**March, 2017 - SysML 2.0 Model Construction RFP Requirements (updated based on the March 2017 Reston workshop audience feedback)**

Some of the feedback included.

* A core requirement is to create, update, and delete a data set with 1 or more data elements
* Replace the service requirement to import and transform multiple elements in batch mode with a transaction service. This includes a requirement to read a list of structured data elements and its associated schema, and another requirement to transform the structured data to model elements.
* When creating an element or other model construct, create the element id (i.e., UUID)
* When transforming structured data, optionally set the id depending on whether one is specified
* When deleting an element, ensure the final state is consistent with the deletion semantics.
* When deleting an element, retain and reserve its uuid. (This may be a model management function)
* Add a service requirement to apply a pattern.
* Consider how to construct models through elaboration and refinement to transition from one level of abstraction to another, while preserving the earlier abstraction. (Note: this may be considered a transformation of one abstraction level to another that can be viewed in different viewpoints.)
* Consider usability issues that were identified in the usability discussion below

Action: Ron to update model construction service requirements with pre and post conditions. Send requirements to Geoffrey Biggs and Andy Ko for review.

Top of Form

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Bottom of Form

**1. Model Construction Functional Requirements for the Systems Modeling Environment (SME)**

* **1.1 Functional Requirements Overview**
  + Model construction is the ability to create, update, and delete individual model elements or sets of model elements or model constructs including metadata elements.
  + Model construction applies to model patterns, queries, rules and expressions, transformations, links to external data elements, interface layers, and any other constructs that are used to support the construction of the system model.
  + The goal is for the SysML v2 specification to enable adaptable, efficient and intuitive model construction for a broad range of users (novice to expert). SysML v2 should not limit the use of current and future technologies that support model construction.
  + Model construction can be performed in complementary ways that include
    - interactively, using the adaptable graphical interface provided by the modeling environment via Visualization Services.
    - data group mode, by importing data/resources from an external file, database or software application, and transforming it to the corresponding SysML model constructs.
  + The model may be constructed using different forms that include textual, graphical, or tabular entry or a combination.
  + The requirements for model construction have interdependencies with other requirements related to model visualization, model management, workflow and collaboration, and model analysis.
    - Model construction uses services provided by these other capability areas, and the other capability areas use the model construction services.
  + It is expected that all interactions with the SME be in the context of a transaction that provides the ability to ensure all SME operations are either completed successfully or the SME can be rolled back to a prior consistent state.
  + Deletion Semantics: It is expected that the submitters will define the semantics associated with the deletion of model elements or constructs.
* **1.2 Create**
  + SysML v2 shall provide the ability to create model elements and other model constructs interactively via Visualization Services using textual, graphical, and/or tabular entry.
  + SysML v2 shall provide the ability to create a set of model elements and other model constructs from an external source, and transforming the source data to the corresponding model elements or constructs being created.
  + SysML v2 shall create the element id (e.e. UUID) when crating an element or other model construct.
  + SysML v2 shall optionally set the element id depending on whether one is specified, when transforming structured data.
* **1.3. Update**
  + SysML v2 shall provide the ability to update model elements and other model constructs interactively via Visualization Services using textual, graphical, and/or tabular entry.
  + SysML v2 shall provide the ability to update a set of model elements and other model constructs based on data obtained from an external source, and transforming the source data to the corresponding model elements or constructs being updated.
* **1.4 Delete**
  + SysML v2 shall provide the ability to delete model elements and other model constructs interactively via Visualization Services using textual, graphical, and/or tabular entry.
  + SysML v2 shall provide the ability to delete model elements and other model constructs based on data obtained from an external source, and transforming the source data to the corresponding model elements or constructs being deleted.
  + SysML v2 shall preserve the unique identifiers (UUID) for the deleted model elements and constructs
  + SysML v2 shall define model element and construct deletion semantics.
  + SysML v2 shall ensure the final state is consistent with the deletion semantics, when deleting a model element or construct.
* **1.5 Apply**
  + SysML v2 shall provide the ability to apply patterns, model library content, or other model element source data to the model under construction.
* **1.6 Crosscutting**
  + SysML v2 shall manage unique identifiers for all model elements and constructs.
  + SysML v2 shall provide a transaction mechanism for all operations on the system modeling environment.
  + SysML v2 shall Consider how to construct models through elaboration and refinement to transition from one level of abstraction to another, while preserving the earlier abstraction. (Note: this may be considered a transformation of one abstraction level to another that can be viewed in different viewpoints.)
  + SysML v2 shall consider usability issues as defined in the usability section of the SysML v2 RFP.

Top of Form

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Bottom of Form

**2. Model Construction Service Interface Requirement**

* **2.1 Service Requirements Overview**
  + Model construction services further specify each of the functions defined by the functional requirements above and provide a definition of the signatures associated with each of the functions.
* **2.2 Create**
  + Pre Condition: Model element being created does not exist with the specified id (i.e. UUID)
  + Post Condition: The model is updated to include the new model element and remains in a consistent state.
  + return value: Single UUID or collection of UUID's of the model elements that were created
  + Function Name: createModelElements
  + Function Parameters:
    - Collection of “Attribute”, attribute type, name and value quadruplets
    - Collection of operations
      * “Operation” type
      * return type,
      * operation name and
      * operation parameter type and name pairs
    - Collection of “Relationship”, relationship type, relationship name and related element UUID quadruplets
  + **Example:** createModelElements( { {Attribute, String, Name, “MyName”}, {Attribute, String, Description, “My description”}, {Operation, Integer, Sum, {{myValue1, 10}, {myValue2, 20} } } }, {Relationship, Dependency, “my dependency”, aUUID } )
* **2.3 Update**
  + Pre Condition: Model element being updated exists with a uniue id.
  + Post Condition: The model is updated to included the new model element updates and remains in a consistent state.
  + Return value: Single UUID or collection of UUID's of the model elements that were updated
  + Function Name: updateModelElements
  + Function Parameters:
    - Collection of UUID, Attribute Name, Value triplets
  + **Example:** updateModelElements({{MyUUID, MyAttributeName1, NewValue1}, {MyUUID, MyAttributeName2, NewValue2}})
* **2.4 Delete**
  + Pre Condition: Model element being deleted exists with a uniue id.
  + Post Condition: The model is updated without the deleted element and remains in a consistent state.
  + Return value: Boolean (true if deleted successfully, false if error condition)
  + Function Name: deleteModelElements
  + Function Parameters:
    - Collection of UUIDs
  + **Example:** first retrieve a collection of model element UUID's and then invoke the deleteModelElements service using the UUID collection as a parameter.
* **2.5 Apply**
  + Pre Condition: The pattern being applied is complete and self-consistent.
  + Post Condition: The model is updated to include the new pattern remains in a consistent state.
  + Return value: TBD
  + Function Name: applySourceData
  + Function Parameters: TBD
  + Example: apply a pattern from the pattern library to the current workspace and instantiate the model elements associated with the pattern.

Top of Form

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Bottom of Form

**3. Standard Modeling Languages**

* SysML v2 shall provide a platform independent modeling language and selected platform specific bindings to create, read, update, and delete model queries.
* SysML v2 shall provide a platform independent language and selected platform specific bindings to create, read, update, and delete model transformations.
* SysML v2 shall provide a platform independent language and selected platform specific bindings to create, read, update, and delete expressions.
* SysML v2 shall provide a platform independent language and selected platform specific bindings to create, read, update, and delete viewpoint methods.

Top of Form

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Bottom of Form

**4. Model Construction Concept Definitions**

* **4.1 Concept Definitions Overview**
  + The concepts defined in this section clarify the meaning of terms used in the requirements sections above.
* **4.2 Core concepts related to model construction**
  + Model - (refers to existing definition)
  + Model Element – (refers to existing definition)
  + Model Construct – A model element or other entity used to construct a system model that includes model patterns, queries, rules and expressions, transformations, and links to external data elements
  + Model Collection - A collection of model elements and/or modeling constructs used to construct the system model
  + UUID (Universal Unique Identifier) - A globally unique identifier for each model element (refer to existing definition?)
  + Interactive - User initiated operations using the graphical interface of the SysML user interface
  + Batch Mode - User initiated operations using an external collection of model element properties, operations and- or relationships
  + External (Resource) Collection - A file based or database or link based mechanism to persist descriptions of model elements
  + Transaction - A mechanism to ensure an operation applied to the SME maintains the SME in a consistent state.
  + Deletion Semantics - The rules associated with deletion of model elements or constructs.