



Product Information: CANoe Option AMD
Version 1.1
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1.0 CANoe AUTOSAR Monitoring and Debugging (AMD)

Current and future generations of ECUs involve increasing numbers of functions and increasingly more complex functions. Moreover, these functions are distributed among different ECUs and are developed by different suppliers. These trends lead to a situation where previous methods for testing and debugging are no longer adequate. A look into the inner workings of the ECU is necessary, e.g. to identify faulty software components or test an ECU's subfunctions. This 'look into the ECU' is made possible by CANoe Option AMD.

Option AMD gives CANoe access to ECU memory; this capability can be exploited for testing and debugging. A prerequisite for the use of CANoe.AMD is ECU access over XCP/CCP or with VX measurement and calibration hardware from Vector.

CANoe.AMD is used to measure and stimulate AUTOSAR and non-AUTOSAR ECUs. An A2L file or configuration is needed that matches the ECU. Due to their modular layout, AUTOSAR ECUs are especially well-suited for Option AMD. For example, the user can use the SWC (Software Component) Editor to configure which ports are to be measured, and this information then makes it possible to generate an A2L file.

2.0 Use cases

- > Debugging in networks and distributed systems, e.g. the go-to-sleep and wake-up behavior of Network Management
- > Debugging in the BSW and SWCs
- > Analysis of distributed functions with access to multiple ECUs in parallel
- > Automated testing of functions with access to ECU memory
- > Testing the integration of BSW and RTE by reading out relevant parameters.

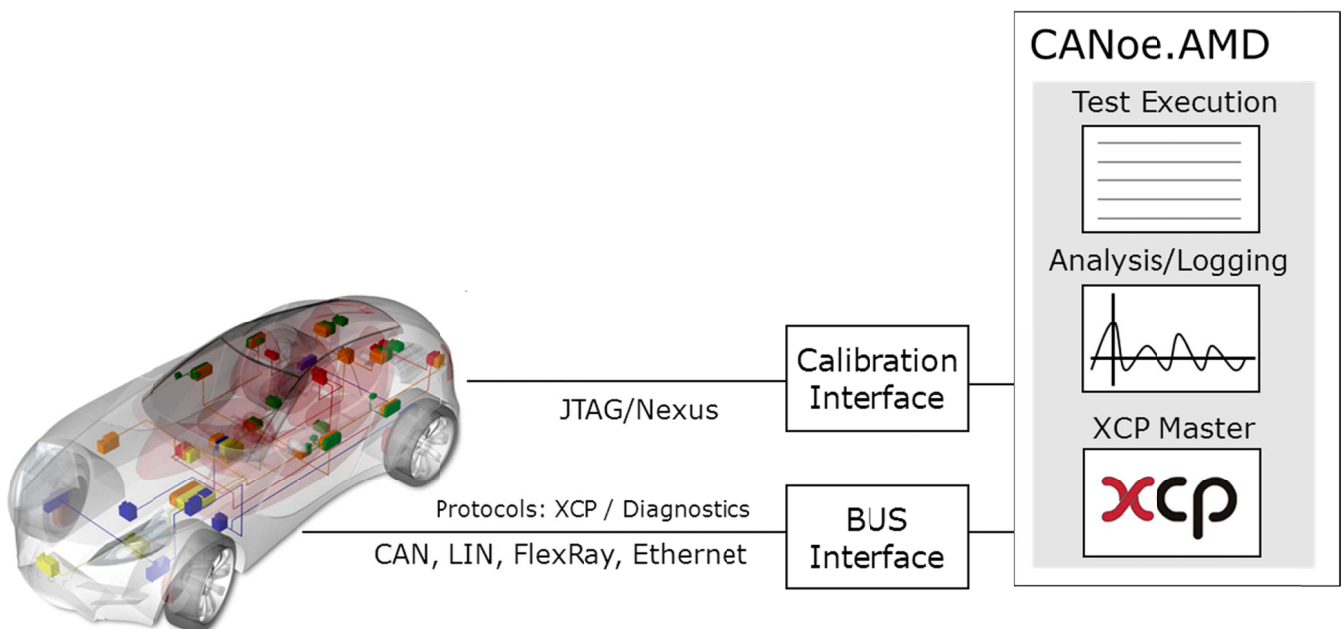


Figure 1: CANoe.AMD, e.g. use in the vehicle

3.0 ECU accesses

To be able to access the ECU memory, CANoe Option AMD needs an access to the ECU. This access may be made over the existing bus infrastructure (CAN, FlexRay, Ethernet) or over the Vector VX measurement and calibration hardware. The VX hardware accesses ECU memory via the debug interfaces (JTAG, Nexus, DAP) of the microcontroller.

3.1.1 VX1000 Measurement- and Calibration Interface

- > Measure at rates of up to 5 MB/sec
- > Supported debug interfaces: DAP (Device Access Port), Nexus Class 2 and 3
- > Very low CPU loading during measurement with data trace access (Nexus Class 3 and DAP)
- > Available for the following microcontrollers: Infineon TriCore, Infineon XC 2000, Freescale MPC5xxx, Texas Instruments TMS 570, Renesas V850 E2, others upon request



3.1.2 Supported bus systems and protocols:

- > XCP (X Calibration Protocol) on **CAN, FlexRay** and **Ethernet**
- > CCP (CAN Calibration Protocol)

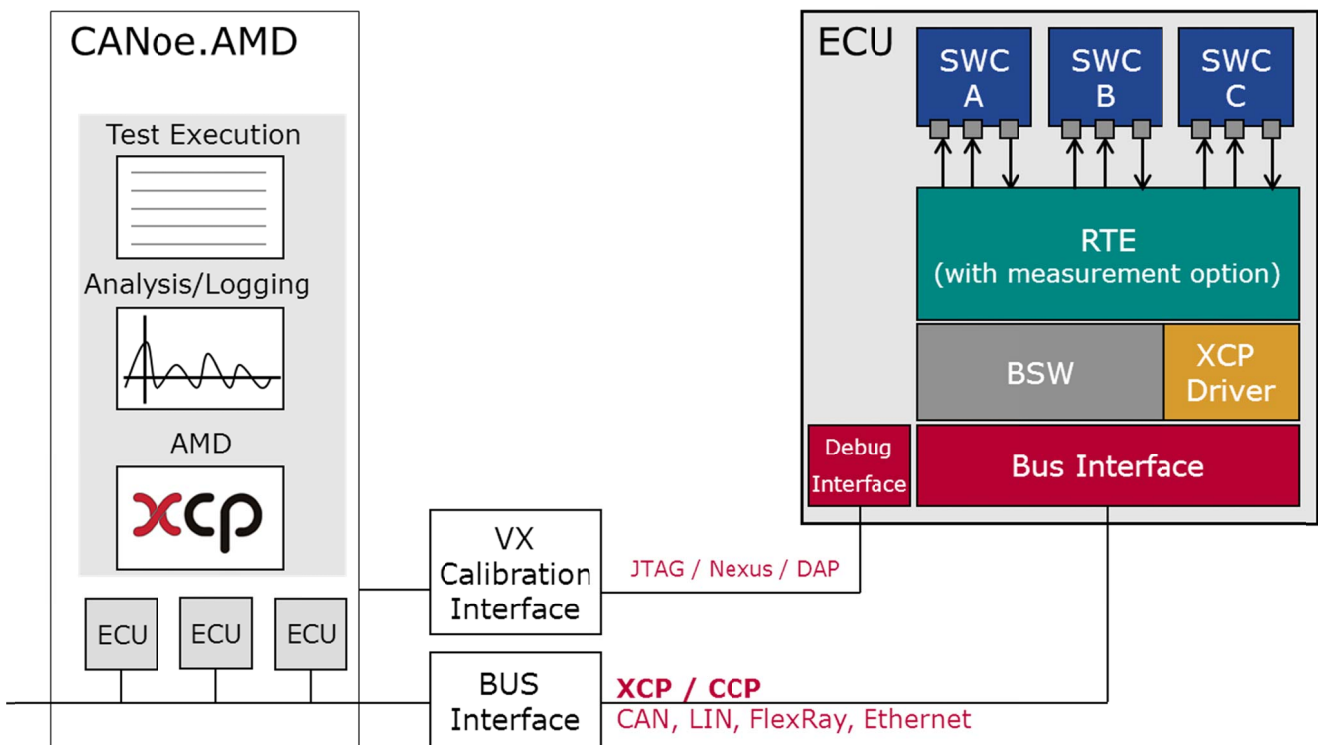


Figure 2: Possible ECU access points with CANoe.AMD

4.0 Configuration

Option AMD is configured by the A2L file format that has been standardized by the ASAM working group. The A2L file contains information on communication (Transport Layer) with the ECU and descriptions of the measurable and stimulatable variables. Also included is information on the interpretation of values (symbolic value tables) and conversion formulas, so that symbolically interpreted values can be displayed directly in CANoe analysis windows.

4.1.1 Configuration process for conventional measurement

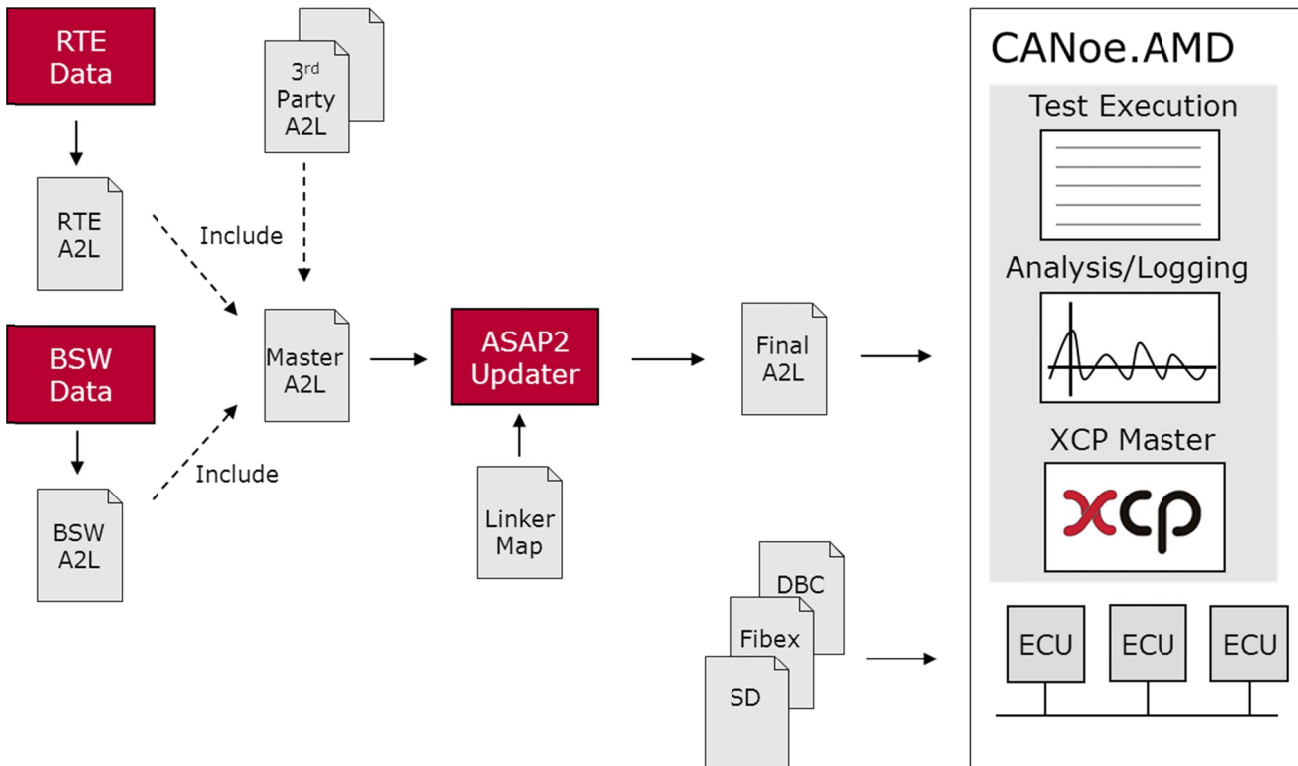


Figure 3: Configuration process

4.1.2 ASAP2 Updater

The task of the ASAP2 Updater is to assign the real ECU addresses from the Linker MAP file to the variables in the A2L file and thereby create a complete A2L file. The ASAP2 Updater can be started and parameterized via the instruction line or it can be called via a GUI from the Tools folder in the Start menu.

5.0 MICROSAR Monitoring Feature

The MICROSAR Monitoring Feature is an extension of the Vector AUTOSAR solution. This extension makes it possible to measure the BSW (Basic Software) modules. A generator generates an A2L file based on the configuration of the BSW modules.

5.1.1 Generic measurement

Generic measurement is part of the MICROSAR monitoring features. In generic measurement, the real ECU addresses are transmitted for selected variables when establishing the XCP connection from the ECU to CANoe. An address update of the A2L file before the measurement is not necessary. The A2L file is thereby no longer ECU dependent. ECUs with different software levels can be measured with the same A2L file. A generic A2L file contains a special identifier for all variables that are read out via the generic measurement; therefore, generic measurement can be combined with conventionally measured variables in the A2L file.

Comment: The XCP Slave driver in the ECU must support generic measurement. The Vector MICROSAR¹ XCP Professional driver supports generic measurement.

6.0 Integration in CANoe

In CANoe, the variables measured over XCP are mapped to the system variables of the CANoe internal data model. System variables are hierarchically set up via name spaces. The XCP signals are always located below the namespace <XCP>::<ECU name>. ECU name stands for the name of the ECU to be measured, which is entered during the XCP configuration process. The system variables can be used in all CANoe analysis windows, in CAPL and the Test Feature Set of CANoe. CANoe.AMD can address multiple ECUs over XCP in parallel.

Supported XCP functions:

- Dynamic and static DAQ (Data Acquisition) measurement
- Evaluating ECU time stamps in DAQ measurement
- Security access via Seed & Key
- Polling measurement
- One-time measurement in establishing connection
- Stimulation on request
- Measuring via CAPL trigger
- Support of scalar values and one-dimensional arrays²
- Symbolic value tables

Variable	Datentyp	Min / Max	Read-only	Quelle
XCP				XCP
MyECU				
CanNm_CommState	Integer	0 / 255	<input checked="" type="checkbox"/>	
CanNm_MsgTimeoutTimer	Integer	0 / 65535	<input checked="" type="checkbox"/>	
CanNm_MsgTimer	Integer	0 / 65535	<input checked="" type="checkbox"/>	
CanNm_NmState	Integer [Wertetabelle]	0 / 255	<input checked="" type="checkbox"/>	
ComM_ActiveComMode	Integer [Wertetabelle]	0 / 255	<input checked="" type="checkbox"/>	
ComM_UserReqFullComArray	Integer	0 / 255	<input checked="" type="checkbox"/>	

Figure 4: Configuring system variables in CANoe

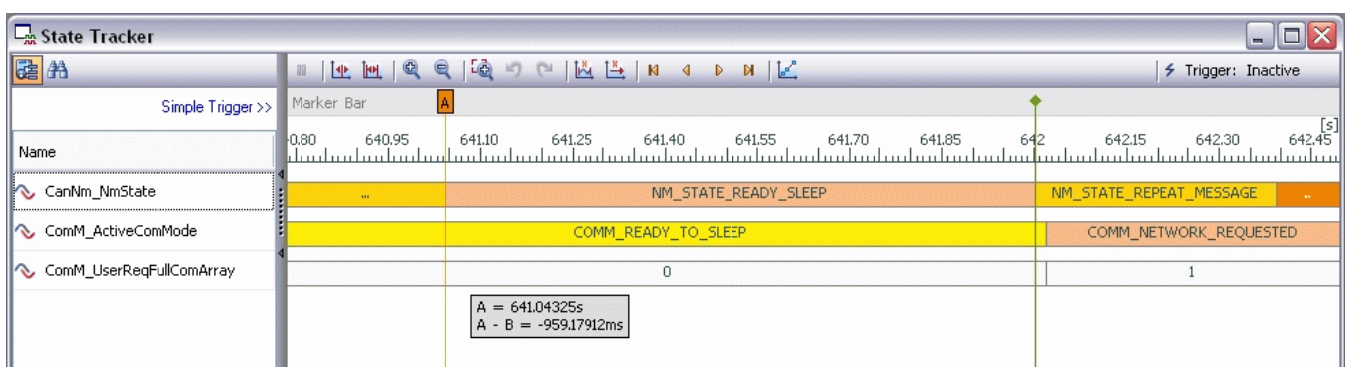


Figure 5: XCP system variables in the State Tracker window

¹ MICROSAR is the AUTOSAR basic software and RTE implementation (Runtime Environment) from Vector Informatik

² The data types Maps (2 and 3 dimensional) and Curves are not supported, 64-bit variables can only be used with a value range of 52 bits.

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