SysML v2 Submission Team (SST)  
SysML v2 Update
Presentation Purpose

• 1 Year after RFP Issued and SysML v2 Submission Team Established
  ○ Share preliminary progress & directions with broader community
  ○ Highlight some differences and benefits relative to SysML v1

• Slides derived in part from previous presentations:
  ○ SysML v2 Overview and Demo to OMG SE DSIG 2018-12-11 – Friedenthal/Seidewitz
  ○ SysML v2 and MBSE: The Next Ten Years 2018-10-16 Models Conference - Seidewitz
  ○ Future Directions for MBSE with SysML 2018-05-22 No Magic Symposium - Friedenthal
• SysML has evolved to address user and vendor needs
  ○ v1.0, adopted in 2006; v1.5, current version; v1.6, in process

• SysML has facilitated awareness and adoption of MBSE

• Much has been learned from using SysML for MBSE
SysML v2 Objectives

Increase adoption and effectiveness of MBSE by enhancing…

- Precision and expressiveness of the language
- Consistency and integration among language concepts
- Interoperability with other engineering models and tools
- Usability by model developers and consumers
SysML v2 Functional Enhancements

Improved integration with analysis

Variant Modeling & Design Configurations

Geometric View

Improved integration between Behavior & Structure

Trade Studies

Property-based requirements

Friedenthal and Oster, Architecting Spacecraft with SysML
SysML models must support flexible visualizations.

Source: C. Schreiber, J. Feingold, M. Sarrel
Axel Reichwein, Koneksys
SysML v2 Model Interoperability & Standard API Requirements
- **SysML v2 RFP issued December, 2017**
  - Initial Submission: November, 2019
  - Revised (Final) Submission: November, 2020
- **SysML v2 API & Services RFP issued June, 2018**
  - Initial Submission: February, 2020
  - Revised (Final) Submission: February, 2021
- **SysML v2 Submission Team (SST) formed December 2017**
  - Leads: Sandy Friedenthal, Ed Seidewitz
A broad team of end users, vendors, academics, and government liaisons

- Currently 96 members from 60 organizations

Developing submissions to both RFPs

Driven by RFP requirements and user needs
## SST Participating Organizations

<table>
<thead>
<tr>
<th>Academia/Research</th>
<th>Tool Vendors</th>
<th>INCOSE rep</th>
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<tbody>
<tr>
<td>End User</td>
<td>Government Rep</td>
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</tbody>
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- Aerospace Corp
- Airbus
- AIST
- ANSYS medini
- Aras
- ARDEC
- BAE
- BigLever Software
- Boeing
- CEA
- Christian Doppler Laboratory
- Contact Software
- Draper Lab
- Elbit Systems of America
- European Space Agency
- Ford
- Franhofer
- General Motors
- George Mason University
- GfSE
- GTRI/Georgia Tech
- IBM
- IncQuery Labs
- Innovative Decisions
- InterCax
- Jet Propulsion Lab
- John Deere
- Kenntnis
- Lieber Lieber
- Lightstreet Consulting
- Lockheed Martin
- LSST
- Maplesoft
- MITRE
- Model Driven Solutions
- Model Foundry
- No Magic
- NIST
- No Magic
- OOSE
- Ostfold University College
- Papyrus Industry Consortium (PIC)
- Phoenix Integration
- PTC
- Raytheon
- Rolls Royce
- SAF Consulting *
- SAIC
- Siemens
- Sierra Nevada Corporation
- Simula
- System Strategy *
- Tata Consultancy Services
- Thales
- Thematix
- Tom Sawyer
- University of Cantabria
- University of Alabama in Huntsville
- University of Detroit Mercy
- Vitech
- 88solutions

6/20/18
Key Elements of SysML v2

- New Metamodel that is not constrained by UML
  - Grounded in formal semantics
- Robust visualizations based on flexible view & viewpoint specification and execution
  - Graphical, Tabular, Textual
- Standardized API to access the model
Concrete Syntax (Textual Grammar)

NamespaceDefinition:
  PackageDefinition | ClassifierDefinition

PackageDefinition:
  PackageDeclation "{ PackagedElement* "}\n
PackagedElement: NamespaceDefinition | …
ClassifierDefinition: ClassDefinition | …
ClassDefinition:
  ClassDeclaration "{ ClassMember* "}\n
ClassMember: FeatureDefinition | …
FeatureDefinition: AttributeDefinition | …
AttributeDefinition:
  Visibility Name ":" QualifiedName
Initial SST Validation Cases

- The following 11 validation cases capture initial required functionality in SysML v2
  - Parts Tree
  - Parts Interconnection
  - Function-based Behavior
  - Functional Allocation
  - State-based Behavior
  - Individuals and Snapshots
  - Variant Configuration
  - Requirements
  - Verification
  - Analysis & Trade Studies
  - View and Viewpoint

Reflects approximately ½ of the SysML v2 RFP requirements
A paradigm shift to make SysML v2 more precise and intuitive to use

- Emphasizes modeling of usages (e.g., parts on an ibd)
  - Decompose, connect, relate, and group usages

- Supports other language requirements
  - variant design configurations, individuals, analysis, verification, ...
Usage Focused Modeling Approach
Multiple Views of a System

Graphical notation for illustrative purposes only
Standard APIs and services provide a mechanism for tool interoperability.

Service Definition
Services and Operations

ample API bindings include: Java, .NET, REST/HTTP, OSLC, and others

conforms to

From: SysML v2 API & Services RFP
SST is addressing RFP requirements and issues associated with SysML v1 to improve:
- Precision and expressiveness
- Consistency and integration among language concepts
- Interoperability with other engineering models and tools
- Usability by model developers and consumers

Initial approach:
- SysML v2 metamodel that overcomes fundamental UML limitations
- Flexible graphical notations and textual notation
- Formal semantics
- Standardized API for interoperability

Working towards initial submission

1/28/2019
OMG SysML v2 RFP
Requirements Development References

- Friedenthal, S, Burkhart, R. Evolving SysML and the System Modeling Environment to Support MBSE, INCOSE INSIGHT, Model-Based Systems Engineering, August 2015 (August 15 Volume 18 Issue 2, Pg 39-42)
  - Capabilities, effectiveness measures, and driving requirements for a system modeling environment (SME) to support MBSE

- Friedenthal, S. Evolving SysML and the System Modeling Environment to Support MBSE-Part 2, INCOSE INSIGHT, (December 16 Volume 19 Issue 4, Pg 76-80)
  - Concept for a system modeling environment (SME) to support MBSE

- Friedenthal, S. Requirements for the Next Generation Systems Modeling Language (SysML® v2) INCOSE INSIGHT, (March 18 Volume 21 Issue 1, Pg 21-25)
  - SysML v2 RFP Requirements

- OMG SysML v2 RFP Working Group Wiki