Vision & Roadmaps Work Stream.

IW 2023 Working Session Documentation

Paul Schreinemakers
FuSE Vision & Roadmaps Lead

Agenda.

- Stream Intro and planned activities
  General overview of the SE Vision & Roadmap stream and planned activities
- SAT Session:
  Prioritization of roadmap topics to be addressed
- SUN Session:
  a. *How we keep collecting feedback*
  b. *Elaborate on roadmap items to address in each stream*
  c. *Elaborate on projection of the challenges on each stream*
  d. *Set up an Inventory*
- MON Session:
  Which WG's and external organizations are to be involved in the efforts identified

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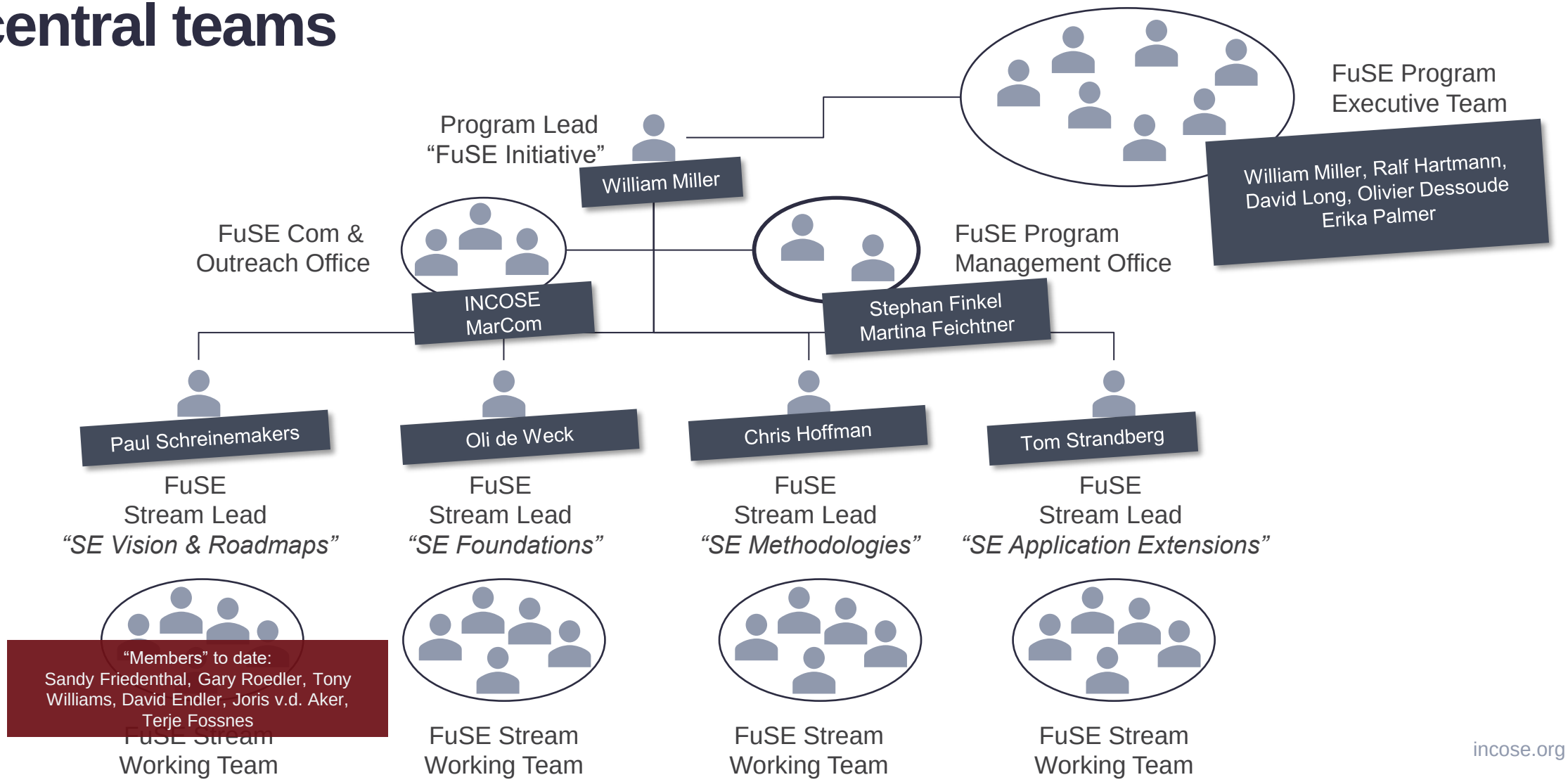
FuSE Vision & Roadmaps Stream

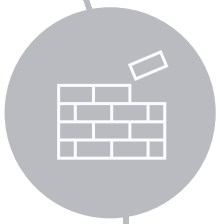
The FuSE program is organized in 4 streams with additional central teams



The FuSE program is organized in 4 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 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.



Foun-dations

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.

Metho-dologies

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.

Application Extensions

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.

FuSE Vision & Roadmaps Stream at IW

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”

e paul.schreinemakers@incose.net

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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				

FuSE beyond IW

FuSE Targeted Events in 2023

Where to engage

International Workshop
Torrance, CA USA
28. – 31. JAN 23

Working Sessions
Virtual
Planned for CW 8 – 9

EMEA WSEC
Sevilla, Spain
24. – 26. APR 23

International Symposium
Honolulu, HI USA
15. – 20. JUL 23

Working Sessions
Virtual
TBD

AOSEC
Bengalore, India
11. – 14. OCT 23

Planned interaction in 2023

How to participate?

- Join our Vision & Roadmaps meetings
- Visit the targeted events 2023
- Join FuSE Yammer Community
- Visit our Website www.incose.org/fuse

Vision Supplements

- Quaterly meetings to evaluate add-on information, suggested modifications and whitepapers

Roadmap activities

- Synchronize plans for the overall and stream specific roadmaps
- Meet every 1 to 2 months (fequency as needed)

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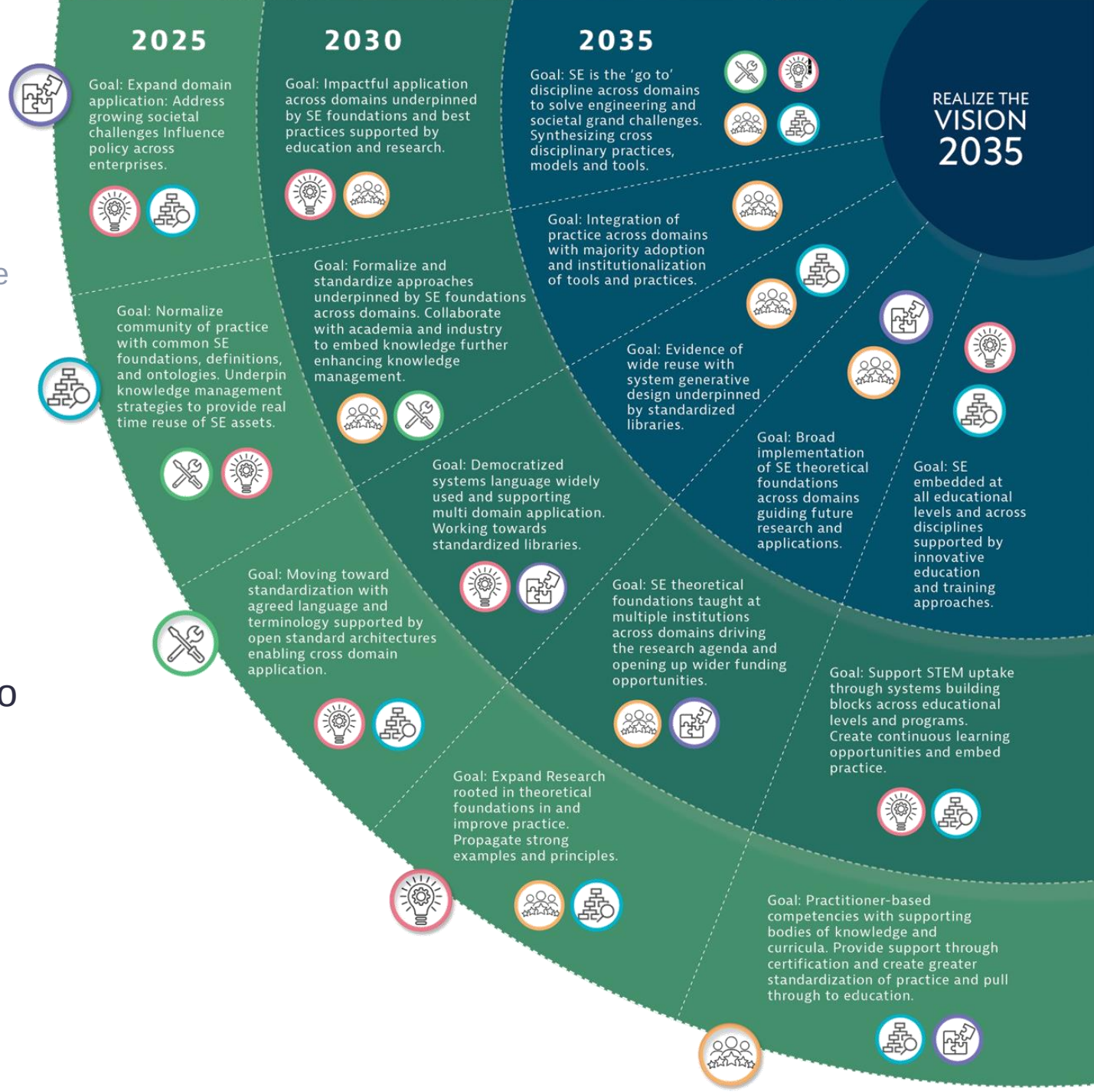
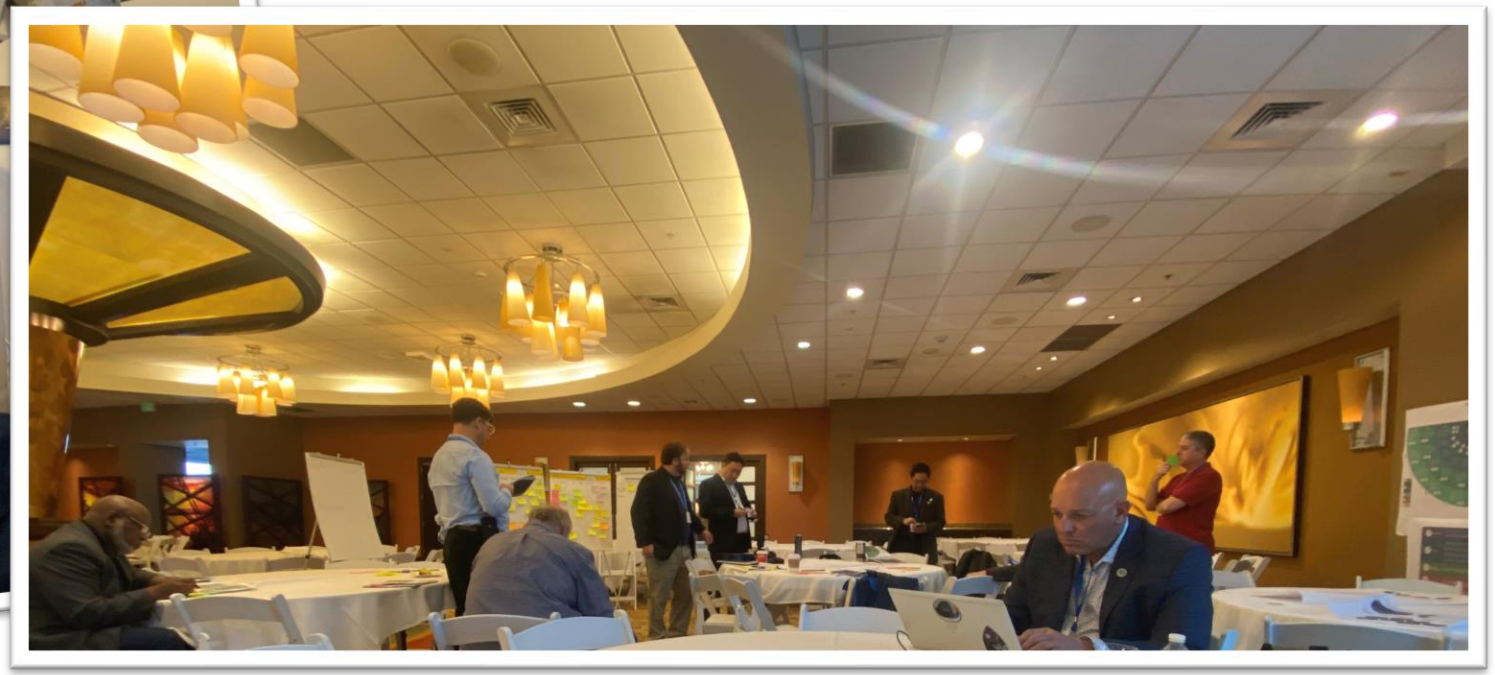
SE Vision 2035 published roadmap

Please do the following actions on the related poster in the room:

We would like to collect your feedback on the vision, on the scope and planned activities.

- What questions do you have
- What measures of success would you propose
- What risks do you see & what mitigations do you propose
- What other activities should be considered





First Session

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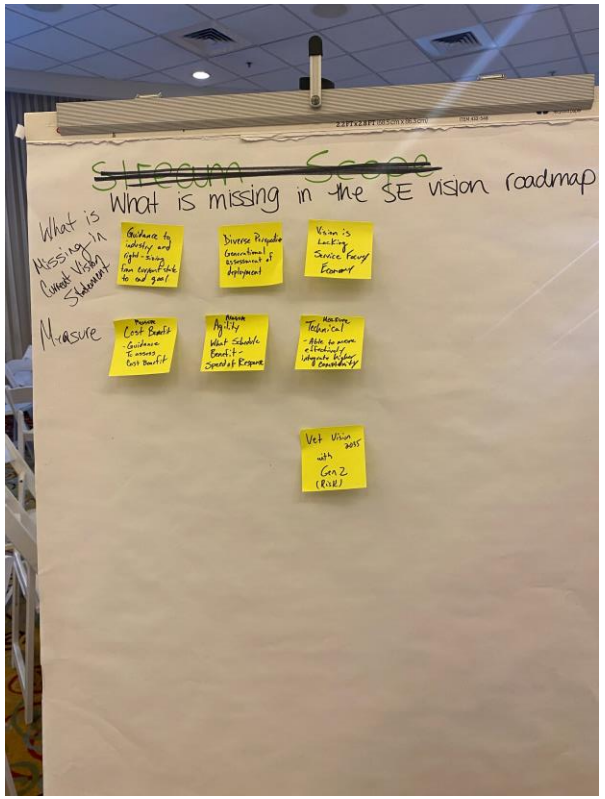
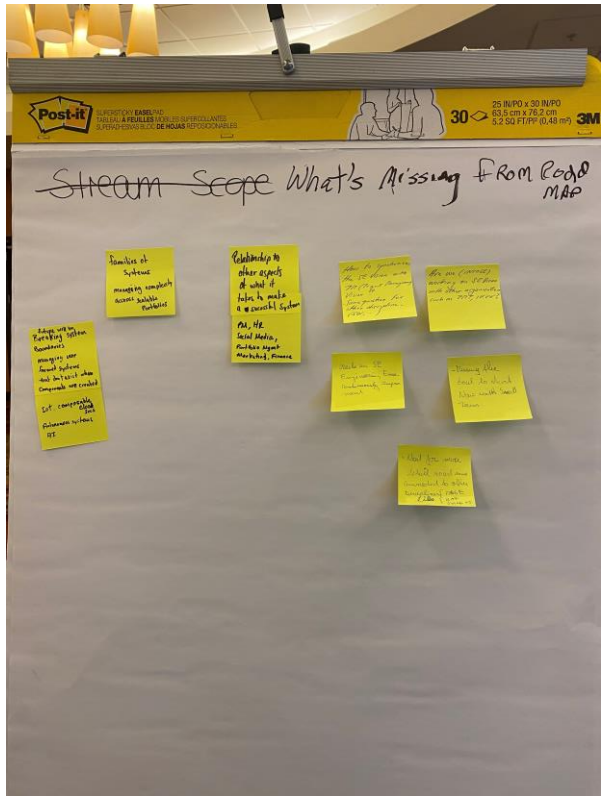
Posters from 1st Vision & Roadmaps Working Sessions





What is missing in the SE Vision Roadmap?

- Diverse perspective generational assessment of deployment (Measure: cost benefit - guidance to assess cost benefit)
- Vision is lacking service focus economy (Measure: agility; schedule benefit - speed of response)
- Guidance to industry and right-sizing from current state to end goal (Measure: technical - able to more effectively integrate higher complexity)
- Families of systems managing complexity across scalable portfolios
- How to synchronize the SE Vision with PM (Project Management); same question for other discipline. (e.g., SW, ..)
- Relationship to other aspects of what it takes to make a successful system PM, HR Social Media, Portfolio Mgmt, Marketing, Finance
- Are we (INCOSE) working on SE Vision with other organization such as PMI, IEEE?
- Missing the goal to start now with small teams
- Future will be breaking system boundaries managing user formed systems that don't exist when components are created; IoT, composable cloud services, autonomous systems, AI
- Create a SE engineering environment; continuous improvement
- Need for more detail road may connected to other like (MBSE, UAF, SysML v2)

Second Session

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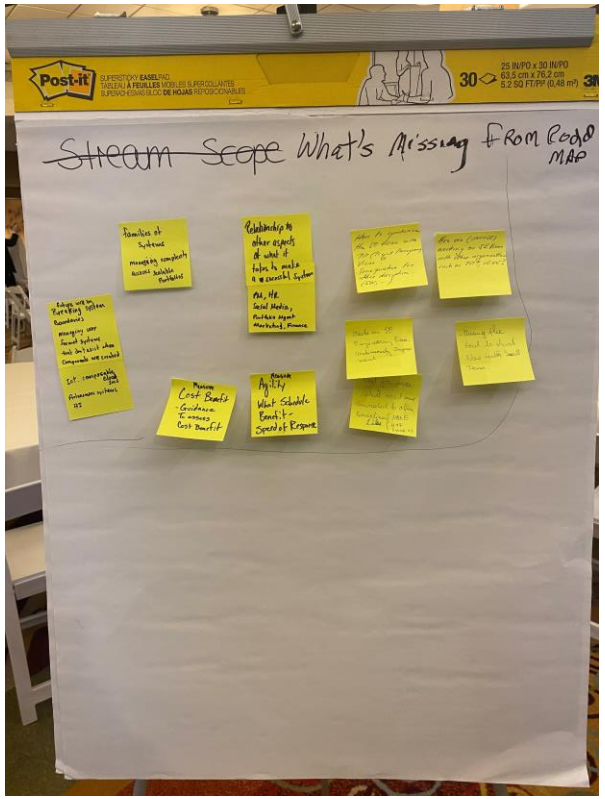
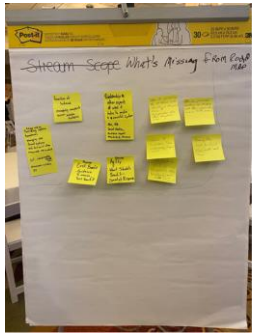
Posters from 2st Vision & Roadmaps Working Sessions



Feedback on the stream scope

Communication & Outreach:

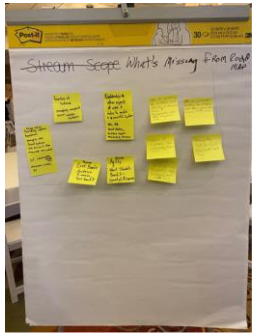
- Who is the audience for it? - Who is the customer?
- How do we ensure that this represents / speaks to many practitioners, not just a few volunteers?
- Speaks to thousands not a few hundred
- Results of this communicated to the masses - not shelfware
- How do we sell the Idea in the context to convince others to invest and motivate change
- Be sure to include and embrace a Social systems aspect in foundations
- Open vs. closed; Discover, not create, the future of SE



Feedback on the stream scope

Measure Success and Progress:

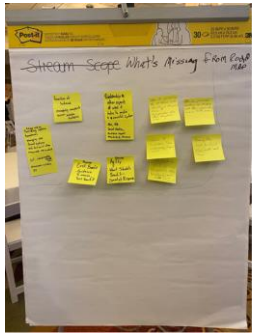
- What does success look like?
- What does the optimized system look like?
- When does our methodology tell us to stop?
- How did we progress from last year?
- How do we track the progress using this stream?
- How to sell? What does the MVP (Minimal Viable Product) look like ?
- How do we have predictable results when we tailor our system per systems methodology while tailoring to individual customers



Feedback on the stream scope

Process and Methodology

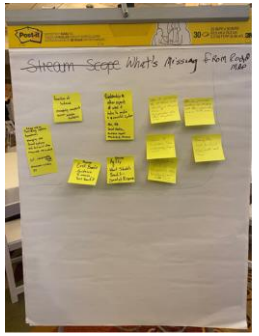
- How are we correlating the four streams with the five categories on the roadmap?
- Is a process and method for conducting this sort of continuous roadmap evolution itself a desired product or outcome than this effort?
- Do people also vote to determine where the community is at on the roadmap?
- What happens if we fail ? what is the mitigation plan?
- Emphasize trans- disp. approach
- How are we capturing the dependencies + intersections between roadmaps?
- Is this steam (V&R) producing its own roadmap? Why said across four FUSE streams ?
- How are we capturing the traceability of projects, products, etc. to the roadmap ?



Feedback on the stream scope

Wording

- Provably true? falsifiability?
- Should Foundations include hypotheses near term that may or may not ultimately be proven or even provable
- Instead of "justify SE's role" "publicize SE's substantial contribution to the policy table" or "the essential role of SE in solving SDGs"...
- "Conservation of System Complexity" is there a better term? It seems like we want to keep things complex .

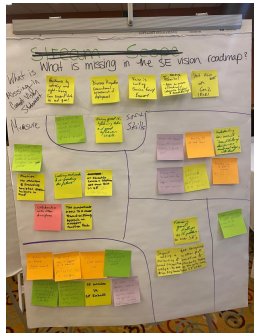


What is missing in the current vision?

Inclusion and collaboration

- Validate Vision 2035 with Gen Z (Risk)
- Vision is Lacking Service Focus/ Economy
- Guidance to industry and right-sizing from current state to end goal
- Diverse Perspective Generational assessment of deployment
- What about se culture? How should SE culture evolve? need to add
- Giving good SE; influencing skills and good influencers in SE skills
- Inculcate SE + systems thinking across a wider swath of academic disciplines, not just SE
- All education levels and discipline set their role in SE & vice versa
- Looking outward & co-treating the future

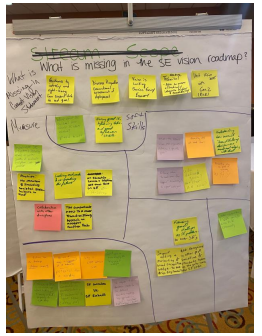
- No intention of including societal stakes holders in FuSE?
- The competencies need a more transdisciplinary approach and address complex problems
- Collaboration with other disciples - greater integration of SoSE concepts across the SE community
- Framing grand challenges as SE problems to non-SE's
- Recognized by other prof societies & Standards bodies as the go to source for SE Standards
- Suggest adding a marketing & brand recognition wedge to non-SE community



What is missing in the current vision?

Setting goals

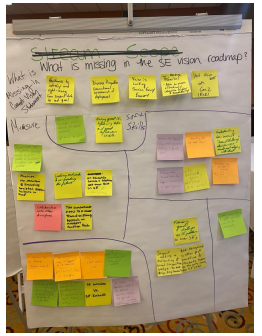
- Understanding Grand Challenge decisions are made and aligning with that
- Quantify ROI of each goal
- What is the scenario when one organization achieve a specific goal?
- Description of the goal is necessary - WHY
- Who defined goals is not clear
- Reference where the need comes from (a paper? a workshop?) to support each goal



What is missing in the current vision?

Wordings

- Need work on transdisciplinary language ontologies
- Define how the roadmaps reduces complexity
- Re- use of design is opposite of SE methodology potential flaw in wording
- Why is STEM outreach 2030?
- The integration of each stream needs to be defined - how does competency help application in 2025
- Ontologies by 2025 is aggressive, esp. w / what to do to get secretly as foundations perspective for system design
- Achieve greater consensus on nomenclature SE meta-model to Support MBSE (ontology)
- SE Includes VS. SE Embeds



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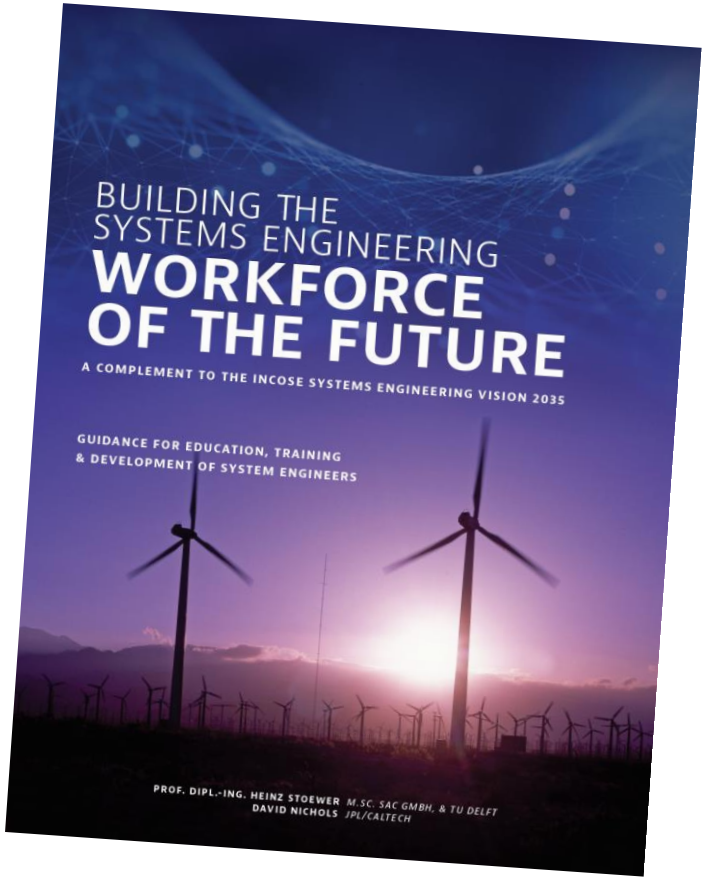
Sub-session A: Vision feedback collection

Sub-session A: Vision feedback collection

Please capture the results on the related poster(s) in the room.

- Group A: 30 min – Discuss types and sources of feedback to collect (discussions and collection on post-its)
  Feedback types on: SE Vision 2035 modifications, as well as proposed additions for the on-line version of the vision
- Group A: 30 min – Based on types: What means are needed to process the feedback? (discussions and collection on post-its)
- Group A: 30 min – What is the process for managing / evaluating the feedback? (discussions and collection on post-its)



Whitepaper submitted by
Heinz Stoewer & David Nichols

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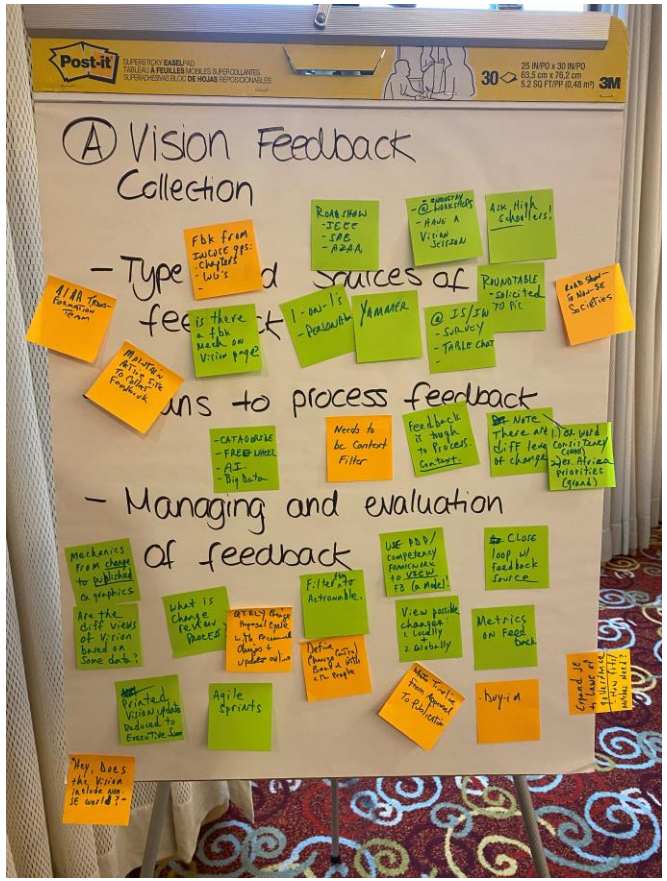
Posters from Sub-Session A



Vision feedback collection

Discuss types and sources of feedback to collect

- Industry workshops; have a vision session
- Road show - IEEE - SAE - AIAA and non-SE societies
- AIAA Transformation Team
- Ask High schoolers
- Feedback from INCOSE Groups: chapter’s, WG'S
- Roundtable - solicited to Pic
- YAMMER
- 1-on-1’s; personal
- IS/ IW; Survey or table chat
- Feedback mechanism on vision page
- Maintain active site to collect feedback

Discuss types and sources of feedback to collect

- Feedback is tough to process; needs to be context filtered
- There are different levels of change
- Categorize, free wheel, AI, big data
- 1) ex. word consistency (shall)
  2) ex. Africa priorities (grand)

Discuss types and sources of feedback to collect

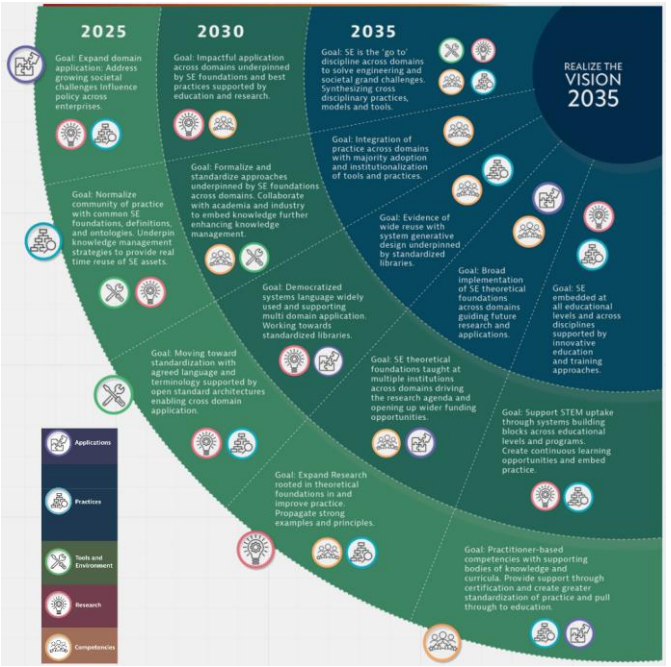
- Use PDP / competency framework to view FB (a Model!)
- CLOSE loop w/ feedback source
- Filter for/to actionable,
- Mechanics from change to published ex graphics; are the different views of the Vision based on some data?
- Quarterly change proposal cycle with recommended changes and updates online
- What is change review process
- View possible changes! 1. Locally + 2. Globally
- Metrics on feedback
- Define change control board with relevant people
- Expand to laws of governance - How does it fit/ match the need?
- Printed Vision updates reduced to executive sum.
- What timeline from approved to publication
- Agile sprints
- Buy-in

Sub-session B: Elaborate Roadmaps

Sub-session B: Elaborate Roadmaps

Please capture the results on the related poster(s) in the room.

- Group B: 30 min – Group gets acquainted with the roadmap (“Gallery walk”)
- Group B: 30 min – Identify additional/changed topics for the roadmaps (discussions and collection on post-its)
- Group B: 30 min – Evaluate cross-cutting aspects of all roadmaps (discussions and collection on post-its)



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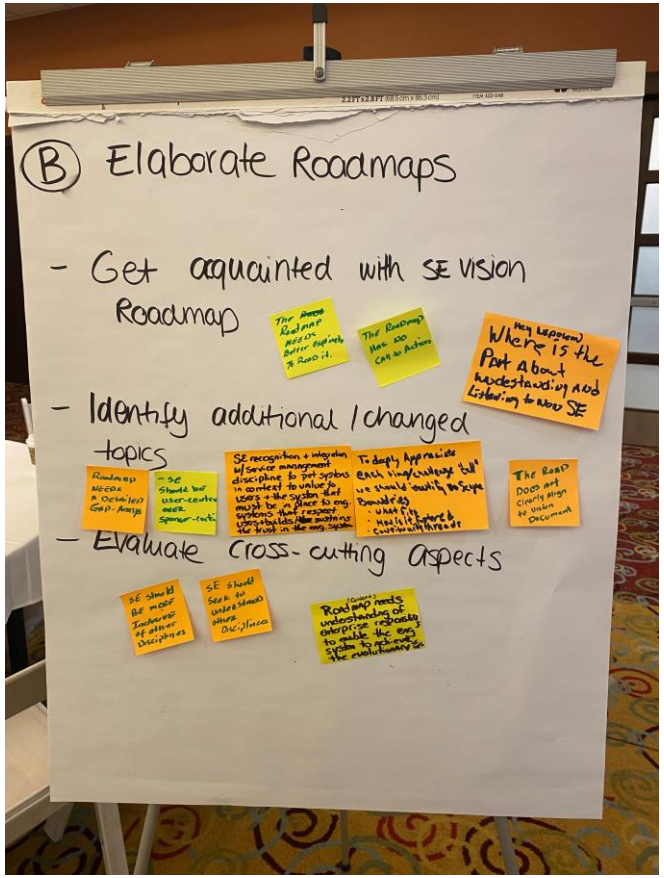
Posters from Sub-Session B



Elaborate Roadmaps

Group gets acquainted with the roadmap (“Gallery walk”)

- The road map needs better explanation to read it .
- The roadmap has no call for action
- Where is the part about understanding and listening to non-SE

Identify additional/changed topics for the roadmaps

- SE recognition and integration with / service management discipline to put systems in context to value to users + the systems that must be in in place to eng. systems that respect users and builds and sustains the trust of the engineered system
  To deeply appreciate each time/challenge "cell" we should identify the scope - boundaries: what fits, how is the future, continuity threats
- The roadmap does not clearly align to vision document
- The roadmap needs a detailed gap-analysis
- SE should be user-centric over sponsor-centric

Evaluate cross-cutting aspects of all roadmaps

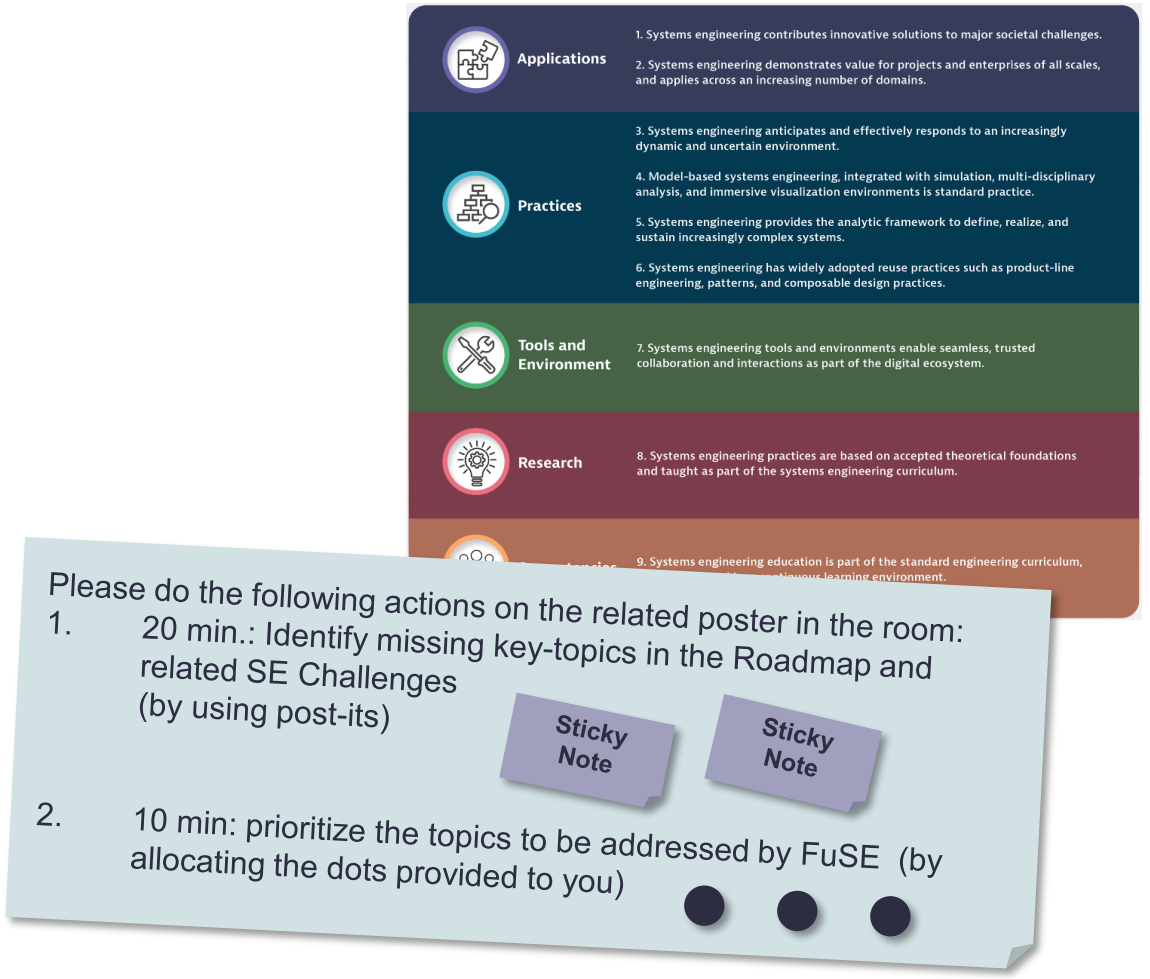
- SE should seek to understand other disciplines
- (Context) Road map needs understanding of enterprise responsibility to enable the engineer system to achieve the evolutionary SE system
- SE should be more Inclusive of other disciplines

Sub-session C: Roadmap of grand challenges

Sub-session C: Roadmap of grand challenges

Please capture the results on the related poster(s) in the room.

- Group C: 30 min – Group gets acquainted with the grand challenges including recommendations (“Gallery walk” through vision)
- Group C: 30 min – Prioritization of grand challenges + reasoning (Post-its on the posters (including reasoning))
- Group C: 30 min – Recommendation what to work on first (Post-its on the posters (including reasoning))



Input from FuSE working session on roadmap for SE Vision 2035 at INCOSE IW (29, January 2023)

Working Session Objective:
Identify high priority roadmap activities that will address the SE Challenges in the SE Vision 2035.

Approach:
Start by identifying a small number of high priority activities for a single SE challenge.
Then determine how these activities might relate to the roadmaps of the other SE challenges.

We selected the Tools and Environment challenge as the initial challenge which is stated as follows:
Systems engineering tools and environments enable seamless, trusted collaboration and interactions as part of the digital ecosystem.

Initial roadmap activity:
Establish a reference architecture for a systems engineering environment that supports the SE practices in 2035 of an organization or enterprise that can be used as a basis for:

- Identifying critical standards to support seamless integration
- Developing concepts to support trusted collaboration including management of proprietary and classified information
- Enabling methods to validate data (e.g., tagging information with provenance information)

The reference architecture includes a definition of the interfaces between the logical components of the systems engineering environment and a data model that specifies the kind of information that is exchanged.

The reference architecture is intended to be instantiated by different sets of tools and repositories that:

- Can be applied to a wide range of different application domains and scaled to different enterprise and project sizes
- Addresses other non-functional concerns such as availability, security, and performance.
- Provides the ability to integrate domain-specific knowledge repositories
- Can continue to evolve to address new technologies and needs

Establish a working group to perform the above activity that includes stakeholder representation from vendors and end users across multiple domains with the needed expertise to provide a credible and accepted baseline reference architecture for the SE community. This group should identify any relevant related work that has already been done as an input to this activity.

Note. It is anticipated that this activity will impact or be impacted by the other roadmap activities for the other SE Challenges.

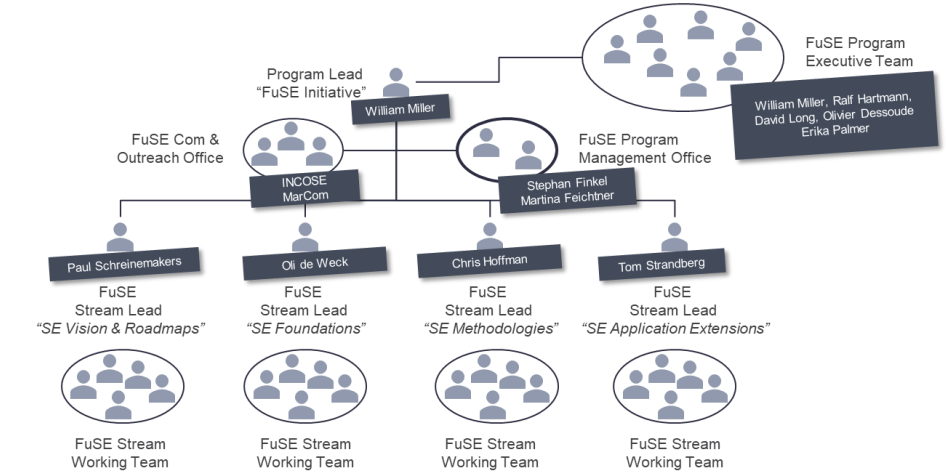
Separate input to the SE Vision 2035 roadmap.
In addition to the above, a member of our working group (David.schrunk@scienceoflaws.org) identified the following gap in the SE Vision that could be incorporated into the Applications challenge.
Apply systems engineering to the development of cost-effective laws and regulations that meet societal needs.

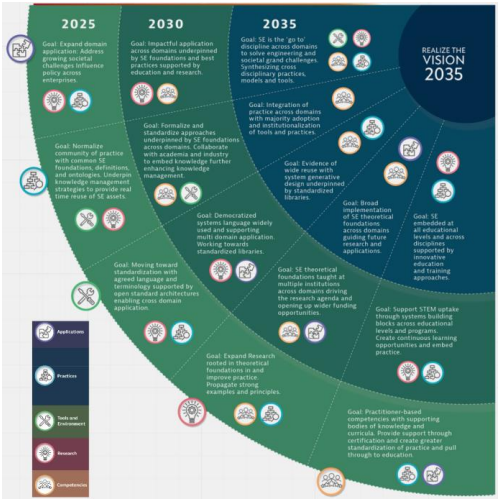
Sub-session D: Projection on the Streams

Sub-session D: Projection on the Streams

Please capture the results on the related poster(s) in the room.

- Group D: 30 min – Discuss the gaps collected in the Sat. session + identify missing gaps (add post-its)
- Group D: 30 min – Prioritize the gaps identifies and collect the reasoning for the prioritization (prioritization with reasoning)
- Group D: 30 min – To which of the FuSE streams do the prioritized gaps apply (mapping to four FuSE streams)?





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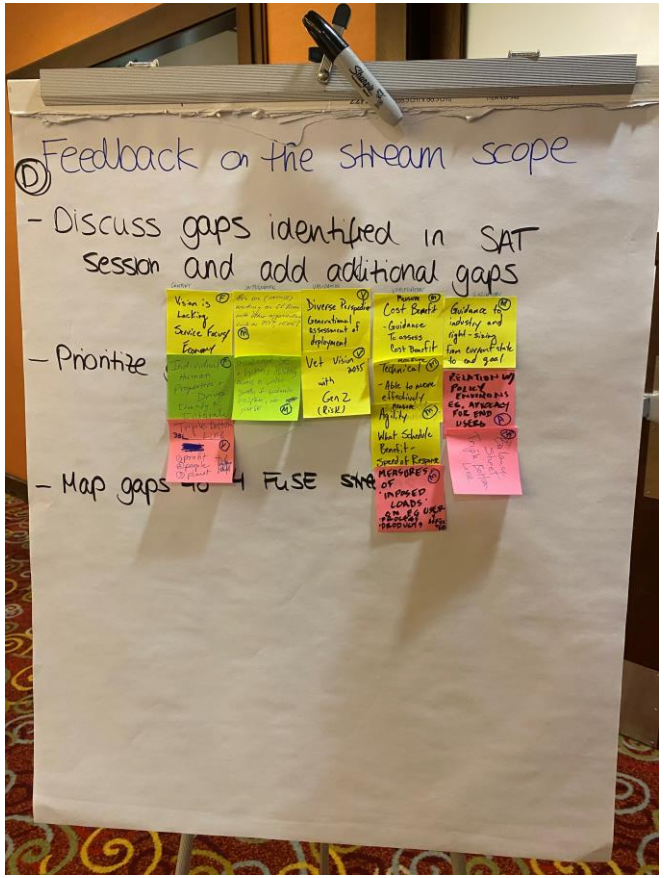
Posters from Sub-Session D



Projection of roadmap gaps

Content

- Vision is lacking service focus/ economy
- Individual human properties + Drives identify x integrate
- Triple bottom line: - profit - people - planet

Integration

- Are we (INCOSE) working on SE Vision with other organizations such as: - PMI - IEEE
- Inculcate SE + systems thinking across a wider swath of academic disciplines, not just SE

Validation

- Diverse perspectives of generational assessment of deployment
- Validate Vision 2035 with Gen Z

Verification

- Cost benefit; guidance to assess cost benefit
- Technical; able to more effectively measure agility
- Schedule benefit - speed of response
- Imposed loads on e.g., user & affecters, products, projects

Execution

- Guidance to industry and right-sizing from current state to end goal
- Relation with policy environs e.g., advocacy for end users
- Balance sheet triple bottom line

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  a. *How we keep collecting feedback*
  b. *Elaborate on roadmap items to address in each stream*
  c. *Elaborate on projection of the challenges on each stream*
  d. *Set up an Inventory*
- **MON Session:**
  Which WG's and external organizations are to be involved in the efforts identified

Sub-session A/B: Contribution

Please capture the results on the related poster(s) in the room.

- 30 min – The team goes through all information in the room, as generated on Sat & Sun
- 30 min – Identify WGs that can contribute to specific actions + define inputs needed / results / benefits for the WG (mapping to INCOSE WGs with post-its)
- 30 min – Identify which non-INCOSE organization should contribute to specific efforts + define input / results expected / PoC (mapping to external organizations with post-its)

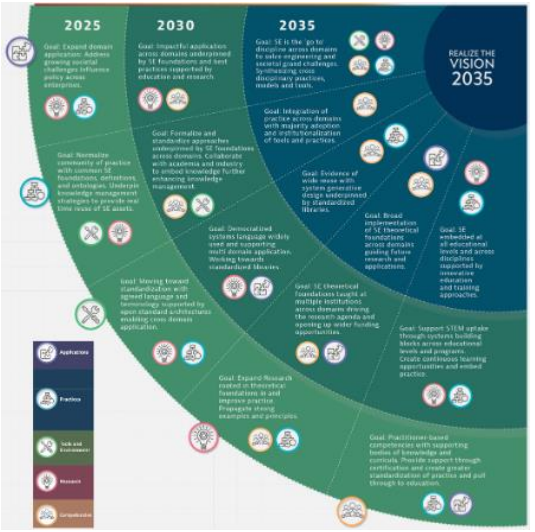
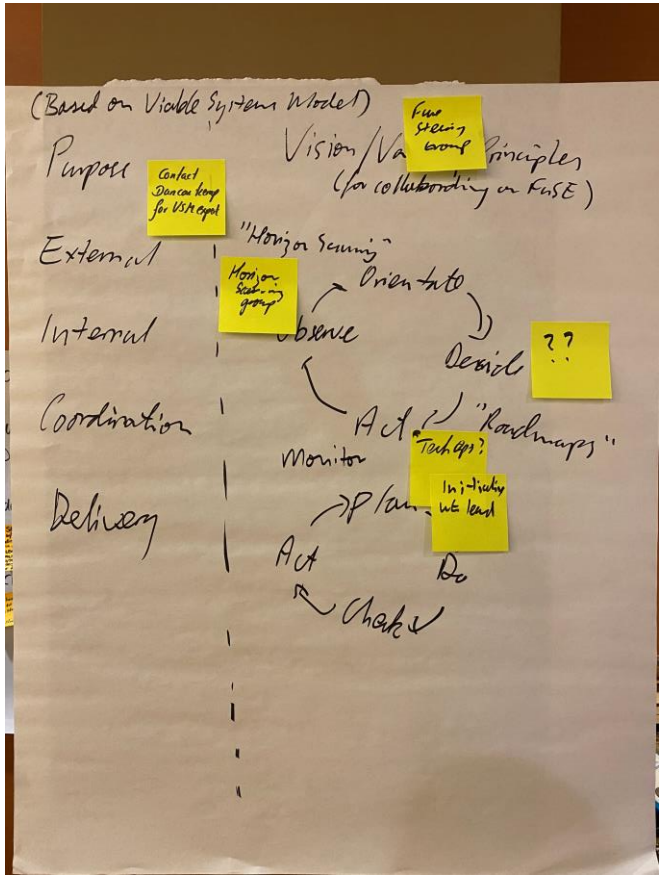
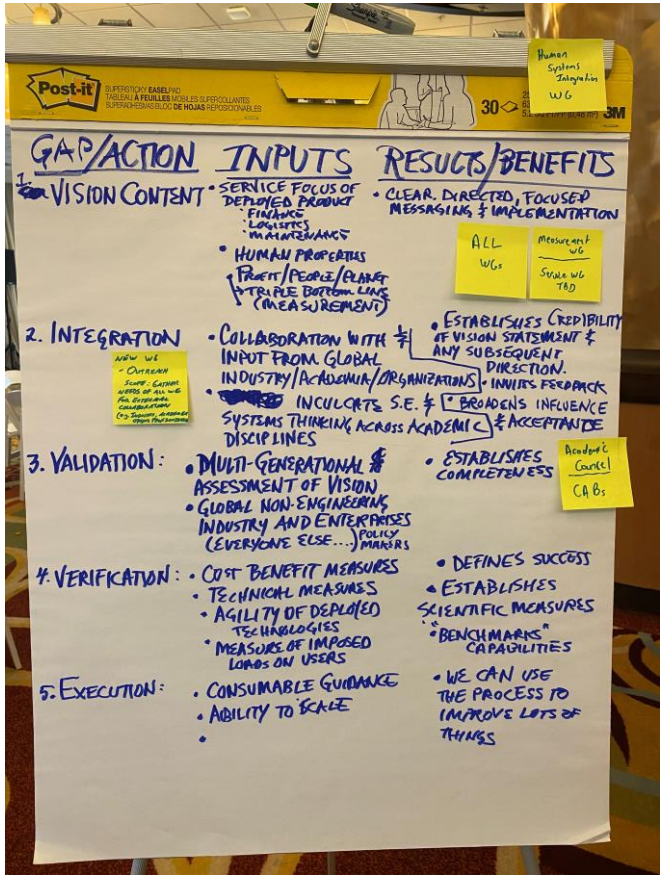
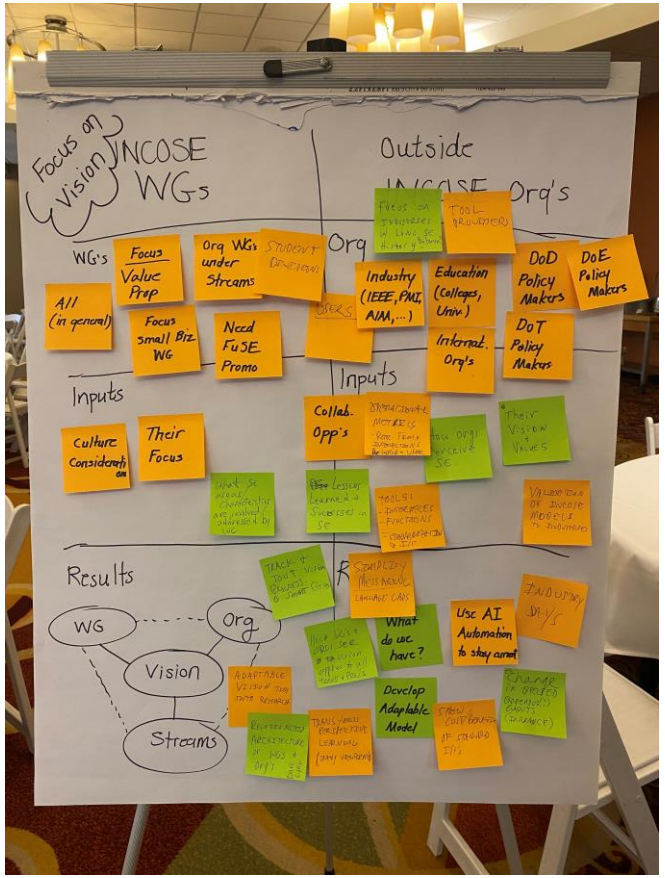


Foto documentation







Operation / collaboratoin based on VSM

Purpose

Vision

FuSE Program

External

Horizon Scanning

Horizon Scanning WG

Orientate

Observe

Decide

Act

Internal

TBD

Roadmaps

Coordination

Tech-Ops

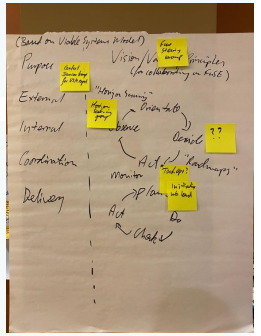
Plan

Initiate WG lead

Act

Do

Check



Suitable WG

VSM – Viable Systems Model

Specific actions + define inputs needed / results

Group B

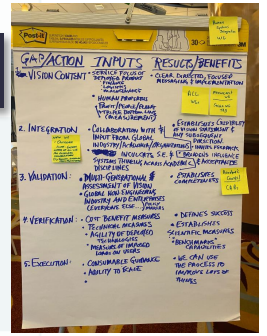
Human systems integration WG

Gap / Action	Input	Results / Benefit

VISION CONTENT	• SERVICE FOCUS OF
	  • DEPLOYED PRODUCT
	  • FINANCE
	  • LOGISTICS
	  • MAINTENANCE
	• HUMAN PROPERTIES
	  • PROFIT / PEOPLE /PLANET
	  • TRIPLE BOTTOM LINE
	  • (MEASUREMENT)
		• CLEAR. DIRECTED, FOCUSEDMESSAGING & IMPLEMENTATION
		All WG
		Measurement WG
		Service WG (tbd)

INTEGRATION	• COLLABORATION WITH AND INPUT FROM GLOBALANY INDUSTRY / ACADEMIA/ ORGANIZATIONS • INCLUDATE SE AND SYSTEMS THINKING ACROSS ACADEMIC DISCIPLINES	• ESTABLISHES CREDIBILITY OF VISION STATEMENT & ANY SUBSEQUENT DIRECTION • INVITES FEEDPACK • BROADENS INFLUENCE AND ACCEPTANTE
VALIDATION	• MULTI-GENERATIONAL ASSESSMENT OF VISION • GLOBAL NON-ENGINEERING INDUSTRY AND ENTERPRISES; POLICYMAKERS (EVERYONE ELSE ....)	• ESTABLISHES COMPLETENESS Academic Councel CABs
VERIFICATION	• COST BENEFIT MEASURES • TECHNICAL MEASURES • AGILITY OF DEPLOYED TECHNOLOGIES • MEASURE OF IMPOSED LOADS ON USERS	• DEFINES SUCCESS • ESTABLISHES SCIENTIFIC MEASURES • “BENCHMARKS“ • CAPABILITIES
EXECUTION	• CONSUMABLE GUIDANCE ABILITY TO SCALE	• WE CAN USE THE PROCESS TO IMPROVE LOTS OF THINGS Suitable WG

New WG: Outreach
Scope: Gather needs of all WG from external collaboration (e.g., Industry, Academia..



Specific actions + define inputs needed / results

INCOSE WG	Outside INCOSE Org
WG	**ORG**
• Org WG's under Streams • Focus: Value Prop • Students Divisions • All (in general) • Users • Need FUSE Promo • Focus small BIZ WG	• Focus on Industries w/ long SE history - e.g., defence • Tool provider • DOD / DOE / DOT Policy makers • Industry (IEEE, PMI AIAA , ...) • Education (Colleges, Univ, …) • Users • International Org's
INPUT	**INPUT**
• Collab. Opp's • Their Focus • culture Considerations • Lessons Learned + Successes in SE • what SE weas / characteristics are involved / addressed by WG	• Operational metrics interactions world-user • Their vision and values • Collab. opp's • How orgs perceive SE . • Lessons Learned + successes in SE • Validation of INCOSE models to industries • Tools - interfaces - functions - standardization
RESULTS	**RESULTS**
• Track and tout vision progress ex smart cities • Adaptable vision tied into research • Relationship architecture of WG’s and org’s	• Simplify messaging language caps • Industry days • Use AI automation to stay currant • What do we have • Change In expected exogenous (?) events (Insurance) • Develop adaptable model • Show of cost/benefit of standard I/F's

Let's connect.

Or find us on
www.incose.org/fuse

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Vision: Inspire the global community to realize the SE Vision

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The FuSE Program is organized in 4 streams.

Vision & Roadmaps

Foundations

Methodologies

Application Extensions