MegaM@art²

MegaM@Rt2 will create a framework incorporating methods and tools for continuous development and validation leveraging the advantages in scalable model-based methods to provide benefits in significantly improved productivity, quality and predictability of large and complex industrial systems.

AT A GLANCE

Project title
MegaM@RT2 Modelling at Runtime - A scalable model-based framework for continuous development and runtime validation of complex systems

Project coordinator
Mälardalen University, Sweden

Partners
Mälardalen University, SOFTEAM, Thales SA, Smartesting Solutions and
Services SAS, ClearSy SAS, Association pour la Recherche et le Développement
des Méthodes et Processus Industriels, L'Université de Pau et des Pays de
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Ro Technology Srl, Åbo Akademi, AinaCom Oy, Space Systems Finland Oy,
Nokia Solutions and Networks Oy, Teknologian tutkimuskeskus VTT Oy,
Conformiq Software Oy, Bombardier Transportation Sweden AB, Volvo
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Total cost
15.500.000 €

Programme
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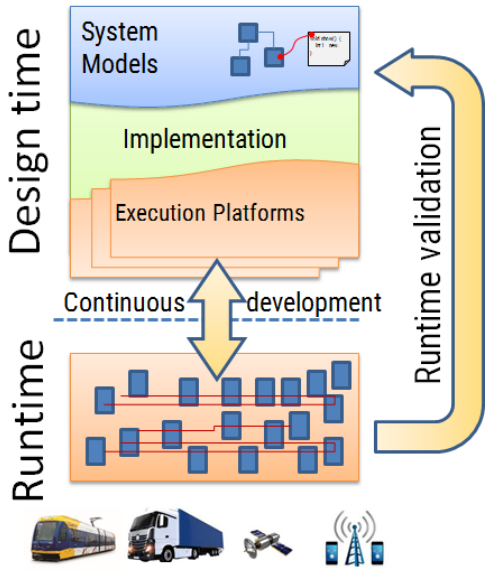
Further information
https://megamart2-ecsel.eu

Context and motivation
Productivity and quality are two of the major challenges of building, maintaining and evolving large complex and business critical software systems.
In the global context, the European industry faces stiff competition. Electronic systems are becoming more and more complex and software intensive, which calls for modern engineering practices to tackle advances in productivity and quality of these now cyber-physical systems. Model-driven Engineering and related technologies promise significant productivity gains, which have been proven valid in several studies. However, these technologies need to be further developed to scale for real-life industrial projects and provide advantages at runtime.
The ultimate objective of enhancing productivity while reducing costs and ensuring quality in development, integration and maintenance can be achieved by the use of techniques that integrate design and runtime aspects within system engineering methods incorporating existing engineering practices. Industrial scale models, which are usually multi-disciplinary, multi-teams, combine several product lines and typically include strong system quality requirements can be exploited at runtime, by advanced tracing and monitoring. Thus, achieving a continuous system engineering cycle between design and runtime, ensuring the quality of the running system and getting valuable feedback from it that can be used to boost the productivity and

provide lessons-learnt for future generations of the products.



Challenge

The major challenge in the Model-Driven Engineering of critical software systems is the integration of design and runtime aspects. The system behavior at runtime has to be matched with the design in order to fully understand the critical situation, failures in design and deviations from requirements. Many methods and tools exist for tracing the execution and performing measurements of runtime properties. However, these methods do not allow the integration with system models - the most suitable level for system engineers for analysis and decision-making.

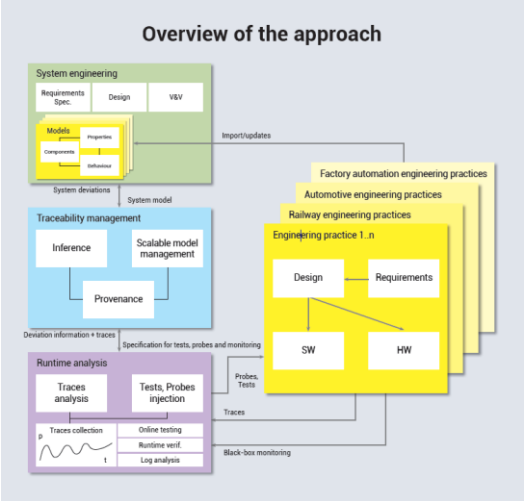
Model-Based Engineering principles and techniques have already shown promising capabilities. However, they have generally failed in terms of a) Scalability to support real world scenarios implied by the full deployment and use of complex electronic components & systems; and b) Efficient traceability, integration and communication between two fundamental system levels: design time and runtime, especially for verification and validation of non-functional properties

Solution

MegaM@Rt2 project will create a framework that mitigates these problems by incorporating methods and tools for continuous system engineering and validation leveraging the advantages in scalable model-based methods to provide benefits in significantly improved productivity, ensure quality, safety and predictability of large and complex industrial systems, while achieving cost reduction.

The solution provided by **MegaM@Rt2**, will be driven by real-world requirements provided by end users from maritime, railway, telecom and other industrial domains, will be packaged under the MegaM@Rt2 tool box, which includes:

- **Design-time Tools:** Holistic system engineering; Team collaboration over distributed models; and Global traceability;
- **Run-time Tools:** Tracing / Monitoring and Models@Runtime



The main technical innovations of **MegaM@Rt2** solution will include:

- Scale up the use of model-based techniques by offering proper methods and related tooling interacting between both design time and runtime,
- Enhance and combine existing model-based techniques
- Provide efficient traceability support between design time and runtime models
- Collect and analyse runtime information to provide feedback to design phase
- Validate the designed and developed approach in concrete industrial cases involving complex systems
- Design and deploy a scalable mega-modelling approach to manage all the involved artifacts (e.g. the many different models, corresponding workflows & configurations) and to better tackle their large diversity in terms of nature, number, size & complexity

Expected impact

MegaM@Rt2 will impact on the research and academic communities, and its outcomes, methods and tools will be

validated in highly relevant European industry case studies:

- Flight management system (Thalès)
- Railway case study (ClearSy)
- Electric smart grid (Schneider)
- Smart warehouse (Ikerlan)
- Short range communication (Tekne)
- Telecom system (Nokia)
- Train control and management system (Bombardier)
- Construction Equipment automation (Volvo)
- Vision-based intelligence system (Camea)
- Communication gateway (Ainacom)

For more information on the initiative contact the coordinator Gunnar Widforss (gunnar.widforss@mdh.se), visit our website https://megamart2-ecsel.eu or follow us on Twitter https://twitter.com/MegaMart2_ECSEL.