Automated Testing of Diagnostic Software in ECUs

What is CANoe.DiVa?
DiVa is a CANoe extension for automated testing of diagnostic software implementations in ECUs. Reproducible test cases are generated based on an ECU diagnostic description in CANdela or ODX format. CANoe automatically executes these test cases and generates a conclusive test report. CANoe.DiVa then supports the evaluation and further processing of the test results.

Overview of Advantages
> Automatic generation of test cases and their specification with comprehensive test coverage based on ECU diagnostic descriptions in ODX or CANdela format
> Automated execution of test cases and generation of a test report
> Supports different diagnostic standards and bus systems (CAN, FlexRay, DoIP, OBD, KWP2000, GMW3110) and OEM-specific interpretations and test specifications
> Easy to configure test contents
> Integration in the CANoe test environment
This means savings in time and effort while improving the quality of ECU diagnostic software at the same time.

Highlights of Version 13
CAN FD Transport Layer Tests
> CANoe.DiVa now offers over 40 test cases for validating the ISO transport protocol implementation (ISO15765-2) on CAN FD.

Evaluation Notes for Test Results
> In case of found errors CANoe.DiVa now also provides hints on possible error causes.

Test of D-PDU API-based Diagnostic Jobs
CANoe.DiVa validates diagnostic communication from D-PDU API-based Diagnostic Jobs, controls them and enables the following tests:
> Using D-PDU API-based Flash Jobs in CANoe.DiVa software download tests
> Tests also of third-party Diagnostic Jobs in all areas (development, production, after-sales, OTA, onboard tester, ...). The original third-party platform is used for execution, e.g. the diagnostic tester used by the OEM.
Advantage: the user ensures already in early development phases that later required diagnostic sequences match the ECU and run robustly.

Manufacturer support
> Many new manufacturer-specific test extensions
Functions
CANoe.DiVa consists of a configuration tool with a dedicated user interface, test case generator and runtime library for extended CANoe test functionality. The generator uses diagnostic descriptions in ODX or CANdela format to generate comprehensive test cases (good and bad cases). It generates a test module that is loaded to a CANoe test environment, as well as a test specification. The generated tests cover both protocol and application scope. The (re-) programming of ECUs for valid and invalid sequences is also checked. The test results are documented in a clear report. The test analysis is supported by CANoe.DiVa with functions for sorting, comparing, filtering, commenting and further processing of the test results.

Protocol Validation
- Physical/functional addressing and timing
- Protocol format: Processing of valid and invalid requests
- Execution or rejection of services at various session and security levels
- Data types and value limits

Validation of the Application: Diagnostic Parameter and Fault Memory
- Parameter vs. parameter: Compare write/read
- Compare parameters to expected values, e.g. values acquired over CCP/XCP
- Compare parameter with I/O or network signals
- Error states can be automatically provoked (network signal errors or electrical errors via VT System) and reset
- Test of whether the ECU detects the error, reports it according to protocol and specification and again resets the error

Software Download Test
Validation of the flash programming of ECUs in conjunction with vFlash. CANoe.DiVa can generate tests for the bootloader supported by vFlash. vFlash supports more than 120 bootloaders.
CANoe.DiVa generates, among others, the following tests:
- Valid flashing and testing of diagnostic communication with regard to timing and format.
- Flashing when under / overvoltage.
- Abort the flash sequence at different points and targeted interruption of the power supply during flashing.

Requirements Mapping
- Creation of requirements or import of requirements from requirements systems (e.g., Doors) or test data management systems
- Generated tests can be mapped to requirements. This facilitates the tracking of the requirements
- Display of all test results for individual requirements
- Returning test results to the system
- Automated control of CANoe.DiVa for integration into an existing build and test environment (e.g. Jenkins or Subversion)

Security
- Integration of Vector Security Manager. The Vector Security Manager provides OEM-specific security functions, e.g. for diagnostic authentication.
- Test of diagnostic authentication and service availability

Application Areas
Only with the help of test automation, it is possible to secure the extensive diagnostic interfaces of ECUs. CANoe. DiVa contributes a large part to this: The system supplier needs extensive tests to support development as well as regression and release tests. Automotive OEMs also need systematic tests, especially in integration and release on the vehicle level.
CANoe.DiVa is designed to be used by automotive OEMs and suppliers. CANoe.DiVa is not tailored to a specific automotive OEM, but it allows OEM specific adaptions and extensions by configuration and/or plug-ins.

Supported Bus Systems/Diagnostic Standards/Protocols
- CAN/CAN FD, FlexRay, DoIP, LIN, etc.
- Specific test support for numerous automotive OEMs

More information: www.vector.com/diva