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## Large Scale Model Based Systems Engineering

There has been a lot of interest in Model Based Systems Engineering (MBSE) over the last few years. Yet there have not been too many reports on experiences made with the application of MBSE – positive or negative. In this seminar the focus is on experiences made in large projects. The following topics will be covered:

- Potential benefits of MBSE
- Points to consider prior to introducing MBSE
- Large scale MBSE
- Version and variant modelling
- Integrating requirements engineering and modelling
- Measurements

### Program

Time	Title	Speaker
09:30 – 10:00	Coffee and mingle	
10:00 – 10:05	Welcome and seminar overview	Erik Herzog, SAAB
10:05– 11:00	Introduction and overview of experience at SAAB	Erik Herzog, SAAB
11:10 – 12:30	Variant Modeling and other techniques for large scale models with SysML	Tim Weilkiens, OOSE, Hamburg
12:30 – 14:00	Lunch	
14:00 – 15:30	Model-based Engineering in Medical Device Development – Issues & Solutions	Arnold Rudorfer, Siemens, Erlangen
15:30 – 16:00	General Q&A session	

The seminar will be held in the conference room **von Neumann** at the Department of Computer and Information Science, House B, Campus Valla, Linköping on April 4<sup>th</sup> 2011.

### Attendance

The attendance fee is SEK 400 for INCOSE members and staff at Linköping university. The fee for non-INCOSE members is SEK 800. Note, the venue seats only 30 people. Sign up for the seminar by sending an e-mail to [Gert Johansson](mailto:Gert.Johansson@liu.se). Any questions regarding the seminar should be directed to [Erik Herzog](mailto:Erik.Herzog@liu.se), 0734 183922



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# Presentation and presenters' outline

## Lessons learned from Introducing MBSE at SAAB Aeronautics

Erik Herzog, SAAB Aeronautics

**Abstract:** Introducing a model centric way of working in large organisations is difficult. At SAAB Aerosystems it has been tried over multiple years in many projects. Success has been limited. In our latest attempt to introducing SysML as a tool for system design it was decided to change focus. Instead of trying to promote models as the new way of documentation it was decided to setup the tools with the objective to create consistent and readable document centric deliverables. Instead of giving the modellers the freedom to use the language at its extreme, it was decided to limit language use to an absolute minimum.

As a result there have been some quite drastic initial complaints from our some experienced modellers, but surprisingly strong acceptance of the new approach to modelling from the stakeholders responsible for quality control, but not directly involved in the core development team.

**Biography:** Erik Herzog is a SAAB Fellow in Systems Engineering. His professional interests include development and introduction of Systems engineering processes, specification methods, information modelling and tool integration techniques. Erik is active in multiple INCOSE working groups and has implemented the INCOSE i-pub system. He is also the president of the Swedish INCOSE chapter

## Variant Modeling and other techniques for large scale models with SysML

Tim Weilkiens, OOSE

**Abstract:** The modelling of system variants is a core technique for model based systems engineering. You need to model variants for analysing design alternatives, judging variants via trade-offs, modelling of product families, and the separation of a logical and a physical architecture. In large scale models it is necessary to follow the formalism of the language and rules of the methodology. Otherwise the model gets out of sync and is more and more useless or even dangerous due wrong information.

SysML doesn't provide explicit elements for variant modelling. I present a profile for SysML that extends the language to enable the modelling of variation points and variations. I show how we use the profile for the model of the INCOSE MBSE Challenge Team SE<sup>2</sup> (telescope model). Besides the variant modelling I show some best practices from the MBSE Cookbook that are important for large scale models. All examples are based on a comprehensive model about a real telescope system.

**Biography:** Tim Weilkiens, managing director of the German consultancy oose GmbH, is a founder of INCOSE MBSE Challenge Team SE<sup>2</sup> (Telescope modeling). He is also an active member of the OMG working groups about SysML and UML and has written sections of the SysML specification. He publishes his knowledge in many books, articles and conference presentations.

## Model-based Engineering in Medical Device Development – Issues & Solutions”

Arnold Rudorfer, Siemens AG

**Abstract:** Medical device development is increasingly under market pressure to reduce deployment time in critical care facilities. Further, budget cuts in critical care facilities drive process innovation mostly realized through a holistic integration of IT systems across departments (hospital information systems, PACS and modalities). One important leverage to reduce development cycle time and to control complexities of software along the life-cycle is to use model-based engineering approaches. Such new technology adoption is still in its early adoption phase. Less than 10 percent of organizations (in the medical device industry) use such approaches. As more and more clinical workflows start to be IT-supported > 60% (end of the '90 only ~ 30%), model-based engineering

brings viable solutions to large software development efforts (> 5000 requirements) in multi product lines. This talk will discuss implemented model-based engineering in Requirements Engineering, Architecture Design as well as outline what is planned for the system test by means of an imaging platform project carried out in Siemens Healthcare. Our own experience and an underlying business case show concrete cost savings in the project planning, testing and complexity reduction of the imaging platform architecture using a model-based requirements engineering approach. Further, the current status and requirements of engineering tools will be discussed.

**Biography:** Arnold Rudorfer is Director Software Initiative and Process Improvement in the Siemens Healthcare Imaging and Therapy Division. He is responsible for introducing new software engineering technologies with the goal to optimize engineering cost and development efficiency. Prior to joining Healthcare, he was the Head of the User Interface Design Center for Corporate Technology in the US. Later, he took over as the Global Technology Field Leader Requirements Engineering at Siemens Corporate Research (in Princeton, NJ, USA) with worldwide Centers of Competence (Munich, Erlangen and Beijing). He is co-author of the previously published book "Software Systems Requirements Engineering" (McGraw Hill, April 2009). Also, he is an organizer of Siemens Best Practice Sharing Events and speaker at Siemens-internal and international conferences on Requirements- and Software Engineering topics.

# Maps and directions

The conference room von Neuman is located in the B-house, first floor at Campus Valla in Linköping.

