The Future of Systems Engineering: Realizing the Systems Engineering Vision 2035.

A Systems Community Initiative

Launching the Next Phase

William D. Miller
Future of Systems Engineering Lead

FuSE Plenary Agenda.

- Future of Systems Engineering (FuSE) Initiative – William Miller
- Keynote Olivier de Weck on *The First Law of Systems Science: Conservation of Complexity*
- Q&A

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Systems Engineering Vision 2035

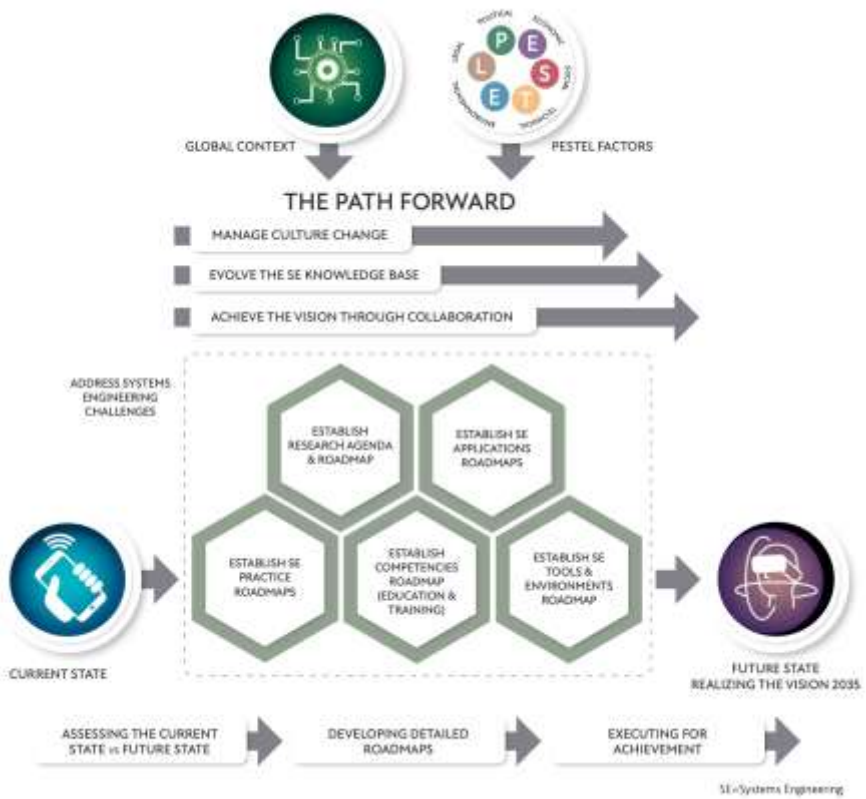
Executive Summary

- 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

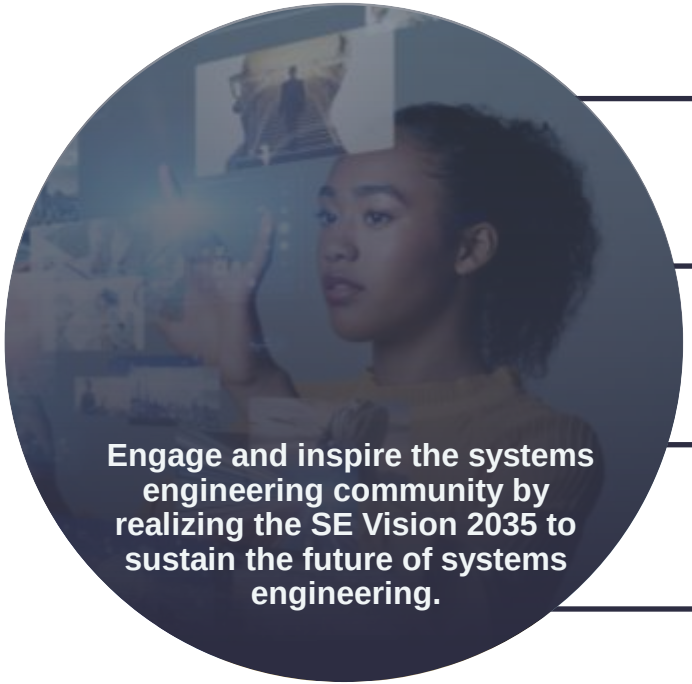


"Our situation is not comparable to anything in the past. It is impossible, therefore, to apply methods and measures which at an earlier age might have been sufficient. We must revolutionize our thinking, revolutionize our actions …."

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.

FuSE Program Charter

Vision Statement

Inspire the global community to realize the Vision of SE

Mission

Engage and inspire the systems community for sustaining the future of systems engineering in realizing the SE Vision 2035

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

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

FuSE **fosters involvement and collaboration** within and outside of INCOSE.

FuSE **educates, shares success, and expands**.

Success Factors

Inclusive: From an exclusive club to inclusive initiative

Attractive: Engage members and non-members

Implementation: The degree to which the road map is realized

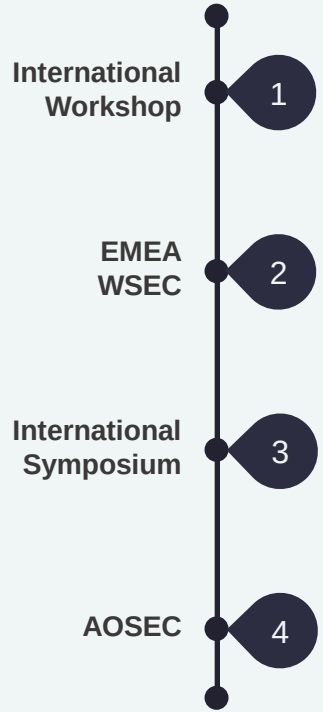
Fresh: Relevant and updated road map and context

Close to application: Involvement of companies and domains

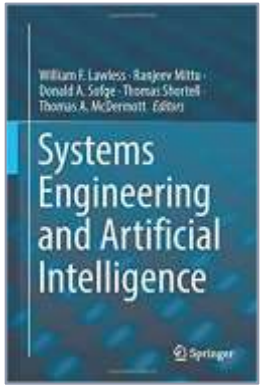
Global promotion: Attractive global digital marketing

Passion: To get the working group proud to be part of it

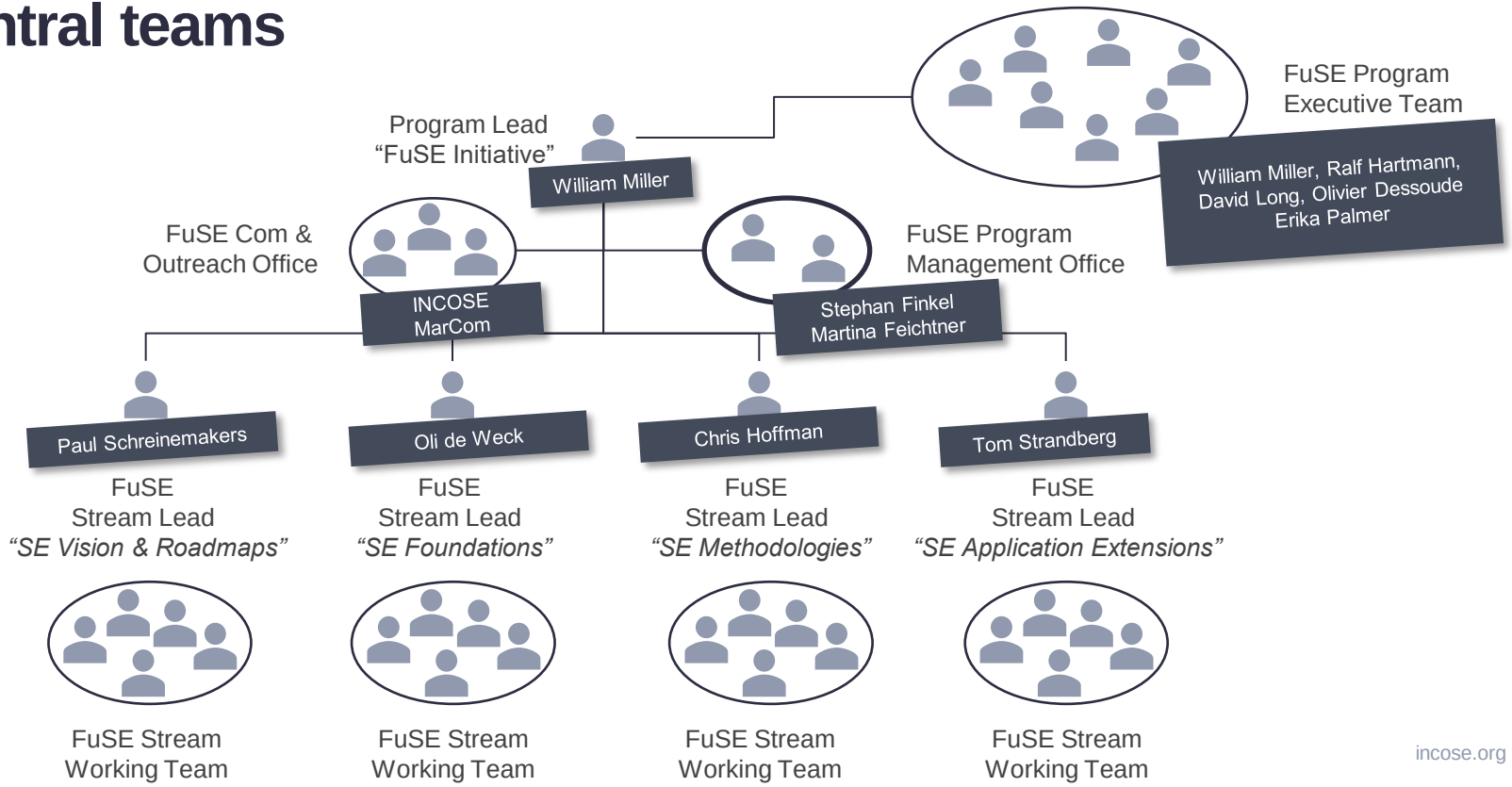
2023 Milestones



FuSE Journey Beginning IW 2018



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



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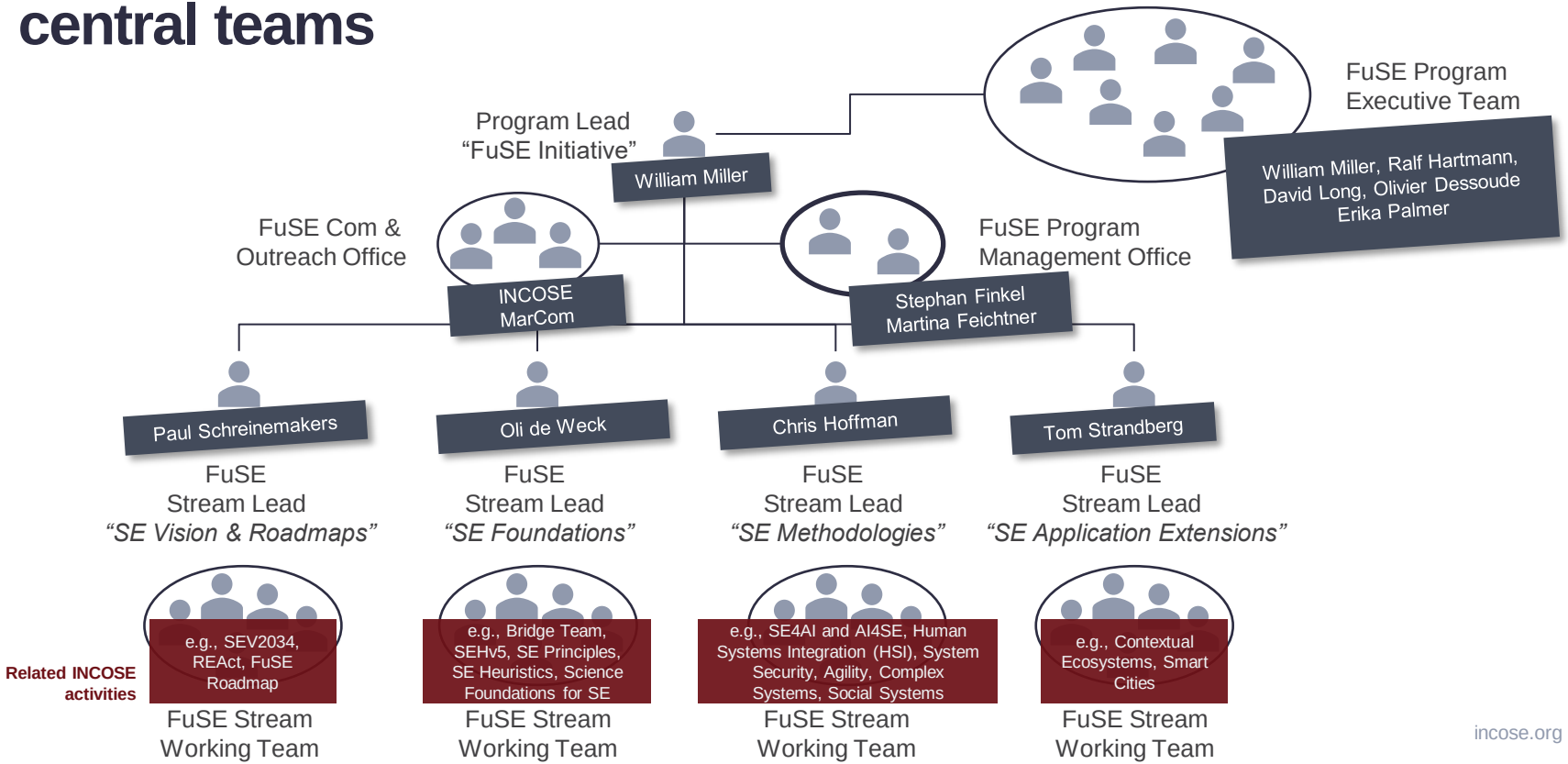

Schedule at IW 2023

FuSE at IW 2023 overview

	SAT	SUN	MON	TUE
08:00		FuSE Stream Working Sessions 4 rooms (in person only)	FuSE Stream Working Sessions 4 rooms (in person only)	
08:30				Wrap-up FuSE (for participants)
09:00				
09:30	Break			
10:00	FuSE Kick-off	Break		
10:30				
11:00				Wrap-up FuSE
11:30				
12:00	Lunch			
12:30				
13:00				
13:30				
14:00	FuSE Stream Working Session 4 rooms (in person only)			
14:30		B		
15:00	Break			
15:30	FuSE Steam Working Session 4 rooms (in person only)			
16:00				
16:30				

Rooms for FuSE Stream Sessions:

Vision & Roadmaps Stream: Ballroom

Foundations Stream: Salon A

Methodologies Stream: Salon D

Application Extensions Stream: Salon C

Systems Engineering Vision & Roadmaps Stream

Paul Schreinemakers
Stream Lead “SE Vision & Roadmaps”

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The Systems Engineering Vision and Roadmaps stream continuously refines, evolves, and complements the SE Vision 2035. Furthermore, we create an integrated set of roadmaps across the four interrelated FuSE streams. The concurrently executed streams will guide and influence each other.

The IW 2023 goal is to frame the structural relationships and value models for the roadmaps’ creation.

	SAT	SUN	MON	TUE
08:00		1. How we keep collecting feedback 2. Elaborate on roadmap items to address in each stream 3. Elaborate on projection of the challenges on each stream 4. Set up an Inventory	Which WG's and external organizations are to be involved in the efforts identified	
08:30				Wrap-up FuSE (for participants)
09:00				
09:30	Break			
10:00	FuSE Kick-off	Break		
10:30				
11:00				Wrap-up FuSE
11:30				
12:00	Lunch			
12:30				
13:00				
13:30				
14:00	Introduction, Activities for 2023, Prioritization of roadmap topics to be addressed			
14:30		Break		
15:00	Break			
15:30	Introduction, Activities for 2023, Prioritization of roadmap topics to be addressed			
16:00				
16:30				

Systems Engineering Foundations Stream

Oli de Weck
Stream Lead “SE Foundations”

e deweck@mit.edu

In order to yield predictable results Systems Engineering methods and tools need to be built on foundational principles that are provably true and based on laws and axioms that can be tested for falsifiability similar to those in other well-established disciplines of science and engineering like Chemical Engineering, Electrical Engineering or Biological Engineering. This stream will formulate a set of candidates underlying Laws of Systemics, the science at the foundation of Systems Engineering.

The IW 2023 goal is to assess the foundational value of the “Conservation of System Complexity,” which parallels the Conservation of Energy in the First Law of Thermodynamics and the Conservation of Mass in continuum mechanics.

	SAT	SUN	MON	TUE
08:00		FuSE Interactive working session on technical complexity	FuSE Working Sessions on organizational complexity	
08:30				Wrap-up FuSE (for participants)
09:00				
09:30	Break			
10:00	FuSE Kick-off	Break		
10:30				
11:00				Wrap-up FuSE
11:30				
12:00	Lunch			
12:30				
13:00				
13:30				
14:00	FuSE Interactive working session Conduct complexity experiment Frame SE Foundations			
14:30		Break		
15:00	Break			
15:30	FuSE Interactive working session Conduct complexity experiment Frame SE Foundations			
16:00				
16:30				

Systems Engineering Methodologies Stream

Chris Hoffman
Stream Lead “SE Methodologies”

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The SE Methodologies stream guides the advancement of practices, methods, and tools for the effective engineering of systems to be fit for purpose in the presence of varying scale, interrelatedness, complexity, non-determinism, and emerging technology innovations such as AI and agility.

The IW 2023 goal is to assess the adequacy of current INCOSE technical products and ongoing FuSE projects in this stream and identify gaps.

	SAT	SUN	MON	TUE
08:00		Elaborate disruptors: 1. Scale & Interrelatedness 2. Complexity, Chaotic, Complicated, Clear 3. A.I. for SE, other technologies 4. TBD by participants	Clarify problems / opportunities: 1. Digital ecosystem 2. Software as the capability driver 3. Continuous iterative model development 4. Evolution in learning systems	
08:30				Wrap-up FuSE (for participants)
09:00				
09:30	Break			
10:00	FuSE Kick-off	Break		
10:30				
11:00				Wrap-up FuSE
11:30				
12:00	Lunch			
12:30				
13:00				
13:30				
14:00	Introduction, Activities for 2023, Initial feedback, Opt-in participation			
14:30		Break		
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15:30	Introduction, Activities for 2023, Initial feedback, Opt-in participation			
16:00				
16:30				

Systems Engineering Application Extensions Stream

Tom Strandberg
Stream Lead “SE Application Extensions”

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The SE Application Extensions stream integrates social sciences, soft systems, as well as initiatives such as Smart Cities to address grand challenges to meet human and societal needs as stated in the United Nations Sustainable Development Goals.

The IW 2023 goal is to frame the value model to justify systems engineering’s role at the policy table for these grand challenges.

	SAT	SUN	MON	TUE
08:00		1. How SE supports sustainable cities 2. How SE supports innovation	1. SE to improve public spending (joint effort – physical – asset management) 2. Integrate soft systems, social systems and other initiatives for grand challenges	
08:30				Wrap-up FuSE (for participants)
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- Q&A

Keynote:
The First Law of Systems Science: Conservation of Complexity

Prof. Olivier de Weck
Massachusetts Institute of Technology

deweck@mit.edu

Keynote.

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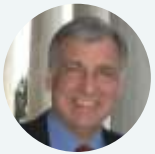
Survey Results.

Questions & Answers.

Let's connect.

Or find us on
www.incose.org/fuse



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INCOSE

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FuSE
Future of Systems Engineering

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FUTURE OF SYSTEMS ENGINEERING (FUSE)

Vision: Inspire the global community to realize the SE Vision

The FuSE Program is organized in 4 streams.

Vision & Roadmaps

Foundations

Methodologies

Application Extensions