Charter: Pattern-Based Systems Engineering (PBSE) Challenge Team

The Pattern-Based Systems Engineering (PBSE) Challenge Team is a component of the INCOSE/OMG Model-Based Systems Engineering (MBSE) Initiative (http://www.omgwiki.org/MBSE/doku.php). This Charter is a draft proposed by the founding team members, for review and update by the team in formation and INCOSE MBSE Initiative leadership.

1. Purpose:
1.1. Conceptual Summary:

As used here, System Patterns are configurable, re-usable System Models that would otherwise be like those expected and found in the practice of MBSE (not limited to, but including, SysML models). Through the availability and use of System Patterns, the outcomes targeted by MBSE models are made more accessible, in terms of ease (and skill) of generation and use, associated modeling cost, schedule, risk, completeness, and consistency, etc. Over time, System Patterns become points of accumulation of organizational learning and expertise. Because they are configurable and re-usable models of families or classes of systems, model-based System Patterns involve some additional methods and disciplines that extend the ideas of MBSE (e.g., Pattern Management, Configuration Rules, model minimality, etc.).

This model-based PBSE approach has been in use for a number of years, applied across enterprises and domains that include mil/aerospace, communications, automotive, medical/health care, advanced manufacturing, consumer products, along with business processes including sales, engineering, production, and general innovation. The first INCOSE PBSE tutorial was provided at IS2005, another given at GLRC2012, and another at IS2013, with those attending the latter responding positively to interest in an ongoing PBSE group of some kind. We have also published a number of papers on this approach. Another PBSE workshop is currently planned for GLRC2013 in October.

1.2. Specific Challenge:

The PBSE Challenge Team will advance the availability of model-based System Patterns and related PBSE resources, and awareness of them, increasing the availability and successful use of System Models across the life cycle of systems. Specifically, this will be accomplished by meeting the following challenge:

> *Generating two or more MBSE models across multiple systems and system domains from single system pattern asset(s) leveraged across them. The specific domains and systems will be chosen based on the team membership's priority interests, but are currently expected to include at least one multiple-configuration manufactured product line system, as well as the manufacturing system that produces it. This challenge will include quantification of the demonstrated economies or other gains obtained through pattern asset leverage, and the infrastructure (e.g., tools, processes) necessary to support those gains.*

2. Measures of Success:

Targeted stakeholder and related measures of success are:

System Innovation / Development Teams: Enjoy the benefits of MBSE with lower per-project model-origination and refinement time, effort, skill load, and risk, by employing configured System Patterns as early draft models.

System Modelers: Extend the span of influence of skilled individual modelers by making their models effectively available, applicable, and impactful to more projects, systems, and products.

Product Line Managers, Platform Managers, Portfolio Managers: Improve the effectiveness of families-of-systems disciplines, measured in terms of economic leverage.

System Verification Teams: Improve the performance of system verification planning and execution in high risk or complexity systems.

System Life Cycle Groups: Improve satisfaction with the early fit of systems to the learned needs of system life cycle communities, including manufacturing, distribution, end user, operations, and maintenance, over a broad range of issues that should not be re-discovered each generation (functionality, safety, many other aspects).

Tool Suppliers: Improve the ROI demonstrated by tools.

Enterprises: Improve organizational-level learning across individual people and projects, reducing occurrences of re-learning the same lessons and repeating the same mistakes.

3. Plan Overview / Description:

Phase 1: (Time period to be established)

1. Supplement start-up team membership with other interested team members, sharing and refining charter and gaining team buy-in to this plan.
2. Bring team membership to a common level of PBSE understanding, using PBSE Tutorials conducted in recent years at IS, GLRC, and chapter levels, including example System Pattern content.
3. Identify target products for near-term work by the team:
    a. Target System Patterns
    b. Target System Pattern Applications
    c. Business Process Implications Model of PBSE
    d. Demonstration of PBSE support in Tools and Information Systems
    e. PBSE Tutorials
    f. Other target products

Phase 2: (Time period to be established)

4. Create and validate targeted Challenge Team products, prioritized from above

Phase 3: (Time period to be established)

5. Make Challenge Team products available to INCOSE membership, extending benefits.

4. <u>Schedule</u>

Date	Milestone	Status	Point of Contact
Aug, 2013	Gain agreement of MBSE leadership	Done	Bill Schindel
Jul-Aug 2013	Collect initial team members, refine charter	Done	Bill Schindel
Oct, 2013	Provide PBSE Tutorial at GLRC2013	Done	Bill Schindel
Jan, 2014	Provide PBSE introductory report and announce start up at IW2014	Arranged in principle, details being generated	Bill Schindel
	(To be filled in based on schedule planned above)		

5. <u>Team Members</u>

Name	Organization	Contact Information
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6. <u>References and Links</u>

1. Bill Schindel, Troy Peterson, "Introduction to Pattern-Based Systems Engineering (PBSE): Leveraging MBSE Techniques", INCOSE IS2013 Tutorial, June, 2013.

2. W. Schindel, "What Is the Smallest Model of a System?", *Proc. of the INCOSE 2011 International Symposium*, International Council on Systems Engineering (2011).

3. W. Schindel, "Pattern-Based Systems Engineering: An Extension of Model-Based SE", INCOSE IS2005 Tutorial TIES 4, (2005).

4. J. Bradley, M. Hughes, and W. Schindel, "Optimizing Delivery of Global Pharmaceutical Packaging Solutions, Using Systems Engineering Patterns" *Proceedings of the INCOSE 2010 International Symposium* (2010).

5. W. Schindel, and V. Smith, "Results of Applying a Families-of-Systems Approach to Systems Engineering of Product Line Families", SAE International, Technical Report 2002-01-3086 (2002).

6. W. Schindel, "The Impact of 'Dark Patterns' On Uncertainty: Enhancing Adaptability In The Systems World", INCOSE Great Lakes 2011 Conference, Dearborn, MI, 2011.

7. W. Schindel, "Introduction to Pattern-Based Systems Engineering (PBSE)", INCOSE Finger Lakes Chapter Webinar, April 26, 2012.

8. W. Schindel, "Integrating Materials, Process & Product Portfolios: Lessons from Pattern-Based Systems Engineering", *Proc. of 2012 Conference of Society for the Advancement of Material and Process Engineering,* 2012.