SysML v2: The New Standard for Model-Based Systems Engineering

Presented to ModProd 2023
7 February 2023

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Systems Modeling Language™ (SysML®)

Supports the specification, analysis, design, and verification and validation of complex systems that may include hardware, software, information, processes, personnel, and facilities

SysML v1.0 adopted in 2006
Standard profile of UML v2.1

Current version is SysML v1.7
v1.7 expected to be last for SysML v1

SysML v2 RFPs issue
Language: December 2017
API and Services: June 2018
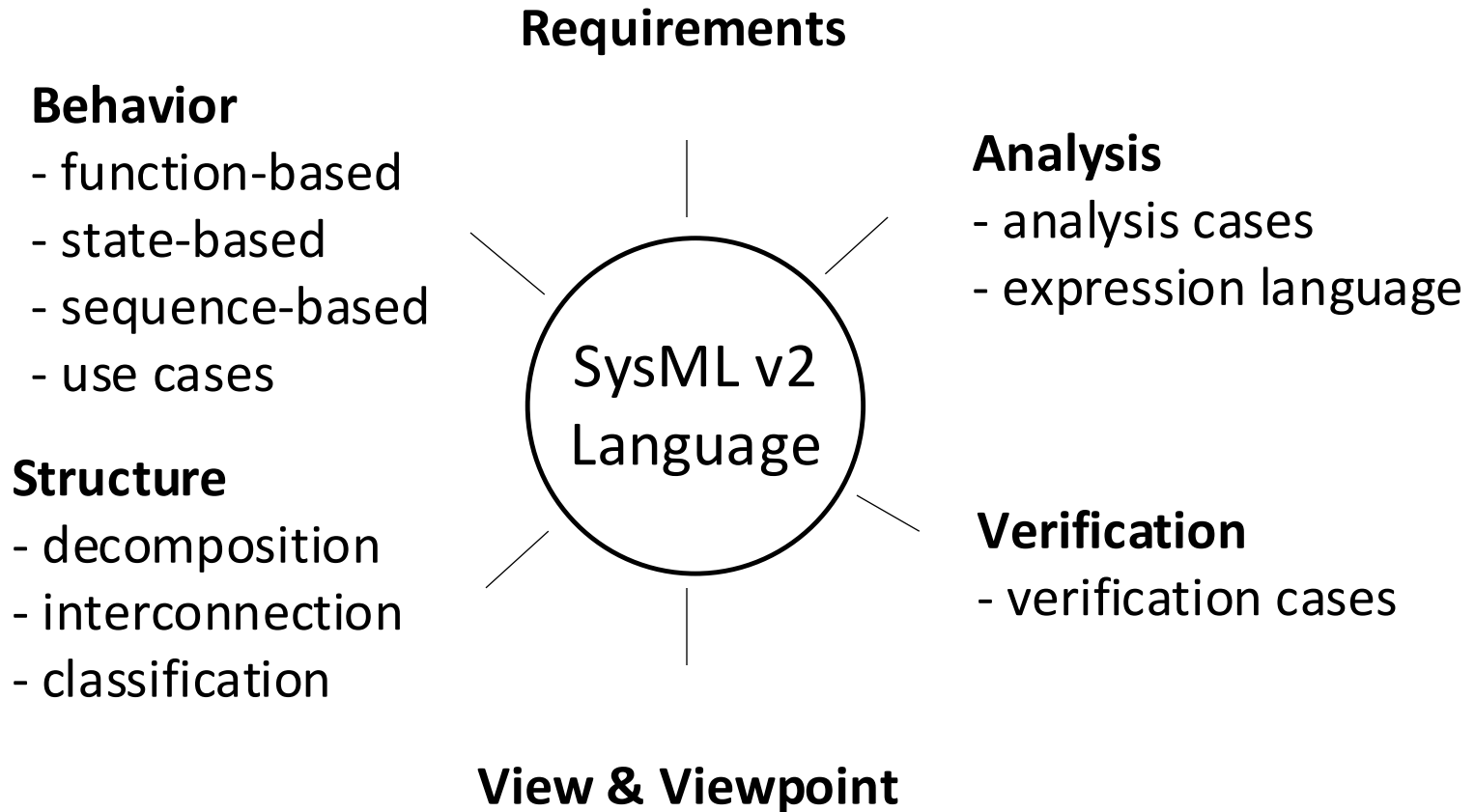
SysML v2 Submission Team (SST)

Formed December 2017
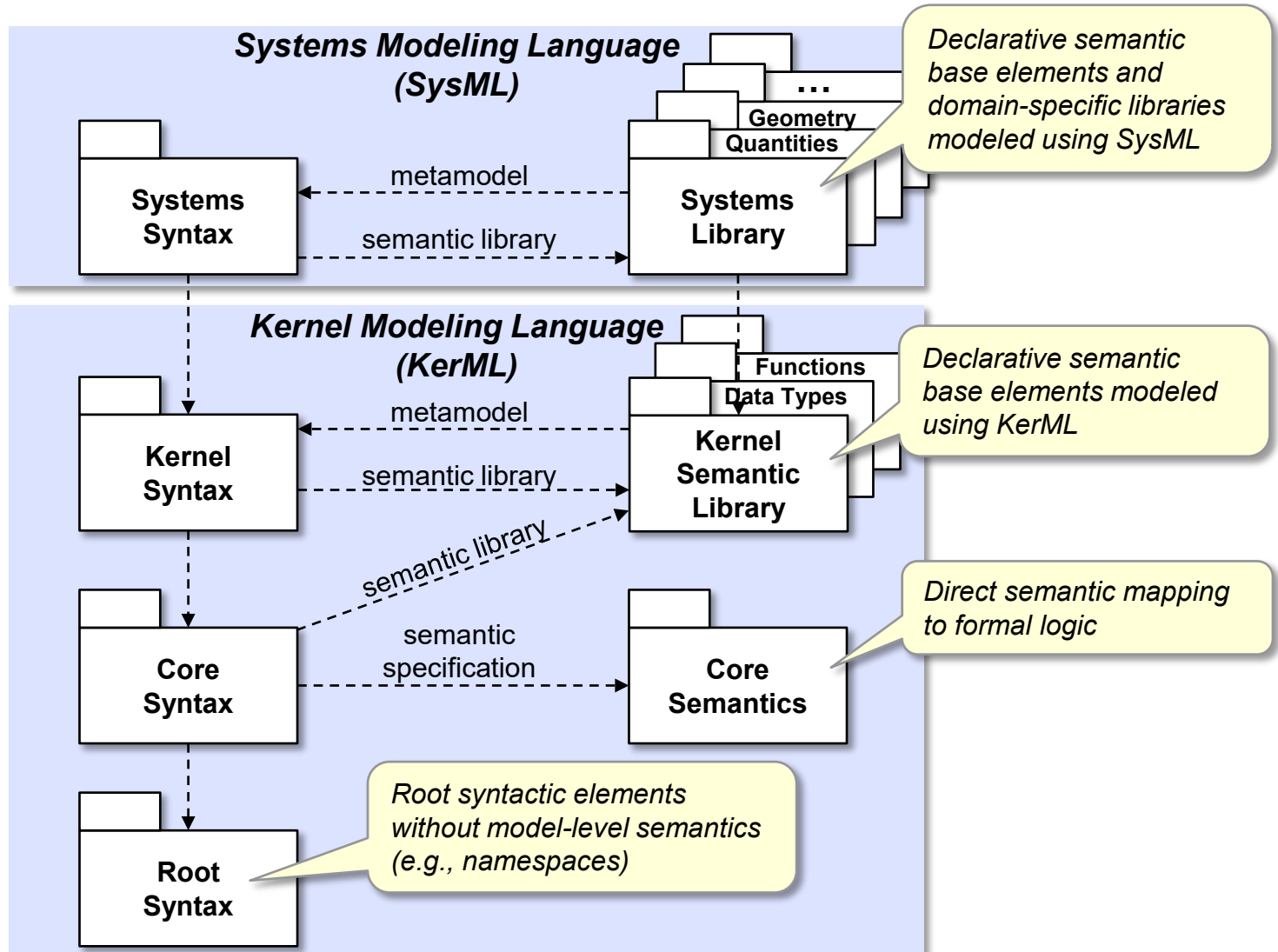*Leads: Sandy Friedenthal, Ed Seidewitz*

A broad team of end users, vendors, academics, and government liaisons
Currently 200+ members from 80+ organizations

Developing submissions to both RFPs
Final submission: February 2023

SysML v2 Language Capabilities

Requirements
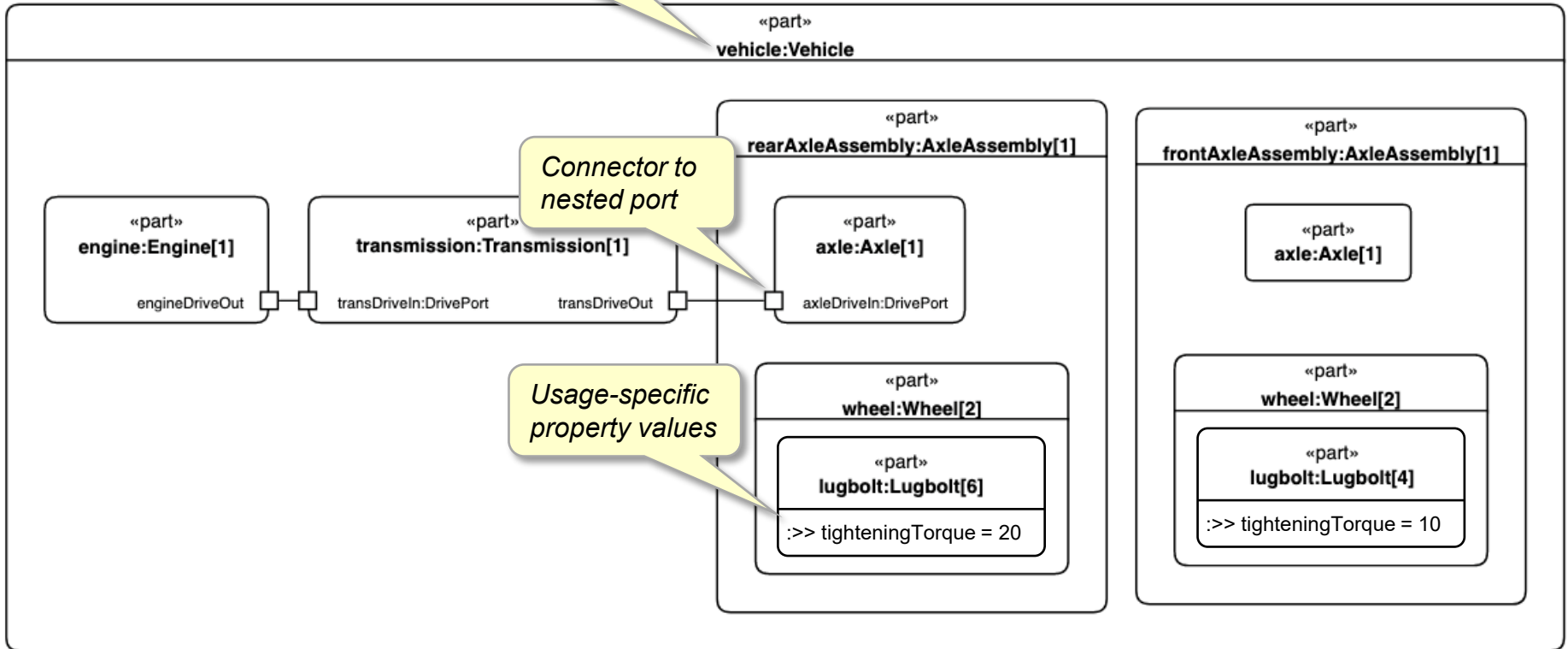
Behavior
- function-based
- state-based
- sequence-based
- use cases

Analysis
- analysis cases
- expression language

SysML v2
Language

Structure
- decomposition
- interconnection
- classification

Verification
- verification cases

View & Viewpoint

Language Architecture

Systems Modeling Language (SysML)

Systems Syntax ← metamodel ← Systems Library

Systems Syntax → semantic library → Systems Library

Geometry / Quantities / ...

Declarative semantic base elements and domain-specific libraries modeled using SysML

Kernel Modeling Language (KerML)

Kernel Syntax ← metamodel ← Kernel Semantic Library

Kernel Syntax → semantic library → Kernel Semantic Library

Functions / Data Types

Declarative semantic base elements modeled using KerML

Core Syntax → semantic library → Kernel Semantic Library

Core Syntax → semantic specification → Core Semantics

Direct semantic mapping to formal logic

Root Syntax

Root syntactic elements without model-level semantics (e.g., namespaces)

New Metamodel

SysML v2 language design isn't limited by being a UML profile

Usage-focused modeling

«part»
vehicle:Vehicle

«part»
engine:Engine[1]

engineDriveOut

«part»
transmission:Transmission[1]

transDriveIn:DrivePort

transDriveOut

Connector to nested port

«part»
rearAxleAssembly:AxleAssembly[1]

«part»
axle:Axle[1]

axleDriveIn:DrivePort

«part»
wheel:Wheel[2]

«part»
lugbolt:Lugbolt[6]

:>> tighteningTorque = 20

Usage-specific property values

«part»
frontAxleAssembly:AxleAssembly[1]

«part»
axle:Axle[1]

«part»
wheel:Wheel[2]

«part»
lugbolt:Lugbolt[4]

:>> tighteningTorque = 10

Textual and Graphical Notation

Allows integration with many existing text-based language technologies.
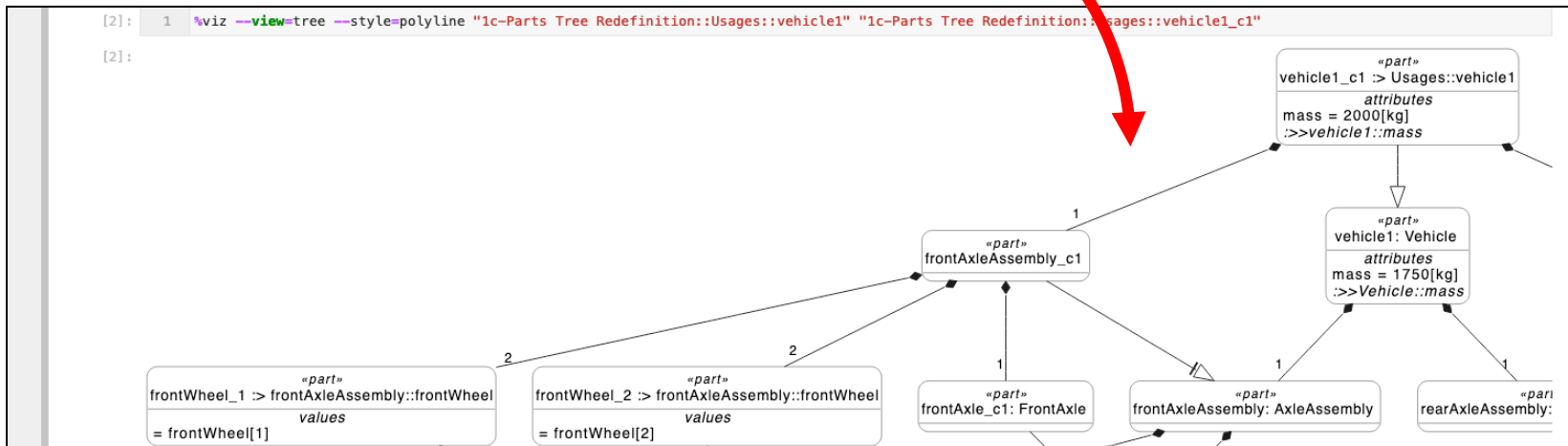
Standardized API

Allows SysML tooling to interoperate with other tools
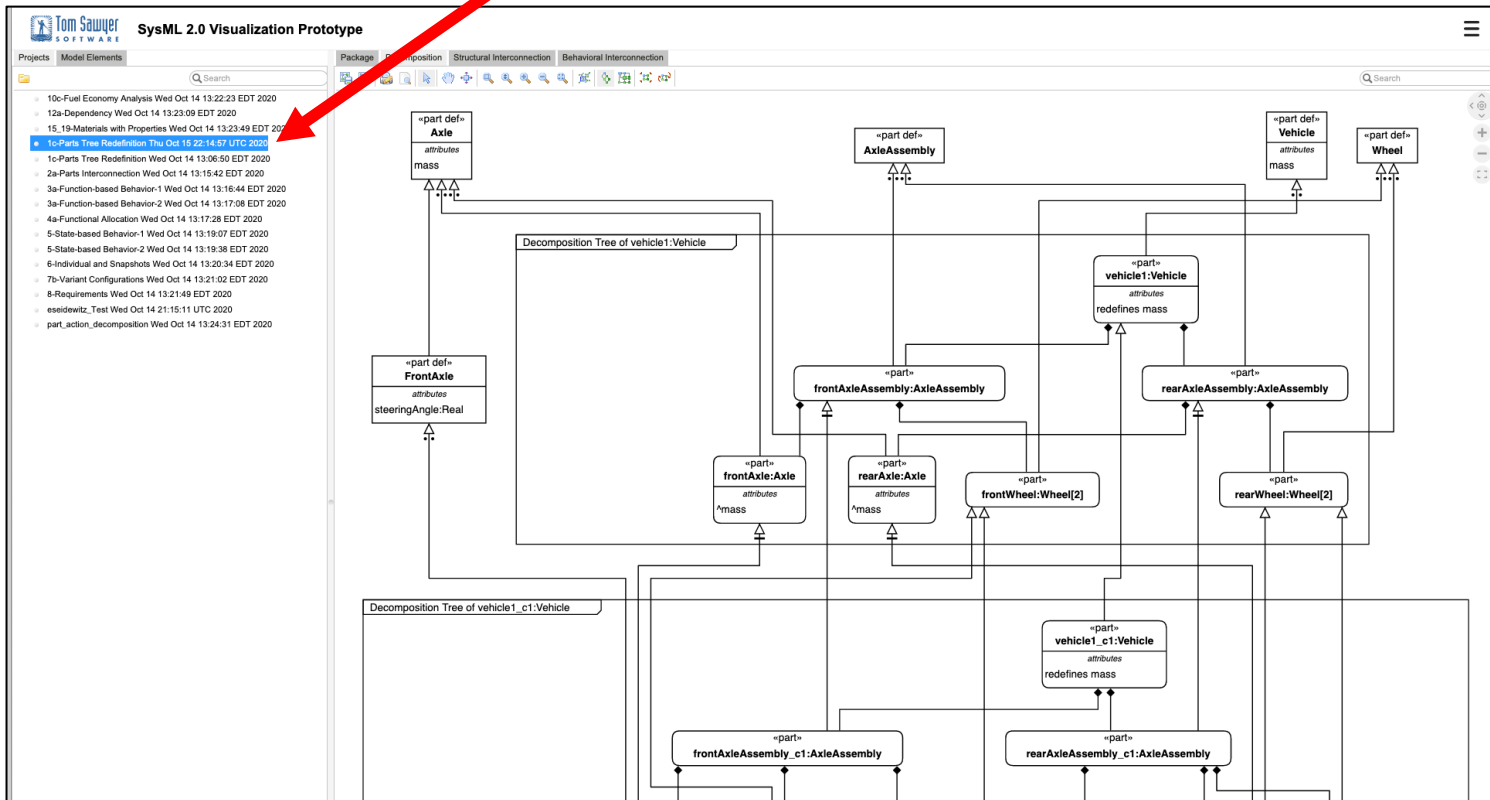
Pilot Implementation

Open source
https://github.com/Systems-Modeling

Current release: 2022-12

Specification documents (for KerML, SysML and API)

Training material for SysML textual and graphical notation

Example models (in textual notation)

Installer for Jupyter tooling

Installation site for Eclipse plug-in

Link to API Cookbook repository

Web access to prototype repository via SysML v2 API

Web access to Tom Sawyer visualization tooling

Google group
for comments and questions

https://groups.google.com/g/SysML-v2-Release
(to request membership, provide name, affiliation and interest)

Dassault/3DS
Cameo

IBM
Rhapsody

PTC
Windchill Modeler
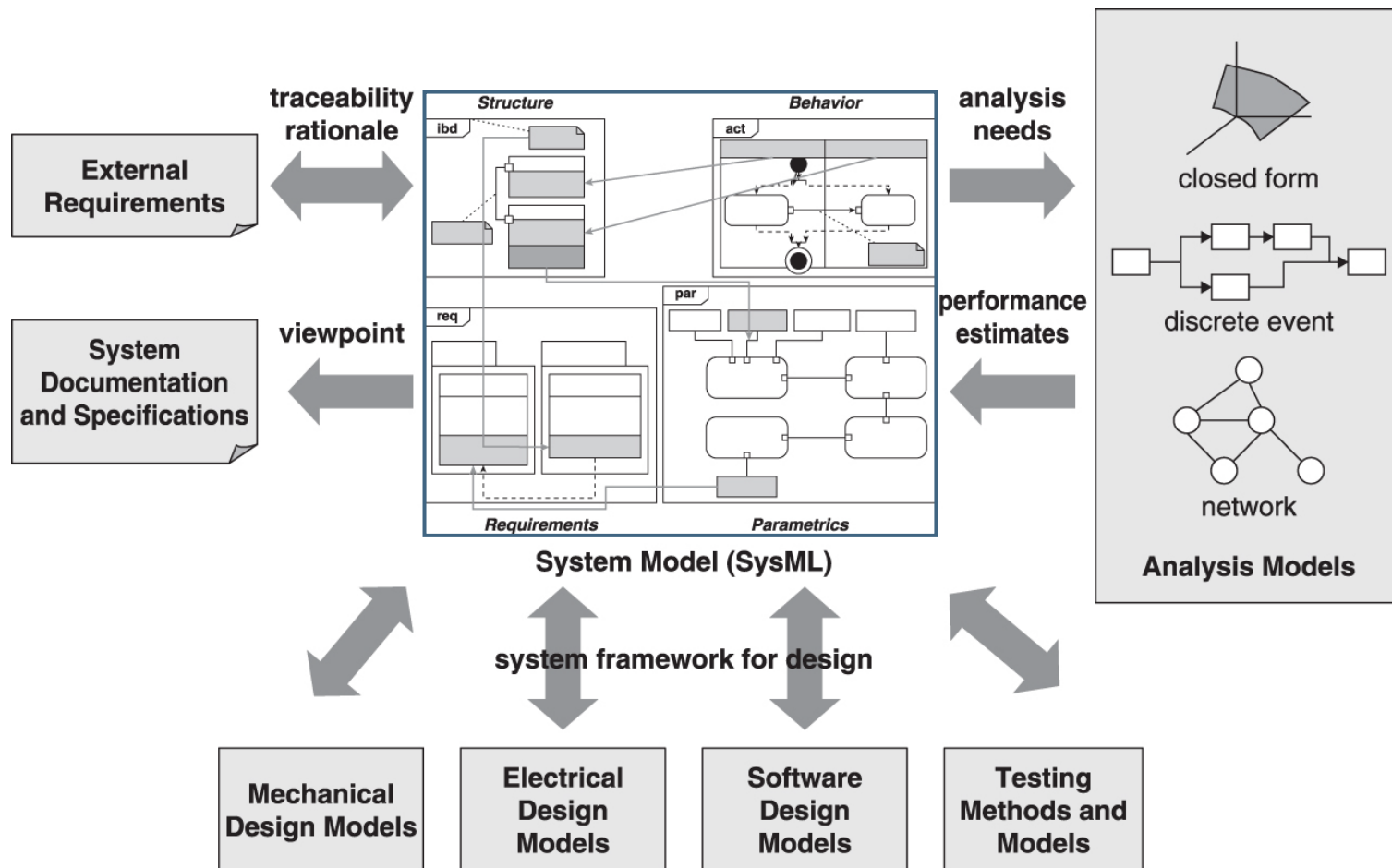
Sparx
Enterprise Architect

Intercax
Syndeia

Siemens

Model-Based System Engineering (MBSE)

puts the System Model at the center

A Practical Guide to SysML 3rd Edition (Figure 18.1)