

Simulation and Virtualization of Vehicle Systems

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Developing and testing distributed functions using ETAS COSYM

Automated driving functions unite multiple electronically controlled vehicle systems – how to get them into full scale production quickly while maintaining quality and competitive prices? And what is the best design for complex drive systems with electric and combustion engines, battery, catalytic converters, and automatic transmission?

In order to seamlessly develop and flexibly test new functions using MiL/SiL and HiL environments, developers need powerful environments to generate virtual control units, advanced tools for the integration and configuration of modular system models, and scalable platforms for conducting simulations.

ETAS COSYM

COSYM allows for efficient testing and validation of connected, embedded systems in virtual environments. It also offers an open simulation platform based on new software technologies (see figure). At its core, COSYM enables comprehensive MiL/SiL/HiL (XiL) system testing, paying particular attention to control unit networks. At the same time, COSYM offers a platform for modern continuous-integration processes in the development of systems and software.

COSYM comes with tools for the following operations:

- Creating a system model, for instance by importing plant, function, or restbus models, and signal connection. Option to create virtual networks and connect them with

virtual and physical control units. As a result, the system model generated does not merely couple model signals, but can also factor in network communication. If the virtual control unit is integrated on the micro-controller abstraction level, by using ETAS ISOLAR-EVE for instance, this allows for much more precise simulation in contrast to integration on the application software level.

- Configuring the simulation for MiL, SiL, and HiL environments, according to the execution platform and timeframe (real time or in line with the simulation timescale).
- Executing experiments with the help of the ETAS experiment environment.
- Automation via the XiL API or the native REST interface, which allows for state-of-the-art software implementation of continuous integration environments. Thanks to this, COSYM allows users to create projects on the server and, in the future, also conduct experiments.

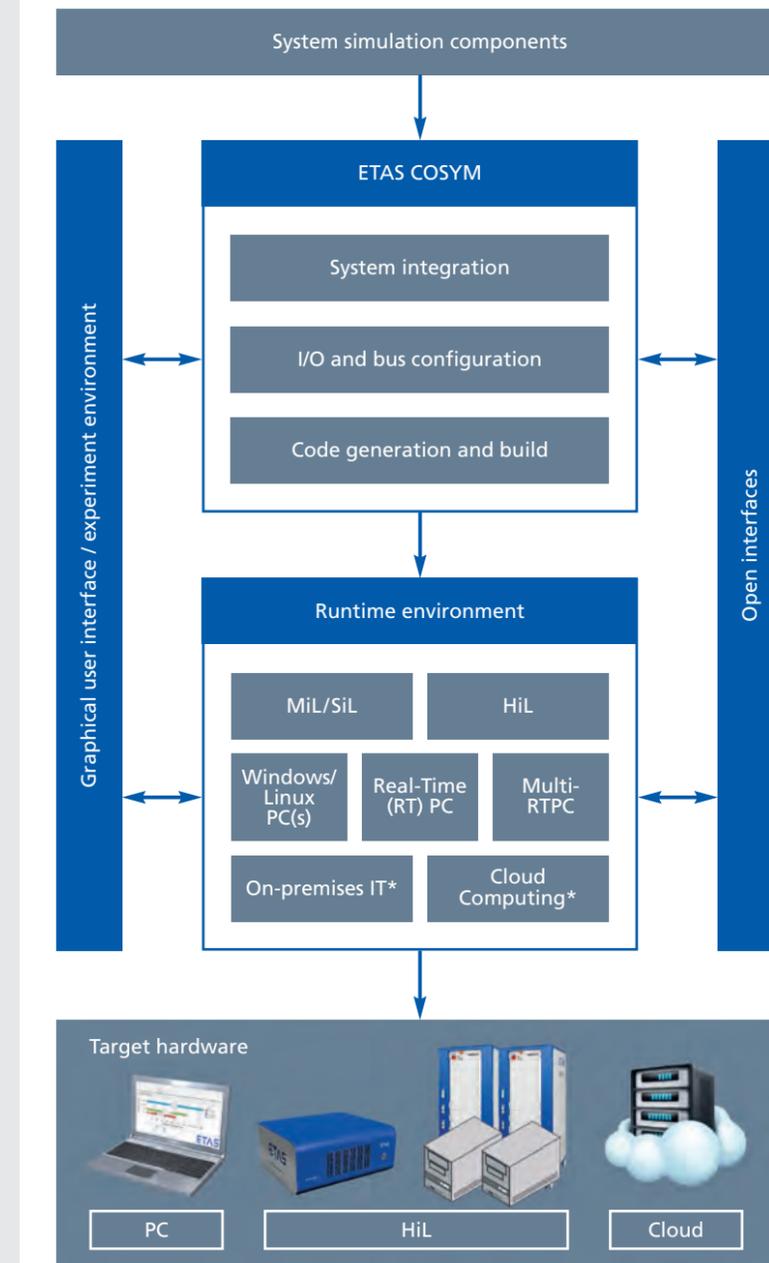
COSYM is based on modern software technology, with a consistent separation of services and user guidance. The well documented REST services interface is easy to integrate into one's own user guides or auto-

mation processes. COSYM comes with a web-based user interface as standard. Thanks to its service-oriented architecture, the platform can be incorporated into integrated development environments (IDEs) such as Eclipse.

Market launch

COSYM will be launched in three phases as part of pilot projects. At the end of 2017, it will be available for ETAS LABCAR HiL systems. This will make it possible to transfer HiL tests into fully virtual environments, for instance on PCs. This can be done using plant simulations of the LABCAR-MODEL family, for instance. If the physical control units are replaced by virtual control units or appropriate functional models, it becomes possible to make the entire system virtual.

In the second phase up to mid-2018, it will be possible to integrate virtual networks for all standard vehicle buses. In addition, virtual timescales will be offered as an alternative to real-time simulation, both by COSYM and by LABCAR-MODEL. This makes testing significantly faster than using HiL in real time.



*in the future

ETAS COSYM – system overview.

Finally, phase three, starting in mid-2018, will lay the foundations for the calibration of complex systems in virtual environments. This is noteworthy for two reasons in particular. First, it will allow for testing based on real driving emissions (RDE). And second, this will ultimately allow for adjustment and testing of ADAS and driving automation applications in the virtual environment, for instance with the aid of measurement data from road tests.

Outlook

In the medium term, the COSYM platform will be expanded for implementation in high-performance server infrastructures – including on-premises, if desired. In order to better support the data-intensive development of systems for automated driving, there will also be a focus on integrating big data solutions that allow users to quickly shift through large data sets for suitable measurement data to compare or combine with simulations.