

Nordic Systems Engineering Tour

Empowering the North – From Hamburg via Copenhagen to Stockholm, Helsinki, and Warsaw



Conference Program

- [Conference Day in Helsinki \(May 23rd, 2016\)](#)
- [Conference Day in Stockholm \(May 24th, 2016\)](#)
- [Conference Day in Copenhagen \(May 25th, 2016\)](#)
- [Conference Day in Hamburg \(May 26th, 2016\)](#)
- [Conference Day in Warsaw \(May 27th, 2016\)](#)

Warsaw, May 27th, 2016

09:00 – Welcome by INCOSE Poland!
09:15

Practical Aspects of Lean Management of Complex Programs

09:15 – Bohdan
10:00 – Oppenheim

The presentation is intended as a highly practical talk about Lean in engineering programs. It begins with a brief refresher of the classical Lean approach, including the meaning of value and waste in engineering programs, the Lean Principles, and some practical “low hanging fruit” practices for elimination of major wastes. Next, the presentation cites several powerful remedies to eliminate waste based on the SpaceX and other leading programs. The Challenges stifling efficiency in many programs are cited from [Oehmen, 2012]. Three appendices (covered to the degree time permitting) summarize the development process of the Lean Enablers, list all enablers with selected ones marked for discussion, and briefly summarize the super-efficient Lean Project Development Flow (LPDF) method for executing well-understood projects.

10:00 –
10:30 Coffee Break and Networking

Can systems engineering help in the sustainability challenge for engineering designs?

10:30 –
11:15 Mike Nicolai

The emissions generated by a flight from London to New York and back are roughly as much as an average person in the EU creates by heating their home for a whole year. This number seems to be big, but the complete civil aviation sector is only responsible for 10% of the EU’s total greenhouse gas emissions in the transportation sector. Cars are responsible for around 70% of total EU emissions of carbon dioxide (CO₂), the main greenhouse gas (see EU Climate Action Transport).

The automobile design involves creativity and deep technical understanding of the involved techniques. However, for most modern engineering designs, physics and/or system complexity are limiting factors for the designer to fully “understand” his design. In the last century for both factors individual solutions were found: numerical simulations became a key tool to help the designer to understand the physical behavior, while methodologies from systems engineering became essential to handle system complexity. Both fields have to merge to solve the sustainability challenge.

In the presentation two examples of design processes will be shown, where physical behavior simulations are essential and where the system complexity is already an issue. The first example is a kinetic energy recovery system (KERS) which will be placed in an existing design. In addition to the needed trade-off studies, the overall configuration and the model management including simulation models and data are important and will be shown. The second example is a design process of an automated guided vehicle (AGV): here the design process has dependency loops, which can be detected, e.g. by the usage of design structure matrix (DSM), but cannot be easily resolved. This is mainly due to the fact that the process has manual steps (CAD design) and non-linear behavior simulations. For both examples the energy conscious design is important for ecologic and economic reasons, but a various set of tools has to be used. In addition to some supporting tools, two main methodologies will be presented: a design space exploration methodology for the KERS and a dependency resolution methodology for the AGV.

11:15 – Coffee Break and Networking
11:45

[Building the Business Case for Systems Engineering](#)

Justifying the Return On Investment (ROI) from Systems Engineering is an issue that continues to surface whenever Systems Engineers meet at conferences. Without a compelling business case it can be a struggle to gain support from senior management to fund investment in the systems approach. This presentation aims to introduce you to building your business case, drawing on the accumulated body of evidence.

In 2000, Sarah Sheard and Chris Miller published “The Shangri-La of ROI” on the subject of the value provided by Systems Engineering. In the opening paragraph, they summarised that “This paper shows that:

- (1) There are no “hard numbers”;
- (2) There will be no hard numbers in the foreseeable future;
- (3) If there were hard numbers, there wouldn’t be a way to apply them to your situation;
- (4) If you did use such numbers, no one would believe you anyway.”

11:45 – Paul Davies
12:30

However, time has moved on, and recently reported studies have started to quantify the correlation between SE practices and business benefit. In this paper, consideration is given to business models for project engineering, a variety of intervention strategies, and the calculation of resulting Return on Investment figures. Sheard and Miller’s points (1) and (2) are therefore seen to have been overcome. The paper also covers some empirical rules for consideration of point (3), and start to address the barriers to adoption of point (4).

The presentation content is based on that delivered by Paul at the INCOSE UK ASEC2013 conference, which won the Best Presentation award. The underlying theory is based on two extensive and academically refereed studies, plus several extra corroborative later studies. The two principal studies are:

- “Systems Engineering Effectiveness”, NDIA /SEI / Carnegie Mellon University, 2012-13 – lead editor Joe Elm
- “Systems Engineering Return on Investment” (SEROI), University of South Australia PhD thesis 2013, Eric Honour [INCOSE Fellow and Past President]

Biography: The presenter is the lead author of the INCOSE UK 1-page Guide “Z3: How Systems Engineering can save your business money”.

12:30 – Lunch and Networking
14:00

[Model-Based System Architectures](#)

14:00 – Tim Weilkens
14:45

The talk covers the role of the system architect in a model-based environment and gives an overview about different architecture tasks. Additionally, we present some concrete tools for the system architect.

Starting with a brief motivation and definition of model-based system architectures we will present the following

topics:

Architecture kinds and their relationships: Base Architecture, Functional Architecture, Logical Architecture, Product Architecture, Physical Architecture

We introduce the different architecture kinds and their relationships. Each architectural work costs effort and you typically do not sell the outcome. The architectural work supports (and sometimes drives) the development of a product. Therefore, it is important to have a critical eye on the value and effort.

Product Line Engineering – How to manage variants

Many industries shift from mass production to mass customization. Associated with that trend engineers must manage more and more variants of their products. We present concepts of variant modeling and the impact on system architectures.

Architecture assessments

A system architecture is a set of crucial technical decisions. Typically, it is hard to revert such a decision at a later stage of the development process. It is absolute important to assess the decisions before using them as a basis for further development. We present an architecture assessment method.

Soft skills: It's all about communication – the soft side of a system architect

Engineers like to focus on the hard facts. However the soft skills are getting more and more important in the age of highly dynamic markets with lots of surprises, globalization with international collaborations, and interdisciplinary engineering.

Biography

Stephan Roth and Tim Weilkiens are authors of the book Model-Based System Architecture published by Wiley in 2015.

Stephan Roth is a coach, consultant, and trainer for Systems and Software Engineering at the German consultancy oose Innovative Informatik eG in Hamburg. He holds a State-certified Technical Assistant for Computer Science from Physikalisch-Technische Lehranstalt (PTL) Wedel and is a Certified Systems Engineer (GfSE)® – Level C.

Tim Weilkiens is the CEO at the German consultancy oose Innovative Informatik eG, coach, consultant, and trainer. He has introduced model-based systems engineering to a variety of industry sectors, has worked as a software developer for medical devices, and as a consultant for business modeling, software and systems engineering. He is co-author of the SysML specification, author of several books about modeling and a frequent speaker on conferences. He is author of the MBSE methodology SYSMOD.

14:45 – Coffee Break and Networking
15:15

15:15 – Peter Gorm [Well-founded Engineering of CyberPhysical Systems and Systems of Systems](#)
16:00 Larsen This presentation illustrates how well-founded engineering of Cyber-Physical Systems (CPSs) and Systems of

Systems (SoS) can be supported from a modelling perspective. The starting point of this presentation is the DESTTECS, COMPASS and INTO-CPS European Research projects. The focus is on the need to enable collaboration between stakeholders with different disciplinary backgrounds. We believe that methods and tools that enable step-wise transformation of different models with a well-defined semantics towards final realisations of system components are essential. Using industrial applications we will demonstrate how it is possible to provide tool support that can keep different engineers in their own disciplinary scope and still enable collaborative modelling and simulation. Based on this it is also possible to explore the design space of candidate solutions and analyse their desirable properties in a holistic fashion. SoSs have additional challenges because there typically are different stakeholders in control of different constituent systems with opposing interests. Thus, it is necessary to support collaborative engineering where negotiation of the SoS desirable properties as well as the contracts which can be made for the interfaces for the different constituent systems. The presentation will also elaborate on the future challenges for the well-founded engineering of dependable CPSs and SoSs.

The presentation here will include video clips and demonstrations of industrial applications including examples of the analysis that it has been possible to perform. By the time of the Nordic Systems Engineering tour Springer will have published a new book entitled: “Collaborative Design for Embedded Systems –Co-modelling and Co-simulation” based on the results of the DESTTECS project using the [Crescendo technology](#). From the COMPASS project it will also be possible to report some of the findings from Bang & Olufsen’s use of the technology for modelling SoSs.

Biography: Peter Gorm Larsen is currently professor at Aarhus University at the Department of Engineering where he is leading the software engineering research team. After receiving his M.Sc. degree at the Technical University of Denmark in Electronic Engineering and Computer Engineering in 1988, he went to industry to bridge the gap between academia and industry. He later returned and did an industrial Ph.D. (1995). He gave industrial courses all over the world, and had an industrial career until he decided to return to academia in 2005.

His prime research interest is to improve the development of complex mission-critical applications with well-founded technologies and in particular tool building that enables such development. Key areas of interest are Cyber-Physical Systems and System of Systems. He is the author of more than 100 papers published in journals, books and conference proceedings and a couple of books.

In Warsaw the NoSE conference is arranged by INCOSE Poland and Warsaw University of Technology. The event is held at The Center of Innovation and Technology Transfer Management (Centrum Zarządzania Innowacjami i Transferem Technologii), 4 Rektorska St., 00-614 Warsaw.

The registration fee is:

- 150 PLN for members of INCOSE or Faculty of Warsaw University of Technology
- 50 PLN for students (also full-time PhD students)
- 200 PLN for others

The fee includes also lunch and refreshments.

For registration send e-mail to Aleksander Buczacki (a.buczacki@wp.pl) and indicate the registration category that applies.

Include your invoicing address in the e-mail.

May 17th is the final date for registration.