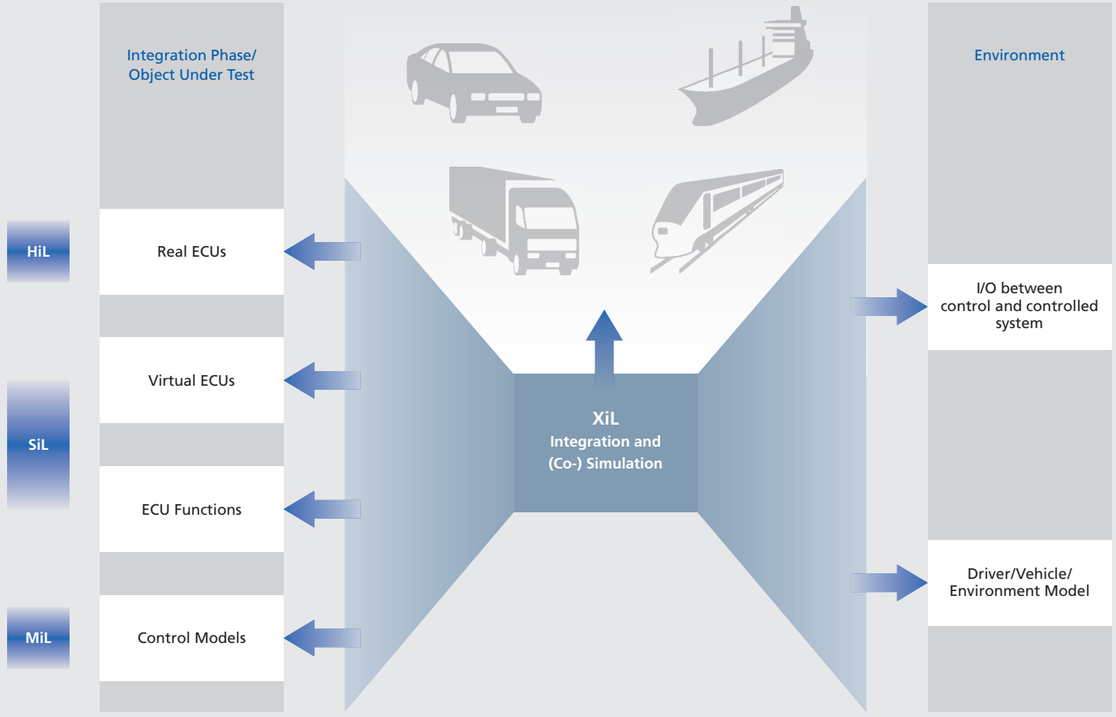
# Virtualization Is the Key to Greater Efficiency


## Improving the development of electronically controlled systems

More and more development work for new vehicle models is being conducted in the virtual world – including the validation, verification, and calibration of embedded software. Increasingly precise models and more powerful computers are making it possible to integrate and test systems before hardware prototypes are available. Standards play an important role in these virtualization activities, helping to break down barriers between heterogeneous tool landscapes and facilitating cooperation between OEMs and suppliers.




- XiL (X-in-the-Loop): with X representing any control model, software, or hardware under test
- XiL stands for MiL, SiL, or HiL testing environments
- XiL strives for seamless transition between MiL, SiL, HiL, and the physical environments by reusing models, tests, data, and tools

Combining development, testing, and validation environments via XiL

ETAS is continuously expanding its comprehensive product and service portfolio in the virtualization field. One of its current projects is a solution that breaks through the limitations of established specialized simulation tools. The company is also actively promoting standardization through various initiatives and projects.

Customers report that around four-fifths of all software errors can be isolated at an early stage by using virtualization solutions on a PC, on a test bench, or in a HiL system. This saves money and permits more targeted use of precious timeslots on a test bench or with cost-intensive test vehicles. Moreover, as testing and validation make up more than half of the development spendings for embedded software, virtualization solutions represent a powerful lever for improving efficiency.

As well as offering numerous tools that enable virtualization at all levels of abstraction, ETAS also helps its customers to integrate the tools with their existing applications as

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seamlessly as possible by means of targeted consulting and engineering services. Cornerstones of this approach are the ETAS INTECRIO and ISOLAR-EVE tools, which are used to validate software function models and AUTOSAR software components in the context of Model- and Software-in-the-Loop (MiL/SiL) scenarios, as well as the established LABCAR Hardware-in-the-Loop (HiL) testing system. ETAS ASCMO, which creates system models based on measurement data with which extremely precise predictions of system behavior can be made, and the RT2 testing tool are also key components of ETAS' virtual development environment.
Standards play a vital role in extracting maximum potential from the use of virtualization solutions. On the one hand, they break down barriers between heterogeneous tool landscapes; on the other, they form an important basis for successful cooperation between OEMs and suppliers with respect to exchanging models and software components.

ETAS is actively engaged in promoting standardization, including working in the relevant committees and associations. In addition to its longstanding premium membership in the AUTOSAR development partnership for facilitating the exchange of software, ETAS is also a member of the FMI Advisory Committee and promotes the continuous further development of the Functional Mock-up Interface through this channel. The goal of this tool-independent standard for supporting model exchange and co-simulation, which is managed within the Modelica Association framework, is to facilitate the use of dynamic system models from different domains for MiL, SiL, and HiL.

For ETAS, supporting open tool landscapes goes hand in hand with these efforts – a fact embodied both in the current product portfolio and in ongoing research projects. One example is the development of an FMI-based integration and simulation platform.

In cooperation with colleagues at home and abroad, Dr. Corina Mitrohin works on the ongoing development of the FMI-based system integration and simulation platform at ETAS. For the past two years, she has been leading conceptual work on the project. The project's goal is to create an environment for engineers in which models of individual system components can be combined into an overall system model and simulated independently of the application-specific tools used to create the system components themselves. Mitrohin has come up with a conceptual route that enables the scalable simulation of modern vehicle systems.
"Our focus is on the FMI standard and we based our overall system simulation approach around it," explains Mitrohin. In the future, it should be possible to combine the different models of the individual system components into subsystems and systems of any size and complexity via FMI interfaces.

Alongside its development and standardization work, ETAS is also pursuing different aspects of virtualization in collaboration projects with other companies and research institutions. An example of this is ETAS' collaboration with the VIRTUAL VEHICLE research center based in Graz, Austria, which specializes in exploring strategic issues related to virtualization. The project aims to define requirements for a development, testing, and validation environment for carrying out virtual quality assurance on ECU software. In addition, the project is evaluating the requirements interfaces that must be fulfilled to integrate virtual ECU functions and plant models. One of the objectives is to define requirements for so-called XiL-capable component models and thereby further expand consistency and compatibility between the different validation phases of MiL, SiL, and HiL.

ETAS is spearheading progress in these areas in the conviction that only those who create and implement viable concepts have a voice in setting the future course and influencing developments.
And this is precisely what ETAS has been doing for the last 20 years!