***SysML v2 RFP WG,***

The following is a summary and follow-up actions from our 1.5 day face-to-face Working Group meeting at the Chicago OMG meeting on September 13 and 15, 2016. My thanks to all who contributed. The meeting summary and related material is posted on the Chicago meeting page at:

<http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:chicago_september_2016_meeting_presentations>

Hedley will provide the web and dial up information for our next WG telecon on Wednesday, October 5, at 11:00 AM ET. Our next face-to-face meeting will be at the OMG meeting in Coronado, California scheduled for Tuesday and Thursday, December 6 and 8, where we will continue to review the requirements and plans for the SysML v2 RFP.

**FOLLOW-UP ACTIONS**

* Sandy to post meeting summary and presentation slides to the WG Wiki
* Hedley to schedule the next WG telecon for Wednesday, October 5, at 11:00 AM ET
* Concept Leads
	+ Prepare response to feedback from Chicago meeting
	+ Prepare figure of concept (Refer to visualization concept below as an example)
	+ Review service requirements below and determine whether this is sufficient for the RFP or whether more detailed functional requirements need to be specified for your concept
	+ Identify any additional requirements for the SysML v2 RFP beyond the functional requirements to support your concept
* Model Visualization
	+ Update concepts for geometry to include concepts for Coordinate System and Shape
	+ Coordinate with John Watson to integrate the Analysis Concepts into the SECM.
* Model Analysis
	+ Update concepts for geometry to include concepts for Coordinate System and Shape
	+ Coordinate with John Watson to integrate the Analysis Concepts into the SECM.
* Formalism
	+ Update formalism requirements based on discussion
	+ Should validation rules and query languages be part of the modeling language?
	+ Present alternative formalism approaches at December meeting
	+ Coordinate with Michael Chonoles to present formalism approach to ADTF at December meeting
	+ Develop use cases from a user perspective to motivate formalism requirements (e.g., do we need a temporal logic formalism to reason about time?)
* Interoperability and Standard API
	+ Propose a refinement to the Web API approach and the requirements for the SysML v2 RFP based on these feedback and discussions in Chicago
	+ Determine what level of service requirements is the appropriate level of detail to specify the API requirements in the RFP
* SECM Properties and Expressions Concepts
	+ Consider at Marte, Modelica, and ALF as example expression languages
	+ Distribute the requirements for review by Conrad Bock, Michael Chonoles, and Nerijus Jankevicius
	+ Create examples to illustrate the intent of key requirements such as the Discrete sample data function
* SECM Interface Concepts
	+ Incorporate the concepts associated with physical constraints such as Kirchoff’s Laws to physical interfaces similar to Modelica
	+ Engage Brian Selvy in the requirements review process.
* RFP Planning
	+ Sandy to coordinate with Michael Chonoles to schedule time on the ADTF agenda in December to present the status and plans for the SysML v2 RFP
* Sandy to draft the agenda for the 1.5 day WG meeting (Tuesday and Thursday) on December 6 and 8, 2016 at the OMG meeting in Coronado (refer to topics for the Coronado meeting below). We will also include a ½ day SE DSIG meeting on Tuesday morning as we have done the last 2 meetings.

The following sections are included below:

* Background
* Meeting Summary
* Next WG Meeting on December 6,8, 2016 in Coronado, California

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**BACKGROUND**

The SysML v2 RFP WG was kicked off on July 23, 2016 at the end of the last OMG meeting in Orlando, Florida. This concluded an approximate year-long effort to establish a baseline concept for a System Modeling Environment (SME), which will is being used to help derive the requirements for the SysML v2 RFP. The meeting summary from the last meeting in Orlando, which includes an attachment that documents the baseline SME concept, along with the presentations can be found at:

<http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:orlando_june_2016_meeting_presentations>

The initial high level requirements for the SME are documented in the August 2015 edition of the INCOSE Insight, which has MBSE as its theme. The article is entitled *'Evolving SysML and the System Modeling Environment to Support MBSE'* and defines 7 capabilities, 8 measures of effectiveness (moe's), and 11 driving requirements for the SME. This article was the first key milestone for SysML v2 development. A second article is being submitted for the December, 2016 edition of the INCOSE Insight. This article is entitled *'Evolving SysML and the System Modeling Environment to Support MBSE – Part 2'* and summarizes the baseline SME Concept along with the high level approach to the RFP. The updated draft article is available on the home page for this Working Group under the Documents section at:

<http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:sysml_assessment_and_roadmap_working_group>

**MEETING SUMMARY**

The objectives and agenda for our WG meeting on September 13 and 15 in Chicago are included below:

**Meeting Objectives**

1. Review draft Service Req’ts & Standard API for the SysML v2 RFP
2. Review draft Req’ts for Properties & Expressions and Interfaces
3. Review/Update Plans for SysML v2 RFP

**Meeting Agenda**

*Tuesday, September 13, 2016*

13:00 - 13:45 Introduction - Sandy Friedenthal

13:45 - 14:30 SME Concept Updates - All

14:30 - 15:00 Break

15:00 - 16:45 Service Requirements & Standard API - Axel Reichwein

16:45 - 17:00 Safety Profile RFP Update - Geoffrey Biggs

*Thursday, September 15, 2016*

09:00 - 09:30 SE Concept Model (SECM) Update - John Watson

09:30 - 10:30 Draft RFP Req’ts for Properties & Expressions - Hans Peter deKoning

10:30 - 11:00 Break

11:00 - 12:00 Draft RFP Requirements for Interfaces - Marc Sarrel

12:00 - 13:00 Lunch

13:00 - 13:30 Formalism Requirements - Jonathan Patrick

13:30 - 14:30 SysML v2 Requirements (Other) - Concept Leads/All

14:30 - 15:00 Break

15:00 - 16:00 SysML v2 RFP Planning - Sandy/All**Highlights**General

***Updates to SME Concept***

*Model Construction.* Ron Williamson presented refinements to the Model Construction concept which is documented on the [Model Construction Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:systems_engineering_model_construction_focus_area). This included refinement of the service requirements and elaboration of the effectives measures for model construction.

*Model Visualization.* Chris Schreiber presented refinements to the Visualization concept which is documented on the [Model Visualization Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:model_visualization_working_group) Chris also presented a high level illustration of the concept per below.



**Action:** Determine whether standard diagrams and standard symbols are required for SysML v2. (raised by M. Chonoles)

*Model Analysis.* Manas Bajaj presented refinements to the Model Analysis concept which is available as a presentation link on the [Model Analysis Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:system_analysis_workgroup). This includes updates to the analysis use cases in support of the Hybrid SUV Change Scenario, updates to the services based on these scenarios, and updates to the Concept Model for analysis.

**Action:** Update concepts for geometry to include concepts for Coordinate System and Shape

**Action:** Coordinate with John Watson to integrate the Analysis Concepts into the SECM.

*Model Management.* Laura Hart provided updates to the service requirements for the Model Management concept. The details for this concept are available on the [Model Management Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:model_lifecycle_management_working_group).

***SysML v2 RFP***. A primary goal for SysML v2 is to improve the language precision, interoperability, and usability over SysML v1. The following represents the presentation and discussion related to the RFP.

*Formalism requirements.* Jonathan Patrick presented the proposed draft formalism requirements for SysML v2 with support from Conrad Bock and Ed Seidewitz. His presentation is avaialable on the [Formalism Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:sysml_v2_model_formalism_working_group). Some highlights from the presentation include:

* The modeling language includes:
	+ Concrete syntax – symbols (graphical and/or textual)
	+ Abstract syntax – grammar (e.g., block contains properties)
	+ Interchange/API – what computers read and write
	+ Semantics – meaning
	+ Vocabulary – the words (captured in a model library)
* Key requirements
	+ Uniform syntactic and semantic interpretation
	+ Abstract syntax independent of notation
	+ Concrete syntax is interchangeable and maps to abstract syntax
	+ Operational/Declarative semantics expressed in or translated to mathematical logic
		- Semantics are modeled in SysML
		- Example provided of mapping an axiom (Subclass) to a mathematical expression in set theory. This is called interpretation.
	+ Semantics and syntax are extensible
* Other discussion
	+ fUML includes a base semantics (BUML) with approximately 50 axioms
	+ Consider require generating a MOF representation from the model
	+ Consider automatically generating conformance classes to support automated conformance testing

**Action:** Update formalism requirements based on discussion

**Action:** Should validation rules and query languages be part of the modeling language?

**Action:** Present alternative formalism approaches at December meeting

**Action:** Coordinate with M. Chonoles to present formalism approach to ADTF at December meeting

**Action:** Develop use cases from a user perspective to motivate formalism requirements (e.g., do we need a temporal logic formalism to reason about time?)

*Interoperability and Standard API.* Axel Reichwein presented different approaches for Web API’s including the use of SOAP, Restful, Hypermedia, Linked Data, Linked Data Platform, and OSLC. In particular, he recommended the use of a Level 3 Rest API called a Hypermedia API and a vocabulary for defining this API called Hydra. Axel’s presentation is available on the [Interoperability Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:systems_engineering_interoperability_working_group). Candidate languages such as JSON-LD support the requirements of the Hypermedia API. Axel provided the following additional comments following the meeting:

* The SysML v2 RFP should specify a machine-readable API model that specifies the API functionality and which is published on the web and provide at least 1 language binding from SysML v2 to RDF that conforms to the API model
* REST is not a standard, it is a set of principles. A Hypermedia API (Level 3 REST API) can be implemented using various technologies.
* Cybersecurity concerns are highly technology-dependent and change rapidly. I don't think that it is meaningful to specify security-related requirements. It is up to each vendor to provide secure, scalable, etc. web services. Each vendor can for example provide different authentication mechanism for clients, different cloud infrastructure options etc...
* A Hypermedia API could be described according to the W3C standard called Hydra. No big deal if this is not done. It would make the documentation of the SysML v2 Web API simpler for clients to understand, both the human- and the machine-readable version of the API documentation. I didn't get to mention it in yesterday's presentation.
* No need for the SysML v2 Web API to conform to W3C LDP and LDP paging standards. Even though I recommend it in the presentation, these standards are not so important.
* Support for JSON-LD or other RDF serialization formats is not mandatory, as indicated in the presentation.

The general consensus was that the SysML v2 specification should not be locked into a particular technology since the web technologies continue to evolve. Ed Seidewitz also recommended that the RFP require the development of a technology independent API model expressed in SysML, and then require different language bindings for different technologies. CORBA IDL was developed as a technology independent representation with different language bidnings. He noted that several other groups within the OMG including MARS, Healthcare, the Gov DTF Records Management, and the Ontology SIG API4KB are or have developed API’s that we can refer to.

In a follow-up discussion with Axel, Sandy asked about requiring a registry to enable service providers to post their services, and service consumers to discover the services. This will be a future topic of discussion that Axel will present.

**Action:** Propose a refinement to the Web API approach and the requirements for the SysML v2 RFP based on these feedback and discussions in Chicago

*Service requirements.* The WG reviewed and updated the top level functional requirements that the API requests are intended to support. The following is the updated set of services requirements.

* export and import structured data (e.g., models, images, lists, spreadsheets)
* create, read, update, and delete model elements (including patterns)
* apply model patterns, model libraries, and reference models
* setup, validate, and execute models (e.g., system models, analysis models, validation rules)
* create, read, update, delete, and execute model queries
* create, read, update, delete, and execute viewpoints
* create, read, update, and delete model metadata (e.g., owner, comments, versions, status)
* manage changes to model down to the element level
* manage changes to views
* create, read, update, delete data protection controls (e.g., user access permissions, roles, data rights, and markings)
* create, read, update, delete, and execute workflows & notifications
* create, read, modify, delete, and execute links between SysML models and other data
* create, read, update, delete, and execute transformations to/from SysML models

Notes:

1. A model contains model elements
2. Models can include system models, analysis models, validation rules, and queries

The team will need to continue to refine and elaborate these requirements in a similar form to the earlier spreadsheet that includes the name, inputs, outputs, and service description. We also need to determine whether this is the right level of detail for the RFP requirements.

**Action:** Concept leads to refine the above service requirements to include description, inputs, and outputs

**Action:** Axel to determine what level of service requirements is the appropriate level of detail to specify the API requirements in the RFP

*Systems Engineering Concept Model (SECM).* The SECM models the concepts that are used to specify the requirements for the metamodel and profile in the SysML v2 RFP. We have multiple subgroups working different concepts. John Watson is leading the overall SECM, and he, Sandy, and the rest of his team do the pre-work to develop the concept needs and then handoff to a working group to refine and elaborate the concepts and derive the requirements for the RFP. The overall approach can be found on the [SECM Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:systems_engineering_concept_model_workgroup). The initial scope for the SECM for SysML v2 is similar in scope as current SysML, but the intent is to improve integration and precision. The working groups include:

* [Properties and Expressions](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:property_modeling_core_team)
* [Interfaces](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:interface_concepts_modeling_core_team)
* [Requirements & Verification](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:requirement_concepts_modeling_core_team)
* Structure and Behavior
* Element Concepts

*Properties and Expressions Concepts.* Hans Peter de Koning leads the working group on properties and expressions. He presented the updated concept model and draft requirements for properties and expressions at this meeting, which is available on the [Properties and Expressions Wiki](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:property_modeling_core_team). There are 57 requirements corresponding to the concepts in the Properties & Expressions Concept Model. Some of the more important requirements address the following.

* Abstract value element typed by value type
* Scalar and vector
* Enumerations
* Primitive data types
* Date/time
* Discrete sample data function
	+ An example is a table name with columns representing the domain and range such as amplitude versus frequency with their own type
* Value expressions (math expressions)
* Minimum set of functions/operators including Boolean operators (e.g. and, or, nor, not)
* State dependent properties
* Probability distributions
* Name and short name

**Action:** Consider at Marte, Modelica, and ALF as example expression languages

**Action:** Distribute the requirements for review by Conrad Bock, Michael Chonoles, and Nerijus Jankevicius

**Action:** Create examples to illustrate the intent of key requirements such as the Discrete sample data function

*Interface Concepts.* Marc Sarrel leads the working group on interface concepts. Marc noted that the preliminary concept model that was used as a starting point is their current baseline. These concepts emphasized the distinction between interface specification and realization. They also clarified that an interface includes 2 ends (e.g. the ports), the interface medium (e.g., a harness), the items that are exchanged (e.g., item flows) which must be better integrated with behavior concepts, the constraints on the exchange, and the concept of a layered interface such as a physical layer and application layer.

Marc presented the preliminary requirements for the SysML v2 RFP based on these concepts. The concepts and requirements are available on the Interface Concepts Wiki. There are 132 requirements that are partitioned into 7 categories. Only 1 category relates directly to the interface concepts. The other category of requirements apply more broadly, such as the ability to present different abstraction levels (this is a critical requirement for interface modeling to enable views of different levels of detail relative to interface connections, connection medium such as an electrical harness, flows and message structure, layers, and protocols. The requirements in the other categories will be dispositioned accordingly.

Steve Hetfield presented a use case example of a trade study that highlighted different interface modeling considerations. Chas Galey then highlighted some features in the next version of Magic Draw to more efficiently connect ports by dragging an interface block on to an association that types a connector.

**Action:** Incorporate the concepts associated with physical constraints such as Kirchoff’s Laws to physical interfaces similar to Modelica

**Action:** Engage Brian Selvy in the requirements review process.

*Requirements & Verification Concepts.* John’s team is completing the prework for the Requirements & Verification concepts, which will be available on the [Requirements & Verification Wiki.](http://www.omgwiki.org/OMGSysML/doku.php?id=sysml-roadmap:requirement_concepts_modeling_core_team) The key concepts build on the work done in the SysML v1.5 RTF for property based requirements. John presented a simple example of a weight requirement to illustrate the concepts. This approach is being extended to support other kinds of requirements such as functional and interface requirements.

Structure and Behavior Concepts. John, Sandy, and Chas Galey are starting the prework for these concepts to establish the needs. Chas will then lead this effort and work closely with members of the other working groups to integrate their concepts into structure and behavior. For example, the properties and expressions are fundamental to any structural modeling, and the interface concepts help to bridge structure and behavior. A primary objective is to ensure that structure and behavior modeling are well integrated.

*Element Concepts.* There has been an initial effort to capture concepts that apply to all model elements such as names, id, versions, variant, etc. This will be addressed as we proceed to integrate the various concepts into a single integrated model for the SysML v2 RFP. We will then be in a position to identify common concepts to be refactored.

Other Concepts. Additional concepts will surface as the SECM development continues that will need to be integrated in. For example, Manas who leads the Model Analysis effort, has identified some analysis concepts, and other concepts will surface to support model management.

*SysML v2 RFP Planning.* We reviewed and updated the milestones for the SysML v2 RFP plan per below.

Aug 2015: Driving Requirements (INCOSE MBSE Themed Insight Article)

June 2016: System Modeling Environment Concept (Draft)

June 2016: RFP Objectives, Scope, and Outline (Draft)

June 2016: SysML v2 RFP WG kickoff

Sept 2016: Integrated Service Requirements (Draft)

Sept 2016: Systems Engineering Concept Model (Properties & Expressions, I/F’s)

Dec 2016: Systems Engineering Concept Model (Requirements &Verification)

Dec 2016: Initial Presentation to ADTF

Dec 2016: Publish SME Concept in INCOSE INSIGHT Article

Jan 2017: Presentation for INCOSE IW

Mar 2017: Systems Engineering Concept Model (Integrated Behavior & Structure)

June 2017: Draft RFP and Presentation to ADTF

Sept 2017: Reviews Complete

Sept 2017: Issue RFP (ADTV vote, AB vote, start TC vote)

It was noted that the June OMG meeting will be in Brussells, and many of the current working group members from the US may not be able to attend. We also had a discussion as to whether to split the RFP’s/Specifications for maintainability purposes, and will come back to this as we mature the requirements.

**Action:** Sandy to coordinate with Michael Chonoles to schedule time on the ADTF agenda in December to present the status and plans for the SysML v2 RFP

*SysML Profile for Safety and Reliability.* Geoffrey Biggs from AIST presented the SysML Profile for Safety and Reliability. The summary of his presentation is included in SE DSIG Meeting Summary

**NEXT WORKING GROUP MEETING ON DECEMBER 6,8, 2016 IN CORONADO, CALIFORNIA**

The following are tentative topics for the SysML v2 RFP Working Group meeting in Coronado, California on Tuesday and Thursday (December 6 and 8, 2016):

1. Alternative Formalisms
2. Service Requirements Update
3. Standard API Update
4. Systems Engineering Concept Model (SECM) Review
	1. Requirements
	2. Interfaces – Update
	3. Properties & Expressions - Update
	4. Structure
5. Concrete Syntax Requirements (graphical, text)
6. RFP Development Plan Update
7. Other (TBD)