Introduction of Future of Systems Engineering (FuSE) initiative.

A Systems Community Initiative
Launching the Next Phase

William D. Miller – Future of Systems Engineering Program Lead
Ralf Hartmann – INCOSE President Elect

FuSE Plenary Agenda.

- Introducing FuSE (15 min)
  Bill Miller
- FuSE Impulse (15 min)
  David Long
- Outlook and Q&A (15 min)
  Bill & David

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Systems Engineering Vision 2035

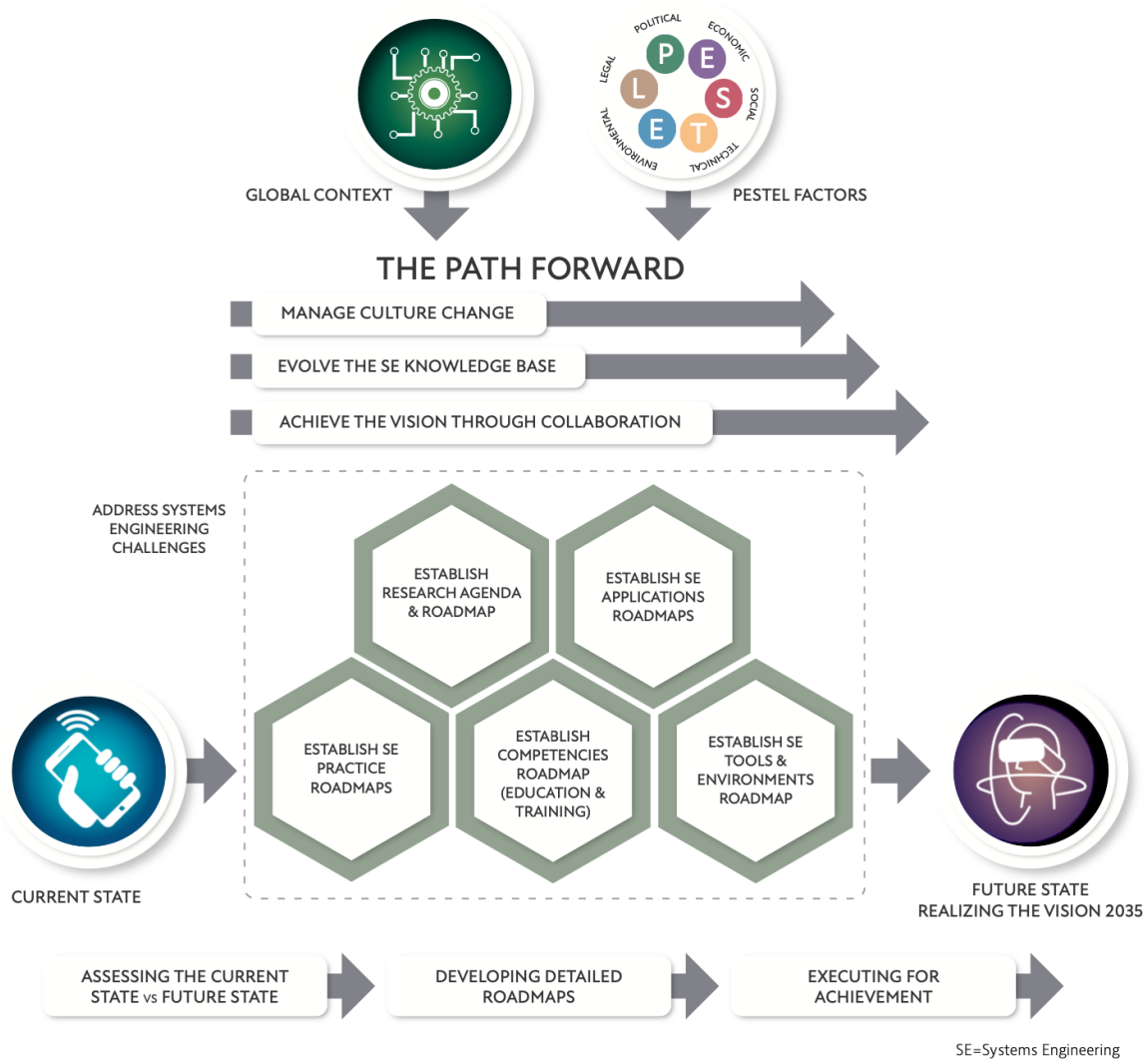
Executive Summary

- The Global Context for Systems Engineering
- The Current State of Systems Engineering
- The Future State of Systems Engineering
- Realizing the Vision

5 Categories:

https://www.incose.org/about-systems-engineering/se-vision-2035

Realizing the Vision: The Path Forward



"Our situation is not comparable to anything in the past. It is impossible, therefore, to apply methods and measures which at an earlier age might have been sufficient. We must revolutionize our thinking, revolutionize our actions …."

Albert Einstein (1948) in "A Message to Intellectuals"

Program Overview

FuSE Program Mission Statement

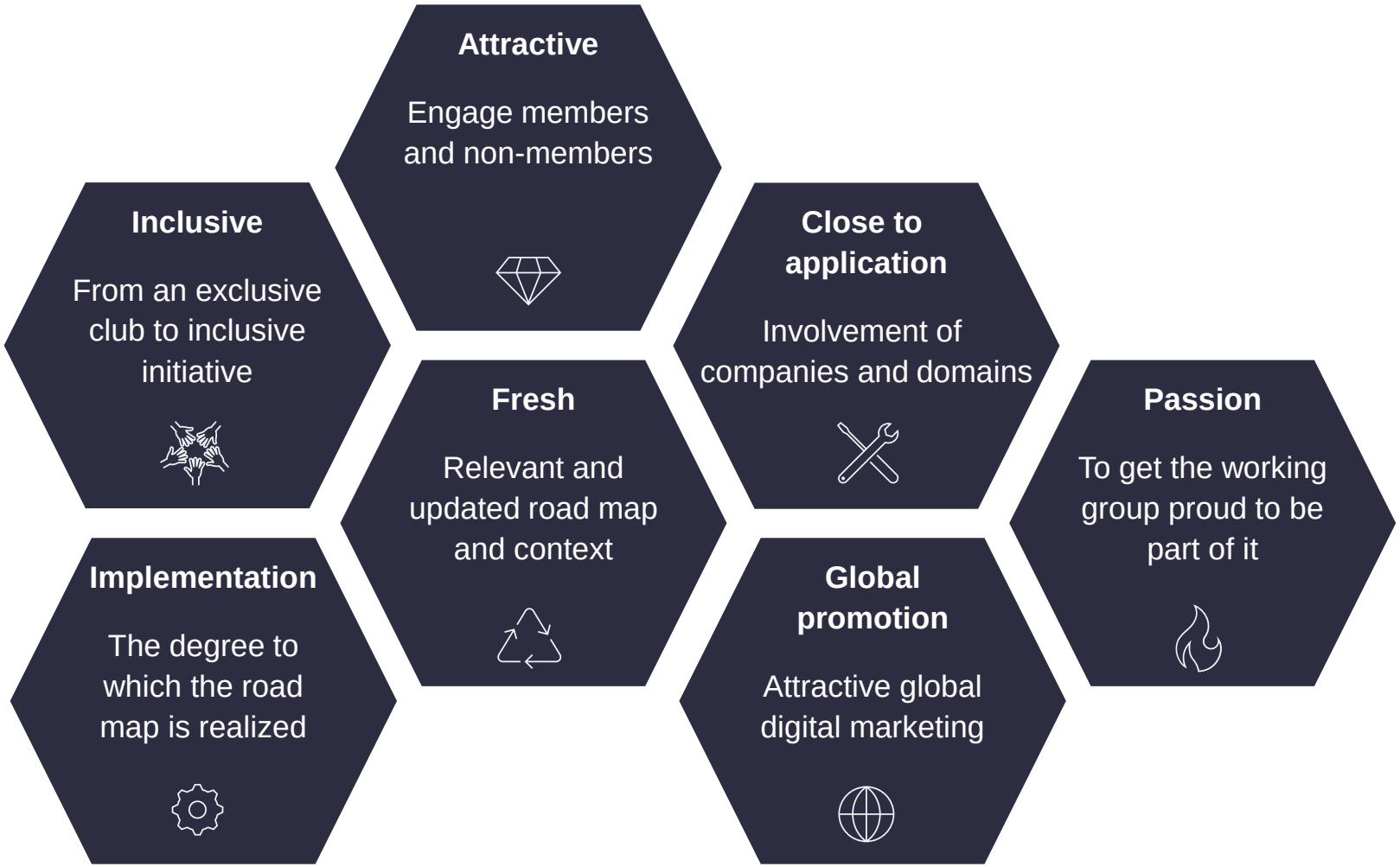
FuSE refines and evolves the SE Vision 2035 across competencies, research, tools & environment, practices, and applications.

FuSE identifies critical gaps towards the vision realization and initiates & supports relevant actions

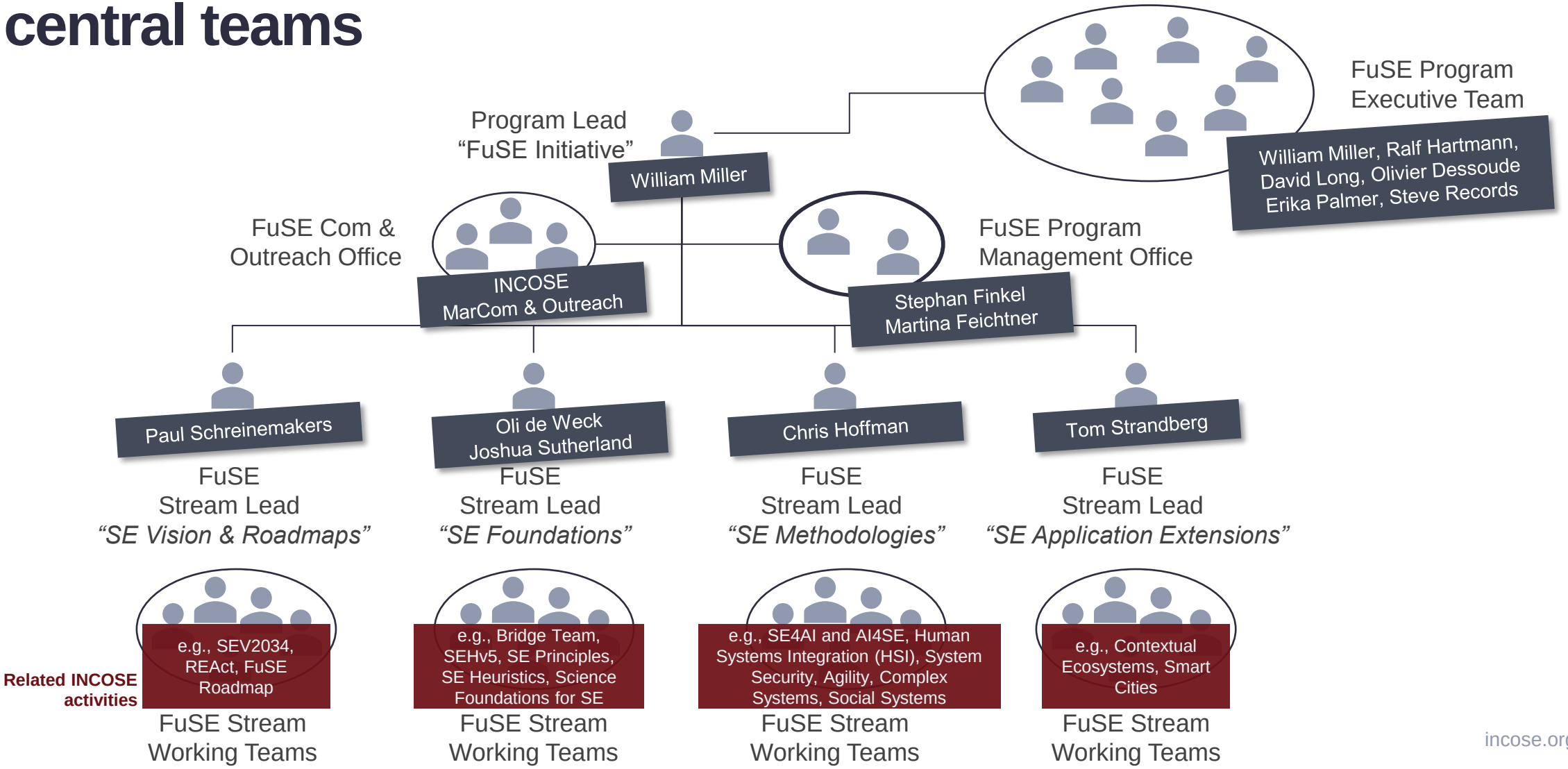
FuSE fosters involvement and collaboration within and outside of INCOSE.

FuSE educates, shares success, and expands.

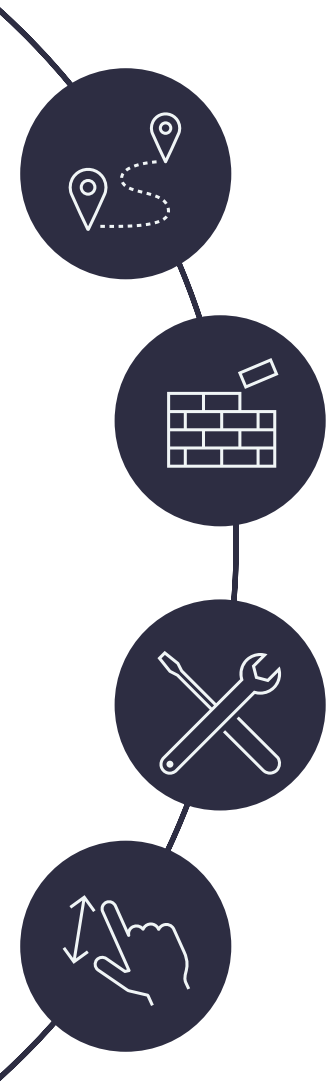
7 success factors the FuSE program



The FuSE program is organized in 4 streams with additional central teams



Foucus areas of the 4 FuSE streams:



Vision & Roadmaps

The Systems Engineering Vision and Roadmaps stream continuously refines, evolves, and complements the SE Vision 2035. Furthermore, we create an integrated set of roadmaps.

Foundations

In The SE Foundations stream has its basis in both theory and industrial practice. First goal is to assess the adequacy of the foundations and identify gaps to determine future directions

Methodologies

The SE Methodology stream guides the advancement of practices, methods, and tools for engineering systems to be fit for purpose.

Application Extensions

The SE Application Extensions stream integrates social sciences and soft systems into systems engineering practice to address grand challenges.

The FuSE Journey - so far…

The FuSE journey begins at IW 2018

INCOSE published the SE Vision 2035

Introducing the new FuSE PMO organization at IW 2023

2035

First FuSE related products and articles are published

FuSE related products and articles are published

Example of latest FuSE results.

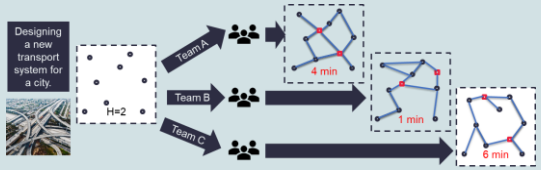
Generated at IW and in the FuSE mini event series.

Vision & Roadmaps

- Feedback on the SE Vision 2035 roadmap and challenges.
- Identification and prioritization of gaps in the Vision document
- Inventory of topics to address and link to INCOSE working groups

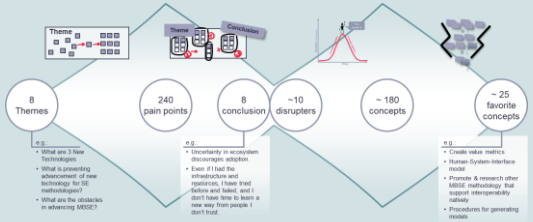
Foundations

- Survey on Systems Engineering Maturity
- Experiments to validate the proposed “first law of complexity”
- Introduction on technical and organizational complexity



Methodologies

- Identification and prioritization of disrupters to advance Systems Engineering including specific solution proposals
- Identification of key SE methodologies for the future of SE



Application Extensions

Stating the value and derivation of measures that Systems Engineering can add to the application areas

- smart cities,
- innovation,
- asset management, and
- grand challenges

FuSE in the EMEA sector

European and US Collaboration in SE Research

Research Center Roadmaps

DLR Institute of Systems Engineering for Future Mobility — Technical Trustworthiness as a Basis for Highly Automated and Autonomous Systems

TNO-ESI — Systems Engineering Methodologies for Managing Complexity in theHigh-Tech Equipment Industry: Our Roadmap

SERC — Guiding Systems Engineering Research for Enhanced Impact in the Development ofIncreasingly Complex Cyber-Physical Systems

TECoSA — Trends, Drivers, and Strategic Directions for Trustworthy Edge Computing in Industrial Applications

Topic Coverage

Digital Engineering and Model-Based Systems Engineering

Artificial Intelligence and Machine Learning

Systems Engineering and Agile Development

Systems Security and Resilience

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- **FuSE Impulse (15 min)**
  David Long
- Outlook and Q&A (15 min)
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INCOSE Director for Strategic Integration David Long on FuSE

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FuSE sessions @ EMEA WSEC

	MON	TUE	WED
11:00		FuSE Session 2: Extend the SE Vision 2035's Systems Engineering Challenges and Roadmap with active contribution by the EMEA participants (Paul)	FuSE Session 4: Extending systems engineering application to address climate change (Tom, Gerhard)
11:30			
12:00	Invited Content: Introduction of Future of Systems Engineering (FuSE) initiative (Bill & Ralf)		
12:30			
13:00			
13:30	FuSE Session 1: How might we advance Systems Engineering Methodologies to Engineer a more Sustainable World? (Chris)	FuSE Session 3: Systems Engineering Foundations: An experiment on the Conservation of Complexity. (Joshua)	
14:00			
14:30			

FuSE related sessions throughout EMEA WSEC

Time slots (CEST, GMT+2)		Monday (24 April 2023)							
07:30 - 08:30		Registration							Registration from 07:30 - 16:15
08:15 - 10:00		Plenary Session 1: Welcome, EMEA Sector Director, Keynote 1							
Track		Track 1	Track 2	Track 3	Track 4	Track 5	Track 6 (Virtual)	Other meetings	
Room name		Sevilla 1	Espana 1	Espana 5	Espana 3	Espana 2	N/A		
Room Capacity		200	70	70	50	50	N/A		
10:00-10:30	Session 1	Sponsor - Exhibitor#212: 1.1 / Jama Software | Systems Engineering for Regulated Product Development Systems Engineering; Regulated Product Development	Sponsor - Exhibitor#214: 1.2 / Semantic Systems Engineering - A case study with SAFRAN Group ARP4754; ontologies; requirements; traceability; MBSE; quality assessment; test cases	Sponsor - Exhibitor#215: 1.3 / Tom Sawyer Software	Sponsor - Exhibitor#217: 1.4 / INGENIERIA DE SISTEMAS PARA LA DEFENSA DE ESPAÑA SA SME MP - ISDEFE	**Special Session#101: 1.5 / SEP Test**			
10:30 - 11:00		Coffee Break in front of Plenary Hall							
11:00 - 11:45	Session 2	Special Session#102: 2.1.1 / INCOSE Vision 2035 Heinz [illegible]	Presentation#34: 2.2.1 / Realizing Digital Threads for engineering of sustainable products Eran Gery (IBM)	Paper#1: 2.3 / An MBSE Approach for Argonaut Alberto Gonzalez Fernandez, Elaheh Maleki, Ludovic Duvet, Manon Tarrade (European Space Agency)	Workshop#131: 2.4 / Empowering Women Leaders in SE & Diversity, Equity and Inclusion Awareness Anabel Fraga	**Special Session#101: 1.5 / SEP Test**	Presentation#42: 2.6.1 / Engineering Sustainable Astronomical Research Infrastructure Gelys Trancho, Sarah Gajadhar (TMT International Observatory)		
11:45 - 12:30		Special Session#103: 2.1.2 / Introduction of Future of Systems Engineering (FuSE) initiative William Miller, Ralf Hartmann	Presentation#35: 2.2.2 / Next-Generation Completeness and Consistency Management in the Digital Thread of the Future Géza Kulcsár (incquery labs)	**Tutorial#121: 3.3 / From Operational Concept Development to Systems Architecture Definition with SysML and MBSE Grid approach** **Aurelijus Morkevicius, Aiste Aleksandraviciene**			Paper#16: 2.6.2 / Context is Everything! Matthew Hause, David Hetherington, Chad Bear (SSI)		
12:30 - 13:30		Lunch and Sponsor visits @ market place							
13:30 - 14:15	Session 3	Special Session#110: 3.1 / FuSE Session 1: How might we advance Systems Engineering Methodologies to Engineer a more Sustainable World? A FuSE Workshop Chris Hoffman, Martina Feichtner, Stephan Finkel	Workshop#132: 3.2 / Past, Present and Future of Systems Science as a Scientific Foundation of SE Javier Calvo-Amodio, James Martin	**Tutorial#121: 3.3 / From Operational Concept Development to Systems Architecture Definition with SysML and MBSE Grid approach** **Aurelijus Morkevicius, Aiste Aleksandraviciene**	Workshop#133: 3.4 / Setting a common Systems Engineering Language: How concepts mapping can help Jean Duprez	Presentation#50: 3.5.1 / How to apply for CSEP? Courtney Wright, Joshi Mrunmayi (INCOSE)Presentation#30: 3.5.2 / How to Apply for ESEP Courtney Wright, Frederic Autran (INCOSE)	Paper#4: 3.6.1 / UAE's Energy System and GHG Emissions Reduction Pathways to Achieving National Goals by 2050 Ammar Hummieda, Ali Bouabid (Khalifa University)		
14:15 - 15:00						Presentation#29: 3.5.3 / How to Apply for Academic Equivalency Courtney Wright, Bernardo Delicado (INCOSE)Presentation#51: 3.5.4 / Impact of INCOSE Systems Engineering Handbook update on Certification Process Courtney Wright, Joshi Mrunmayi (INCOSE)	Paper#8: 3.6.2 / Interoperable Smart and Sustainable Urban Energy Systems (ISSUES) Anabel Fraga (UC3M University); Raul Pastor (Seam, UC3M University); Luis López-Cozar (Azentúa)		
15:00 - 15:30		Coffee Break in front of Plenary Hall						EMEA CL Meeting	
15:30 - 16:15	Session 4	Special Session#104: 4.1.1 / Redefining and customizing the validation strategy to ensure accomplishment of UNESCO's Sustainable Development Goals. Alberto Sols	Presentation#25: 4.2.1 / The ENYSE journey to build innovative and more sustainable products Almudena Duran Peña (IBM)	**Tutorial#121: 3.3 / From Operational Concept Development to Systems Architecture Definition with SysML and MBSE Grid approach** **Aurelijus Morkevicius, Aiste Aleksandraviciene**	Workshop#134: 4.4 / Smart Cities Initiative Metrics and UN Sustainability Goals : How to make it a perfect match Jennifer Russell, Marcel Van de Ven, Matthew Hause	Workshop#135: 4.5 / Natural Systems Curt McNamara	Paper#12: 4.6.1 / Circular human sphere – The conceptual development of embedding a social pillar in the Circular Economy framework Leandi Van der Linde, Siebert Benade (GSTM University of Pretoria)		
16:15 - 17:00		Paper#2: 4.1.2 / Engineering a sustainable world by enhancing the scope of systems of systems engineering and mastering dynamics Rasmus Adler, Frank Elberzhager, Florian Balduf (Fraunhofer IESE)	Presentation#55: 4.2.2 / Challenges of systems engineering approach for innovative technologies Kelly Lance (Nova Systems)				Presentation#44: 4.6.2 / Evolving the Systems Engineering Discipline to Address Global Challenges Peter Brook (INCOSE Fellow)		
17:00 - 17:30		Plenary Session 2: Workshop Feedback and announcements							
17:30 - 18:00		Personal Time							
18:00 - 20:00		ICE BREAKER @ market place							

FuSE session
Related to FuSE

FuSE related sessions throughout EMEA WSEC

Time slots (CEST, GMT+2)		Tuesday (25 April 2023)						
07:30 - 08:15		Registration						
08:15 - 09:15		Plenary Session 3: Keynote 2						
Track		Track 1	Track 2	Track 3	Track 4	Track 5	Track 6 (Virtual)	Other meetings
Room name		Sevilla 1	Espana 1	Espana 5	Espana 3	Espana 2	N/A	
Room Capacity		200	70	70	50	50	N/A	
09:15 - 09:45	Session 5	Sponsor - Exhibitor#219: 5.1 / ULMA Embedded Solutions	Sponsor - Exhibitor#218: 5.2 / Dassault Systèmes	Sponsor - Exhibitor#221: 5.3 / Project Performance International	Sponsor - Exhibitor#222: 5.4 / Bridging the Gap: What MathWorks Brings to MBSE Model-Based Systems Engineering; Model-Based Design; Digital Engineering	#N/A		
09:45 - 10:30	Session 6	**Presidential Address**	Presentation#40: 6.2 / SE application in Nuclear Big Science Sebastiaan Voorderhake (Belgian Nuclear Research Centre)	Tutorial#123: 6.3 / Enabling Architecture Thinking by using Architecture Spaces Anand Kumar	Paper#22: 6.4 / Keeping People First in the Smart Cities Enterprise Matthew Hause (SSI); Lars-Olof Kihlström (Syntell AB); Jennnifer Russell (Garver)	Presentation#49: 6.5 / Digital Interface Management System (DIMS) Joshi Mrunmayi (ISAE Supaero); Mudit Mittal (Blue Kei)	N/A	
10:30 - 11:00		Coffee Break in front of Plenary Hall						
11:00 - 11:45	Session 7	Panel#171: 7.1 / The Archimedes Initiative: a Global Research Network Moderator:Dinesh Verma (Stevens Institute of Technology); Panelists: Wouter Leibbrandt (TNO/Embedded Systems Institute (ESI)); Tom McDermott (Stevens Institute of Technology); Martin Törngren (KTH Royal Institute of Technology); André Bolles (Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR));	Special Session#107: 7.2 / FuSE Session 2: Extend the SE Vision 2035's Systems Engineering Challenges and Roadmap with active contribution by the EMEA participants Paul Schreinemakers, Martina Feichtner, Stephan Finkel	Tutorial#122: 6.3 / Live the experience of MBSE models enabling agility in complex systems engineering Juan Navas, Sophie Plazanet (Thales)	Workshop#136: 7.4 / Sustainability enabled by Configuration Management Adriana D'Souza	Workshop#137: 7.5 / Lean Healthcare Systems Engineering Process for Clinical Environment Bo Oppenheim	Presentation#26: 7.6.1 / Study on the relationship between leadership and management from a Systems Engineering perspective *Anabel Fraga (Universidad Carlos III de Madrid); Natalie Davila-Rendon (LMCO); Raymond Wolfgang (Sandia); Luis Andes (AKKODIS); Francesco Dazzi (INAF - National Institute for Astrophysics); Elena Gallego Palacios (Thales); Adam Williams (Sandia)*	Registration from 07:30 - 16:15
11:45 - 12:30							Presentation#52: 7.6.2 / Exploring Explainable Artificial Intelligence to aid Systems Engineers in Design and Evaluation of Complex Systems Ali K. Raz, Shou Matsumoto, Paulo Costa (George Mason University)	
12:30 - 13:30		Lunch and Sponsor visits @ market place						
13:30 - 14:15							Paper#3: 8.6.1 / MBSE Maturity Levels in European Railway Sector Marc Sango (SNCF)	
14:15 - 15:00	Session 8	Special Session#108: 8.1 / FuSE Session 3: Systems Engineering Foundations: An experiment on the Conservation of Complexity. A FuSE Workshop Joshua , Martina Feichtner, Stephan Finkel	Workshop#138: 8.2 / Hazardous Waste Treatment Moshe Katz	Tutorial#122: 6.3 / Live the experience of MBSE models enabling agility in complex systems engineering Juan Navas, Sophie Plazanet (Thales)	Workshop#139: 8.4 / PM-SE Integration : Focus on a serious game for students on eco-design considerations Jean-Claude Roussel, Jean-François Veron, John Lomax	Workshop#140: 8.5 / Requirements Use Case on Sustainability Tami Katz, Lou Wheatcraft, Jean Duprez	Paper#7: 8.6.2 / Creating a general Collaborative Systems Thinking Culture in 7-steps for any organization and any sustainability application Anabel Fraga (Universidad Carlos III de Madrid); Mickael Bouyaud (Ingenico); Natalie Davila-Rendon (Lockheed Martin Corporation); Raymond Wolfgang (SANDIA); Alex Deng (SNC-LAwalin Atkins); Jean Duprez (Airbus); Leema John (Eli Lilly & Company); Ryan Noguchi (Aerospace Corp.); Erika Palmer (Cornell University); Jay Patel (Lockheed Martin Corporation); Maria Romero (Aerospace Corp.); Michael Wozniak (Lockheed Martin Corporation)	
15:00 - 15:30		Coffee Break in front of Plenary Hall						
15:30 - 16:00		Plenary Session 4: Workshop Feedback and announcements						
16:00 - 17:00		Personal Time						
17:00 - 19:00		Social Event: Real Alcazar						
19:00 - 22:00		Dinner						

FuSE session
Related to FuSE

FuSE related sessions throughout EMEA WSEC

Time slots (CEST, GMT+2)		Wednesday (26 April 2023)						
07:30 - 08:15		Registration						
08:15 - 09:15		Plenary Session 5: Keynote 3						
Track		Track 1	Track 2	Track 3	Track 4	Track 5	Track 6 (Virtual)	Other meetings
Room name		Sevilla 1	Espana 1	Espana 5	Espana 3	Espana 2	N/A	
Room Capacity		200	70	70	50	50	N/A	
09:15 - 09:45	Session 9		Sponsor - Exhibitor#213: 9.2 / Jama Software | IT Tools for Systems Engineering Systems Engineering; IT Tools	Sponsor - Exhibitor#220: 9.3 / ULMA Embedded Solutions	#N/A	#N/A		
09:45 - 10:30	Session 10	Technical Director Address	Paper#10: 10.2 / Utilization of integrated simulation modeling for process flow analysis and improvement in the Emergency Department Aleksander Buczacki (Warsaw University of Technology); Ali Ghobadi (Kaiser Permanente Bernard J. Tyson School of Medicine, Department of Clinical Science. Pasadena, CA); Hassan Movahedi (Kaiser Permanente Orange County); Bohdan Oppenheim (Loyola Marymount University)	Paper#11: 10.3 / Perspectives on Models Erik Herzog (SAAB AB); Johanna Axehill (Saab AB); Åsa Nordling Larsson (Saab)	Presentation#54: 10.4 / Unifying the views of ecological and engineering resilience in applications of coupled human systems modelling for sustainable development Steve Conrad (Colorado State University)	Presentation#53: 10.5 / Transformation Challenges in Transportation Industry and IVECO Group Approach Tugrul Yildirim, Felice Radogna, Ayman Mokdad (IVECO Group)	#N/A	
10:30 - 11:00		Coffee Break in front of Plenary Hall						
11:00 - 11:45	Session 11	Special Session#105: 11.1 / FuSE Session 4: Extending systems engineering application to address climate change Gerhard Krinner, Tom Strandberg, Martina Feichtner, Stephan Finkel	Workshop#145: 11.2 / Human System Integration (HSI) for Sustainability Guy Boy, Christophe Merlo, Avi Harel, Grace Kennedy, Gauthier Fanmuy, Jean-Jacques Speyer, Stéphane Vales	Workshop#142: 11.3 / What if Architecture is a lever of Sustainability for Complex Systems Christophe Surdieux, Jean-Luc Wippler, Prakhar Agarwal, Stéphane Rivet, Olivier Klotz	Workshop#147: 11.4 / Academic Council in EMEA Sector Alejandro Salado, Rob Vingerhoeds	Workshop#144: 11.5 / Systems and SoS Engineering challenged to support EU's ambitious sustainability plans (focus on the 100% Electric Vehicle @2035 case) Yann Chazal, Mickael Bouyaud, Stephen Powley, Philippe Bouteyre, Alain Dauron	Special Session#111: 11.6.1 / SystSystems Thinking: From Pioneering to Mainstream Mike Jackson	
11:45 - 12:30							Paper#17: 11.6.2 / Automatic creation of trace links based on model content and meta data Martin Leo Valdivia Dabringer, Carina Fresemann, Rainer Stark (Technische Universität Berlin)	
12:30 - 13:30		Lunch and Sponsor visits @ market place						
13:30 - 14:15	Session 12	**Panel#172: 12.1 / Architecting sustainable infrastructure projects Moderator:Rashmi Jain (Montclair State University); Panelists: Michael Salvato (Mott MacDonald); Yoshimasa Masuda (Carnegie Mellon University); Mark Enzer (Mott MacDonald); Naohiko Kohtake (Keio University);**	Workshop#141: 12.2 / Architecting Sustainable Systems Anand Kumar, Gary Smith, Mickael Bouyaud, Peter Bernus	Workshop#146: 12.3 / Human Centric Artificial Intelligence for Sustainable SE Herve Panetto, Barclay Brown, Nouria Oliver	Workshop#143: 12.4 / Integration of Sustainable Development and Societal Responsibility in SE education : the example of Aquapoinc Greenhouse project Christophe Merlo, Rob Vingerhoeds	Workshop#148: 12.5 / ISO STEP Standard and Systems Engineering Pascal Hubert, Kyle Hall, Juan Carlos Mendo	Presentation#47: 12.6.1 / System Engineering approaches to achieve sustainability transformation within industries Mikaël Le Mouëllic, Laurent Alt (BCG)	
14:15 - 15:00							Presentation#56: 12.6.2 / System Engineering Driven Data and Computational Structures for Artificial Intelligence Enabled Decisions to Address Diabetes Prevalence Jyotirmay Gadewadikar (Mitre)	
15:00 - 15:30		Coffee Break in front of Plenary Hall						
15:30 - 16:30		CLOSING SESSION: Workshop Feedback, Awards						

Registration from 07:30 - 16:15

FuSE session
Related to FuSE

Where to engage

Targeted FuSE events 2023.

Mini Events usually scheduled for 14:00 CE(S)T


Q&A.

Let's connect.

Find us on
www.incose.org/fuse

Or write us at
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