SoSECIE Webinar

Welcome to the 2021 System of Systems Engineering Collaborators Information Exchange (SoSECIE)



We will start at 11AM Eastern Time

You can download today's presentation from the SoSECIE Website:

https://mitre.tahoe.appsembler.com/blog

To add/remove yourself from the email list or suggest a future topic or speaker, send an email to <u>sosecie@mitre.org</u>

NDIA System of Systems SE Committee

Mission

- To provide a forum where government, industry, and academia can share lessons learned, promote best practices, address issues, and advocate systems engineering for Systems of Systems (SoS)
- To identify successful strategies for applying systems engineering principles to systems engineering of SoS

• Operating Practices

 Face to face and virtual SoS Committee meetings are held in conjunction with NDIA SE Division meetings that occur in February, April, June, and August

NDIA SE Division SoS Committee Industry Chairs:

Mr. Rick Poel, Boeing Ms. Jennie Horne, Raytheon

OSD Liaison:

Dr. Judith Dahmann, MITRE

Simple Rules of Engagement

- I have muted all participant lines for this introduction and the briefing.
- If you need to contact me during the briefing, send me an e-mail at sosecie@mitre.org.
- Download the presentation so you can follow along on your own
- We will hold all questions until the end:
 - I will start with questions submitted online via the CHAT window in Teams.
 - I will then take questions via telephone; State your name, organization, and question clearly.
- If a question requires more discussion, the speaker(s) contact info is in the brief.

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2021-2022 System of Systems Engineering Collaborators Information Exchange Webinars Sponsored by MITRE and NDIA SE Division

July 13, 2021 Developing Meta Systems Architectures for Leading Innovation with Complex Societal and Technical Challenges Dr. Cihan Dagli

> July 27, 2021 Advancements Towards a Digital Approach for Mission Engineering Todd Shayler and Daniel Browne

August 10, 2021 OUSD R&E: USD(R&E) Mission Engineering (ME) State of Practice Elmer L. Roman

https://www.mitre.org/capabilities/systems-engineering/collaborations/system-of-systems-engineering-collaborators

Digital Engineering: From Toolchain to Platform

Dr. Aleksandra Markina-Khusid Greg Quinn

29 June 2021



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Digital Engineering as an Accelerator



Sponsors are implementing OSD strategy MITRE is employing modern DE practices to meet sponsor objectives

Enabling Multidisciplinary Collaboration

Enable people of different disciplines to be at their very best to solve the nation's most challenging problems



Key Assumptions:

- Experts use specialized tools of their domains
- Data needs to be exchanged repeatedly on a project
- "Serve up" data in a format usable in their environment

Improved Access to Data is One of Best Ways to Improve Performance



MITRE DE Platform Workstreams



DE Platform Differentiators



Pight Data in Pight Tool in Pigh

- Right Data in Right Tool in Right Form
- Processes and Training that Users Need
- User Discoverable DE Capabilities and Knowledge



Standards-Based

• Vendors integrate Tools not the Government

• Support User-Interface Level and Data-Level Integrations



Extensible, Maintainable

- Low Barrier to New Data Analysis Services
- New Types of Tools
- DevOps delivered



Infrastructure Agnostic

• Deploy to cloud, hybrid, or on-premise computing infrastructure

MITRE DE Platform Tools & Integration

- Model Integration Environment is a hard technical problem
 - Experimenting with multiple techniques
 - Open Services for Lifecycle Collaboration (OSLC) open standard is promising
- Loose coupling of data & tools to scale
 - Serve multiple types of users
 - Foster innovation
- Roles for Tool Vendors, Contractors and Government
- Contractor delivered data managed as baselines in PLM



Open Services for Lifecycle Collaboration – Functional

OASIS Standard (since 2013)

- Establish links between resources in different lifecycle tools from within those tools
- Use resources in one tool to affect resources in another tool (e.g. transformation)
- Add new types of tools (domains)
- Switch versions of tools
- Switch tool used for a domain



Open Services for Lifecycle Collaboration – Technical

- Domains define vocabulary (resources) for each type of tool (circles on previous diagram)
- Domains build on OSLC Core
 - No copying of data
- Linked Data Platform (LDP)

HTTP / REST

 Resource Description Framework (RDF)

Property: **Book A** (subject) has **author** (predicate) of **Greg** (object)

Relationship: **Block X** (subject) **satisfies** (predicate) **requirement Z** (object)

OSLC Domains Vocabularies
RM AM CM QM
OSLC Core Tracked Resource Set Query
Delegate User Interfaces Discovery Resource Preview
Linked Data Platform (LDP) Linked Resources
Open World Assumptions Paging Container
HTTP/REST POST GET PUT DELETE
MIME Types Content Negotiation OAuth RDF



New OSLC Domains

Operational Analysis Setup Domain

- Sub-domains at different levels of fidelity (e.g., component, system, mission, campaign, ...)
- Commenting Domain
 - Manage comments against system elements
 - Delegated user interface support to create comments from any other tool
- Cost Analysis Domain
 - Work Breakdown Structure
 - Component type and Estimation Method (e.g., Function points for software components)





MITRE DE Platform Infrastructure

- Computing and Security Infrastructure hosting DE Environment is a key enabler
- DE environment is infrastructure-agnostic: On-premise or Cloud
- Maintainability through automatic deployment:
 - Develop and update environment once, deploy to multiple instances (e.g., at multiple classification levels)



MITRE DE Platform Knowledge Sharing

- Curate DE knowledge and solutions
- Facilitate connections between project staff and DE assets
 - High demand for "real examples": multidisciplinary and acquisition
- Promote reuse of DE products across multiple projects
- Foster Communities of Practice
- Provide advice and assistance to projects
 - Tailor to real user
- Understand demand to guide investment



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MITRE DE Platform Processes & Training

Processes

- Provide guidance on roles, tasks, workflows, and work products in different subject areas in a reusable and highly accessible fashion
- Provide guidance on the use of commercial DE tools and custom MITRE enhancements integrated into the process steps

Training

- Improve skills and knowledge of engineering and managerial staff to realize the DE vision, to effectively employ modeling, and to meet emerging sponsor needs
 - Master series a sequenced set of courses to achieve a standardized, effective level of skill and knowledge of DE technology, tools, and methods
 - Supplementary courses a set of standard-alone special topic course of interest, such as "How to Read SysML"
 - On-line courses and tutorials on various topics of need and interest

DE for Managers Course Topics (160 people trained on this course)





Example: JIAMDO DE Environment



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Lessons Learned in FY20

- Collaboration requires access to data across a broad user community
- Skill of our staff is far more important than tools selected
- Increase emphasis on end users
- Look for ways to accelerate analysis to inform decisions
- Use best of breed existing software, tools, and applications
- Address technical and cultural challenges in Tool and Data interoperability