

# Meeting Minutes

**Meeting:** Jan 27, 2014, meeting of Patterns Challenge Team of MBSE Initiative, 1:00 – 4:00 PM, at INCOSE IW2014, Los Angeles (Torrance), CA, USA

**Attendees:** (\* by telephonic/web meeting access) (\*\* co-chairs of challenge team)

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## **Summary:**

1. This was the start-up meeting of the Patterns Challenge Team, based on the formation draft Charter.
2. On the preceding day, Eric Berg gave a presentation at the MBSE Workshop, on Procter & Gamble's use of S\*Patterns and Pattern-Based Systems Engineering over recent years.
3. Attendees introduced themselves, and explained their individual interests in system patterns.
4. Bill Schindel provided a briefing on the model-based foundation of S\*Patterns this group targets.
5. A verbal Q&A session explored the attendees' questions and interests.
6. Attendees identified a set of four (4) challenge team projects of interest to pursue by specific members, along with two (2) activities.
7. Frequency of future team or sub-team meetings and major milestone timing were discussed.

## Details:

8. We discussed the S\*Metamodel, the basis of S\*Models that are the foundation of S\*Patterns. Particular emphasis was given to physical Interactions as the core of these patterns, and to selectable Features as the basis of their modularity. See the References below.
9. Question: What is the history and background of the S\*Metamodel? Answer: The S\*Metamodel has been around for many years and has a history in INCOSE tutorials and papers going back about 10 years. It has been applied across many different system domains and industries (examples in References below).
10. Question: Is there a modeling language aspect? Answer: Although S\*Models and S\*Patterns are frequently expressed in SysML, the underlying S\*Metamodel is independent of any particular modeling language or tool, and used with several.
11. Question: Is there a modeling tool aspect? Answer: The S\*Metamodel is tool-neutral, and has been mapped to and used in a number of third party COTS tools and PLM repositories.
12. Question: Is there some form of related licensing required? Answer: The core approach and summary Metamodel are widely published and described in public tutorials, as through this MBSE Initiative team. References noted to licenses are concerned with more advanced packagings of PBSE by ICTT System Sciences, for enhancing enterprise processes and third party COTS tools.
13. Question: Does the entire S\*Metamodel need to be applied, and across the entire system life cycle? Answer: No, S\*Patterns can be applied with benefit in narrow or broader parts of the system life cycle—this is a business choice. You can use the portions of the S\*Metamodel that make sense for what you are trying to accomplish. It represents the minimal set of things you should include in a model for purposes of engineering or science.
14. Question: Is the S\*Metamodel application specific? Answer: No, it can be / has been used in many different domains – for instance it could be used for a product/system, the business process or the manufacturing process to develop the product. Regardless, you want a strong pattern with the minimal set of information to represent that system – no specialization required. There are fixed parts and variable parts to patterns, and you can populate and depopulate classes and set attribute values.
15. Patterns generally apply in some domain, suggested by the pattern’s domain model. Crash Konwin suggested that there could be a natural link to an NDIA effort to provide data requirements across the DoD lifecycle, within seven DoD-oriented domains. May be good to connect the efforts; the first call is 30-Jan. Crash Konwin offered to be the group POC to link to this effort.
16. Question: Have you thought about things which are not patterns? Point was made that this could provide a good example and show contrast.
17. Question: Does the Stakeholder Feature have any linkages to ISO4210? Are patterns different than a Reference Architecture or Architectural Framework? Answer: Patterns are related to architectural frameworks. See TRAK, for example. The S\*Metamodel, by its intended scope, covers more territory than some frameworks, and other aspects of some frameworks show up as specialized pattern classes within certain S\*Patterns.
18. Question: Are S\*Patterns the same as software design patterns (as pioneered by the “Gang of Four”, following the earlier civil patterns metaphor of Christopher Alexander)? Answer: There

are a number of comparisons. Software design patterns are about software, not general systems, so they fit within a subset of the larger space described by S\*Patterns. Software design pattern descriptions were not conceived as explicitly model-based (although they could be), and particularly are not S\*Model based. Software design pattern descriptions spend somewhat more attention describing the solution (design) than the context in which it applies (also described), and does not formalize that context as formal requirements per se, but both could be said to describe requirements and design, although to different degrees. The scope of the S\*Metamodel formalizes coverage of the whole requirements and design space. S\*Patterns also describe failure modes and other aspects of systems that S\*Patterns were not originated to describe. If one were to expand the design technology scope of software design patterns to systems in general, and were to convert the descriptions to being model-based, including minimal S\*Metamodel content, and were to include the other system information, then software design patterns would be said to expand or generalize to S\*Patterns.

19. Question: What about domain classifications of patterns – what level, general/specific? Answer: S\*Patterns are themselves arranged into families and class hierarchies. For example, there are general manufacturing system patterns, specific assembly and process-oriented manufacturing patterns, there are product-oriented patterns for vehicles, medical devices, orbital instrumentation platforms, consumer products, communication systems, aerospace systems, and pharmaceuticals, there are business process patterns, engineering or innovation process patterns, sales and marketing patterns, etc.
20. There was discussion of working on an engineering process pattern--something everyone was familiar with and could be of use to the INCOSE community.
21. Andy made the point that system artifacts should be reviewed by those most likely to detect errors, and this could be captured using a related process and domain pattern.
22. There was a discussion of the size and frequency of use (cycles) of different system patterns.
23. Andy pointed out that patterns can be used to provide early recognition of risk – helping to identify when you are off the path.
24. Group discussed research (pursued by MBSE Activity Teams) versus an applied product focus (pursued by MBSE Challenge Teams, of which this is one), and there was general consensus that the attendee preference was toward applied, as defined by our team’s charter.
25. Question: At what level of complexity do patterns have value? Response: Bill replied that a similar question could be asked of MBSE, about models. It really requires an understanding of the economic levers which vary depending upon the industry, business, program, risk, situation etc. However, there is a general economic difference between one-off models and patterns, which are re-usable models. In the case of patterns, the focus is on learning the model, not how to model, and the recurring cost is much lower than the development of a model, while retaining the benefits of models.
26. There was mention of potential projects focused on First Robotics, Rocket Competition, NASA sponsored lunar projects and the like.
27. The team reviewed the draft charter description of potential projects. Bill Schindel emphasized interest from MBSE Initiative leadership (Sandy Friedenthal, Mark Sampson) in the theme of infusing MBSE across the organization. After a length planning discussion, the following projects and interested project sub-team members emerged:

- a. Challenge Project 1: Restaurant System Pattern—describing requirements and possibly high level design of Service Providing System/Kitchen “Meal Manufacturing” System/Business Process System, configurable for different classes of restaurants. Members: Katy, Eric, JD. Purpose: Illustrate System Requirements Patterns
  - b. Challenge Project 2: Engineering Verification Pattern—describing (a) the structure of Target Engineered System model data to “pre-cast” it in an expected form that is suited for ease of verification analysis (in the most advanced case, by automated analysis; in other cases, by human analysis), along with (b) the Verification Process Pattern for the verification business process, providing configurability to different verification agents, to indicate what kind of agent is required to analyze or verify a given case—different levels of seniority or experience, or even an automated agent, in different cases. Members: Dan, Andy. Purpose: Improve target system models and engineering processes to gain effectiveness and efficiency in the review process.
  - c. Challenge Project 3: SEMP/SEP generation pattern—describing the auto-generation of SEMP/SEPs from target system patterns. Members: Shams, JD, Bill. Purpose: aid to anyone generating a SEMP/SEP; education for engineering students.
  - d. Challenge Project 4: NDIA Domains Pattern—aid in the form of a high level System Pattern, conforming to the seven defense system domains classified by NDIA. Members: Crash, Troy, Shams
  - e. Activity A: Liaison to SEBoK Challenge Team, at their request to the working groups. Members: Bill
  - f. Activity B: Liaison to Energy & Power Working Group. Members: Katie
28. Schedule: Teams to meet and pick work plan for major milestones at the time of IS2014, readiness to write an INCOSE IS2015 paper in time for November, 2014, papers deadline, project completion by IW2015.
29. Support: Bill willing to help any of the teams, including answering questions, holding a webinar, reviewing progress, etc.

#### **Action Items:**

- 30. Generate meeting notes and distribute to attendees and interested parties (Troy P, Bill S)
- 31. Project sub-teams join up and establish working plans against project goals (Katy, Eric, JD, Dan, Andy, Shams, Bill, Crash, Troy, others as interested—see above contact information)
- 32. Set next meeting of whole Challenge Team for IS2014 (Bill Schindel, Troy Peterson)
- 33. Report to MBSE Initiative on Challenge Team plans and status (Bill Schindel, Troy Peterson)

#### **References:**

- 34. Patterns Challenge Team web site (contains all the following downloadable references):  
<http://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns>
- 35. Patterns challenge team Charter
- 36. Meeting slides from Jan 27 2014 Patterns challenge team meeting
- 37. Eric Berg’s presentation on Procter & Gamble use of S\*Patterns, from MBSE Workshop
- 38. Other references on PBSE provided there.