Syndeia for Model-Based Engineering (MBE/MBSE)

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About Intercax

- Georgia Tech spin-off 2008
- **Locations**: Tech Square, Atlanta; Pune IT Park, Pune, India
- **Focus**: Software for MBE/MBSE
  - **Syndeia** – MBSE (SysML) + PLM/CAD/CAE/Data/Simulations
  - SysML parametric solvers (e.g. ParaMagic, Melody, Solvea, ParaSolver)
- Training, consulting, custom apps
  - 4000+ participants since 2008
- Customers
  - Gov.: NASA, DoD, DoE, DoC
  - Commercial: aero, auto, transportation, consumer goods, energy, mfg., healthcare
Contents

• MBSE ++
• Introduction to Syndeia
• SysML 2.0 WG - System Modeling Environment (SME)
• Syndeia Demonstration
• Syndeia Latest Release
• Syndeia Future
• Questions and Comments
Where is the system architecture / blueprint?

Use of models in systems engineering IS NOT model-based systems engineering (MBSE)

Point-to-point ad-hoc information flows without a common architecture model
• MBSE = Unified model of the system versus series of disconnected documents or document-based flows between models (DBSE)

• System docs and views can be generated from this unified model

• DBSE > MBSE ⇔ 2D > 3D CAD

• Models in SE ≠ MBSE
DBSE > MBSE > MBSE++

• OMG SysML – www.omgsysml.org
  • Widely adopted as a standard for modeling, analyzing, and developing system architecture

• However
  • Most of the detailed engineering carried out in domain-specific tools and repositories, such as in PLM, ALM, Req. Mgt., Databases, Simulation environments, Project Management, CAD, CAE, and other tools
What is MBSE++

Connect architecture model (SysML) with domain-specific models

**Total System Model (TSM)** as a digital blueprint of the system connecting models across disciplines, tools, and version-management systems

Goal: Seamless traceability between disciplines across the system lifecycle
Total System Model (TSM)

*TSM evolves as each of the version-managed models evolve*

**Timeline**

- **T1**
- **T2** *(Baseline B1)*
- **T3**
- **T4** *(Baseline B2)*
6 Principles of MBSE++


1. Heterogeneous and Decentralized Data
2. Capturing and Maintaining High-Level System Architecture
3. Spectrum of Model-Based Connections
4. Unified Framework for Model-Based Connections
5. From Traceability to Impact
6. Many Users, Many Views
Model-Based Connection Patterns

• What is the purpose of model-based connections?

  **Reference Connections**
  - Track/compare/sync versions of connected elements

  **Data Map Connections**
  + Track/compare/sync element attributes

  **Function Wrap Connections**
  + Track/execute connection elements

  **Model Transform Connections**
  + Track/compare/sync element structure (multi-level)
Intra-Model and Inter-Model Connections

• Model-based connections are building blocks of interoperability

• Types of connections
  • **Inter-model** connections are between elements in different models / tools e.g. SysML block – PLM part
  • **Intra-model** connections are between elements in same model / tool, e.g. SysML block – SysML requirement
Syndeia = Software Platform for MBSE++

Search, Connect, Access, Transform, Compare, Sync, Visualize models in the TSM

We will Illustrate 6 principles of MBSE++ using Syndeia

Syndeia 3.0 released July 2016 – www.syndeia.com
System Modeling Environment (SME) - SysML 2.0 WG

Practices Repository

Systems Engineer

External Sources
- PLM/Workflow Manager
- Engineering Tools/Models
- External Data Sources

External Interface & Management

Model Editor
'Rich' interface
- Query model
- Perform analysis
- Present results

Model Editor
'Web' interface

Information Exchange Mgr
Synchronize
Orchestrate
Transform
Manage Viewpoint

Model Manager
Access control
Configuration mgmt

Model Analyzer
Check
Solve
Simulate

Development Environment
Ontology Definition
Domain Specific Model Editor
Metamodel Transformation

Facilitate collaboration
- Real Time
- Asynchronous
Facilitate MBSE Workflow
- Task synchronization

Model Repository
System Models
Analysis Data
Metadata

Includes standard APIs

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Syndeia Demonstration

In this demonstration, you will see clear examples of:
1. Total System Model Interfaces, Repositories, APIs
2. Total System Model Construction
3. Total System Model Management & Config. Control
4. Total System Model Visualization
5. Total System Model Analysis
Sam’s Challenge

Diverse set of modeling & simulation software, databases, & repositories

Sam wishes to do
- System engineering
- Modeling & simulation
- Model reconciliation
- Model communication
- Document exchange
Sam's Current SE Environment

UAV Integrator
GetYourUAV

Detailed Design & Simulation
GetYourUAV

System Architecture

Teamcenter

UAV platform provider
Platforms Inc.

Payload provider
Instruments LLC

Windchill®

MySQL™

NX
Creo™

Simulink
Sam’s New SE Environment

UAV Integrator
GetYourUAV

UAV platform provider
Platforms Inc.

Detailed Design & Simulation
GetYourUAV

Payload provider
Instruments LLC

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Watch Demonstration Video

• YouTube - https://youtu.be/Fu1w6sQviko
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Syndeia 3.0

- [www.syndeia.com](http://www.syndeia.com)
- 100+ Features

http://goo.gl/BGz2Yd
Syndeia leverages open standards, open frameworks, and open APIs

- Systems Modeling Language
  - MagicDraw, Rhapsody, Enterprise Architect, Integrity Modeler
- REST Web Services
- JSON
- JDBC
- ISO STEP 10303
- Apache projects (multiple)
- OSLC
- FMI
- ... and others
Syndeia Roadmap

• **Syndeia started as a MBSE-centric tool**, deployed as a plugin for SysML Modeling tools (MagicDraw, Rhapsody,...)
  • Stores inter-model connections in the SysML model
  • Operates primarily from the SysML tool

• **Syndeia is an enterprise MBE application**
  – REST web services with a backend graph database
  – Advanced query & visualization capabilities
  – Accessible from anywhere in the tool chain (SysML, PLM, ALM,...)
  – Incorporates parametric execution and analysis
  – API for extensible end user applications

• **Syndeia 3.1 (Backend Graph Database, Fall 2016)**
Questions / Comments

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