

Ontology from an MBSE perspective

Brief-out from breakout session Monday, January 31st, 2011





Ontology from an MBSE perspective

- 1. What is an ontology?
- 2. Why apply ontologies to MBSE?
- 3. What are some approaches?
- 4. What are the critical issues?
- 5. Roadmap?







What is an ontology?



- Definition of a set of concepts, properties, relationships that are applicable to a domain/universe of discourse
- Formal model founded in a theory
 - Theory e.g. first order logic / common logic
- Ontology = Conceptual Data Model (?)
- Issue: term "model" is highly overloaded

http://en.wikipedia.org/wiki/Ontology_(information_science)

In computer science and information science, an ontology is a formal representation of the knowledge by a set of concepts within a domain and the relationships between those concepts. It is used to reason about the properties of that domain, and may be used to describe the domain.



Why apply ontologies to MBSE?

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- Formalized definition of a domain
- Enables semantic interoperability
 - Within domains
 - Across domains
- Tool/platform independence
- Long term stable definition
- Enables types of analysis: inferencing / reasoning
- Enables re-use across projects and enterprises
- Allows to reap benefit from semantic (web) technology
- Supports effective tool production (MDA-like)
- Knowledge management / sharing
- Helps / forces you to think more clearly about design problem





What are some approaches?

- NASA/JPL develops QVT based bi-directional transformations between SysML/UML and OWL as well ontologies for space system development
 - Ontologies are largely generic
 - Working to release ontologies
- ECSS develops conceptual data models in UML2
 - Derived concepts from SysML, AP233, ESA projects
 - Tool–indepent definitions
 - Eclipse based tool implementation for validation
 - Evolved into complete tool development framework
 - About to be published on www.ecss.nl
- Henson Graves: Retrofit SysML with formal semantics
- Fact Based Modeling (FBM)
 - Consolidate ORM (Object Role Modeling)





What are the critical issues?



- To make the case for ontologies
 - Up front investment / Convince management
 - Note:
- Semantic foundations of UML/SysML are incomplete and complex
 - Hundreds of issues found in UML 2.4 revision
- Scope of SysML is very large
- What methodology to use to develop ontologies?
- What is the technology to capture ontologies in?
 - Model management issues
 - Ontology development tools not yet at industrial robust level





Roadmap?



- Refine this material
- Team charter
- Write up on 4 approaches
 - Address the benefits / shortcomings of each
- Post the above to OMG Wiki
- Identify next steps
 - Consider papers for IS12 in Rome





Participants

- Henson Graves (Lead)
- Armin Mueller
- Harald Eisenmann
- Ray Jorgensen
- Roger Burkhart
- Sandy Friedenthal
- Steve Jenkins
- Steve Vanhorn
- Hans Peter de Koning (reporter)





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