Model Based Systems Engineering for Systems of Systems

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

Pain Points

SoS Authority
What are effective collaboration patterns in SoS?

Leadership
What are the roles and characteristics of effective SoS leaders?

Capabilities & Requirements
How can SE address SoS capabilities and requirements?

Constituent Systems
What are effective approaches to integrating constituent systems?

Testing, Validation & Learning
How can SE approach SoS validation, testing, and continuous learning in SoS?

Autonomy, Interdependencies & Emergence
How can SE address the complexities of interdependencies and emergent behaviors?

SoS Principles
What are the key SoS thinking principles?

Complexity, Perspectives, Interdependencies, Dynamics

A Practitioner’s Approach using MBSE for SoS

Richard Deakins
Doug Parsons
Army AMRDEC

I//ITSEC 2014
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
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