Project Profile

MERgE
Joint architectural solutions for safety and security

In a variety of application domains, engineering methods and practices, engineering support tools and architectural solutions exist to ensure compliance with demanding system-wide requirements such as safety and security. These are based on domain-specific standards and certification processes. However, in all domains, the demand for new capabilities and the technology opportunities for more integrated devices and more interconnected subsystems are challenging established practices and architectural solutions. In particular, some systems, sub-systems and equipment must show simultaneously the interaction between system aspects. The ITEA 2 project MERgE – Multi-Concerns Interactions System Engineering – aims to develop and demonstrate innovative concepts and design tools to address these issues, targeting the elaboration of effective architectural solutions with a focus on safety and security.

MERgE will provide tools and solutions that comprehensively combine safety and security concerns in systems development. It will provide theoretically sound solutions and models that are proven in practice to enable systems developers and systems owners to tackle the challenges of designing seamless and optimum, cost-effective safe and secure solutions that conform to the model-driven engineering paradigm. This will be achieved through the tight integration of requirement engineering, safety, security and risk management in a comprehensive design process supported by the proper tools and methods.

COMBINED SAFE & SECURE SYSTEM DEVELOPMENT

The main technical innovation of the project is the application of state-of-the-art design tools, customisation capabilities and 'multi-concern engineering' core technologies to safety and security and other similar concerns in the design process. Use cases in the aerospace, telecommunications, industrial control systems and automotive industry domains will demonstrate:

- usability and efficiency of such concepts and tools to support combined multi-concern modelling, in particular for safe & secure system design;
- the early assessment of candidate architectures, including architectural disruptions in particular, based on innovative safe & secure run-time support;
- flexibility of the modelling tools to adapt to different application domains, engineering process and tier tools;
- acceptability of the concepts and tooling by system, safety and security experts, including validation by specialised testing tools.

MERgE results will be validated and demonstrated in the four industrial application domains

MERgE
(ITEA 2 ~ 11011)

■ **Partners**
ALL4TEC
Codenomicon Oy
E2S
INRIA
Katholieke Universiteit Leuven
Melexis Technologies NV
nSense Oy
Obeo
Onera
Pohto
Space Applications Services NV
STUK
Thales Communications and Security
Thales Global Services
Thales Research & Technology
Université Paris VI
University of Jyväskylä
University of Oulu

■ **Countries involved**
Belgium
Finland
France

■ **Project start**
December 2012

■ **Project end**
November 2015

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Project Profile

In the short term, impact is expected through the adoption of the proposed tools by the domains represented in the project. This is with respect to critical systems as well as in other domains subject to less critical but still with multiple constraints. In the medium term, the availability of such innovative tool support for critical systems can be regarded as a key enabler for the evolution of engineering practices and methodologies. In the long term MERgE is an enabler for seamless integration of safety and security.

ADVANCING THE STATE OF THE ART
The central aim of MERgE is to develop, demonstrate and validate novel concepts, tools and methods for integrated engineering and management of safety and security concerns and their traceability. The MERgE approach advances the state of the art by developing a multi-concern modelling framework that defines concepts, tools and methods to enable:
- a set of common concepts to model all concerns in an aligned model;
- the seamless integration of multi-concern modelling process with general software development processes;
- a systematic identification of interactions among two or more concerns, an inter-concern analysis and trade-off.

The novelty of the MERgE solution is contained in the systematic integration of multiple concerns, like safety and security considerations. This is from requirements through architecture design implementation and maintenance and in the provision of process guidance implemented within a process-centric environment (PCE). PCE is expected to alleviate both problems of lack of training and failure to follow standard procedures, which are two of the root causes of the traceability problem.

IMPACT
The result of the MERgE project will be a core platform that builds on the conceptual results of the project to provide a comprehensive modelling framework delivering the innovative aspects of the project to end-users. The impact will be significant in three dimensions:

- *technology* – driving progress beyond current practices to a wide range of business domains and actors thanks to the use cases implemented in the project;
- *business* – providing advanced engineering capabilities in several business domains, thereby engaging in their transformation that will enable a more secure, eco-efficient society and thus a more economy-efficient Europe; and in terms of
- *leadership* for European research and industry whereby standardisation will pave the way for a more prominent role for European SMEs in products and services.

Ultimately, this triple impact will have an important knock-on effect in terms of boosting commercial opportunities and therefore jobs throughout Europe.
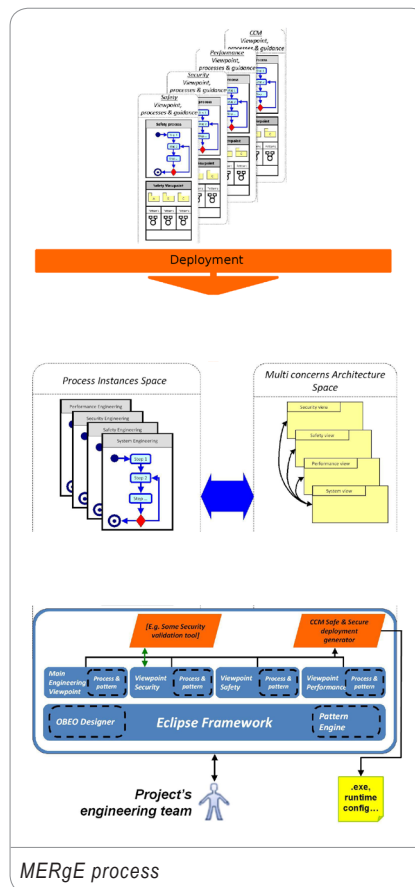
MERgE process

- ITEA 2 – Information Technology for European Advancement – is Europe's premier co-operative R&D programme driving pre-competitive research on embedded and distributed software-intensive systems and services. As a EUREKA strategic Cluster, we support co-ordinated national funding submissions and provide the link between those who provide finance, technology and software engineering. Our aim is to mobilise a total of 20,000 person-years over the full eight-year period of our programme from 2006 to 2013.

- ITEA 2-labelled projects are industry-driven initiatives building vital middleware and preparing standards to lay the foundations for the next generation of products, systems, appliances and services. Our programme results in real product innovation that boosts European competitiveness in a wide range of industries. Specifically, we play a key role in crucial application domains where software dominates, such as aerospace, automotive, consumer electronics, healthcare/medical systems and telecommunications.

- ITEA 2 projects involve complementary R&D from at least two companies in two countries. We issue annual Calls for Projects, evaluate projects and help bring research partners together. Our projects are open to partners from large industrial companies and small and medium-sized enterprises (SMEs) as well as public research institutes and universities.

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