.

Additional View:

Additional view displays the additional properties of the element selected in the element view. Properties displayed in the additional view will vary based on the type of element selected in the element view.

Table 1:

Selected Element	Properties displayed
Node (Master/Slave)	<ol style="list-style-type: none"> 1. Node Attributes 2. List of published frames
Frame (Unconditional, Event Triggered, Sporadic and Diagnostic frames)	<ol style="list-style-type: none"> 1. Frame Attributes 2. List of published signals
Signals (Normal and Diagnostic Signals)	<ol style="list-style-type: none"> 1. Signal Attributes 2. List of Codings mapped to the signal
Codings	<ol style="list-style-type: none"> 1. Coding Attributes
Schedule Table	<ol style="list-style-type: none"> 1. Schedule Table Items 2. Schedule Table attributes populated based on the type of the frame selected

Signal Groups	<ol style="list-style-type: none"> 1. Signal Group properties 2. Signals mapped to the Signal group
Node Compositions	<ol style="list-style-type: none"> 1. List of Composite nodes mapped to the Node Configuration

Network View:

Network view displays the Master and Slave nodes. Published, subscribed frames and signals will be displayed under respective node.

On Selecting an element in the network view respective element in the element view is selected and elements properties are displayed in the Property view and Additional view.

Warning Window:

On Save or Load LDF file, warning will be displayed in the Warnings window if exists any with description and action taken is specified if any action is performed to correct the warning.

Getting Started

1. Creating LDF File Using LDF Editor:

Currently LDF Editor supports creation of LDF 1.3, 2.0 and 2.1 versions.

Recommended work flow to create a LDF file:

1. Create LDF File using File->New->LDF <version>.LDF Editor will create a Master and a Slave node with default parameters.
2. Create slaves if required. (Refer section : [Slave](#) on page 7)
3. Create signal and provide its Publisher and subscribers (Refer section:[Signals](#) on page 19)
4. Create unconditional Frames and map publisher and signals. (Refer section:[Unconditional Frame](#) on page 10)
5. Create Event triggered and sporadic frames if required (Refer sections:[Event Triggered Frame](#) on page 13 and [Sporadic Frame](#) on page 15)
6. Add Diagnostic Messages and signals if required (Refer section:[Diagnostic Support](#) on page 17)
7. Create schedule table(s) and define slots (Refer section:[Schedule Table](#) on page 25)
8. Create codings and associate to signals (Refer section:[Signals](#) on page 19)
9. Create signal groups if required.Signal groups are depreciated from LDF 2.x (Refer section:[Signal Group](#) on page 20)
10. Create Node compositions if Required (Refer section:[Node Composition](#) on page 26)

2. Importing\Editing LDF File:

Use File->Open to import the existing LDF file.If any errors found tool will report the same and file not be loaded.If any warnings are found tool will display the same in warnings window with the description, action point if any and imports LDF File

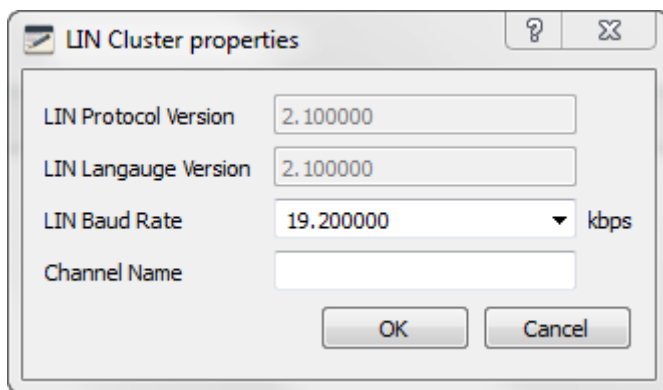
3. Preview LDF File:

To preview the current LDF File use View->Preview File menu.

LDF Elements

Cluster Properties

The LIN Cluster parameters can be edited by Right clicking the LIN Cluster Element in Element View and click on pop up menu 'Edit'.A dialog Box as Shown in below image will be displayed.



1. Lin protocol and Language versions are read only sections.
2. Baud rate of the Lin cluster can be defined in the LIN Baud rate Section.
3. Channel Name can be provided in **Channel Name** section. This field is available from LDF2.1 version.

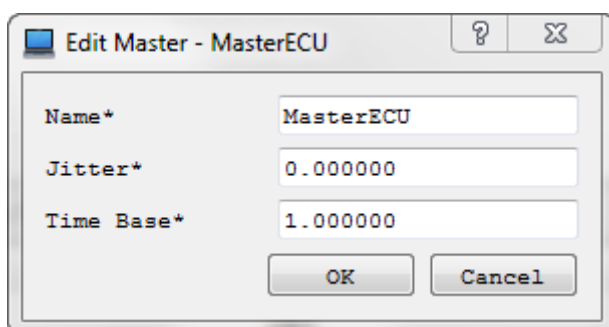
Master

Creating Master ECU:

When a new LDF File is created with LDF Editor a master node with default values will be created automatically.

Editing Master ECU Properties:

To edit the properties of master ECU right click on the Master node item in the Element view and click on 'Edit'. A dialog will be displayed as shown below.



To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

- ECU name will be checked for its uniqueness

To discard the changes click on 'Cancel' button.

Deleting Coding:

Master Node can not be deleted.

Slave

Creating Slave:

To create or edit slave nodes right click on the 'Slaves' element in the Element View. By default one slave will be created on creating new LDF file. 'Create Slave Dialog' is as shown below.

Slave can be created with the following Slave Protocol versions, Properties displayed will vary based on the protocol version selected

- Slave created with the protocol version 1.3 is as shown below

Create Slave

Properties

Name*

Protocol

1.3

Node Address

Configured NAD*

Initial NAD

OK

Cancel

- Slave created with the protocol version 2.0 is as shown below

Create Slave

Properties

Name*

Protocol

2.0

Node Address

Configured NAD*

Initial NAD

Diagnostic Timings

NAs

1000.0000

P2Min

50.000000

NCs

1000.0000

STMin

0.000000

Product Identifiers

Function ID

0xFFFF

Supplier ID

0xFFFF

Variant

0xFFF

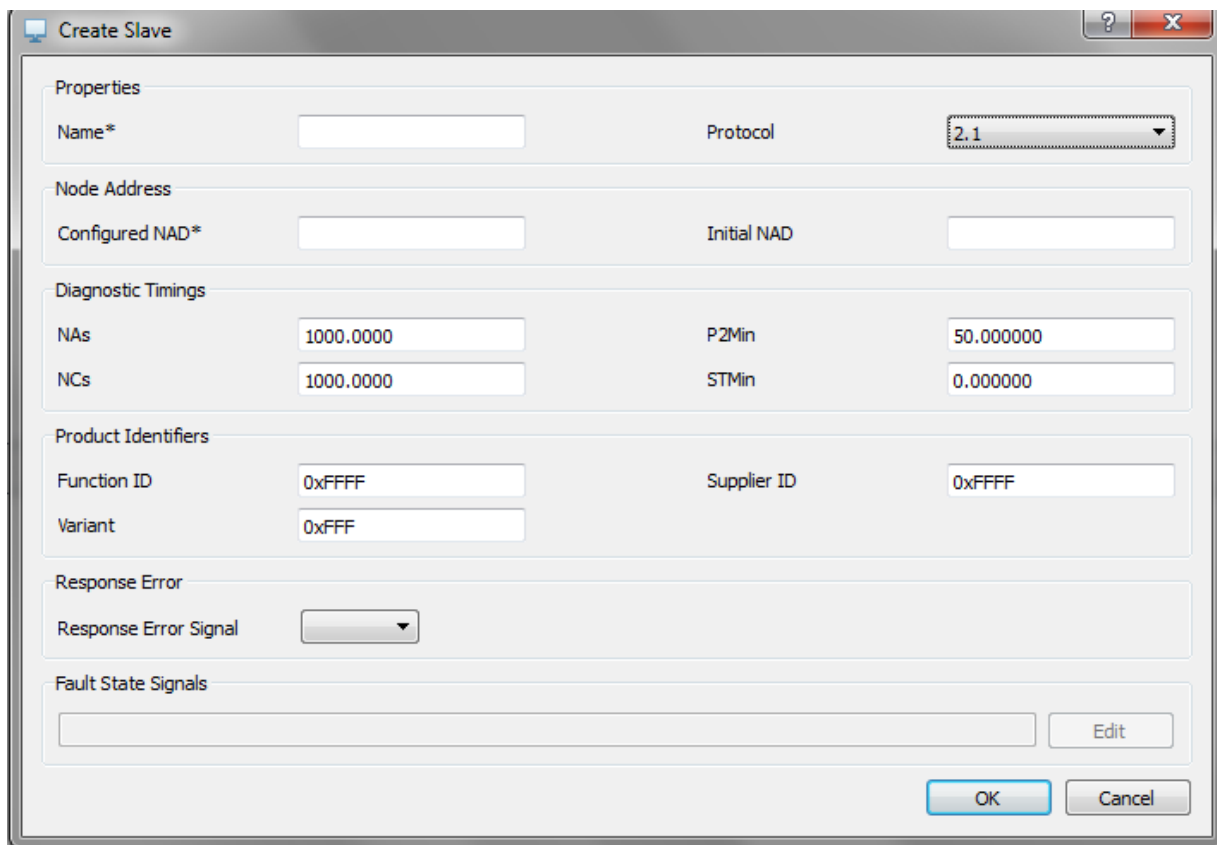
Response Error

Response Error Signal

OK

Cancel

- Slave created with the protocol version 2.1 is as shown below



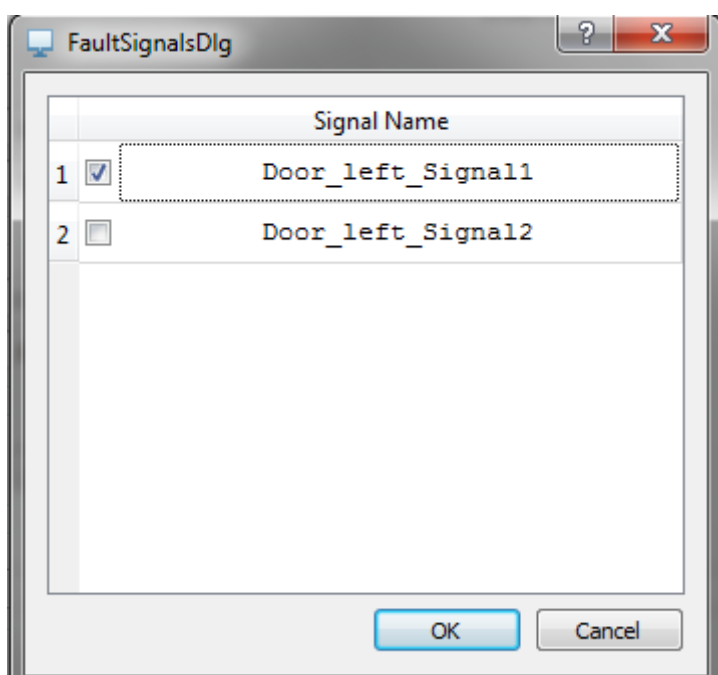
The 'Create Slave' dialog box is used to configure a new slave node. It contains several sections for inputting various parameters:

- Properties:** Includes a 'Name*' text field and a 'Protocol' dropdown menu currently set to '2.1'.
- Node Address:** Includes a 'Configured NAD*' text field and an 'Initial NAD' text field.
- Diagnostic Timings:** Includes four text fields: 'NAs' (1000.0000), 'NCs' (1000.0000), 'P2Min' (50.000000), and 'STMin' (0.000000).
- Product Identifiers:** Includes three text fields: 'Function ID' (0xFFFF), 'Variant' (0xFFF), and 'Supplier ID' (0xFFFF).
- Response Error:** Includes a 'Response Error Signal' dropdown menu.
- Fault State Signals:** Includes a text area for specifying fault state signals and an 'Edit' button.

At the bottom right, there are 'OK' and 'Cancel' buttons.

General Properties:

- **Name:** Name of the Slave which should follow C identifier rules and should be unique.
- **Protocol Version:**
 1. For LDF Version 2.1, Protocol version drop down will be populated with 1.3, 2.0 and 2.1
 2. For LDF Version 2.0, Protocol version drop down will be populated with 1.3 and 2.0
 3. For LDF Version 1.3, Protocol version drop down will be populated with 1.3
- **Response Error Signal:** Response Error Signal drop down will be populated with the list of signals existing in the configuration. Response Error Signal is displayed if the Slave protocol versions 2.0 and 2.1
- **Fault State Signals:** To specify fault state signals, click on 'Edit' button which displays



The 'FaultSignalsDlg' dialog box is used to specify fault state signals. It features a table with two columns: a checkbox column and a 'Signal Name' column.

	Signal Name
1 <input checked="" type="checkbox"/>	Door_left_Signal1
2 <input type="checkbox"/>	Door_left_Signal2

At the bottom, there are 'OK' and 'Cancel' buttons.

Editing Slave:

To Edit the existing Slave node, right click on the Slave in the Element View and select popup menu 'Edit' which displays

Edit Slave - Door_Left

Properties

Name* Protocol

Node Address

Configured NAD* Initial NAD

Diagnostic Timings

NAs P2Min
 NCs STMin

Product Identifiers

Function ID Supplier ID
 Variant

Response Error

Response Error Signal

Fault State Signals

Deleting Slave:

To delete Slave node, right click on the Slave node in the Element View and select pop up menu 'Delete'. Confirmation message will be displayed before deleting the Node.

On deleting node, all the frames and signals published by the node will also be deleted.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

- Slave name will be checked for its uniqueness
- On delete, checks if at least one Slave node is available. If not tool will give error.

Unconditional Frame**Creating Unconditional Frames:**

To create Unconditional frame right click on the Unconditional Frame element in the element view and click on popup menu 'New'. 'Create Unconditional Frame' dialog is shown as below.

Create Unconditional Frame

General Properties

Name* ID*

Length* Byte(s) ☐ Dynamic Frame

Tx/Rx Relations

Publisher* Subscribers

Signal Map

Signal Name	Start Bit	Subscriber (s)	Length (bits)	Init Value	Coding
-------------	-----------	----------------	---------------	------------	--------

1. General Properties:

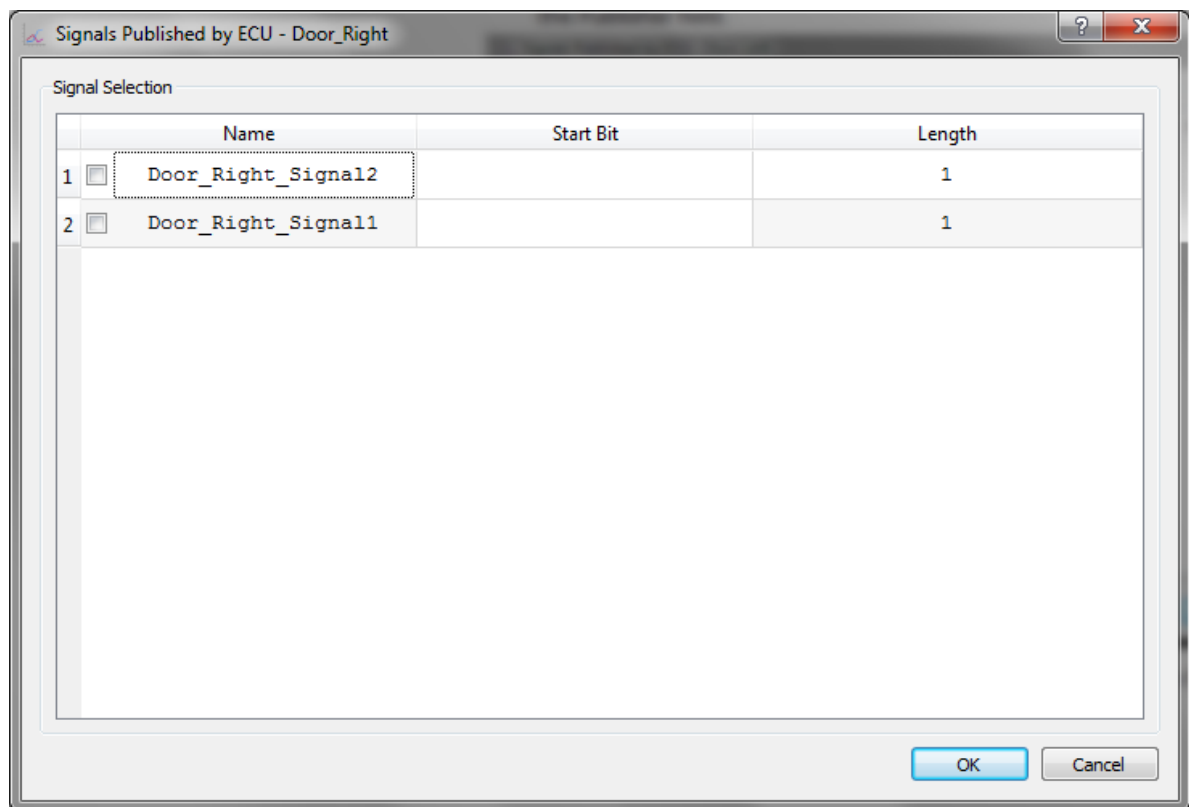
- **Name:** Name of the frame should follow C identifier rules and should be unique.
- **ID:** Identifier of the frame [0-59]
- **Length:** Length of the frame [1-8] in bytes
- **Dynamic Frame:** If dynamic frame, the 'Dynamic Frame' check box should be checked. More than one Unconditional frame can exist with the same Id and it is introduced from LDF version 2.0.

2. Publisher and Subscribers:

- Frame publisher can be selected from the Publisher drop down which lists Master and Slave nodes
- Subscribers list is read only and will get populated on mapping signals using 'Map Signal' button

3. Signal Mapping:

- To map signals to the frame click on 'Map Signal' button. Map Signal dialog is displayed as shown below with lists signals that belong to the publisher selected in the Publisher field.



To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

- Frame name will be checked for its uniqueness
- If the frame is not dynamic frame, Frame Id will be checked for uniqueness

To discard the changes click on 'Cancel' button.

Editing Unconditional Frames:

To edit existing Unconditional Frame right click on the Unconditional frame item in the Element view and click on 'Edit'. 'Edit Unconditional Frame' dialog is displayed as shown below.

Edit Unconditional Frame - Door_Right_Open

General Properties

Name* ID*

Length* Byte(s) ☐ Dynamic Frame

Tx/Rx Relations

Publisher* Subscribers

MasterECU

Signal Map

	Signal Name	Start Bit	Subscriber (s)	Length (bits)	Init Value	Coding
1	Door_Right...	0	MasterECU	1	0x1	

Deleting Unconditional Frame:

To delete Unconditional Frame, right click on the Unconditional frame item in the Element view and click on the popup menu 'Delete'. A confirmation message will be displayed before deleting the frame.

On deletion, deleted Unconditional frame will be unmapped from the Publisher and the Subscribers.

Event Triggered Frame

Creating Event Triggered Frames:

To create Event Triggered frame right click on the Event Triggered Frame element in the element view and click on popup menu 'New'. Create Event Triggered Frame dialog is as shown below.

Create EventFrame

General Properties

Name* ID 0x1 ▼

Collision Resolution Table ▼

Associated Frames

	Frame Name	ID	Length (Byte(s))	Publishers	Subscribers
1	<input type="checkbox"/> Door_left...	0x2	4	Door_Left	
2	<input type="checkbox"/> Door_Righ...	0x3	4	Door_Right	

OK Cancel

1. General Properties:

- **Name:** Name of the frame which should follow C identifier rules and should be unique.
- **ID:** Identifier of the frame [0-59]
- **Collision Resolution Table:** Using drop down select the Schedule table to be referred in case of Collision.

2. Associating Frames:

- Check the Unconditional frames to be mapped to the Event Triggered frame from the Associated Frames list.

The following validations are performed:

- Frame name will be checked for its uniqueness
- Frame Id will be checked for its uniqueness
- Checked if selected Associated frames belong to the Collision resolving table

To discard the changes click on 'Cancel' button.

Editing Event Triggered Frames:

To edit existing Event Triggered Frame right click on the Event Triggered frame item in the Element view and click on 'Edit'. 'Edit Event Triggered Frame' dialog is displayed as shown below.

Edit EventFrame - Door_Open

General Properties

Name* ID

Collision Resolution Table

Associated Frames

	Frame Name	ID	Length (Byte(s))	Publishers	Subscribers
1	<input checked="" type="checkbox"/> Door_left...	0x2	4	Door_Left	
2	<input checked="" type="checkbox"/> Door_Righ...	0x3	4	Door_Right	MasterECU

OK Cancel

Deleting Event Triggered Frame:

To delete Event Triggered Frame, right click on the Event Triggered frame item in the Element view and click on the pop up menu 'Delete'. A confirmation message will be displayed before deleting the frame.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

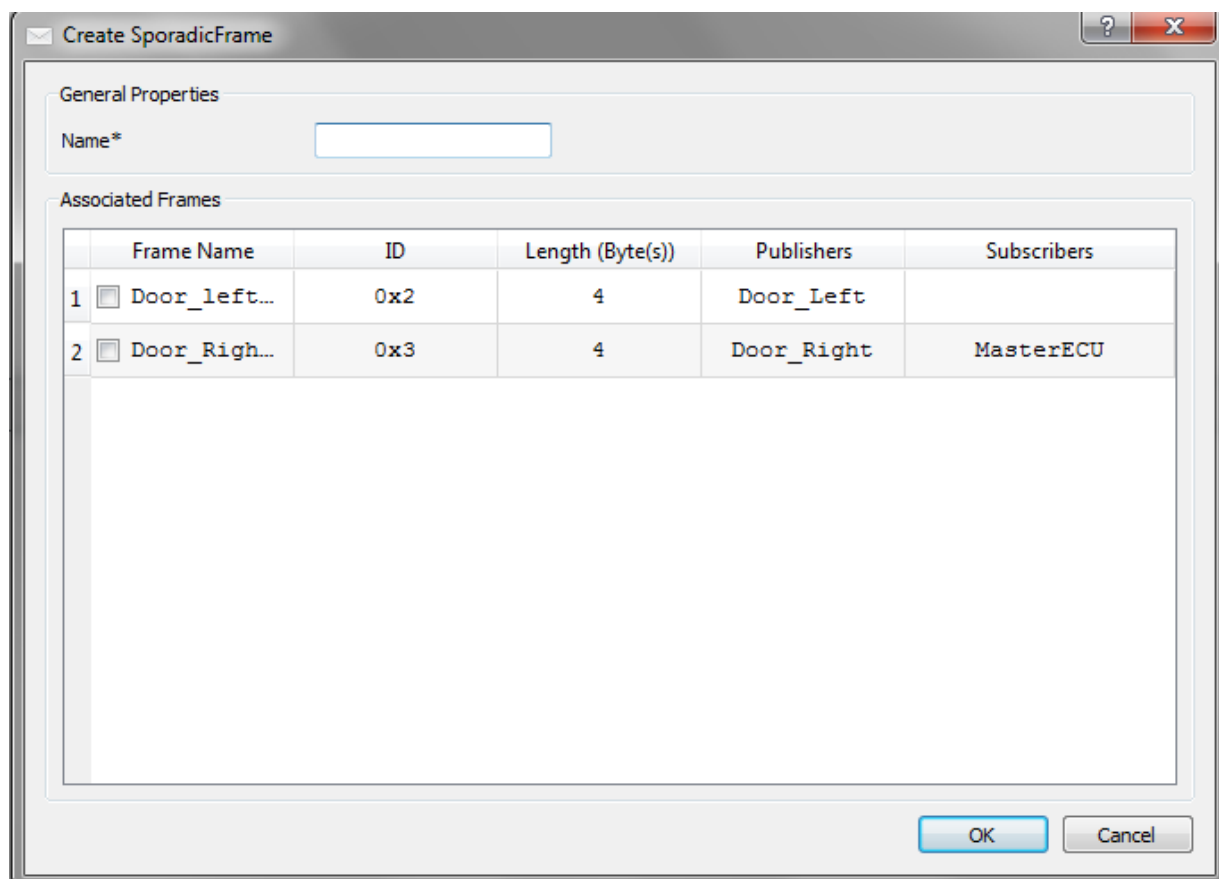
- Frame name will be checked for its uniqueness
- Frame Id will be checked for its uniqueness
- Checked if selected Associated frames belong to the Collision resolving table

To discard the changes click on 'Cancel' button.

Sporadic Frame

Creating Sporadic Frames:

To create Sporadic frame right click on the Sporadic Frame element in the element view and click on popup menu 'New'. 'Create Sporadic Frame' dialog is as shown below.



1. General Properties:

- **Name:** Name of the frame which should be follow C identifier rules and should be unique.

2. Associating Frames:

- Check the Unconditional frames to be mapped to the Sporadic frame from the Associated Frames list.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

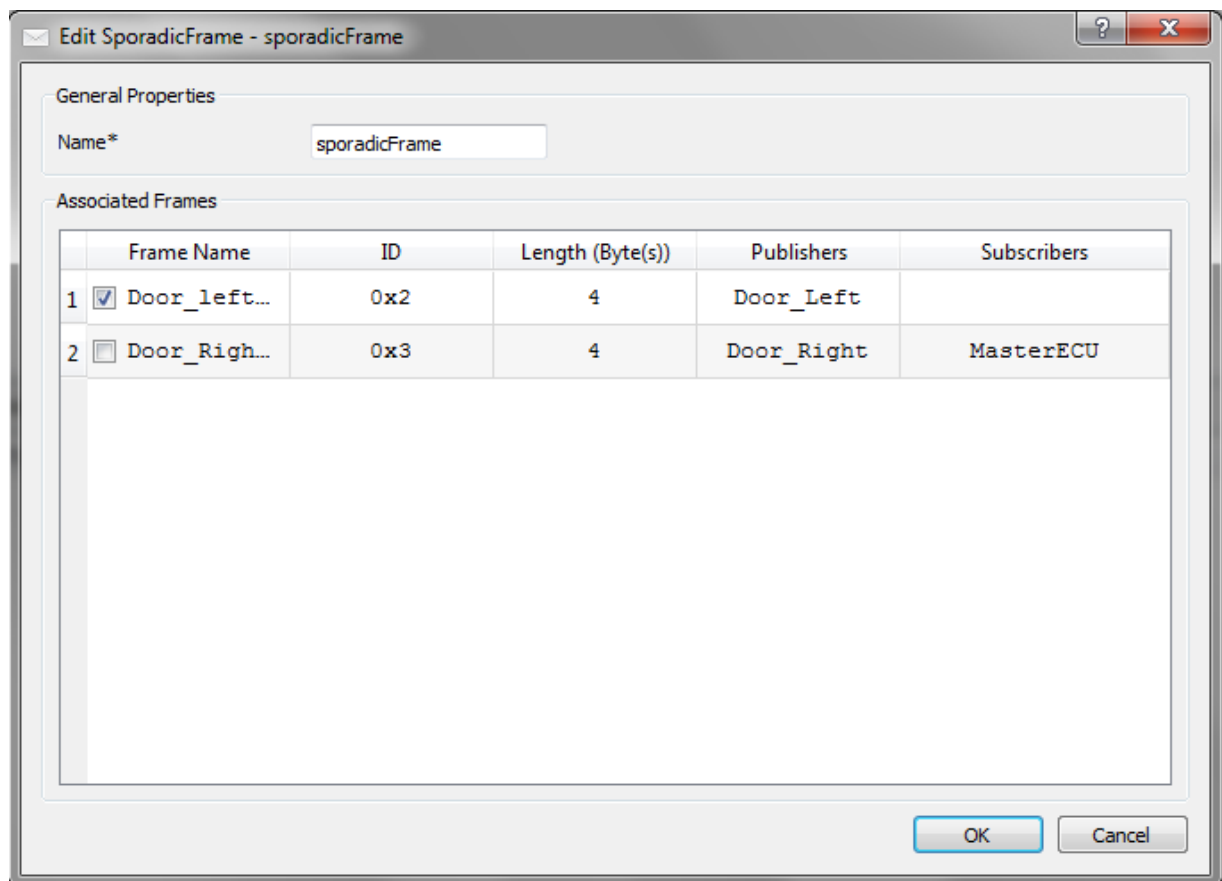
The following validations are performed:

- Frame name will be checked for its uniqueness

To discard the changes click on 'Cancel' button.

Editing Sporadic Frames:

To edit existing Sporadic Frame right click on the Sporadic frame item in the Element view and click on 'Edit'. 'Edit Sporadic Frame' dialog is displayed as shown below.



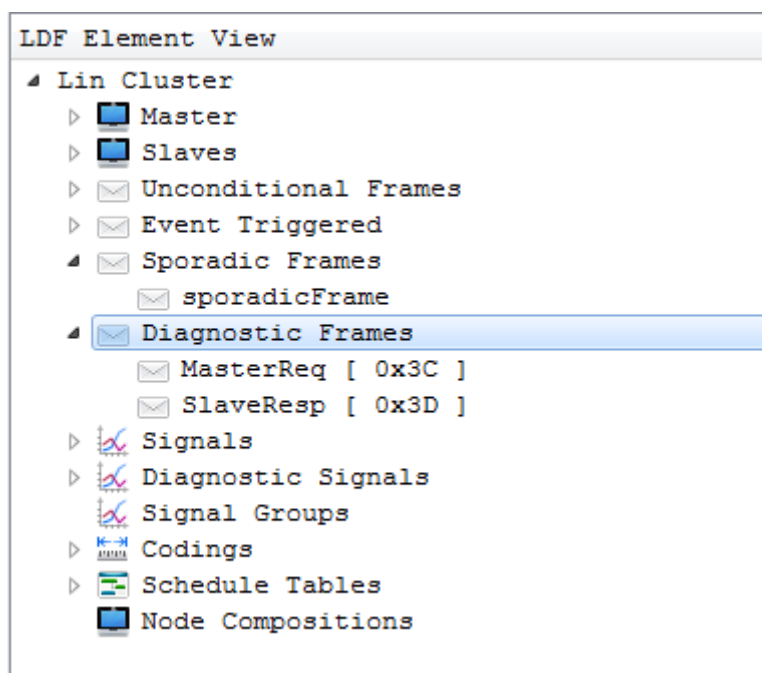
Deleting Sporadic Frame:

To delete Sporadic Frame, right click on the Sporadic item in the Element view and click on the popup menu 'Delete'. A confirmation message will be displayed before deleting the frame.

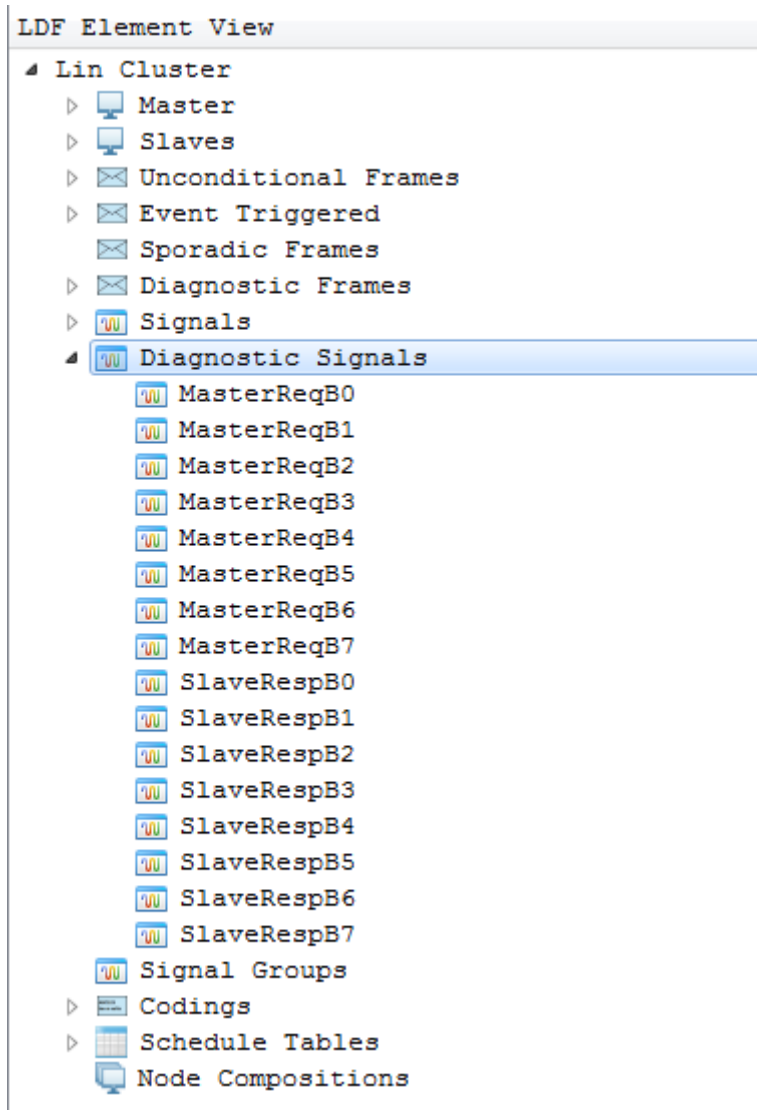
Diagnostic Support

Adding Diagnostic Support:

To create diagnostic frames, right click on the 'Diagnostic Frames' element in the Element view. By default 'MasterReq' and 'SlaveResp' diagnostic frames will get created as shown below.



On Adding diagnostic support for Frame, Diagnostic Signals will get automatically created for Master and Slave under 'Diagnostic Signals' in the Element View as shown below.



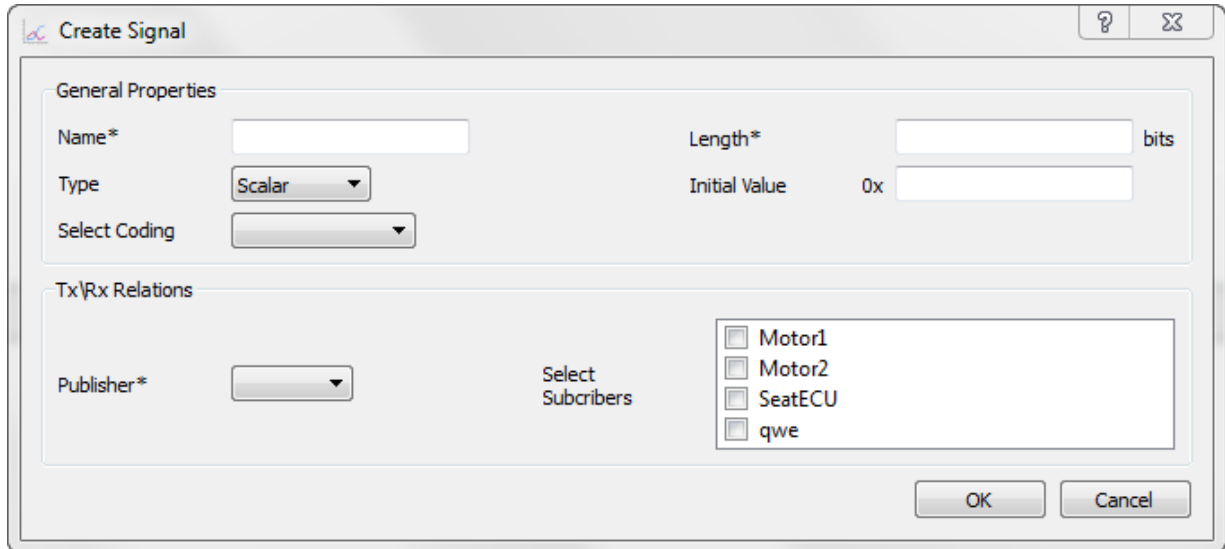
Removing Diagnostic Support:

To remove diagnostic support right click on 'Diagnostic Frames' in the Element view and click on 'Remove Diagnostic Support' which removes diagnostic frames and diagnostic signals.

Signals

Creating Signals:

To create Signals right click on the **Signals** element in the element view and click on pop up menu 'New'. A dialog Box as Shown in below image will be displayed.



The 'Create Signal' dialog box is shown with the following fields and controls:

- General Properties:**
 - Name*:** Text input field.
 - Length*:** Text input field followed by 'bits'.
 - Type:** Dropdown menu with 'Scalar' selected.
 - Initial Value:** Text input field with '0x' prefix.
 - Select Coding:** Dropdown menu.
- Tx/Rx Relations:**
 - Publisher*:** Dropdown menu.
 - Select Subscribers:** List box containing:
 - ☐ Motor1
 - ☐ Motor2
 - ☐ SeatECU
 - ☐ qwe

Buttons: OK, Cancel

1. General Properties:

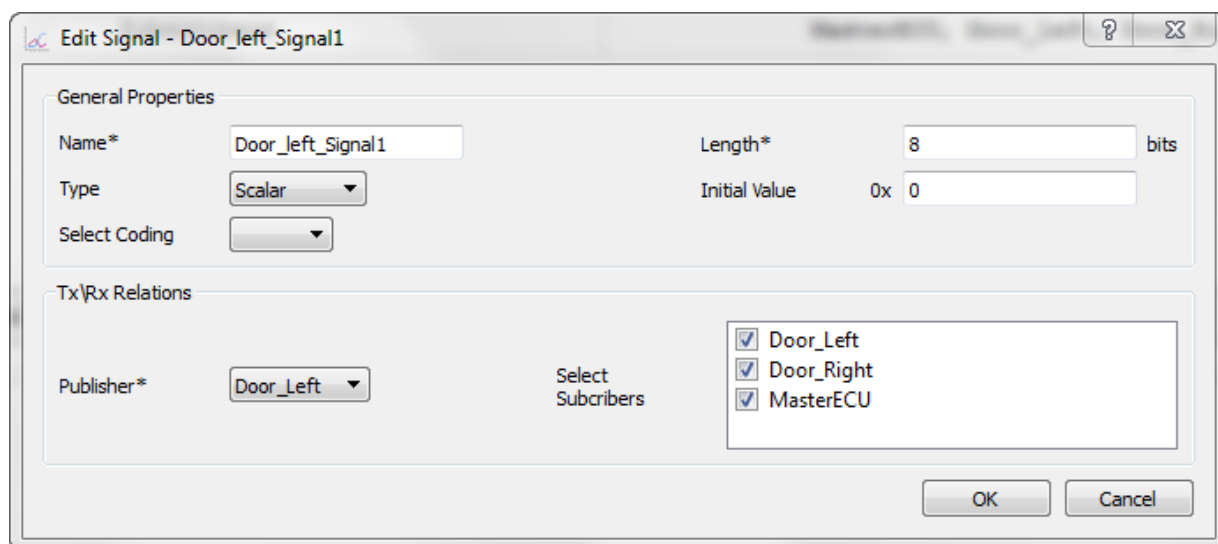
- **Name:** Name of the Signal should follow C identifier rules and should be unique in signal list.
- **Length:** Length of the Signals in bits. The value always will be displayed as Decimal mode
- **Type:** Signal type can be either scalar or Byte array.
- **Initial Value:** This will be the initial value of the signal.
- **Coding:** Coding for the signal can be selected from the drop down **Select Coding**, which lists all the defined Codings. To define new coding refer the section Codings.

2. Publisher and Subscribers:

- Signal publisher can be selected from the **Publisher** drop down which lists Master and all the Slave nodes
- Subscribers of the signals can be selected from the **Select Subscribers** list.

Editing Signals:

To edit existing Signal right click on the required signal item in the Element view and click on 'Edit'. **Edit Signal** - <Signal Name> dialog is displayed as shown below.



If the publisher is changed, the signal will be unmapped from the frames which are published by the old ECU.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

- Signal name will be checked for its uniqueness
- Initial value should be in range of 0 (to $2^{\text{signal_length}-1}$)
- A Publisher should be selected.

To discard the changes click on 'Cancel' button.

Deleting Signal:

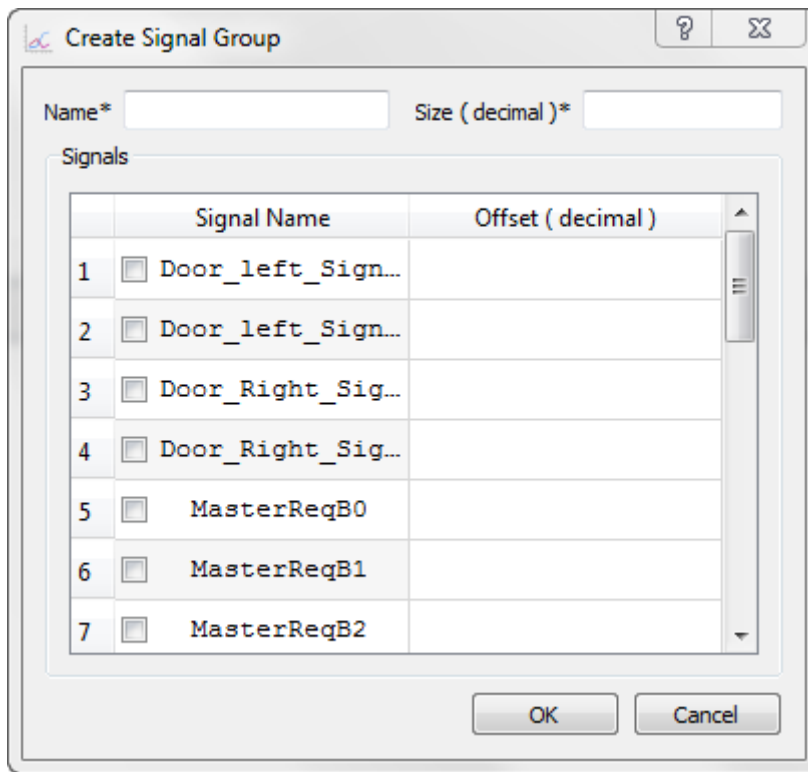
To delete any signal, right click on the Signal item in the Element view and click on the pop up menu **Delete**. A confirmation message will be displayed before deleting the signal.

On deletion, deleted signal will be unmapped from all associated frames, Publisher and the Subscribers.

Signal Group

Creating Signal Groups:

To create Signal group right click on the **Signal Group** element in the element view and click on pop up menu 'New'. A dialog Box as Shown in below image will be displayed.



1. General Properties:

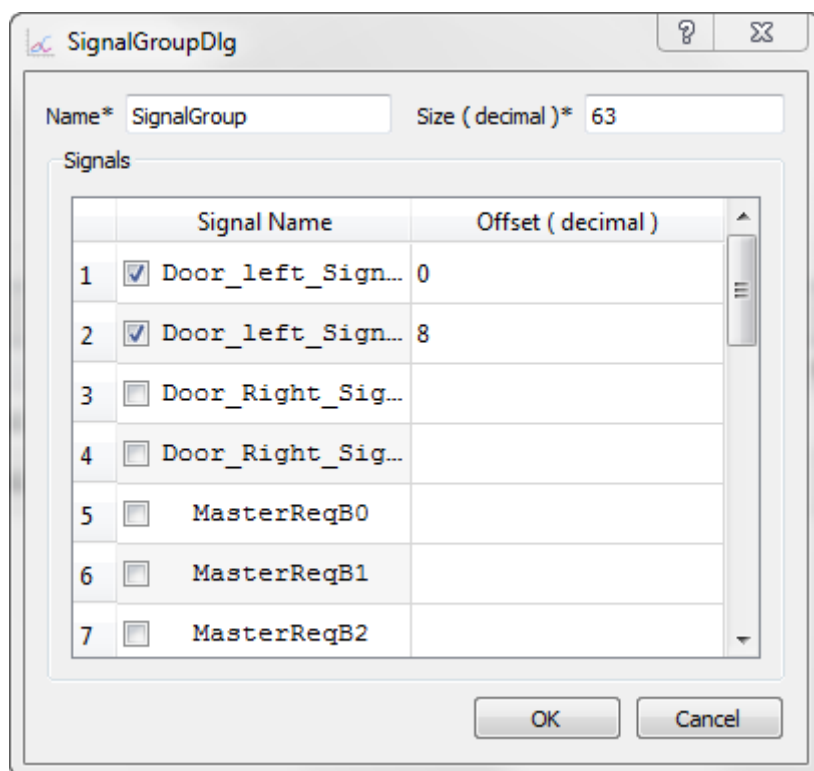
- **Name:** Name of the Signal Group should follow C identifier rules and should be unique in Signal and Signal Group List.
- **Size:** The size of the signal group can be defined here.

2. Signals:

- This list the all the signal defined in the LIN Cluster. Signals can be added\deleted from the group by checking\ unchecking.

Editing Signal Group:

To edit existing Signal group right click on the required Signal group item in the Element view and click on 'Edit'.
Edit Signal - <Signal Group Name> dialog will be displayed as shown below.



Signals can be added\deleted from the group by checking\ unchecking corresponding check box.The signal offset can be changed in the Offset filled.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

- Signal group name will be checked for its uniqueness.
- The offset of each signal should be less than the Signal Group size.

To discard the changes click on 'Cancel' button.

Deleting Signal Group:

To delete any signal group, right click on the signal group item in the Element view and click on the pop up menu **Delete**. A confirmation message will be displayed before deleting the coding.

Note: Signal groups are depreciated from LDF2.x version.

Codings

Creating Codings:

To create Codings right click on the Codings element in the element view and click on pop up menu 'New'.A dialog Box as Shown in below image will be displayed.

Create Coding

General Properties

Name*

Logical Values:

Raw Value	Description

Add Delete

Physical Values:

Offset	Factor	Minimum	Maximum	Unit

Add Delete

OK Cancel

1. General Properties:

- **Name:** Name of the Coding should follow C identifier rules and should be unique in coding list.

2. Logical values and physical values can be created using Add Buttons provided in the corresponding sections.

Editing Codings:

To edit existing Coding right click on the required coding item in the Element view and click on 'Edit'. **Edit Coding - <Coding Name>** dialog will be displayed as shown below. All The values are editable

Edit Coding - Coding

General Properties

Name* Coding

Logical Values:

	Raw Value	Description
1	0x0	Off
2	0x1	On

Add Delete

Physical Values:

	Offset	Factor	Minimum	Maximum	Unit
1	0.000000	1.200000	0x0	0x5	

Add Delete

OK Cancel

To delete a logical element select the logical row and click on the Delete button provided in the same section. Similarly Physical values also can be deleted using the delete button provided in the same section.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

- Coding name will be checked for its uniqueness

To discard the changes click on 'Cancel' button.

Deleting Coding:

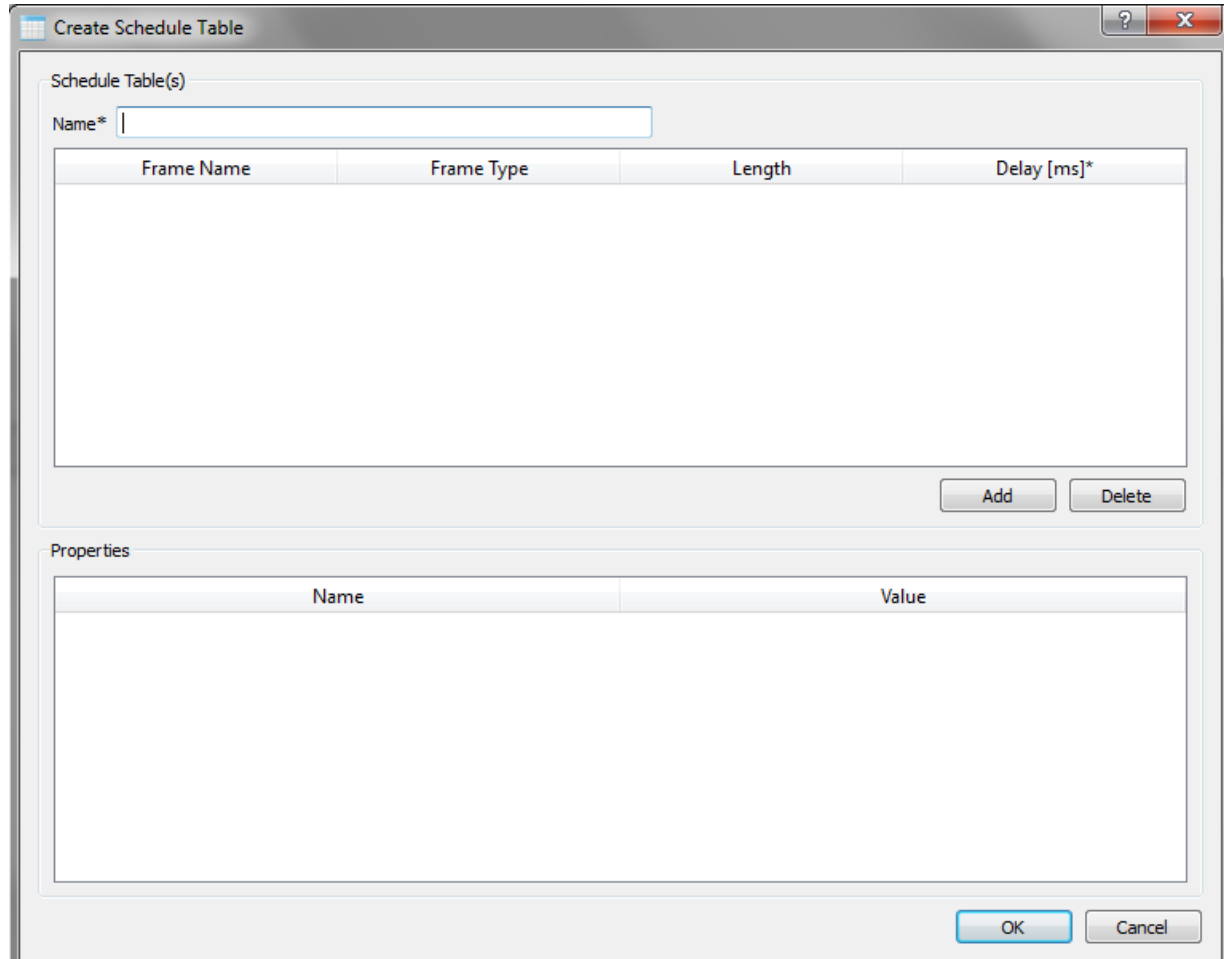
To delete any coding, right click on the coding item in the Element view and click on the pop up menu **Delete**. A confirmation message will be displayed before deleting the coding.

On deletion, coding will be unmapped from all associated signals.

Schedule Table

Creating Schedule Table:

To create Schedule Table right click on the Schedule Table element in the element view and click on popup menu 'New'. Create Schedule Table dialog is as shown below.



The 'Create Schedule Table' dialog box contains two main sections: 'Schedule Table(s)' and 'Properties'.

Schedule Table(s) Section:

- A text field labeled 'Name*' for entering the table name.
- A table with the following headers: 'Frame Name', 'Frame Type', 'Length', and 'Delay [ms]*'.
- An 'Add' button and a 'Delete' button located at the bottom right of the table.

Properties Section:

- A table with the following headers: 'Name' and 'Value'.
- An 'OK' button and a 'Cancel' button located at the bottom right of the dialog.

1. General Properties:

- **Name:** Name of the Schedule Table should follow C identifier rules and should be unique.

2. Adding Schedule Table Item:

- To Add Schedule Table Item, click on 'Add' button which adds a new row in Frame list.
- Frame Name drop down will be populated with the list of Unconditional frames, Event Triggered frames, Sporadic frame and Diagnostic Frames.
- Select the Frame name from the Frame Name drop down.
- Specify the delay in delay field.

3. Deleting Schedule Table Item:

- Select the Schedule Table Item in the list and click on 'Delete' button

4. Property view:

- On selecting Schedule Table Item in the list, properties will be displayed in the property view based on the type of the frame selected
- User defined parameters will be editable in the Property view for user input

Editing Schedule Table:

To edit existing Schedule Table right click on the Schedule Table in the Element view and click on 'Edit'. 'Edit Schedule Table' dialog is displayed as shown below.

Dialog Title: Edit Schedule Table - NormalTable

Schedule Table(s)

Name* NormalTable

	Frame Name	Frame Type	Length	Delay [ms]*
1	Door_Left_Open	UnConditional	4	50.000000
2	Door_Right_Open	UnConditional	4	10.000000

Add Delete

Properties

Name	Value
------	-------

OK Cancel

Deleting Schedule Table:

To delete Schedule Table, right click on the Schedule Table in the Element view and click on the popup menu 'Delete'. A confirmation message will be displayed before deleting the frame.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

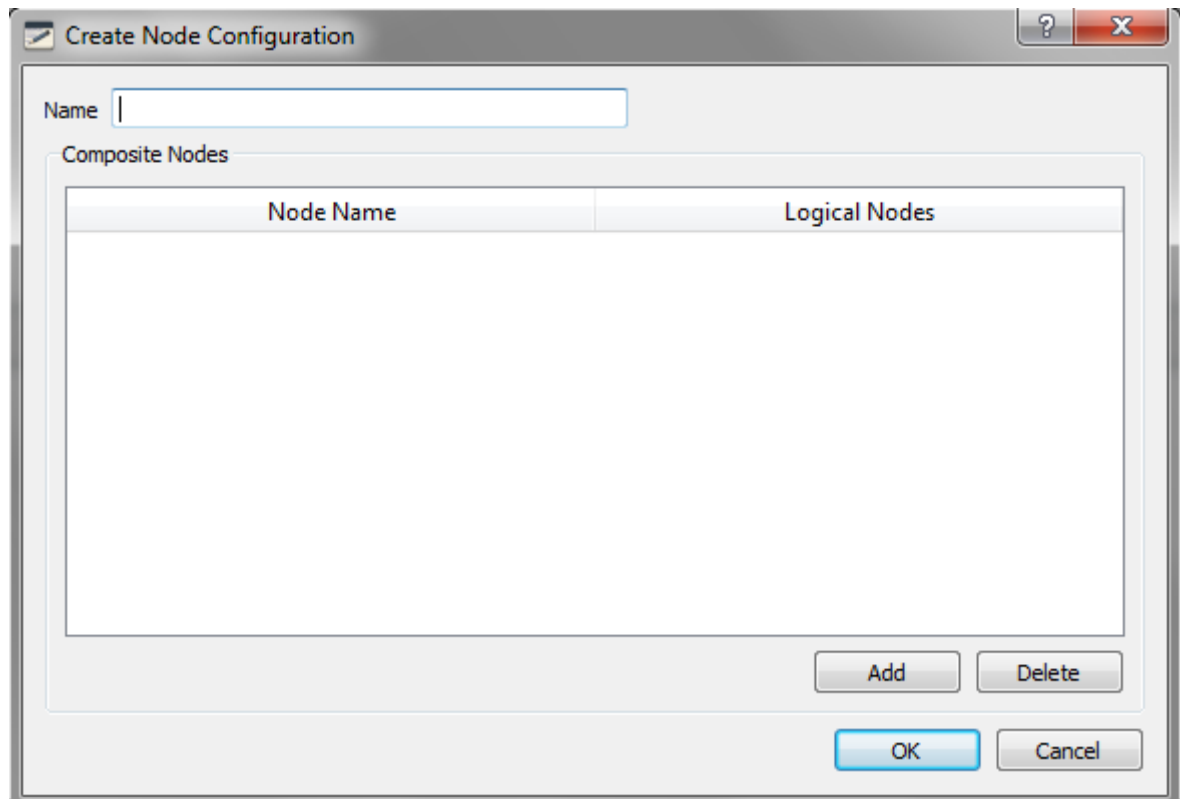
- Schedule Table name will be checked for its uniqueness

To discard the changes click on 'Cancel' button.

Node Composition

Creating Node Compositions:

To create Node Configuration right click on the Node Composition element in the element view and click on popup menu 'New'. Create Node Configuration dialog is as shown below.



1. General Properties:

- **Name:** Name of the Node Configuration should follow C identifier rules and should be unique.

2. Adding Node Composition:

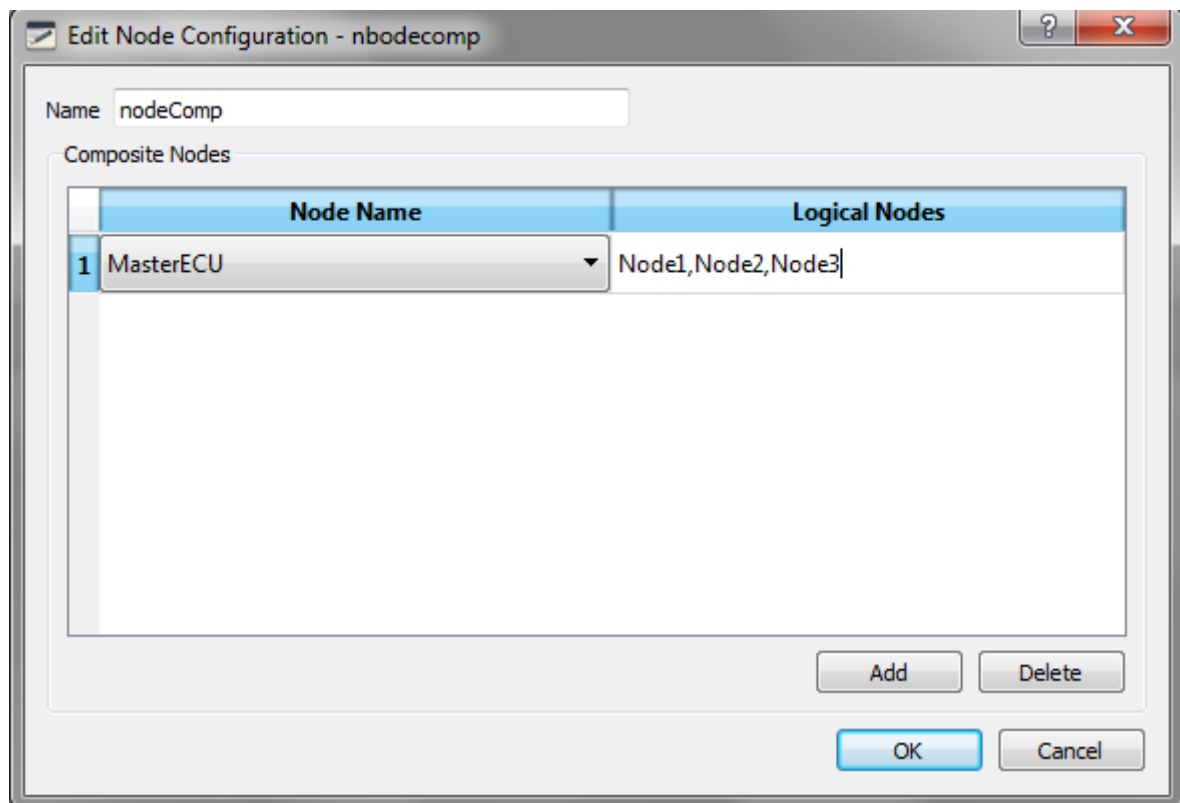
- To Add Node Composition, click on 'Add' button which adds a new row in Node list.
- Node Name drop down will be populated with the list of Nodes available.
- Select the Node from the Node Name drop down.
- Specify the logical nodes in the Logical Nodes field. Multiple Logical Nodes can be specified separating with comma.

3. Deleting Node Composition Item:

- Select the Node Composition Item in the list and click on 'Delete' button

Editing Node Compositions:

To edit existing Node Configuration right click on the Node Composition in the Element view and click on 'Edit'. 'Edit Node Configuration' dialog is displayed as shown below.



Deleting Node Composition:

To delete Node Configuration, right click on the Node Configuration in the Element view and click on the popup menu 'Delete'. A confirmation message will be displayed before deleting the Node Configuration.

To save the changes click on 'OK' button. Errors are displayed if validation fails.

The following validations are performed:

- Node Configuration name will be checked for its uniqueness
- Logical Nodes will be checked for its uniqueness

To discard the changes click on 'Cancel' button.