Рачунарска техника и рачунарске комуникације
Аутомобилске мреже

Вежба 1 – Преглед *CANoe* алата

Циљеви вежбе:

- Упознавање са *CAN-oe* алатом
- Креирање *CAN-oe* конфигурације

1 *CANoe* алат

1.1 Увод

CANoe алат је напредни алат за развој, тестирање и анализу како појединачних електронских управљачких јединица, тако и комплетне комуникационе мреже у аутомобилу. Овим алатом могуће је заокружити комплетан процес од планирања мреже до тестова на системском нивоу. *CANoe* алат је изграђен око функционалности за подешавање и праћење комуникације у аутомобилу преко разноврсних магистрала (LIN, CAN, FlexRay, Ethernet …).

Основне предности овог алата су:

- Један заједнички алат и за тестирање и за развој
- Лако аутоматско тестирање
- Могућност симулирања и тестирања електронских управљачких јединица преко дијагностике
- Откривање и исправљање грешака у раним фазама развоја софтвера
- Интуитивно графичко окружење и евалуација резултата базирана на тексту

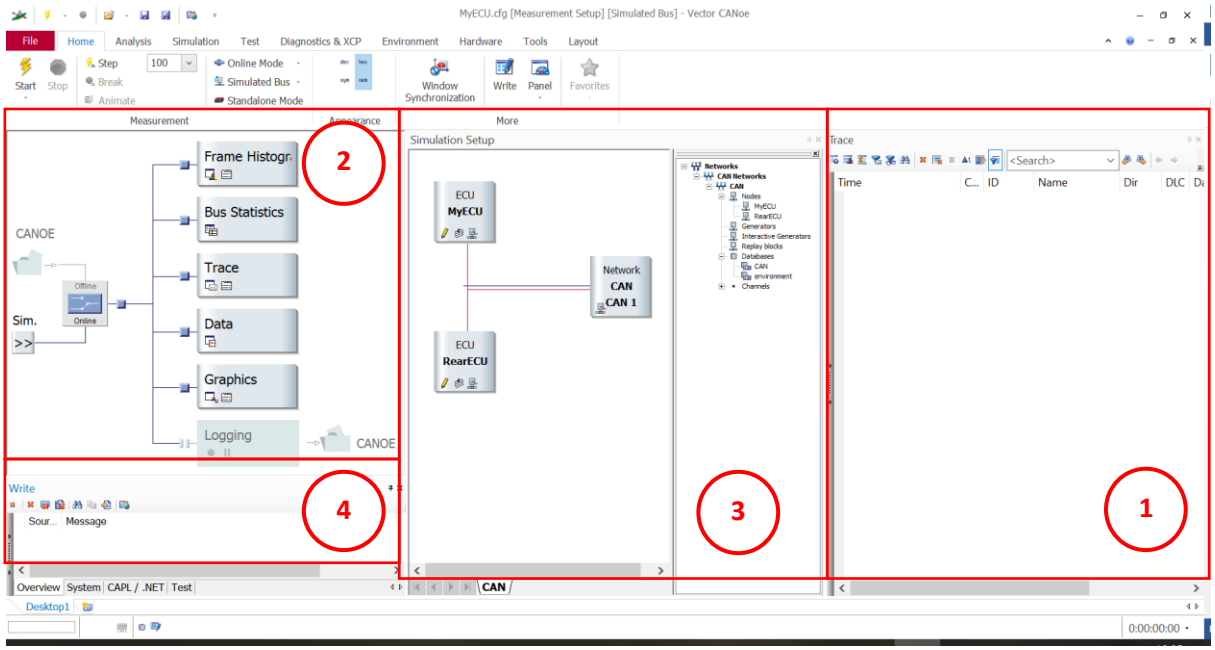
Корисници *CANoe*-а могу анализирати више магистрала као и цео систем на свом столу. У ту сврху користе се неки од наведених прозора (Слика 1-1):

1. **Trace Window** – За посматрање свих активности на магистралама као што су поруке (енг. messages) или оквир грешке (енг. *error frames*). Постоји могућност да се за сваку индивидуалну поруку прикаже вредност сигнала.
2. **Measurement Setup** – Графички приказ поставке симулираног окружења. Могућност за подешавање улазних података као и начина за обраду излаза.
3. **Simulation Setup** – Графички приказ симулиране мреже и битних параметара
4. **Write Window** – Приказ текстуалног излаза из програма – може да садржи грешке, упозорења, као и стандардни излаз за штампање корисничких порука

Поред основних прозора могуће је по потреби активирати више додатних прозора:

- **Graphics Window** – Графички приказ вредности послатих порука и дијагностичких захтева у реалном времену. Нпр. могуће је издвојити и графички представити вредност сигнала који садржи вредност температуре у зависности од временске осе.

- **Statistics Window** – Приказ корисне статистике мрежа и чворова. Као нпр. оптерећење магистрале, контролисање стања, бројач грешака...
- **Data Window** – Приказ изабраних нумеричких података.
- **State Tracker** – Приказивање стања и бита сигнала.

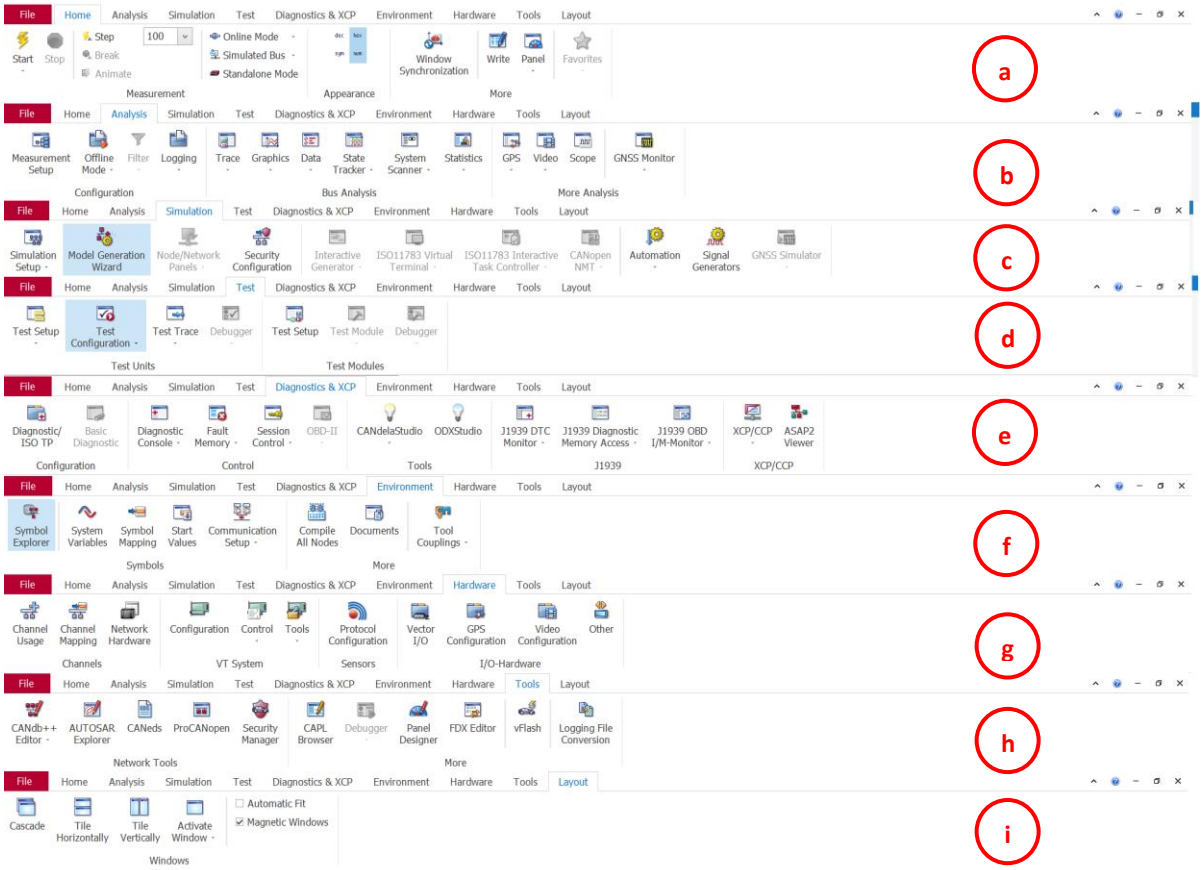


Слика 1-1 Изглед главних прозора у оквиру CANoe алата

CANoe је богат опцијама и могуће их је активирати из језичака (Слика 1-2):

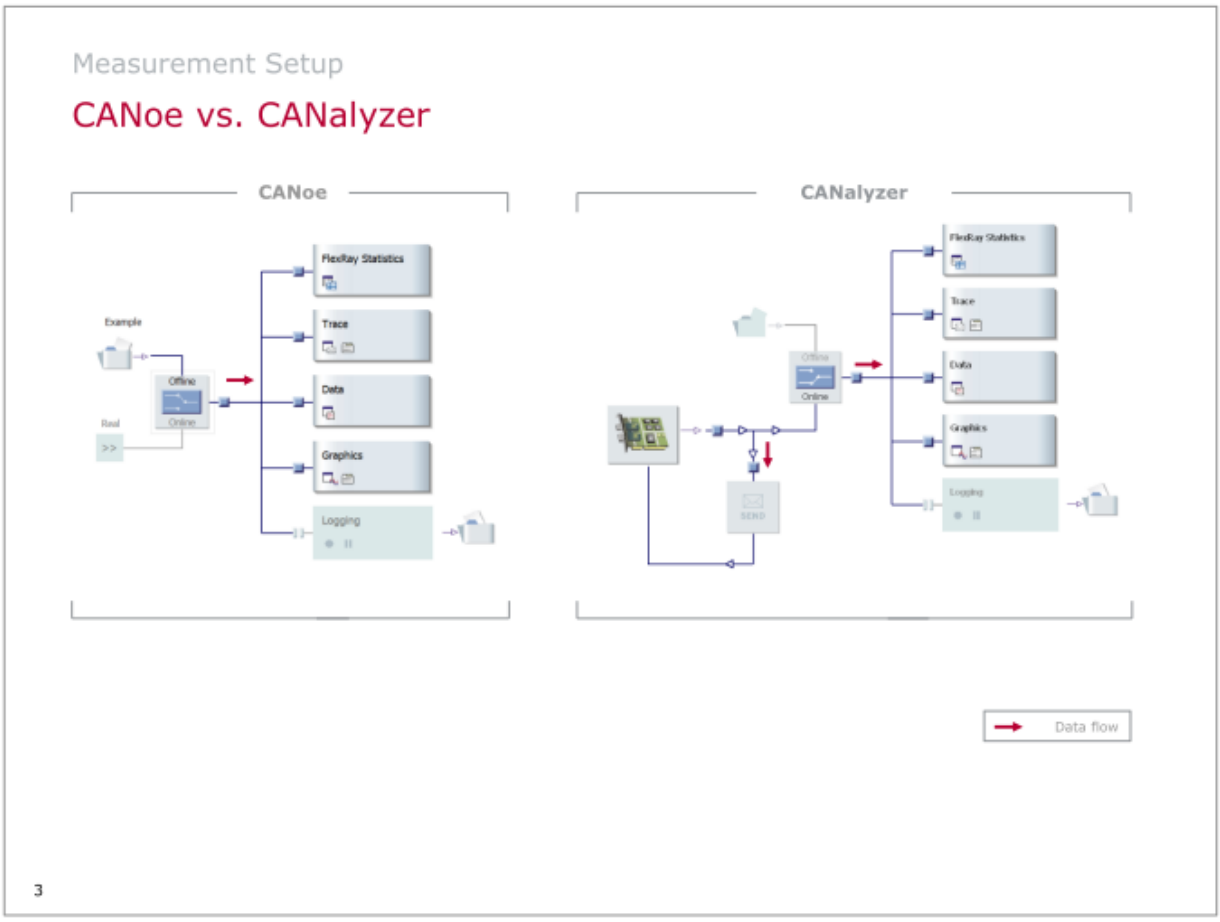
a) **Home** - Опције за покретање и подешавање режима рада (симулација/стварна мерења), прегледа панела и мерних прозора
b) **Analysis** – Могућност покретања додатних прозора за анализу измерених података
c) **Simulation** – Подешавање симулираног окружења и генерисаних сигнала
d) **Test** – Могућност подешавања тестова
e) **Diagnostic & XCP** – Подешавање калибрације и дијагностике
f) **Environment** – Подешавање окружења и системских променљивих
g) **Hardware** – Поставка повезаних физичких уређаја који комуницирају са симулираним окружењем, могућност подешавања уређаја за тестирање у физичкој петљи
h) **Tools** – Скуп алата увезаних са *CANoe* са којима је могуће прегледати базе података које описују комуникацију, писати код за управљање симулацијом, или креирати панеле
i) **Layout** – Могућност манипулације прозорима и просторног уређења истих

Кроз ову вежбу, проћи ћемо кроз најважније целине алата и упознати се са радом у *offline* и *online* моду. У наредним вежбама уводићемо у причу нове протоколе и њихово коришћење у овом алату.



Слика 1-2 Преглед свих језичака у CANoe алату и припадајућих опција

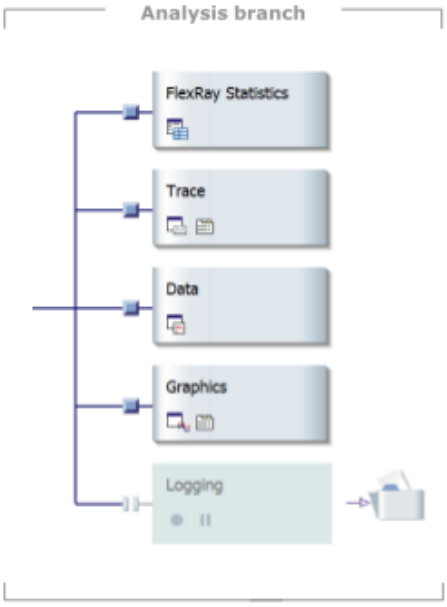
1.2 Measurement Setup



Основна разлика између ових алата ја да *CANoe* за разлику од CANanalizer подржава симулацију са више чворова. Ако је потребно симулирање целог дистрибуираног система који је састављен од више чворова који размењују податке између себе у једном *CAN* окружењу, онда је то једино могуће одрадити помоћу *CANoe*-а. *CANanalyzer* подржава симулирање само једног чвора и због тога за дистрибуирани систем са више чворова могуће је симулрирати само један чвор, а остатак чворова мора бити физички повезан.

Measurement Setup

Analysis Branch



- Indicates which analysis windows are available in a configuration:
  - Trace, Data, Graphics windows
  - FlexRay Statistics Monitor, FlexRay Cluster Monitor
  - State Tracker (only in CANoe)
  - Logging Block
- Lets users reduce data via blue hotspots
- Lets users link CAPL programs to analysis

4

The Measurement Setup represents the flow of data from its source on the left to the analysis windows on the right. The two sides are interconnected via the analysis branch with its hotspots.

Receiving data:

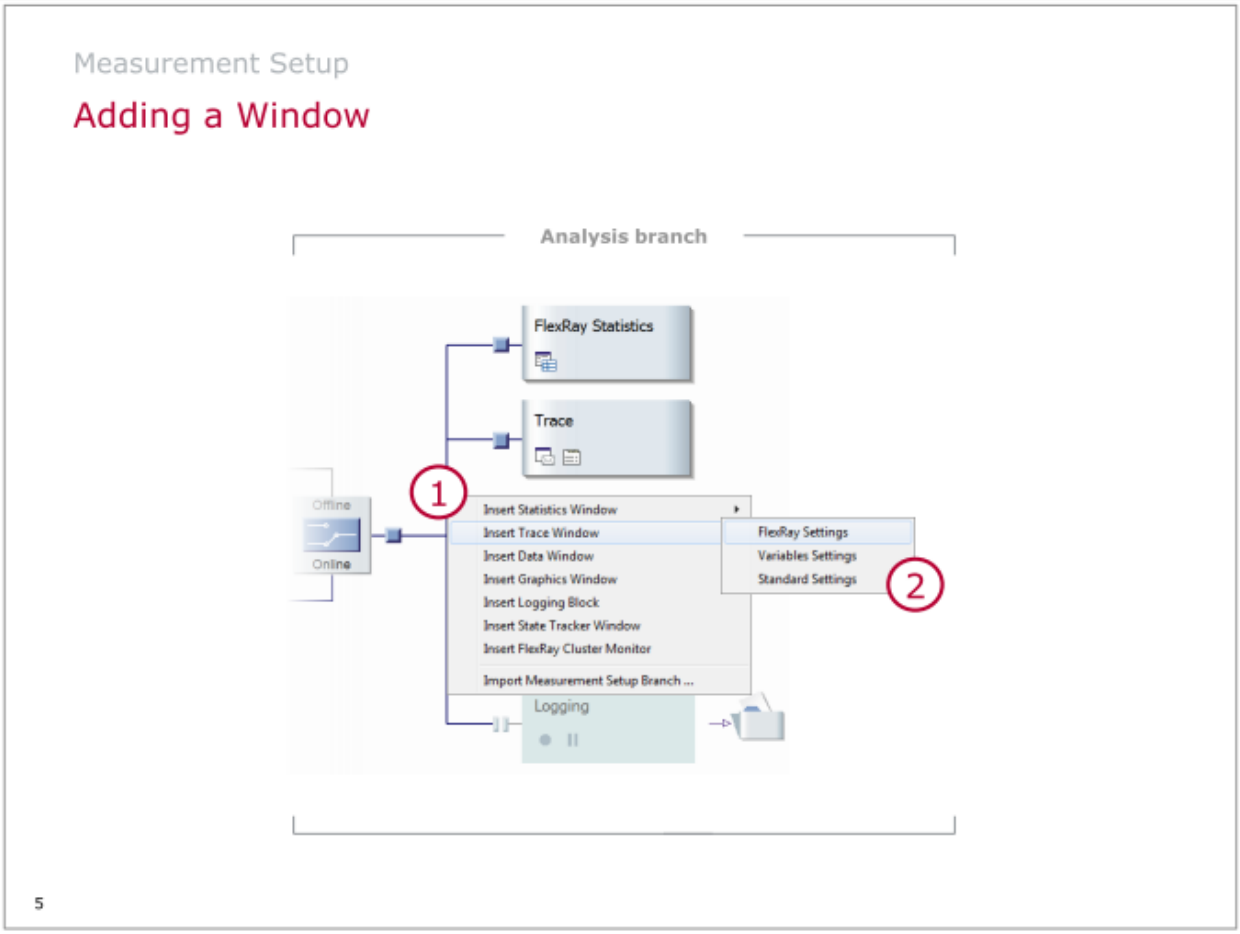
- Online: The data source is either a real bus or else a partial or fully simulated bus
- Offline: The data source is a previously generated log file

Distributing and processing data:

- Filters, triggers and CAPL programs may be inserted at the hotspots
- Functions that are not needed are deactivated by disconnecting them

Displaying and logging data:

- Analyzing messages, signals, statistics, etc.
- Logging, possibly only if trigger conditions are satisfied



Other windows may be added in the analysis branch of the Measurement Setup. This lets users adapt the configuration to the specific application situation.

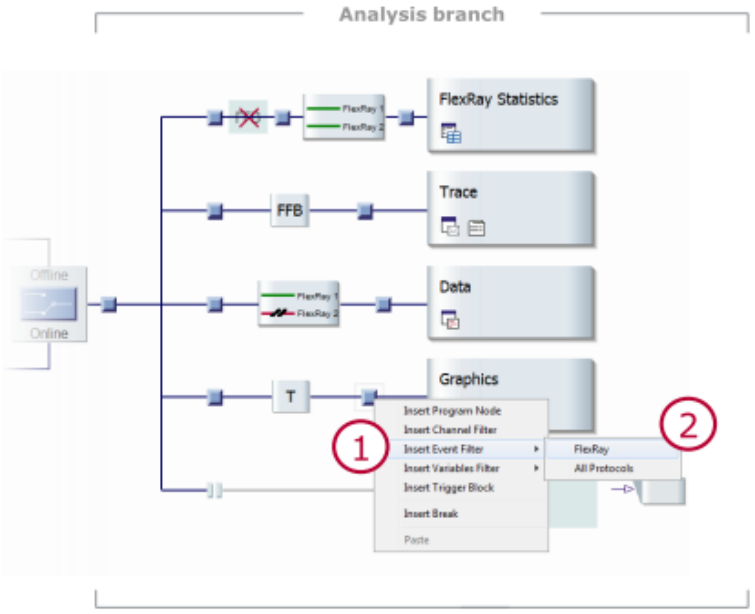
Adding a window

(1) Right-click the blue main branch.

(2) From the shortcut menu, select the desired window and add it to the analysis branch with a left mouse click.

Measurement Setup

Filter and Trigger Blocks



6

You can use the blue hotspots to add filter and trigger blocks to the analysis branch. Filter and trigger blocks serve to reduce the volume of data. They can be placed before any measurement or analysis window.

Adding a filter or trigger block:

(1) Right-click a blue hotspot.

(2) From the shortcut menu, select the desired block and add it to the analysis branch with a left mouse click.

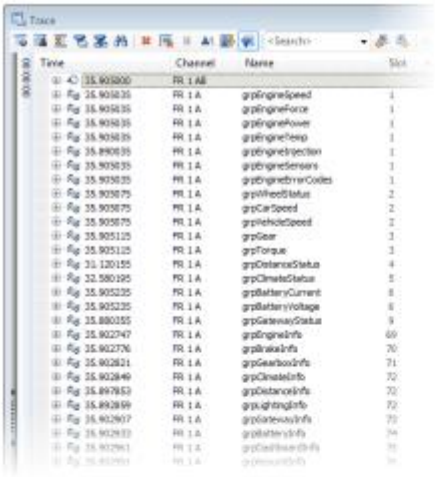
Available filter and trigger blocks:

- Channel filter: Enables passing or blocking of all information that is received on an application channel.
- FlexRay filter block: Filter for FlexRay events (frames, PDUs, nodes, bus events).
- Trigger block: Enables filtering of information when a desired event occurs.
- Variables filter: Filter for system and environment variables.

1.3 Trace Window

Trace Window

Properties



- Analysis window for displaying bus activities and events:
  - Messages, PDUs, signals
  - POC states of the FlexRay communication controller
  - System and environment variables
  - Error events and status messages
  - Messages of the transport protocol
  - Messages of diagnostic services

 Detailed view

 Statistics view

 Difference view

 Predefined filter

 Analysis filter

 Search

 Clear Trace contents

 Hide transparent contents

 Stop view updating

 Switch time stamp

 Switch output mode

 Activate/deactivate analysis filter

 Position of Trace Explorer

 Additional output area

 Configuration for current Trace

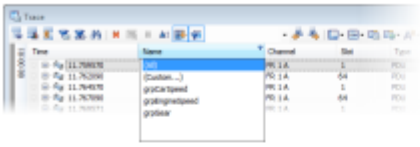
 Configuration for all Trace

 Font size in current Trace

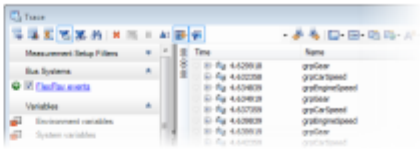
Trace Window

Filter Options

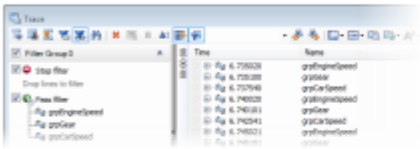
- Columns filter



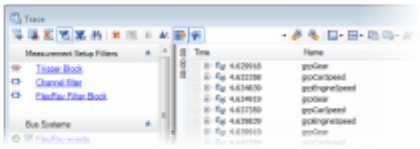
- Predefined filter



- Analysis filter



- Filters in the Measurement Setup*

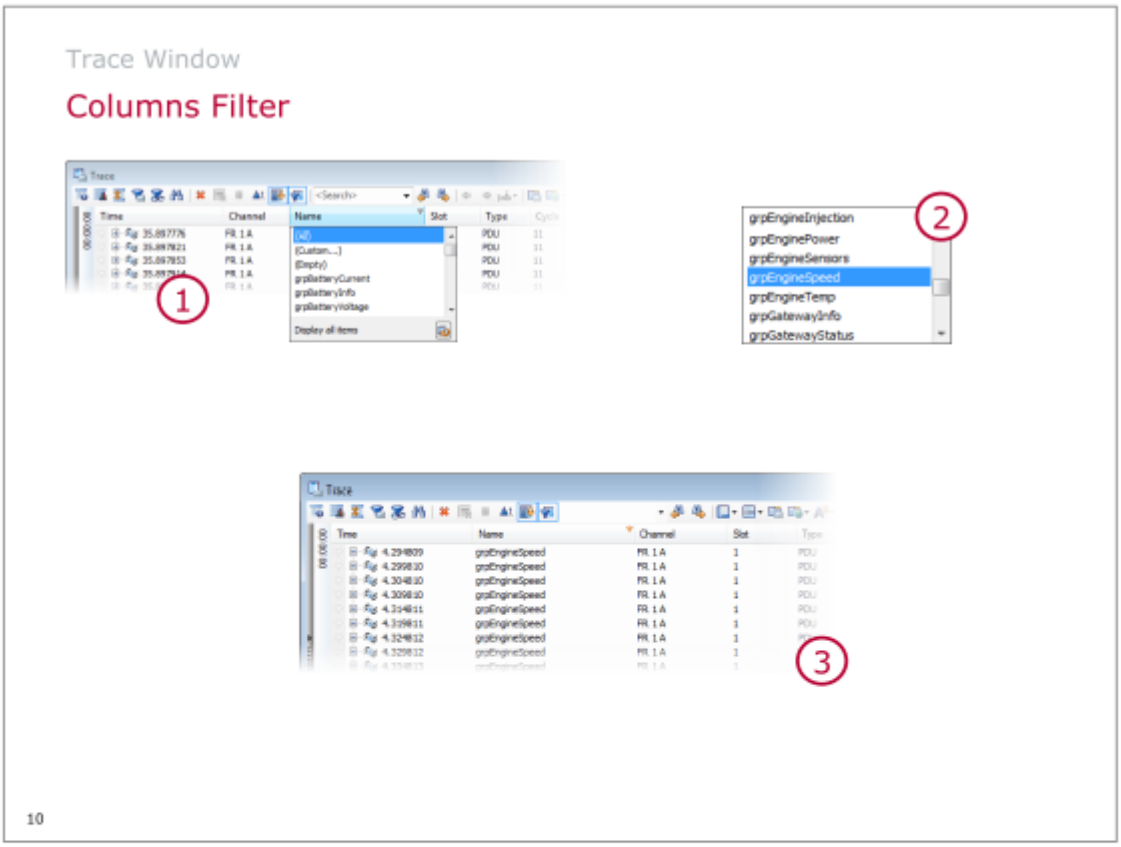


* see chapter on Measurement Setup

9

- **Columns filter:**
  Ad-hoc filters can be configured directly in the columns of the Trace window (cf. Excel auto filter).
- **Predefined filter:**
  Filters from a fixed set of events can be activated here. These filters can be configured so that events are actually removed from the data stream, which saves on memory. This requires deactivating the save events in buffer option by right-clicking.
- **Analysis filter:**
  In the analysis filters area, it is possible to configure blocking and passing filters by drag & drop from the Trace window. Filter configurations can be subdivided into individual filter groups. You can conveniently switch back and forth between these groups. Analysis filters only affect the view of events shown in the Trace window. Events are not removed from the data stream.
- **Filters in the Measurement Setup:**
  The filter and trigger blocks from the Measurement Setup affect the memory of the Trace window. Blocks that are placed before a Trace window are included in the view of predefined filters.

Note:
Filter settings are saved in the configuration.



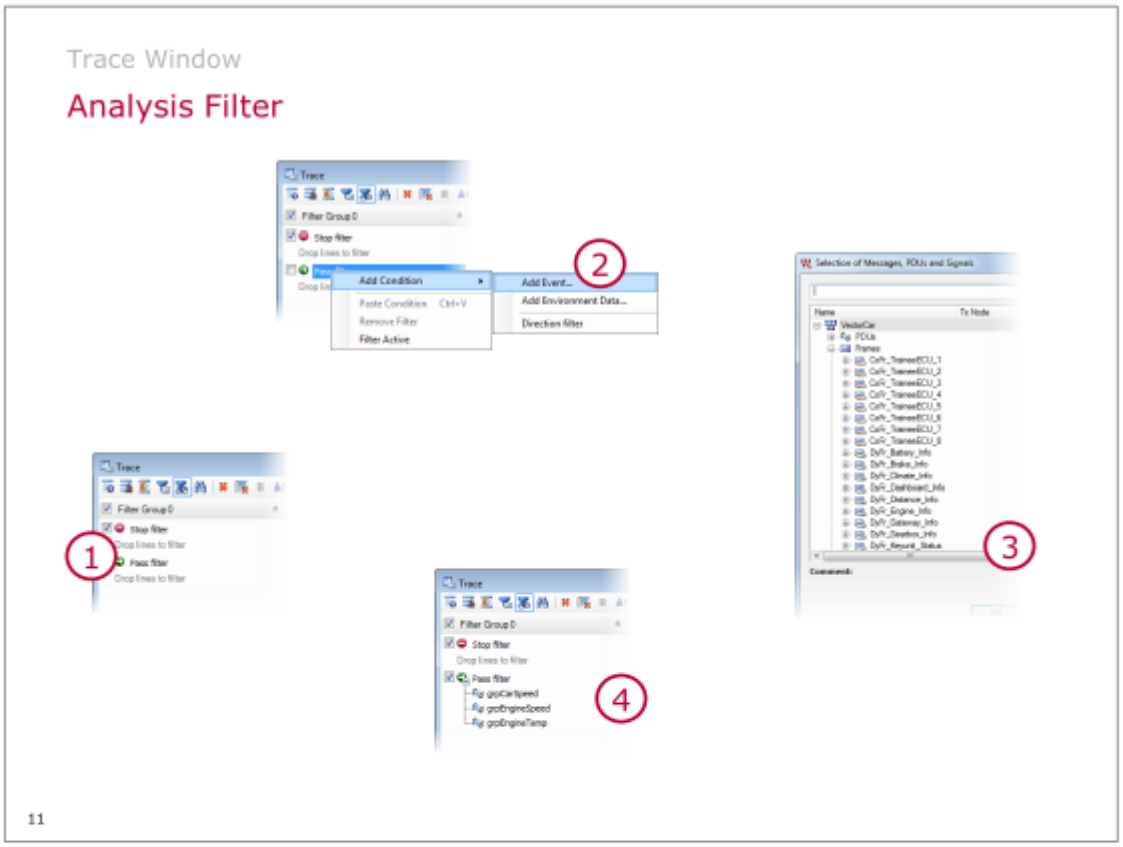
A columns filter may be placed at any column.

Adding a columns filter:

(1) Use the mouse to select the title of a desired column, and left click the small filter symbol (upper right).

(2) Select a desired filter event by left-clicking in the shortcut menu.

(3) The filter is active if the small filter symbol lights up. The selected events are shown directly in the Trace window.



Analysis filters can be inserted in the Trace Explorer and configured.

Adding and configuring analysis filters:

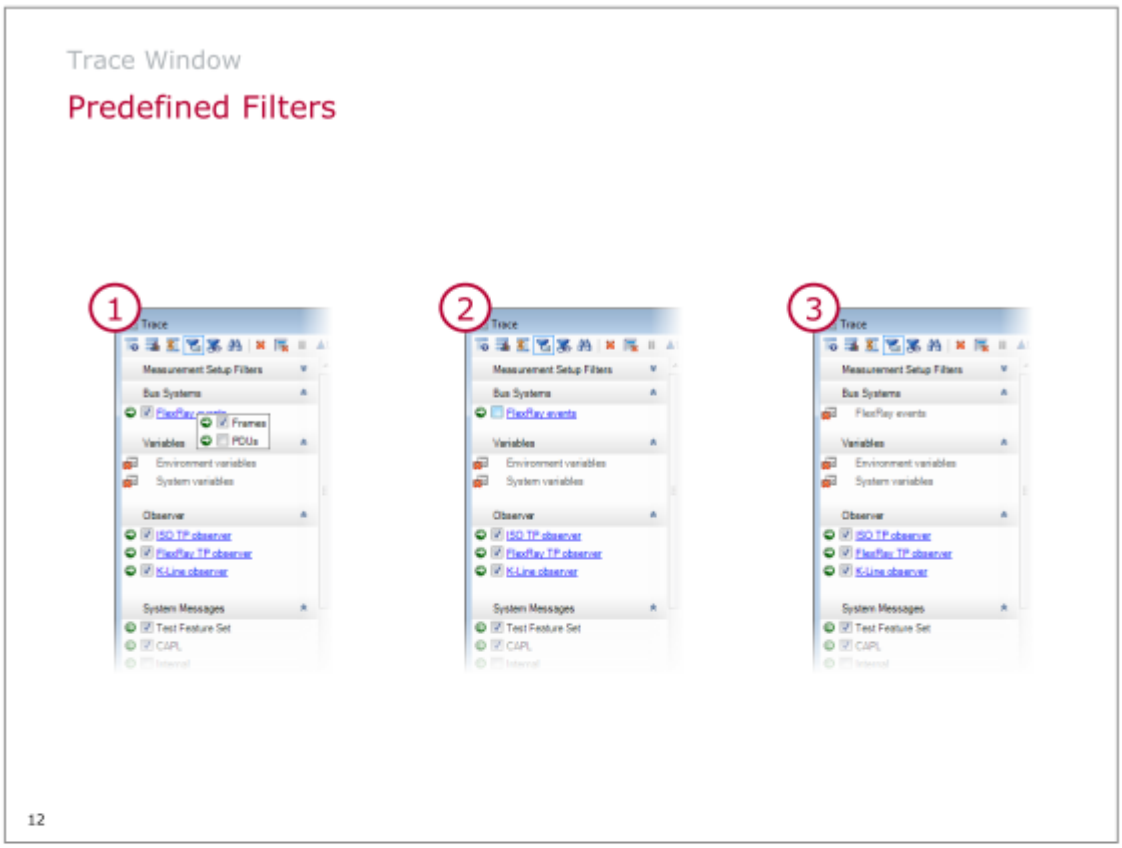
(1) Press the button for the analysis filters on the shortcut bar. The Trace Explorer appears in the Trace window.

(2) Right-click a blocking or passing filter. In the shortcut menu, select the entry *Add event* or *Add environment data* and confirm the selection by left-clicking.

(3) Select a desired event in the database/environment data window, and accept it by pressing the OK button.

(4) Activate the filter group and the associated filter. The filtered information is shown in the Trace window

Note:
Right-click the existing filter group to add another filter group or another filter.



Predefined filters are available in the Trace Explorer. The button on the shortcut bar must be selected for this. Three types of predefined filters are available.

Predefined filter:

(1) The blue hyperlinks provide analysis filters that can be used to affect the view in the Trace. To configure a viewing filter, the user left-clicks its hyperlink. Then the different events may be selected.

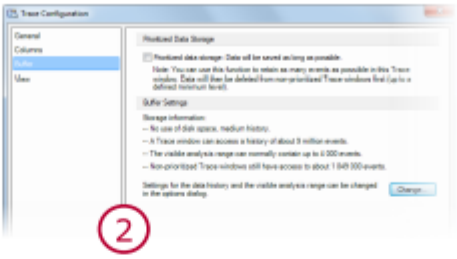
(2) All events of a category can be activated or deactivated by a check mark in front of a hyperlink. This is also a filter that affects the view.

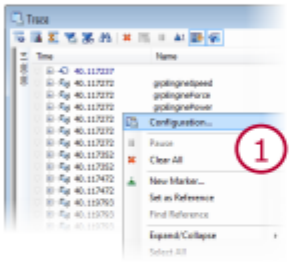
(3) The user can influence how events are saved in the measurement memory by the symbols in front of the check mark of a filter category. Double-clicking a specific symbol toggles saving of events on and off.

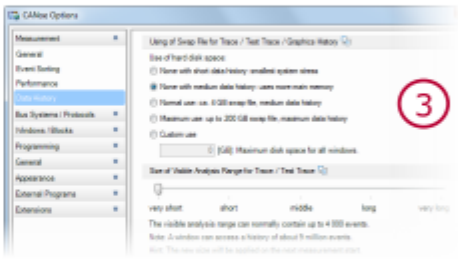
Caution!
If saving of events is deactivated, the data is no longer available. It is not possible to restore the information.

Trace Window

Measurement Memory







13

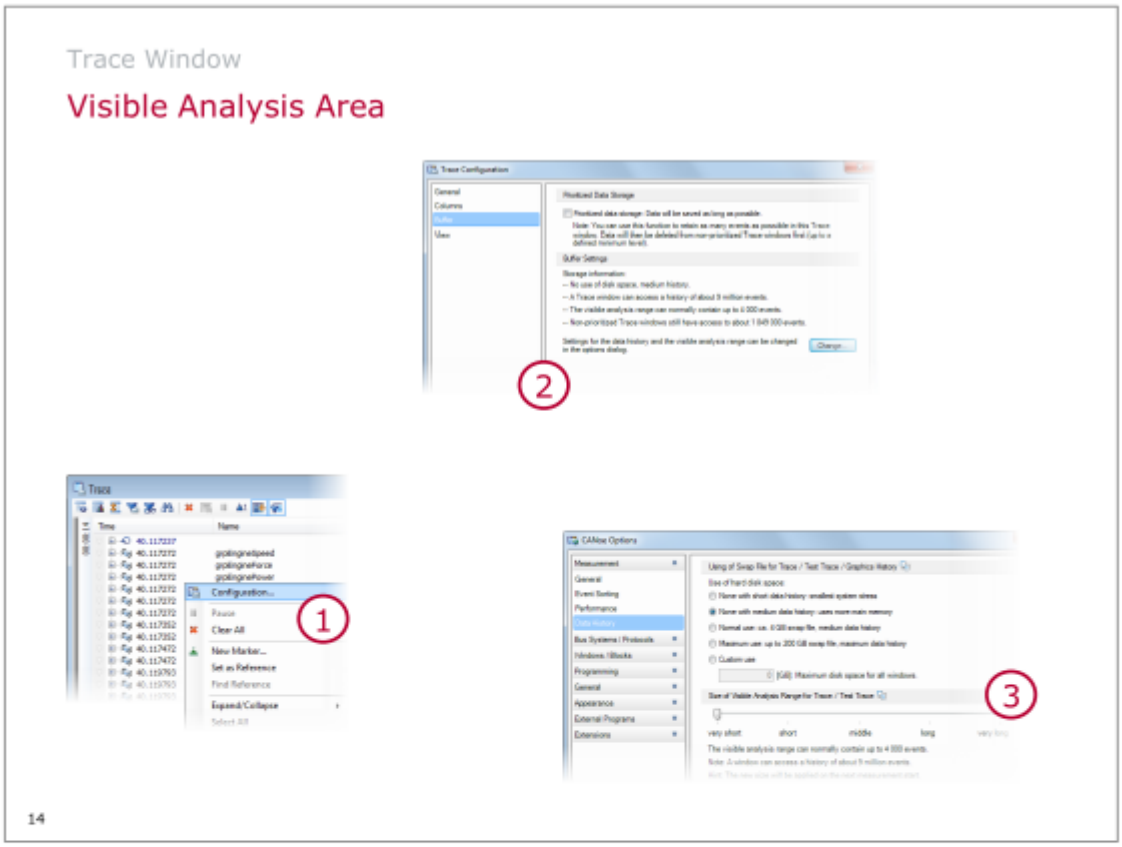
The size of the measurement memory can be set in the configuration of the Trace window. Normally, CANoe/CANalyzer uses the working memory provided by Windows. However, the user can specify a swap-out file, in which measurement data can be saved.

Configuring measurement memory:

(1) Right-click in the Trace window. Choose *Configuration* from the shortcut menu and left-click it.

(2) In the Trace configuration window, choose the *Buffer* entry on the left side. Afterwards, left-click the *Change* button.

(3) The size of the swap-out file and its memory location can be configured in the Data History window.



The visible analysis area can be configured in the Trace Window setup. The user can decide if more rows are displayed in the view area or more events in the measurement buffer. As more rows are shown in the visible view as less events are stored in the measurement buffer.

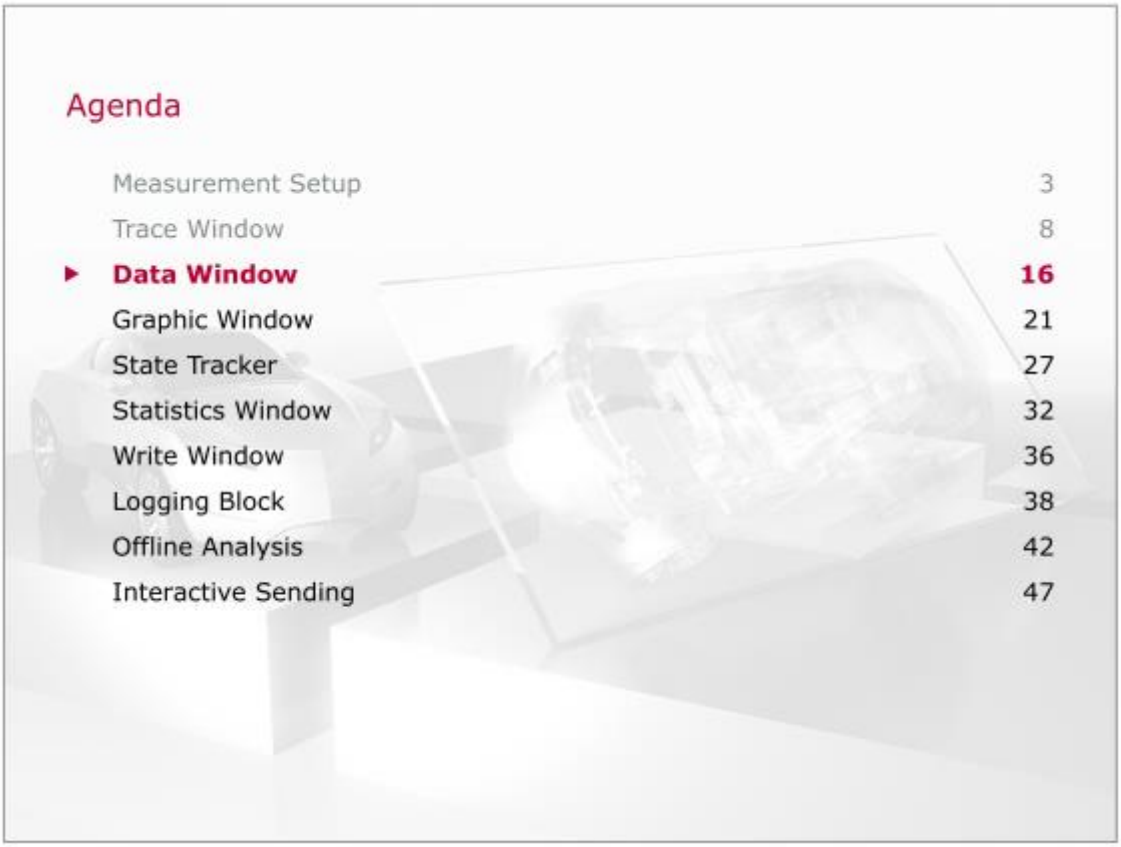
Configuring the visible analysis area:

(1) By right click into the Trace Window, open the context menu and select by left click the entry *Configuration*.

(2) Select the entry *Buffer* on the left side. Left click to *Change…* button behind the size of visual analysis statement.

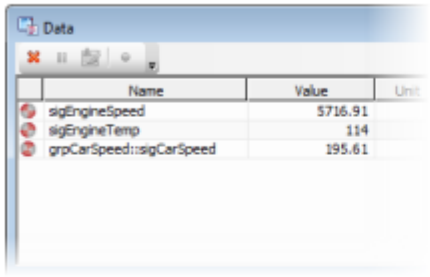
(3) In the window for the size of visible analysis area, predefined settings between *very short* and *very long* can be selected.

1.4 Data Window



Data Window

Properties

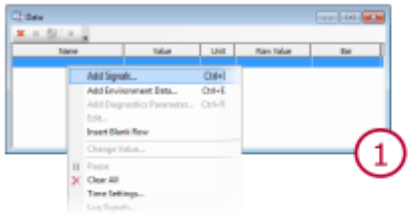


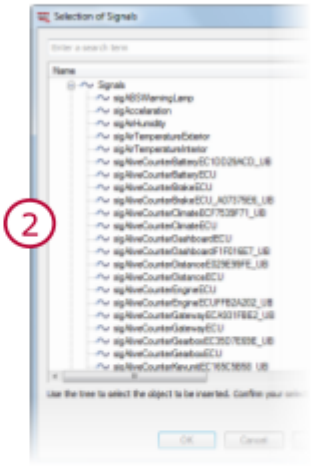
- Analysis windows for table-based display of signal values:
  - Physical value and raw value
  - Physical minimum and maximum since measurement start
  - Units from the database
  - Comments from the database
  - Graphic display of received signals and changes in signal value

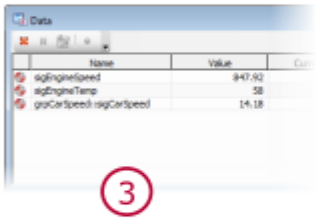
The Data window serves to display momentary signal values. By default, the signal value is shown as a physical value, raw value and as a bar display. Other columns are available for viewing.

Data Window

Adding Signals/Environment Data







17

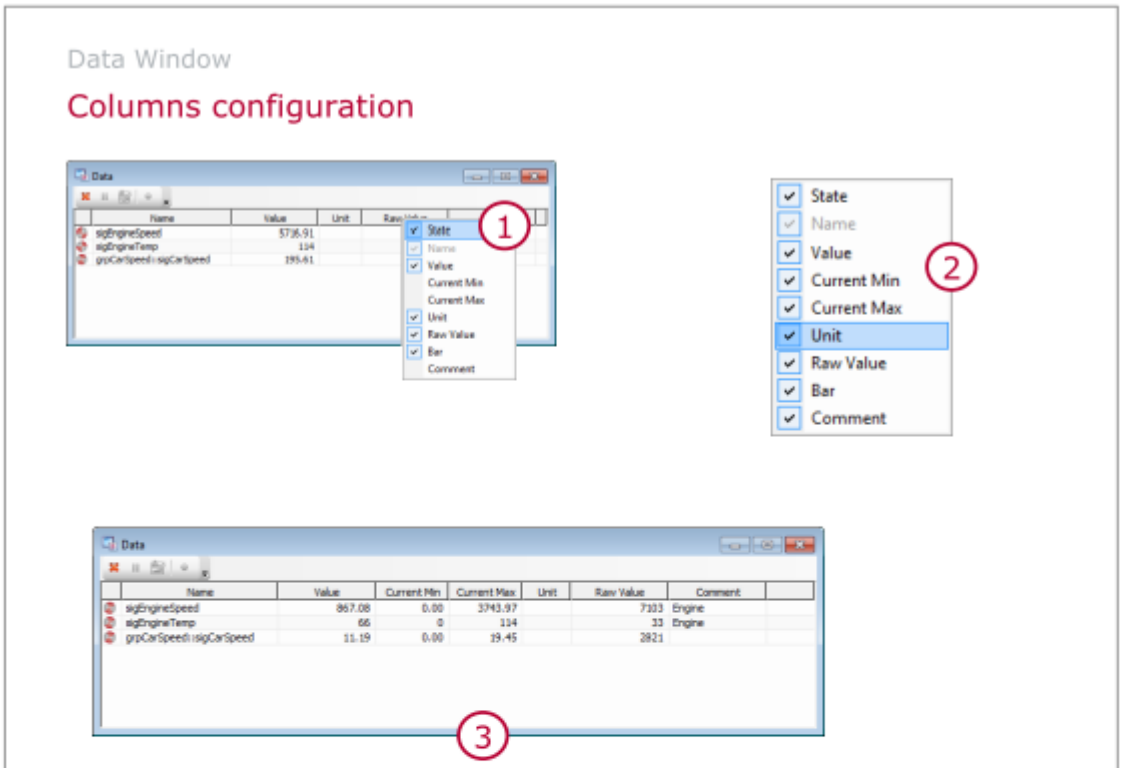
The Data window can be used to evaluate signals and environment data.

Adding signals/environment data:

(1) Right-click in the Data window. In the shortcut menu, select the entry *Add Signals* or *Add Environment Data* and left-click it.

(2) Select the desired signal or desired environment/system variable and accept with *OK*.

(3) The signal or environment/system variable is displayed in the Data window.



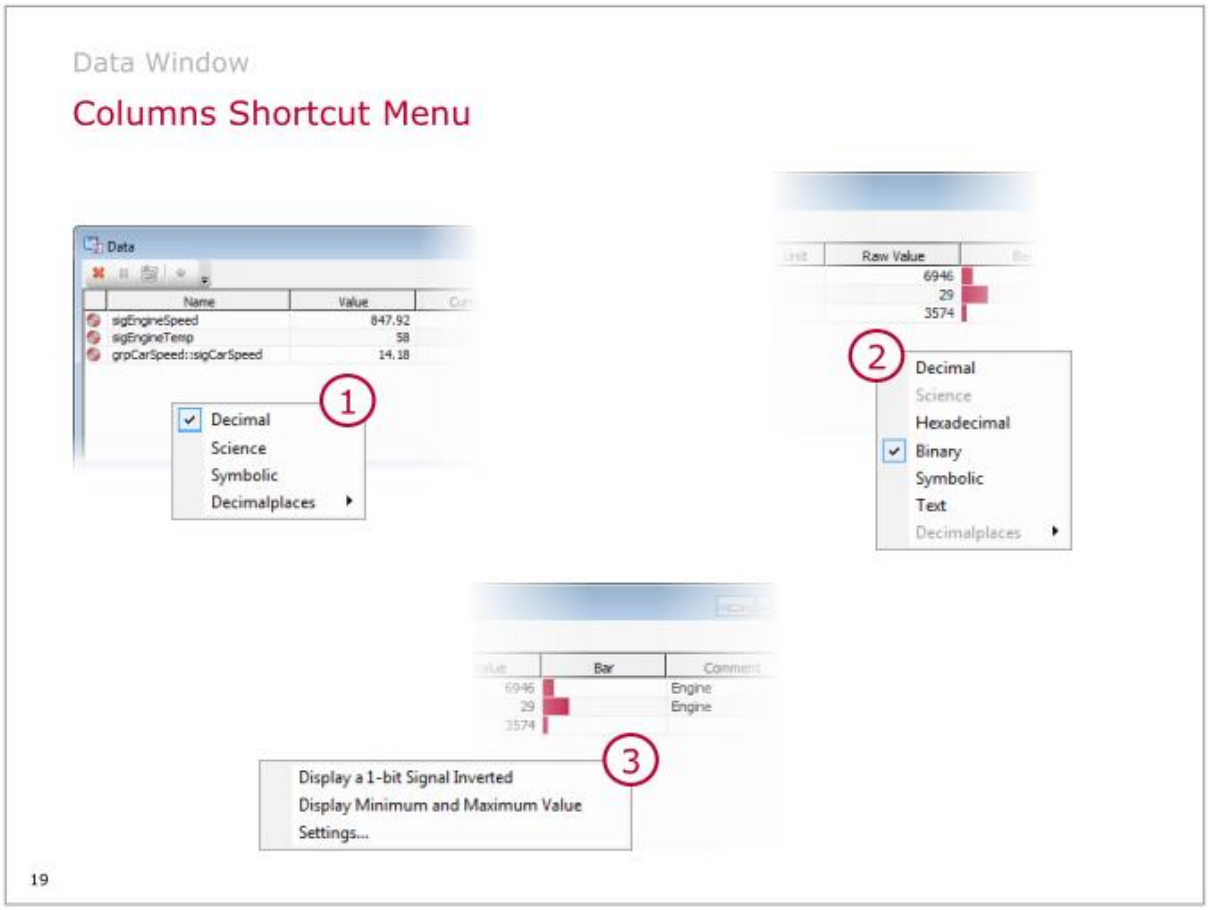
Individual columns may be shown or hidden in the Data window.

Configuring columns:

(1) Right-click the line with the column headers.

(2) From the shortcut menu, select or deselect the desired columns.

(3) The selected columns are shown directly in the Data window.



It is possible to select various representations for the value column, raw value column and bars column from the associated shortcut menu.

Available display representations:

(1) Values column: Decimal notation, scientific notation with exponent, symbolic representation with values table, decimal notation with different numbers of digits.

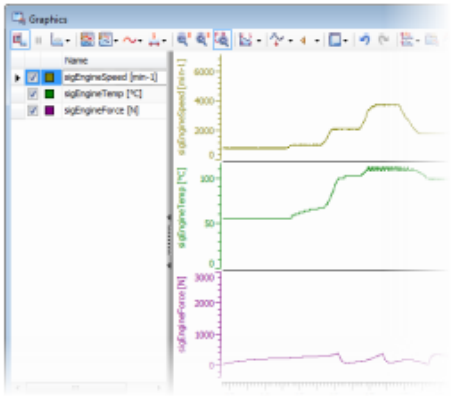
(2) Raw value column: Decimal notation, scientific notation with exponent (for float), hexadecimal notation, binary notation, symbolic representation with values table, text display (ASCII), decimal notation with different numbers of digits after the decimal point (for float).

(3) Bars column: Show 1-bit signal inverted, show minimum and maximum.

1.5 Graphic Setup

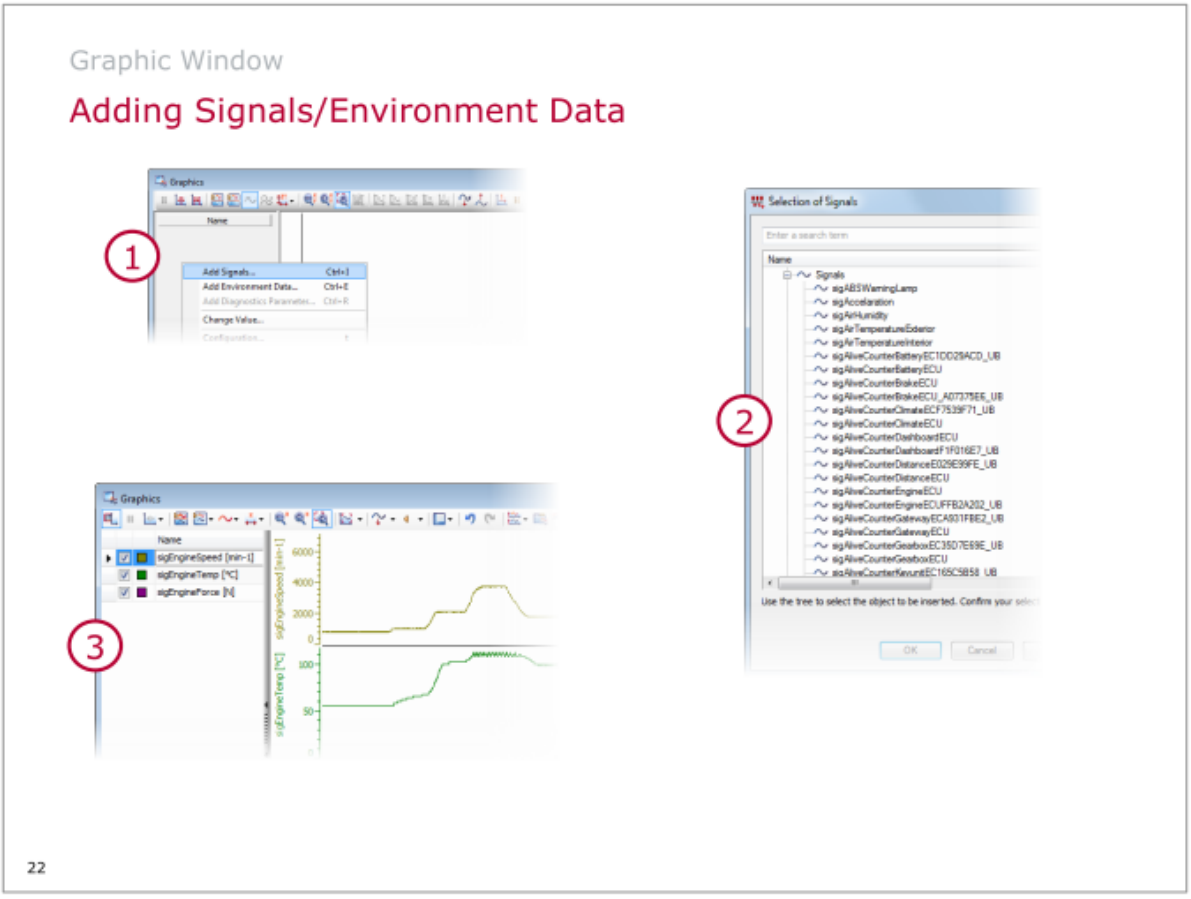
Graphic Window

Properties



- Analysis windows for graphic display of signal responses:
  - Graphic response of physical value or raw value
  - Measurement and difference markers for signal evaluation
  - Cursor bar for entering comments in offline analysis
  - Export/Import of signal responses
  - Configurable legend
  - Synchronization with Trace Window is possible

Time-based signal responses are shown graphically in the Graphic window. They are displayed in an X-Y diagram above the time axis. Message signals, statistics and environment variables or diagnostic parameters can all be shown graphically.



The Graphic window can be used to evaluate signals and environment data.

Adding signals/environment data:

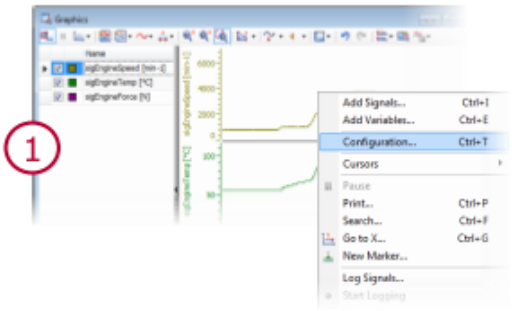
(1) Right-click the legend of the Graphic window. In the shortcut menu, select the entry *Add Signals* or *Add Environment Data* and left-click it.

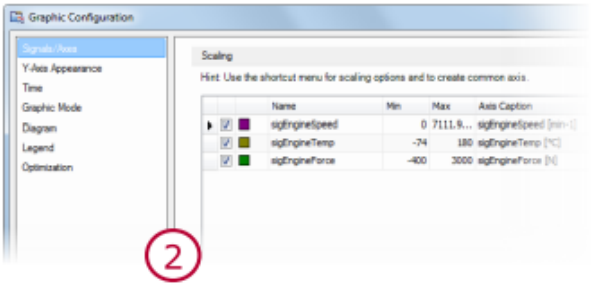
(2) Select the desired signal or desired environment/system variable and accept with *OK*.

(3) The signal or environment/system variable is displayed in the Graphic window.

Graphic Window

Configuration





23

The Configuration window can be used to influence the display properties in the Graphic window.

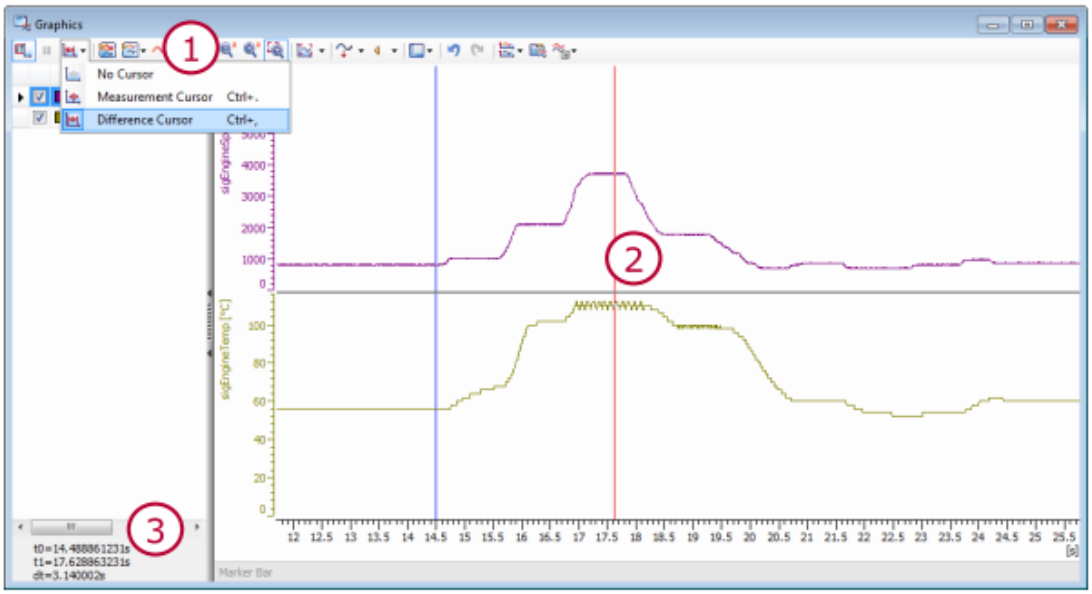
Opening the Configuration window:

(1) Right-click in the Graphic window. Choose *Configuration* from the shortcut menu and left-click it.

(2) Make the desired settings in the configuration and confirm with *OK*.

Graphic Window

Measurement and Difference Markers



24

Measurement and difference markers may be used to evaluate signal responses. They are only available when the measurement has been stopped or the Graphic window has been switched to pause.

Using measurement and difference markers

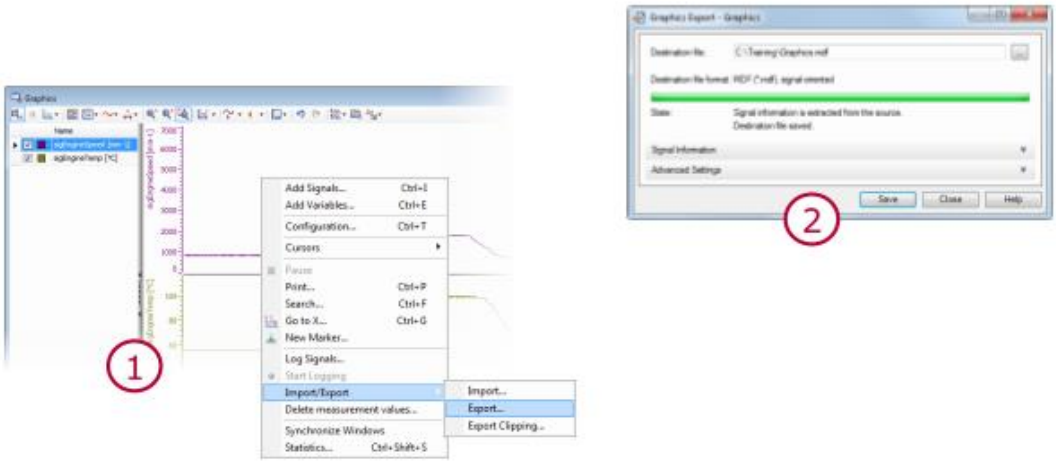
(1) Activate measurement or difference markers with the buttons on the shortcut bar.

(2) Position the measurement or difference markers at the desired positions.

(3) Read off the measurement values or difference values in the legend.

Graphic Window

Export/Import of Signal Responses



25

Signal responses can be exported from the Graphic window or imported into the Graphic window.

Exporting signals:

(1) Right-click in the Graphic window. From the shortcut menu, choose *Import/Export* and left-click the *Export* entry.

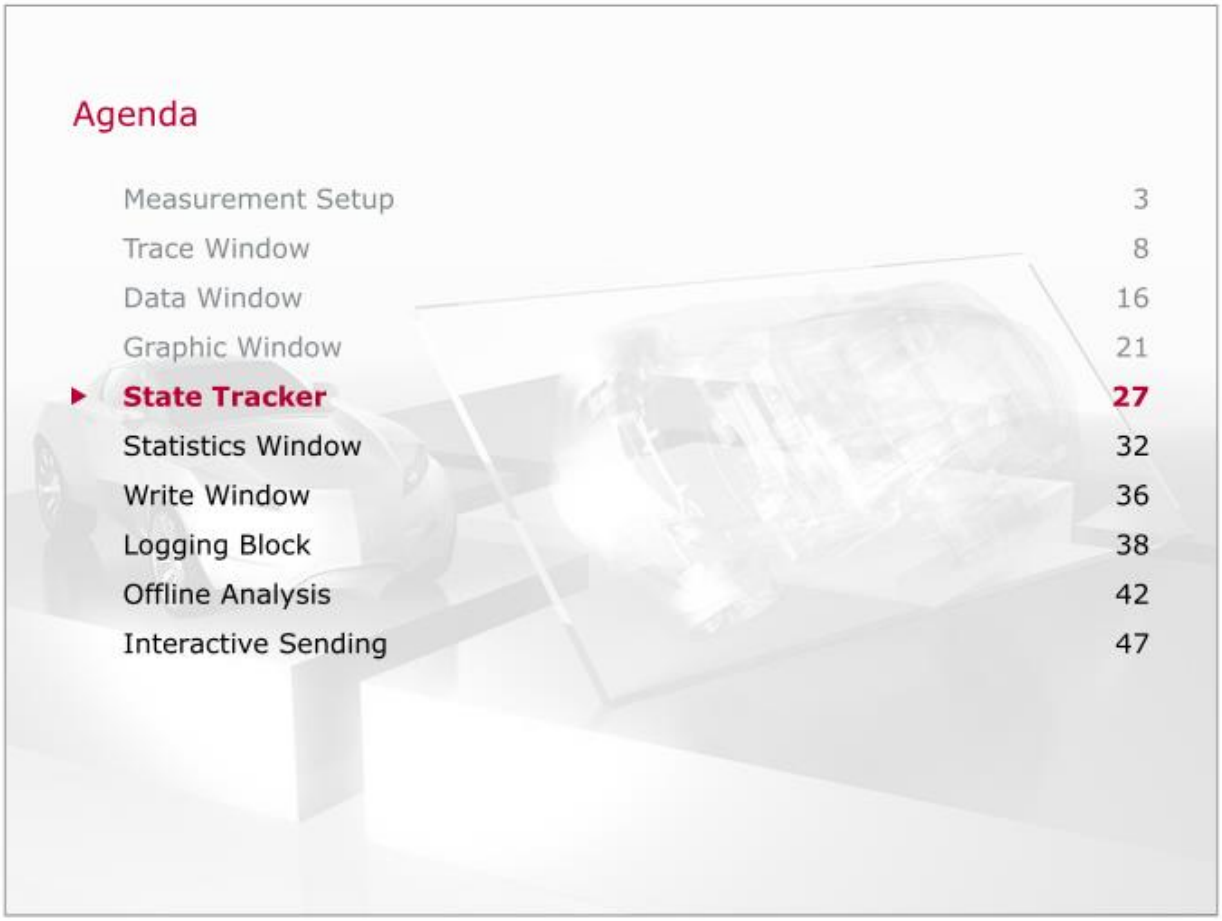
(2) Select the desired file format and the memory location and choose *Save*. A file is generated in the desired directory.

Importing signals:

(1) Right-click in the Graphic window. From the shortcut menu, choose *Import/Export*, and in the submenu left-click the *Import* entry.

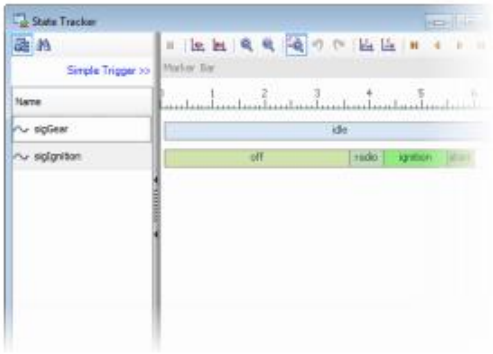
(2) Select the desired file and confirm with *Open*. Select the desired signal assignments and confirm with *OK*. The signal responses are shown in the Graphic window.

1.6 State Tracker



State Tracker

Properties



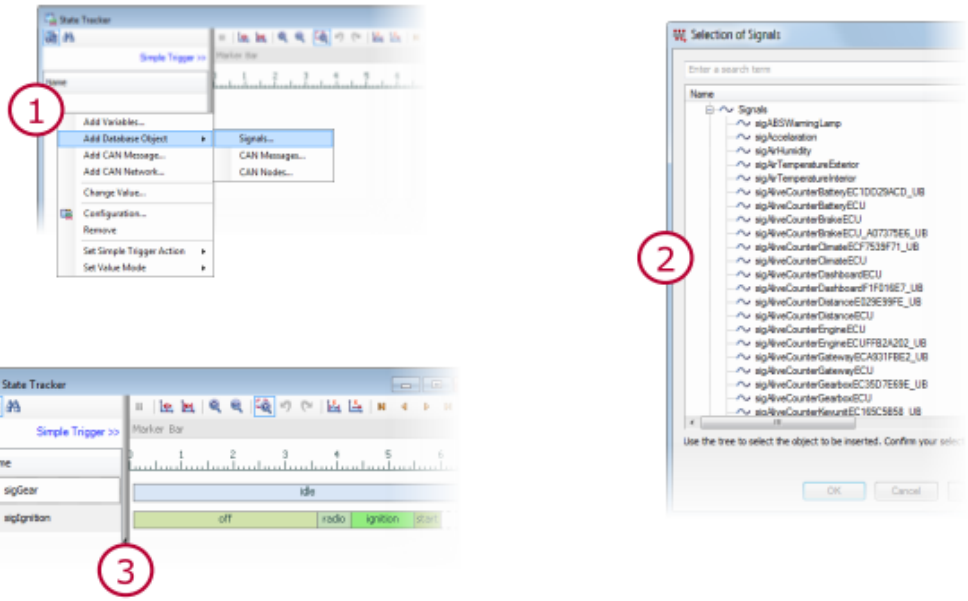
- Is only available in CANoe
- Analysis windows for graphic display of signal states:
  - Graphic response of symbolic values or raw values
  - Measurement and difference markers for signal evaluation
  - Cursor bar for entering comments in offline analysis
  - Trigger for pausing or stopping the measurement

27

The State Tracker can be used to analyze states, state transitions and signals and to visualize time dependencies. The information can come from different sources (system variables, environment variables or bus signals).

State Tracker

Adding Signals/Environment Data



28

The State Tracker can be used to evaluate signals, bus events (messages) and environment data.

Adding signals/environment data:

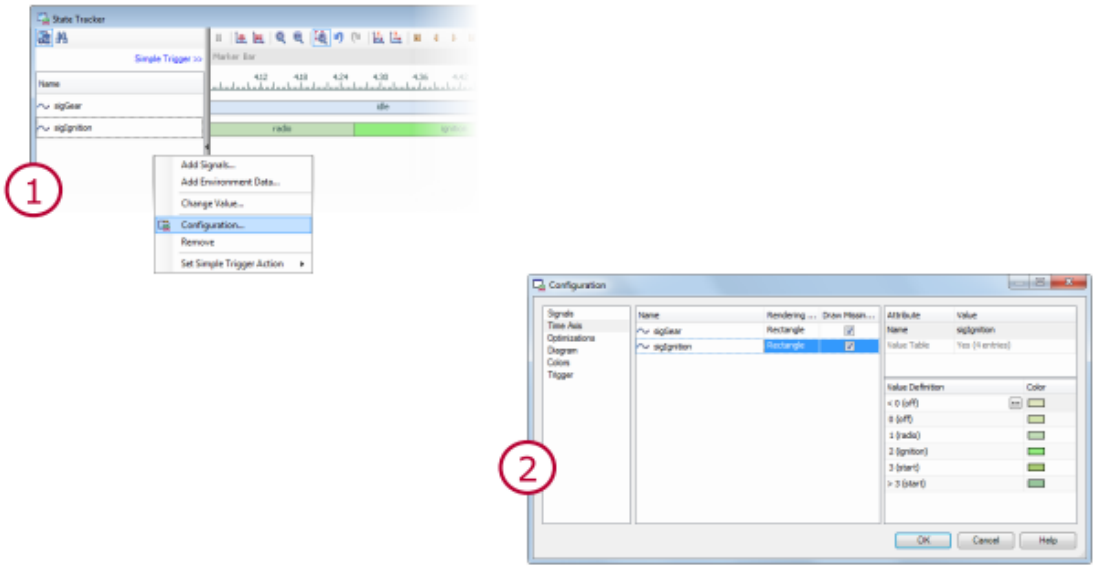
(1) Right-click the legend of the State Tracker. In the shortcut menu, select the entry *Add Signals* or *Add Environment Data* and left-click it.

(2) Select the desired signal or desired environment data and accept with *OK*.

(3) The signal, bus event (message) or environment data is displayed in the State Tracker.

State Tracker

Configuration



29

The representation of signals or environment variables in the State Tracker can be modified in the Configuration window.

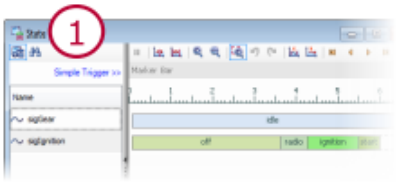
Opening the Configuration window:

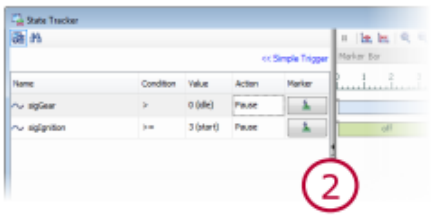
(1) Right-click the State Tracker. Choose *Configuration* from the shortcut menu and left-click it.

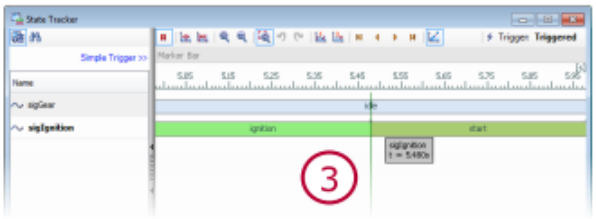
(2) Make the desired settings in the configuration and confirm with *OK*.

State Tracker

Triggers







30

In the State Tracker, triggers can be defined which execute an action when a specific signal state occurs.

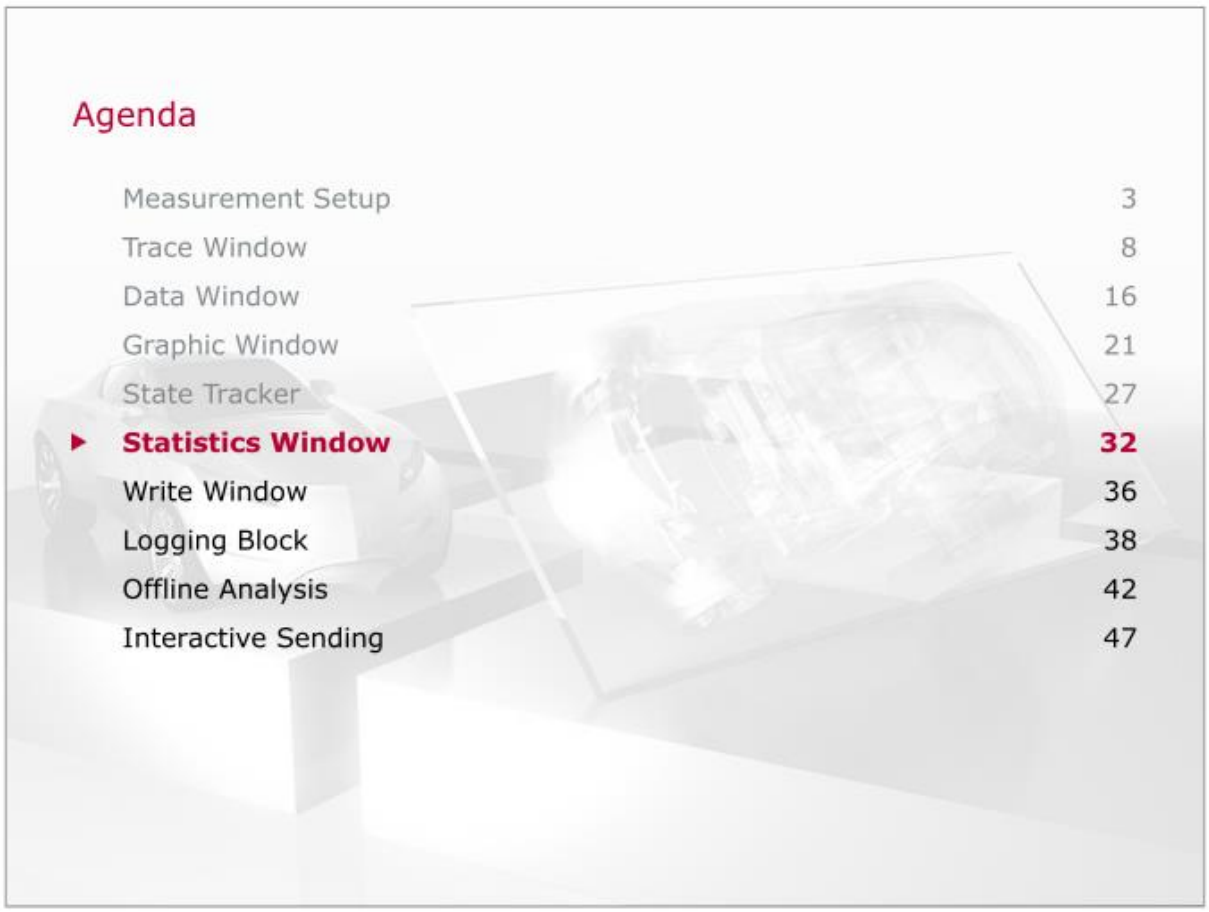
Configuring a trigger:

(1) Left-click the blue *Simple Trigger* hyperlink.

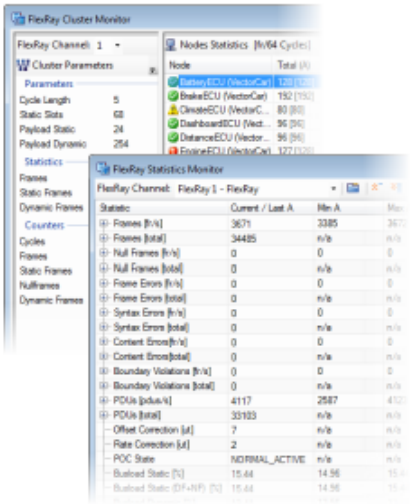
(2) Define a trigger for a signal with an associated signal state and a desired action.

(3) If a measurement is running and the defined signal state occurs, the action is executed.

1.7 Statistics Window



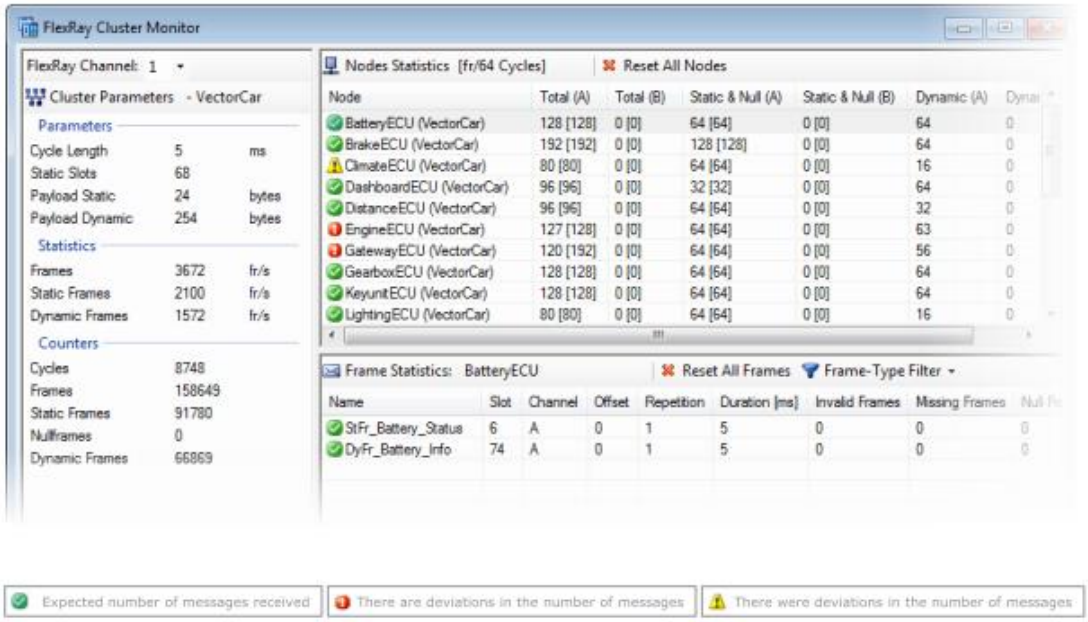
Overview



- FlexRay Cluster Monitor
  - Checks whether enough messages have been received by a node
- FlexRay Statistics Monitor
  - Frame and PDU statistics
  - FlexRay error statistics
  - Bus loads for static and dynamic segment
  - State display for FlexRay communication controller

Statistics Window

FlexRay Cluster Monitor

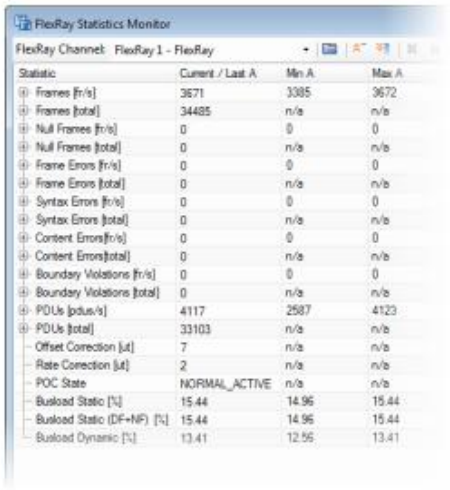


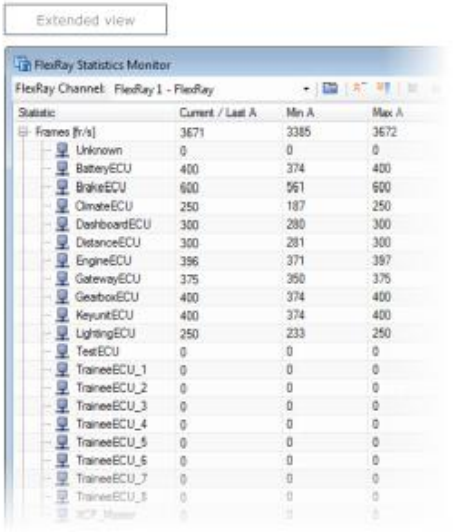
33

The Cluster Monitor window shows statistics and the bus activities of a FlexRay Cluster during a measurement. The real data of FlexRay communications is compared to the data from the database. Afterwards, deviations and differences are shown. The comparison is always executed over 64 cycles.

Statistics Window

FlexRay Statistics Monitor

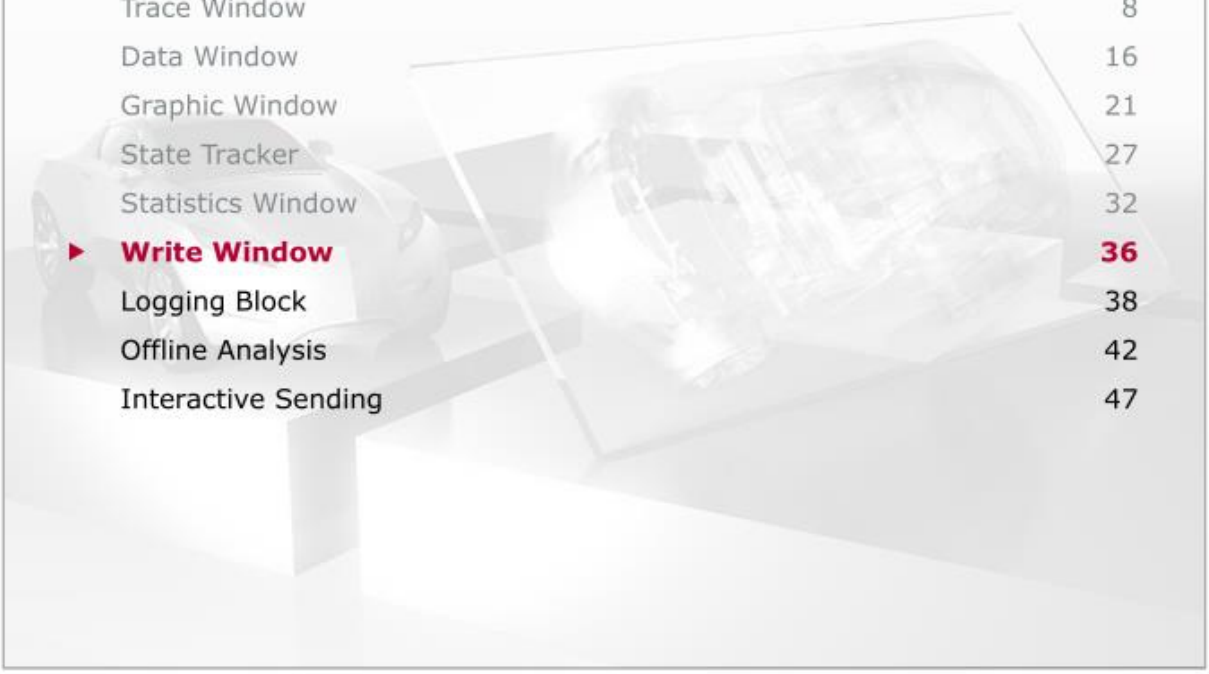




34

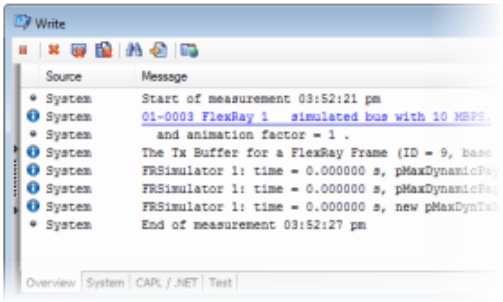
The Statistics Monitor shows the Tx data of the entire cluster or the FlexRay nodes. The display content can be reduced.

Agenda



Write Window

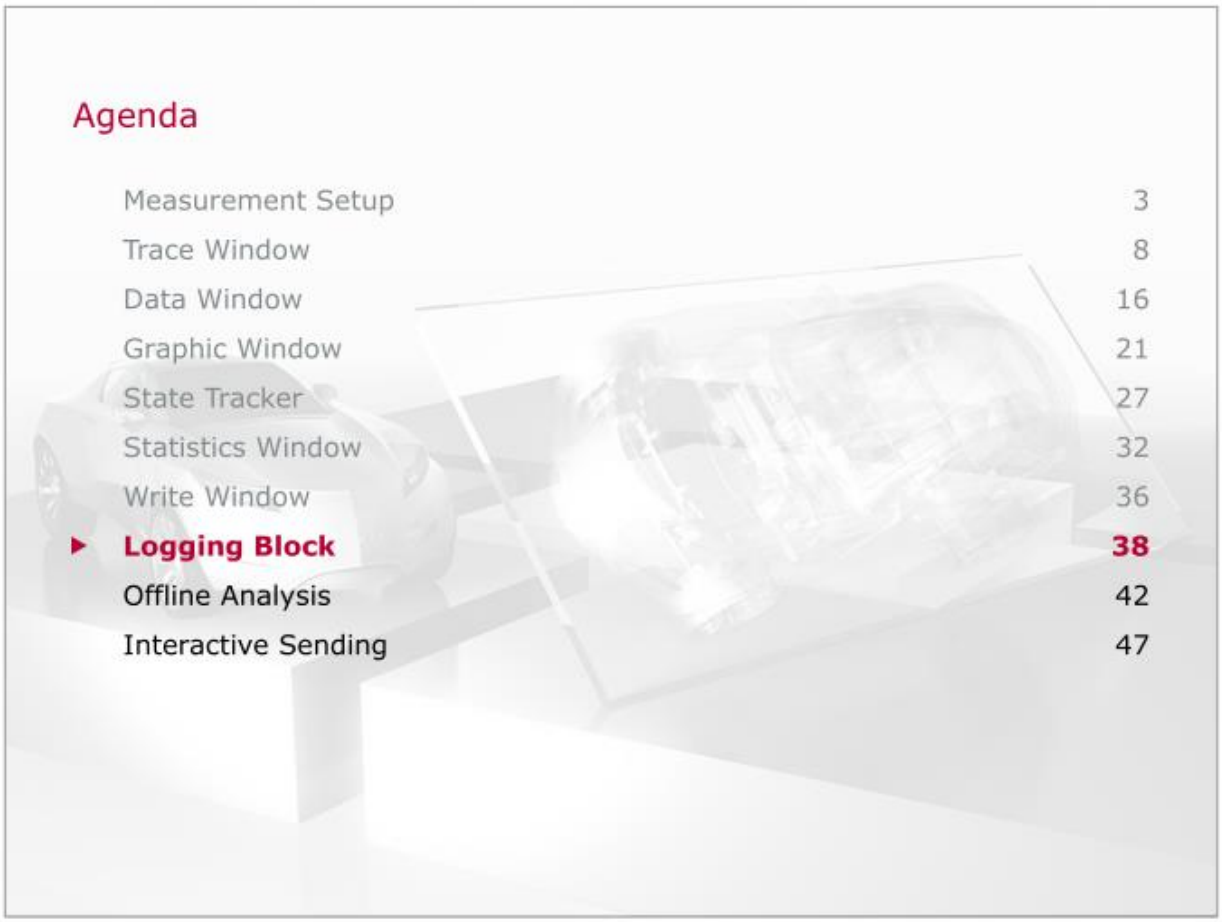
Properties



- Serves to output messages:
  - Status and error messages of CANoe or CANalyzer
  - Information on the status of the hardware used
  - Messages from CAPL programs or test modules

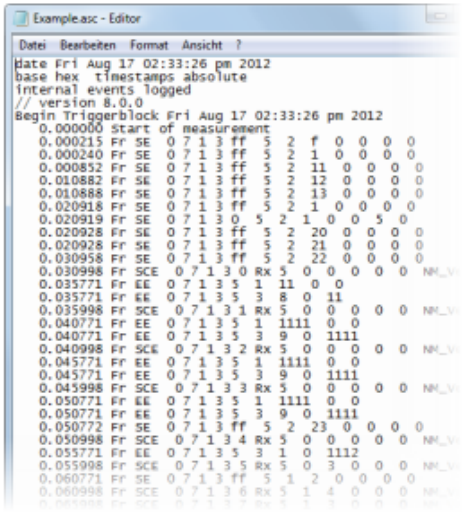
The Write window does not have any direct relation to the bus communication. This window serves as an informational window for the user, e.g. if CANoe/CANalyzer cannot start a measurement due to a faulty configuration. Along with information on settings or changes, the window also permits simple text outputs from the CAPL programming language.

1.8 Logging Block



Logging Block

Properties



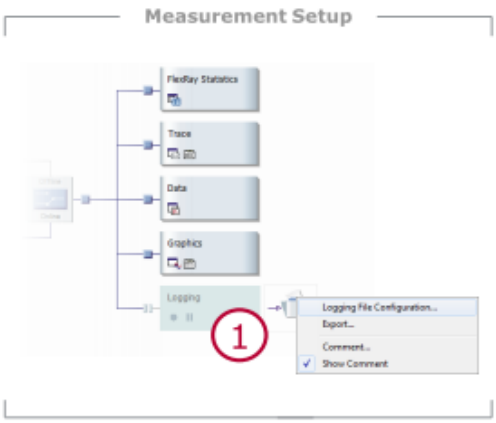
- Serves to log measurement information:
  - Messages and PDUs
  - Status and error messages
  - System and environment variables
  - Available file formats:
    - *.ASC: ASCII logging format
    - *.BLF: Binary logging format
    - *.MDF: ASAM logging format

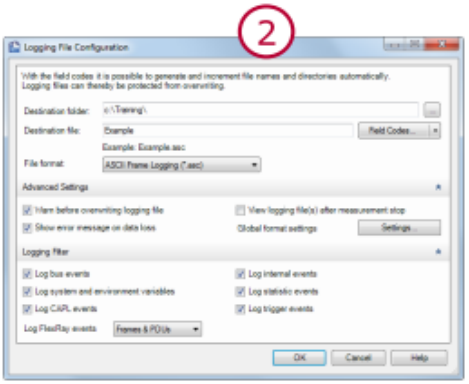
Logging of frames/PDUs and their signals is used to analyze the bus communication by different work groups. The data of a network can be logged or independent analysis, and then it can be edited or shared in the form of a file. In CANoe/CANalyzer, frames can be logged individually, according to their associated ECU or the bus used. It is possible to use multiple logging blocks, and the user can use trigger a log manually.

Information: The data can be logged in ASCII format; however, this leads to larger files. The BLF format leads to smaller (packed) files that are saved in binary format. Instead of ASCII or BLF, the MDF format may also be used. This is a logging format that was standardized by ASAM. The MDF format is signal-based and therefore does not contain any message or PDU information.

Logging Block

File Configuration





39

Before logging is started, the memory location and file type of the log file must be set. The shortcut menu also offers automatic modification of the filename to ensure that unique filenames are generated when multiple logging operations are performed.

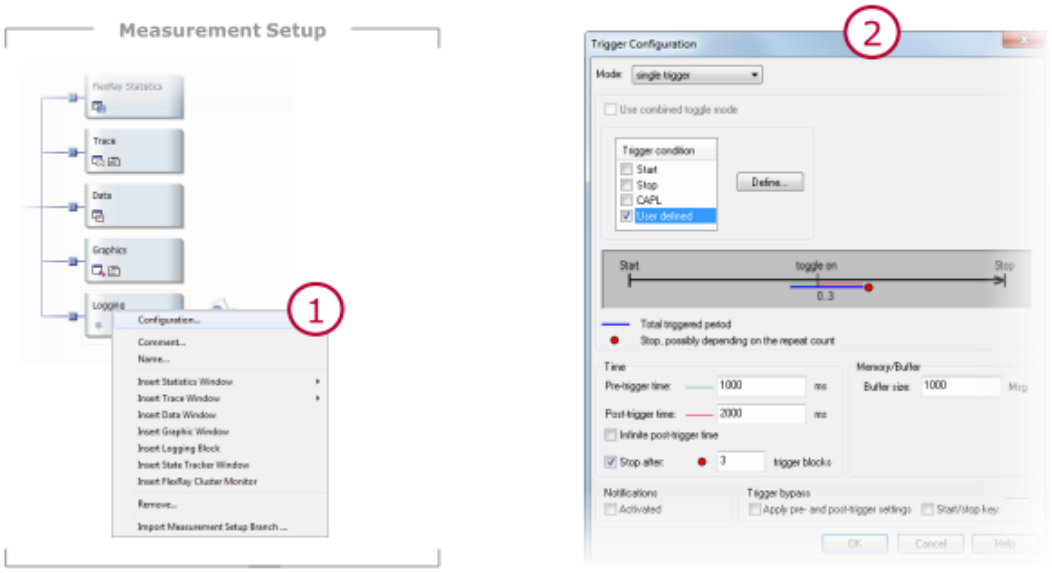
Configuring a log file:

(1) Right-click the file symbol after the logging block. Choose *Log File Configuration* from the shortcut menu and left-click it.

(2) Make the desired settings for the log file and confirm with *OK*.

Logging Block

Configuration of the Trigger Condition



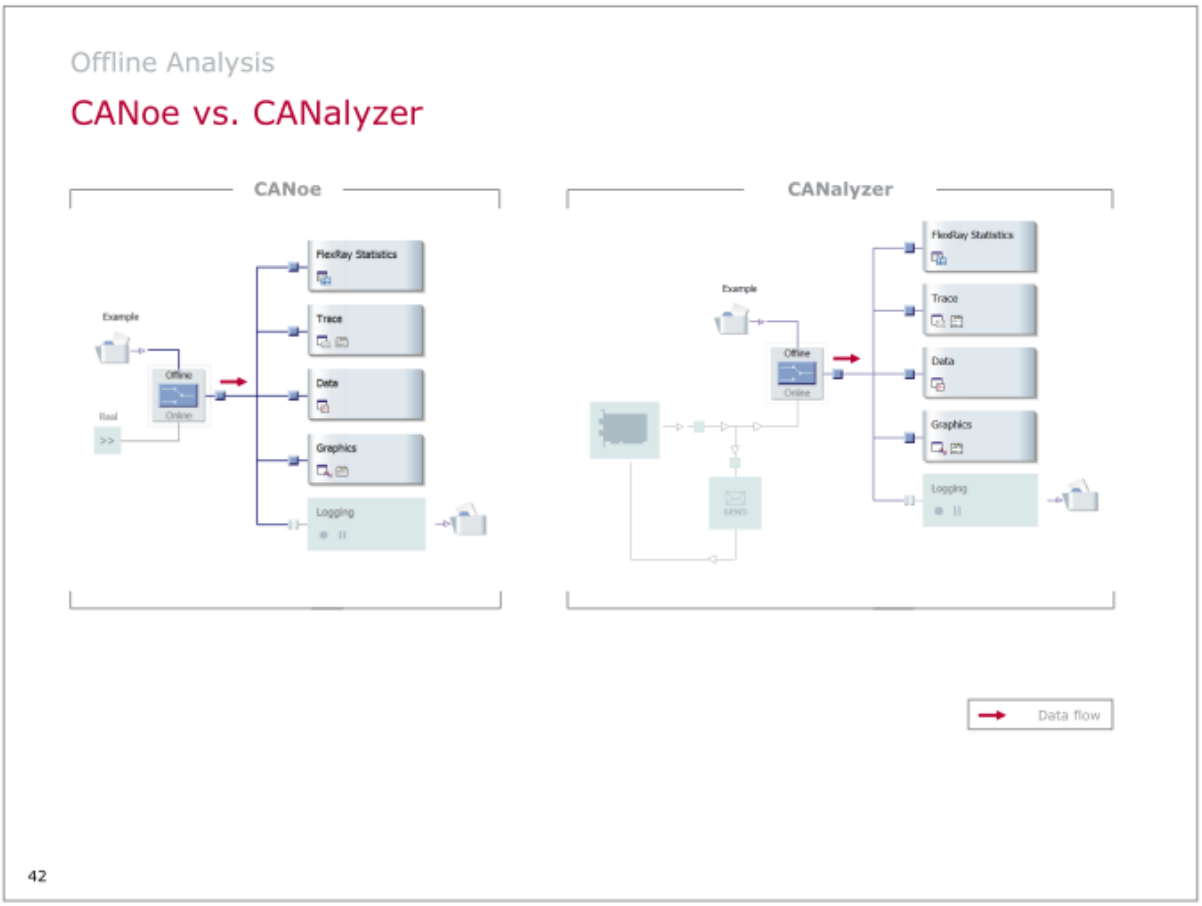
Essentially, it is possible to log a complete measurement from the measurement start to the measurement stop. However, if logging should occur in response to a specific event or over a desired time period, then trigger conditions can be set for the beginning and end of a data logging operation.

Configuring a trigger:

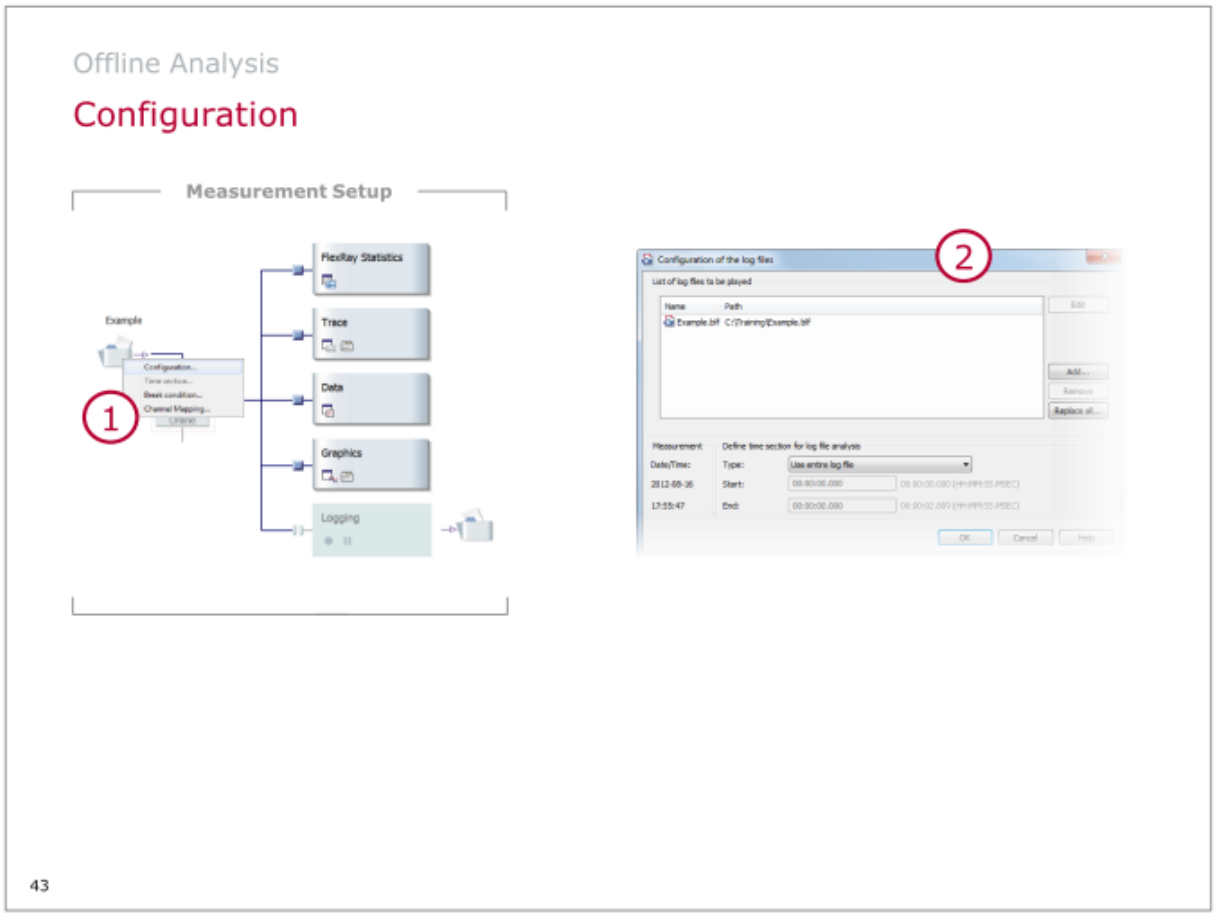
(1) Right-click the *Logging* block. Choose *Configuration* from the shortcut menu and left-click it.

(2) Configure the desired trigger and confirm with *OK*.

1.9 Offline Analysis



Logged data can be analyzed offline. In this context, offline refers to use of the log file as a data source. Toggling can be done by a switch (double-click or right-click) in the Measurement Setup of CANoe/CANalyzer.

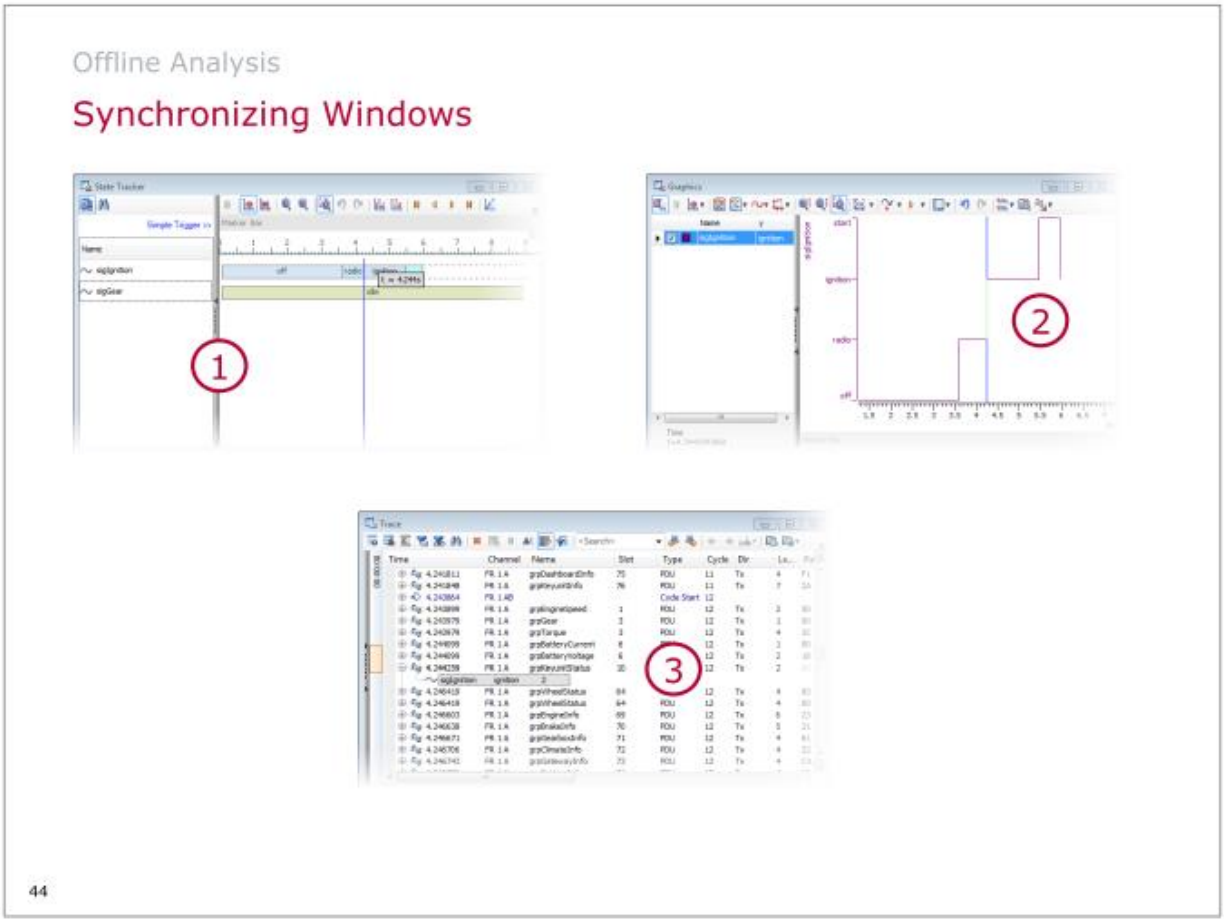


For offline analysis, one or more log files must be assigned to CANoe/CANalyzer. An assignment is made via the file symbol in front of the online/offline toggle switch.

Configuring a file:

(1) Right-click the file symbol in front of the online/offline toggle switch. Choose *Configuration* from the shortcut menu and left-click it.

(2) Select the desired files by pressing the *Add* button, and define a replay type. Afterwards, accept the configuration with the *OK* button.



Essentially, the displays in the Trace window, Graphic window and State Tracker can be synchronized while the measurement is stopped. This is a way to analyze the time behavior of a signal. This mechanism is also available in offline analysis.

Synchronizing windows:

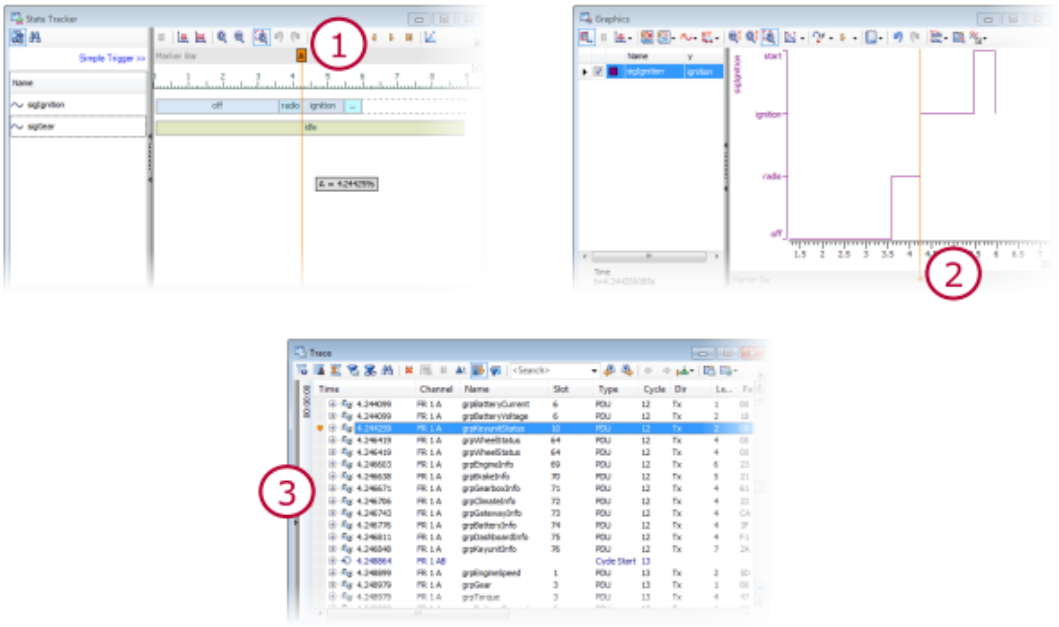
(1) State Tracker: Right-click in the State Tracker and choose *Synchronize Windows* in the shortcut menu. Move the measurement marker to the desired position. The Trace window and Graphic window are automatically synchronized.

(2) Graphic Window: Right-click in the Graphic window and choose *Synchronize Windows* in the shortcut menu. Move the measurement marker to the desired position. The Trace window and Graphic window are automatically synchronized.

(3) Trace Window: Right-click in the Trace window and choose *Synchronize Windows* in the shortcut menu. Select the desired signal from the associated PDU. The State Tracker and Graphic window are automatically synchronized.

Offline Analysis

Global Markers



45

Global markers are available in the Trace window, Graphic window and State Tracker, which can be used to comment a measurement. This mechanism is also available in offline analysis.

Adding global markers:

(1) State Tracker: Right-click the Marker Bar and choose *New Marker* in the shortcut menu. Configure the marker and move it to the desired position. If a marker already exists in the Graphic window or Trace window, it can also be made visible.

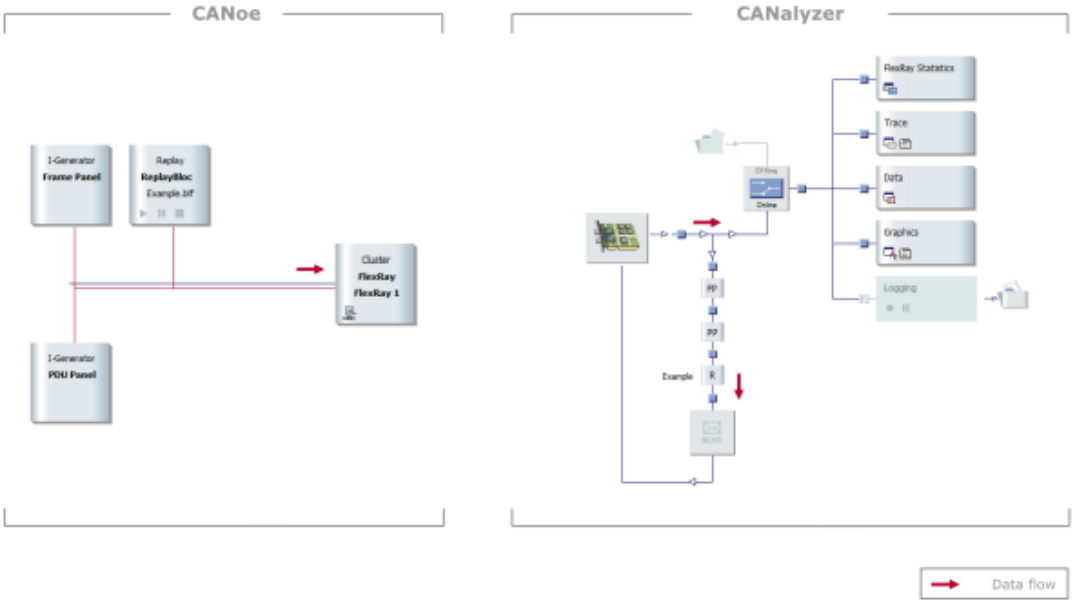
(2) Graphic Window: Right-click the Marker Bar and choose *New Marker* in the shortcut menu. Configure the marker and move it to the desired position. If a marker already exists in the State Tracker or Trace window, it can also be made visible.

(3) Trace Window: Right-click the Marker Bar and choose *New Marker* in the shortcut menu. Configure the marker and move it to the desired position. If a marker already exists in the Graphic window or State Tracker, it can also be made visible.

1.10 Interactive Sending

Interactive Sending

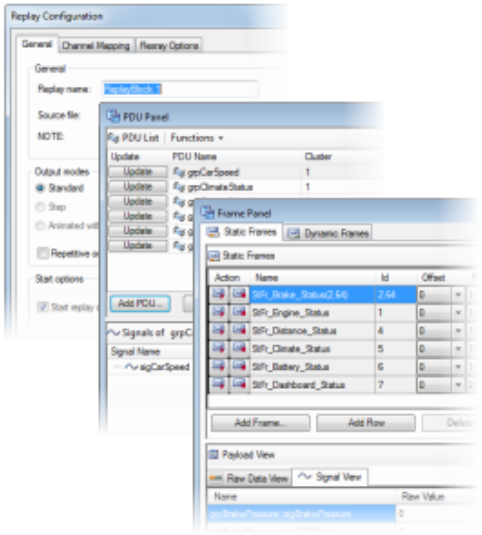
CANoe vs. CANalyzer



In CANoe, it is possible to send out messages, PDUs and signals in the Simulation Setup. In CANalyzer, the Tx branch of the Measurement Setup is used for this purpose. The Frame Panel, PDU Panel and Replay Block are available for sending here. To insert them, the user right-clicks the branch in the Simulation Setup or the blue hotspot in the Tx branch (CANalyzer). The three components are available in the relevant shortcut menus.

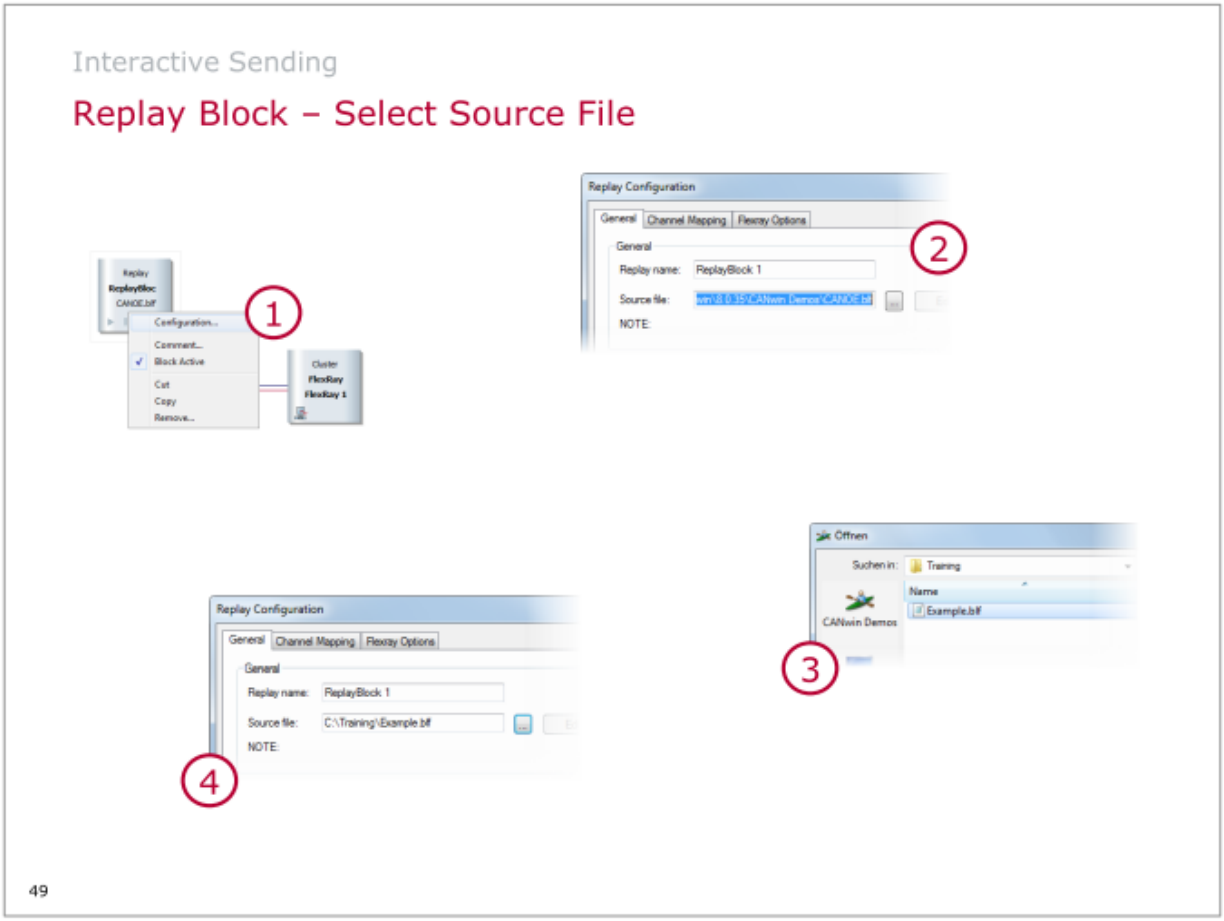
Interactive Sending

Overview



- Replay Block
  - Is used to replay log files
- PDU Panel
  - Serves to send out PDUs
  - Enables sending of signal values in PDUs
- Frame Panel
  - Serves to send out messages
  - Enables sending of signal values in messages

The Replay block makes it possible to restore an ECU's states or situations. To do this, the logged data traffic is replayed on the FlexRay bus. With the PDU Panel, PDUs can be sent out via the associated frame without background information. The Messages Panel is used to send out messages on the FlexRay level.



The Replay block is used to replay log files. The Replay block supports various formats here.

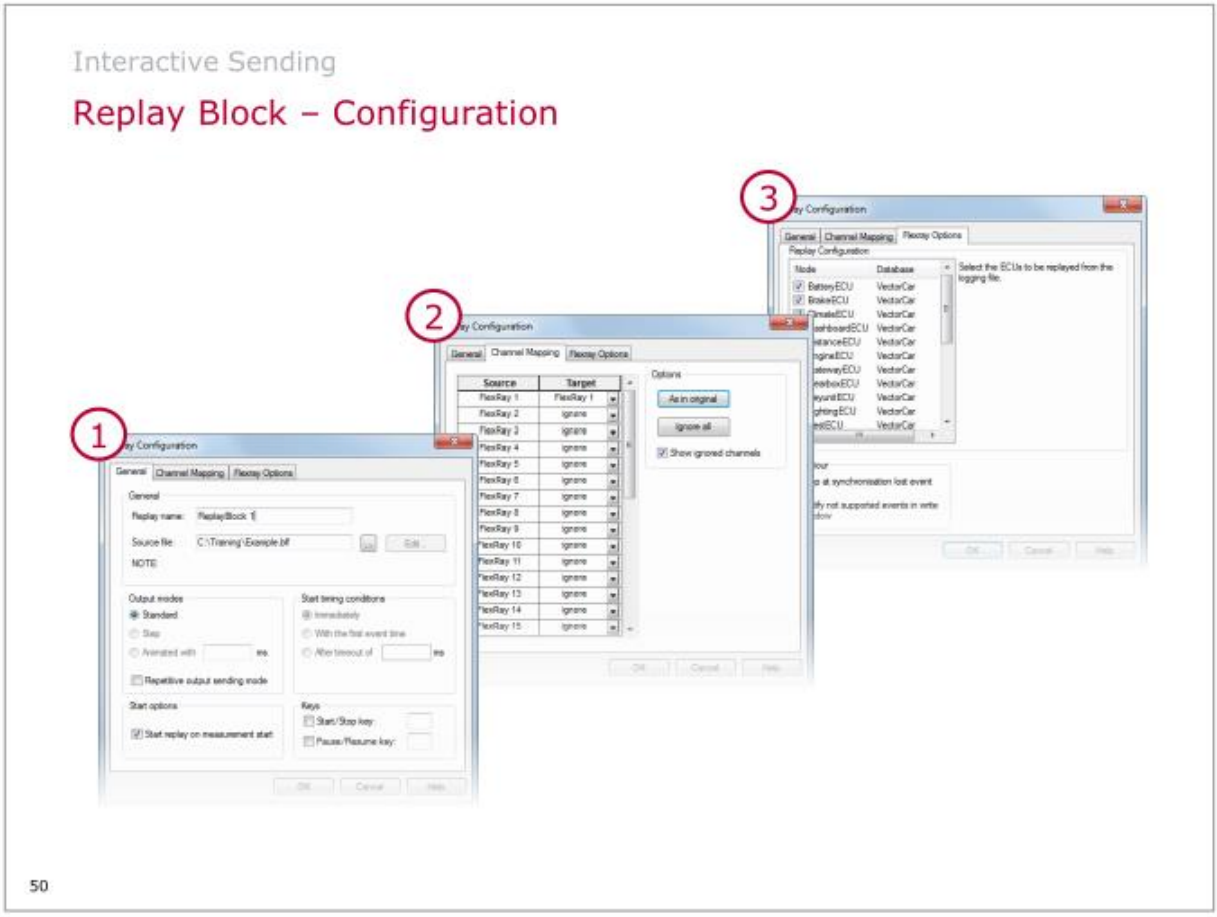
Configuring a file:

(1) Right-click a symbol of the Replay block. Choose *Configuration* from the shortcut menu and left-click it.

(2) Right-click the ... button.

(3) Select the desired file and confirm with *Open*.

(4) Make any other necessary settings for the replay and close the Replay Configuration with the *OK* button.



Various settings are available in the Configuration window, which can be used to influence the replay of the log file.

Tabs in the Replay configuration:

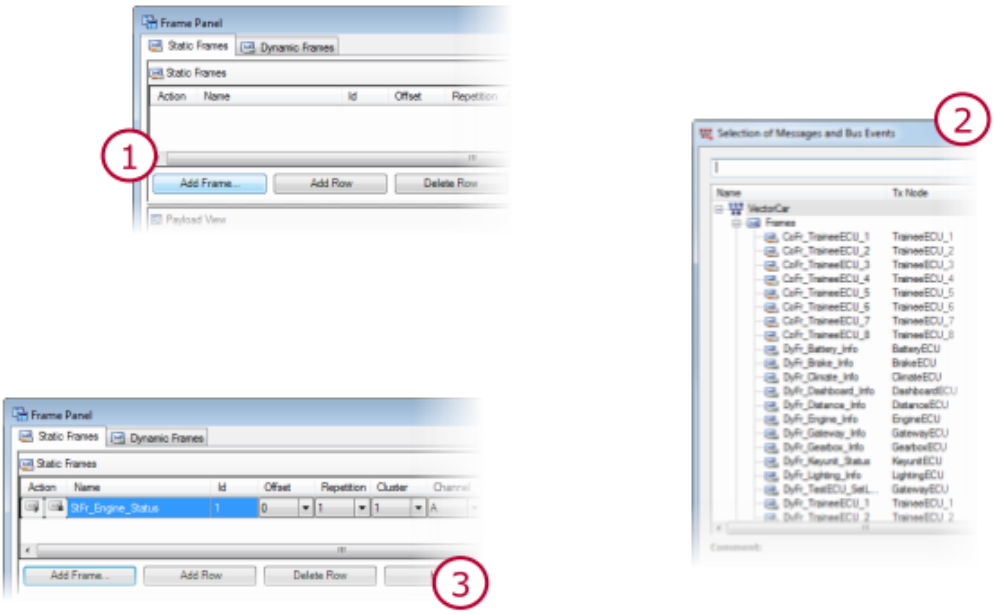
(1) General settings: Besides configuring the file here, the user can also specify whether the file should be replayed from the measurement start and whether keys for starting, stopping and pausing the replay are to be used.

(2) Channel mapping: Under this tab, the user can define the source and target channels.

(3) FlexRay options: Here, the user indicates which node should be simulated. Only the messages of activated nodes are replayed on the bus.

Interactive Sending

Frame Panel – Adding Messages



51

Double-clicking the symbol of the Frame Panel lets the user add messages and configure them.

Adding messages:

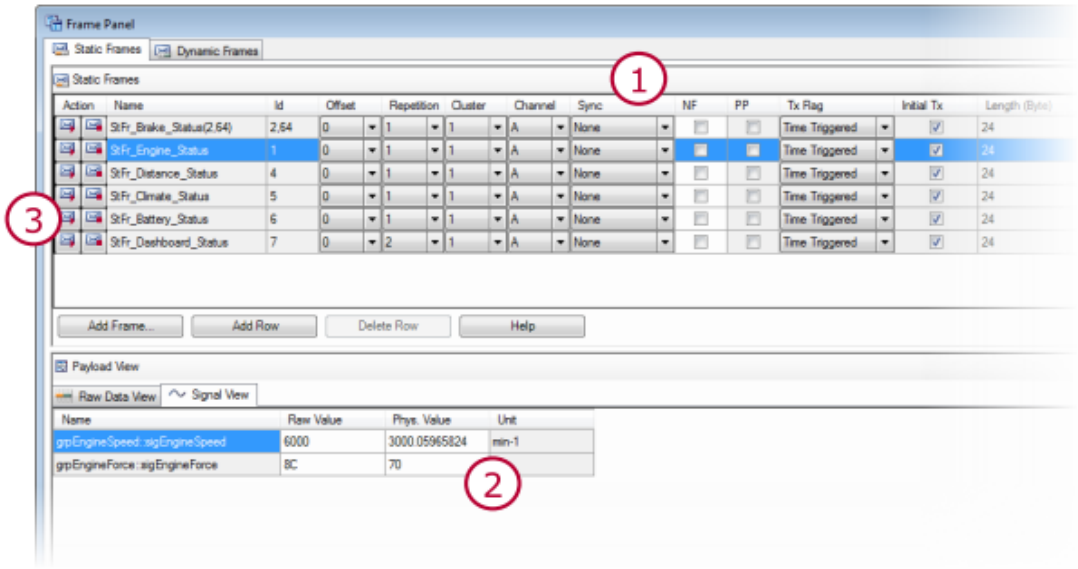
(1) Left-click the *Add Frame...* button.

(2) Select message from the database view and accept with *OK*.

(3) Configure properties of the message. The message can be sent as soon as the measurement is started.

Interactive Sending

Frame Panel – Configuring and Sending Messages



Double-clicking the Frame Panel symbol lets the user add messages and configure them.

Configuring messages:

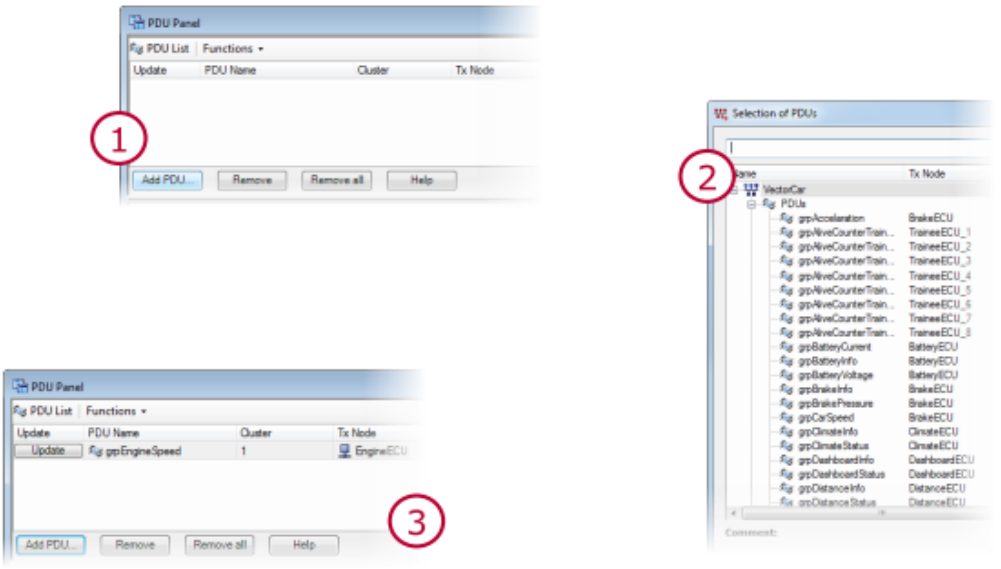
(1) Message properties can be changed: Offset, Repetition, Cluster, Channel, Sync, NF, PP, Tx Flags, initial Tx. The basic settings come from the database.

(2) Signal values can be modified in the window for the available signals. As an alternative, the values of the individual bytes can be changed.

(3) The signal values in the interface's message memory are not routed until the Update button is pressed.

Interactive Sending

PDU Panel – Adding PDUs



53

Double-clicking the symbol of the PDU Panel lets the user add PDUs and configure them.

Adding a PDU:

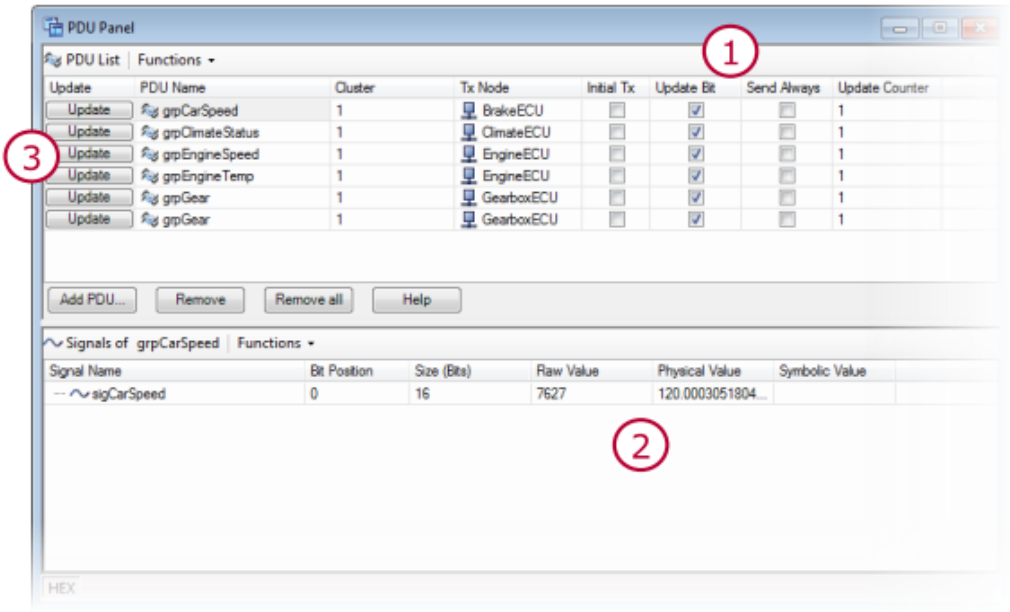
(1) Left-click the *Add PDU...* button.

(2) Select PDU from the database view and accept with *OK*.

(3) Configure properties of the PDU. The PDU can be sent as soon as the measurement is started.

Interactive Sending

PDU Panel – Configuring and Sending PDUs



54

Double-clicking the symbol of the PDU Panel lets the user add PDUs and configure them.

Configuring a PDU:

(1) The properties of a PDU can be changed: Update bit, initial Tx, send always.

(2) Signal values can be modified in the window for the available signals.

(3) The signal values in the message memory of the FlexRay hardware are not routed until the Update button is pressed.