Virtual ECUs

ETAS ISOLAR-EVE in application

Developing new, electronically controlled vehicle functions involves a number of discrete stages: design, prototyping, implementation, verification, integration, and validation. However, these can all be seamlessly connected by using virtual ECUs. Virtual ECUs can be duplicated any number of times, which makes it easier for work processes to be performed in parallel and for tasks to be better assigned. Both these factors can do a lot to speed up software development and improve software quality. At the same time, using virtual ECUs brings down development costs because they make it possible to recognize errors or flaws at the design and implementation stages and resolve them early on.

AUTHORS

Dr. Ulrich Lauff is Senior Expert Marketing Communication at **ETAS GmbH**.

Joachim Löchner (Dipl.-Ing.) is Field Application Engineer for AUTOSAR solutions at **ETAS GmbH**.

Johannes Wagner (Dipl.-Ing.) is Product Manager ISOLAR-EVE at **ETAS GmbH**.

As a result of this, there is much less of a need for elaborate breadboard assemblies, challenging Hardware-in-the-Loop test systems, test benches that cost a lot to purchase and operate, or expensive test vehicles. Software- and Hardware-in-the-Loop tests will increasingly complement each other in the future, with fluid boundaries. In this process, tools such as ISOLAR-EVE are key factors in bridging the gap between these methods of testing.

ISOLAR-EVE: open, and based on the Eclipse platform

With ISOLAR-EVE (ETAS Virtual ECU), ETAS provides an open platform that makes it possible to virtualize an individual ECU or an entire ECU network on a PC. In doing this, the solution supports both AUTOSAR and proprietary software. Functional models, application software components, and basic software modules from various sources can be integrated quickly and easily – and they can then be tested and calibrated with the virtual ECUs generated. It is no problem to configure and parameterize these virtual ECUs flexibly on a Windows PC, and so to customize them for the current application.

ISOLAR-EVE is interoperable with development, testing, measuring, and calibration tools offered by ETAS and other vendors. This is due to the fact that on the one hand it is built on the open source Eclipse platform and on the other hand it offers open, flexible, and configurable interfaces that comply with automotive standards.

Applications

Because of the virtualization platform's openness, it is easy to integrate it with special editors, version control systems, or specific tools for the purposes of test automation. The same is true for software testing environments as well as for measurement and calibration tools. In addition, ISOLAR-EVE supports the generation of virtual ECUs with functional mockup interfaces (FMIs) for co-simulation of systems in various vehicle domains; it also supports integration into vehicle dynamics simulations, such as IPG CarMaker. Over and above that, virtual ECUs can be packaged together as S-functions for integration into Simulink® simulations. Virtual ECUs can be calibrated in the same way as real ECUs by connecting them to measurement and calibration tools such as ETAS INCA – and calibrating them in a closed-loop simulation, for example. The calibration data obtained can then be used again in subsequent process steps.

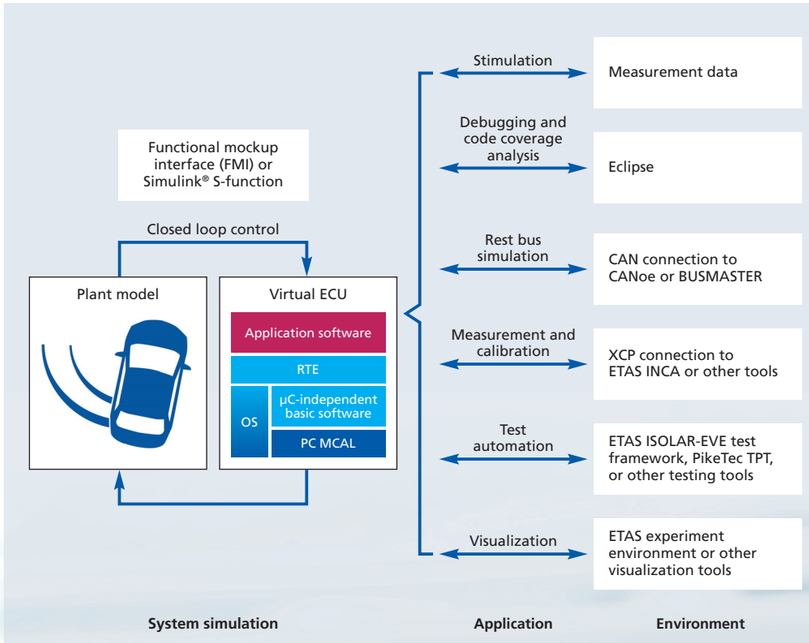
Since both the application software and the basic software of ETAS Virtual ECUs – including RTE and OS – correspond as closely as possible to the software of real ECUs, then the right test designs permit many integration and release tests to be performed using them. Using ISOLAR-EVE, developers can verify and validate the implementation as well as the behavior of application software components and basic software modules provided by a number of vendors. The spectrum here ranges from component tests, including AUTOSAR conformity testing, to integration testing and downstream functional validation. In this process, the virtualization platform makes it possible to generate test interfaces at all levels of the software architecture – be it on the level of the application software, the basic software, the runtime environment (RTE), or the microcontroller abstraction layer (MCAL).

Simulation versus measurement

Measurement data from experiments on vehicles or at a test bench serves as an important basis for simulations and virtualizations. On the one hand, this data can act as a source of reference for calibrating functions in the virtual environment. On the other hand, it can be used both to stimulate simulations and to generate data-based models – which often make system behavior easier to describe and more precise to predict than do physical calculations.

In the future, test drives will mainly be used to create the database for computer simulations and to back up validations that have been performed in these simulations. In spite of the growing complexity of powertrains and assistance systems – and equally the ever-growing numbers of sensors and ECUs – it will thus be possible to further shorten the testing stages and to significantly reduce again the number of prototypes and test vehicles.

ISOLAR-EVE V3.1 runs on Windows 10 and supports automotive Ethernet. Furthermore, it features a variety of other improvements. Find out more on page 29.



The openness of ISOLAR-EVE enables flexible integration into available tool environments.