CAN Newsletter Online

COLLABORATION

End-to-end application layer test solution

Rohde & Schwarz has announced a collaboration with automotive E/E networking specialist Vector on a cellular vehicle-to-everything (C-V2X) application layer test solution.

Rohde & Schwarz collaborates with Vector to deliver Cellular-V2X end-to-end application layer test solution (Photo: Rohde & Schwarz)

The companies' integrated test platform, which will be showcased for the first time at Mobile World Congress 2019 in Barcelona, combines the R&S CMW500 network simulator and the R&S SMBV100A/B GNSS simulator operating together with Vector's CANoe .Car2x, a comprehensive software tool for simulation, development, and test of V2X-based communication applications.

The automotive industry is evolving toward connected and autonomous vehicles that offer many benefits, such as improved safety, less traffic congestion, reduced environmental impact, and lower capital expenditure. With the trend to equip vehicles with 3GPP Release 14 C-V2X ECUs, peer-to-peer data transfer in ad-hoc networks between vehicles will be realized. All vehicles share location, speed, and trajectory, enabling warnings regarding on-road dangers to be shared between drivers. Applications cover use cases such as vehicle-to-vehicle (V2V) communication, data exchange with roadway infrastructure (V2I), and interaction with vulnerable road users such as pedestrians (V2P). Data communication is implemented in the 5,8-GHz and 5,9-GHz intelligent transportation system (ITS) spectrum bands.

Rohde & Schwarz and Vector have announced the demonstration of a solution designed to configure and run traffic scenarios to comprehensively test the physical layer 3GPP Rel. 14 up to the application layer of C-V2X ECUs in a lab environment.

Repeatable C-V2X testing

Rohde & Schwarz, supplier of test and measurement equipment, has expanded the capabilities of its R&S CMW500 LTE network simulator and R&S SMBV100A/B GNSS simulator to operate with Vector CANoe .Car2x, a software tool for simulation, development and test of V2X-based communication applications. The solution enables engineers to verify critical end-to-end safety-related V2X scenarios in a lab environment.

The solution uses the C-V2X software package for the R&S CMW500 to simulate the Physical- and MAC-layer, transmitting and receiving data over the simulated PC5 interface. This covers faded and congested channel conditions to the device under test (DUT). In its current form, the solution supports both GNSS and PSSS/SSSS sidelink synchronization options.

CANoe .Car2x offers a range of functions designed to configure and run traffic scenarios. This allows the stimulation of a C-V2X control unit according to a defined traffic situation that tests the implemented application in a structured manner. The included Car2x Scenario Editor supports the creation of traffic scenarios using a graphical interface. CANoe .Car2x generates the corresponding ITS communication based on the test scenario. The scenario is then played back with the R&S CMW500 providing the radio access layer with the specific physical interface. This verifies data transmission and reception over the PC5 interface so that the functions of the ECU can be tested comprehensively.

The combined solution covers all layers - the complete stack, 3GPP Radio Access Layers for C-V2X Mode 4, region specific ITS protocol layers such as EU ITS-G5 and U.S. Wave and the ITS application message sets. This enables testing of specific use cases such as Emergency Electronic Brake Light, Left-Turn Assist, or Intersection Movement Assist, as well as more complex scenarios with multiple simulated vehicles such as a congested highway. Additionally, security mechanisms could also be verified running simulations with both valid and invalid signed certificates. On top of this CANoe supports all common automotive bus connectivity

such as CAN, LIN, Most, Flexray, and Automotive Ethernet, enabling the test engineer to analyze or stimulate the ECU within an entire system from their desk. By extending the solution with the VN4610 interface from Vector, customers can access IEEE 802.11p and CAN (FD) networks as well. This enables users to analyze and test C-V2X and IEEE 802.11p (DSRC) communication and related applications with a single setup and a common user interface.

“C-V2X device testing through the application layer is a significant step towards achieving the goal of having fully connected vehicles to improve road safety,” said Anton Messmer, VP Mobile Radio Testers at Rohde & Schwarz. “Our efforts in developing and verifying C-V2X end-to-end application scenarios are enabling user equipment manufacturers and OEMs to reduce the time needed to roll out C-V2X technology on a worldwide basis.”

“CANoe .Car2x has a strong focus on testing V2X based protocols and ADAS applications. This combined solution, CANoe .Car2x with the R&S CMW500, enables our customers to stimulate the V2X ECU with real scenario data in order to perform tests from physical layer up to the application”, said Stefan Krauß, Director Tools for Network and Distribution Systems at Vector. “The collaboration on this solution shows what can be achieved when leading players from the automotive and telecommunication industries work hand in hand.”

Rohde & Schwarz demonstrates the test solution at MWC 2019 exhibition in Barcelona in hall 6, booth 6C40 from 25 to 28 February 2019.

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