CANoe/CANalyzer New Features

Version 11.0
Agenda

- Release Information
  - General
  - Diagnostics
  - Testing (CANoe only)
  - VT System
  - AMD/XCP (CANoe only)
  - Scope
  - Sensor
  - CAN / CAN FD
  - Ethernet
  - LIN
  - Car2x
  - J1939 / ISO11783
  - Summary
Overview

- Release date 11.0
  - 2018-04-20
- Supported bus systems
  - CAN & CAN FD, LIN, FlexRay, MOST, J1708, Ethernet, WLAN
- Options
  - AMD/XCP – CANoe
  - Car2x
  - Scope for CAN & CAN FD, LIN, FlexRay
  - J1939, CANopen, J1587
  - ISO11783 - CANoe
  - Aerospace options: AFDX®, A429, CANaero
  - Sensor: PSI5, SENT, SPI - CANoe
Agenda

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**Skip topic**
Main Benefits

- Communication concept to address service oriented architectures (SOA) and adaptive AUTOSAR
- Security Support – TLS/SecOC support
- Support for Multi Tasking Simulink models – emulation of a RT OS scheduling
- Offline VT System – setup and configuration of VT systems without physical connection
- VH6501 CAN disturbance interface – graphical panels for trigger and sequence configuration
- New licensing and installation concept – MSI compliant installer, tool characteristics determined by license only
Complete new installation program
General

Setup and Licensing

- Complete new installation program
  - Better support for software deployment
    - Full MSI compliant
    - Dedicated setup for CANoe and CANalyzer
  - Simple selection/deselection of additional demos or editors (e.g. ODX Studio, CANdela Studio, ...)

- Licensing: Program variant and options depends only on the licenses
  - Easy upgrade, side grade without the need for reinstall
  - Full support of the new Vector licensing
General

**Communication Concept**

- Support for service oriented architectures (SOA)
  - Import and merging of multiple extracts
  - Support of complex service interfaces
  - Fields, Events, Methods, complex Data Types
  - AUTOSAR Adaptive
    - R17-10 (11.0)
    - R18-03 (11.0 SPx)

- Communication Object Editor
  - Complex data types
  - Encodings
  - Signal groups

- vTESTstudio support
Communication Concept

- **Bindings**
  - Ethernet SOME/IP
    - Extended serialization of complex data types
    - Fields
    - IPv4/IPv6
    - Simplified configuration interface
  - CAN FD (11.0 SPx)
    - PDU based communication model
    - Container PDU Support

- **Model Generation (11.0 SPx)**
  - Ethernet + CAN
  - NM, E2E, SecOC and fault injection

- **Targeted customers**
  - VAG adaptive use cases
  - DAG STAR 3 architecture

More info:
DE - https://vector.com/vi_canoe_de.html#vi_canoe_com_model_iframe_de.html
Interactive Generator for AUTOSAR PDUs (11.0 SPx)

- Supports ASR PDUs for CAN, FlexRay and Ethernet
- Support of ASR4.x for statically mapped PDUs (GM and BMW) and PDU streaming (DAG)
- Support of new communication concept as well as classic
Security Manager & CANoe
- System variable support for Freshness start values
- Automatic download of Security Manager modules to RT systems (VN89xx...)
- Low level crypto functions (AES128 CBC ECB, CMAC, SHA256, SHA512) in CAPL
- Support of VLAN Ids at secured PDUs and Freshness messages
- TLS support (with SP2) for Ethernet

Security Manager
- Copy to clipboard function for output window
- New AUTOSAR SecOC Template with JASPAR Freshness Manager

OEM Security Packages
- Current available security support for DAG, Toyota, Nissan, VAG
- Further OEMS are under development / in planning
Distribute CANoe to multiple computers

- Scalable CPU power for simulation and analysis
- Almost unlimited total channel count
- Common measurement start
- Time synchronization via HW sync and FDX
- System variable exchange via FDX
Split of video files during recording
Simultaneous recording and splitting of video and logging files (logging trigger used)
Field codes available for incremented video file names and folder names

Video Configuration dialog
Offline Mode

Improved offline configuration

- Activate / deactivate files for offline analyze
- Integrated video file configuration
- Grouping of triggered video files by unique IDs
Mapping Groups allow the configuration of different sets of mapping relations

Dynamic Mapping Sets can be toggled via CAPL

SymbolMappingSetDynamicGroup("Dynamic Mapping 1")
General

Symbol Explorer

- New Navigation Path control
  - Shows the path to the selected element
  - Allows navigation to parallel elements along the path

- Improved search functionality
  - Wildcards * and ? are supported now

- Suspension of search to see all sub elements
MATLAB/Simulink Integration

- Support of latest tool versions
  - MATLAB/Simulink R2016b...R2018a
  - Visual Studio 2015 and 2017
- Support of any data type in the Simulink model
  - previously data was implicitly casted to double
- Raw/physical interpretation
- Support of system variables structs
  - Create sysvar structs from non-virtual Simulink buses or
  - Directly use predefined sysvar structs
MATLAB/Simulink Integration

- Support for Multi Tasking Models
  - Specify different sample times the Simulink code generation options
  - Each sample time in the model is mapped to a specific task
  - Creation of system variables for task info
  - Emulation of a pre-emptive RT OS scheduler

![Diagram showing Simulink model with different colors representing different sample times.](image)

<table>
<thead>
<tr>
<th>ActiveTask</th>
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<th>TaskInfo[0].CalCount</th>
<th>TaskInfo[0].OVERRIDE</th>
<th>TaskInfo[0].OVERRIDEQueue Count</th>
<th>TaskInfo[0].TurnaroundTimeLast</th>
<th>TaskInfo[0].TurnaroundTimeMin</th>
<th>TaskInfo[0].TurnaroundTimeMax</th>
<th>TaskInfo[0].TurnaroundTimeAvg</th>
<th>TaskInfo[0].CycleTime</th>
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</tbody>
</table>

**Tasking and sample time options**

- **Periodic sample time constraint:** Specified
- **Sample time properties:**
  - Periodic: [0.5, 1.0, 2.0, 3.0, 4.0, 5.0]
- **Tasking mode for periodic sample times:** MultiTasking

**Color Annotation**

- **Color:**
  - **Black:** Continuous 0
  - **Red:** Discrete 1
  - **Green:** Discrete 2
  - **Blue:** Discrete 3
  - **Yellow:** Discrete 4
  - **Pink:** Constant
  - **Purple:** Hybrid

**Description Value**

- **D1:** (period)
- **D2:** (period)
- **D3:** (period)
- **D4:** (period)
- **Inf:** constant
- **H:** Hybrid

**Higher priority value indicates higher task priority**
Integration of ECU code via vVIRUTUALtarget
Support VN8900 connected via Ethernet in **CANalyzer**
End of support for VN8910/A, VT6010, VT6050/A in distributed mode (CANoe RT)
  - VN8900 Devices can still be used in Interface Mode
Graphics Window CAPL API
  - CAPL functions to control Clear, Pause, Fit and Time Interval
  - CANalyzer: Automates the Graphics Window for manual analysis
  - CANoe: Allows screenshot automation for test reports
Panel Designer

- Panel Overview Window
  The new window lists all controls and symbols of the selected panel
  - You can quickly identify which symbols are assigned to the controls
  - Assign symbols to the controls
  - Find controls that are hidden or outside the panel

- Switch/Indicator
  Now, you can enter not only concrete values but also value ranges for the switch values, e.g. for a digital tank display.
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Release Information

General

- **Diagnostics**
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J1939 / ISO11783

Summary

Skip topic
Diagnostics

Diagnostic Parameters Window

- Auto-Read: Send diagnostic requests with a defined cycle time and display selected diagnostic parameters of corresponding diagnostic response
- Trigger a diagnostic request manually to update corresponding response parameter(s)
Improved Symbol Explorer for Diagnostics

- Better representation of complex data structures
- Improved display of nested parameters

10.0:

11.0:
Diagnostics

Diagnostic Parameters as Trigger Block condition

- Triggering on diagnostic parameter values
- Online- and Offline-mode supported
- No CAPL necessary in offline mode
- No CAPL necessary in online mode as well if corresponding requests are triggered using the Diagnostic Parameter Window
Mixed operation of CAN 2.0 and CAN FD

- Improved behavior of the OSEK_TP.dll (since CANoe/CANalyzer 10.0 SP3)
- Diagnostic Channel (Tester side) support (new setting in “Diagnostics/ISO TP...” configuration dialog:

![Configuration dialog](image)

- Setting for mixed operation:
  - CAN ID (hex) for Normal: 0x702, 0x602, 0x750
  - CAN ID (hex) for UUDT from ECU: 0x782

- Additional ISOTP protocol parameters:
  - Min: 20 ms, Block size: 0, Max length: 4095

- CAN FD Parameters:
  - DLC: FD = 64
  - Enable BRS

- Reception of other frame types by tester:
  - Ignore

![Configuration dialog details](image)
Further Improvements

- Diagnostic Authentication using Security Sources configured with the Security Manager
- Display of DTC related parameters (e.g. DTC status byte) in analysis windows (State Tracker, Data- and Graphics Window) only depend on the corresponding DTC, no longer on the position of the DTC in the diagnostic response
- DoIP: Improved simulation behavior for IPv6 in combination with VLAN tags
- New/extended CAPL functions to enable parallel testing using the CAPL Callback Interface (CCI)
- Support sending and receiving of CAN frames with different types, e.g. sending frames with 11 bit ID and receiving frames with 29 bit ID (or vice versa)
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Together with vTESTstudio 3.0:
- Navigate to a test case, test sequence, test fixture or test group in vTESTstudio as well as to single test commands within a test case.
- Navigation supported into the Test Table Editor, the Test Sequence Diagram Editor and the State Diagram Editor in vTESTstudio.
- Navigation supported from the CANoe Test Configuration window, the CANoe Test Trace window and the CANoe Test Report Viewer.
Testing (CANoe only)

Access to Communication Concept

Together with vTESTstudio 3.0:

- Access to communication concept of CANoe
- Dedicated Test Feature Set functionality in .NET C#
- Comfortable test design for e.g.
  - Autosar Adaptive
  - Ethernet Some/IP
New analysis window “Timeline”
- Timely base, independent from structure
- Very useful for the analysis of activities that start/end across test cases
- Navigation from/to other views is supported
Testing (CANoe only)

Report Viewer

- Navigation possibilities
  - Navigation to CANoe...
    - ... can be started on timestamps
    - Navigation to test cases and further structural elements within test configurations
  - Navigation to vSignalyzer (if available) based on timestamps
  - Navigation to vTESTstudio based on testcases etc.
- Several further usability enhancements
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Summary

Skip topic
Motivation

- Measurements using VT System modules can now also be started when single or all modules are not available as real hardware

Configuration

- VT System modules can be switched individually or commonly into offline or online mode in the VT System Configuration dialog
- The offline/online state of each module is displayed in the VT System Control dialog
- Activation / deactivation of the VT System is now performed automatically, only dependent on the configuration of VT System modules. The formerly available manual VT System activation in the global options menu is therefore obsolete
- The network adapter for the VT System is now selected directly in the Configuration dialog of the VT System → Single access point for all VT System relevant settings
Operation

- The offline/online state of each module can be read on each channel by a corresponding Read-Only System Variable.
- All measurement System Variables can be written via an additional name space "Offline" in order to obtain the expected test results also in the offline mode.
- CAPL and .NET commands which involve VT System modules return the expected result also when VT System modules are not physically present or set offline.
- The offline/online mode of all VT System modules is stored in an additional file (*.vtcfg.local) by configurations who use the VT System → workplace specific use.
VT System

VT6104A – Network Interface Module

**Motivation**
- Successor of discontinued module VT6104

**Main Features**
- Network Interface Module for VT System
- 4 channels (CAN/LIN/J1708), configurable via piggybacks
- **New:** CAN FD support for all channels
- Hardware time stamp synchronization
- Relays for short circuit, open wire, bus termination
VT System

VT7820 - Rotation Sensor Simulation Board

Motivation
- Simulation of wheel speed sensors
- Serving e.g. powertrain or chassis ECUs with sensor signals

Main Features
- Application board for new VT7900 FPGA
- Simulation of wheel speed sensors
- 4 sensor simulation channels
- Voltage + current modulation
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Summary
Main Benefits

- **Product Concept**
  - The single CANoe options .AMD and .XCP are combined to the new option CANoe .AMD/XCP
  - No change of existing license bits required when upgrading to CANoe 11.0

- **XCP on Ethernet**
  - When CANoe .Ethernet is available, a TCP/IP stack instance from any simulation node can be selected for communication with an XCP device
  - Allows XCP connections to multiple ECUs with identical IP addresses (durability / end of line tests)
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Option .Scope – New Features (CANoe /CANalyzer 11.0 SPx)

- **New Graphics View** with multi view concept
  - Faster data representation
  - Scope graphic windows support Y-Axis scaling in addition to grid scaling
  - Multi cursor concept with generic cursor legend showing detailed information about sample points
  - Global markers for each graph view
  - One intelligent graph toolbar to control several graph views
  - X- and Y-axes of several graph views can be synchronized

- **Compare Mode** to compare measurements in different graph and trace views

- **CAPL Analysis**
  - Serial bit mask analysis for LIN conformance tests (eg. Duty Cycle Measurement)
  - Flexray transition time measurement for single frames
Option .Scope – New Features (CANoe /CANalyzer 11.0 SPx)

- **Support of current measurements**
  - Current is measured using current probes

- **Support of new scope hardware (11.0 SP3)**
  - Up to 4 channels, BNC single-ended
  - Up to 16 digital channels (2 ports of 8 channels each)

- **Support of signal decode for ARINC 429 specification**
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Summary
Support of User-Programmable FPGA on VT2710 (since 10.0 SP4)

- Support of high-performance applications
  - All standard functions of VT module still available
  - Additional functions by user FPGA
  - Full access to I/O hardware of VT module in user FPGA code
- Time-critical functions directly implemented on the VT module
  - User-specific pre-processing of input signals
  - Fast, precise hardware-generated output signals
  - Implement protocol extensions deviating from CANoe standard features
- FPGA design by modeling
  - Using Matlab/Simulink® with Altera DSP Builder block set
  - Simple design tool for FPGA handling → VT FPGA Manager
  - Done by user himself or Vector project team
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- **CAN / CAN FD**
  - Ethernet
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  - J1939 / ISO11783

Summary
Graphical user assistance added to sample configuration

- Sub-panels for trigger and sequence configuration
- Information about interface channel and trigger state
- Enable disturbance on device with feedback

**VH6501 – CAN FD Disturbance Interface**

- MainConfigPanel
- Trigger Configuration
  - TriggerPosition-Information
    - Field Name
    - TriggerOffset
  - Repetition Configuration
    - Cycles: 1
    - Repetitions: 1
    - CycleHoldOff[ms]: 0
    - RepetitionHoldOff[ms]: 0
- Sequence Configuration
- Enable On Device
- Configuration Status
- Disturbance Interface Channel Information
  - DeviceID: 0
  - Channel:
  - ChipState: Active
- Disturbance Interface State:
  - Idle
  - Active
  - Triggered
  - Repetition: 0
  - Cycle: 0
  - Source:
VH6501 – CAN FD Disturbance Interface

- **Trigger Configuration Panel**
  - All CAN / CAN FD fields available
  - Definition of bit mask values with dominant, recessive and don’t care
  - Drop-Down list for trigger position definition

- **Sequence Configuration Panel**
  - Selectable segment value (dominant, recessive, recessive stress)
  - Selection between user defined and pre-calculated durations for arbitration and data phase
  - Possibility to define multiple segments
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Summary
IP Network Monitor

- Monitor for simple interpretation of SOME/IP communication relationship between network nodes
- Easy access to fundamental communication information such as amount of nodes, IP addresses, MAC addresses, VLAN, etc.
  - No protocol knowledge required, ideal for reporting
- List of provided and consumed services per node, activity counter and status information
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Summary
New LIN Interactive Scheduler

- Simple interactive configuration of a LIN master simulation
- Allows control of the schedule tables defined in the LDF file
- Control of the NM by simply sending sleep mode frames and wake-up signals
- Easily start and stop the scheduler
- Replaces the LIN Interactive Master
- Works as an independent LIN master

Previously two blocks were required:
- Master Node Simulation: LIN Master Node from LDF
- Controlling of Master Schedules: LIN IM

Only one block is required:
- LIN ISC (Interactive Scheduler) simulates the master and controls schedules
Controlling the LIN Master Mode

- New CAPL API to control the LIN Master Mode

- Dynamically activate or deactivate the LIN Master Mode on a communication channel
  - This allows to dynamically toggle between a real and a simulated Master node in a measurement

- Restrict transmitting headers by selecting the node which models the Master behavior
  - Master node defined in the LDF file
  - Master node implemented in CAPL
  - Master node modeled by a Replay Block
  - Master node LIN stack modeled by a Node Layer DLL
New LIN Header Transmission Mode

- New CAPL API that allows to transmit headers with their intended schedule
  - Usually a master simulation waits until the network is idle before transmitting e.g. a response
  - The new mode does not wait for an idle network but will transmit a header immediately when due
    > This allows a more accurate modelling of a Master node e.g. when testing a LIN Master stack with CANoe
    > A slave node that is responding too slow would lead to a collision
The Option Scope supports now bit mask analysis for LIN.

- This allows automated physical layer tests.
- CANoe will provide a sample configuration that shows a LIN duty cycle measurement.

**Sample Configuration: Measure LIN Duty Cycle**
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Car2x scenario editor provides GUI to easy and fast configure a traffic scenario

CANoe.Car2x imports the scenario and uses the data to create the according Car2x communication
New Car2x Scenario Editor

- GUI to create routes and ITS stations on a map

- Configuration of speed and position of the ITS stations
- Scenario specific attributes can be added to configure the behavior
New Car2x Scenario Editor

- Timeline Window allows to scroll to a specific time or waypoint
- Attributes allows to configure scenario specific behavior
- Keypoints to define values at a specific time
New Car2x Scenario Editor

- Car2x Scenario Manager imports scenario data
  - Car2x IL can access the scenario data
    - Scenario Nodes are automatically mapped to database nodes
    - Automatic assignment of scenario data to Car2x application messages
  - Specific Nodelayer functions available
    - To start and stop a scenario from CAPL
    - To access the scenario data from scenario manager
    - Callback functions which are called if a keypoint changes
Extended analysis of Car2x application messages

- Automatic visualization of Car2x events in the Map window
  - Content of BSM and DENM messages are automatically visualized
  - Visualized content are event code (causeCode), path points and relevance area
  - The map window details view lists the detected events
    - Fast overview of received events
    - Fast location of events in the map window
    - Fast access to frame which transmitted the event via doubleclick on event
Protocol support

- Security
  - Support of new security specification ETSI TS 103097 v1.3.1

- GeoNetworking Protocol
  - Support of new GeoNetworking specification ETSI EN 302 636-4-1 V1.3.1
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Summary
J1939 / ISO11783

J1939-82 Compliance Test: 2015 specification has been implemented

- Easy configuration with panel
- Well structured report
Support for J1939 AUTOSAR (Version 4.2.2)

- CANoe/CANalyzer: J1939 ARXML System Description can be used together with DBC files
ISO11783 Tractor Implement Management (TIM)

- ISO11783_IL can simulate both the TIM Server and the TIM Client
- A comprehensive set of CAPL functions makes it possible to configure a TIM simulation as required
- The trace window provides specialized intelligent filters that clearly arrange TIM-relevant messages
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For more information about Vector and our products please visit

www.vector.com

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