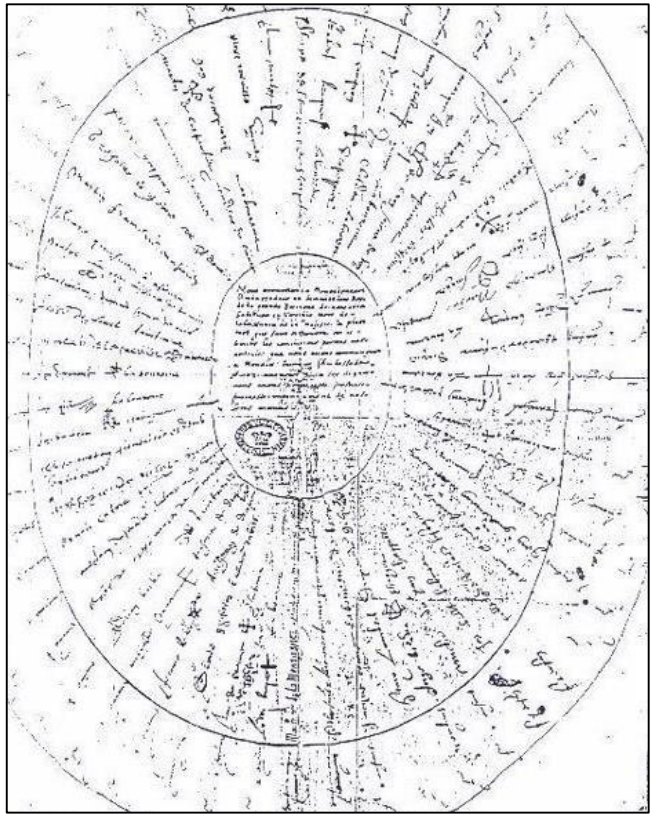
schindel@ictt.com
V1.2.1

2021 Annual INCOSE international workshop
Virtual Event
January 29 - 31, 2021

Call for
Project Participants

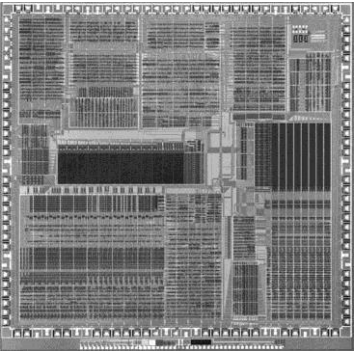


Jessé de Forest's Round Robin from 1621
https://en.wikipedia.org/wiki/Round-robin_(document)

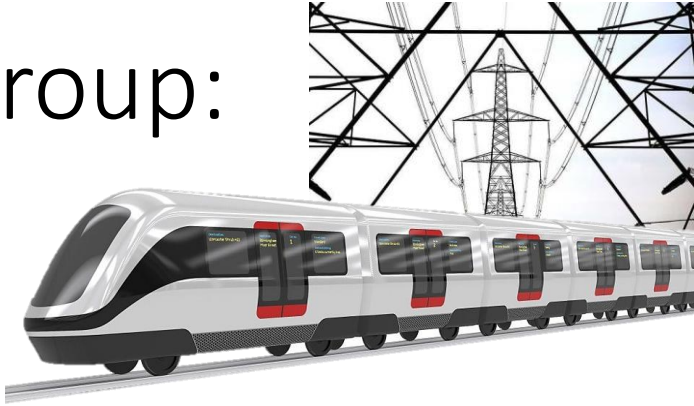
MBSE Patterns Working Group

IW2021 MBSE Workshop, 30 Jan 2021:
Working Groups 'Round Robin' Session

Round robin (n.): "petition or complaint signed in a circle to disguise the order in which names were affixed and prevent ringleaders from being identified," 1730, originally in reference to sailors and frequently identified as a nautical term. https://www.etymonline.com/word/round%20robin

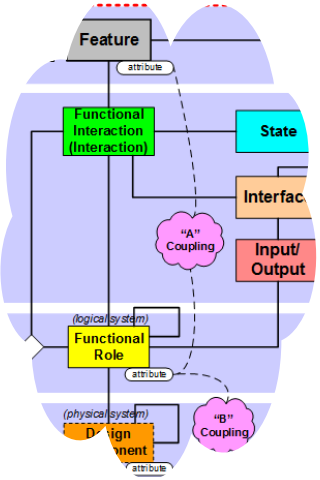


Focus of MBSE Patterns Working Group: S*Patterns



***Configurable, re-usable system models*:**

1. Models containing a certain minimal set of elements are called S*Models (S* is short for “Systematica”)
2. Those underlying elements are called the S*Metamodel, which was inspired by the physical sciences
3. S*Models using those elements may be (have been) expressed in any modeling language (e.g., OMG SysML, or other languages)
4. S*Models can be (have been) created and managed in many different COTS modeling tools.
5. Re-usable, configurable S*Models are called S*Patterns
6. By “Pattern-Based Systems Engineering” (PBSE) we mean MBSE enhanced by these generalized assets
7. These are system-level patterns (models of whole managed platforms), not just smaller-scale component design patterns



Current MBSE Patterns WG Projects, Activities

1. *INCOSE SE Handbook*, 5th Edition Project
2. *INCOSE Vision 2035*, SE Theoretical Foundations Project
3. Adaptive Learning Ecosystem Pattern—the ASELCM Reference Framework
4. Universal Model Metadata Wrapper: Model Characterization Pattern (MCP)
5. INCOSE MBSE Patterns Primer
6. Minimal S*Models—A Primer
7. Semantic Technologies for Systems Engineering (ST4SE) Project

Join and participate!

1. *INCOSE SE Handbook*, 5th Edition Project

- The Patterns Working Group is contributing an invited section on pattern-based methods to the INCOSE SE Handbook, 5th edition project, now in generation.
- The structure of the 5th Edition of the SE Handbook is re-architected compared to past editions, based on progress and needs of the community.
- Those interested in participating can contribute to review of the related handbook material during defined project phases, as the overall SE Handbook 5th Edition progresses during 2021.
- Initial review held during IW2021 meetings.
- Overall project is led by INCOSE Handbook Editorial Team, chaired by Dave Walden.

Current (4th) Edition

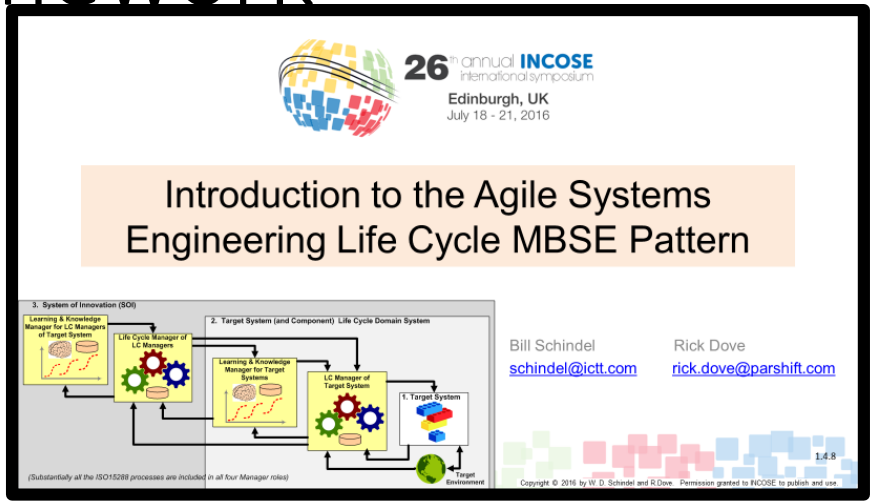
2. *INCOSE Vision 2035*, SE Theoretical Foundations Project

- The Patterns Working Group is providing the SE Theoretical Foundations section of INCOSE Vision 2035 publication project, now underway.
- At IW2020, an initial conceptual review with a set of expert reviewers was held, since followed by drafting of the related sectional material.
- This includes a community-wide Roadmap for the advancement of SE Practice, Education, and Research, based on the impacts of these strengthened foundations.
- Those interested in participating can be a part of the diverse future activities listed in that roadmap over the coming periods, beginning with review of the materials to date.
- Overall INCOSE project is led by editorial team chaired by Sandy Friedenthal.

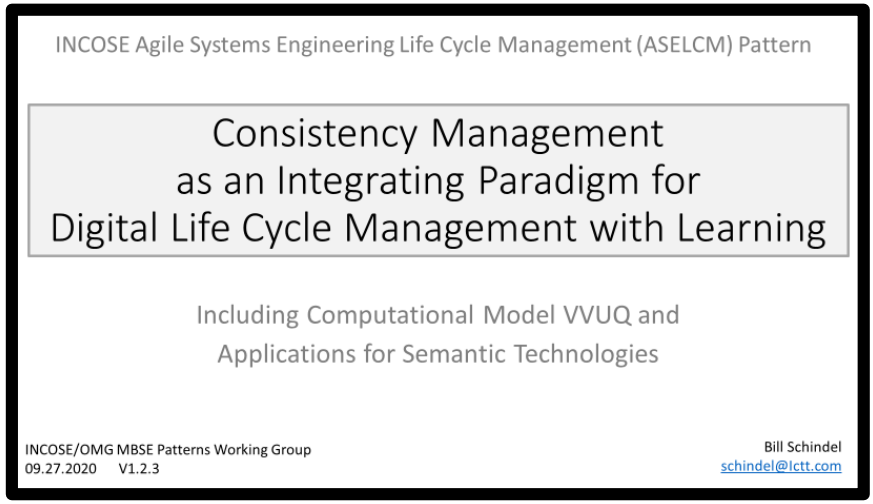
Current (Vision 2025) Edition

3. Adaptive Learning Ecosystem Pattern—the Learning Ecosystem (ASELCM) Reference Framework

- Collaborating with the INCOSE Agile SE WG, a reference pattern was contributed by the Patterns WG as part of the two-year INCOSE study of agile SE practices of four major organizations during 2015-2017, leading to its application in four published case studies. (Led by Rick Dove, Agile SE WG.)
- That original pattern (Agile SE Life Cycle Management (ASELCM) Operational Reference Pattern) has subsequently been formalized by the Patterns WG as a configurable S*Pattern in SysML, for the planning, analysis, and management of advancement in learning ecosystems for projects, enterprises, and supply chains.
- The resulting multi-layer pattern focuses on *leveraging Digital Engineering to advance performance through the paradigm of strengthened Consistency Management*.
- Those interested in participating can be a part of extension and application of this pattern in case studies of their own projects, enterprises, or supply chains, plus related tooling.



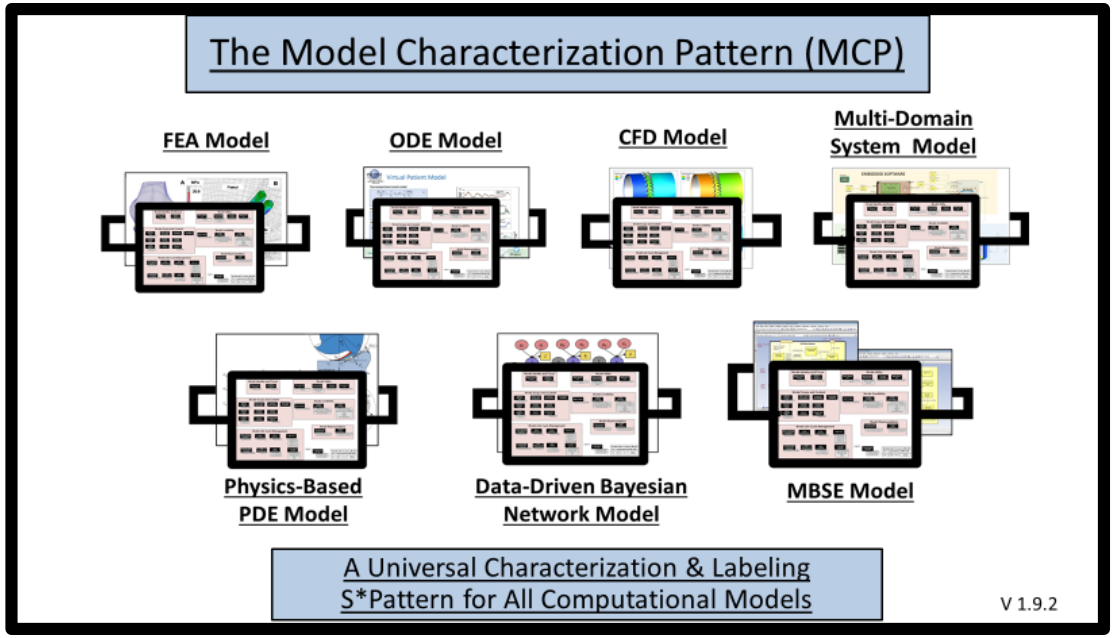
http://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:is2016_intro_to_the_aselcm_pattern_v1.4.8.pdf



http://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:aselcm_pattern_--_consistency_management_as_a_digital_life_cycle_management_paradigm_v1.2.2.pdf

4. Universal Model Metadata Wrapper: The Model Characterization Pattern (MCP)

- Collaborating with the ASME Standards Committee on Model Credibility, VV50 Subcommittee, the Patterns WG has created a configurable pattern for representing metadata on any virtual model, including Machine Learning, Simulation (FEA, CFD, SD, ODE), MBSE, or otherwise. (ASME WG led by Joe Hightower.)
- This universal metadata framework includes Model Identify and Focus, Model Utility, Model Scope and Content, Model Credibility, Model Representation, and Model Life Cycle Management.
- Those interested in participating can be a part of continued testing and feedback on the application of the MCP to model library organization and management, model exchanges and markets, and model life cycle credibility management.



http://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:model_characterization_pattern_mcp_v1.9.3.pdf

5. *MBSE Patterns Primer*

- The Patterns WG generated an introduction and overview of pattern-based methods and their relationships with other subjects—this was several years ago and before the emergence of newer INCOSE Tech Ops approaches to INCOSE Technical Product "primers" on various subjects supported by the working groups.
- This project is concerned with recasting the earlier publication in the form of an updated "Primer" on model-based patterns and related subjects.
- Those interested in participating can be a part of review of the earlier document and newer INCOSE primers, regeneration of an updated primer form asset, or review of the resulting document for submission as a Technical Product.

MBSE Methodology Summary:

Pattern-Based Systems Engineering (PBSE), Based On S*MBSE Models

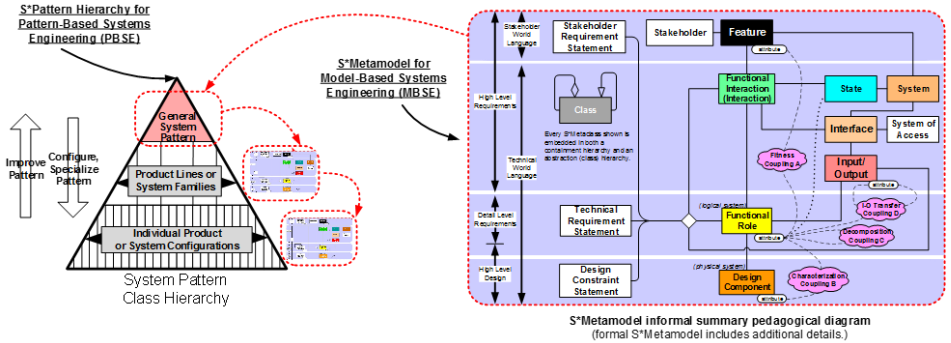
Document Purpose:

This document is a methodology summary for Pattern-Based Systems Engineering using S*MBSE models. The material below, resulting from Patterns Challenge Team review, feedback, and related updates, is for contribution to the INCOSE-maintained on-line directory "MBSE Methodology: List of Methodologies and Methods".

The current content of that on-line directory may be found at
http://www.omgwiki.org/MBSE/doku.php?id=mbse:methodology#mbse_benchmarking_survey

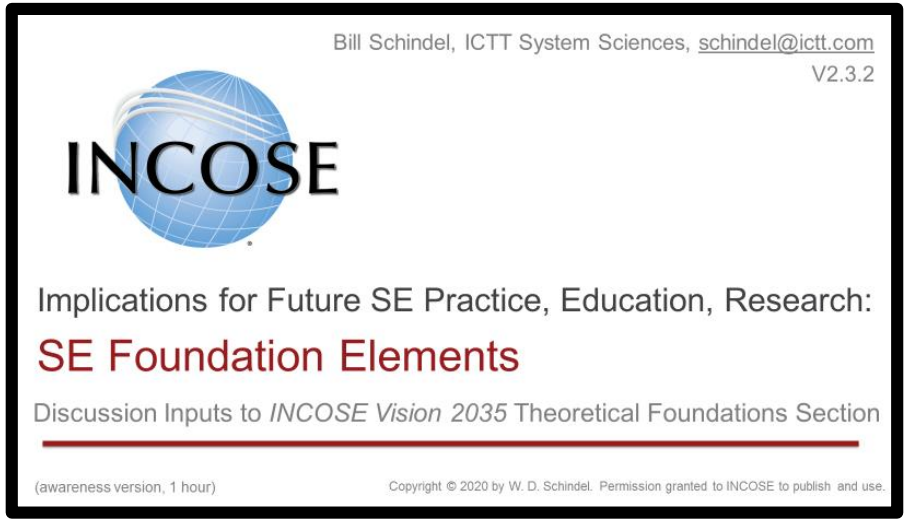
The sectional structure of the following sections conforms to the standard summary outline template used by the referenced methodology directory. The typical methodology descriptions in that directory are currently summaries, not detailed "how to" manuals, for each methodology.

http://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:pbse_extension_of_mbse--methodology_summary_v1.6.1.pdf



6. Minimal S*Models—A Primer

- The laws of nature which are the basis of the natural sciences are all formal descriptions of recurring patterns associated with observable phenomena (things that happen).
- Finding the smallest model-based representation of those patterns has important practical as well as theoretical importance.
- The practical importance is reduction of unnecessary proliferation of information that is redundant and often inconsistent or conflicting.
- The theoretical importance is that size of minimal models is one of formal measures of (Kolmogorov) complexity.
- Independent of choices of modeling languages, tools, and methods, we want to base our representation of system patterns on the simplest framework necessary for the purposes of engineering and science over the life cycle of systems.
- This Primer is to describe the S*Metamodel—a long-tested pattern based on the history of physical sciences and engineering, focused on the minimal information set.
- Those interested in participating can be a part of writing and review of this S*Metamodel Primer—including examples.



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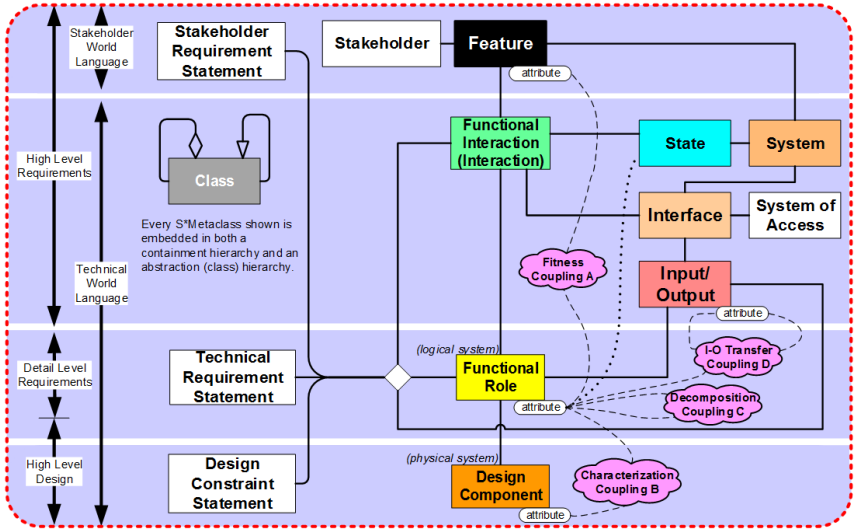
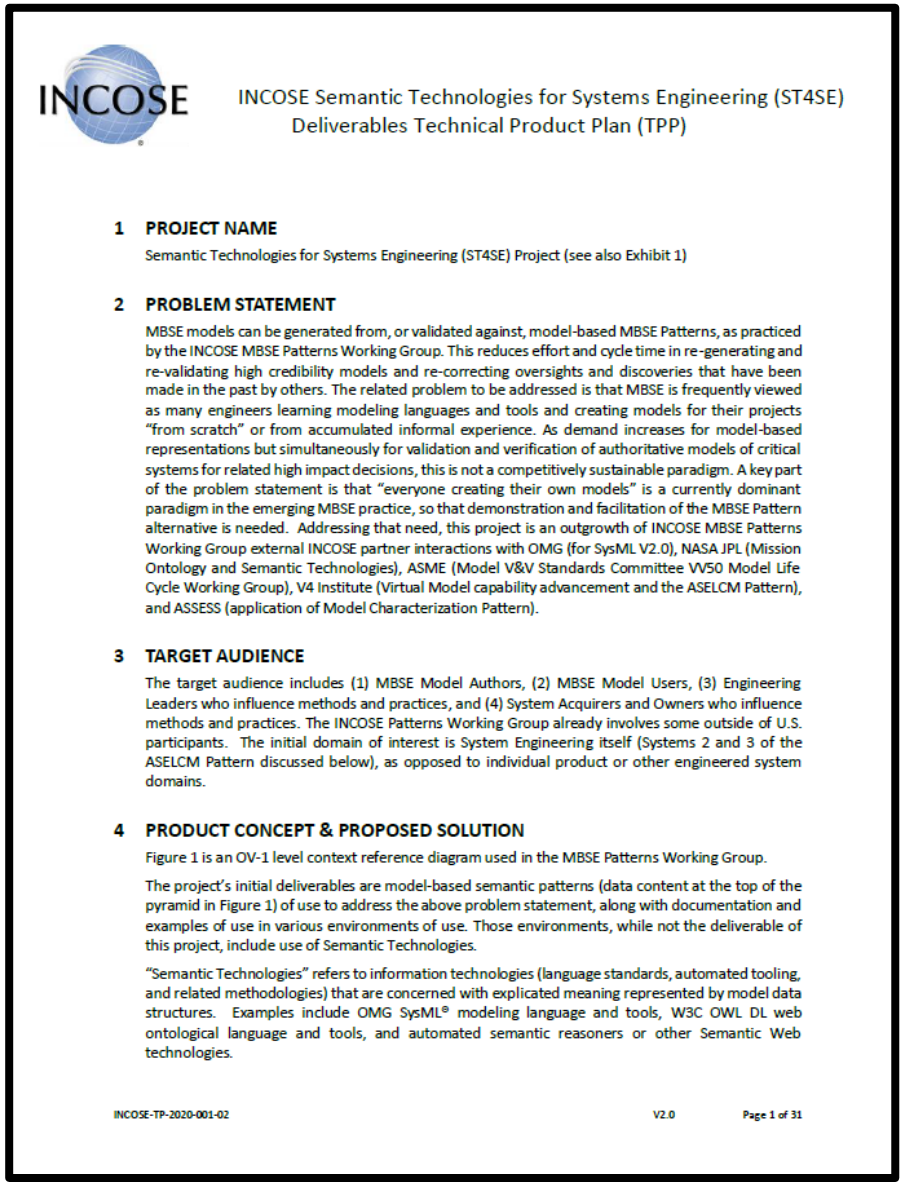


S*Metamodel informal summary pedagogical diagram
(formal S*Metamodel includes additional details.)

7. Semantic Technologies for Systems Engineering (ST4SE)

- Human beings may be the original interpreters of the meaning of models, but non-human semantic technologies have joined them.
- Information technologies that deal with model semantics (relationally encoded meaning) include modeling languages, model authoring tools, simulation engines, web-based semantic data structures, and query and reasoning technologies for retrieving views and implications of semantic models.
- Semantic technologies offer to supplement human SE skills with IT-based abilities to strengthen the ability for model-based semantics to impact engineering work.
- This project is merging demonstration of (1) [automated generation of consistent trustable models from trusted model-based patterns] with (2) [automated checking of human-generated models against trusted model-based patterns].
- This project is the second phase of the Interface Patterns Project of the MBSE Patterns WG, under a newer Technical Product Plan that includes exploration of INCOSE Product distribution of pattern data structures that are not themselves documents.
- Those interested in participating can be a part of evaluating the utility of the combination as well as the new shared patterns distribution paradigm.



INCOSE

INCOSE Semantic Technologies for Systems Engineering (ST4SE)
Deliverables Technical Product Plan (TPP)

1 PROJECT NAME

Semantic Technologies for Systems Engineering (ST4SE) Project (see also Exhibit 1)

2 PROBLEM STATEMENT

MBSE models can be generated from, or validated against, model-based MBSE Patterns, as practiced by the INCOSE MBSE Patterns Working Group. This reduces effort and cycle time in re-generating and re-validating high credibility models and re-correcting oversights and discoveries that have been made in the past by others. The related problem to be addressed is that MBSE is frequently viewed as many engineers learning modeling languages and tools and creating models for their projects "from scratch" or from accumulated informal experience. As demand increases for model-based representations but simultaneously for validation and verification of authoritative models of critical systems for related high impact decisions, this is not a competitively sustainable paradigm. A key part of the problem statement is that "everyone creating their own models" is a currently dominant paradigm in the emerging MBSE practice, so that demonstration and facilitation of the MBSE Pattern alternative is needed. Addressing that need, this project is an outgrowth of INCOSE MBSE Patterns Working Group external INCOSE partner interactions with OMG (for SysML V2.0), NASA JPL (Mission Ontology and Semantic Technologies), ASME (Model V&V Standards Committee VV50 Model Life Cycle Working Group), V4 Institute (Virtual Model capability advancement and the ASELCM Pattern), and ASSESS (application of Model Characterization Pattern).

3 TARGET AUDIENCE

The target audience includes (1) MBSE Model Authors, (2) MBSE Model Users, (3) Engineering Leaders who influence methods and practices, and (4) System Acquirers and Owners who influence methods and practices. The INCOSE Patterns Working Group already involves some outside of U.S. participants. The initial domain of interest is System Engineering itself (Systems 2 and 3 of the ASELCM Pattern discussed below), as opposed to individual product or other engineered system domains.

4 PRODUCT CONCEPT & PROPOSED SOLUTION

Figure 1 is an OV-1 level context reference diagram used in the MBSE Patterns Working Group.

The project's initial deliverables are model-based semantic patterns (data content at the top of the pyramid in Figure 1) of use to address the above problem statement, along with documentation and examples of use in various environments of use. Those environments, while not the deliverable of this project, include use of Semantic Technologies.

"Semantic Technologies" refers to information technologies (language standards, automated tooling, and related methodologies) that are concerned with explicated meaning represented by model data structures. Examples include OMG SysML® modeling language and tools, W3C OWL DL web ontological language and tools, and automated semantic reasoners or other Semantic Web technologies.

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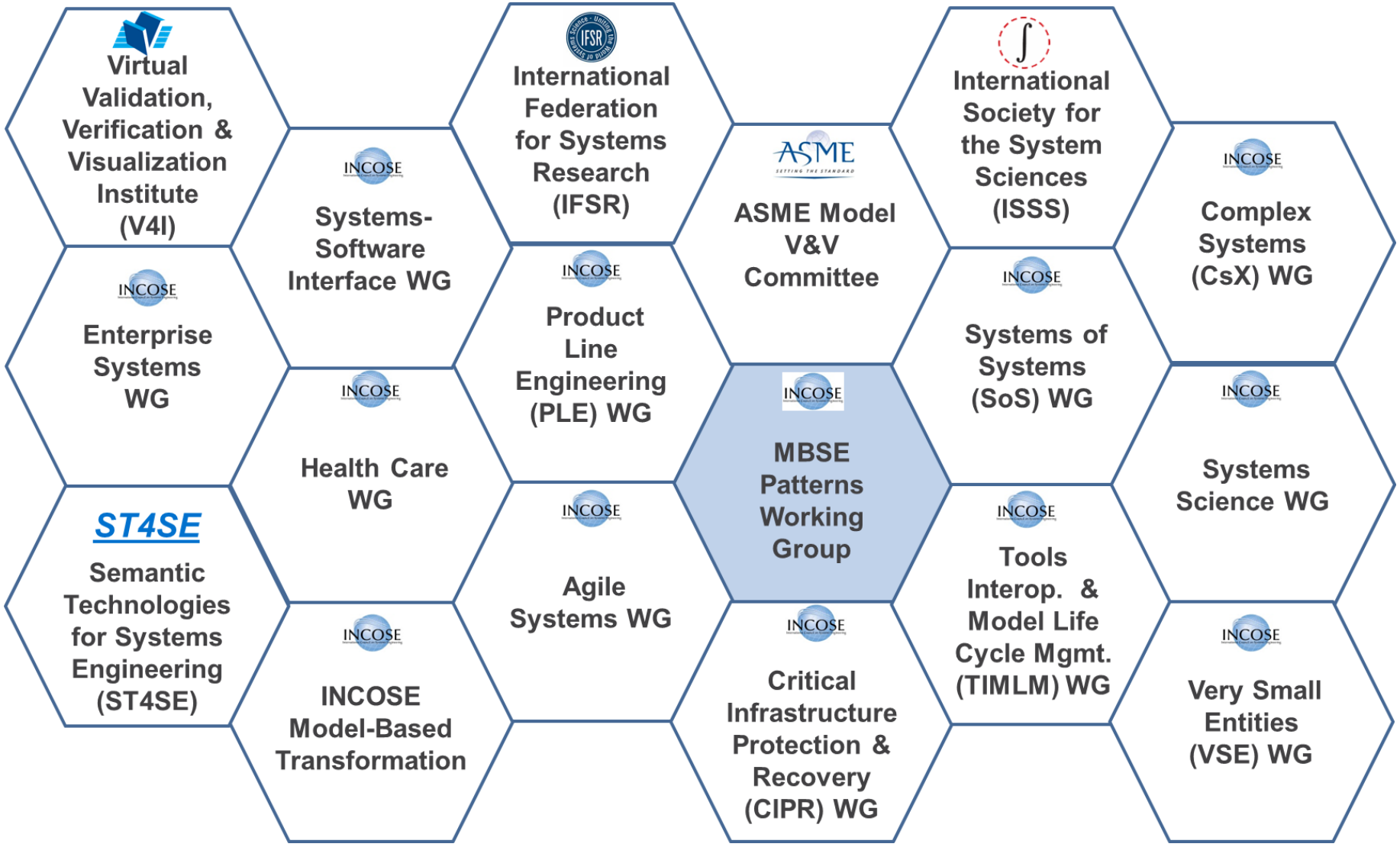
http://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:incose_patterns_wg_st4se_project_tpp_v2.0_signed.pdf

Nearly all our work includes partner INCOSE WGs or others



Participate!

Contact: Bill Schindel schindel@ictt.com

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2. "The Model Characterization Pattern (MCP): A Universal Characterization & Labeling S*Pattern for All Computational Models". Retrieve from -- http://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:model_characterization_pattern_mcp_v1.9.3.pdf
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7. "What Is the Smallest Model of a System?" Retrieve from -- http://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:what_is_the_smallest_model_of_a_system_v1.4.4.pdf
8. MBSE Patterns Working Group web sites:
   - Public-facing (main resources, INCOSE joint with OMG): http://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns
   - Inward-facing (incose.org): https://www.incose.org/incose-member-resources/working-groups/transformational/mbse-patterns