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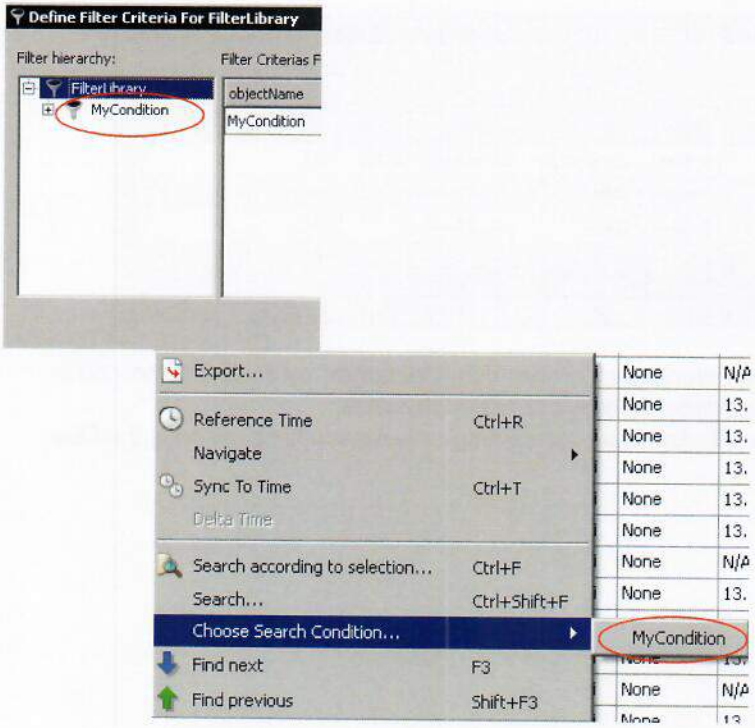
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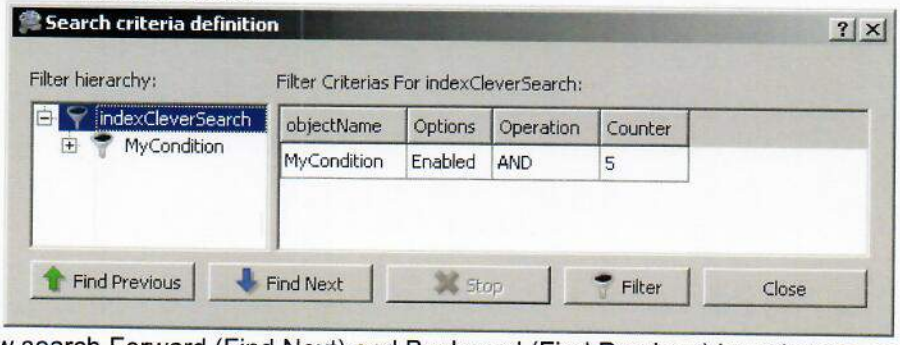
Find the *AIM APU429-16* at our website: *Click HERE*

5.6.2 Search in the Recording File View

With the above defined Conditions and Filters from the FilterLibrary, it is possible to search in the Recording File View for dedicated Messages. Predefined Search Conditions from the FilterLibrary can be selected in the Local Popup Menu of the Recording File View.



After the selection of a Search Condition, the condition is copied to the search dialog of the Recording File View, and the dialog is shown.



You may now search Forward (Find Next) and Backward (Find Previous) by using the corresponding Buttons in the dialog, you may create a Filtered Recording File View, by clicking on the "Filter" button.

You may also close the Dialog, and the search can be used with the ToolBar Buttons  or by using the Keyboard Shortcuts F3 (Forward) or Shift-F3 (Backward) search. These Keyboard shortcuts also work from the Message Detailed View.
A new empty search Condition can be created by selecting "Search" in the Local Popup Menu. You may load Filters from the FilterLibrary, or save new conditions in the FilterLibrary or the Alias Container, by selecting the corresponding Menu Entry in the Local Popup Menu of the Filter Hierarchy.
You can create a new condition, when you select the Properties of interest, and choose

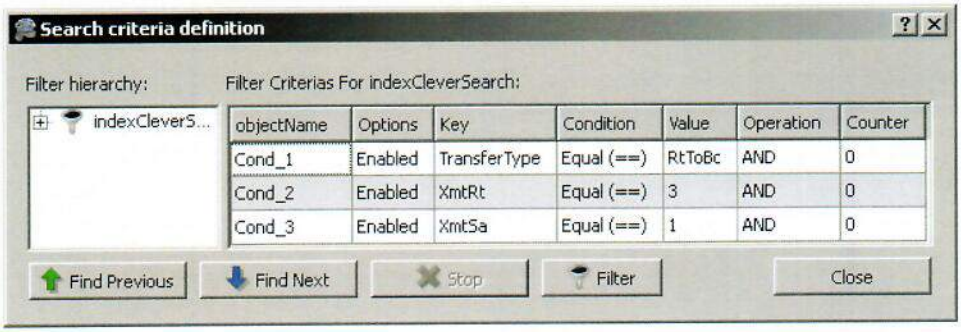
"Search according to selection", use the Shortcut CTRL+F or use the Search  Toolbar Button.
A selection of e.g. three Properties.

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:e	TransferType	XmtRt	XmtSa	Rc
:...	RtToBc	3	1	N/

creates the following search filter.

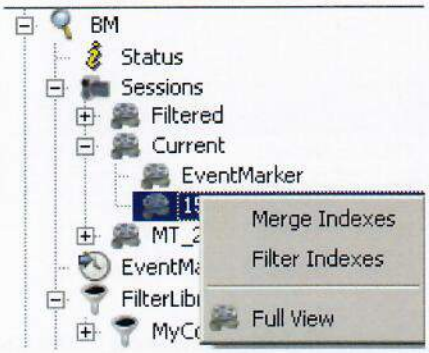


The new conditions may be stored in the FilterLibrary or the Alias Container, by selecting the corresponding Menu Entry in the Local Popup Menu in the Filter Hierarchy area.
A click to the *Filter* Button will open a new Index View, containing only messages matching the filter (see also next chapter).

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5.6.3 Messages Filtering

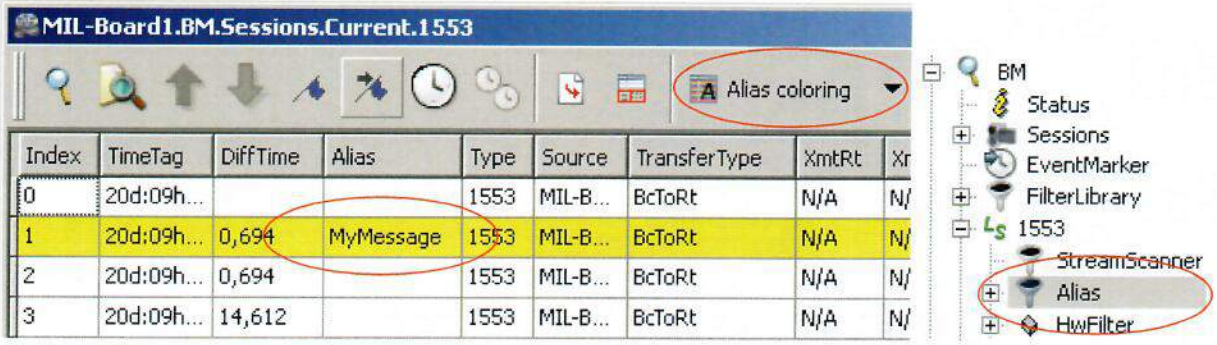
Filtered Recording File Views, containing only messages of interest, can be created by clicking to the "Filter" button in the Search Dialog above. Furthermore you may create a filtered view with a Right Click to the Recording Stream, and select "Filter Indexes" in the local Popup Menu.



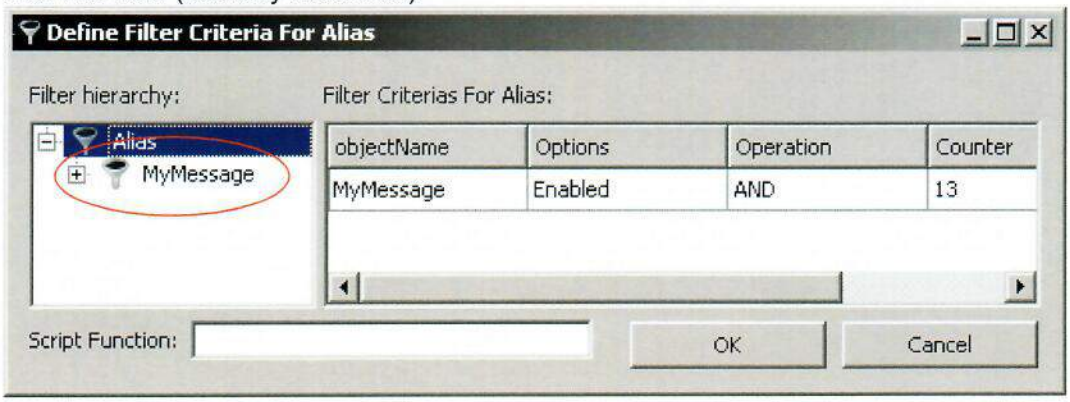
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5.6.4 Alias

The Alias functionality is used to populate the "Alias" Property of the Message. This property can be used e.g. for Message Naming or Payload decoding. The Alias node is located on the Source Recording Stream.



The "Alias" column typically displays the name of the first filter matching to the message. If a color has been set within the Alias Dialog and the coloring mode "Alias coloring" is selected, the matching messages are colored according the color. If you want to suppress the display of the Alias Name in the and only want to use the Coloring Feature of the Alias node (e.g. using the Database for the Alias Naming), start the of the Alias node with a # (Hash) sign.
e.g. Use "#MyMessage" as name instead of "MyMessage" to suppress the display of "MyMessage" in the Alias Row (use only the colour).



Note:
By default only the first matching alias function is displayed. If you want to display all matching Alias Names, you have set the within the settings
BusMonitor/ShowAllMatchingAliasFunctions to true

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Furthermore you may use a script to populate the Alias Property. For this, it is possible to define a script function, which should do the decoding of the Message. The Script function can return any string, which is displayed in the Alias Property. This option can only be used, when a Script Component is available.
You define a function in a script, which looks like follows:

```
def GetMyAlias(Msg):
      Type = getProperty(Msg,"Type")
      if Type == "A429":
            return "This is a Arinc 429 Label"
      if Type == 1553:
            return "This is a MIL-STD 1553 Message"
      return "Unknown Message Type%s"%(Type)
```

The Function now can be used by entering the string

PY:GetMyAlias

to "Script Function" field in the dialog above. PY is Script Interpreter, which should be used to search for the Function (PY for Python, TCL for TCL). `GetMyAlias` is the Name of the Function to use. If the function cannot be found, an error will be displayed (e.g. Error calling script function PY:<funcname>)
A third possibility to populate the Alias Property is the Alias String of the DBS Node holding the Parameters for the Message. These are the Sub Address DBS Nodes for MIL Bus Parameters, the Label or SDI Nodes for 429 Parameters, respectively the Message Nodes of AFDX Parameters. This possibility is only available, if the database component is available.
The order of evaluation of those three possibilities to populate the Alias Property is:

1. Script Function
   if no Script Function is defined, or the Script Function returns an empty string
2. The Filters or Conditions defined in the Alias Node
   if still no Result:
3. The Alias Property of the related database node.

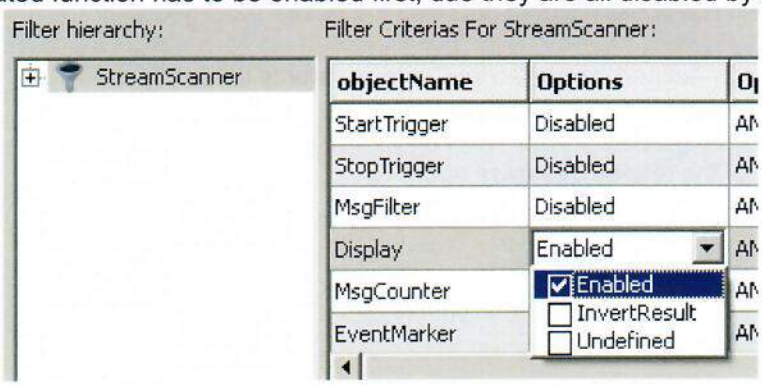
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5.6.5 StreamScanner

The Stream Scanner node on the Recording Stream can be used for the following operations.

Start Trigger	Starts the Recording if one of the Filter matches
Stop Trigger	Stops the Recording if one Filter matches (no Restart possible)
MsgFilter	Filters the Recording data. The Recording data contains only messages matching to one of the filters. All other messages are **not** included in the Recording and will be **lost**.
Display	Creates a dedicated display under the Sessions/Current node for each of the Filters. Each display contains the last 10 messages, which have met the Filter Condition. The amount of messages can be changed within the Settings BusMonitor/ScannerDisplay/RingBufferSize respectively with the property OnlineRingBufferSize of the Bus Monitor
Counter	Just counts the Number of Matches for the Filter.
EventMarker	Automatically generates an Event in the Event Marker Stream on a match of a Filter. The Name of the Event is the Name of the Matched Filter. You may insert a "%n" in the Filter Name, which evaluates to the Match Counter. **Note:** Be careful with this, due to it may cause a big load, if e.g. every Message matches.

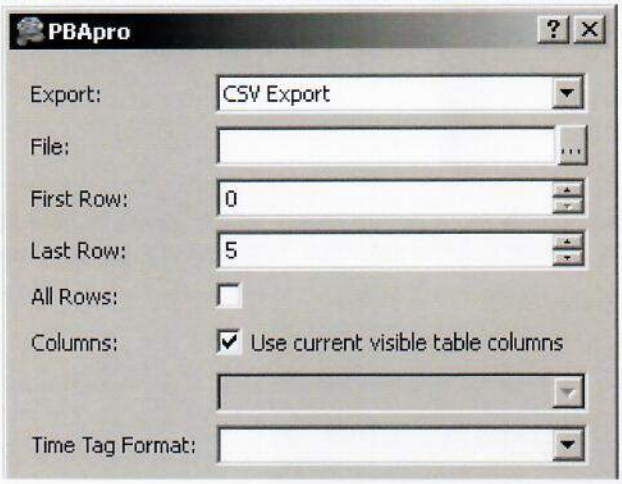
Note:
The related function has to be enabled first, due they are all disabled by default.



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5.7 Export of Recorded Data

PBA.pro offers the possibility to export the Data to several output formats. The Export functionality is accessible either via the Context Menu or the Toolbar Button.

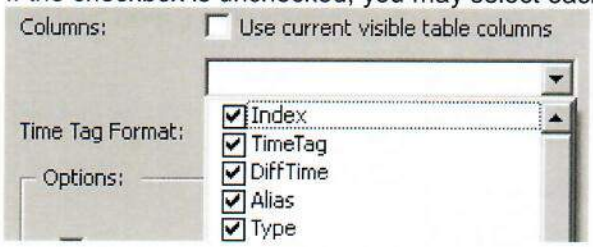


The basic options of the export dialog allows to select

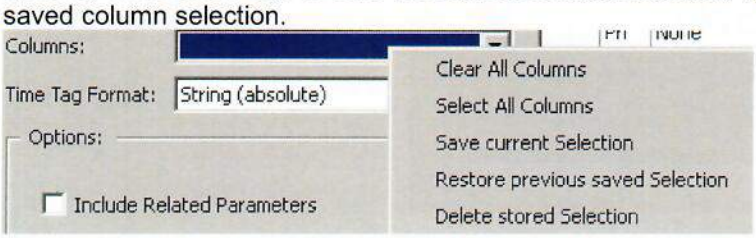
- Export Type
- The Filename
- The First and the Last row to use or all if the “All Rows” is checked

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- The Columns to Export (if applicable)
  If the "*Use current visible table columns*" checkbox is checked, only the visible Columns are exported.
  If the checkbox is unchecked, you may select each column



  A Right Click to the Columns Combo Box shows a popup menu, which allows to select further options, which allow e.g. to save the current column selection, respectively restore a previous saved column selection.



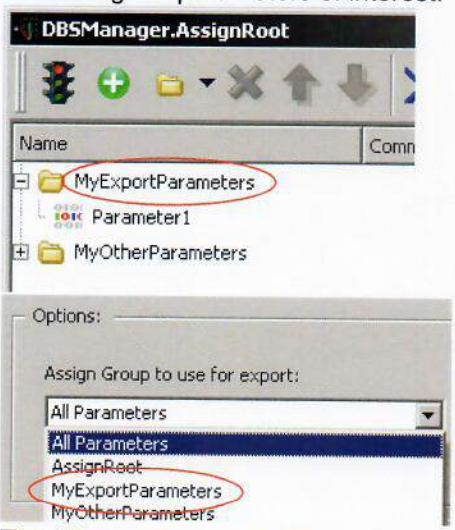
- The Time Tag format allows to select the format of the IrigTime row

String (absolute)	e.g. 49d:12h:21m:52.098731s
String (relative)	e.g. 00d:00h:01m:52.098731s (relative to the first entry)
Seconds	e.g. 1.234 (relative to the first entry)
Mili Seconds	e.g. 1234 (relative to the first entry)
Micro Seconds	e.g. 1234000 (relative to the first entry)

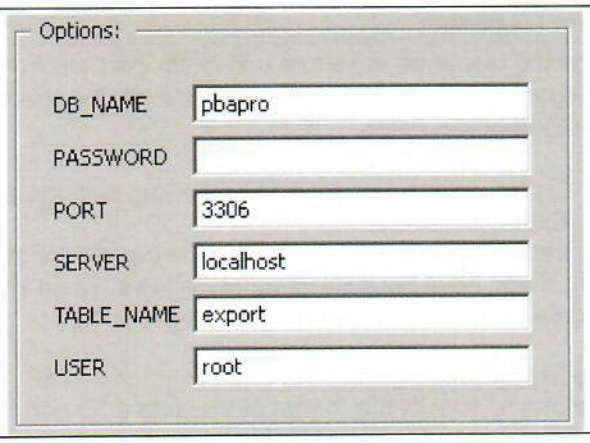
Note:
Some of the Options may be greyed out, if they are not applicable for the current selected export type.

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The following export formats are supported:

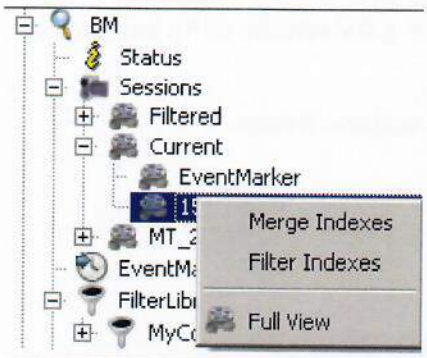
CSV Export	Exports the displayed rows to a text file in the CSV Format. The Separator Character for the CSV File can be changed within the Settings: PPCsvExport\Separator If the "Export Data" is selected, the following settings apply: PPCsvExport\DataSeparator the character which should be used as separator for the Data. This allows to specify, if you have the data in separate rows (when you use csv separator), or all data in one row (e.g. use blank as separator) PPCsvExport\DataFormat This allows to specify the format of the data if "Export Data" is selected. e.g. 16 for hex, 10 for dec, 2 for binary Note: Use \t for a tabulator as separator (data and csv)
PDF Export	Exports the Recording Data to a PDF file.
Text Export	Exports the Recording Data to a Text File
Recording Export	Exports the recording data to a recording file (*.pprec). This can be used to export a dedicated range of a recording file.
Parameter Export to *.csv	Exports the Parameter of the Message to CSV. Parameters may be selected via the Assign. The export dialog allows to select the folders of the Assign, containing the parameters of interest.  The "Convert Values to Decimal" options causes that the following database parameter formats are exported via their decimal value instead of the displayed string value: Enum, Logic, Octal, Binary and Hex. This export option is only available with the Database Component The Separator Character for the CSV File can be changed within the: PPBDS/ParameterExport/Separator
Parameter Export to *.pprec	Exports the Recording Data to a Binary File, which allows to view the Recording Data inside the PBA.pro either as a Graphical View or in the Table Format. For the selection of the parameters please see "Parameter Export to *.csv" This export option is only available with the Database Component
MS_Access_Export	Exports the data to an MS Access Database Note: Available on Windows only and MS Access has to be installed on the local computer
MS_Excel_Export	Exports the data to an MS Access Database Note: Available on Windows only and MS Excel has to be installed on the local computer
MySQL_export	Exports the Data to a MySql Server in the local Network

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Print Selection	This “Exports” the Data to a Printer

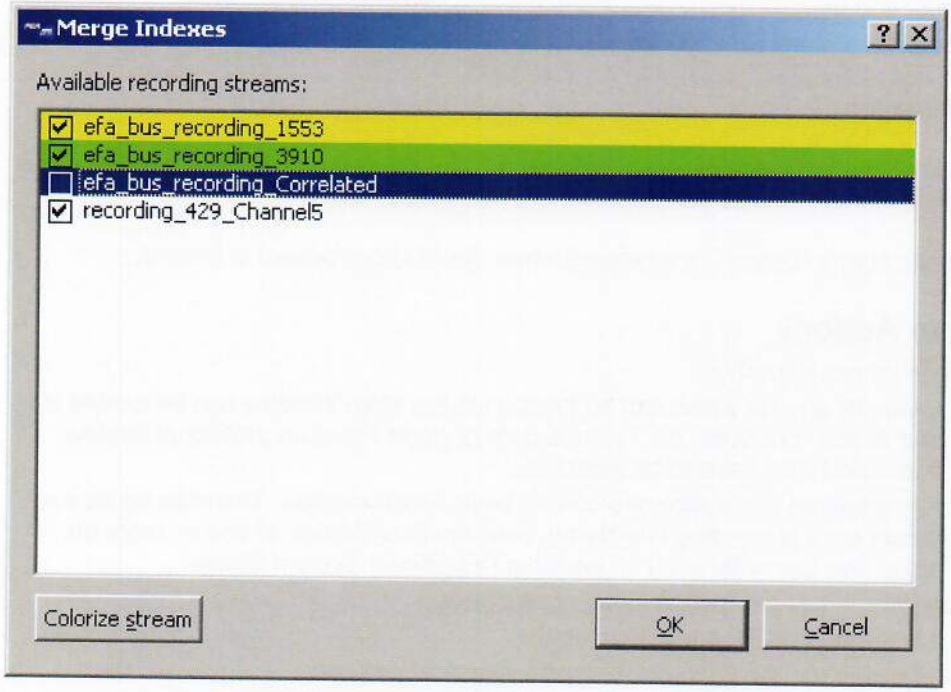
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5.8 Merging Recorded Data



The Merge Functionality allows to merge recording data from different sources into one Recording File Display. The Messages are Merged according their Time Tag. For this it is required, that the different sources have the same Time Base from synchronized time sources (or are recorded on the same Board).
The Merge Functionality is accessible via the local popup menu of the Recording File Stream.

The dialog shows all currently available recording streams, which may be included to the merge. You may merge recordings from different Busses and different Resource Types.



The streams can be colored by selecting them within the merge dialog and clicking on “Colorize stream”. After merging the streams, the coloring option “Stream coloring” is available within the toolbar of the IndexView.

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6 System States

The PBA.pro System States allow to combine several System State Actions (e.g. Load Files/Scripts, Start/Stop operations etc.), which can be started on user request or automatically at Project Load or PBA.pro Startup.

System States may be used globally, on Designer Panels or in the Database Assign.

6.1 System State Elements

6.1.1 Project System State List

The Project System State List allows to create different System States and Groups.
The System States outside the *Global* List are stored in the Project File.
All States inside the *Global* list are stored in the file

GlobalStates.ppref

located in the "Application Config Directory" (see help about dialog) and are always present (after startup and in every project).

Any State or Action with the Name "Default" is executed when the PBA.pro project is loaded.

6.1.2 System State Actions

A System State Action can do the following:

Load a File	Basically any file which can be loaded via the Main Window can be loaded via and Action. For some file Types e.g. (e.g. ppref Files) an additional destination object may have to be selected.
Predefined	A Predefined State allows to control basic functionalities. This may be for example set a Recording File Name, start the Bus Monitor of one or more objects. See below for a list of available Predefined System States.
SlotCall	Allows to call a Function (Slot) of an object
ProperySet	Allows to set a Property of an object
Trigger	Allows to run the System State on a signal of an object.
ShowView	Opens the View of an Object

These Actions may be applied to one or more equal Objects with one click.

The following Predefined System State Actions may be available (depending on present components).

A429.Set Channel Type	Allows to modify a Arinc 429 Channel Type (Disabled / Rx / Tx)
A429.Start Channel	Allows to Control the 429 Channel (Start/Stop)
BM.Select Recording File	Allows to select a Recording File Note: You may have to use %r (for Resource Name) macros in the filename, if you want set the recording file name to more than one Bus Monitor
BM.Start Recording	Allows to Start/Stop the Recording on the selected Bus Monitors
BM.Warn on existing Recording File	Allows to suppress the Warning on Recording Start and the Recording File exists.

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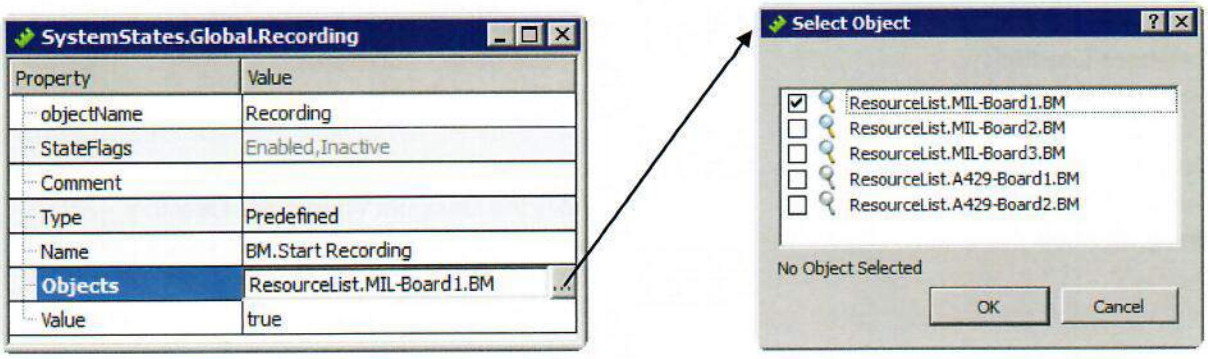
Database.File Add	Adds a Database to the Stream Assign
Database.Load All	Loads all previous added Databases
Database.Run Assign	Allows to Start/Stop the Assign
Designer.Set Template Directory	Allows to modify the Designer Template Directory
Designer.Set Widgetset Directory	Allows to modify the Designer Widget Set Directory
Designer.Show Template	Allows to Open a Template Panel from the actual Template Directory. The Templates visible in the Designer Template group may be selected.
FDX.Capture Mode	Allows to set the Capture Mode of a AFDX Capture Port
FDX.Capture Start	Start/Stop AFDX Capture Port
FDX.Login Board	Login to AFDX Board
FDX.Login Port	Login to AFDX Port
FDX.Send Mode	Allows to set the Send Mode of a AFDX Send Port
FDX.Send Start	Start/Stop AFDX Capture Port
MIL.Set Coupling	Allows to modify the LS Coupling of a 1553 Bus
MIL.Set HSCoupling	Allows to modify the HS Coupling of a 3910 / Efex Bus
MIL.Set IrigTimeSource	Allows to set the Irig time Source
MIL.Start BC	Start/Stop Bus Mil Controller
MIL.Start RT	Start/Stop Bus Mil Remote Terminal
MIL.Start Scope	Start/Stop Bus Mil Scope
Misc.Init Project	Init the Entire Project PBA.pro (**all changes are lost without warning**)
Misc.Load MainWindow Layout	Allows to select one of the Main present Main Window Layouts.
Misc.Run external Program	Allows to start any external Application
Misc.Show Project Modified Warning	Allows to suppress the PBA.pro Project modified warning
Replay.Select File	Allows to Select a MIL or 429 Replay File
Replay.Start	Allows to Control the MIL or 429 Replay Functionality
Replay.Sync Replay	Allows to Modify the Sync Replay Functionality
Script.Exec Command	Allows to execute any Script Command

For each of this you may select one or more Objects which can handle the Action.

Example:

You may create a System State Action and use the *Predefined* Type *BM.Start Recording*
You may select the Object to control when the Action should be applied.
Furthermore you have to select the State which should be applied when the action should be applied.
(in this example use true for Run and false for Stop the Recording)

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Under the following condition an aciton is togglable:

1. It has only one Value property which is a Bool Type (true/false)
2. The Value is set to "*toggle*"
3. It is a SetProperty Type or a Slot Type, which allows to readback the state

If an Action is togglable, it it can be also switched off with the same action. In this case the Button shows a square instead of a triangle.

This are typically the Control Actions like starting Bus Monitor, BC, RT, 429 Channels etc.

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6.1.3 System State

A System State is a set of different System State Actions, which are applied together.

This may be for e.g.

1. Load a BC Setup to 2 Streams
2. Select the Recording File on 2 Streams with a Macro (C:\recording\Test%s.pprec)
3. Start the Recording
4. Start the BC's

This system state may be applied with one click to the corresponding System State in the System State Dialog (see below), which loads the BC setup, sets the recording file and starts the recording.

States with the name "Default" are automatically executed on Project Load, respectively on PBA.pro startup.

You may prepare some System States in the Global List and run them with from another System State.

A System State is togglable, when at least one containing action is togglable. Applying the State from not set to set will trigger all actions within the state.
If a toggle action is switched of, only the togglable actions are triggered with the Value set to false.

This means for the example above, assumed the "Start the Recording" and "Start the BC's" Actions are switched off:

Switching on the State will load the BC Setups, set the recording files and Start Recording and BCs
Switching off the State will only switch off Recording and the BC

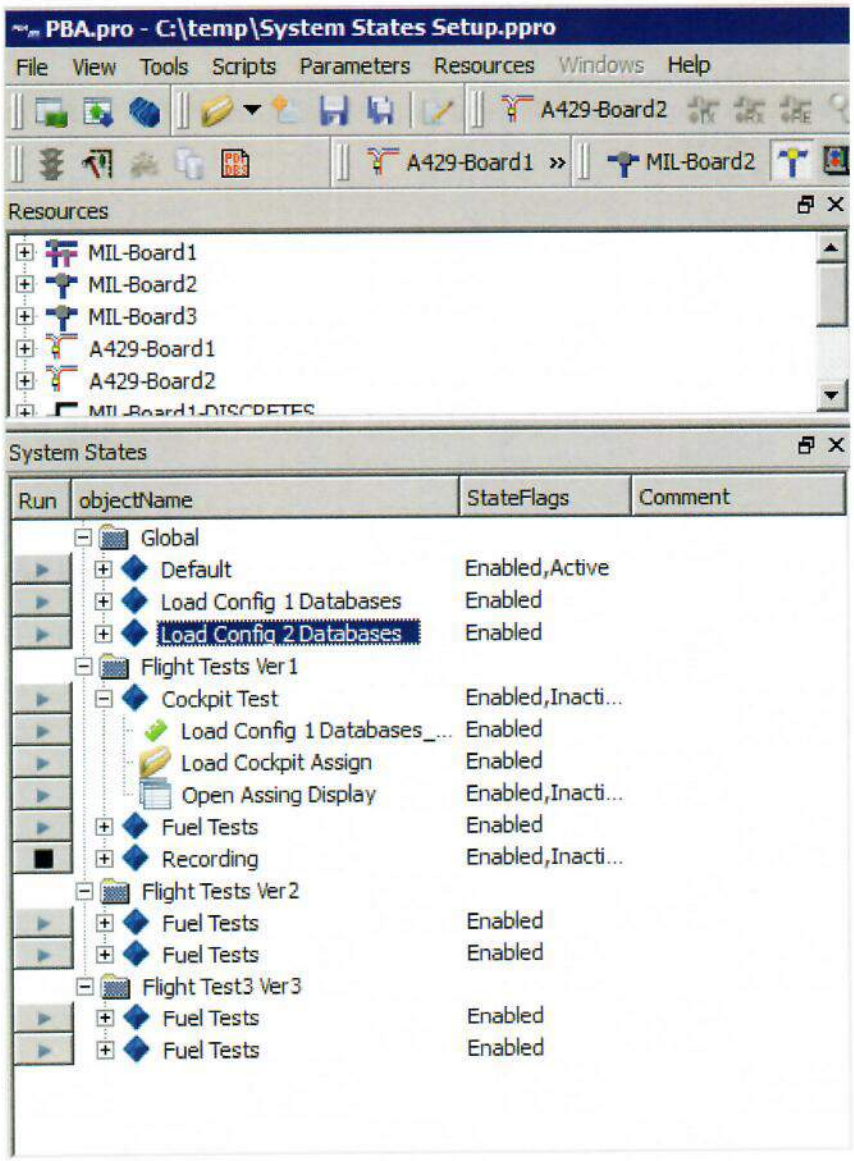
6.1.4 System State Groups

System State Groups are just folders which may contain Several States or Actions.

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6.2 System States Dialog

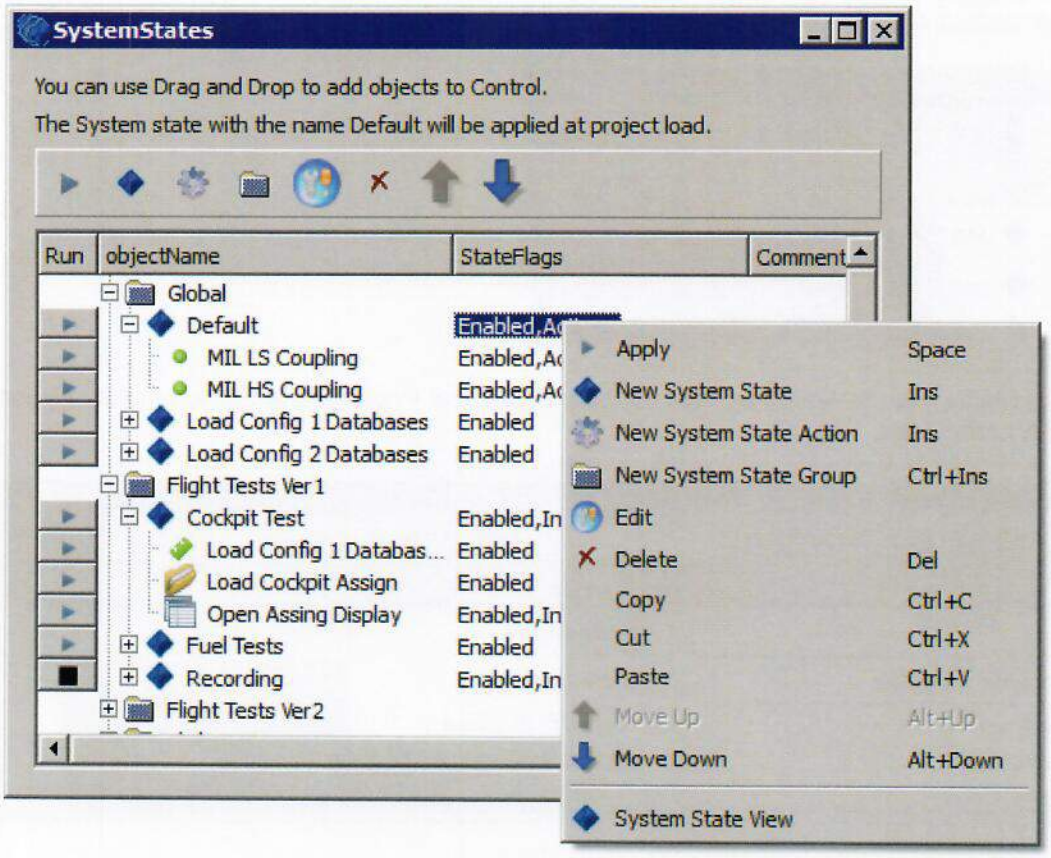
The Global System States can be edited and applied from the corresponding Docking Widget.



Togglable actions are indicated via the Square icon.

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The System State Dialog which can be opened with the Tool Button. This may be helpful, if you want to Drag and Drop objects to the Dialog.



You can add objects to control via drag and drop from many other views (Resources, Assign etc)
You may drag and drop files from a File Manager (e.g. Windows Explorer) to the system state dialog.

You may call System States from other System States drag and drop them to another State.
This will create a System State Action, which calls the Run slot of the related State.

6.2.1 Creating Actions

Predefined Actions

- Add a new Action by clicking to the button.
- Select for the Type "Predefined"
- Select the Objects to Control

File Actions

- Add a new Action by clicking to the button.
- Select for the Type "LoadFile"
- Select the desired File or Script
- Some file types (e.g. ppref files) may require the selection of a destination object if they are not unique.

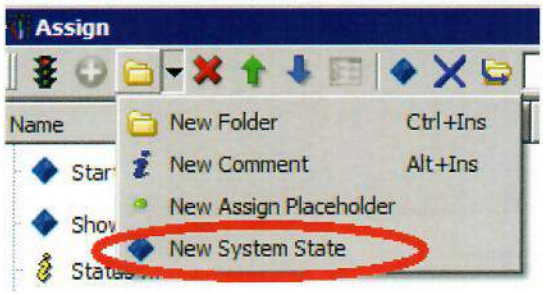
Call Slot, Set Propery, Show View and Trigger Actions:

- Drag and drop the Object you want to control to the related System State or Group
- Select the Action Type
- Select the Propery/Slot or Signal you want to use
- Setup the Values to the desired state

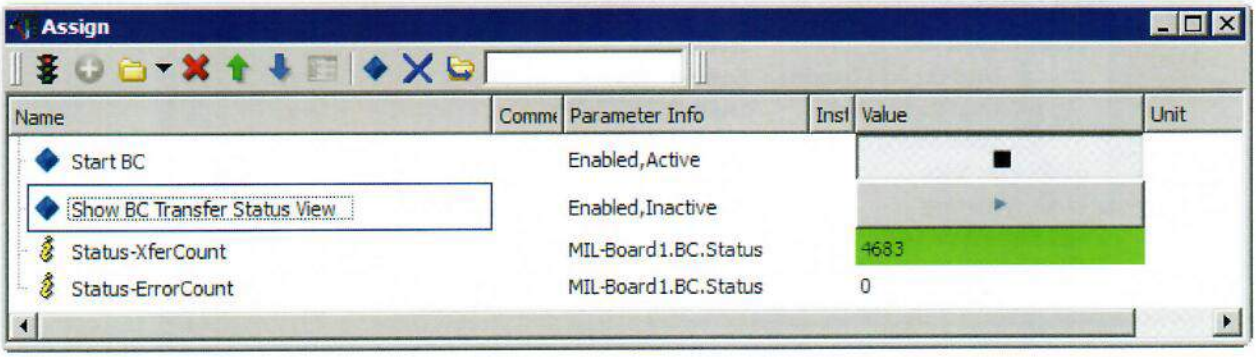
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6.3 System States within the Assign

The PBA.pro Database Assign may be also contain system states.
States may be created with the corresponding action:



Assign System States may be edited by the corresponding Local Popup Menu Entry, which is shown on a Right Click to the State.



A System State with the Name “Default” will be executed when the assign is started.

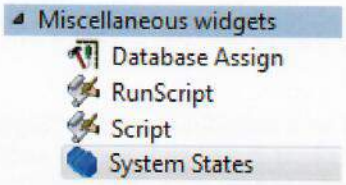
Note:
You should not System State Actions in the Assign, which delete the Assign (e.g. Load a Project, Load an Assign ppref file). This may cause an undefined behaviour.

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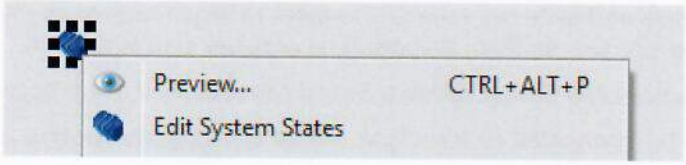
6.4 System States within the Designer

The Designer provides a Utility Widget allowing to create a system states on a Designer Panel. Connect the Dialog Elements with the Run() respectively Run(bool) slot of the system states.

A System State List may be added to the Designer via the "Miscellaneous widgets" group.



Drag and Drop the "System States" object to the designer. They may be edited via a right click, which opens the System States dialog (see above).



A System State with the Name "Default" will be executed when panel is loaded.

Note:
Currently it is not possible to load PBA.pro projects from a designer system state.

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7 The Global Connection Manager

The global connection manager provides fast configuration access to set up connections and data synchronisation algorithms.
The Global Connection Manager (GCM) functionality is based on a so called "Signal - Slot" connection mechanism and on a "Property" connection mechanism.

7.1 Connection Principles

The "Signal - Slot" connection mechanism can be understood as a definition where a "Signal" (a kind of Event) of a PBA.pro object invokes a "Slot" (a kind of Function or Event Handler) of another or the same PBA.pro object. Note that the signals and slots mechanism is type safe: The signature of a signal must match the signature of the receiving slot. (In fact a slot may have a shorter signature than the signal it receives because it can ignore extra arguments.) Signals and slots are loosely coupled: A class which emits a signal neither knows nor cares which slots receive the signal. The signals and slots mechanism ensures that if a signal is connected to a slot, the slot will be called with the signal's parameters at the right time. Signals and slots can take any number of arguments of any type. As the mechanism is only activated if the signal is emitted, no polling on receiver side is needed.

Example: A Push Button on a Dialog sends a Signal ("Pressed") if it is pressed by the user. This Signal can be connected to the close slot of a dialog, the Button is placed on. Thus the dialog will be closed if the button is pressed.

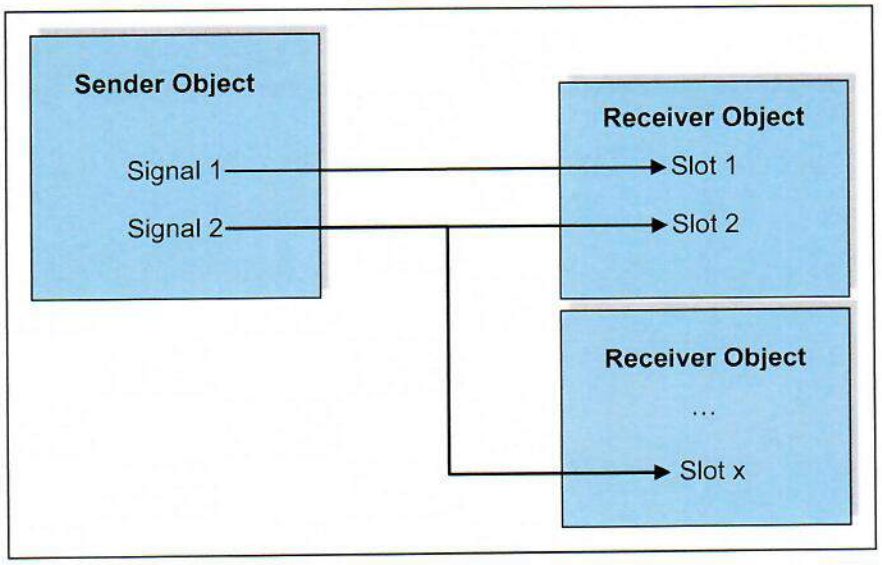


Figure 26: Signal-Slot connection principles

The "Property" connection mechanism is understood as a definition where a "Property" of a PBA.pro object is connected to a "Property" of another or the same PBA.pro object. Furthermore a trigger signal has to activate the synchronisation of the receiver property to the sender property.

Example: A Parameter has a "Property" ValueStr indicating the Engineering Unit String of some raw data. A Dialog hosts a LCD Display, which should be used for visualisation of this value. The LCD owns a "Property" named "value" for displaying a value.

The connection to be defined is between the "ValueStr" property of the Parameter and the "value" property of the LCD. The Trigger is the Updated signal of the Parameter

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In comparison to "Signal-Slot" connections, which are already event driven, a "Property" connection requires to be triggered. As trigger any signal of any PBA.pro object e.g. a Timer widget for a cyclic synchronization of the properties or as in the smaple the Parameter object itself (event driven synchronization of the properties) can trigger the synchronization.

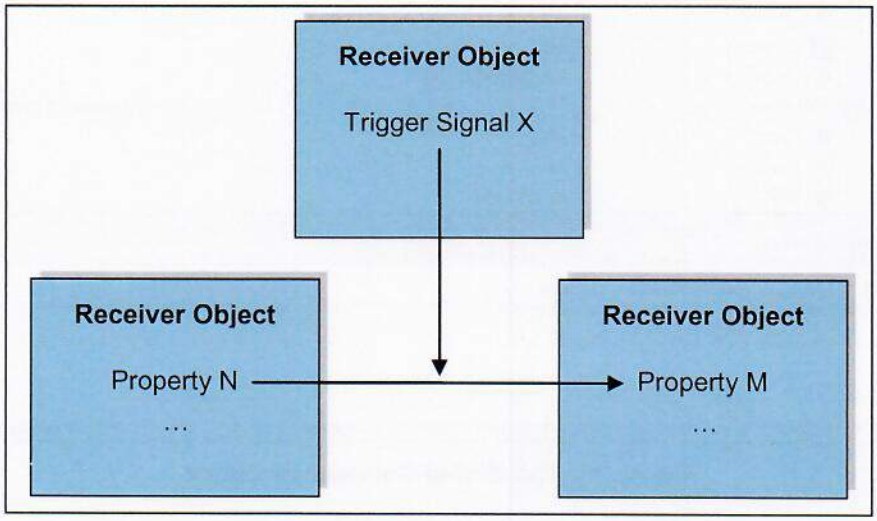


Figure 27: Property connection principles

7.2 General

The Global connection Manager provides an interactive Global Connection Manager Editor (GCME) view to set up connections and save them within a project file. This Editor is accessed either via the Menu entry “Global Connection Manager”, found in the “Tools” Menu or via the corresponding Tool Button of the Toolbar.

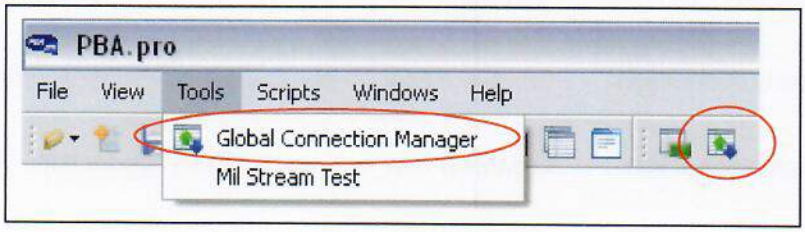


Figure 28: Accessing the Global Connection Manager

After opening the view via one of the alternatives explained above, the GCME provides simple and straight forward functionality to create and configure simple as well as complex connection setups. The Toolbar of the view provides functionality to create new connections of different types, to delete already selected connections and to establish the configured connections. Furthermore a tree is used to display the various connections and their setups in hierarchical manner. Each node provides further configuration functionality via its corresponding context menu as well as via the editable "Value" and “Comment” columns. The context menu is accessible on right click on a tree node. The columns are edited via a editor, which will open double click on a corresponding editable cell.

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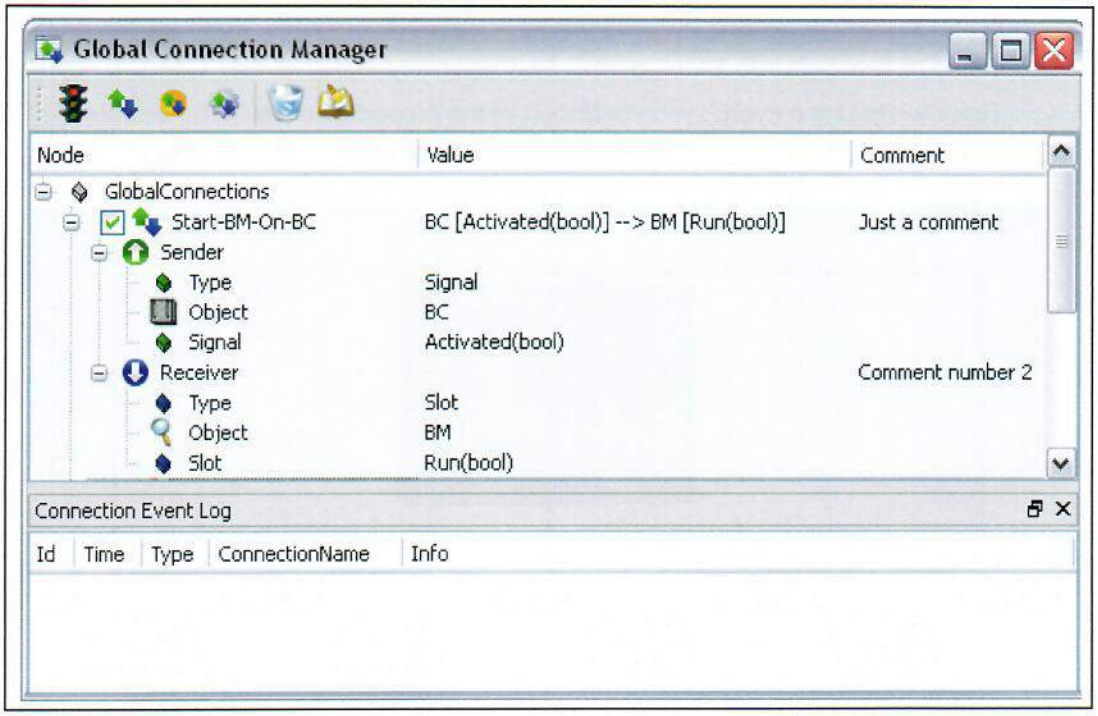


Figure 29: The Global Connection Editor

7.2.1 The GCME Toolbar

As described in section 7.2 General, the Toolbar offers different functionality to create, delete and establish connections. Thus the following Tool Buttons are available:

Establish connections:	Establish all available connections.
New Signal-Slot connection:	Creates a new simple predefined Signal-Slot connection.
New Property connection:	Creates a new simple predefined Property connection.
New Custom connection:	Creates a new extended custom connection.
Delete Selected connection:	Deletes the currently selected connection.
Clear Log	Clears the log window

7.2.2 The Connection Event Log

The connection Event Log Window is a dockable Window used within the GMCE. The display is used to show event information of the global connections in table style. An event is added to the list, where the following information is provided:

Event Id:	The Sequence Id
Time:	The Time, the event occurred
Event Type:	The Event Type (Info, Warning, ConnectError or DisconnectError)

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Connection Name: The name of the connection, which emitted the event

Info: An addition info string to describe the event cause.

To clear the event log during on runtime, just click on the corresponding Clear Log Tool Button.

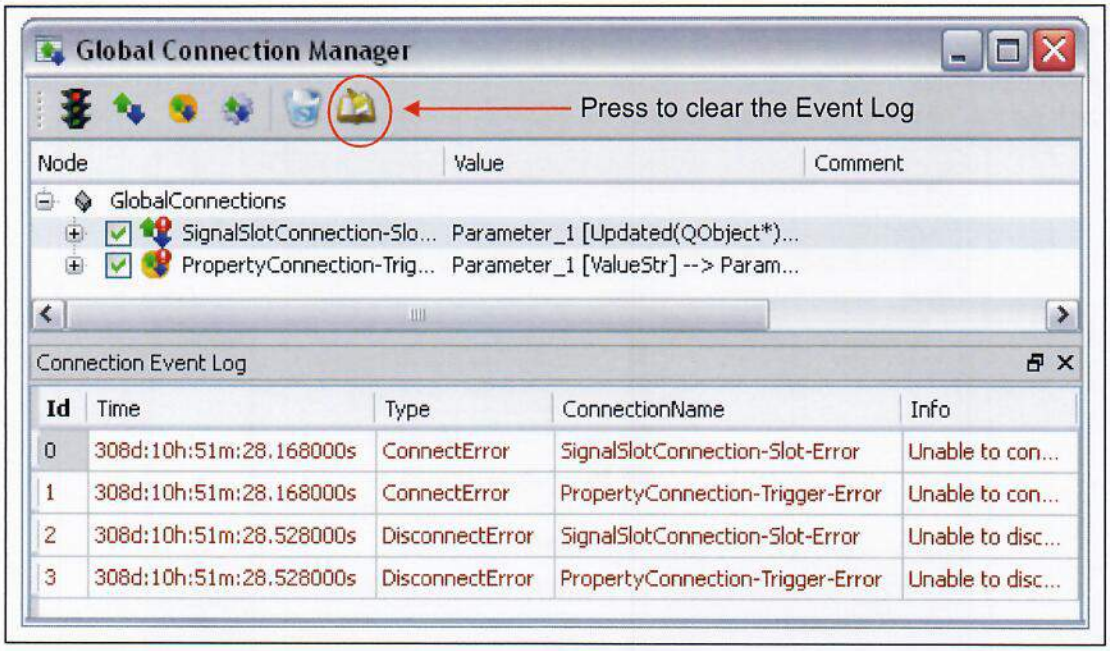


Figure 30: Connection Event Log window

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7.3 Simple connection configuration

Simple connections are either Signal-Slot or Property-Property connections. While for a Signal-Slot connection a sender signal is connected to a receiver slot, Property connections need a third element a so called Trigger Object. This Object has to provide a trigger signal to activate the property synchronisation, which will cause that the sender property value is written to the receiver property value. For further information about connection principles see the corresponding chapter of this getting started document (7.1 General).

7.3.1 Signal-Slot connection configuration

Signal slot connections are set up either via the corresponding tool button of the GCME view or on right click on the "GlobalConnections" node of the GCME connection tree.

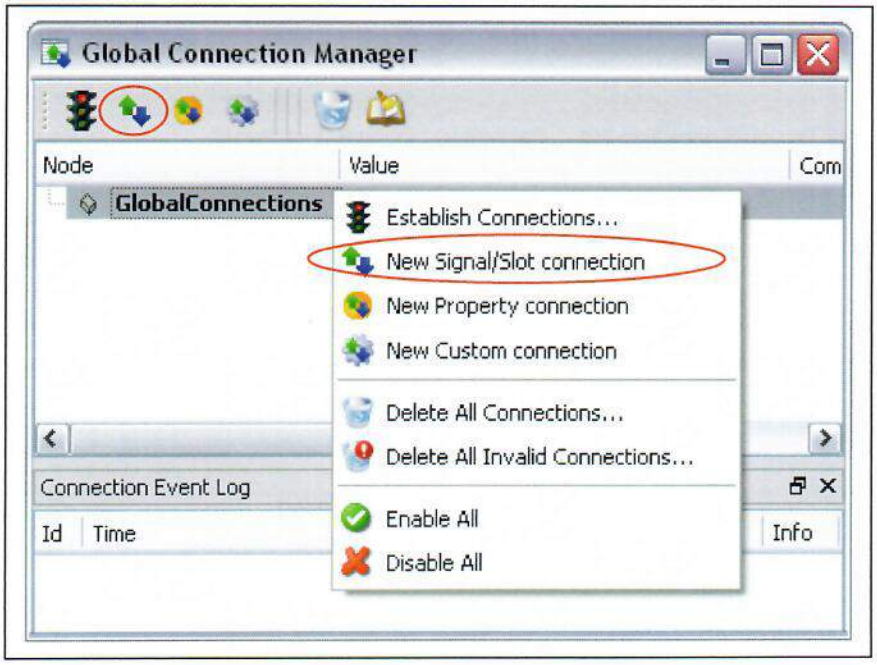


Figure 31: Signal-Slot creation

The created connection contains a Sender node as well as a Receiver node as children. While the sender Type is of type Signal, the Receiver Type node indicates that the Receiver is of type Slot. In addition to the type node, the Sender and Receiver Nodes contain two additional child nodes. Thus Sender and Receiver nodes contain three child nodes which are used to configure the connection.

- Type: The Type node indicates the signature type. For Signal-Slot connections the type nodes are read only. As mentioned the Sender Type is set to Signal and the receiver Type is set to Slot

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- Object: The Object Node indicates the Object which provides the Signal or Slot. If the Object node is invalid or not configured, a red exclamation icon is displayed; else the dragged object icon is displayed.

- Signature: The Signature node is used to define the Signature resp. Signal or Slot to be used. If the signature is invalid or not configured, a red exclamation icon is displayed; else a standard icon is displayed. The signature Node name is just set to the Value of the corresponding Type node.

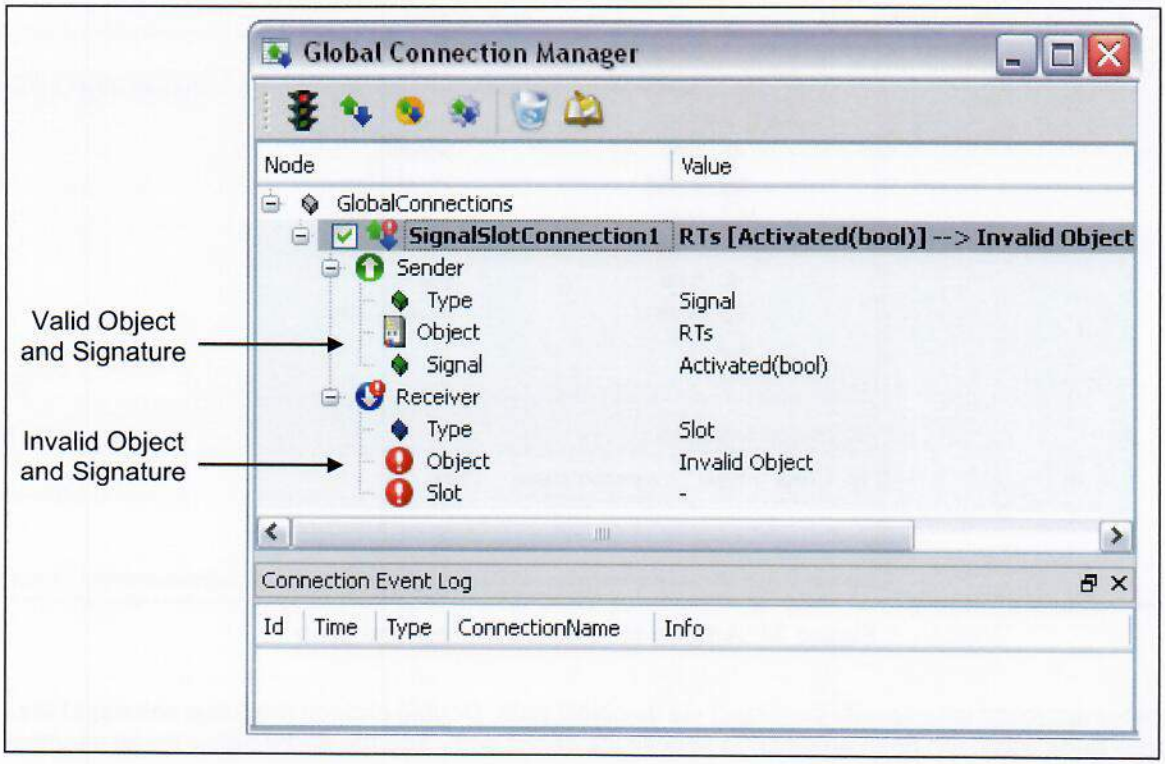


Figure 32: Signal-Slot connection nodes

After creation of the Signal-Slot connection, the connection will be initialised with a default name. To rename a connection right click on the connection node and select the "Rename Connection..." menu entry which will bring up a text input dialog to define a different connection name



Figure 33: Changing the connection name

The next step is to initialise the Object and the signature nodes of the Sender and the Receiver nodes. Objects are added via drag and drop of any accessible object (for example a node of the resource tree) to the Object node of the Sender or Receiver.

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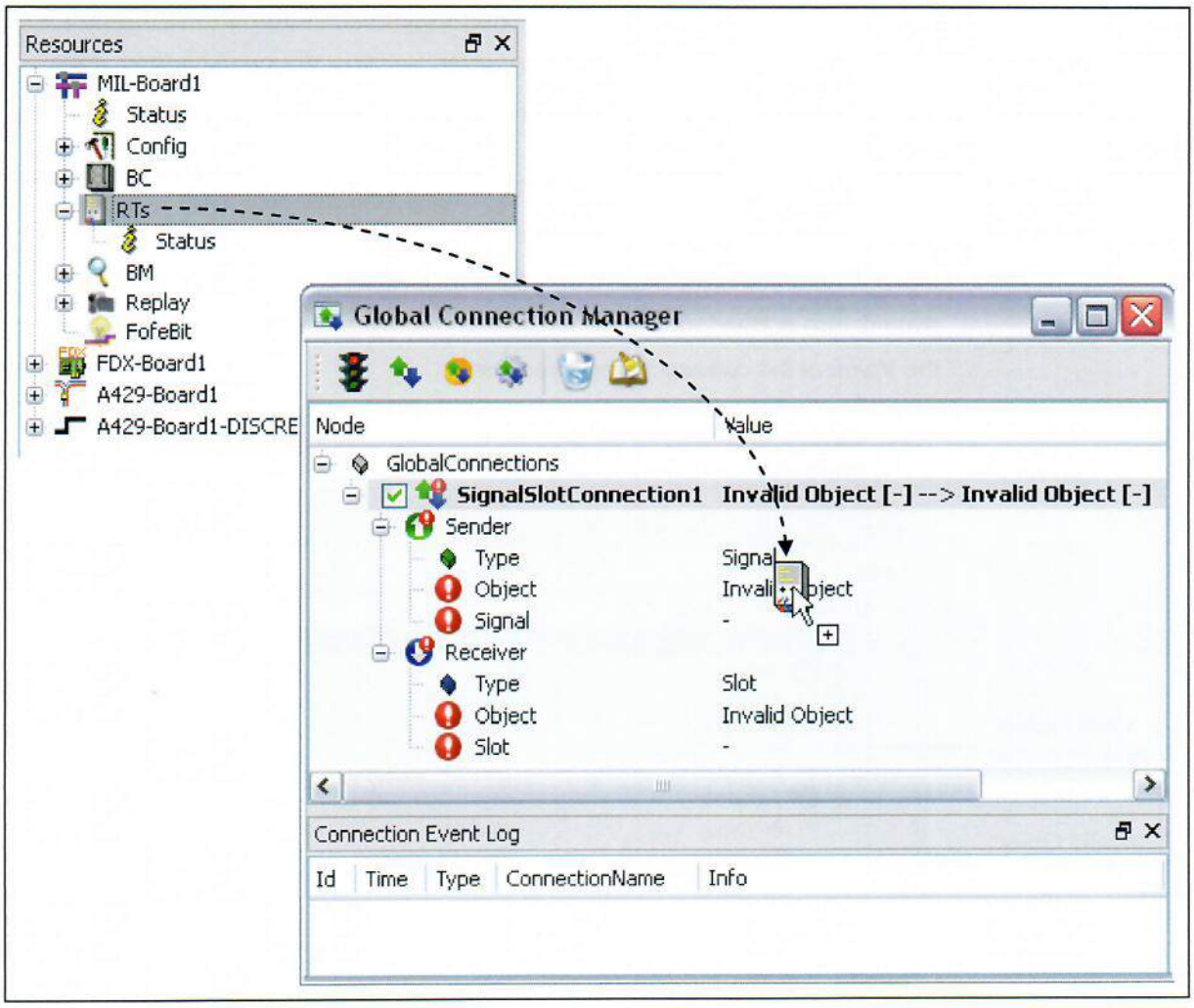
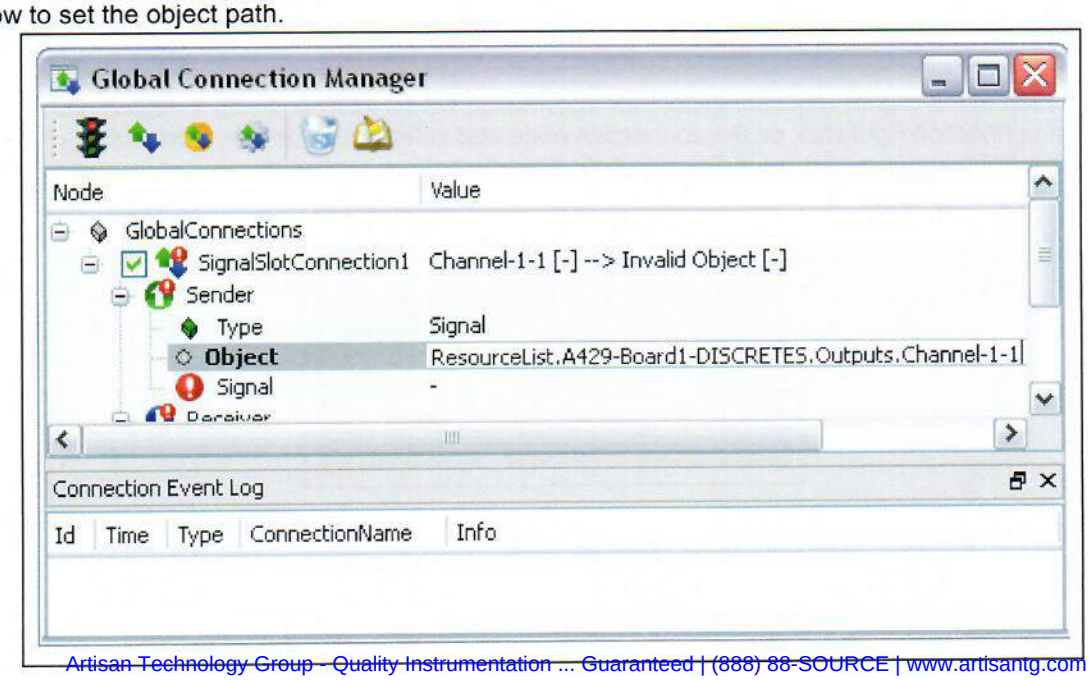


Figure 34: Adding an object via drag and drop

Another approach is to specify the object via its object path. Double click on the value column of the Object node which will open an editor to specify the object path. See the figure below for an example of how to set the object path.



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Figure 35: Specifying an object via the object path

If a valid object is specified, the signature node is initialised according to the “Object” and the “Type” nodes. If default interfaces are available, the signature node is set to the first found and accepted interface. Note that slots of Signal-Slot connections have to have a signature, which matches to the signal of the sender. (For further information see chapter 7.1 Connection Principles) Thus only slots which fit to the configured sender signal will be available on receiver Slot node side. The signature is set via double click on the Signature Value column. A combo box provides all available Signals or Slots which can be used for the connection.

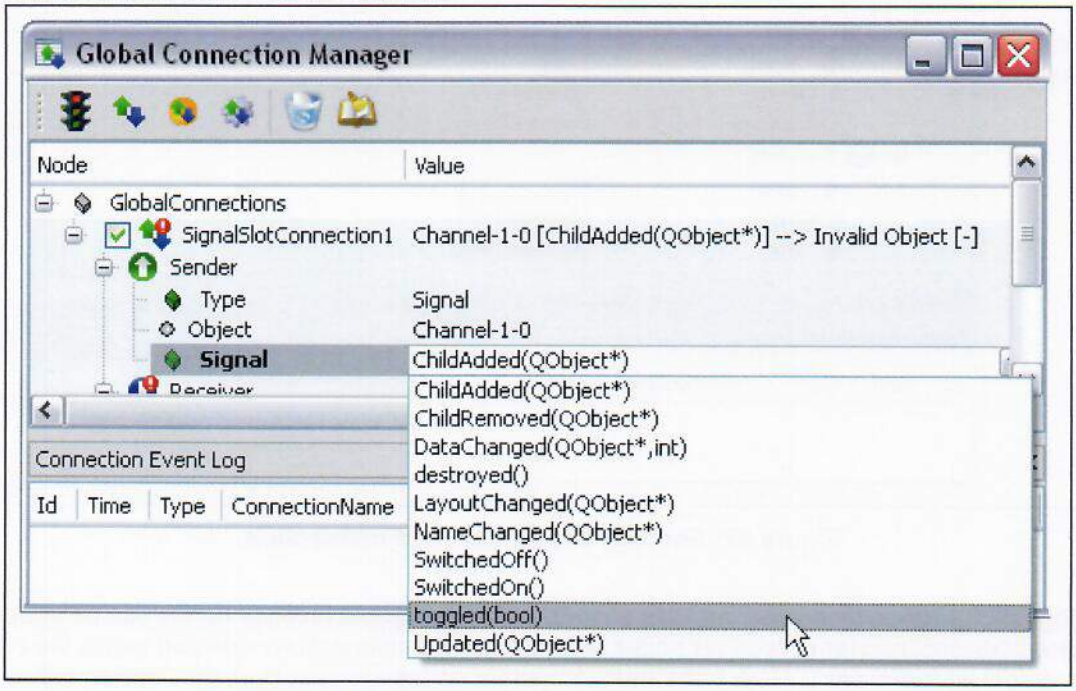


Figure 36: Specifying the connection node signature

If the receiver and the sender is set up and the red exclamation mark on the connection node itself (on the figure below the icon of the node called “SignalSlotConnection1”) is gone, the connection is configured and can be established.

To establish a connection the checkbox, placed in front of the connection, is to be checked and the "Establish connections..." context menu action of the “GlobalConnections” node or the corresponding Tool Button is to be checked. If the action or Tool Button is toggled, all enabled connections will be established resp. un-established.

As soon as a connection is established, a green accept icon is displayed on the corresponding connection node, the displayed text turns to grey and the connection is not editable resp. configurable anymore. If the GCME mode is set to "Establish connections" (the traffic light Tool Button of the toolbar is green), single connections can be established resp. un-established on the fly using the enabled checkbox of a connection.

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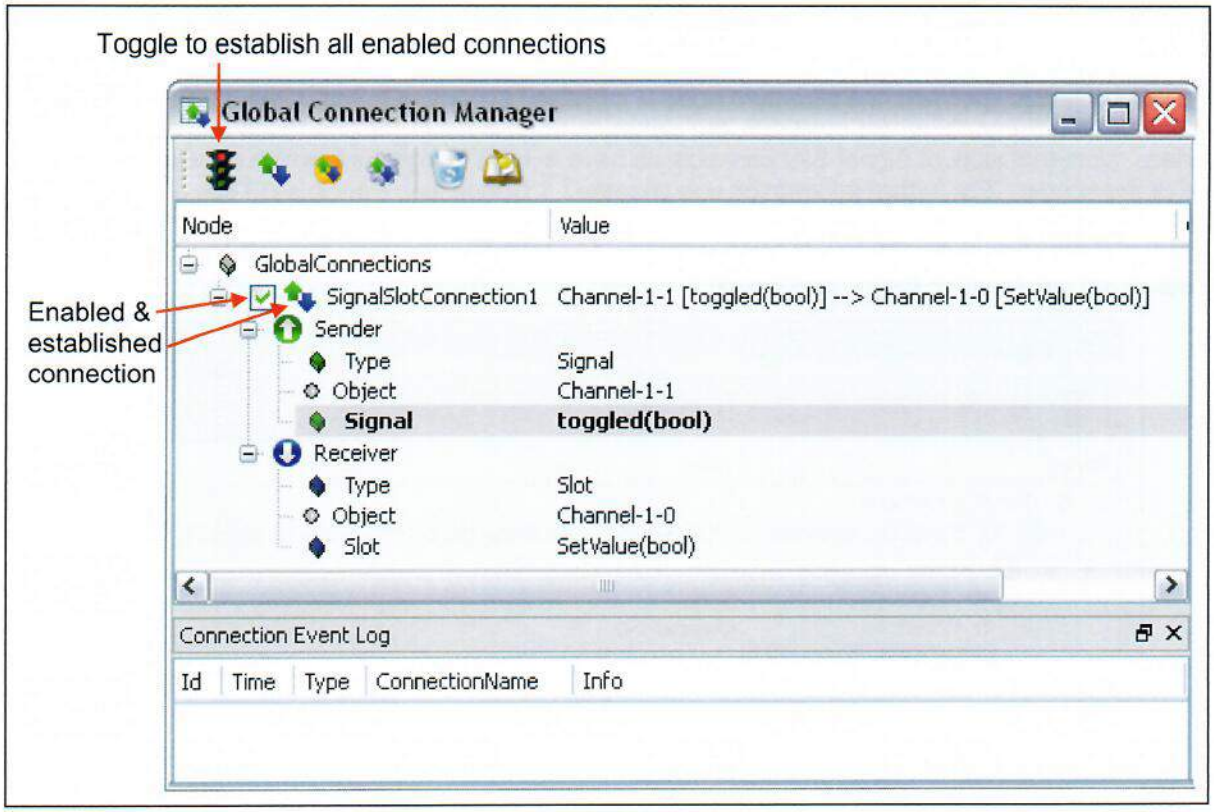


Figure 37: Enabled and established connection

For a Signal-Slot connection either multiple sender nodes or multiple receiver nodes can be created. To create additional sender or receiver nodes right click on the connection node and select the corresponding context menu entry. Note that if multiple sender nodes are specified, the receiver will only provide slots, which match to every sender signal signature.

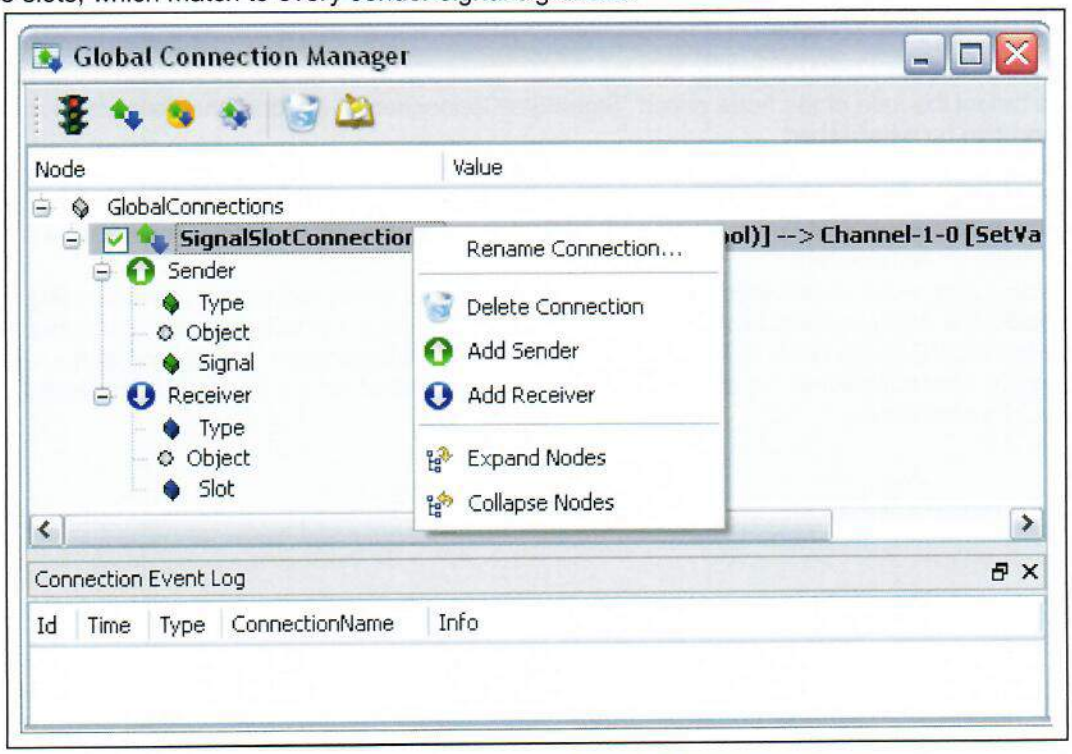


Figure 38: Adding additional sender or receiver nodes

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7.3.2 Property to Property connection configuration

The second type of simple connections is the property to property connection. In contrast to Signal-Slot connections, this type of connection requires an additional trigger node. Thus Property connection nodes have three children:

- Sender: Comparable with the Signal-Slot approach this is the sender configuration node. An object and the sender property to read from are to be specified.
- Receiver: Comparable with the Signal-Slot approach this is the receiver configuration node. An object and the receiver property to write the read sender value to are to be specified
- Trigger: The trigger node is comparable with the sender node of a Signal Slot connection. An object and a signal, which is used as event to synchronise the receiver property to the sender property value are to be specified.

After creation of the Property connection the objects as well as the Signature nodes, are invalid resp. not initialised and have to be configured. As described in the previous section for Signal-Slot configuration, objects are added either via drag and drop or via a double click on the Value column of the corresponding Object node of the Sender, Receiver or Trigger and setting the path manually. The "Type" node of the Sender and Receiver is set to Property. According to this type, the available Signature value will provide all Properties of the specified sender or receiver object. The Trigger type is set to Signal. Thus a signal is to be specified for the Trigger Signature, which is named “Signal”.

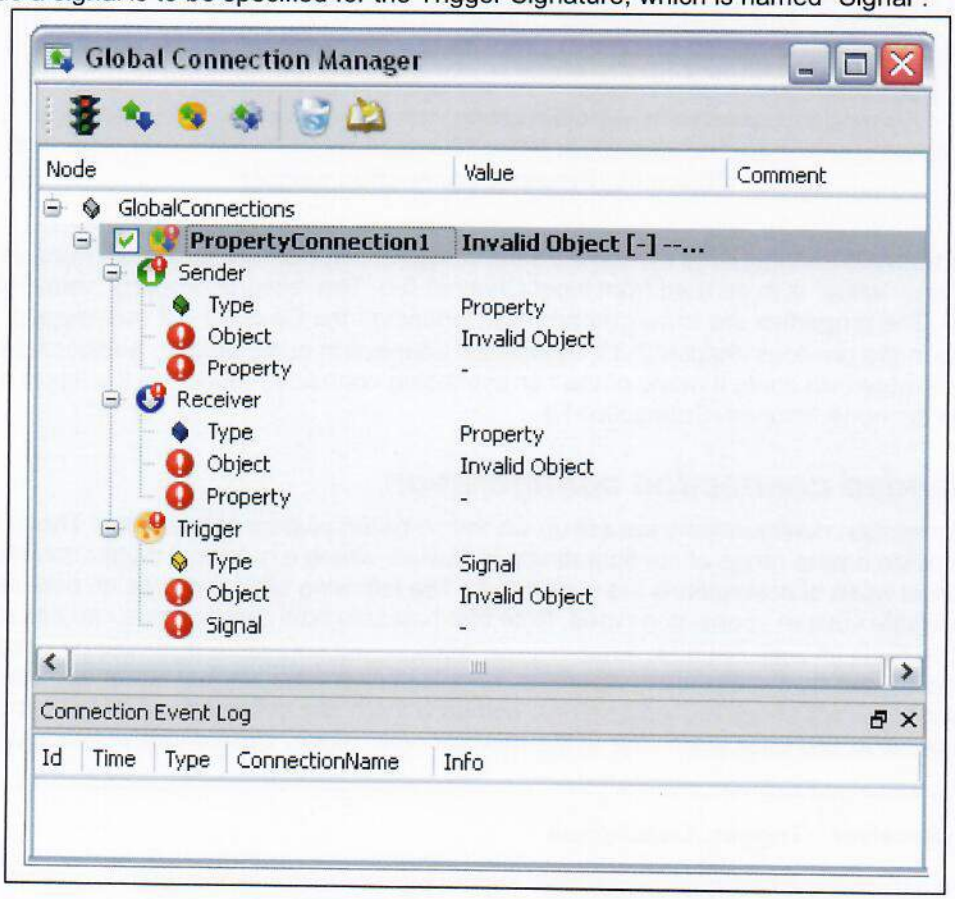


Figure 39: Property connection nodes

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To establish the connection set the connection enabled and activate the establish action of the GlobalConnections node or press the corresponding Tool Button of the toolbar. (For further information see the previous chapter 7.3.1 Signal-Slot connection configuration.)
Comparable to Signal-Slot connections established Property connections are indicated via the icon of the connection, the grey text colour and the not editable nodes.

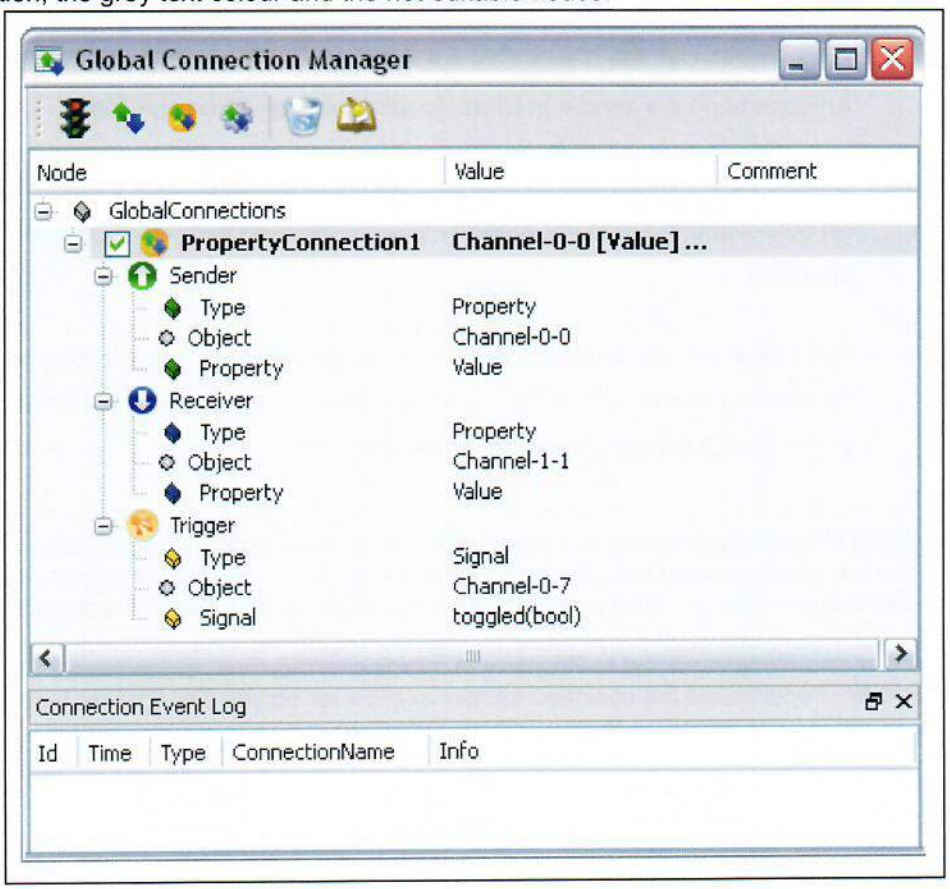


Figure 40: Property connection sample

The sample above is configured to synchronize the values of two discrete nodes or channels. The sender property "value" is to be read from input Channel-0-0. The receiver property "value" to set is of Channel-1-0. The properties are to be synchronised whenever the Channel-0-7 has toggled.
As explained in the previous chapter 7.3.1 Signal-Slot connection configuration, additional receiver nodes can be added via context menu of the corresponding connection node. (In the figure above on right click on the node "PropertyConnection1")

7.4 Extended connection configuration

Extended connection configurations are set up via the so called custom connections. These connection types provide a wide range of configuration possibilities where e.g. logical trigger conditions as well as different types of connections are supported.[1] The following table provides an overview of the different, available custom connection types. Note that basically both simple types can be realized as custom connections as well. Anyhow, whenever possible simple connections should be used to reduce the load caused by the signalling algorithm. Simple connections are just faster and direct, while custom connections will check the input values, compare them and convert them to the reciever or trigger configuration and pass them over to the receiver resp. trigger slot for further checks and method calls.

Sender	Receiver	Trigger	Description

[1] As connections of this type may become very complex and dependin(on the connection) not all types implemented

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Signal	Signal	✗	Signal to Signal connection. The sender signal will emit the receiver signal.
Signal	Signal	✓	Signal to Signal connection with trigger options. The sender signal parameter values are passed to the receiver signal if the trigger accepts the signal values resp. the trigger conditions match. Note that there are various trigger option on which signal the trigger should check the signal parameter (See the following trigger node description for further information)
Signal	Slot	✗	Signal to Slot connection. The sender signal calls the receiver slot. If possible this connection type should be configured as simple signal-slot connection.
Signal	Slot	✓	Signal to Slot connection with trigger options. The sender signal parameter values are passed to the receiver slot if the trigger accepts the signal values resp. the trigger conditions match.
Signal	Property	✗	Signal to Property connection. The receiver property is set to a signal parameter value if the sender signal triggers.
Signal	Property	✓	Signal to Property with trigger options. The receiver property is set to a signal parameter value if the sender signal triggers and the trigger if the trigger accepts the signal values resp. the trigger conditions match.
Slot	Signal	✓	Slot to Signal connection with trigger options. The receiver Signal will be emitted if the trigger accepts the sender slot parameter values resp the trigger conditions match.
Slot	Slot	✓	Slot to Slot connection with trigger options. The receiver slot will be called if the trigger accepts the sender slot parameter values resp the trigger conditions match.
Slot	Property	✓	Slot to Property connection with trigger options. The receiver property will be set if the trigger accepts the sender slot parameter values resp the trigger conditions match.
Property	Signal	✓	Property to Signal connection with trigger options. The receiver Signal will be emitted if the trigger accepts the sender slot property val-

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			ue resp the trigger conditions match.
Property	Slot	✓	Property to Slot connection with trigger options. The receiver slot will be called if the trigger accepts the sender slot property value resp the trigger conditions match.
Property	Property	✓	Property to Property connection with trigger options. The receiver property will be set if the trigger accepts the sender slot property value resp the trigger conditions match. If possible this connection type should be configured as simple property-property connection.

Table 2: Available custom connection types

7.4.1 Sender and Receiver configuration

As listed in table Table 2: Available custom connection types, the sender and receiver nodes can be configured as Signal, Slot or even Property. In contrast to simple connections the parameter types on receiver side are not dependant to the sender signature. According to this, slot signatures can differ to the connected signal signature.

Example: A signal called ValueChanged(int), is used as sender Signal. If a simple connection is set up, slots holding a bool or nothing in the parameter list can be connected to this signal. In custom connection case each slot, irrespective of its signature can be connected. E.g. setValue(uint, int).

Depending on the type of the sender and receiver signature, additional child nodes will appear below the signature.

- If the type is **Signal** or **Slot**, a Parameter node for each parameter of the signal or slot is created. (Note that on sender side only slots will provide this functionality as on sender side signals can only be received).

- If the type is **Property**, a Property type node is created. Note that child nodes will only be created on receiver side as on send side the property will be used as data source.

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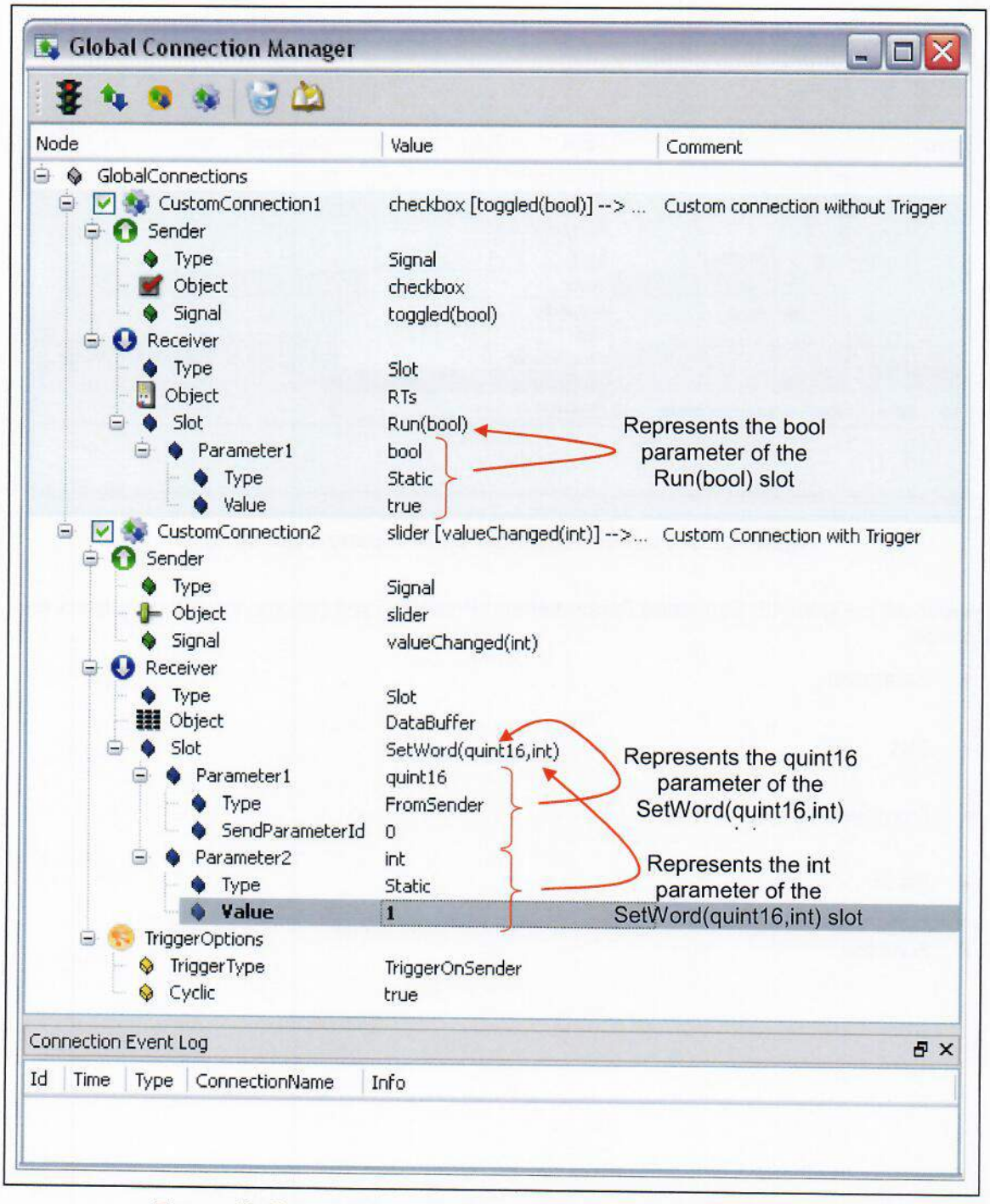


Figure 41: Parameter nodes for custom connection signatures

Each Parameter or Property-Type node provides a Type child node, where the value, the parameter or property is to be populated with, is defined. On double click on the Value column of the "Type" node, a combo box opens to set the type.

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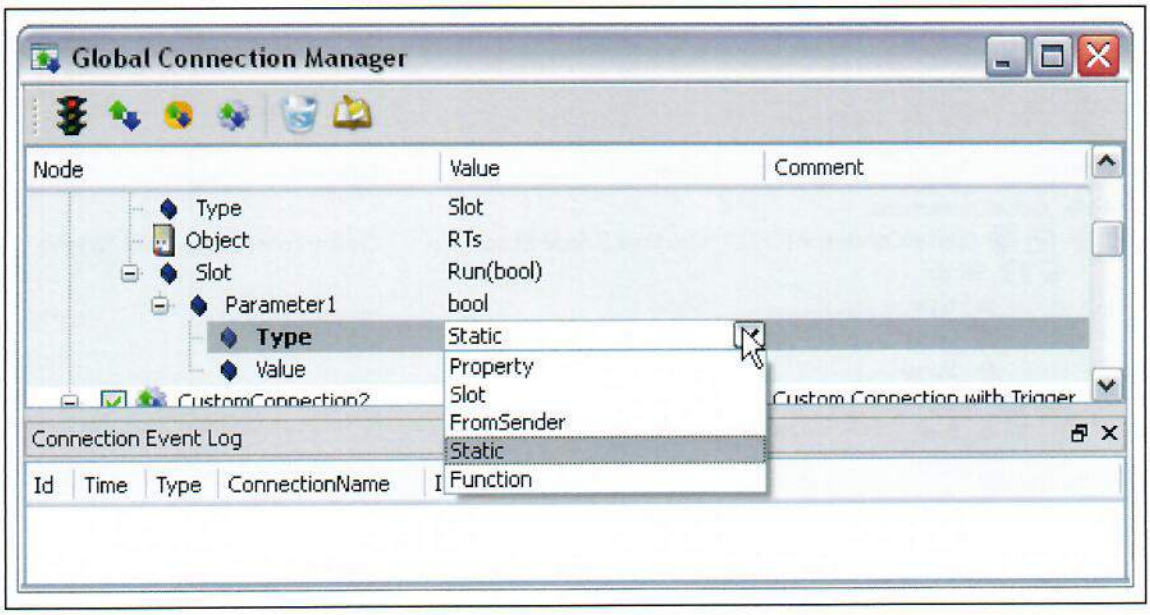


Figure 42: Supported Parameter and Property-Type options

As displayed in Figure 42: Supported Parameter and Property-Type options, the following types are supported:

- Parameter
- Slot
- From Sender
- Static
- Function

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7.4.1.1 Property Parameter Type

On "Property" type selection, an object and the property of which is read from is to be specified. To specify an object and the corresponding property, the standard configuration procedure via drag and drop or path specification (explained in section 7.3.1 Signal-Slot connection configuration) is provided. The Parameter of the signature will be set according to the read property value of the specified object. Note that only properties, which can be converted to the parameter node type, can be used as value source property.

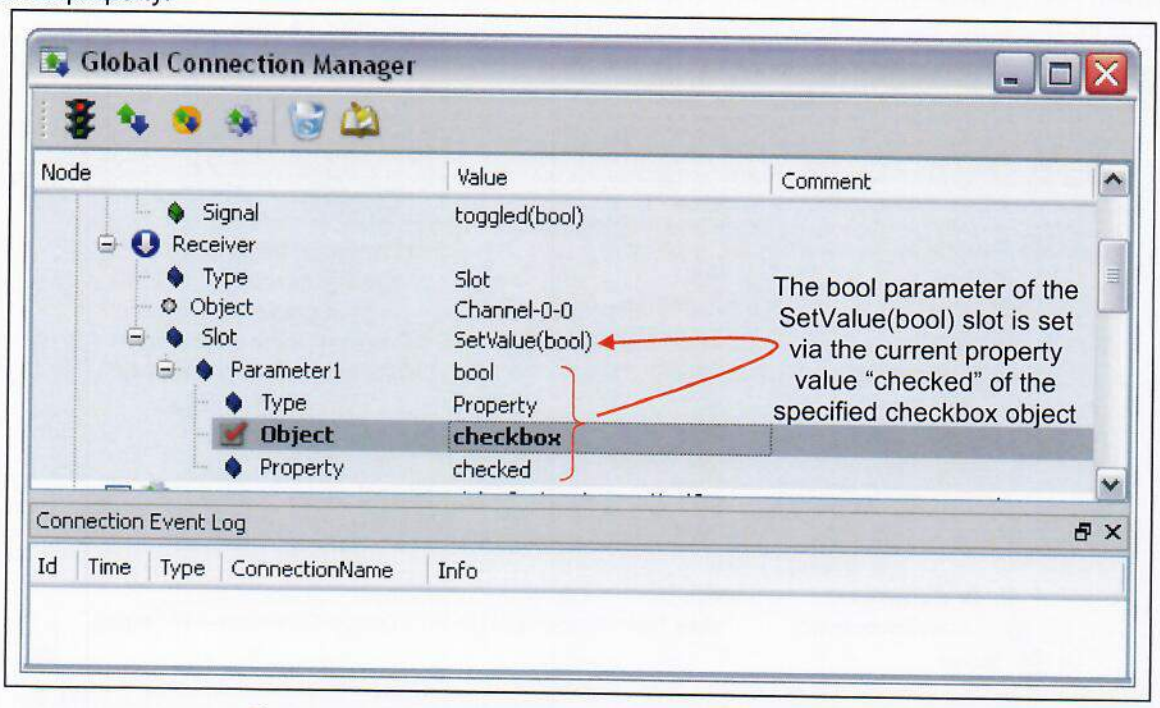


Figure 43: Parameter value populated via a Property

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7.4.1.2 Slot Parameter Type

On "Slot" type selection, an object and a slot of which the return type should be used as value source is to be specified. To specify an object and the corresponding slot, the standard configuration procedure via drag and drop or path specification (explained in section 7.3.1 Signal-Slot connection configuration) is provided. The Parameter of the signature will be set according to the slot return value of the specified object. Note that only slots which return a value can be used as value source slot. If the specified slot, of which the return value is used to populate a parameter of the signature, holds parameters in its signature, the slot node will hold sub nodes for each parameter as well.

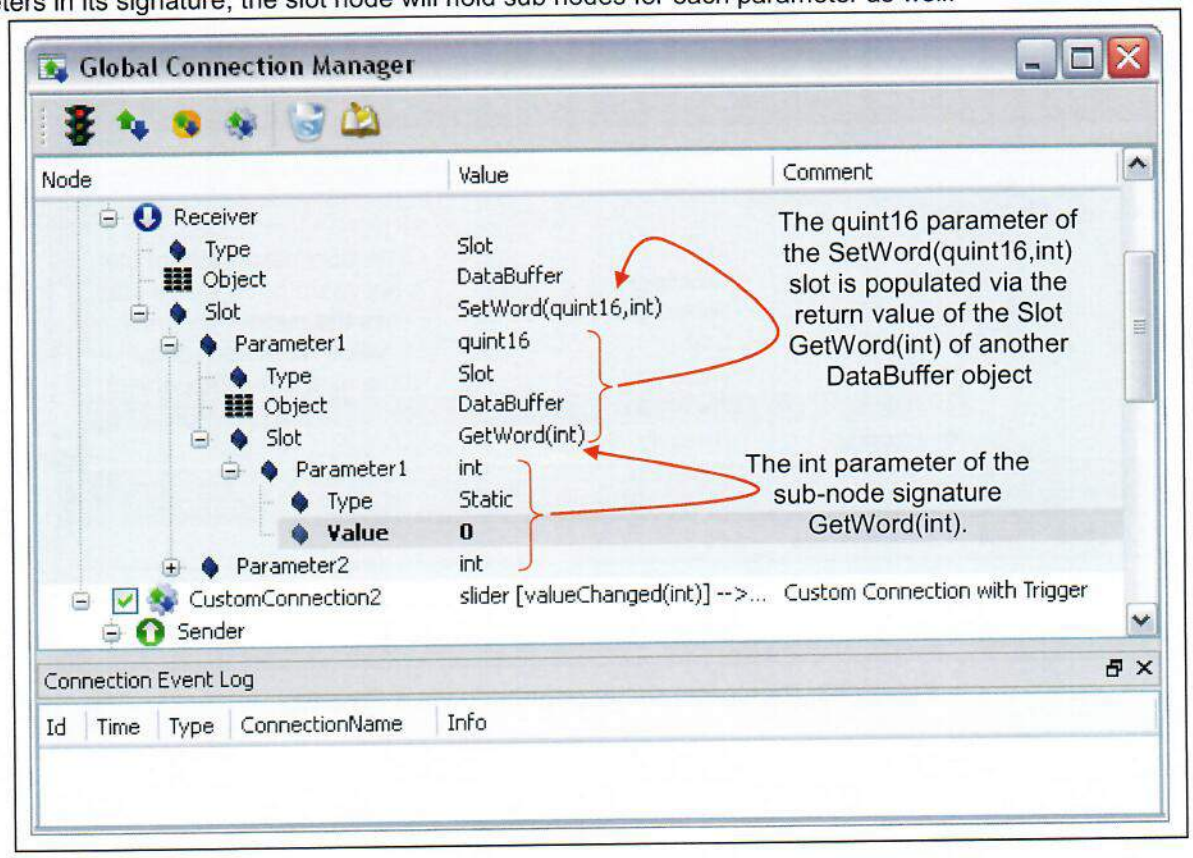


Figure 44: Parameter value populated via a Slot return value

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7.4.1.3 From Sender Parameter Type

On “FromSender” type selection, the parameter of the sender signature is to be specified. A sender parameter of the signature is just specified by its id. Thus, the first parameter is indicated via the value 0, the second parameter by 1 and so on. If a Property or a slot is specified as sender node type, the Property Id should be set to 0.

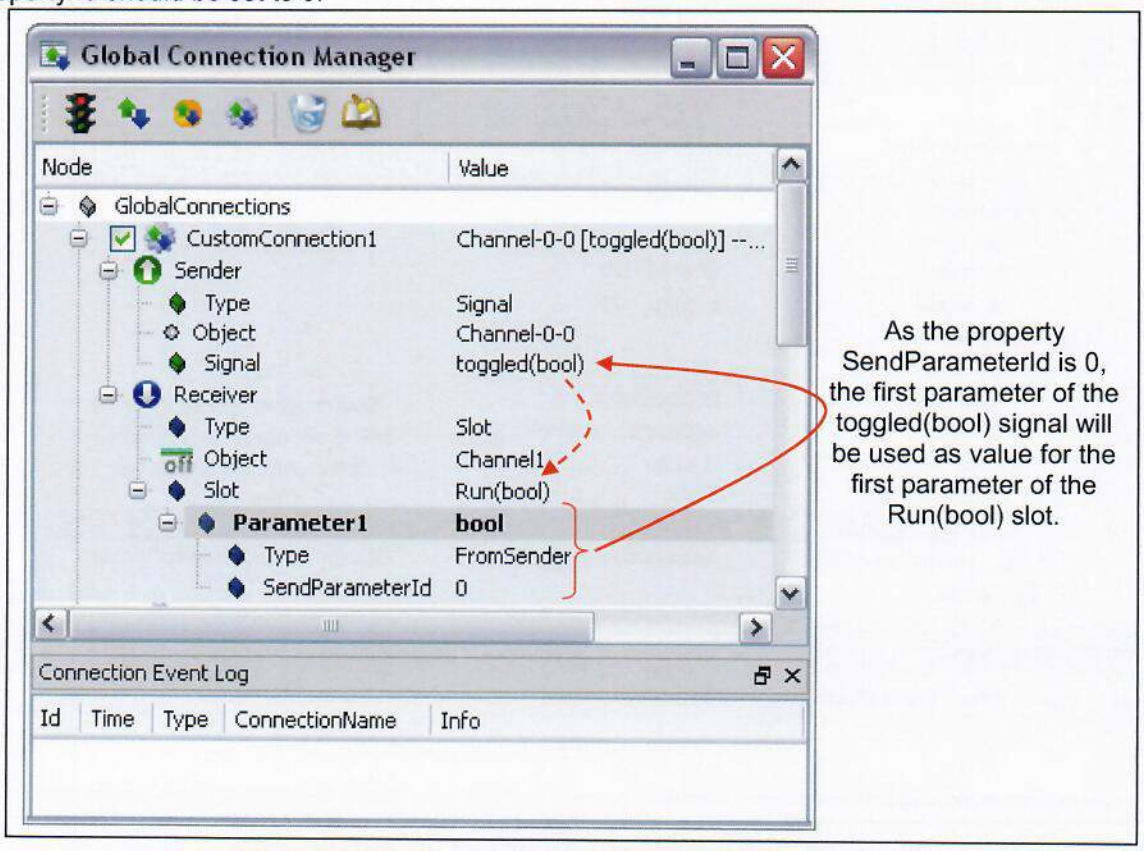


Figure 45: Parameter value populated via a sender Parameter

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7.4.1.4 Static Parameter Type

On “Static” type selection, a static value is to be specified. The Parameter value is set to the specified static value.

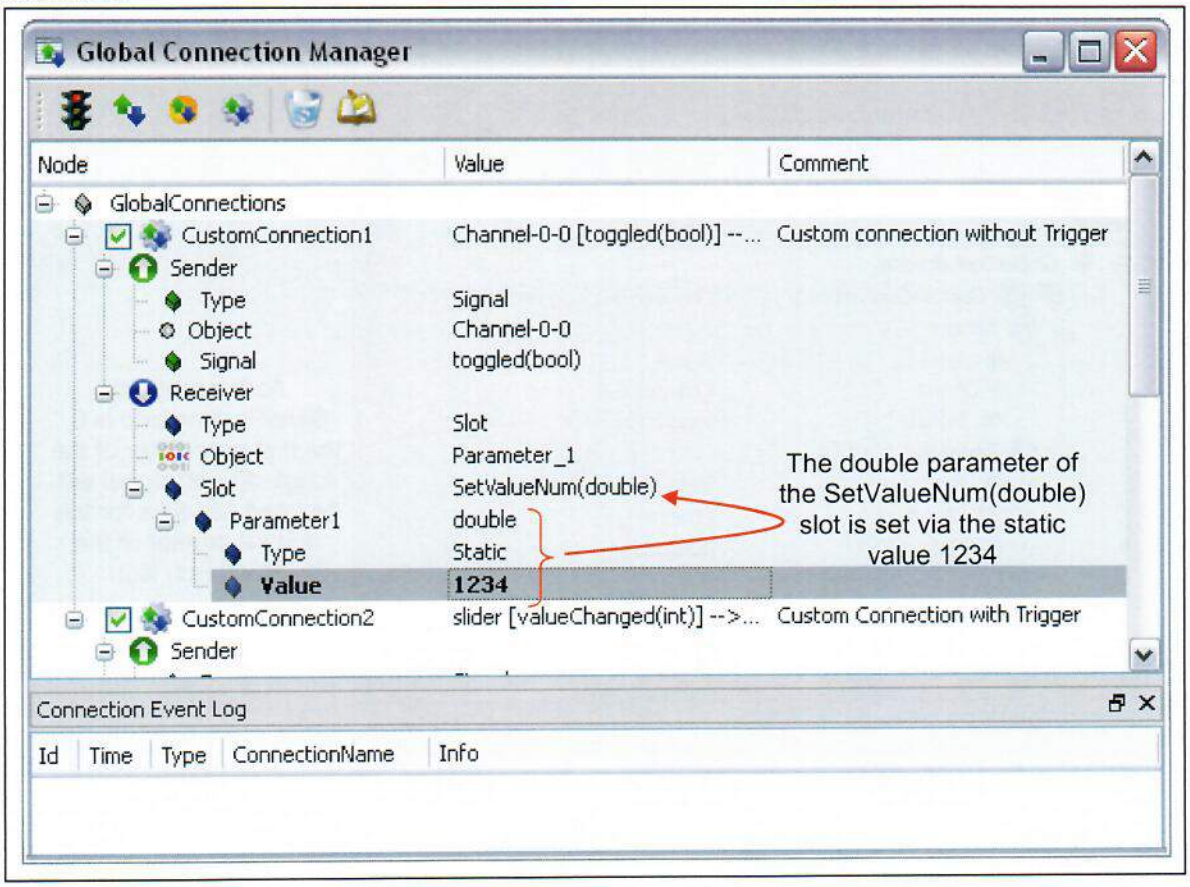


Figure 46: Parameter value populated via a static value

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7.4.1.5 Function Parameter Type

On "Function" type selection, a function is used to set a parameter of the signature. A function holds up to 10 function entries. Each function entry can be populated via one of the signature types Parameter, Slot, FromSender, Static or Function as well. Function entries are named V1 to V10 and are to be referred in the function formula, which is defined in the "Value" column of the Function node.

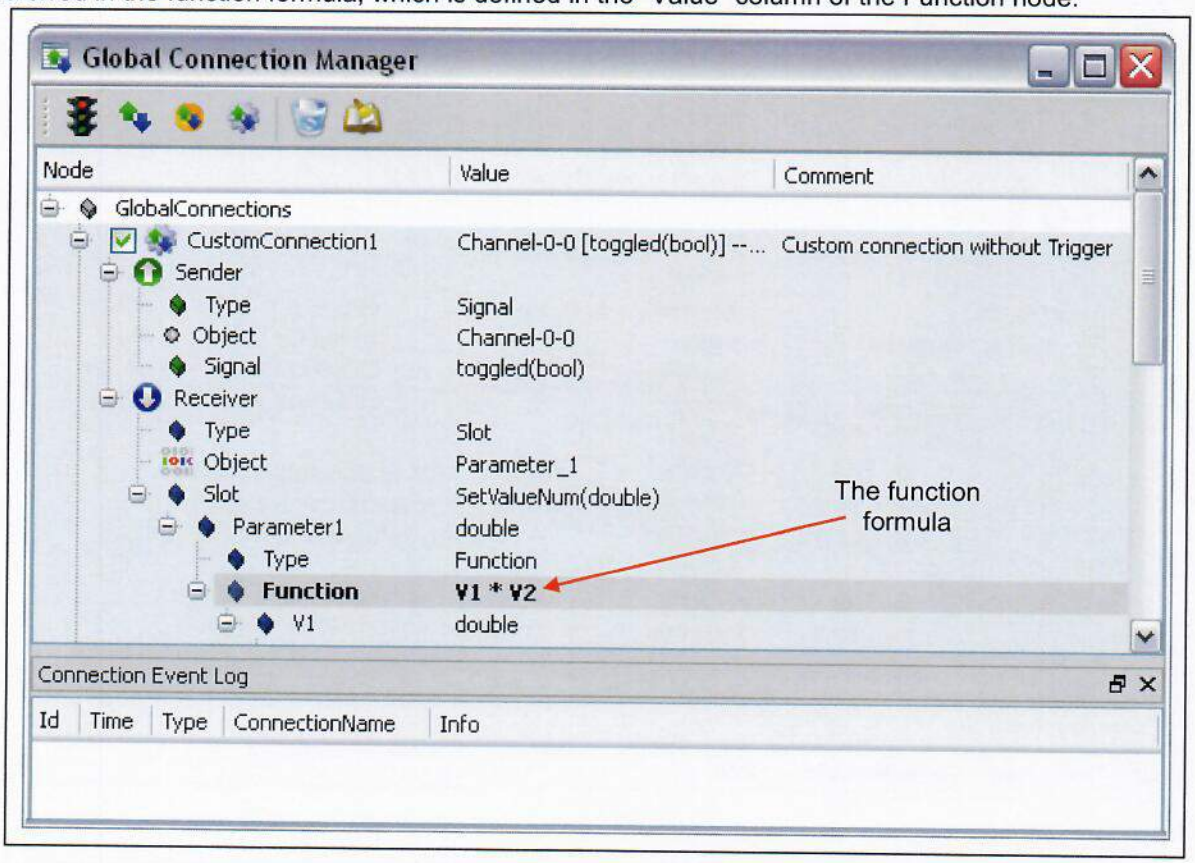


Figure 47: Setting the function formula

To create a function entry, right click on the Function node and select the "Add Function Entry" context menu entry. To delete a function entry, right click on the function entry node and select "Delete node". Note: If a function entry is deleted all following entries will be renamed according to their new entry position.

> *Example: The function holds three function entry nodes V1, V2 and V3. The function entry node V2 is deleted by the user. Subsequently the Node V3 is renamed to V2. If necessary, the function formula is to be adapted by the user.*

Per default, the function entry node type is set to the referred parameter type. To change the Type of a function entry, double click on the "Value" column of the function entry node and switch the type accordingly. The function will calculate the value according to the given formula and function entry types. Subsequently, the result is converted and written to the referred parameter value type of the signature.

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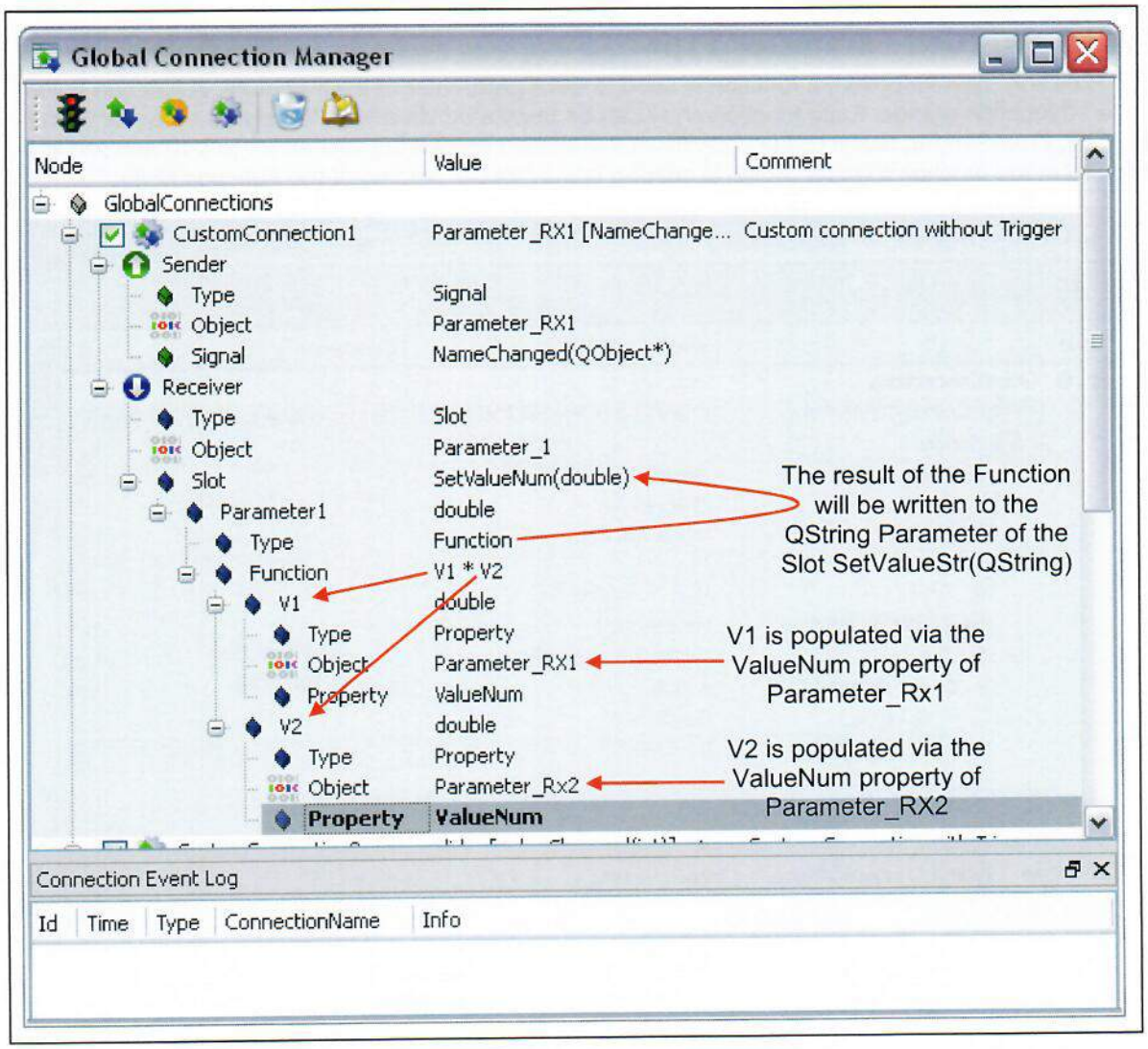


Figure 48: Parameter value populated via a function

7.4.2 Trigger configuration

The trigger node is used to define the trigger condition which defines the situation in which the sender values should be written to the receiver resp. the receiver should be called. As listed in Table 2: Available custom connection types, connections of which the sender node is of type signal can have an optional trigger node. In contrast to this, the trigger node is mandatory for connections with sender of type Property or Slot. this is just because an event resp. signal is to be provided to trigger the connection.

In contrast to simple connections the trigger is not only configured via the trigger object and the trigger signal, In addition to this, the signal source as well as some optional trigger conditions and modes can be set up.

To create a trigger node right click on the Custom connection node and select the “Add trigger” menu entry. To delete a Trigger, right click on the Trigger node called “TriggerOptions” and select the "Delete Node" menu entry.

After Trigger creation the trigger will hold two sub nodes which are to be used to configure the basic trigger behaviour.

- Trigger Type

  The Trigger Type specifies the trigger signal source. The trigger source is a signal of an object, where the object and the signal can be:

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- TriggerOnSender: The specified sender object and signal is used as trigger option. (Only for sender nodes of type Signal.)
- TriggerOnTimer: A Timer with a user definable interval is used as trigger option
- TriggerOnCustomObject: A custom object and signal is used as trigger option. If this option is selected an object and a signature node will appear. The configuration of these two nodes is just the same as for the sender node, described in section 7.3.1 Signal-Slot connection configuration.

- Cyclic

Per default the Cyclic option is set to true. If the trigger should only trigger a certain amount of times, set this option to false. A new node will appear where the amount of trigger cycles has to be set.

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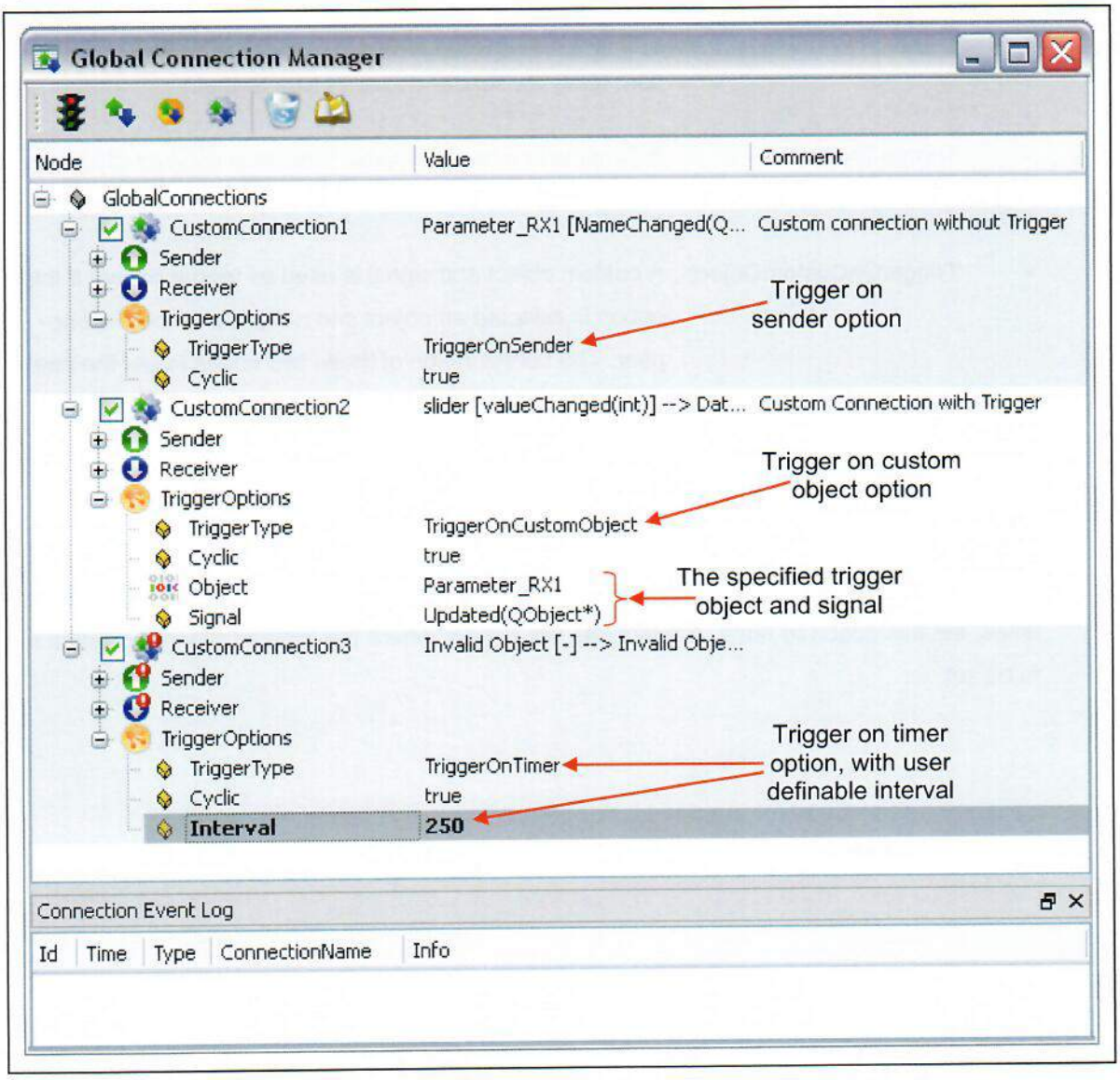


Figure 49: Available Trigger Types

In addition to the basic configuration a trigger condition to specify the situation, in which the connection should be triggered, can be created. To create a trigger condition, right click on the “TriggerOptions” node and select the “Create trigger function” menu entry. To delete the trigger condition, right click on the trigger condition node named “TriggerCondition” and select the “Delete Node” menu entry. The trigger condition is configured in the same way as Functions of Parameters described in chapter 7.4.1.5

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Function Parameter Type. The difference between Functions and Trigger conditions is that the return value of a trigger condition is always interpreted as Boolean value. A result unequal to 0 is interpreted as true; the value 0 is interpreted as false. Thus Trigger condition formulas should always return a Boolean term as result (e.g. "(V1 - V2) > 100").

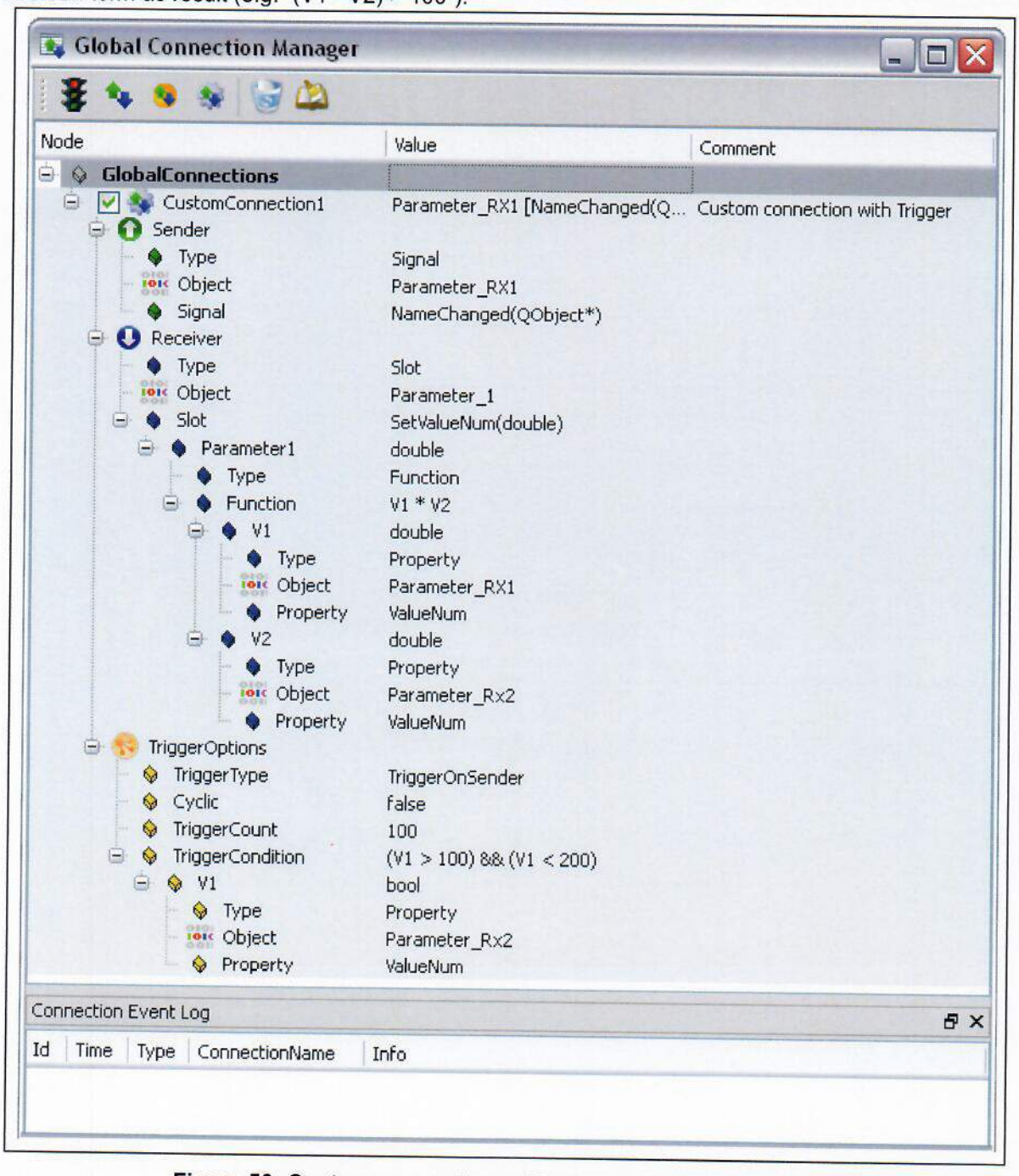


Figure 50: Custom connection with trigger condition example

The example figure above displays a sample setup of a custom connection with an optional trigger condition. The connection logic is as follows:
The signal Updated(QObject*) of Parameter_RX1 is used as sender signal.
The Trigger is specified to check the trigger condition on this signal (The "TriggerType" is set to "TriggerOnSender")
The "Cyclic" option is set to false and the "TriggerCount" to 100. After 100 times, the trigger condition has been accepted, nothing will be accepted anymore.
The "TriggerCondition" checks the property value "ValueNum" of the Object Parameter_RX2. If the read property value is in the range between 100 and 200 the condition is accepted.

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If the trigger accepts the trigger condition, the receiver is called, where the Property "ValueNum" of the Parameter "Paramater_1" is to be written. The value is calculated via a function, where the result of the function entry nodes V1 and V2 should be used as new value.
The value for V1 is specified to be a double value and is read from Parameter_RX1, of which the Property "ValueNum" should be used.
The value for V2 is specified to be a double value and is read from Parameter_RX2, of which the Property "ValueNum" should be used.

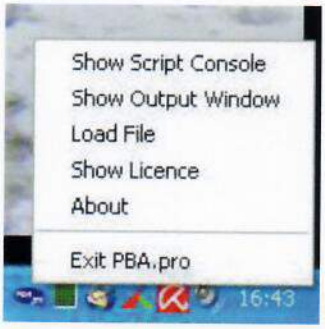
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8 PBA.pro Runtime Mode

The PBA.pro Runtime Mode is a licensing option, which allows running Scripts and Designer Panels, but do not require any other PBA.pro User Interface. This mode is used for Test Applications, which do not require the creation of any PBA.pro setups. For Creating Setups and Designer Panels, you require a full Licence.
For testing the created setups, scripts and panels you can start the PBA.pro via the command line argument –rtm to force the PBA.pro to Runtime Mode.
You can use one of the following File types as a Runtime File

*.tcl, *.py	Python or TCL Script. The scripts have to create own Designer Panels to have anything visible to the user.
*.tmpl	Designer Panel Template
*.ppro	PBA.pro Project Files. Note: To use Project Files after the load, you should configure either a Auto-Run script in the Script Manager or a Default Screen Layout loading a Designer Panel. Otherwise nothing may be visible to the user.

The Files can either be loaded via the Command Line. If no file is specified by the command line the File Selector is shown at startup (see Chapter 4.1.2 Loading Files via the File Selector).
If started in Runtime Mode, the PBA.pro indicates its running status via a System Tray Icon, and no other User Interface than Designer Panels can be used.
A right click to the System Tray Icon shows the following menu:



A double Click to the System Tray Icon, shows the File Selector dialog.

The Icon sometimes will show some hints, you can modify the displayed hints via the Settings PBA.pro\RuntimeMode.

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