



# **MoSiS** - From Requirements to Models to Implementation Seminar

A Full Day Event on March the 15th, 2010 at 9.00-16.00

VTT (Digitalo), Vuorimiehentie 3, 02044 Espoo, Finland

The need for embedded software systems is growing significantly. The increasing size, complexity and diversity of embedded software systems render it much more difficult to efficiently and effectively design, develop and manage them.

The vision of MoSiS (Model-driven development of highly configurable embedded Software-intensive Systems) project is that modelling technology, with its capacity for abstraction and for code generation, is a key enabling technology for successful design, development and management of embedded software systems. Thus, MoSiS project aims at developing processes, methods and techniques that enable the European industry to:

- Produce more flexible and adaptable products,
- Create products with high quality more cost-efficiently, and
- Issue in a reliable manner more complex products than what can be done today.

This seminar focuses on requirements engineering with model-based approaches, bridging the gap between requirements engineering and software engineering, and methods to aid model-driven development of embedded systems. Much of the focus of this seminar is on actual industrial experiences in the application of model-driven development. In addition, this seminar provides an exceptional opportunity to experience how easy it is to develop a modelling language fit for a specific domain and a code generator for the language producing 100% of the required code. This really is an opportunity one should not miss.

Please register for the seminar before the 10th of March, by e-mail at [Janne.Merilinna@vtt.fi](mailto:Janne.Merilinna@vtt.fi) containing your name and company. The seminar is free of charge including the material and both the morning and afternoon refreshments.

For questions about the contents of the seminar, please contact [Janne.Merilinna@vtt.fi](mailto:Janne.Merilinna@vtt.fi) (tel. +358 44 278 8501 )

**We are happy to invite you to this MoSiS seminar. Welcome to Espoo!**

## PROGRAMME

9:00 Registration and coffee

### 9:10 - 11:45 Part 1

9:10 Opening of the seminar, *Janne Merilinna, VTT, Finland*

9:15 The MoSiS project, *Hans-Petter Dahle, ICT-Norway, Norway*

9:30 Industrial experiences on using Domain-Specific Modelling for full code generation, *Juha-Pekka Tolvanen, MetaCase, Finland*

10:00 Experiences in applying MDD for feature modelling, *Jari Lehto, Nokia Siemens Networks, Finland*

10:30 Break

10:45 Bridging the gap between non-functional requirements and implementation in the context of MDD, *Janne Merilinna, VTT, Finland*

11:15 Introducing an approach for automatic enforcement of architectural design rules: a case study, *Anders Mattsson, Combitech, Sweden*

11:45 Lunch

### 12:45 - 16:00 Part 2

12:45 Common Variability Language - how to standardize variability, *Øystein Haugen, SINTEF, Norway*

13:15 Domain-Specific Modelling in practice: MDD that works, *Steven Kelly, MetaCase, Finland*

14:45 Break

15:00 Questions and Answers, *All*

16:00 End of seminar, *Janne Merilinna, VTT, Finland*

# PRESENTATIONS

## **Industrial experiences on using Domain-Specific Modelling for full code generation**

Juha-Pekka Tolvanen, MetaCase, Finland

Domain-specific languages and code generators have significantly improved the productivity and quality of software development in many areas, but seem a particularly good fit for embedded software and for product lines. Companies like EADS, Nokia, Panasonic, Polar and Siemens have reported significant productivity increases when moving from traditional manual coding to modelling and code generation. This talk introduces domain-specific modelling with real-life examples from various fields of software development and takes then a detailed look to industry experiences.

## **Experiences in applying MDD for feature modelling**

Jari Lehto, Nokia Siemens Networks, Finland

In Nokia Siemens Networks the conventional specification discipline has been document based for years. An attempt has been made to renew these specification practices. A modern way of Model Driven Development has been taken as an objective to show the way. The effort was carried out in one product line. A set of required views and description techniques for them was determined based on relatively extensive interviews in the product line. This resulted in a workflow and a model structure to support the work. A tool definition was determined based on the workflow.

Together MDD and a repository based modelling environment good results were recognized during pilots. The pilots were run in real business situations and actual working tasks were also used as learning situation using on job learning techniques, mainly coaching. Same time feedback was gathered from the workflow and the tool environment, and they were continuously improved. Step by step the working environment - the repository - was built to the needed extend and benefits could be identified. According to our experiences and observations the new way of working in contrast to the document based working style was seen to be many times more efficient. It has also multiple effects on related activities making them easier and more effortless and thus improving the over all efficiency.

## **Bridging the gap between non-functional requirements and implementation in the context of MDD**

Janne Merilinna, VTT, Finland

Accurate and correctly specified requirements are extremely important in ensuring the production of feasible software products. To assure that the requirements have actually been implemented, there has to be a trace link from requirements to implementation. Thus far requirement engineering has been a rather separate task from software design and implementation from the process point of view. This separation has a negative impact on requirements traceability and further, to product quality. Tracing of non-functional requirements (NFRs), such as performance, has been particularly cumbersome.

In this presentation, we show how the gap between NFRs and implementation can be bridged in the context of MDD. We apply and extend the NFR Framework, which provides systematic approach for defining NFRs for products, with a concept of measurable NFRs that enables to empirically verify the realization of defined NFRs in a product. We have implemented the extended NFR Framework, which we call NFR+ Framework, as a modelling language including a softgoal interdependency graph validation tool with a MetaCase MetaEdit+ language workbench. The usage of the NFR+ Framework is demonstrated with a laboratory case.

## **Introducing an approach for automatic enforcement of architectural design rules: a case study**

Anders Mattsson, Combitech, Sweden

Current techniques for modelling software architecture do not support the modelling of architectural design rules. This is a problem in the context of Model-Driven Development in which it is assumed that major design artefacts are represented as formal or semi-formal models. This presentation addresses this problem by presenting a case study on an industrial development project using a novel approach to modelling architectural design rules in UML. The results indicate a high Return On Investment (ROI) for introducing the approach since it yields a substantial increase in both productivity and quality at the same time as the needed investment in training and tooling is small. In addition the approach is very well received by the users claiming increased satisfaction in their work.

## **Common Variability Language - how to standardize variability**

Øystein Haugen, SINTEF, Norway

Variability modelling is intended to describe how a product is similar but still different from another product variant. Variability modelling, therefore, is regarded as the enabling technology for delivering a wide variety of software products in a fast and consistent way.

The MoSiS project has taken the initiative to standardize a variability language in the OMG (Object Management Group) by drafting a Request for Proposals (RFP) "The objective of this RFP is to enable the specification of variabilities on models in order to support product line modelling." The RFP is now issued and initial submissions are due in June 2010.

The talk will give more insights to the challenges of variability modelling and some of the solutions that we are exploring within the MoSiS project. Find out more on <http://variabilitymodeling.org>.

## Domain-Specific Modelling in practice: MDD that works

Steven Kelly, MetaCase, Finland

Everybody would like the productivity benefits of modelling with full code generation, but the upgrade path from coding to modelling seems to be a closely guarded secret. The hardest part for many is making their own modelling language starting from a blank screen: coming up with something that isn't just a variant of UML, but one that will actually raise abstraction and productivity.

This session will show you the practical, repeatable steps to invent and implement your own modelling language and code generator. We'll build everything live, creating the first version of the language from scratch and progressively improving it. Each improvement will be a step that you can apply in the development of your own language.

## SPEAKERS

**Hans Petter Dahle** works for Fornebu Consulting and has for more than 10 years acted as project manager on behalf of IKT-Norge (ICT-Norway) in national and international research projects, many of them funded by the Research Council of Norway. He has worked in various positions in the research field and in IT companies: researcher at the Norwegian Computing Center, research manager at ABB Technology AS, General Manager of R&D at tool vendor Sysdeco Innovation, Chief Technology Officer at EDB Telekom. His main interests are in efficient production of IT systems. He has participated in several joint Scandinavian and European research projects — Mjølner, Eureka Software Factory, SPECS (with focus on object oriented extensions to SDL) — and has been leading the Norwegian effort in the ITEA projects CAFÉ, FAMILIES, COSI and OSIRIS. He is currently project leader for the ITEA2 project MoSiS, where IKT-Norge is the project coordinator

**Dr. Juha-Pekka Tolvanen** is the CEO of MetaCase. He has been involved in domain-specific approaches and tools, notably method engineering and meta-modelling since 1991. He has acted as a consultant world-wide for modelling language and code generation development. Juha-Pekka has co-authored a book (Domain-Specific Modeling, Wiley 2008) and over 60 articles in software development magazines, journals and conferences. He holds a Ph.D. in computer science.

**Jari Lehto** has extensive managerial experience from industrial enterprises and currently he is working in a large telecommunication company in method development. He is responsible for supporting business units in the area of architecture and system design especially in requirements engineering. He has contributed to research of multi-site collaboration practices. He has graduated in information processing science 1993 (Ph. lic.) in University of Oulu.

**Janne Merilinna** has been working at VTT Technical Research Centre of Finland since 2004. Merilinna's current research activities focus on quality-driven model-based software development. As he understands the importance of modelling and documentation but also he values working software over comprehensive documentation, he constantly seeks opportunities to combine the both worlds. Thus, his research ambitions extensively centralize on utilizing Domain-Specific Modelling with full code generation in various contexts.

**Anders Mattsson** received the MSc degree from Chalmers University of Technology, Sweden, in 1989. After receiving the MSc degree he worked two years as a software designer at Volvo Data AB, followed by one year as a system designer at Saab Instruments AB. Since then he has worked at the Swedish consultancy company Combitech AB where he currently serves as Lead Engineer in software architecture and model-driven development. He is currently also pursuing a PhD at Lero – the Irish Software Engineering centre. His research interest includes software architecture and model-driven development in the context of embedded real-time systems.

**Dr. Øystein Haugen** is Senior Researcher at SINTEF and Associate Professor at University of Oslo. He has been working with standardization of languages since 1989. He has had the responsibility for sequence diagrams in UML 2, and is now working on the variability language initiative as well as a standard for Agents. Haugen is the Technical Coordinator of MoSiS.

**Dr. Steven Kelly** is CTO of MetaCase and co-founder of the DSM Forum. He has over fifteen years of experience of tool building and consultancy in Domain-Specific Modelling. As architect and lead developer of MetaEdit+, he has seen it win or be a finalist in awards from SD Times, Byte, Innosomi, Net.Object Days, and Jolt Productivity. He has co-authored a book and over 50 articles in software development journals, conferences and magazines, and regularly speaks at events like OOPSLA and Code Generation. Steven is a member of the IASA, on the editorial board of JDM, and has a PhD in Computer Science.