Precise Semantics Standards at OMG: Executing on the Vision

14 October 2018

Ed Seidewitz
Chief Technology Officer
Model Driven Solutions
ed-s@modeldriven.com • @seidewitz
Precise Semantics Standards: The Executable UML Vision

- Standardize the precise semantics for a subset of UML useful for executable modeling.

- Specify “precise semantics” by defining an executable UML model of an interpreter for executable UML models.

- Ground this meta-circular definition by using formal logic to give a base semantics to a minimal executable UML subset.

- In order to support the development of standards-based executable modeling tools.
An executable subset of standard UML that can be used to define, in an operational style, the structural and behavioral semantics of systems. 

Adopted: v1.0 (2011)  
Planned: v1.5 (2019)
At the extended conformance level, Alf can also be used to represent structural class models.

A textual surface representation for fUML models, particularly executable behaviors

Adopted: v1.0.1 (2013)
Planned: v1.2 (2019)
Precise Semantics of Composite Structure (PSCS)

An extension of fUML for the execution of composite structure models
Adopted: v1.0 (2015)
Current: v1.2 (2018)
Planned: None

Composite structure modeling

Precise Semantics of Composite Structure (PSCS)

Action Language for fUML (Alf)

Foundational UML (fUML)
**Precise Semantics of State Machines (PSSM)**

*An extension of fUML for the execution of state machine models*

Beta: (2016)
Planned: v1.0 (2018)

<table>
<thead>
<tr>
<th>Precise Semantics of Composite Structure (PSCS)</th>
<th>Precise Semantics of State Machines (PSSM)</th>
</tr>
</thead>
</table>

**State machine modeling**

**Action Language for fUML (Alf)**

**Foundational UML (fUML)**

Copyright © 2018 Ed Seidewitz
An extension to fUML to more precisely define the semantics of time in executable UML models.

RFP: Dec 2017
Initial submissions: August 2019
Final submissions: May 2020

Possible future standards

- Precise Semantics of Composite Structure (PSCS)
- Precise Semantics of State Machines (PSSM)
- Precise Semantics of Time (PSOT)
- Precise Semantics of Interactions
- Precise Semantics of Profiles

Action Language for fUML (Alf)

Foundational UML (fUML)
Roadmap for Executable UML

Precise Semantics of Interactions RFP

2017
Precise Semantics of Time for fUML RFP

2018
fUML 1.4, PSCS 1.2, PSSM 1.0

2019
Alf 1.2

2020
PSOT (Alpha), fUML 1.5, SysML 1.7

Additional functionality
- Unmarshall action
- Activity partitions
- Streaming
- Interruptible regions
- Exceptions (?)

Refactoring
- Threading

Possibly improve Interactions in the base UML specification first.

Possibly finish the Metamodel Extension Facility (MEF) specification first.

Precise semantics for SysML, building on fUML and PSCS (a precursor to SysML v2).
Precise Semantics for Uncertainty Modeling (PSUM)

- RFP issued for a metamodel that enables:
  - Capturing uncertainty and its related concepts
  - Measurement of uncertainty and its related concepts
- Proposals are required to include “an ontology of uncertainty”.

Systems Modeling Language v2

- RFPs issued for both the language and for APIs/services
- Proposals are required to include “a metamodel that includes abstract syntax, concrete syntax, semantics, and the relationships between them”.
- Proposals may include non-mandatory features such as a semantic model library, declarative semantic grounding and a reasoning capability
  - The submission team is currently committed to including all these features.
Resources

- Specification documents and machine-readable artifacts
  - http://www.omg.org/spec/PSCS

- fUML Open Source (Reference) Implementation (Lockheed Martin/Model Driven Solutions)
  - http://fuml.modeldriven.org

- Alf Open Source (Reference) Implementation (Model Driven Solutions)
  - http://alf.modeldriven.org

- OMG Groups (requires OMG membership)
  - Executable UML Working Group: executable-uml@omg.org
  - SysML Revision Task Force: sysml-rtf@omg.org
Requests for Proposals

- **Precise Semantics of Time for fUML**
  - RFP: [https://www.omg.org/cgi-bin/doc?ad/17-12-07](https://www.omg.org/cgi-bin/doc?ad/17-12-07)
  - Submission Team Contact
    - Ed Seidewitz, ed-s@modeldriven.com

- **Precise Semantics of Uncertainty**
  - RFP: [https://www.omg.org/cgi-bin/doc?ad/17-12-01](https://www.omg.org/cgi-bin/doc?ad/17-12-01)
  - Submission Team Contact
    - Tao Yue, tao@simula.no

- **SysML v2 RFPs**
  - Language RFP: [https://www.omg.org/cgi-bin/doc?ad/17-12-02](https://www.omg.org/cgi-bin/doc?ad/17-12-02)
  - API/Service RFP: [https://www.omg.org/cgi-bin/doc?ad/18-06-03](https://www.omg.org/cgi-bin/doc?ad/18-06-03)
  - Submission Team Contacts:
    - Ed Seidewitz, ed-s@modeldriven.com
    - Sandy Friedenthal, sanford.friedenthal@gmail.com