Model-Driven Development of Embedded Systems
**MDSD Concepts for the Optimization of Embedded Systems Development**

Embedded systems are often present in a variety of very different technical systems and equipment, for example, in aircraft, vehicles, household appliances, consumer electronics, building technology, and processing plants. They fulfill their duties there largely unseen.

An essential part of the functionality of these systems is realized or made possible by the included software. The ever-increasing functionality of these systems inevitably leads to an increased amount of software. Additionally, complex technical systems often involve a variety of distributed embedded systems. The extent and distribution of software functions lead to a complexity which, above all, makes the consideration of the system and software architecture increasingly more important.

Model-driven software development (MDSD) is gaining ever greater importance in the development of complex software systems. This is also true for the development of embedded systems. MDSD is able to comprehensively augment model-based and generative approaches already applied to development of embedded systems for years. Standard notations and languages such as UML or SysML or a custom domain-specific language (DSL) can be used for modeling. Alongside the selection of suitable model types is the design of appropriate and flexible tool chains highly relevant. With this come special requirements such as the integration of existing tools and the consideration of validation and simulation mechanisms. itemis advises you in the development of embedded systems. To this end are the following core topics:

**Domain-Specific Languages and Editors**

MDSD is not limited to UML models only. Any kind of domain-specific models requisite for embedded system development can be used for model-driven software development. With an eye towards tool support, there are two options:

- Adaptation of a standard tool (UML/SysML + Profiles)
Creation of a domain-specific editor

Domain-specific editors provide an appropriate means of expression in order to directly implement the technical notation used in the modeling of embedded systems. In addition to graphical depictions, textual forms of description are also particularly relevant. These can be used for the modeling of structures as well as behavior (e.g. in the form of state machines) and can be used for code generation.

Validation and Simulation

In the development of embedded systems, it is important to detect errors early as fixing them in advanced stages of development is very expensive. A test of the modelled system can be carried out early through model validation (e.g. via OCL) and simulation. Both validation and simulation require seamless integration with the tool chain. With itemis, you create a plan specially adapted to your models and that also takes validation and simulation into consideration.

Tool Integration

Software development usually requires various tools. Integration is particularly difficult when the tools come from different manufacturers. itemis supports you in the integration of commercial tools (Artisan, Rhapsody, Rational Real Time, MatLab, WinFACT, …), open source tools (Topcased, openArchitecture …).
itemis is an independent IT consulting company that supports its customers in the implementation of modern development methods. The company focuses on model-driven software development because through this method, projects are subject to high automation potential which, in addition to increasing productivity, improves the quality and maintainability of software systems. In addition, many years of experience with Model Driven Architecture (MDA) proves that an extensive decoupling of expertise and technology is possible, and with that comes easier reuse. This means reduced costs across the entire application lifecycle. As a member of the Eclipse Foundation, itemis is instrumental in the development of the open source generator framework openArchitectureWare. The Eclipse platform and open ArchitectureWare form the core of the overall platform for the model-driven development of embedded systems.