



34th Annual **INCOSE**
international symposium

hybrid event

Dublin, Ireland
July 2 - 6, 2024



There is a real need for the ability to interface between Systems Models and simulations

How can we better serve systems engineers in accomplishing this?

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Ladies and gentlemen

I would like to start by asking for a round of
applause for **12 years of collaboration
between NAFEMS and INCOSE**

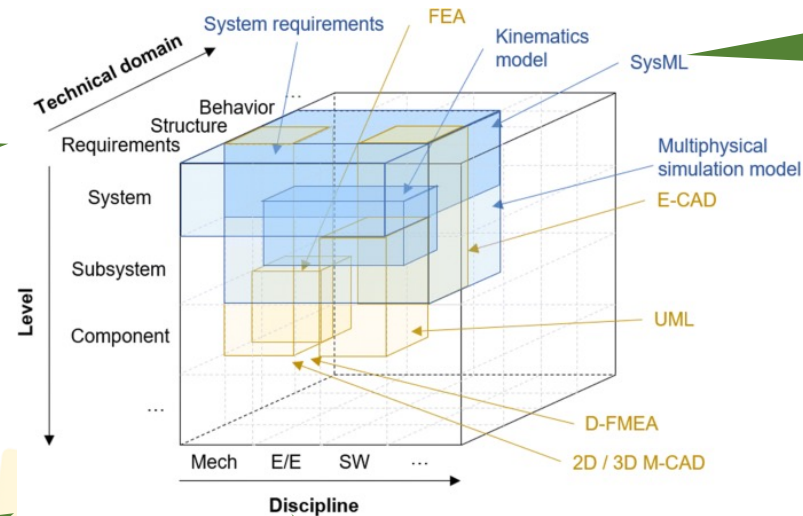
INCOSE Outreach Director

Let's refresh some concepts

model is a simplified representation of reality

SE primarily makes use of **digital models**

Modeling is the conception, creation, and refinement of models



system model represents aspects of a system and its environment

Simulation the process of using a model to predict and study the behavior or performance of the Sol

Engineering disciplines make use of **both physical and digital models**

Systems Engineering Evolution

Source: INCOSE MBSE Workshop, Jan 2014

Today

- *Standalone models* related through documents.

Future:

- *Shared system model* with multiple views and connected to discipline models.
- Reusable, *model-based engineering* with virtual product development and simulation capability.

Benefits of Interfacing Systems Models [MBSE] and Engineering Simulations

- **Early Detection of Issues:** Identifying potential design flaws early in the lifecycle.
- **Cost Efficiency:** Reducing costs through virtual prototyping and testing.
- **Risk Mitigation:** Enhancing safety and reliability by simulating various scenarios.

Challenges of Interfacing Systems Models [MBSE] and Engineering Simulations

- **Complexity:** Managing the complexity of integrating diverse models and simulations.
- **Interoperability:** Ensuring different tools and systems can work together seamlessly.
- **Data Consistency:** Maintaining consistent and accurate data across models and simulations.

Current State and Gaps

Current Practices:

- Separate use of models and simulations with minimal integration.
- Existing tools often lack interoperability and comprehensive integration capabilities.

Identified Gaps:

- Lack of standardized frameworks and protocols for integration.
- Need for specialized training and skills in both modeling and simulation techniques.
- Insufficient collaborative platforms for real-time data exchange and integration.

Why is this important in SE?

- **systems models** assist in working in a systemic manner
- **M&S is a skill of thinking** needed by systems engineers to perform the processes and conduct “good” Systems Engineering

How can we better serve systems engineers in accomplishing this?

Strategies to Enhance Integration

- Promote **new standards**
- Facilitate seamless **data exchange and interoperability** between different tools and platforms.
- Implement **robust data management** practices to ensure consistency and accuracy.
- Invest in **developing and adopting toolchains** for system modeling and simulation tools.
- Utilize **digital twins** to provide a real-time, dynamic representation of systems.
- Establish **collaborative platforms for real-time information collaboration**.
- Develop **specialized training programs** focusing on modeling and simulation.
- Encourage **continuous professional development** through courses, and certifications.

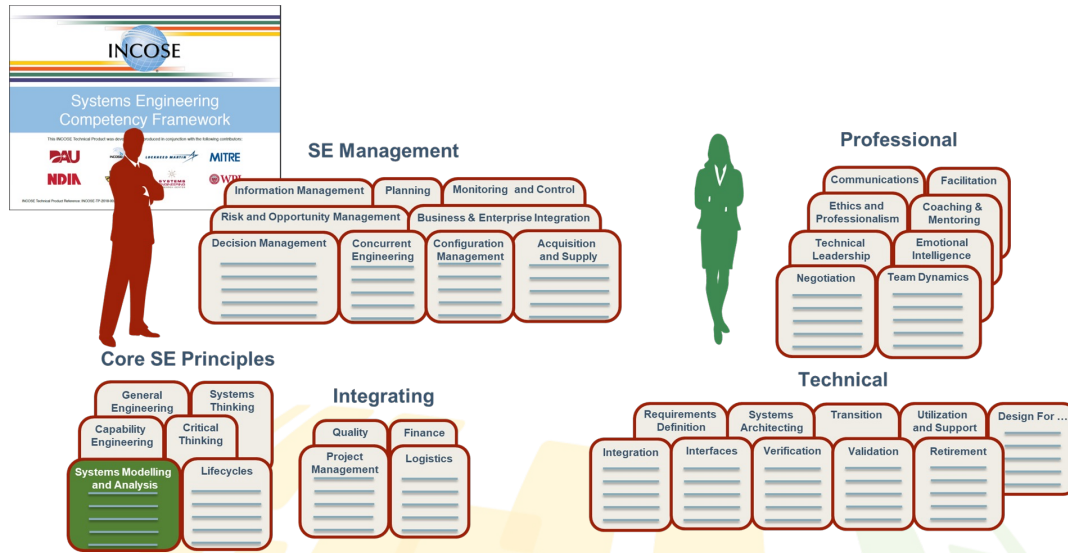
Professional
Society

Organization

Team

Individual

Mapping of SE Processes to M&S Competency



- Business or Mission analysis
- Stakeholder needs and requirements definition
- System requirements definition
- Architecture definition
- Design definition
- Risk management

M&S Competency needed by practitioners to perform the above processes and conduct “good” Systems Engineering.

At Professional Society Level

- **Joint NAFEMS-INCOSE MoU signed in 2012** with announcement to form the NAFEMS-INCOSE SMSWG
- **MoU renewed in 2015, in 2019 and in June 2022**
- **MOU Addendum Update (February 2024)**
 - *Addendum A Mutual Benefits Joint Activity Recommendations*
 - *Addendum B Certification*

NAFEMS-INCOSE M&S Competency

Alignment of INCOSE SE Competency Framework with the NAFEMS Professional Simulation Engineer (PSE) Certification Schema ***adding a new PSE Core Competency named “ Systems M&S ”*** by adopting the current INCOSE Competency Framework

The **collaboration with NAFEMS** is strategic for **INCOSE** and is being used as **the reference for the new Outreach model** with other sister organizations maximizing benefits for our members and producing results that enrich both parties through collaborative products and services



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www.incose.org/symp2024
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