ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

Project Profile

Whole product approach speeds systems development

Integrated open modelling and simulation environment to cut time to market and improve quality

The OPENPROD project is developing an open whole-product, model-driven systems development, modelling and simulation (M&S) environment that integrates the leading open industrial software development platform Eclipse with open-source modelling and simulation tools such as OpenModelica and industrial M&S tools and applications. The project will enable a more formalised validation of production to cut time to market and ensure higher quality, using open solutions which will have a high impact, based on easy uptake and wide dissemination.

A general tendency in product development is the increasing complexity of technical systems and the distributed networks in which they are designed and manufactured. This complexity involves a higher degree of automation, a greater number of technologies and strong coupling of software and hardware development. Moreover, strong market trends are towards more complex products that include software and hardware components, requiring more integrated whole-product development approaches.

In addition, software and hardware component suppliers are increasingly involved in the design process of the overall system.

Original equipment manufacturers already ask their component suppliers to validate the functionality of components provided in the system context at the design stage, long before the system itself is actually built.

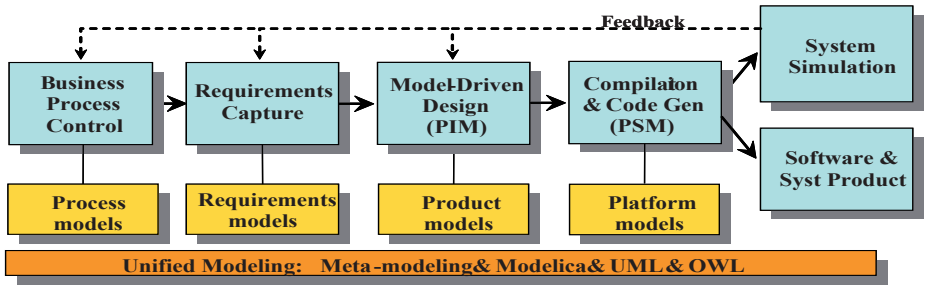
ADOPTION OF COMMON SYSTEM MODELS

One of the most important paradigm shifts now occurring is the adoption of common system models as a foundation for product and system design. This approach results in a much more effective product-development process, since a system can be tested at all stages of the design.

The integrated holistic environment developed in OPENPROD will generalise model-driven approaches to include most aspects of product development. This will involve three key concepts:

1. An holistic whole-product model-driven rapid development and design environment for both software and hardware, also including support for product business processes;
2. Open-source tools and components for open reusable solutions; and
3. Standardised model representation of products primarily based on Modelica and the unified modelling language (UML).

Closed proprietary solutions are often a hindrance to widespread dissemination



OPENPROD Vision of unified modeling framework for model-driven product development from platform independent models (PIM) to platform specific models (PSM)

OPENPROD
(ITEA 2 ~ 08021)

Partners

Appedge
Bosch Rexroth AG
CEA LIST
EADS Innovation Works
Electricité De France
Equa Simulation AB
ETH Zürich
Fachhochschule Bielefeld
Fraunhofer FIRST
IFP
INRIA Rocquencourt
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Nokia
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PSA Peugeot Citroen
Siemens Industrial TurboMachinery AB
Siemens AG, Sector Energy
SKF Sverige AB
Technische Universität Braunschweig
TLK Thermo GmbH
VTT Technical Research Centre of Finland
XRG Simulation GmbH

Countries involved

Finland
France
Germany
Sweden
Switzerland

Project start

June 2009

Project end

May 2012

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and uptake. The use of open-source and open solutions in OPENPROD will make it more adaptable and more affordable for users – especially small and medium-sized enterprises (SMEs) – to integrate results in their products. The ability to validate the functionality of a system solution before contracting is of strategic relevance to such suppliers. The confirmation of the feasibility – especially in major projects – is often the customer's key criterion. As a consequence, the availability of the fundamental modelling and simulation technology will play a significant role in increasing competitiveness.

EXPANDING ON THE EUROPEAN RESEARCH AGENDA

The work in this ITEA 2 project is closely aligned with the strategic research agenda of NESSI – the European Technology Platform for software and services. It expands on this by addressing whole-product systems containing both software and hardware components. OPENPROD will also be developing novel technologies, strategies and deployment policies that foster openness through the increased adoption of open standards and open-source software as well as the provision of open services.

Significant impacts should be obtained in two strategic areas:

1. Improvement of the competitiveness of whole-product systems engineering in Europe, particularly through the delivery of a next-generation OpenModelica platform with integrated UML/SysML-Modelica-Eclipse support; and
2. Enhancement of European leadership in model-driven engineering for whole-product engineering systems through proactive actions of dissemination and co-ordination towards the whole-product systems engineering communities in Europe.

The success of the Modelica next-generation language and tools is dependent on the co-operation between many partners, both at European and international level, to enable it to become a widespread international standard exchange format for reusable object-oriented model components in multi-domain simulation. To ensure its adoption by European industry and society, the OPENPROD consortium will perform a systematic open-source dissemination effort combined with exploitation by industrial users and tool-providers in the consortium.

MODEL-DRIVEN ENVIRONMENT AND ONTOLOGY MAPPING FRAMEWORK

Key developments in OPENPROD will include:

- An integrated model-driven Modelica-UML-Eclipse-based environment with unified model representation to address software/hardware modelling, distributed business processes, product optimisation and sensitivity analysis;
- Precise requirements capture and traceability based on behaviour trees integrated with Modelica/UML in Eclipse, ontology-based generic 2D/3D graphic modelling and database coupling; and
- An ontology-mapping framework to link design-system and Modelica-based simulation models, including semantic, ontology-based representation of the Modelica language.

An enhanced OpenModelica model compiler with innovations and vendor-specific tool additions will provide:

- A model compiler for extended full Modelica, including an Eclipse Ecore-based UML subset and language enhancements for modularity, aspect orientation and transformation from platform-independent to platform-specific model representations;
- Model portability and system safety based on precise model semantics and stronger type checking, including real-time tool interoperability; and
- Efficient execution based on parallel multi-core code generation and simulation targeting real-time multi-core platforms, enhanced numerical solvers and compiler run-time.

A series of advanced industrial application demonstrators and vendor M&S and in-house tools will be developed for mechanical/mechatronics systems, automotive engines and bodies, buildings, energy and power systems, work and business process simulation – including managing networked investment projects and effective service- process models.

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- 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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