



PROJECT PROFILE

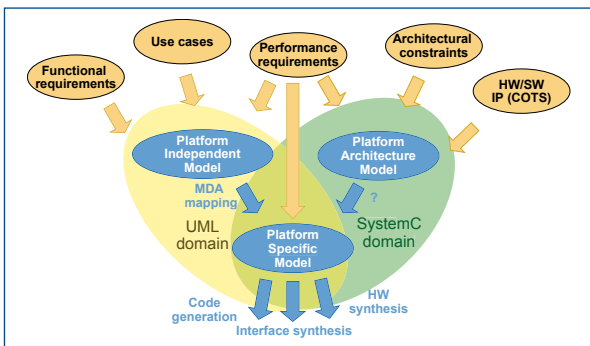
Designing for digital convergence

Managing the complexity of embedded systems development by model-based engineering

The main focus of MARTES is on how to use the standard modelling languages UML and SystemC efficiently in combination for systematic model-based development of real-time embedded systems in an era of digital convergence. The project adopts ideas from MDA (model-driven architecture), particularly the separation of application functionality and platform. A number of special techniques developed around UML and SystemC will also be integrated, to form a coherent methodology.

Digital convergence leads to new products created by combining and integrating existing and new technologies in innovative ways. However, these developments often leave the embedded systems developers struggling with unprecedented complexity and scalability caused by an explosion of new content. Unfortunately, the traditional programming craftsmanship approach cannot deal with all these problems, so a real engineering methodology is needed.

ITEA project MARTES seeks to define, construct, validate and deploy a new model-based methodology



and an interoperable toolset for real-time embedded systems development.

Innovative process

The co-modelling approach will result in an innovative integrated process that will help to reduce cost and time to deployment, while enhancing performance and other life-cycle aspects of embedded systems development.

The improvements brought by the model-based methodology are due to:

- Raising the level of abstraction by hiding details;
- Permitting more concise expression of complex behaviour through the separation of specification and implementation concerns;
- Allowing more comprehensive design space exploration by utilising models instead of implementations, which can be created in collaboration by different actors and disciplines;
- Ensuring predictability through early validation of the system, and consequent property-preserving refinement towards implementation;
- Offering better prospects for sharing and reuse by model encapsulation and repositories; and,
- Facilitating automation and tool interoperability through semantically defined model transformations and code generation.

MARTES (ITEA 04006)

Partners

- Barco
- CoFluent Design
- GMV
- INRIA
- Katholieke Universiteit Leuven
- Lund University
- Nokia
- Philips
- Softteam
- Tampere University of Technology
- Telefónica I+D
- Telelogic
- Thales Communications
- Thales Research & Technology
- Universidad Carlos III de Madrid
- University of Cantabria
- VTT Electronics

Countries involved

- Belgium
- Finland
- France
- The Netherlands
- Spain
- Sweden

Project start

January 2005

Project end

December 2007

Contact

Project Leader:

Klaus Kronlöf, Nokia, Finland

Email:

klaus.kronlof@nokia.com



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Model-based approach

As a starting point the consortium intends to use standard modelling languages, especially UML and SystemC, and to employ existing methods around them, notably MDA (model-driven architecture) and MDE (model-driven engineering). In addition, the analysis of current practices in the participating companies, together with relevant university research results, will identify the modelling concepts needed for the development of real-time embedded systems. Based on these two sources, the partners plan to define appropriate meta-models and language profiles for the MARTES methodology. Existing tools will be adapted and new ones developed to support and automate the process. Finally, the participating companies will undertake a number of design case studies to validate the overall approach.

Expected results

- **UML2 profiles** – their application for documentation, specification, and programming purposes in different domains, and assessment as industrial standards;
- **MDA-oriented design process** for embedded real-time systems, to be evaluated together with its associated environment via representative applications in telecoms, avionics, automotive and consumer electronics;
- **SystemC2 profiles** – methods for application set feasibility analysis, performance evaluation and validation, and their assessment in representative applications. For each abstraction level, definition of a SystemC subset that will match the corresponding UML profiles;
- **Translation rules** from UML profiles to the SystemC language. Provision the SystemC code generators that implement these rules for the UML profiles defined within MARTES project. Proposition of possible extensions to the SystemC language, if necessary;

- A **design platform** that, from a SystemC specification and models of processors and IP modules, is able to generate embedded C code automatically. Implementation of the necessary communication infrastructure for multiprocessor heterogeneous targets;
- **Integrated UML2 and SystemC2 tool environment** for documentation, specification, code generation, and performance analysis, with a focus on interoperability of tools and standards, e.g., XML interchange and SPIRIT;
- **UML2 training** for industry in the domains of embedded systems documentation, specification, and implementation. This includes fostering industry-oriented UML2 education, including the provision of course material.

Opportunity for European industry

This project is driven by the needs of the two main types of actors: system companies and tool providers.

System companies urgently need the co-modelling methodology and supporting tools for efficient development of embedded systems products targeting increasingly diverse markets. This capability is the key in maintaining and advancing the leading position of European companies.

For tool providers, a consistent, widely accepted methodology and tool interoperability are prerequisites to the creation of a large market for system-level design tools. UML2 and MDA have gained widespread acceptance in the IT industry. Complemented by appropriate profiles these concepts can form a basis for an industry-standard embedded systems design methodology. This opens up a market for a new category of UML-based tools – and, thanks to tool interoperability, increases the market for many existing tools.

ITEA Office

Eindhoven University of
Technology Campus
Laplace Building 0.04
PO box 513
5600 MB Eindhoven
The Netherlands
Tel : +31 40 247 5590
Fax : +31 40 247 5595
Email : itea2@itea2.org
Web : www.itea2.org

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