

## K2-Mobility

### VIRTUAL VEHICLE Kompetenzzentrum –

### Das virtuelle Fahrzeug Forschungs-GmbH

### Programme: COMET – Competence Centers for Excellent Technologies

### Programme line: K2-Zentren

### COMET subproject, duration and type of project:

X1T4, 04/2015 – 03/2017, multi-firm

## Efficient development of whole vehicles

Together with partners AVL, Porsche and IVD, Virtual Vehicle is researching new methods for the end-to-end application of co-simulation in the whole vehicle development process. The aim is to implement and demonstrate both vertical and horizontal continuity by means of industrial application examples. This approach represents another way to efficiently develop entire systems, thereby reducing development time and costs.

Development of a new vehicle is accompanied by the desire for a wide variety of features. It should have high performance and low maintenance, be energy-efficient, and have a small environmental footprint. It must look good and be roomy and comfortable. It should be quiet and as safe as possible, networked, smart and innovative, and of course it should be affordable.

Attempting to achieve all these features in a single design can be decidedly difficult because many of them are at cross purposes. On top of that come rising development costs, option diversity and ever shorter time-to-market requirements.

To deal with these challenges as well as increasingly complex customer demands, developers use co-simulation technologies. In vehicle development, co-simulation involves breaking down the complexity of the overall vehicle into subsystems of coupled components. Individual components in various disciplines and development areas, such as driving dynamics, batteries, drive train or safety, are merged to form a single, interactive simulation model. The advantage for

the automotive industry is that with the simulation of virtual prototypes, design decisions can be taken significantly earlier than with physical prototypes and test stands, and they can be fed into the targeted calculation of system properties.



### Real-time co-simulation

As part of a research project at Virtual Vehicle, a co-simulation extension called ACoRTA has been developed in cooperation with AVL List and Porsche to enable the purely virtual analysis of a complete system with real-time applications (real-time co-simulation). With this extension it is now possible to integrate real hardware components into the overall system simulation. This does not involve conversion of the designed simulation model specifically for use in the real-time system, for example by code generation, but instead computation in individual simulation programs as before.



Source: VIRTUAL VEHICLE



### Methodical implementation of modular system development

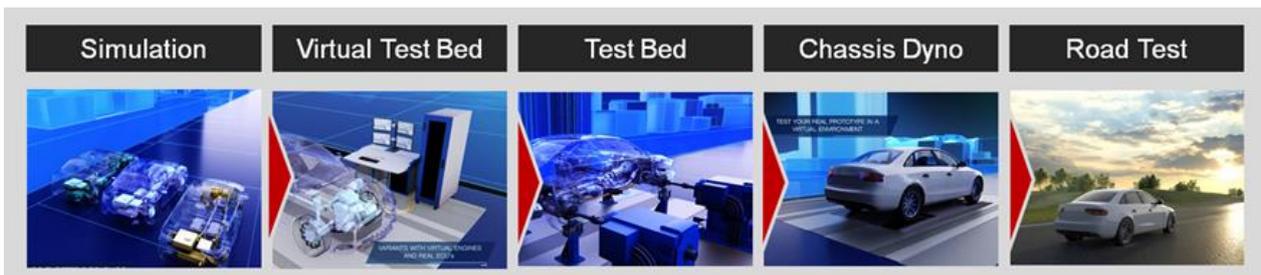
For this reason the partners Virtual Vehicle, AVL, Porsche and IVD have launched a new project dubbed X1T4 with the goal of developing an end-to-end method to utilize the modularity of co-simulation (modular simulation) in the entire development process. The method should:

- **enable horizontal continuity**, from the offline simulation to the real system, by integration of unmodified submodels in different development stages;
- **enable vertical continuity** in every development stage by swapping the subsystem descriptions of the system options.

### Impacts and effects

The current project represents another way to develop entire systems efficiently. Subsystem simulations can still be used flexibly in familiar simulation tools in the office environment in real time, in combination with test stand systems.

Using two application examples, thermal systems for hybrid vehicles have been analyzed end-to-end over various development stages using this method.



Integrated total vehicle development across development stages, Source: AVL

### Contact and information

K2-Mobility

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### Project partners

Organisations	Country
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IVD Prof. Hohenberg GmbH	Austria

**Further information on COMET – Competence Centers for Excellent Technologies:** [www.ffg.at/comet](http://www.ffg.at/comet)

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