Model Based Systems Engineering
for
Systems of Systems

Sunday, January 25, 1:00-5:00

INCOSE
International Council on Systems Engineering

Objective

- Present results from two recent EU projects on SoS modeling
    - COMPASS: Comprehensive Modelling for Advanced Systems of Systems – Claire Ingram and Jeremy Bryans
    - DANSE: Designing for Adaptability and evolutioN in Systems of systems Engineering (DANSE) - an Effective, Model-Based Approach – Eric Honour

- Provide information on current and emerging practices related to MBSE as applied to SoS

- Facilitate exchange on challenges and opportunities

- Prioritize next steps for the SoSWG on SoS and MBSE

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Agenda

1:00   **Introduction on "Why MBSE for SoS?"**

1:15   **COMPASS presentation and demo**
   ❖Claire Ingram and Jeremy Bryans

3:15   **DANSE presentation and demo**
   ❖Eric Honour

4:15   **Panel and group discussion
   "Challenges and Opportunities"**

   ❖ Presenters
   ❖ Stephen Cook, research perspective
   ❖ Fatma Dandashi, Standards perspective

Why MBSE for SoS?

COMPASS

- **Tackling challenges in SoS engineering:**
  - Verification of emergence
  - Heterogeneity of models
  - Contractual specification
- **Usable outputs**
- **Extensible approach**
- **Integrating semi-formal & formal approaches**
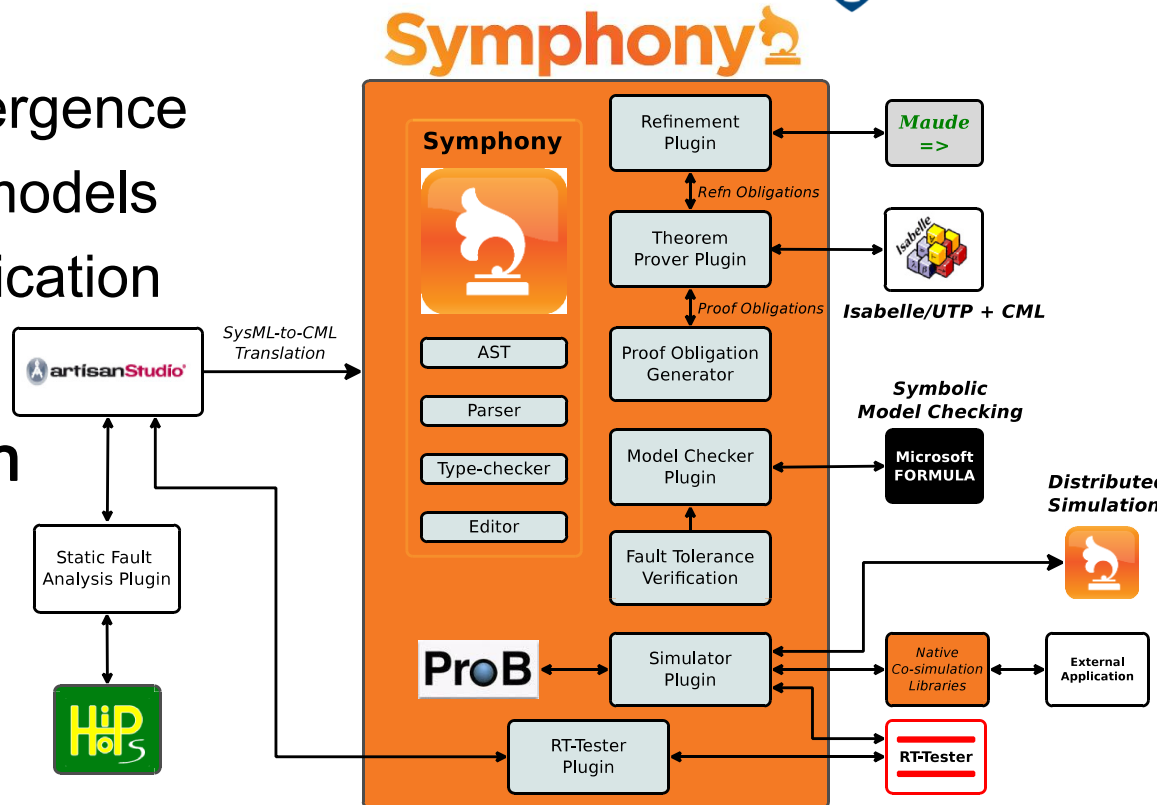
Unified model-based approach promoting consistency, rigour, traceability, validation and verification

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DANSE

- Three-year project exploring MBSE for SoS
- Developed and tested against actual SoS projects:
  - Life cycle methodology based on "Capability Learning Cycle"
  - Goals and contracts specification language
  - Solution methods for architecture exploration
  - Joint simulation with statistical model checking
  - Tool-Net with semantic mediation
- Training, concepts, and some tools available at www.danse-ip.eu
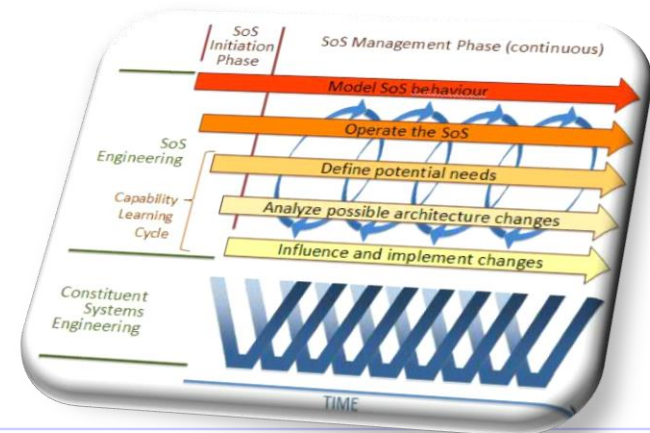
Panels

❖ Presenters
  - ❖ Claire Ingram, COMPASS
  - ❖ Jeremy Bryans, COMPASS
  - ❖ Eric Honour, DANSE

❖ Quod Do, defence and industry perspective

❖ Stephen Cook, research perspective

❖ Fatma Dandashi, standards perspective

Challenges and Opportunities

- **Coping with model complexity**
  - Abstraction
  - Model interoperability
- **Addressing emergent behavior**
- **Dealing with dynamics**
  - Interdependencies
  - Asynchronous change
- **Architecture modeling**
- **Patterns**
- **Contracts**

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