INCOSE
International Council on Systems Engineering

The Swiss Chapter of the International Council on Systems Engineering

In association with ETH - Land Use Systems Engineering Group (LUSE)

1st September 2014 | ETH Zürich

SWISSED14

The Swiss Society of Systems Engineering Day

SWISSED14 is the first Annual Symposium of the Swiss Society of Systems Engineering (SSSE), also acting as the Swiss Chapter of the International Council on Systems Engineering (INCOSE).

This 1-day event brings together first-class presenters and practitioners from across Europe, to share knowledge and experiences on how to plan, develop and manage systems in an efficient and successful way.

The conference gives industry, organisations, educators, researchers, and government the opportunity to learn about cutting edge practice and research, share experiences, and network.

Systems Engineering (SE):

- enables identification of requirements
- is key to realising integration, verification and validation
- provides a structured and auditable approach
- supports interface management
- manages risks
- optimises system lifecycles
- takes an overarching perspective
- considers the whole system
- fosters an interdisciplinary approach

Who will benefit from attendance?

- Those working with complex systems
- Those who want to find out how Systems Engineering can be of use to them
- Organisations looking to be able to generate innovative solutions to technical problems
- Practitioners needing to keep up to date with the latest developments in Systems Engineering or wanting to participate actively in the evolution of the discipline
- Students who want to further their knowledge and employment perspective

This symposium is right for you if you are, for example, a Systems Engineer, Technical Project Manager, Lead Architect, Chief Engineer, Requirements Engineer, Business Analyst or simply ... the person who seems to know everything about the project!

We would like to thank our Sponsors.

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The Swiss Society of Systems Engineering Day

Timetable

Time	Room B1 - Talks	Room C5 - Talks	Room C11 - Workshops	Room C4 - Tutorials
08.00	Doors open, Registration, Coffee			
08.50	Welcome & Introduction by the SSSE President			
09.00	**Keynote 1, Room B1** Michael Henshaw, Loughborough University **Systems of Systems Engineering – a Problem for Systems Engineers?**			
09.55	Coffee + Tea			
10.20	Model-Based SE / Architectures **Jan van Oort** Independent Software Architect & Consultant **An Actual Implementation of a UML Profile For Developing Airworthiness-Compliant (RTCA DO-178B) Safety-Critical Software**	Ergonomics **Lorenz Born** Schweizerische Bundesbahnen SBB **Christopher Müller** Die Ergonomen Usability AG **LISA - User-Centered Design for the new SBB Shunting Radio**	Process **Martin Becker** Fraunhofer IESE **Variant Management for Software-intensive System Families**	Systems Engineering **Dieter Scheithauer** Airbus Defence and Space **Leading Systems Engineering Narratives (Part 1)**
10.55	Model-Based SE / Architectures **Marcel Frikart** FRIKART Engineering GmbH **10 Views in 1 Day**	Group Dynamics **Andreas Koschak** Parametric Engineering **Homonoids, Tools and Methodologies – An Engineer's Reality Check**		
11.30	Lunch			
13.00	System Engineering **David Endler** Freelance SE Consultant **Daniel Steffen** Unity AG **Alexander Lohberg** University Duisburg-Essen **Florian Munker** IPEK **Systems Engineering Return on Investment**	System Safety **Marco Geering** RUAG Aviation **System Safety in the Military Jet Utilization Stage**	MBSE / Architectures **Ian Gibson** Jacobs UK Ltd - Technology & Defence **Kevin Howard** AGT International **Saving the Earth using Enterprise Architecture! (Part 1)**	Systems Engineering **Dieter Scheithauer** Airbus Defence and Space **Leading Systems Engineering Narratives (Part 2)**
13.35	Systems Engineering **Thomas Hott** **The European X-ray Free-Electron Laser**	System Engineering **Alan Harding** BAE Systems **The Age of Systems Challenges**		
14.10	Coffee + Tea			

Timetable

SWISSED14

Time	Room B1 - Talk	Room C5 - Talks	Room C11 - Workshops	Room C4 - Tutorials
14.35	Keynote 2, Room B1 Patrick Godfrey, University of Bristol Systems Centre Complex Systems Decision Support			
15.30	Model-Based SE / Architectures Steve Hitchins PA Consulting Architecture Governance - A Definitive Guide on How to Plait Fog and Nail Jelly to the Wall	Requirements Jeremy Dick integrate systems engineering ltd Evidence-Based Development - Coupling Structured Argumentation with Requirements Development	MBSE / Architectures Ian Gibson Jacobs UK Ltd - Technology & Defence Kevin Howards AGT International Saving the Earth using Enterprise Architecture! (Part 2)	
16.05	Ergonomics Andreas Korf Jeremy Tweedie Atego Systems Gmbh Model-based Product Line Engineering for Complex Systems	Requirements Colin Hood Colin Hood Systems Engineering Automate and Eliminate: These methods can save 50% of your requirements effort		
16.40	Coffee + Tea			
17.05	Integration Jose M. Alvarez-Rodríguez & Juan Llorens Universidad Carlos III de Madrid Connecting everything: A Need in Systems Enineering and a Close Future to OSLC	Requirements Jose Fuentes The REUSE Company From Requirements Quality to Requirements Authoring	Systems Engineering Andrew Travers Travers Executive Search Marketing Yourself as an Engineer	
17.40	Knowledge Management Aurelijus Morkevicius No Magic Europe Integrated Modelling: Adopting Architecture Frameworks for Model-based Systems Engineering	Experience Report Kevin Howards AGT International How I learnt Systems Engineering		
18.15	Student Prize Handout + Closing			
18.30	Final Coffee + Tea			
19.00	We will organise a restaurant reservation in town for those who want to network some more!			

Keynote 1

Prof. Michael Henshaw | Loughborough University UK

Systems of Systems Engineering – a problem for Systems Engineers?

Abstract

Systems of Systems (SoS) Engineering is established as an important area of study, but still there is not complete agreement about what it means. This presentation will examine different types of SoS and consider the adequacy of which traditional systems engineering methods for this type of highly connected systems. It will be shown that much of the important knowledge concerned with design and operation of SoS must be drawn from other disciplines, including non-engineering disciplines and, especially, those associated with human factors and organisational ergonomics.

Defining the system of interest is a particular problem for engineering SoS and the approach towards characterising particular SoS will be considered. Technical governance is found to be problematic for SoS, and some approaches through which this problem may be addressed will be considered.

Biography

Michael Henshaw is Professor of Systems Engineering and the Head of the Systems Division at Loughborough University, UK.

Following a PhD in Applied Physics with research in laser-plasma interactions, he joined British Aerospace (later BAE Systems) in 1989 where he worked in aeronautical engineering with a particular research focus on modelling fluid-structure interaction and non-linear aeroelastics. With an increasing interest in multi-disciplinary research, he joined Loughborough University in 2006 to direct a major research programme in Network Enabled Capability.

He is a co-chair of the IEEE SMC Technical Committee on Systems of Systems and a member of the BKCASE Editorial Board with joint responsibility for the sections on Product Systems, Enterprise Systems, and Systems of Systems.

Keynote 2

Prof. Patrick Godfrey | University of Bristol

Complex Systems Decision Support

Abstract

The complexity of the decisions we face is constantly increasing. Globalisation, Privatisation, Democratisation, Interdependence of systems and infrastructure are all compounding the problem. This presentation sets out to describe, with examples, how by applying systems architecting principles the systems engineer can respond by focusing on People, Purpose, Process and Performance.

Once a holistically structured framework with measurement regime and contextual understanding is in place, then the interdependencies that drive both desirable outcomes and unintended consequences can be tracked and managed on a learning journey to success. The framework can be used as an evolving decision support model throughout the journey. It also forms the basis for organisational learning, improvement in resilience, and de-risking transformational change.

Biography

Patrick Godfrey is Professor of Systems Engineering at the University of Bristol, and Director of the Systems Centre and the Industrial Doctorate Centre in Systems at University of Bristol and University of Bath.

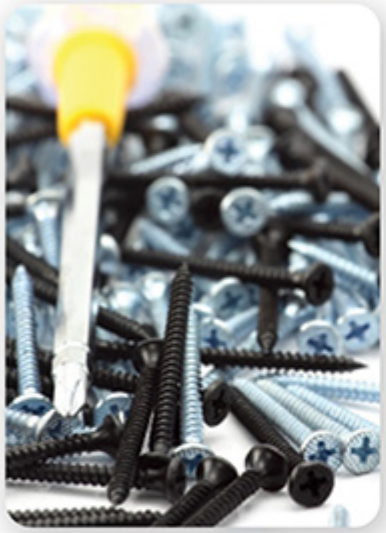
The Centre is focused on 'Managing systems for enhanced performance'. His research focuses on systems thinking applied to complex engineering topics such as: infrastructure design, operations and management; uncertainty, risk, value and safety management and more recently systems for the built environment, and sustainability.

He is a Fellow of the Royal Academy of Engineering, Fellow of Institution of Civil Engineers, Fellow of INCOSE, Fellow of City and Guilds Institute, Fellow of the Energy Institute, Honorary Fellow of the Institute of Actuaries and was awarded an Honorary Doctorate in Engineering by the University of Bristol in 2004. He is also a Member of the Scientific Council of Institut de Recherche Technologique SystemX in France.

Workshop / Tutorial

Dr. Martin Becker | Fraunhofer IESE

Variant Management for Software-intensive System Families



Abstract

The workshop will cover the following topics:

- Specific challenges of software-intensive systems with regard to variant management
- Overview on software product line engineering and tools
- Adoption and improvement patterns and experiences in practice
- Open issues with regard to software-variant management (e.g. agile development, safety critical system families)

Biography

Martin Becker is heading the Embedded Systems Engineering department at Fraunhofer IESE in Kaiserslautern, Germany.
He graduated from the University of Kaiserslautern in Computer Science and Electrical Engineering in 1997 and received his Ph.D. degree in 2004 in the field of variability management. Since 2004, he has been working for Fraunhofer IESE in applied research and technology transfer projects in the area of software product lines, component-based development, architecture-centric engineering, configuration support, and adaptive systems. Until 2009 he has coordinated Fraunhofer IESE's activities in the area of Ambient Intelligence Systems and Ambient Assisted Living.

Among his special interests are the elicitation and sharing of architectural knowledge in variant-rich systems, especially the knowledge on system variants and their efficient production as well as managing variability on the code level.

Workshop / Tutorial

Dr. Dieter Scheithauer | Airbus Defence and Space

Leading Systems Engineering Narratives

Abstract

Rational thinking is based on sequential narratives. Sequential narratives follow a pattern "then ... and then ... and then ...". No single sequential narrative is able to describe our real world. The assumption of a network topology is a better approximation for the environment around us. However, we are still bound to sequential narratives for communicating rational concepts. From the many overlapping and sometimes competing narratives in systems engineering, the best systems engineering narratives used for teaching, training and communication need to be selected.

The workshop focuses on three of the most promising narratives and their interdependencies. The most basic narrative of the three is the problem processing narrative comprising the steps from problem finding to problem solving. In the centre, the systems engineering value stream narrative describes systems engineering processes and methods. The value stream narrative is augmented by the system life cycle narrative, the oldest narrative used in systems engineering.

Biography

Dieter Scheithauer's technical and managerial experience covers 38 years in the German and European aerospace sector. His recent activities at Airbus Defence and Space have focused on process definition, process improvement, and process standardisation in the field of systems engineering. He is a member of the Airbus Group Systems Engineering Steering Board. He worked at IABG – Industrieanlagenbetriebs-gesellschaft GmbH – as technical consultant and project manager on Flight Control System matters. He was involved in all major military aircraft and helicopter development programmes of that time. He was project manager for the development of unconventional airborne and ground-based control systems with a responsibility from concept to delivery. For 12 years he has served as technical officer in the German Air Force officer. He spent time training experienced as well as young technicians for the maintenance of the Flight Control System of the TORNADO.

Dr. Scheithauer is an active contributor to INCOSE. He was president of the German Chapter of INCOSE for 5 years (2003 to 2008). He is an honourable member of GfSE and moderates the annual student awards. He also represents Airbus Defence and Space on the INCOSE Corporate Advisory Board.

Workshop / Tutorial

Ian Gibson | Jacobs UK Ltd – Technology & Defence & **Dr. Kevin Howard** | AGT International

Saving the Earth using Enterprise Architecture!

Abstract

This workshop will introduce the key principles and practices of Enterprise Architecture, and then put them into perspective through an interactive group working session during which delegates will apply these techniques to the problem of saving the Earth from the adverse effects of asteroid impacts.

The facilitators will make use of worked examples to set the scene and provide support and mentoring for the delegates during the exercise itself.

The workshop will end with a wash-up session which will address observations and issues arising from the exercise and the problem situation, and relate them back to wider enterprise architecting issues from the facilitators' own experience (including the merits of using architecture frameworks to enable commonality, coherence and re-use).

This workshop is aimed at delegates who are relatively new to enterprise architecture and want some practical advice on how to apply modelling techniques to answer real world problems.

Workshop / Tutorial

Ian Gibson | Jacobs UK Ltd – Technology & Defence & **Dr. Kevin Howard** | AGT International

Saving the Earth using Enterprise Architecture!

Biography

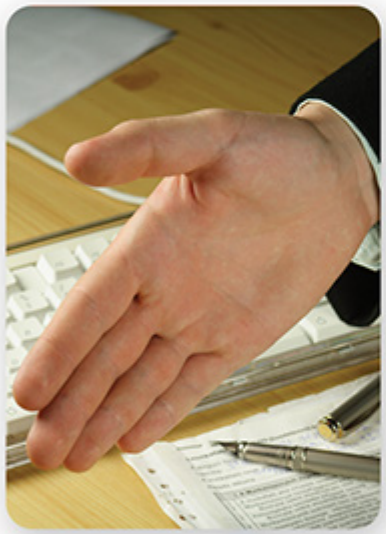
Ian Gibson is a Systems Engineer and Enterprise Architect with over 18 years' experience in the Defence and Aerospace Industry, having worked on projects covering Land, Air, Maritime, Electronic Warfare, C4I, future concepts and experimentation, and also covering business transformation within the UK MOD and Rolls-Royce. He has extensive experience of developing requirements from low level system design to high level concepts, employing various elicitation techniques such as business process analysis, enterprise architecture, use case driven analysis, functional decomposition and informal brainstorming approaches. Ian is currently the Chief Engineer for System of Systems Engineering within Jacobs UK Technology and Defence. He is also currently serving as the Events Director for INCOSE UK, responsible for the content and delivery of the Annual Systems Engineering Conference, Tutorial Days, and One Day Events.

Kevin Howard has an Honours Degree in Engineering from Sheffield University and a PhD in System Eng. from The University of Surrey. He started work in radar and antenna sytems developing the first solid state transmitter for Raytheon's secondary and mode S radar systems in the 1980s and developing a range of low profile printed antennas for various sensor and communications systems, including the first generation of Direct Broadcast Satellite TV receivers. He established a new RF research facility in Ferranti investigating applications of high resolution and millimetre RF techniques and communication to buried systems; generating a range of innovative sensor and communication techniques. He spent 6 years working in advanced software and processing systems developing advance data fusion engine demonstrating practical real time application from multiple and disparate sensor at White Sands Missile Range in mid 1990s. He is advocate for modelling for systems, using OMT in the '90 and adopter the UML at version 1.0 being one of the earliest to apply it to Systems Engineering. Kevin has worked across the UK defence industry; as head of the System and Sensors Group for Thales Missile Electronics and defined first generation processes for the application of MBSE across the business. He has taught Systems Engineering and MBSE for Thales across Europe. More recently he was a Principal Consultant for Jacobs Engineering supporting a range of clients from Airbus Industries, Force Protection Inc to the UK MoD. Kevin is now VP Global Systems Engineering for AGT limit with its head office in Zurich.

Presentation

Andrew Travers | Travers Search

Marketing yourself as an Engineer



Abstract

Engineers are changing the world all of the time. They dream up practical and sometimes creative solutions by designing, inventing and creating things that matter. These days, as some markets shrink or fall into economic crisis and others grow rapidly, engineering jobs, especially those with non-specialised functions, are being re-evalua ted and often relocated to a place around the globe. Therefore, it is no longer enough that an engineer should be efficient and productive but must also be open to moving to a new country, culture or even continent. They need to adapt to change, be able to deliver high quality services and build relationships with customers, clients and colleagues both virtually and in-person. The engineers who can do this will understand how to use self-marketing tools to promote themselves and in turn, have more influence over their own career plans. In fact, excelling in doing so will become a key differentiator for future employment opportunities.

Biography

Andrew Travers started his Executive Search activities properly in 2008, starting with projects in gas compression and electronic manufacturing services and thoroughly enjoys supporting specialists who can "make or design things." Prior to that, his career started in banking, more specifically in finance and asset finance. There he had experience of supporting companies and their management with their acquisition of equipment as diverse as a 10 tonne stamping press, a £1 million horizontal drilling rig and to the first digital printing presses to be adopted in the UK. This variety of projects fed him a daily mix of engineering and financial food. In 2000, Andrew made a total career change leaving finance, to join a new technology start-up as a member of the EMEA subsidiary team, working in hotel technologies as a commercial project manager supporting sales and at the same time leading multiple Internet deployments for Marriott Hotels in the UK. A real "baptism by fire" time when being a systems engineer could have been a huge benefit! Having successfully completed substantial projects for Marriott, Andrew returned back to sales at a NTT Docomo subsidiary taking on EMEA responsibilities for new hospitality products, concentrating on the Hyatt, Thistle, Guoman, Hilton and Le Meridien brands. Then arriving in Switzerland, it was natural that Andrew had to find a new home away from hospitality technology consulting and he used his corporate experience to become a "headhunter" for engineers. The success of which has been borne from the understanding of commercial pressures, the ability to talk sense and last but not least, admit when knowledge may be lacking related to some specific aerospace, automotive or machinery R&D or advanced engineering roles.

Presentation

Jan van Oort | Independent Software Architect & Consultant

An Actual Implementation of a UML Profile For Developing Airworthiness-Compliant (RTCA DO-178B) Safety-Critical Software

Abstract

We discuss a new method for the use and implementation of RTCA DO-178B, "Software Considerations in Airborne Systems and Equipment Certification", the well-known avionics safety and airworthiness standard, in object-oriented modeling.

Based upon a paper by Zoughbi et al., we present an implemented, fully documented UML profile consisting of stereotypes derived from DO-178B concepts, as embodied in verbs and adjectives occurring in the original standard. We also provide an example usage of the new profile, while concluding with a discussion of the potential new perspectives for, and impact upon, code generation toolchains and ecosystems. The work presented here serves as a basis for a currently ongoing effort, by the authors, to also present DO-178C as a UML profile in the near future.

Key learning points: (Aerospace) Safety Certification / DO178B/C for practitioners.

Biography

Jan van Oort is an independent Software and Enterprise Architect with 21 years of experience, especially in modelling complex systems with the help of UML and SysML. In cooperation with Sparx Systems Central Europe he offers courses and consultancy in this domain all over Europe. He is an enthusiastic programmer in Java, ADA and Julia; his experience – in the aerospace domain – with ADA goes back as far as 1993, whereas he jumped on the Java bandwaggon in 1996 and has been building logistical systems as well as performing software research and development ever since. He also lead teams of up to 20 members. Jan communicates at native level in German, English, French and Dutch. He participated in two European R & D projects: CRISMA and HATS, has a seat in the Industrial Advisory Board of the new FP7 project ENVISAGE and participates in IEEE 1622: Common Data Format for Election Equipment.
He lives in the Lower Austrian town of Mödling, at the edge of the beautiful Wienerwald.

Presentation

Lorenz Born | Schweizerische Bundesbahnen SBB & Dr. Christopher Müller | The Ergonomen Usability AG

LISA – User-centered Design for the new SBB Shunting Radio

Abstract

Swiss Railways (SBB) plan to replace its shunting radio devices. The new shunting radio not only has to meet GSM-R standards, but also Switzerland-specific technical, ergonomics- and safety-related requirements. The development of the new device included a thorough user & task analysis, usability testing with shunting personnel, and a highly iterative development from the design through to quick manuals. On the technical level, systems engineering was responsible for the specification as a basis for the WTO tender offering process. It proved highly efficient to prepare some content in advance, i.e. the user guidance concept for the shunting device. This reduced potential project risks considerably.

Take-away message:

- The user-centered Design process helps to identify project risks early on
- Preparing "more finalized" elements of the system can help keeping project risks at bay or to be better able to plan the development phase

Biography

Lorenz Born is an engineer for development and testing of mobile telecommunication devices at SBB Telecom. Responsible for integration of mobile GSM-R equipment into the SBB GSM-R Network.
He received a Bachelor Degree in Electrical Engineering and Computer Science and a Master of Advanced Studies in Information Technology at the University of Applied Sciences in Bern. Moreover, Lorenz Born is a Certified Professional for Requirements Engineering.

Christopher Müller is a Usability and User Experience Expert, and CEO of The Ergonomen Usability AG. He received his doctorate in 2000 at the Swiss Federal Institute of Technology ETH.

Furthermore he is one of the leading Swiss experts in usability and user centered design. He is founder and owner of The Ergonomen Usability AG. Dr. Müller is also columnist for the "Netzwoche", the leading Swiss IT journal.

Presentation

Marcel Frikart | FRIKART Engineering GmbH (CEO & Systems Engineer)

10 Views in 1 Day

Abstract

Can we create a systems model that is of use for the project with an effort of only one day? Are 10 diagrams adequate to model the most important aspects of a system? Does it make sense to support an active project team in a "jump-in/jump-out" manner? This presentation is a case study showing a pragmatic approach to get involved with the holistic systems engineering thinking focussing on a structured systems analysis and architecture. Complementary to stakeholder requirements and systems specifications, 10 views are modelled using the UML/SysML notation. The diagrams are shown as a compact set of diagrams representing the system at an early stage of the project. The system of interest is a packaging line. The plant engineering company develops highly specialized machines and facilities for customers across different industries. We were asked to support them during the feasibility phase in order to increase the quality of their quote: visualization of the available concepts and design approaches, identification of missing aspects, pointing out gaps, making the complexity of the architecture controllable.

The Views modelled include: process analysis; context; use case overview and detailing with activity diagrams; system breakdown structure; interfaces and subsystem level interactions; system states.

Biography

Marcel Frikart has 15 years of experience in the development of safety critical systems in the medical device industry. He received a Bachelor Degree in Electrical Engineering (Dipl. El.-Ing. FH) at the University of Applied Sciences in Bern/Burgdorf. M. Frikart is a Systems Engineering Expert and Project Leader. He is the founder and owner of a small consulting company providing specialized engineering services and involved in various development and industrialization projects.

His special interest areas include systems and systems-of-systems architecture for smaller companies. Moreover he is co-leader of the INCOSE/GfSE/SSSE working group for "systems of moderate complexity" (MkS).

Presentation

Dr. David Endler | Systems Engineering Consultant, Freelancer (Daniel Steffen, Alexander Lohberg, Florian Munker)

Systems Engineering Return on Investment

Abstract

When deciding whether to allocate Systems Engineering Resources to a project, decision makers have to take the responsibility for the return on the investment they approve. In most cases, it is very difficult to provide exact numbers for the benefits gained from the additional efforts.

To support the decision making process of approving Systems Engineering activities, a Failure Modes and Effects Analysis (FMEA) is extended to assess the efficiency of Systems Engineering methods in the project context. FMEAs are well-known across different industries and are very often used in projects anyway.

Consequently, there should be a high level of accep-tance when using FMEAs in a pragmatic way to assess Systems Engineering activities.

Biography

David Endler is a fellow of GfSE, the German Chapter of INCOSE, where he is appointed Director Technology and Methods. David is working as Systems Engineering Consultant (freelancer) for various customers in aerospace, renewable energies and automotive. David started his systems engineering career in 2002 and since then has been involved in a wide range of projects. He supported OEMs, MROs, system suppliers and air forces with his sound systems engineering knowledge.

Currently, David is involved in systems engineering process definition and coaching projects in the automotive industry. He holds a PhD in Physics (Dr. rer. nat.) from University of Hamburg.

In his spare time, David enjoys swimming, cycling and running, some call it triathlon.

Presentation

Marco Geering | RUAG Aviation, Department Manager Engineering Jet&Missiles

System safety in the military jet utilization

Abstract

Maintaining the system safety baseline is the safety task relevant for continuing airworthiness. The presentation gives an overview of application of engineering and management principles, criteria and techniques to achieve an acceptable risk within the constraints of operational effectiveness and suitability, time and costs throughout all phases of the system life cycle.
The main differences between the civil and military world will be highlighted through the ALARP (as low as reasonably practical) philosophy. Hazards affecting the safety baseline are identified through different processes like occurrence reporting, information from users, mishaps investigations etc. Such information sources are inputs to the system safety process and will be explained with real hazard and occurrence notifications and their respective mitigation actions.

The attendees will have a good insight into how the established MIL-STD-882 process can be tailored to a practical system safety program plan as part of the overall systems engineering approach.

Biography

Marco Geering earned his Bachelor of Science degree in Mechanical Engineering with specialization in Mechanical Design and Materials at the University of Applied Science Lucerne in 2001. He started off as a Fatigue Engineer and later took the position of the Chief Engineer for the weapon system Tiger F-5E/F.

During this period, he also published two papers as co-author in the field of residual stresses. In 2008 he joined the Swiss Air Force for a new project as a Flight Safety Specialist for Maintenance where he developed and introduced the Safety Management System for all maintenance personnel.

He still acts as a technical lead investigator for incidents and accidents. In 2010 he went back to RUAG Aviation as Department Manager Military Jet&Missiles Engineering. In this position, he is responsible for the technical airworthiness, safety and reliability of the assigned Jet Weapon Systems. Since 2012, he is a Certified Systems Engineering Professional.

Presentation

Dr. Thomas Hott

The European X-ray Free-Electron Laser

Abstract

The European X-ray Free-Electron Laser (XFEL) is one of the most technical demanding and complex facilities for fundamental research, which is worldwide under construction. It is stretching over 3.5 km and incorporates 5.6 km of tunnels and 20 large underground and surface buildings to house the necessary technology. The actual heart of this facility will be a 1.5 km long, superconducting linear accelerator, operating at -271 °C. Once completed it will be the world's most powerful research facility for studying the dynamics of atomic and molecular processes in the femto-second realm (10-15 s), or to express it more pictorially, it will allow to make even movies of chemical and atomic reactions that are too rapid to be captured by other methods. This 1 billion Euro project is a multinational collaborative (distributed) engineering and fabrication effort with central systems integration. It involves 20 leading scientific institutes from 13 countries and a multitude of (high-end) industrial partners from all over the world. The presentation will discuss the technical management challenges, such as establishing the overall architecture, requirements engineering and planning the systems integration. A critical analysis will evaluate the applied methods regarding appropriateness and possible improvements, and in particular where a "more" of systems engineering could have led to a "less" of troubles.

Biography

Thomas Hott was born in 1964. He studied physics in Heidelberg and made his PhD in 1997 in the field of particle physics. As post-doc, he worked at the Deutsche Elektronen-Synchrotron, DESY, in Hamburg, as the Installation Manager of the Inner Tracker system for the HERA-B experiment. This was an experiment at DESY's electron-proton collider, dedicated to study the origin of the matter-antimatter asymmetry in our universe.

In 2001 he changed to CERN, the European Organization for Nuclear Research, in Geneva. There he became the Technical Coordinator for the installation of the ATLAS Liquid-Argon Calorimeter. ATLAS is one of two huge general-purpose detectors at CERN's Large-Hadron Collider, which discovered in 2012 the famous Higgs particle. From 2006 to the end of 2011 he joined again DESY, to act as the Technical Coordinator for the construction of the European X-ray Free-Electron Laser facility. In this function he set up the central systems integration group and led it throughout this period.

In 2012 Thomas Hott moved to industry and joined Vesdo, a Swiss company specialised in product security and anti-counterfeiting measures for the pharmaceutical industry.

Presentation

Alan Harding | BAE Systems (INCOSE UK President)

The Age of Systems Challenges

Abstract

We live in the age of systems challenges. Global trends include changes to both socio-economic conditions and changes in our physical environment. These place new demands on the types of systems that are needed, their connectedness, and society's expectations of success.

Systems engineers are linchpins in responding to these challenges and it is our opportunity to rise to these challenges. To achieve this however, the practice of systems engineering must continue to evolve, so that, as systems engineers, we have the processes and tools for the job.

Alan will discuss the nature of the challenges, the current state of systems engineering in the UK and internationally, and where he sees the drivers for change.
Learning points: systems perspective on global challenges; diversity of systems we produce in the varying contexts; today's SE challenges.

Biography

Alan Harding is the Head of Systems Engineering for Defence Information in BAE Systems' Military Air and Information business. He is an experienced systems engineering lead comfortable with consultancy, architecting and engineering management roles.

Alan graduated with an Honours Degree in Physics from the University of Durham in 1985, and since then has gained 28 years' experience in systems enginee-ring in a range of domains across defence and security. His specialist interest areas include capability, systems-of-systems, competency development and architecture. In November 2010 Alan was appointed an Engineering Fellow within BAE Systems.

Alan has been a member of INCOSE since 2005 and is currently the President of INCOSE UK, and is President-Elect of INCOSE.

Presentation

Stephen Hitchins | PA Consulting, UK (Managing Consultant Government, Defence & Security practice)

Systems of Systems Engineering – a problem for Systems Engineers?

Abstract

Enterprise Architecture has been with us some time now but still it has mixed reviews. Some excellent work has been done, but for each success there also seems to be a tale of woe.

It is a paradox that something that is used for planning the future of an enterprise is itself so hard to control and manage.

Steve will be unpacking this issue and looking at approaches that can make the outcomes of architecture more reliable. Delegates should gain an understanding of how to classify architecture and how to devise an appropriate governance regime.

Biography

Stephen Hitchins trained as an aircraft engineer but has spent most of his career as a consultant/business architect creating linkage between business plans and requirements and their supporting technologies.

Recent roles include chief architect at Niteworks and CTO of a number of large MOD outsourced datacentres.

He is currently a Managing Consultant at PA Consulting in the Government, Defence and Security practice.

Presentation

Dr. Jeremy Dick | integrate systems engineering ltd (Principal Analyst)

Evidence-Based Development – Coupling Structured Argumentation with Requirements Development

Abstract

This presentation explains the concept of Evidence-based Development (EbD), an approach that draws together requirements development and structured argumentation into a unified assurance framework.

Part of the discipline of requirements management is to document which design artefacts contribute to the satisfaction of which requirements by tracing individual statements of requirement through the layers of design. Evidence-based Development recognises that the systematic collection of "satisfaction statements" for each step in the requirements development, along with supporting evidence provided by design validation and verification activities, amounts to a structured argument for the design. The advantages of this approach are that assurance is coupled tightly to the design process, and that assurance is applied uniformly to all aspects of the design.

I will report on experiences of applying EbD to a number of significant projects in the UK.

Biography

Jeremy Dick received BSc and DPhil degrees in Computing Science from Imperial College, London. With a background in formal methods, he has worked as a consultant in the requirements engineering domain for nearly 20 years, first with QSS and Telelogic, now with Integrate Systems Engineering Ltd. His roles have afforded him a broad exposure to requirements management practices and issues across many industry sectors. Recent work has included 3 years as part of the requirements team in a major UK defence programme applying Evidence-base Development, and currently working in the rail sector with HS2 and the civil nuclear sector with Sellafield. Co-author of a Springer book entitled "Requirements Engineering", Jeremy has been an advocate of tool-supported requirements processes for many years. Known for his work on traceability, he coined the term "rich traceability" for the concept of traceability ratio-nale. These principles have evolved into the concept of "Evidence-based Development", which is one of his current interests. He is also a past chair of the INCOSE Requirements Working Group.

Presentation

Andreas Korff | Atego Systems GmbH (Chief Consulting Engineer)
& **Jeremy Tweedie** | Atego Systems GmbH (Senior Consultant)

Model-based Product Line Engineering for Complex Systems

Abstract

Model-based Systems Engineering using languages like the OMG SysML have been introduced successfully into many domains developing complex systems. Instead of using a document-based approach, all the different views are not created from one, consistent system model. However, when re-using models, the similarity of the developed systems drives the need to re-think the "normal" clone-and-own strategy. What if one model would contain all the information of the product line, including the variability within the different products, so changes to common elements are only to be done once? How can we express variability, and therefore offer the stakeholders responsible for the product portfolio to collaborate? There are norms and standards available, like the ISO26550:2013, which offers a suitable reference model for combining MBSE and PLE.
We will show an approach using SysML and OVM, the Orthogonal Variability Model, including automatic generation of product models for further model usage, like artifact generation, trade-off analysis, and simulation.

Biography

Andreas Korff has over 20 years of experience in the development of real-time, safety- and mission-critical systems. Within Atego, his role as Chief Consulting Engineer involves him in the coordination of the Application Engineering Team in Europe and the Emerging Markets, and in consulting and of key customers in that region. He is one of the lead authors or the Atego Perspective, a norms-based process combining model-based systems and software engineering with strategies for product line engineering and the controlled distribution and publication of reusable assets. After his diploma in Computer Science in 1991, he worked developing aerospace and automation software and systems in several roles as tester, developer and in project management before joining Artisan Software Tools in 2001. Being member of GI and GfSE, the German Chapter of INCOSE, he has written numerous articles, submissions and book contributions about UML and SysML. He is author of the book "Modellierung von eingebetteten Systemen mit UML und SysML", released in June 2008. Within the Object Management Group, he contributes to the OMG SysML and CVL Revision Task Forces.

Jeremy Tweedie has been involved in the development of real-time, mission-critical automated systems for the past 8 years, during which he has worked on marine electronic systems, airborne software and land based training and simulation systems. After completing his engineering studies (following an initial 4 years in Marine Systems), Jeremy worked for an Australasian based engineering firm developing defence software and simulation systems. As a Senior Consultant within the Application Engineering team at Atego, his role includes providing systems and software consulting to a wide range of customers within Germany and the wider Europe.

Presentation

Colin Hood | Colin Hood Systems Engineering

Automate and Eliminate: These methods can save 50% of your requirements effort

Abstract

The presentation shows how to save time and money by eliminating work that is often done but is not necessary, and by automating work that is necessary when specifying requirements for embedded software and electronics systems.

"We cannot master complexity, we must avoid it".
Henning Butz 2011

There is a saying in motor racing, "Drive slower, and go faster". The point of this is that by taking a car beyond its limits, balance is upset and everything becomes sub-optimal. Everything becomes dealing with the problem that the driver has just created. The very fastest laps of a racing circuit look unspectacular. And that is spectacular!

This presentation deals with practical techniques to simplify Requirements Engineering, to help us to master Requirements Engineering by avoiding complexity. An old adage is, "Do as little as possible, and as much as necessary". Colin Hood 1989

So do not work harder, work smarter!

Biography

Colin Hood is well known and well respected in the requirements industry, and is invited to speak at conferences in Europe and the USA. Colin Hood is author of many books on requirements and requirements tools. Colin Hood is co-founder of the International Requirements Engineering Board (IREB), and is co-author of the syllabus and examination of the qualification of Certified Professional in Requirements Engineering (CPRE). Colin Hood has been a member of INCOSE since 1999. Colin Hood started work in the electrical and electronics industry in 1977, and has been a systems engineer since 1985. He has worked as trainer and coach for requirements engineering since 1987. Colin Hood developed software since 1981, working mainly on real-time embedded systems in the automobile industry, chemical, and white goods, and also PLCs for factory control and data acquisition.

Colin Hood together with partners of Colin Hood Systems Engineering supports customers world-wide to successfully improve quality and delivery through system engineering techniques in many industries including Aerospace, Automobile, Banking, Chemical, Food, IT, Insurance, Medical, Military, Pharmaceutical, Telecommunications, and Transport.

Presentation (SESE)

Dr. Jose María Alvarez-Rodríguez | Carlos III University of Madrid, Spain (Knowledge Reuse Research Group)
Dr. Juan Llorens | Carlos III University of Madrid, Spain (Knowledge Reuse Research Group)

Connecting everything: A Need in Systems Engineering and a Close Future using OSLC

Abstract

This talk aims to show the relevance of knowledge-based technology as a cornerstone to improve and boost the development of complex systems. Currently, the systems development lifecycle is focused on the use of domain-specific tools to deal with tasks such as requirements management, simulation, modelling, quality assessment, traceability or verification/validation processes to name a few. Although these tools are well-known and widely accepted by the industrial community, there is a lack of interoperability among them that prevents a better re-use of information and data.
In this sense the growing interest in making systems more interoperable is generating agnostic standards, specifications and services that are expected to exploit existing techniques and capabilities. Therefore, this new realm requires the definition of proper formats and protocols to take advantage of a dynamic and knowledge-centric environment in which more timely, adaptable and flexible processes are becoming a major necessity.

On the other hand, semantic-based technologies emerge to provide the adequate building blocks to represent domain-knowledge and elevate the meaning of information resources through a common and shared data model (RDF) accessible via the Internet Protocols. In this sense, the Open Services for Lifecycle Collaboration (OSLC) effort has emerged to apply the principles of the aforementioned initiative to boost the re-use of information and data across different tools. Our aim is to present the state of the art around this topic, to show ongoing work to drive a data-oriented environment making special emphasis in the management of domain vocabularies to support cross-cutting services such as naming, indexing and retrieval of information resources.

To offer practical results, an OSLC-based API will be shown to connect requirements authoring tools with requirements quality management tools, as well as with ontology management tools. This technology can be seen as a step forward to the creation of a fully and interoperable data environment demonstrating the flexibility of OSLC and Linked Data to represent and share domain knowledge as a key-enabler for the next generation of system development methodologies and tools.

Presentation (SESE)

Dr. Jose María Alvarez-Rodríguez | Carlos III University of Madrid, Spain (Knowledge Reuse Research Group)
Dr. Juan Llorens | Carlos III University of Madrid, Spain (Knowledge Reuse Research Group)

Connecting everything: A Need in Systems Engineering and a Close Future using OSLC

Biography

Jose María Alvarez-Rodríguez holds a Ph.D. (2012) in e-Procurement, Linked Data and Semantics by the University of Oviedo, Spain. From 2005 to 2010 he worked at the R&D Department within CTIC Foundation. He has also participated in more than 15 competitive research projects and has published more than 50 publications and research works serving also as editor and program committee of main international journals and conferences in his research fields. He also held a position as part-time Assistant Professor from 2008 to 2012 at the Department of Computer Science within the University of Oviedo. He has been rewarded with a HPC2-Europe Transnational Access Programme grant at SARA (Netherlands) and a Marie Curie Postdoc at SEERC (Greece) within the RELATE-ITN FP7 project. Currently he is Visiting Professor within the Department of Computer Science at the Carlos III University of Madrid. In the meantime he is part of the research group "Knowledge Reuse" (at the same University) lead by Prof. Dr. Juan Llorens and member of INCOSE and the OSLC Requirements Management group.

Juan Llorens is Professor at the Informatics Department of the Carlos III University of Madrid – Spain. He received his MS degree in Industrial Engineering from the ICAI Polytechnic School at the UPC University in Madrid in 1986, Spain, and his PhD in Industrial Engineering and robotics at the Carlos III University of Madrid, Spain in 1996. In 1987 he started his own company dealing with Artificial Intelligence applied to Database systems, named Knowledge Engineering SL (KE). Dr. Llorens worked as technical director in KE and as Marketing Director in Advanced Vision Technologies until 1992, when he joined the Carlos III University. Since 2003 he is Professor at the Carlos III University of Madrid. His main subject is Knowledge Reuse, which he teaches in the Informatics studies at the University.

In 1998 Dr. Llorens was invited to the Högskolan på Åland (HÅ) (Åland, Finland). From 1998 to 2008 he split his educational activities between Madrid's University and the HÅ, where he taught different Software Engineering subjects. Since 2008, based on a funded agreement, The REUSE Company, a brand of the spin-off organization named CISET, has outsourced all its R&D activities to the Knowledge Reuse Group of the Carlos III University. In this context, Dr. Llorens can defend TRC's CTO role within his professorship. His current research involves the study of knowledge technologies and system engineering techniques integration towards Software and Information quality measurement and Reuse. He is a member of Requirements Working Group and he is the Technical Director of the Spanish INCOSE Chapter (AEIS).

Presentation (SESE)

Jose Fuentes | The Reuse Company Inc., Madrid, Spain

From Requirements Quality to Requirements Authoring

Abstract

Requirements engineering is becoming a key discipline for the proper development of complex safety-critical systems. More specifically, recent times have seen the development of different techniques to promote requirements from raw text to a more structured representation. Even due to the growing awareness of the importance of requirements engineering, there is a lack of a fully integrated environment for writing, managing and checking the quality of requirements. In this sense, the requirements authoring activity is becoming dramatically crucial to the definition of correct, complete and consistent requirements specifications. That is why the use of boilerplates or patterns (statement-level template) to write requirements is gaining momentum in the Systems and Software engineering areas providing a smart and quantifiable way of delivering high-quality requirements. More specifically, the use controlled vocabularies, taxonomies or ontologies to drive requirements writing is considered a step towards the standardization, homogenization and reuse of terms and concepts in a text-based requirement that enable us to design and deliver advanced services of traceability or quality assurance. This speech focuses on the use of patterns to ease the creation of requirements by controlling input texts and the continuous calculation of quality metrics to ensure singular, non-ambiguous and verifiable requirements specifications. In this frame, the Reuse Company, a European IT company, is currently providing the RQS (Requirements Quality Suite) comprising RAT (Requirements Authoring Tool), RQA (Requirements Quality Analyzer) and the KM (Knowledge Manager) to support this concept-based approach of writing safe and high-quality requirements.

Biography

Jose Fuentes received his degree in Computer Science in Carlos III University of Madrid (2003). Now, he's CCO at The REUSE Company, accountable for the definition of the Requirements Quality Suite. For many years he has been involved in the definition of tools, techniques and methodologies aimed to increase the quality and the reusability of both software and system engineering projects. Both working for The REUSE Company, but also as an Associate Teacher at University Carlos III of Madrid, he has lead different work packages in different European projects such as CRYSTAL or AUTOSoft. He is a member of the Spanish Chapter of INCOSE.

Presentation (SESE)

Dr. Aurelijus Morkevicius | No Magic Europe (Solution Architect)

Integrated Modelling: Adopting Architecture Frameworks for Model-based Systems Engineering

Abstract

Model Based System Engineering (MBSE) promises increase in productivity by shifting from documents to the models as the main means to develop systems. However, in order to reach this promise, an organization needs to implement proper practices to enable productive modelling resulting in high quality models. MBSE in most of the cases is followed by Systems Modelling Language (SysML). However, SysML defines neither an architecture framework nor a method. This opens discussions of how to structure the model, what views to build, which artefacts to deliver and in what sequence. Every customer we see deals with the same issue a bit differently. Some use defence architecture frameworks like DoDAF, NAF, MODAF, others come up with their own framework; however, saying there is no need for an architectural framework just doesn't work. You always end-up using an architecture framework whether you want one or not, or whether you intend to or not. Organizations not complying with the standardized approach end up having differently structured models with different sets of views. It results in the loss of capability to interexchange, loss of capability to communicate with other teams, overhead in tool customization, and specific training need. Moreover, the models become impossible to integrate and reuse. In this session we present real-life findings in managing models in various organizations. We discuss the best practices established in the defence domain where system engineers organize their models according to well defined and standardized frameworks – a proven recipe to success.

Biography

Aurelijus Morkevicius is OMG Certified Systems Modelling, UML, and BPM professional. He has been with No Magic, Inc. since 2008. He started as a System Analyst for Enterprise Architecture solutions such as UPDM plugin for MagicDraw. In 2009 he moved to the Product Manager Position for the Cameo Enterprise Architecture product.

By making it one of the most successful products on the market, he decided to work more on the customer side. Currently he is a solution architect for model-based systems engineering (mostly based on SysML) and defence architectures (DoDAF, MODAF, NAF). Aurelijus is working with companies such as General Electric, Kongsberg Defense and Airspace, BAE Systems, INDRA, ESS, SKA, Amadeus, BMW, Schneider Electric, etc. He also participates actively in various modelling standards creation activities. He is a chairman and one of the leading architects for the current OMG Unified profile for DoDAF and MODAF (UPDM) standard development group. On the other side he is actively involved in educational activities.

He has gained a PhD in Informatics Engineering in Kaunas University of Technology in 2013. Aurelijus is also a lecturer (teaches Enterprise Architecture course in Kaunas University of Technology), author of multiple articles, and a speaker in multiple conferences on modelling of various kinds of systems.

Presentation

Dr. Kevin Howard | AGT International

How I became a Systems Engineer

Abstract

I make no excuse for this being a personal perspective. This is a review of the things in my life, both personal and business, that turned me from technology engineering into a systems engineer.

It includes a few key learning points that I think are interesting and I hope entertaining. Those things that have shaped my thinking as a Systems Engineer and that might act as guidance or warnings to others.

I'll explore the implications of Systems of Systems and how we might better understand the implications of very large systems and so called big data systems.

I summarise with my personal perspective of what I think it is to be a Systems Engineer in the modern context and the challenges I think we face in the future.

Here is the hard-working SWISSED14 Committee that made it all happen:

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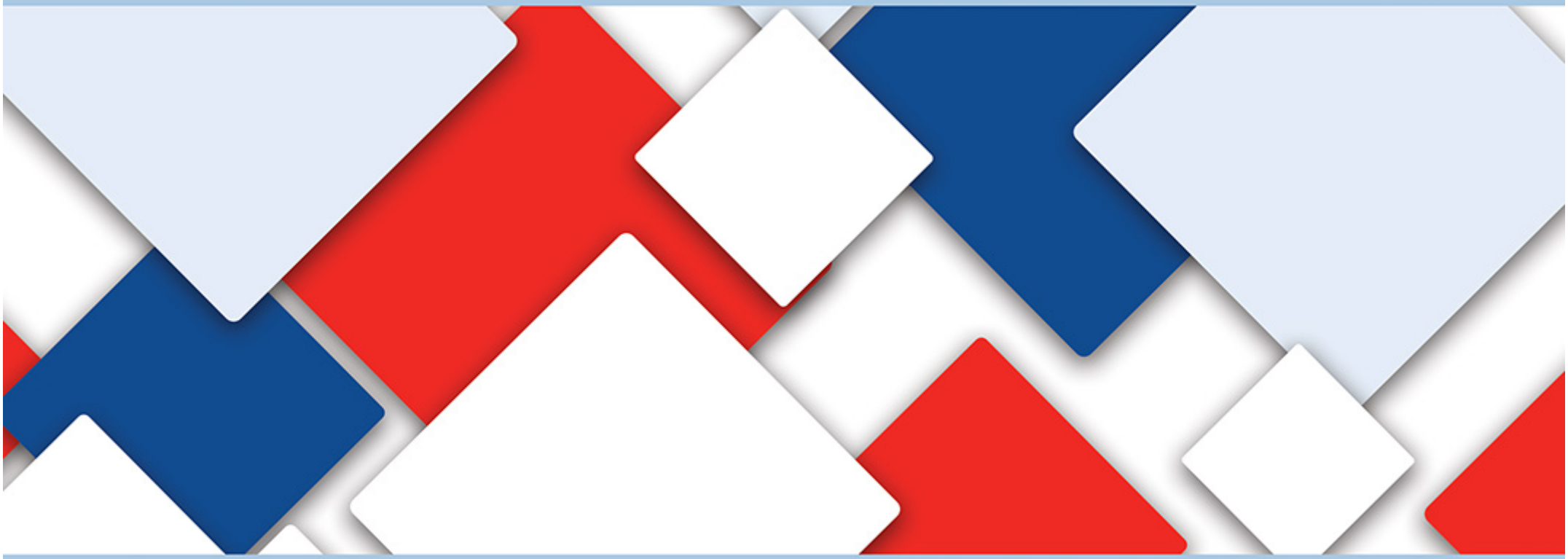

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