SWISS SYSTEMS ENGINEERING DAY

SWISSED22

FROM DESIGN TO REALITY

FROM DESIGN TO REALITY
WALKING UP THE "V"

12. SEP. 2022

Day Programme and Schedule

Using your digital programme...

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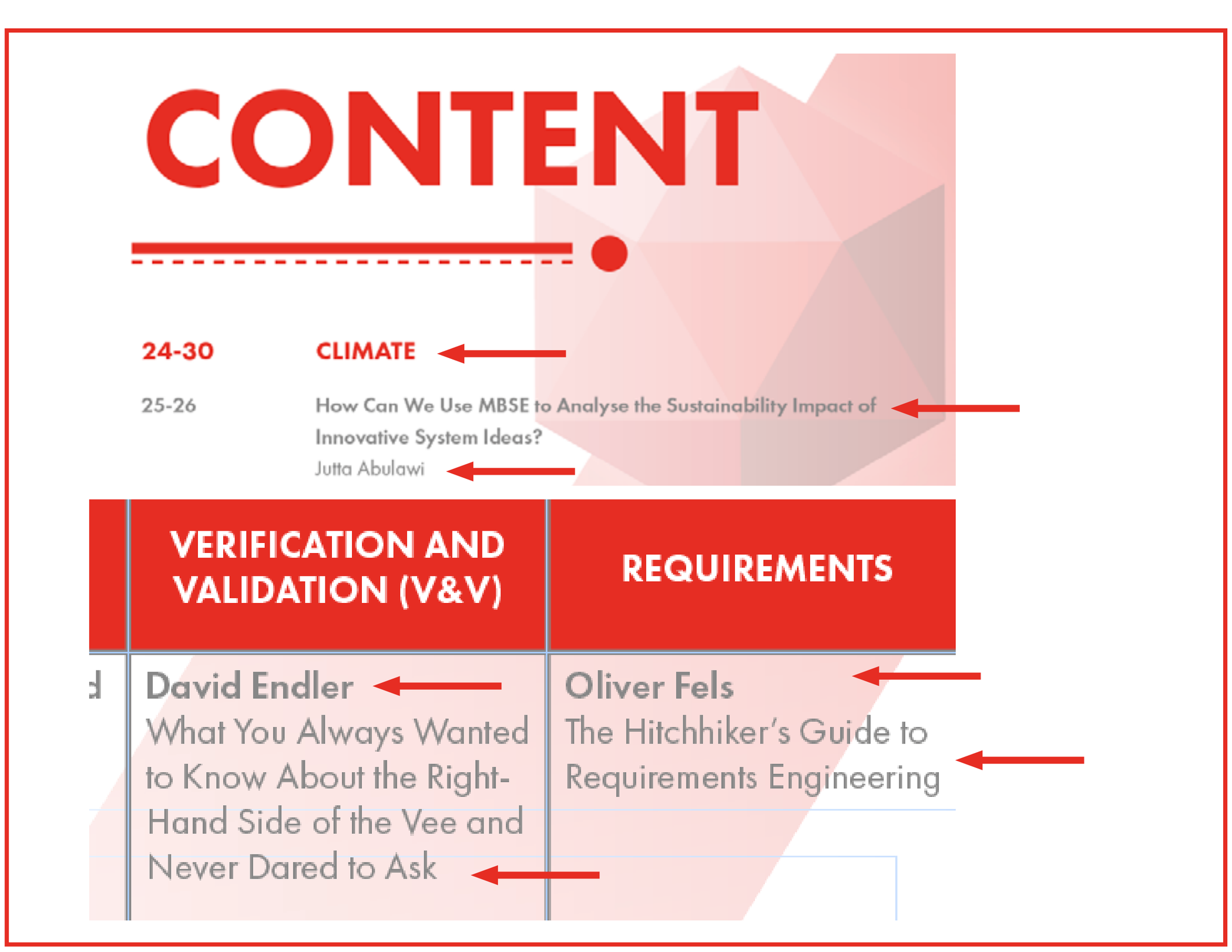

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ABOUT SWISSED

SWISSED22 is the 9th annual symposium of the Swiss Society of Systems Engineering (SSSE). SSSE acts as the Swiss Chapter of the International Council on Systems Engineering (INCOSE).

This one-day event brings together first-class presenters and practitioners, to share knowledge and experience on how to plan, develop and manage systems in an efficient and successful way.

This year, our conference will be run as an inperson event in Zürich, with virtual attendance and live streaming also made possible for those who cannot attend physically.

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PROGRAMME

Morning Schedule

TIME	STREAM 1	STREAM 2	STREAM 3
8:00	Doors Open and Registration		
8:45	WELCOME		
8.55	**Keynote Presentation: From Products to Solutions - How SE Enables a Traditional Steel and Iron Company Bearing Nowadays Challenges** Presented by: Christian von Holst		
STREAM	**MODEL-BASED SYSTEMS ENGINEERING**	**VERIFICATION AND VALIDATION (V&V)**	**REQUIREMENTS**
9:55	**Domonkos Gaspar and Pierfelice Ciancia** MBSE as Backbone for Digital Engineering? A Case Study and Some Strategic Conclusions on Opportunities and Limitations	**David Endler** What You Always Wanted to Know About the Right-Hand Side of the Vee and Never Dared to Ask	**Oliver Fels** The Hitchhiker's Guide to Requirements Engineering
10:25	**Mohammad Chami** AI4MBSE - The Journey So Far	**Ivo Locher** How Hardware-in-the-Loop Test Benches Accelerate Embedded Systems Development	**Marco Chicherio** Beware the Informal Requirement: A Formal Definition and Its Practical Applications
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11:45	**Konrad Wieland and Daniel Siegl** DevOps for MBSE - Accelerate your "V"	**Marco Serra** Verification and Validation as Drivers of Development	**Carlo Leardi** Frontloading: The Evolving Challenge in The Liquid Food Packaging Industry
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PROGRAMME

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STREAM	**CLIMATE**	**MODEL-BASED SYSTEMS ENGINEERING**	**HUMAN FACTOR/ AGILE**
14:45	**Jutta Abulawi** How Can We Use MBSE to Analyse The Sustainability Impact of Innovative System Ideas?	**Davide Bellicoso, Emanuele Tomassi and Ricardo Rambaldi** MBSE-Aided Reverse Engineering of an Interplanetary Space Mission	**Alexander Neng and Eike Appel** Better Agile with Systems Engineering
15:15	**Lukas Oppler** Second Life for EV-Battery-Systems	**Markus Schacher** "Firefighting" in The Electric Car Industry	**Niels Heuthorst** Successful SE projects
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16:05	**Mike Johnson** The Need for Critical Thinking	**Chantal Sinnwell and Susan Faust** Think Outside the Box: Expand MBSE into Model-based Production Engineering (MBPE) to Realize a LEGO Manufacturing System	**Freddy Kamdem** Systems Engineering (SE) and Communication in the Digital Age: A New Model for Metacommunication on SE Operations
16:35	**Marc-Andre Chavy-Macdonald** New Evidence on The RoI of Systems Engineering - A Case Study of NASA, COTS and SpaceX		**CLIMATE** (WORKSHOP) **Martin Neff and Thomas Mächler** Creating an Active MBSE Network to Boost Sustainability
17:05	**Closing**		
17:20	**Apéro**		

PARTNERS

Platinum

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KEY NOTES

Christian von Holst

Tom Gilb

From Products to Solutions

How SE Enables a Traditional Steel and Iron Company Bearing Nowadays Challenges

KEY NOTE

Christian von Holst

John Deere GmbH & Co KG,

The challenges for everybody are huge today, for individuals as well as for companies. Those are environmental challenges in regard of climate change, environmental pollution or quickly raising diseases. This are economic challenges, like feeding more than 10 bln. people in 2050 [1] or sheltering them. Moreover, the poorly balanced distribution of health and wealth leads to conflicts like local wars and crisis and migrations. Another factor is the increasing speed of change, disruptions, so-called VUCA world [2].

Now it is not one single individual or company able to solve all those problems or challenges, but each individual plays a role in it and can significantly contribute into any direction. Therefore, it is the responsibility of each successful company to adopt its behaviour and its way of doing business towards a sustainable and responsible acting.

John Deere did a major re-structuring and re-organization to prepare for this. The presentation will explain, which role...

Systems Engineering played in this re-organization and restructuring and how Systems Engineering will be one of the key enablers for success.

Topics like automation, autonomy, alternative power sources for machinery play a major role in this as well as themes like digital thread and digital twin to collaborate and co-operate with partners and customers. And also in here Systems engineering and Systems Thinking are key enablers to introduce and implement the needed capabilities and methods.

This all is obviously rather a journey than a status and therefore this is more a heads up and not a result, this all is evolving, maturing and developing.

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A 2022 Update on V-Model Thinking

KEY NOTE

Tom Gilb

Consultant and Speaker

Specific Practical Methods for shifting the QA burden to the 'left' (better requirements and design, defect prevention processes), and for focussing testing as an extreme agile feedback cycle, using 'Competitive Engineering/Planguage" and methods of Musk and Bezos. An overview of basic ideas, practices, case study experiences, and measures of effectiveness. The slides will be rich in practical detail and references, too numerous to explain in detail during a talk. But the audience will be introduced to many exciting and very advanced systems engineering ideas from many sources. You can be inspired to study further as needed and return from the conference to your work with many exciting ideas to share with colleagues.

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MBSE

Konrad Wieland and Daniel Siegl

Chantal Sinnwell and Susan Faust

Markus Schacher

Davide Bellicoso, Emanuele Tomasi and Riccardo Rambaldi

Alan Moore and Sébastien Dupertuis

Domonkos Gaspar and Pierfelice Ciancia

Mohammad Chami

DevOps for MBSE

Accelerate Your "V"

MBSE

Konrad Wieland and Daniel Siegl
LieberLieber Software GmbH

Trends such as agile development or mass-customization („Lot-Size 1") require maximum flexibility during production. To cope with the resulting complexity, more and more companies are nowadays using system modeling. Here, products can be managed on a more general level using models.

Currently, these models are still considered independently from the rest of the development process. As a result, every change in a model requires several manual steps to consistently perform this change on all dependent development artefacts. This is not practicable any more in an agile development environment.

To cope with this agility, current modeling practices must be enriched with a process view. Therefore, models can be integrated into existing DevOps-processes. In our presentation, we showcase how such a DevOps-solution for models can look like. We will present a Continuous Integration process that uses modeling tools together with Git for versioning and deployment of system engineering models.

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Think Outside the Box:

Expand MBSE into Model-Based Production Engineering (MBPE) to realize a LEGO Manufacturing System

MBSE

Chantal Sinnwell and Susan Faust
Siemens Digital Software Industry

Mind Game: You want to build a LEGO Mindstorms Factory for Toy Cars and you are Head of Factory Planning. You identify that your manufacturing planning team and your product design team don't collaborate with each other, because they work in silos and speak different languages. Their progress is too slow and the results are not synchronized.

Imagine: You succeed in merging your experts into one interdisciplinary team where everyone is collaboratively working together – already in the early stages of the engineering cycle. And imagine they start to speak the same language. Doubtless, you would speed up your engineering process. Furthermore, you would also reach a synchronized global solution for your manufacturing system and to be produced toy cars, building bridges inside your organization.

But how? This has been introduced by Dr.-Ing. C. Sinnwell in February 2020 in her PhD-thesis. There, she published the latest version of a methodology referred to as...

"MBPE: Model-Based Production Engineering". The MBPE-methodology is a new... approach for the conceptual design of manufacturing systems based on early product information supported by MBSE using UML.

The presentation will spotlight the MBPE-methodology, explaining how to use MBSE in the context of interdisciplinary factory and manufacturing planning. Also, it will be shown, how the methodology could be adapted to be realized with Eclipse Capella instead of any UML-modeling tool, illustrated by an example on how to conceptualize and model a LEGO Mindstorms production line for Toy Cars.

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"Firefighting" in the Electric Car Industry

MBSE

Markus Schacher

KnowGravity Inc.

Not only the German car industry is under enormous pressure to transform itself from the combustion engine to the electric drive. Such pressure, combined with new technology, may lead to increased risks that need to be addressed appropriately.

This presentation reports from a real-world project carried out during the Covid pandemic that aimed to identify and eliminate the risks of fires in an electric car platform. This challenge has been tackled by an intensive series of large, multi-organization virtual workshops. The aim was to prove to the OEM that the problems are comprehensively identified and addressed in a professional way.

Systems Engineering is by definition a multi-disciplinary approach for developing complex technical systems. Thus, a Systems Engineer must be a generalist that is able to combine expertise from different disciplines to find a coherent and convincing solution. Based on this premise, I'll show how a system model crystalizes and manifests the shared understanding of a challenge as well as its solution.

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MBSE-Aided Reverse Engineering of an Interplanetary Space Mission

MBSE

Davide Bellicoso, Emanuele Tomassi and Riccardo Rambaldi

Politecnico di Milano

Systems engineering is an iterative approach which is traditionally applied one-way, from the definition of the user needs to the implemention of a solution which satisfies certain requirements and is constrained by cost and schedule.

This presentation instead aims at exploring the educational benefits of applying the opposite practice, thus retrieving system and subsystem level requirements based on a solution already implemented, by employing systems engineering methodology.

This reverse-engineering process has been applied to a well known Space mission, the ESA Mars Express satellite, whose goal is to investigate all aspects of the martian environment, including the subsurface, surface and atmosphere of the planet, in order to search for evidence of extinct or extant life.

The uppermost goal of this project is to demonstrate the benefits for university students at a Master level keen on systems...

engineering in implementing the V diagram in a "reversed" configuration. In this work, students have been compelled to apply systems engineering processes in order to justify the design choices made at that time by the Systems engineers and specialists who were in charge of developing the satellite.

Furthermore, MBSE possibilities have been exploited to realize a model of the system according to the ARCADIA method and systems engineering approach, using the Capella MBSE Tool. The results prove it is possible, and also recommendable time-wise, to teach Space engineering and Systems engineering students by using this inverse approach, rather than the canonic one in which students have to design a whole mission from scratch.

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Why Models Are Essential to Digital and Systems Engineering

MBSE

Alan Moore and Sébastien Dupertuis
MathWorks

Digital engineering and model based systems engineering are more than just industry buzzwords; they are essential enablers of the transition away from document-driven development approaches.

This talk will focus on two digital engineering principles: enabling automation and maintaining an authoritative source of truth. These two principles are especially applicable to continuous engineering methods like DevOps. This talk will define the concept of semantic blueprints and explain why they are essential to achieving these two pillars in an efficient and scalable way. Finally, we will show why model based systems engineering tools that are tightly connected to model-based design tools are the right ones to author semantic blueprints for systems and software.

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MBSE as Backbone for Digital Engineering?

A case study and some strategic conclusions on opportunities & limitations

MBSE

Domonkos Gaspar and Pierfelice Ciancia
Collins Consulting & Frikart Engineering

Model Based Systems Engineering (MBSE) is, beyond its native benefits, promising an ideal basis for the transformation to Digital Engineering as well.

The case is indeed positive, but due to its specifics, far away from an easy exercise. In this talk we will, based on a recent use case, discuss the opportunities but also the limitations of using MBSE as backbone for Digital Engineering.

We will offer our learnings along the way and strategic considerations for anyone planning to embark or already being on this journey. Recommended for MBSE practitioners, engineering managers and Digital Engineering subject matter experts active in the R&D space.

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AI4MBSE - The Journey so Far

MBSE

Mohammad Chami

SysDICE GmbH

Both Model-Based Systems Engineering (MBSE) and Artificial Intelligence (AI) have been challenged for their deployment in real-world applications. Although MBSE remains the focal point of any systems engineering activities, its adoption still faces significant hurdles to demonstrate its return on investment.

Recently, AI has received intensive attention, and its applications made their way into our daily life products. Therefore, instead of focusing solely on delivering intelligent products, why not supporting as well the product lifecycle with the help of some intelligent framework. This presentation will describe the SysDICE AI4MBSE journey. It will describe the vision capabilities for an AI4MBSE framework, discuss some lessons learned from an implementations' perspective, and will conclude by discussing the power of combining AI with MBSE with a number of potential use cases.

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CLIMATE

Jutta Abulawi

Lukas Oppler

Martin Neff & Thomas Mächler

How Can We Use MBSE to Analyse the Sustainability Impact of Innovative System Ideas?

CLIMATE

Jutta Abulawi

HAW Hamburg

The generation of innovative ideas for systems which can help reduce our negative impact on our environment requires much creativity and a thorough understanding of many technical and also non-technical disciplines.

At HAW Hamburg, we have developed a SysML-based approach to systematically explore system ideas in the early stage of their definition. Various SysML diagram types are used to answer a set of questions, combining analysis with system definition and refinement and laying the foundation for risk analysis. Final steps in this process are the creation of an initial system specification and a parametric analysis of important measures of merit which can be linked to quantitative requirements.

This approach can be used with a professional SysML modeler to lay the foundation for a digital model of the system. It is...

also suitable to inspire team activities in creative workshops sessions and document intermediate decisions and findings in graphical format on flipcharts or whiteboards.

The approach has been used and refined at HAW Hamburg for more than ten years. In this hands-on workshop we will use the method to explore the idea of producing green hydrogen in a small-scale plant to be installed on private properties in rural areas.

The motivation behind the system idea is to produce the fuel required for a hydrogen-powered passenger car to satisfy individual mobility requirements in rural areas in a sustainable way.

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Second Life for EV-Battery-Systems

CLIMATE

Lukas Oppler

Upvolt

How are Li-Ion Batteries built today and how is it possible to give vehicle batteries a second life?

Where are the difficulties and what is already possible today?

Our presentation will give you a broad overview in the fields of battery repair, repurpose and reuse. We will give answers how battery systems can be used in a more sustainable way. Current pilot projects will be shown.

Furthermore we will give insights how we started our company and came to the point we are today.

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Creating an Active MBSE Network to Boost Sustainability

Climate Track Workshop

CLIMATE

Martin Neff and Thomas Mächler

3DS and Helbling

We at SSSE - like many of our colleagues from the SE community - are convinced that tackling the Climate Crisis is a systems problem and that we, therefore, are called to action and must get involved to boost sustainability.

SWISSED dedicates a whole track to discussing SE approaches suitable to better understand and/or mitigate the crisis. It includes a one-hour open workshop that builds on the previous workshops at last year's Swissed (see picture) and this year's Southern European Systems Engineering Tour in Italy (link).

Its main objective is to build on the momentum and get our community on track for the challenges ahead. Let's shape together the first SE World Model for sustainability.

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V&V

Validation and Verification

David Endler

Ivo Locher

Dieter Scheithauer

Marco Serra

What You Always Wanted to Know About the Right-Hand Side of the Vee

... and Never Dared to Ask

V&V

David Endler

Consultant

Today's challenges in systems engineering are not limited to the increase in the amount of functions or features within a system. Other challenges include that we're typically given less time compared to the previous development and that many systems are constantly upgraded. Consequently, systematic approaches are required to achieve balanced solutions that satisfy stakeholder needs. These systematic approaches must not be limited to requirements and architecture definition. Also, integration and verification approaches need to be upgraded to keep up with the increasing market demands. Sometimes, integration, verification, transition, and validation processes are seen on the right-hand side of the Vee. This presentation will give a more up to date introduction to these processes and the implications on the way these processes should be approached.

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How Hardware-in-the-Loop Test Benches Accelerate Embedded Systems Development

V&V

Ivo Locher

konplan ag

Agile project management and developing in sprints have become state of the art in software development over the last decade. Automated testing is a crucial ingredient enabling efficient working in sprints.

However, automated testing can be tricky in the development of embedded software since the software interacts with the physical environment using sensor and actuators that require stimuli and generate stimuli, respectively. We will present a project where a hardware test bench has been developed as enabling system along with the actual embedded system (DUT). We will discuss how requirements for the test bench have been derived from requirements of DUT and how the test bench has been integrated in the development pipeline. Eventually, we will point out the benefits and learnings of having an automated test bench for embedded systems.

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Three Major Risk Areas of Iterative System Integration Approaches

V&V

Dieter Scheithauer

H·I·T·S Engineering

Most descriptions of the V-Model emphasise top-down design and bottom-up integration. That some information concerning a particular system or system element flows directly from the left leg to the right leg of the V remains hidden in process description details. As long as a perfect-world assumption is maintained, this doesn't matter.

The straight-forward narrative of top-down design and bottom-up integration shows it flaws during system integration in case of omissions and/or planned incompleteness. Omissions occur when objectives are not fully met in any process step along the V. Planned incompleteness is a feature of incremental and evolutionary development philosophies.

Bringing innovative systems into being instantiates rarely a perfect-world systems engineering model. Some agility is needed...

to cope with the inevitable learning needs. Consequently, system integration is performed in iterations and in parallel on various levels of the system architecture concurrently.

Based on a strictly information-flow-oriented interpretation of the V presented in an earlier paper, the presentation highlights three major risk areas of iterative system integration approaches including measures for risk avoidance and mitigation: diffusion of system design responsibilities, system integration environments incapable to cope with innovative functions, and flawed configuration information for commencing system integration.

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Verification and Validation as Drivers of Development

V&V

Marco Serra

Engenya GmbH

A structural failure experienced by an oil field services company during the perforation of an offshore well led to an investigation aimed at understanding its causes. What this highlighted, ultimately, was a need for better predictive tools and a more realistic assessment of risk.

A project was launched, with the product of the investigation as a starting point, to develop a simulation tool aimed at predicting the performance and structural integrity risk associated with offshore well completion for a defined subset of completion designs. It was understood right at the beginning that the success of this effort depended heavily on the verification and validation of the approach, consequently leading to the development of testing techniques and supporting hardware that would enable the collection of data in the field in a way that had not been possible to date.

As the tool began to be applied to field jobs, the client began to see the potential of enhanced prediction and began to...

request extended capabilities almost for each new job, while simultaneously reducing the development budget. The flexibility that was built into the development process has enabled the continued evolution of capabilities, while shifting their validation to the field and dealing with a reducing development budget.

The tool's evolution continues, leveraging the flexible architecture of the model generation and solution approach, leaving the majority of the effort focused on iteration about verification and validation activities in the field, which are largely financed by the well operators.

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REQUIREMENTS ENGINEERING

Oliver Fels

Marco Chicherio

42 - The Hitchhiker's Guide to Requirements Engineering

REQUIREMENTS

Oliver Fels
Belimo Automation AG

42 - the answer to life, the universe and everything. If you have ever read the Douglas Adams` Hitchhikers Guide to the Galaxy books, you might be aware that the number 42 is a synonym for answers you do not have the question for.

In many organizations, products and solutions have evolved over time. Engineered by great experts with sophisticated technical knowledge. Successful products and solutions. Now the time has come to improve things, modularize the portfolio, improve it, because the conditions around have changed. Complexity has risen, interoperability is a key factor and more stakeholders are involved.

As a consequence we need a better documentation which forces us to build up traceability and reuse across the portfolio.

The challenge: We are good at engineering solutions. And get stuck in finding out many times why we build this that way.

A classic 42 situation in which we have answers (products and solutions), but what has been the question? And how to link...

all this together into a reusable, modular and traceable way? In this session we will analyze the situation and take a look, how a feature based approach helps us to find the right question for our answers and get rid of the 42 issue.

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Beware the Informal Requirement:

A Formal Definition and its Practical Applications

REQUIREMENTS

Marco Chicherio
Swystems GmbH

The value of requirements in systems engineering is undisputed. In practice however, it is often observed that badly phrased "requirements" jeopardize this value, and that additional techniques are needed to ensure requirements quality. These techniques are often heuristically based on experience, and hard to explain to novices.

In this presentation, a novel appropach is presented which is based on a mathematical definition of a "requirement". The definition is easy to understand and to practically apply, and is compliant with most heuristics to ensure requirements quality. Moreover, it helps stakeholders to distinguish between requirements and "wishes".

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SYSTEMS ENGINEERING PRINCIPLES

Mike Johnson

Marc-Andre Chavy-Macdonald

The Need for Critical Thinking

SE PRINCIPLES

Mike Johnson

SE-Training GmbH

Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.

In the history of the Human race, many notable Critical Thinkers were hugely unpopular, often resulting in their seeking refuge in distant lands or losing their liberties and eventually their lives due to their counter forces, namely governments and/or powerful institutions.

When a Human being is told to accept contradicting evidence as being truthful, which is often the case in highly controlled authoritarian societies, a very serious issue occurs in their belief system. Their fundamental understanding and relationship with reality is shifted into a new domain. The individual must now turn on and off the ability to think critically and engage objectively with the World around them.

When Politicians, the Media and Institutions have a flexible relationship with reality, the impacts of course can be severe...

and it's not the intention of the presentation to cover these aspects. The purpose of this presentation, is to assess the consequences when Engineers developing complex systems and their peers are infected with this condition.

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New Evidence on the RoI of Systems Engineering:

A Case Study of NASA, COTS and SpaceX

SE PRINCIPLES

Marc-Andre Chavy-Macdonald
University of St. Gallen Center for Aviation Competence

Good Systems Engineering (SE) is a key to successful system development. Yet an oft-raised issue by management is "what is the Return on Investment (RoI) of SE?", along with "how much SE is the right amount?" There exists evidence on this, but it has limitations. This is unsurprising for such a complex sociotechnical phenomenon as system development by a team, and the same questions are posed about other corporate functions, e.g. future planning.

Typically-used evidence on the RoI, and "right amount" of SE are summarized in the SE Body of Knowledge (SEBoK). Issues with this evidence include giving a sense of proportion, "how much is at stake?" What is the RoI of good vs. poor development projects? How likely/common are each?

Luckily there is more evidence on the RoI of SE then commonly known in the SE community. It comes from adjoining, or parallel...

fields. Concurrent Engineering claims reduction of 4× in design time, and 2× in design cost via collocated, structured fast-front-end development. The management and innovation literatures show 3× disparities in R&D performance across firms, and point to key factors linked to a "systems approach". Product Development studies identify success factors – tools, processes, etc. – consistent with a SE approach.

NASA's COTS program, which nursed SpaceX, is a rich new case study and excellent source of data and documentation on aerospace engineering with different approaches. The end result is that SpaceX developed the Falcon 9 at 1/10th the cost (and more functionality! Landing) that NASA would have. Understanding why is key; some early data points to (1) incentives (contractual and staff's); (2) intense collaboration with rapid prototyping and decisions; and (3) a flat organization enabling self-organizing for rapid communication and coordination, with clear goals.

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HUMAN FACTOR/ AGILE

Alexander Neng and Eike Appel

Niels Heuthorst

Freddy Kamdem

Better Agile with Systems Engineering

HUMAN FACTOR/AGILE

Alexander Neng and Eike Appel

Method Park Engineering GmbH & Cariad SE

Again and again we hear: Agility solves all problems, or on the other hand: Systems Engineering makes everything better. Is that the case? Does one exclude the other, or can't both approaches coexist? In our lecture, we will get to the bottom of the matter and give impulses on how the two pieces of the puzzle fit together.

The lecture is a work product from the GfSE's Agile Systems Engineering working group.

What will the participants learn?

Understanding of the topic of agility. The use of principles as a basis for inclusion, or demarcation, of the two topics.

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Successful SE Projects

HUMAN FACTOR/AGILE

Niels Heuthorst

Belphini

It is often stated that technical complexity is not the dominating factor in creating complex systems, but rather the complexities introduced by the people involved. Complex Systems Engineering requires multi-functional teams from the beginning until the end of the project. The endeavor will lead to a validated and verified product AND process. This is the result of simultaneous product- and process engineering.

In this presentation, we will be exploring the ways of identifying, involving, and managing key stakeholders to ensure the success of your projects from conception, through development, operations, and retirement. The stakeholders include customers, suppliers, different disciplines, and management.

We will be covering the following themes:

- How are priorities set and how is the project managed as a consequence?
- What is the relation between the individual goals and the common organizational goals and how much energy is put into fighting for those goals?

...

- Who should be involved and what participation can be expected?
- How can support for the project be maximized?
- We will talk about the human factor in the complex world of Systems Engineering using real-life examples.

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Systems Engineering and Communication in the Digital Age:

A New Model for Metacommunication on SE Operations

HUMAN FACTOR/AGILE

Freddy Kamdem
Industry and Research

Systems engineering (or Enterprises or Organisations) operations can be seen as part of a socio-technical ecosystem in which stake-holders have a common, local or global, goal and interest, subject to various constraints (temporal, technical, etc.).

This ecosystem produces various types of artefacts to create glob-al solutions to problems, often transdisciplinary. In the digital age, it may be costly or inappropriate to access a specific repository for general details of what is happening within these operations.

Therefore, communicating structuring facts - through metacommu-nication - related to these artefacts, without going into detail at first, can help to get a global structure-picture; and if necessary, to go into detail later.

We will start by giving an overview of:...

- The complexity and relative difficulty of systems engineering
- Communication and digital engineering in SE
- Some elements of two theories of communication and metacommunication, from which we will derive a new, simple metacommunication model for SE.

We will then present this new model. Finally, we will present some requirements for taking advantage of this model and a platform that implements it (using elementary techniques from category theory and computer science), and we will conclude with some perspectives.

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ENGINEERING

Hanspeter Keel and Adrian Senn

Carlo Leardi

Rocket Recovery System

Leitfaden für Rakektenfallschirme

ENGINEERING

Hanspeter Keel and Adrian Senn
OST - Ostschweizer Fachhochschule

A rocket's recovery system ensures a safe landing. This system has many interfaces with other missile systems. In order to enable a simple development for the Akademische Raumfahrt Initiative Schweiz (ARIS), a guideline was developed by the OST - Ostschweizer Fachhochschule.

This guide combines the systems engineering approach together with the rapid prototyping approach. Systems were technically designed and tested for this purpose.

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Frontloading

The Evolving Challenge in the Liquid Food Packaging Industry

ENGINEERING

Carlo Leardi

Tetra Pak

It is vivid memory, in my working experience, the compulsive need to frontloading from the right to the left leg of the VEE. The first significant methodological framework got developed in the liquid food industry since 2002, as an effect of the EU funded research project "Systest".

Many of these results are still in use in my company as well established best practices. The constraint of verify the system during, and fundamentally only at the end of integration process, severely impacted the practical results. The effective and efficient advancements of M&S, AI, VR and the step change of digital transformation made, in the last two decades, possible what remained for years only an effort with minimal business impact.

The proposed presentation shall provide a walkthrough of the key step changes: methodological, technological, networking and behavioural that allowed this change. The presentation shall be provided with examples of implementation in the industrial environment of the research deliverables.

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PRESENTER PROFILES

Christian von Holst

John Deere GmbH & Co KG,

Dr.-Ing Christian von Holst is the Global Tractor Systems Engineering Lead at John Deere since 2017 with a 20+ years' experience in producing industries and especially tractor development.

- Strong background in modelling, simulation and cross-department, cross-domain, and multi-culture project work.
- Expert in systems engineering methods, tools, competency development and implementation strategies.
- Practitioner in systems engineering and MBSE application to deliver projects for technology, services, and product.
- Passionate networker with a broad internal and external global community of Model-Based...

- Systems Engineering (MBSE) enthusiasts out of various industries.
- Director of corporate and associate members of the GfSE, the German Chapter of INCOSE.
- Member and participant of Prostep iViP in the working group "Digital Data Package".
- Target oriented forward strategist with strong business understanding.
- Highly motivated and creative team player with excellent communication and moderation skills.

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Tom Gilb

Consultant and Speaker

Tom Gilb is the author of 9 books. He is currently a consultant, teacher, and author in partnership with his son Kai. He mainly serves multinational clients in improving their organizations and methods. He joined IBM in 1958, and started freelance consulting in 1960.

He has worked with major multinationals such as Boeing, Bosch, Qualcomm, HP, IBM, Intel, Nokia, Ericsson, JP Morgan, Deutsche Bank, Credit Suisse, Microsoft, US DOD, UK MOD, Norway DoD, Citigroup, Schlumberger, Tektronix, GE, Thales, Rolls Royce, Sony, Hitachi, Philips Medical Systems, Siemens Medical, and many others – including smaller organizations such as. Confirmit (Survey systems), University of Trondheim IT Department...

His latest interest is development and spread of his Planning Language, 'Planguage', described in his CE book, and its application in top management planning, as well as a wide variety of systems applications, for example advanced security management (2022).

He has been a member of INCOSE for 2 decades and is an active member of the Norwegian chapter NORSEC. He happily lectures at INCOSE local chapters on his worldwide travels and at INCOSE conferences and symposia. He is a frequent guest lecturer at universities worldwide.

He has been named Honorary Fellow of the British Computer Society, BCS.

As of 2022, he is largely business-retired, living near Oslo Norway. But he is very active in writing, researching, holding international talks, and some courses, and meeting people digitally, and helping them to use or learn his methods. While hopefully learning more himself.

Much of his work is available on his **website.**

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Konrad Wieland

LieberLieber Software GmbH

2012 he moved to LieberLieber and initially worked as a consultant for numerous companies in the automotive and defense industries in the area of model-driven software and system engineering.

As head of product management since 2016, he used this valuable experience to successfully establish LieberLieber standard products on the market. Since the beginning of 2020 Konrad Wieland is CEO of LieberLieber. He lives with his family in Vienna, Austria.

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Daniel Siegl

LieberLieber Software GmbH

Daniel has been involved with model-based engineering since 2000. He first experienced model-based engineering with Together, and then moved on to the current focus: Enterprise Architect by Sparx Systems.

He gained deep experience handling critical software projects around the world in the IT, apparel and footware industries.

The next logical step was to join European-based LieberLieber, the Enterprise Architect Specialists, in 2006. In 2009 he became CEO, and in his role as developer of international business he also became CEO of LieberLieber Software Corp, based in Houston, TX, in 2014...

Daniel has been involved with model-based engineering since 2000. He first experienced model-based engineering with Together, and then moved on to the current focus: Enterprise Architect by Sparx Systems.

He gained deep experience handling critical software projects around the world in the IT, apparel and footware industries.

The next logical step was to join European-based LieberLieber, the Enterprise Architect Specialists, in 2006. In 2009 he became CEO, and in his role as developer of international business he also became CEO of LieberLieber Software Corp, based in Houston, TX, in 2014.

Daniel is heavily involved with LieberLieber's Automotive and Logistics clients, helping them to build tools to develop their products in a more efficient way. He is passionate about UML/SysML, embedded systems, and industry standards like AUTOSAR. He is an experienced speaker, a founding member of the Enterprise Architect User Group and represents LieberLieber at the Object Management Group, INCOSE and ProStep.

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Chantal Sinnwell

Siemens Digital Software Industry

As a mechanical engineer with a PhD, Dr. Chantal Sinnwell has been working as a Solution Architect for the MBSE topic area at Siemens Digital Industry Software since 2019 and advises companies on the topics of MBSE and Model-based Production Engineering.

She previously completed her doctorate on the question of how MBSE can be applied to production planning.

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Susan Faust

Siemens Digital Software Industry

As a passionate ALM enthusiast, Susan Faust has been working as a PreSales Solution Consultant for the Polarion division at Siemens Digital Industry Software since 2019, advising and supporting companies on the topics related to software and system development.

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Markus Schacher

KnowGravity Inc.

Markus Schacher is co-founder of KnowGravity Inc., a small but smart consulting company based in Zurich, Switzerland and specialized in model-based engineering. As a trainer, Markus ran the first public courses on UML in Switzerland back in early 1997 and as a consultant he helped many large projects introducing and applying model-based techniques. As an active member of the Object Management Group (OMG), Markus is involved in the development of various modelling languages and is co-author of three books on business rules, SysML, and operational risk as well as a frequent presenter in international conferences.

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Davide Bellicoso

Politecnico di Milano

Master’ student in Space Engineering at Politecnico di Milano, President of PoliSpace students’ space association of Politecnico di Milano. INCOSE-ASEP certified and passionate about systems engineering applied to space products.

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Alan Moore

MathWorks

Alan Moore is an architecture modeling specialist at MathWorks and has extensive experience in the development of real-time and object-oriented methodologies and their application in a variety of system domains. Alan served as the language architect for version 1 of the SysML language and is the co-author of "A Practical Guide to SysML."

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Sébastien Dupertuis

MathWorks

Sébastien Dupertuis is a senior application engineer at MathWorks Switzerland. He works in the area of design automation with a focus on signal processing and code generation technologies targeting heterogeneous embedded systems.

Sébastien held a software engineering-related position for five years at Swissvoice in Switzerland. Sébastien obtained a Master in Software Engineering for Embedded Systems from Technische Universität Kaiserslautern, and he graduated as a telecommunication engineer from La Haute Ecole d’Ingénierie et de Gestion du Canton de Vaud and as a physicist from the University of Geneva.

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Domonkos Gaspar

Collins Consulting

Domonkos is a Business Transformation leader with focus on realising ROI in Industrial Digitalization / Industry 4.0 initiatives. With roots in Economic Engineering, business and IT management, I have more than 20 years experience in leading change and delivering results in major transformation initiatives.

Industry experience: medical device, automotive, aviation, wholesale, professiona services

Certifications:
- Supply Chain management: CSCP (APICS)
- Project & Program management: PRINCE2, MSP

...

- Agile: Certified Scrum Master (CSM)
- Service management: ITIL v3

PhD Candidate at the Corvinus University of Budapest.

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Pierfelice Ciancia

Frikart Engineering

Pierfelice is an experienced Model-based Systems Engineering (MBSE) consultant for FRIKART Engineering GmbH. He is both an INCOSE CSEP and an OMG SysML certified. He mainly works in the MedTech domain.

He helps small and big companies to identify major pain points, and to implement innovative solutions to overcome obstacles in the different product development phases.

His services include consulting, coaching and project-related work. He is a SSSE committee member and organizer of the MBSE initiative for SSSE.

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Mohammad Chami

SysDICE GmbH

Mohammad Chami is the founder and CEO at Sys-DICE GmbH, with an extensive career in the field of Model-Based Systems Engineering (MBSE).

Mohammad is an MBSE expert with a solid academic and industrial experience in modelling languages, processes, developing and deploying methods for systems modelling and customizing its tools.

In recent years, his focus has shifted towards the application of artificial intelligence (AI), i.e., natural language processing and machine learning, in MBSE and he is currently leading an AI4MBSE transformation journey.

Mohammad holds a Ph.D. in computer science...

from the Paul Sabatier University Toulouse III and two master's degrees in Electronics and Mechatronics. Mohammad is an active member of INCOSE since 2014.

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Jutta Abulawi

HAW Hamburg

Jutta Abulawi is Professor of Systems Engineering and CAD in the Department of Automotive and Aeronautical Engineering at Hamburg University of Applied Sciences (HAW Hamburg). She has a PhD in mechanical engineering and has worked in industry for 12 years as a design engineer before joining HAW Hamburg.

She uses project-based approaches to teach engineering design and systems engineering at undergraduate and graduate levels. Her research focuses on the practical application of methodic design and SysMl-based model-based systems engineering, including the use of parametric, reusable CAD models, software-based design assistants and systematic sketching and graphical modeling methods.

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Lukas Oppler

Upvolt

Lukas Oppler, born in Basel 1992 studied Process and Product Design with big interest in interdicipli-nary work in the field of technology, society and design.

As a co-founder of Upvolt GmbH he is responsible for the product design and development of energy storage systems that are more sustainable sticking to the principles of a circular economy.

With his devotion the create innovative prducts and designs the life of many batteries were already ex-tended.

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David Endler

Consultant

Dr. David Endler is a systems engineering consultant, trainer and coach (freelancer). He was INCOSE's Technical Director of INCOSE in 2019 – 2020, is a member of the Swiss Chapter of INCOSE, Project Editor of ISO/IEC/IEEE 15288 as well as ISO/IEC/IEEE 24748-2 next revision, and co-editor of INCOSE SE Handbook v5.

In his professional career which started in 2002, David has been involved in various systems engineering projects in the aerospace, marine, automotive and renewable energies industries. Today, he's teaching systems engineering courses to share his experience. He holds a PhD in Physics (Dr. rer. nat.) from University of Hamburg.

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Ivo Locher

konplan ag

Dr. Ivo Locher graduated with a degree in Electrical Engineering from the Wearable Computing Lab of the ETH Zurich in 2006. Currently, he is program manager at konplan ag and he is expert for systems engineering.

In his role, he manages development projects on the technical and on the management side in transforming ideas into market-ready products . In his career, Ivo has successfully led several medical device development projects, starting from requirements engineering up to market clearance.

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Marco Serra

Engenya GmbH

Master’s Degree in mechanical engineering from the University of Pretoria, South Africa (1993).

Master’s Degree in Engineering and Management from the Massachusetts Institute of Technology, USA (2002). Focus on Systems Architecture, Systems Engineering, System and Project Management. Thesis: Evolving the Product Development Process.

Almost 30 years of experience in modelling and simulation of engineering systems, structural and fluid mechanics, technology development and expert witness support. Independent consultant since 2003 working in the aerospace, defence, automotive, and oil & gas industries.

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Oliver Fels

Belimo Automation AG

Oliver Fels started his career in 1996 as a software engineer. After realizing that looking at systems level delivers much more satisfaction, he since worked his way through various roles as systems engineer, architect, project manager, department lead, speaker and coach for and with major players, like Siemens, Dornier and SAP.

He also expertizes in various regulatory environments, like aeronautics, automotive and medical.

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Marco Chicherio

Swystems GmbH

Marco Chicherio, Dipl El-Ing ETH, MSc ITET, E-MBA HEC UNIL,

Marco worked for various companies in different industries in various systems engineering and management positions, and is currently managing director of Swystems GmbH. He has also written a book on systems engineering, on which the presentations are based.

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Mike Johnson

SE-Training GmbH

Mike is a Systems Engineering Manager, Consultant, Trainer and Coach with extensive experience in delivering complex systems and establishing Systems Engineering in the Defence, Space and Medical sectors.

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Marc-Andre Chavy-Macdonald

University of St. Gallen Center for Aviation Competence

Dr Chavy-Macdonald is Project Leader at the HSG Center for Aviation Competence (CFAC), and co-founder of a successful consultancy. Over 11+ years' research & work experience, he has spent 9+ in systems engineering & design methodology, performing research with ESA, the University of Tokyo, MIT, and ispace Inc, resulting in over 15 refereed papers. Previously, he was a space environment and radiation specialist with ESA. Passionate about innovation, he has diplomas in technology & innovation management, and experience with several start-ups.

Marc-Andre's current interests include System-of-Systems modelling, future tech planning for the...

space sector, Concurrent Engineering methodology, and innovation economics.

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Alexander Neng

Method Park Engineering GmbH

Alexander Neng is Engineering Manager Systems Engineering at Method Park. Together with his team, he advises and coaches his customers across domains regarding Systems Engineering and Agility, especially in Safety-Critical areas. The focus is on the application of agile methods and practices and requirements engineering.

The exchange of knowledge in communities is also important to him. He writes technical papers regarding Agility and gives talks at conferences. Alexander Neng is an iSQI® Certified Professional for Project Management, IREB® Certified Professional for Requirements Engineering - Foundation Level, Certified Product Owner, Certified Scrum Master and Certified Agile Leader (Level 1). Systemic Coach (isb-w)

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Niels Heuthorst

Belphini

Niels Heuthorst has bachelor degree in Mechanical Engineering and a master degree in Industrial Engineering from Twente University in the Netherlands. He is a Master Black Belt Lean Six Sigma, accredited by the LSSA.

After his studied he worked in a very broad range of companies and job titles, which facilitated him to build his career to become a highly energetic change manager.

In his professional life Niels helps organisations to achieve their goals. He applies several methodologies like Lean Six Sigma and the 4 Disciplines of Execution (Covey).He is a results driven, entrepreneurial, strategic, innovation oriented leader with...

a proven ability to build and execute strategies in order to maximize effectiveness and efficiency.

Known for connecting teams, Niels focuses on process ownership and setting priorities, empowering people. He is a true process thinker with high energy and love for technology and relationships with (key) customers, suppliers and other internal and external stakeholders.

Niels currently works as a self-employed for several customers and holds a management position at Symbol.nl, the leading training and consulting organisation for Process Improvement, Quality Management and Lean Six Sigma in the Netherlands.

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Freddy Kamdem

Industry and Research

Freddy Kamdem Simo received the PhD degree in Sciences and Technology of Information and Systems, and Computer Science, the engineer degree (master’s degree) in Computer Science from Université de Technologie de Compiègne (UTC), France in 2017 and 2014.

His current research interests tackle the provable foundations and general enablers for Systems Engineering.

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Hanspeter Keel

OST - Ostschweizer Fachhochschule

Hanspeter Keel studied mechanical engineering and has a postgraduate degree from ETH Zurich in the field of management and technology (MTEC). He was also in France at INSEAD for strategic research and development.

He began his career in 2006 at Marenco Engineering in product development and then moved to the international plant manufacturer ELEX. There he took over the development of catalytic denitrification for cement works in 2011. Since 2016 he has been responsible for setting up the activities of the global engineering service provider in Zurich. In this function, he played a key role in the development of new products for well-known customers in German-speaking Switzerland.

In 2020 switched to the OST University of Applied Sciences. His focus is on rapid prototyping combined with a subsequent industrialization phase based on the principles of system engineering.

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Adrian Senn

OST - Ostschweizer Fachhochschule

Adrian Senn is a mechanical engineer and works as a research assistant at the Institute for Product Development, Industrial Engineering and PLM (IPEK) at the Eastern Swiss University of Applied Sciences. In addition to the practical work in rapid prototyping, he has deepened his knowledge in the field of system engineering. He is a co-inventor for separating organic waste with sonic levitation and is involved in the Academic Space Initiative Switzerland (ARIS).

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Carlo Leardi

Tetra Pak

Carlo Leardi graduated in electronic engineering in Genova Italy. His professional background starts with quality assurance responsibility evolving in the last years to full verification, validation and testing commitment within complex systems development deployment projects in the following areas: automotive, freight railways and packaging industry. As a passion before and today as a full job, he is dealing with Quantitative Systems Engineering on a day-to-day application and coaching of a full range of statistical and simulation methodologies supporting the decisional process.

He published several articles in Engineering and Systems Engineering journals. He is certified CSEP, one of the founders and past President of the...

INCOSE Italian Chapter and founder of AISE, the Italian association of Systems Engineering. He taught at the Systems Engineering Masters in Tor Vergata and ForteMare in La Spezia. He is serving the Incose Italian Chapter as director of events and coordinator of the Verification, Validation and Operation working group.

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Thomas Mächler

Helbling PLM Solutions

As a senior consultant, Thomas Mächler supports his customers in the implementation of development processes in 3DEXPERIENCE.

As a DBA (Doctor of Business Administration) student, he is investigating ways of mapping global sustainability chains by using SE methods Company: Helbling PLM Solutions

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Martin Neff

3DS

Martin Neff is responsible for Systems Engineering Business Development at Dassault Systemes.

He has a strong background in Automotive in Complexity Management and Systems Engineering and co-founded 2 start-ups in the high-tech scene .

As holistic systems thinker with a faible for green visions he is regularly presenting in different formats and events.

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Emanuele Tomassi

PoliSpace - Politecnico di Milano

Bachelor’s Degree in Aerospace Engineering, with an ongoing MSc in Space Engineering at Politecnico di Milano, and Mission Analyst for the 6S CubeSat mission in PoliSpace since December 2021.

Involved in improving space sustainability and automation in the on-orbit servicing sector and currently working on developing a deep knowledge of MBSE and Systems Engineering in general.

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Riccardo Rambaldi

PoliSpace - Politecnico di Milano

BSc in Aerospace Engineering, currently at the last year of the MSc in Space Engineering, both at Politecnico di Milano.

Ex-Board Member of the space association PoliSpace and System Engineer for 6S, the first CubeSat entirely built and developed by PoliMi students.

Involved from a business development and system engineering point of view, in a project related to Active Debris Removal and On-orbit Operations.

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Dieter Scheithauer

H·I·T·S Engineering

Dieter Scheithauer provides systems engineering training, coaching and consulting services under the brand name H·I·T·S Engineering. He has more than thirty years of experience in the field of automatic control, with the development of high-integrity technical systems including safety critical flight control systems, and defining, implementing and executing effective and efficient systems engineering processes.

He graduated as Diplom-Ingenieur in 1980 and received a doctor’s degree (Dr.-Ing.) in 1987, both at the Universität der Bundeswehr München. He is a former president and an honorable member of GfSE e.V. – The German Chapter of INCOSE. He became an INCOSE CSEP in 2010, and an INCOSE ESEP in 2012.

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Eike Appel

Cariad SE

Eike Appel is a Systems Engineer at CARIAD SE (Automotive Software for Volkswagen). Here she develops the safety-critical ADAS/AD system as a solution architect in the agile team with a focus on networking.

From 2010 to 2017, she represented Ford in the AUTOSAR working group for the communication stack of the Classic platform.

In her spare time, she has been involved in the organization team of the systems.camp of GfSE in Berlin for more than seven years, which has gained a digital format through the pandemic. Eike Appel is an active member of the GfSE working group "Agile Systems Engineering".

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