



2019
Annual **INCOSE**
international workshop
Torrance, CA, USA
January 26 - 29, 2019

MBSE Collaborations, MB Activities

Model Communities Outreach

www.incose.org/IW2019

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V1.2.1

INCOSE External Model-Based Collaborations



- Concept: INCOSE collaborations with diverse model-related communities
- INCOSE has some history of effective collaboration with model-related communities, but . . .
- The number and diversity of these communities is growing rapidly.
- Difficult to be aware of each other and effectively leverage each other's efforts.
- INCOSE's systems engineering focus means it has a special interest in being aware and in touch with these modeling communities.

Formal vs. Informal Start-Up Relationships



- In some cases there may be formalized INCOSE Memorandum of Understanding (MoU) agreements, but not necessarily so for the most recently started interactions:
 - We like to first reach a point of some identified subject that both parties have begun to demonstrate interest in pursuing together.
 - As we reach out further, at first we are just seeking joint awareness of each other's interests and activities.

Some successful model-based INCOSE external collaborations to date



| Collaboration | INCOSE POC |
|-------------------------------|--------------------------|
| OMG-INCOSE | INCOSE MBSE Initiative |
| NAFEMS-INCOSE | INCOSE MBSE WG |
| ISSS – INCOSE | INCOSE SSWG, Patterns WG |
| ASME – INCOSE | INCOSE Patterns WG |
| V4 Institute – INCOSE | “ “ “ |
| IFSR – INCOSE | “ “ “ |
| ST4SE - INCOSE | “ “ “ |
| ASSESS - INCOSE | INCOSE MBSE Initiative |
| US DoD – INCOSE Collaboration | INCOSE DEIX WG |
| Others that you know about? | |

OMG – INCOSE Collaboration



HOME | SITE MAP | LEGAL | f | t | in | g+ |

OMG
OBJECT MANAGEMENT GROUP®

RESOURCE HUB | OMG SPECIFICATIONS | PROGRAMS | MEMBERSHIP | MEMBERS AREA

DOMAIN SPECIAL INTEREST GROUP

SYSTEMS ENGINEERING DSIG | SUBGROUP DIRECTORY | HOME

USEFUL LINKS:

- SE DSIG Meetings
- OMG SysML®
- OMG SysML Portal
- RFI's & RFP's
- Recent Activities
- Adopted Specs
- Upcoming Meeting
- Vote Status

CHAIR:


Sanford Friedenthal
syseng-chair@omg.org

EMAIL LISTS:

The OMG maintains a number of email lists for our groups. [Click here](#) to view the email list(s) which are pertinent to this group. Many lists are only open to members of the OMG.

If you have any questions about adopted specifications, please feel free to contact the tech-editor.

SYSTEMS ENGINEERING DSIG



MISSION:

Support evolution of model based systems engineering standards to achieve the following goals:

- Provide a standard systems modeling language to specify, design, and verify complex systems
- Facilitate integration of systems and software engineering disciplines
- Promote rigor in the transfer of information between disciplines and tools for developing systems

CHARTER:

The SE DSIG Charter, which includes the mission and goals, was established at the OMG Technical Meeting in Danvers on July 9 - 13, 2001. <http://www.omg.org/cgi-bin/doc?dtc/2001-07-02>

RELATED:

- SE DSIG Background
- Systems Modeling Language (OMG SysML®)
- Unified Profile for DODAF/MODAF (UPDM)
- SysML-Modelica Transformation
- Model Interchange Working Group
- MBSE Wiki
- SysML v2 RFP Working Group

GET INVOLVED:

If you are interested in getting involved with this group, want more information or would like to come as a guest to an upcoming meeting and obtain temporary access to the mailing list, please contact one of our Account Representative or contact one of the Chairs.

www.incose.org

- One of INCOSE's earliest model-related collaborations.
- Now operating nearly 20 years—see most recently SysML V2.0.
- Led to definition of OMG SysML[®] standard modeling language for systems.

NAFEMS-INCOSE Collaboration



- SMS WG established seven years ago as NAFEMS - INCOSE collaboration.
- Defines best practices and standards for vendors to develop and manufacturers to follow
- Merging of engineering analysis with the overall systems behavior analysis to perform more realistic, accurate, and lifelike experiences.

The screenshot shows the NAFEMS website with a navigation menu including Events, Training, NWC19, Professional Development, Resources, Members, and Contact. Below the menu, there are social media icons for Twitter, Facebook, LinkedIn, and Google+. The main content area features the title "Systems Modeling & Simulation Working Group (SMSWG)" in red. To the right, there is a section for the "Chairman" with a photo of Roger Burkhart, Technology Architect at John Deere. The text on the page describes the joint relationship between NAFEMS and INCOSE, announced in July 2012, for mutual participation and collaboration in the advancement of engineering simulation and model based systems engineering. It also mentions the implementation of a joint cross-organizational working group on Systems Modeling & Simulation.

Systems Modeling & Simulation Working Group (SMSWG)

In July 2012, NAFEMS and the International Council on Systems Engineering (INCOSE) announced a joint relationship for mutual participation and collaboration for the advancement of engineering simulation and model based systems engineering.

This collaboration includes the implementation of a joint cross organizational working group on Systems Modeling & Simulation. NAFEMS will launch a new international Technical Working Group (TWG) in concert with INCOSE to promote a deeper understanding of lifelike behaviour to integrate mechanical analysis and simulation within their Model Based System Engineering initiative.

Chairman



Roger Burkhart
Technology Architect
John Deere



ISSS – INCOSE Collaboration

- ISSS-INCOSE Collaboration for System Sciences / Systems Engineering, established 2011 by INCOSE SSWG.
- 2013-today: INCOSE MBSE Patterns WG joined collaboration with ISSS on model foundations of systems science.

International Society for the Systems Sciences

Home About ISSS Membership Meetings Research/Publications Education Students Partnerships

ISSS - a world-wide association for general systems research

- About the Society
- Our Logo
- Special Integration Groups (SIGs)
- Meeting Retrospectives 1998-2012
- Historical Documents
- Members Website

Social Media Links

- ISSS Facebook
- ISSS LinkedIn
- ISSS YouTube
- ISSS on Google+
- Systems Sciences Group on Facebook

ISSS Partners

ISSS Partnerships

- American Academy for the Advancement of Science (AAAS)
- [American Society for Cybernetics \(ASC\)](#)
- Bertalanffy Centre for the Study of Systems Science
- Business Systems Laboratory
- College of Exploration
- International Council on Systems Engineering (INCOSE)
- International Federation for Systems Research (IFSR)
- International Academy for Systems and Cybernetic Sciences (IASCYS)

ASME – INCOSE Collaboration



- 2013: INCOSE Patterns WG joined into ASME Model VVUQ Standards Committee
- Authoring guidelines and standards for verification, validation, uncertainty quantification of models themselves (credibility of models).

V1.2.1



2018
Annual **INCOSE**
international workshop
Jacksonville, FL, USA
January 20 - 23, 2018

INCOSE Collaboration In an ASME-Led Standards Activity

Standardizing V&V of Models

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V4 Institute – INCOSE Collaboration



- Collaboration with INCOSE in advancing Virtual (model-based) Verification, Validation, and Visualization.
- V4I formed out of interest by ASME and INCOSE in 2016.

V4 Institute

Home Membership Engage Use Cases Events About Contact Us

Advanced Assurance in
Product Development & Manufacturing

The V4 Institute is the *trusted accelerator* for new product system and service realization.

Looking for content from the INCOSE GLRC event? [CLICK HERE](#)

V4: Virtual, Verification, Validation, & Visualization

Virtual Verification Validation Visualization

What We Do

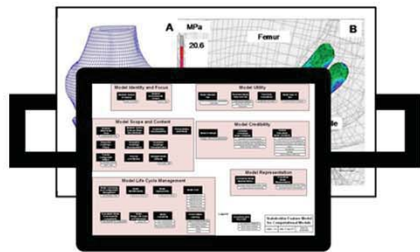
January 20, 2019

www.

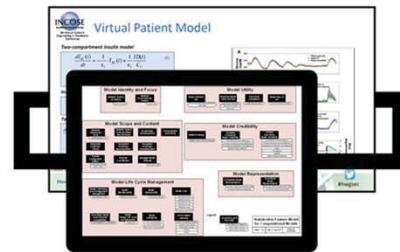
V4I-INCOSE Collab Example: Model VVUQ Pattern

- Uniform model “wrapper” describes all types of computational and representational models.
- Currently being used by INCOSE MBE Transformation to package diverse MBSE models.
- Developed with the INCOSE MBSE Patterns WG.

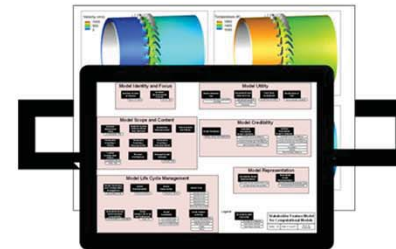
FEA Model



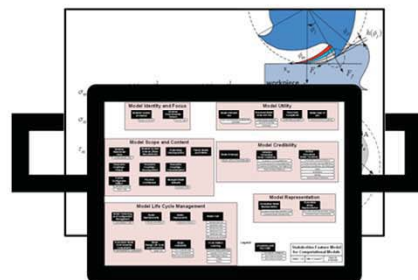
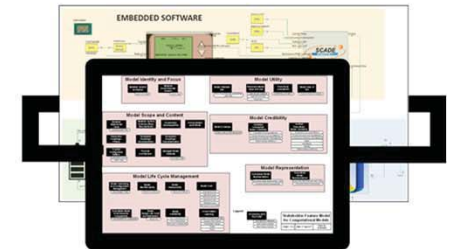
ODE Model



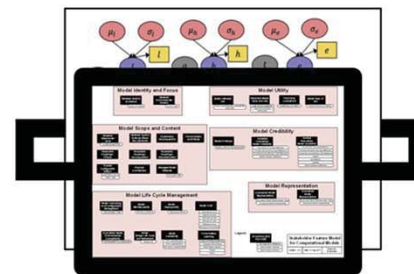
CFD Model



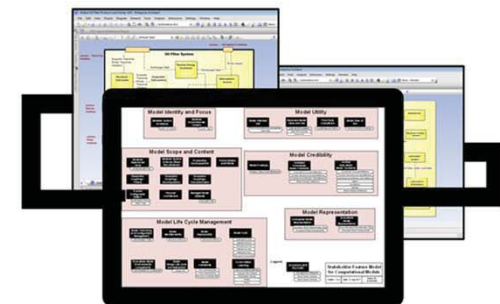
Multi-Domain
System Model



Physics-Based
PDE Model



Data-Driven Bayesian
Network Model



MBSE Model

IFSR – INCOSE Collaboration



- INCOSE a member of IFSR since 2011
- Led by SSWG, several INCOSE WGs collaborating.
- At IFSR “Conversation” meeting of 2018-- authored the “MBE Manifesto”

The screenshot shows the IFSR website homepage. At the top right, there are links for "Payment to IFSR", "Imprint", and "Subscribe to IFSR News". The main header features the IFSR logo and the text "International Federation for Systems Research" with the tagline "Uniting the World in Systems Science". Below the header is a navigation menu with links for "Home", "The IFSR", "Publications", "IFSR Activities", "Member Societies", "IFSR Conversations", "Resources", and "Contact Us". The main content area is titled "What is the IFSR?" and includes a search box on the right. The text describes IFSR as a non-profit organization founded in 1981, comprising 45 member organizations. It lists the Federation's purpose, its governance structure (Board of Directors, Executive Committee), and its major publications, including "The Journal of Systems Research and Behavioural Science", "The IFSR Book Series on Systems Science and Engineering", "The IFSR Newsletter", "Proceedings of Fuschl Conversations", and "IFSR W. Ashby Memorial Lectures". On the right side, there is an "Archives" section with a list of months from October 2018 to March 2017.



ST4SE – INCOSE Collaboration

- Semantic Technologies for Systems Engineering (ST4SE).
- INCOSE collaborating with members from NASA, CSER, others.
- In support of shared ontology for systems engineering, supported by semantic technologies.

Report to INCOSE Fellows at INCOSE IS2018

Semantic Technologies for Systems Engineering

Bill Schindel
ICTT System Sciences

Based on earlier presentation by Steve Jenkins and contributions by other ST4SE Core Team Members



ASSESS – INCOSE Collaboration

- Historical ASSESS focus on simulations—particularly demand versus capabilities.
- Joint participation in both INCOSE IW MBSE Workshops and ASSESS Congresses.

ASSESS >>

[MEMBERSHIP](#) [CONGRESS](#) [THEMES](#) [RESOURCES](#) [ABOUT](#) [CONTACT](#)

CONGRESS >>>

[2019](#) [2018](#) [2017](#) [2016](#) [2015](#)

ASSESS 2019 CONGRESS

Initial investigations into the “Simulation Revolution” have proven that an initiative to compliment the struggle to meet the growing demand for Engineering Simulations in all areas of business was necessary.

The ASSESS 2019 Congress is organized by the ASSESS Initiative to help advance the required “Simulation Revolution”.

As the ASSESS Initiative grows in memberships and Congress attendance, a diversity of ideas and perceptions are essential in developing a way forward that helps everyone involved in the “Simulation Revolution”. This movement is made possible with participants willing to work together to create new perspectives and activities that facilitate broader use and benefit of Engineering Simulation. The effort to move Engineering Simulation forward brings together thought leaders in Engineering Simulation who then collaborate regardless of titles and companies to create a



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OCT 27-29**

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WWW



US DoD – INCOSE Collaboration

- INCOSE Digital Engineering Information Exchange (DEIX) WG
- Not limited to defense focus, inviting civil enterprise, common interest.
- But encouraged by DoD to increase mutual leverage in shared Digital Engineering (DE) interests



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[Ontology](#)

Digital Engineering Information Exchange



Digital Artifacts: A digital form of information content that a digital engineering ecosystem produces and consumes by generally following the systems engineering life cycle's process areas as defined in ISO 15288. Includes all information content shared between stakeholders to execute the total technical and managerial effort required to transform a set of stakeholder needs, expectations, and constraints into a solution and to support that solution throughout its life.

Digital artifacts provide “data for alternative views to visualize, communicate, and deliver data, information, and knowledge to stakeholders. They include model-based representations of “information that originates and terminates in many forms (e.g. audiovisual, textual, graphical, numerical) and mediums (e.g., electronic, printed, magnetic, optical).” Organization constraints, e.g., infrastructure, interorganizational communications, and distributed project workings, are taken into account. Relevant information item standards and conventions are used according to policy, agreements and legislation constraints”. Includes include data sheets (electronics), databases (software), documents (operator role), and exportable data files (mechanics) and more. (ISO 15288 NOTE in Information Management Process)

Digital Engineering Information Exchange (DEIX): The exchange of digital artifacts between system engineering entities (processes, models, and organizational elements).

Chair:

[John Coleman](#) / [Frank Salvatore](#) / [Chris Schreiber](#)

January 20, 2019

All good, but barely scratching the surface



- Numerous other model-related communities
- Example: Many simulation societies
- Not just the “model creators” (modelers)—Much larger are the model user populations:
 - e.g., Decision-makers (e.g., management associations)
- Educators (e.g., ASEE)
- Other technical professional societies
- Simulation societies
- Model-oriented tooling suppliers
- Application domains (chemistry, construction, etc.)



| Population <-- Size (Log) | Stakeholders in A Successful MBSE Transformation (showing their related roles and parent organizations) | | | | | |
|--|---|------------------------------|---|--------------------------|--|---|
| | | Industry & Govt. Initiatives | Orig. Internalizing MBSE, Including Govt Contractors & Commercial Vendors of MBSE Tooling and Services | Academia and Researchers | Technical Societies, Other Non- Technical Organizations | |
| Model Consumers (Model Users): | | | | | | |
| **** | Non-technical stakeholders in various Systems of Interest, who acquire / make decisions about / make use of those systems, and are informed by models of them. This includes mass market consumers, policy makers, business and other leaders, investors, product users, voters in public or private elections or selection decisions, etc. | X | X | | X | |
| ** | Technical model users, including designers, project leads, production engineers, system installers, maintainers, and users/operators. | X | X | | X | |
| * | Leaders responsible to building their organization's MBSE capabilities and enabling MBSE on their projects | X | X | | X | |
| Model Creators (including Model Improvers): | | | | | | |
| * | Product visionaries, marketers, and other non-technical leaders of thought and organizations | X | X | | X | X |
| * | System technical specifiers, designers, testers, theoreticians, analysts, scientists | X | X | | X | X |
| * | Students (in school and otherwise) learning to describe and understand systems | | | | X | X |
| * | Educators, teaching the next generation how to create with models | X | X | | X | |
| * | Researchers who advance the practice | | X | X | X | |
| * | Those who translate information originated by others into models | X | X | | X | X |
| * | Those who manage the life cycle of models | X | X | | X | X |
| Complex Idea Communicators (Model "Distributors"): | | | | | | |
| ** | Marketing professionals | X | X | X | | X |
| ** | Educators, especially in complex systems areas of engineering and science, public policy, other domains, and including curriculum developers as well as teachers | X | X | X | X | |
| ** | Leaders of all kinds | X | X | X | X | X |
| Model Infrastructure Providers, Including Tooling, Language and Other Standards, Methods: | | | | | | |
| * | Suppliers of modeling tools and other information systems and technologies that house or make use of model-based information | | | X | | |
| * | Methodologists, consultants, others who assist individuals and organizations in being more successful through model-based methods | X | X | X | X | |
| * | Standards bodies (including those who establish modeling standards as well as others who apply them within other standards) | X | | | | X |
| INCOSE and other Engineering Professional Societies | | | | | | |
| * | As a deliverer of value to its membership | | | | | X |
| * | As seen by other technical societies and by potential members | | | | | X |
| * | As a great organization to be a part of | | | | | X |
| * | As promoter of advance and practice of systems engineering and MBSE | | | | | X |



INCOSE Outreach Planning & Work Session

- At INCOSE IW2019: Tuesday, January 29
- Available 8:30 – 11:30 AM PT (come & go)
- Salon H -- or dial-in
- Purpose: Start improving our collective understanding of the different model-based community segments, relationships, how we gain by improving awareness and interaction:
 - Including awareness & support for current outreach efforts by others.
- Along with ideas on additional actions that INCOSE and others can take to improve our effectiveness as a connected community advancing the practice of model-based approaches.



Remote participation in this meeting

PARTICIPANT GlobalMeet Join Details - Join as GUEST

Meeting Details Web Address:

<https://incose.pgimeet.com/GlobalmeetFourteen>

Dial In Numbers:

USA /Canada (toll free): 1-877-860-3058

USA/Canada: 1-719-867-1571

Or attend on site:
Salon H at IW2019

Guest Passcode: 288 747 4803



Meeting/Work Session Agenda

- Objectives
- Introductions
- Some existing INCOSE examples
- Model community segments
- Identification of organizations, interests
- Contact tree: contributions and follow ups
- Generation of initial directory
- Other next steps



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