

Model Based Systems Engineering for Systems of Systems

Sunday, January 25, 9:00-12:00

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 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**

Agenda

- 9:00 Introduction on “Why MBSE for SoS?”
- 9:15 **COMPASS presentation and demo**
 - ❖ Claire Ingram and Jeremy Bryans
- 10:15 **DANSE presentation and demo**
 - ❖ Eric Honour
- 11:15 **Panel and group discussion**
“Challenges and Opportunities”
 - ❖ Presenters
 - ❖ Quoc Do, Industry/defence 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?

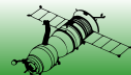


SoS Principles

What are the key SoS thinking principles?

Autonomy, Interdependencies & Emergence

How can SE address the complexities of interdependencies and emergent behaviors?



Interdisciplinary Training, Simulation, and Education Conference (ITSEC) 2014

A Practitioner's Approach using MBSE in Systems of Systems

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INTRODUCTION

In a world of uncertainty for today's Department of Defense (DoD) there exists an uncertainty that the services will require more of the systems brought to the battlefield than originally intended. Our expectations will be to deliver decisive victory against a dynamic and ever increasing complex threat, all the while being within tightening budget constraints. To be successful these systems will be required to such a way to allow the warfighter to "reconfigure and adapt" in order to engage and consume whatever the conditions on the ground or sea or in the air. Furthermore, the employment of a battlefield system will not only operate effectively but to optimize the success of a mission reconfigured defined in terms of systems-of-systems (SoS). As stated in the DoD SoS Systems Engineering guide (DODS STE, 2009).

"With the adoption of test-centric approach to information management, developers recognize that systems operate in a broader context today than in the past. Most importantly, changing threat scenarios increase the need for flexibility and adaptability to the way the war fighter configure and apply suites of systems in response to changing situations. The notion of "systems of systems" is becoming a critical perspective in thinking about systems."

In 2012 the RAND Corporation published a report, "Lessons Learned from the Army's Future Combat System," in the context of the Army's Acquisition Executive to provide an alternative analysis of the FC3 program (Peters, et al., 2012). FC3 program officials interviewed for the report stated, "The trend toward articulated capabilities will increasingly demand increased early time acquisition of platforms in addition and toward a more sophisticated consideration of how the Army should integrate systems into existing and future formations." Further, they agreed that more programmatic system requirements is needed for such a large, multi-year program such that SoS requirements should have been much stronger early in the program. And in case the reader believes that programs like FC3 are the exception, the Defense Acquisition Guidelines (DAG) states that relative to not a system is formally acknowledged as an SoS, nearly all of our DoD systems function in part as SoS to deliver capability to the warfighter. Unfortunately, the acquisition of these systems were value measured and they always yield optimal systems-of-systems. There are strategic contributions leading to sub-optimal conditions that include, but are not limited to organizational structure/culture, governance, budget, and conflicting schedules. While understanding the impact that these contributions have on programs and mission success is significant, it is the aim of this paper to focus discussion on how the use of a model based, i.e. Model Based Systems Engineering (MBSE), approach may provide a remedy for some of the technical aspects of the condition.

A Practitioner's Approach using MBSE for SoS

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