

# NDIA SE Division Meeting

2019-12-05

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# What is FuSE?

- Future of Systems Engineering
- Multinational, Multiorganizational team led by INCOSE
- Leads:
  - Bill Miller – Stevens Institute of Technology
  - Tom Shortell – Lockheed Martin
- Champions
  - Garry Roedler – INCOSE President
  - Kerry Lunney – INCOSE President Elect

# Emerging Challenges

- The future environment is becoming:
  - More dynamic and nondeterministic
  - Increasingly evolutionary, with an accelerating rate of change
  - Resource constrained driving a need for sustainability
  - Highly interactive among individuals, communities, organizations, and systems
- There are growing expectations for SE solutions:
  - Increased level of functionality providing more comprehensive solutions
  - Higher order of intelligence and adaptability augmenting human performance
  - Greater level of connectivity and interoperability across and between systems
  - Trust, safety, and cybersecurity of digital representations
  - Increased inclusivity, growing the scale and scope of solutions
- Emerging technologies provide opportunities to enhance the practice of SE:
  - Machine Learning
  - Autonomous Physical Systems
  - 3D Printing, Genomics
  - Quantum and Nano Technology
  - Biomimicry
  - Complexity Science
  - Systems Sciences
  - Data Science (Big Data)
  - Smart Everything
  - Connected Everything (IoT)
  - Artificial Intelligence
  - Cybersecurity

# Charter

Purpose: Evolve the practice, instruction and perception of SE to:

- 1) Position SE to leverage new technologies in collaboration with allied fields
- 2) Enhance SE's ability to solve the emerging challenges
- 3) Promote SE as essential for achieving success and delivering value

Goal: Create a road map that drives the evolution of SE to:

- 1) be increasingly *adaptable, evolvable and fit for purpose*
- 2) account for human abilities, needs as an integral system element and their interactions with a system
- 3) be more responsive in resolving increasingly challenging societal needs
- 4) realize and enhance Systems Engineering Vision 2025 and other visionary inputs

Scope: Identify the needs, priorities and means for transforming SE including:

- 1) underlying foundations, systems theory and principles
- 2) people, methods, tools, processes, education and training
- 3) the future social and ethical duties, contributions, and responsibilities of future systems engineers

# Outcomes of FuSE

- The SE community is focused on realising the Systems Engineering Vision 2025 and beyond
- The SE community is aligned to the common goals of the FuSE road map
- Our road map is the point of differentiation for the future of SE
- Our road map forms the focal point for SE transformational activities
- INCOSE is positioned to monitor progress against the road map and adapts it to the emerging needs of the SE community

# The Team

- Core Team Responsibilities

- “Steering Committee”
- Oversee/Assist Project teams
- Diverse across World
  - Representation across three sectors of INCOSE

- Core Team

- Bill Miller (Lead), Tom Shortell (Co-Lead), John Artus (LM), Ron Luman (APL), David Rousseau (ISSS), Paul Schreinemakers (How2SE), Kevin Robinson (Shoal), Duncan Kemp (UK MoD)

- Community Team

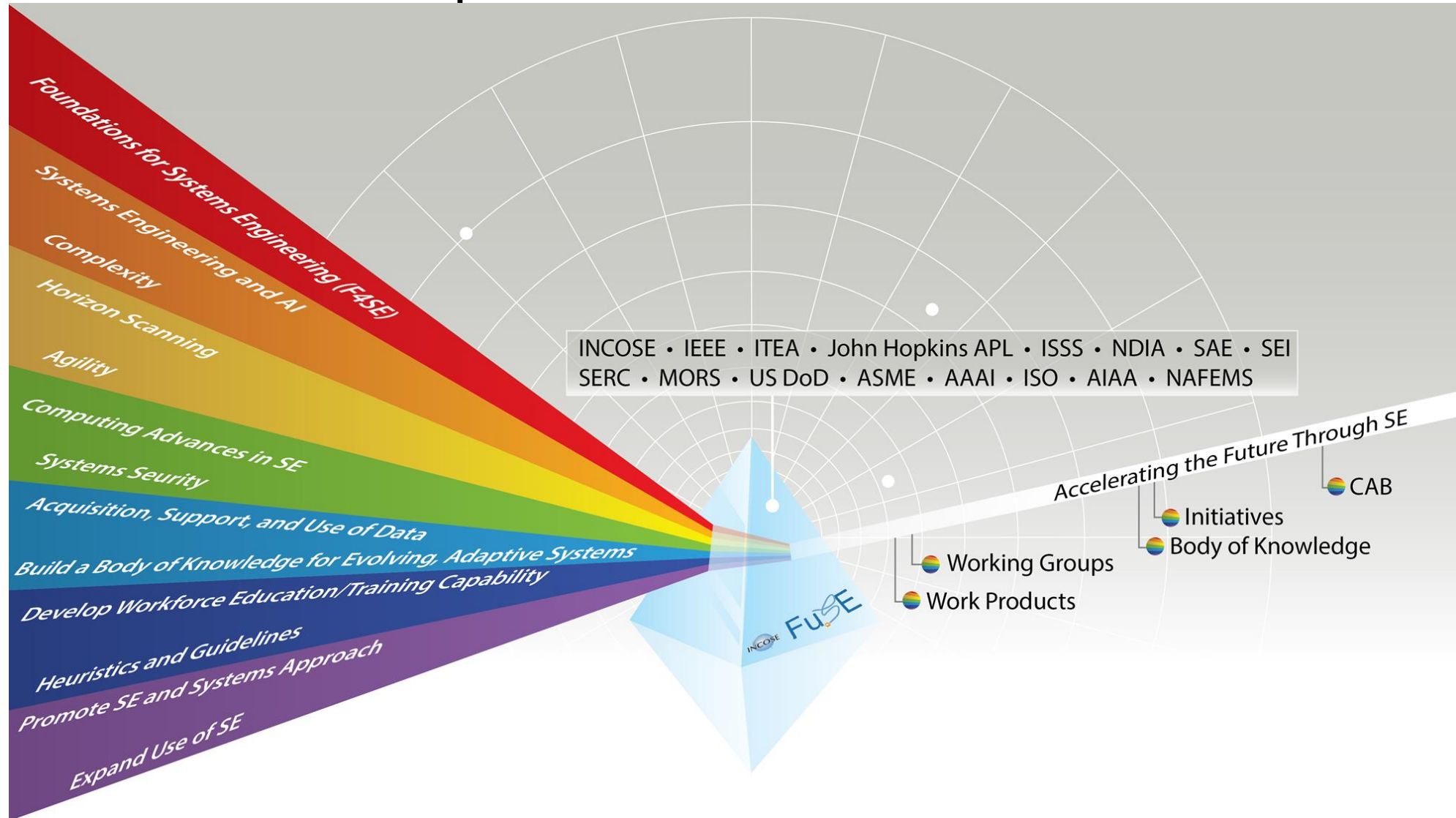
- Participate in Meetings/Projects
- Provide recommendations to Core Team

# FuSE Projects Chartered & Proposed

1. Collaborate with groups inside and outside the system community to develop:
  - a. Foundations for Systems Engineering (David Rousseau) → Summit in conjunction with EMEA Workshop
  - b. Methods, Processes, Tools for AI including Autonomous Systems and ML (Tom Shortell)
  - c. Methods, Processes, Tools for the acquisition, support and use of data → Knowledge Management & Ontologies WG?
  - d. Methods, Processes, Tools for Complexity → Complex Systems & CIPR Working Groups and SF Bay Area Chapter? (Mike Watson)
  - e. Methods, Processes, Tools for Agility → Agile Systems & SE WG (Keith Willett)
  - f. Advances in Computing for Engineering (???)
2. Evolving Systems Expertise
  - a. FuSE Route-Map and Horizon Scanning Workstream (Tom McDermott)
  - b. Create a body of knowledge for evolving, adaptive systems (TBD)
  - c. Develop heuristics & guidelines relevant to these evolving systems and variable environments
  - d. Systems Security --> Systems Security Engineering WG (Rick Dove)
3. Workforce
  - a. Create an Education/Training capability to educate the evolving system workforce
4. Broadly apply
  - a. Evangelize the credibility & value of systems engineering and a systems approach (Mike or Juan?)
  - b. Develop in our community the understanding that complicated/deterministic systems are a special case and that different methods, processes, and tools are required for complex/non-deterministic systems → VVUQ?
  - c. Build community and expansion of boundaries of systems engineering use (John Artus)

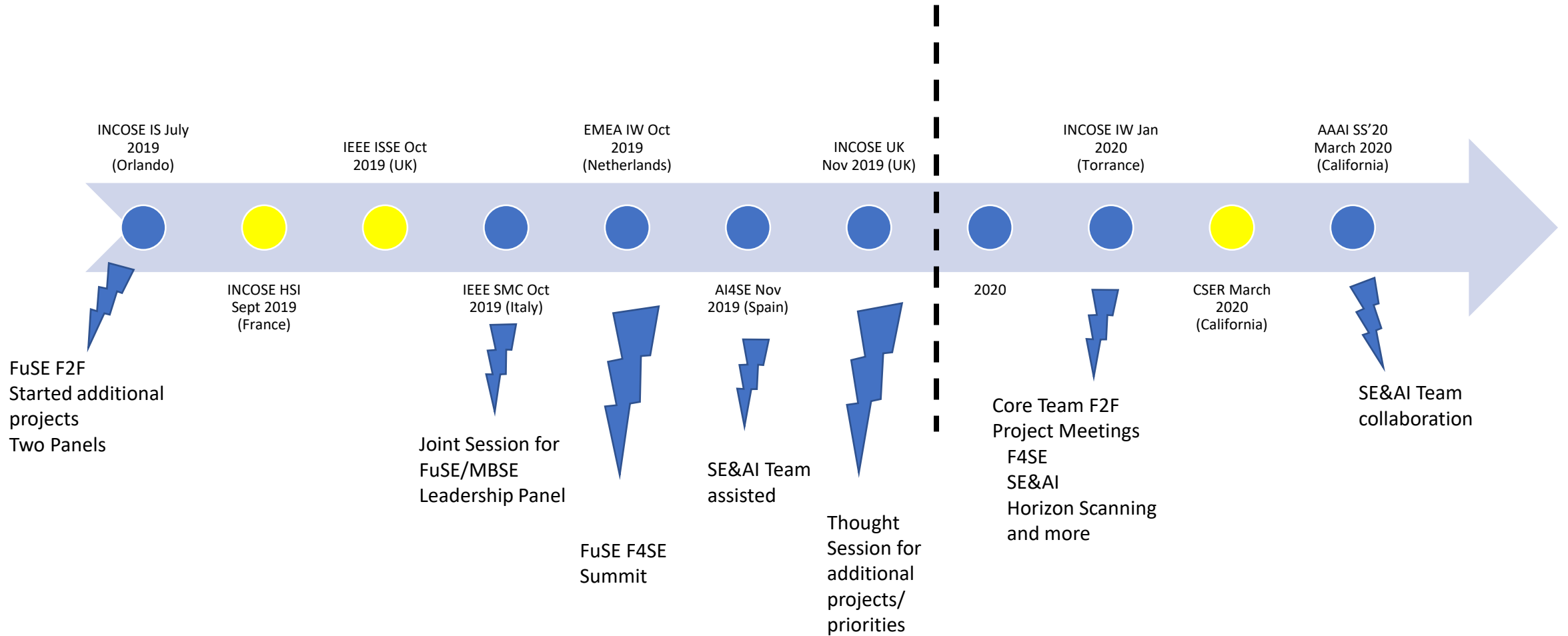


# FuSE Road Map





# Recent Events



# Battle Rhythm

- Core Team Meeting
  - First Wednesday of the Month
- Community Team Meeting
  - Second Wednesday of the Month
- Project Meetings
  - Held at discretion of individual project leads

# Want to get Involved?

- Email [fuse@incose.org](mailto:fuse@incose.org)
  - Goes to Bill Miller and Tom Shortell