Systems Engineering Modernization (SEMod) Key Enablers for System Development on DoD Programs

Systems Engineering Division
Education & Training Committee

NDIA Report
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Robert E. Raygan, Ph.D.
Committee Chair
DAU Professor of Engineering Management

Committee

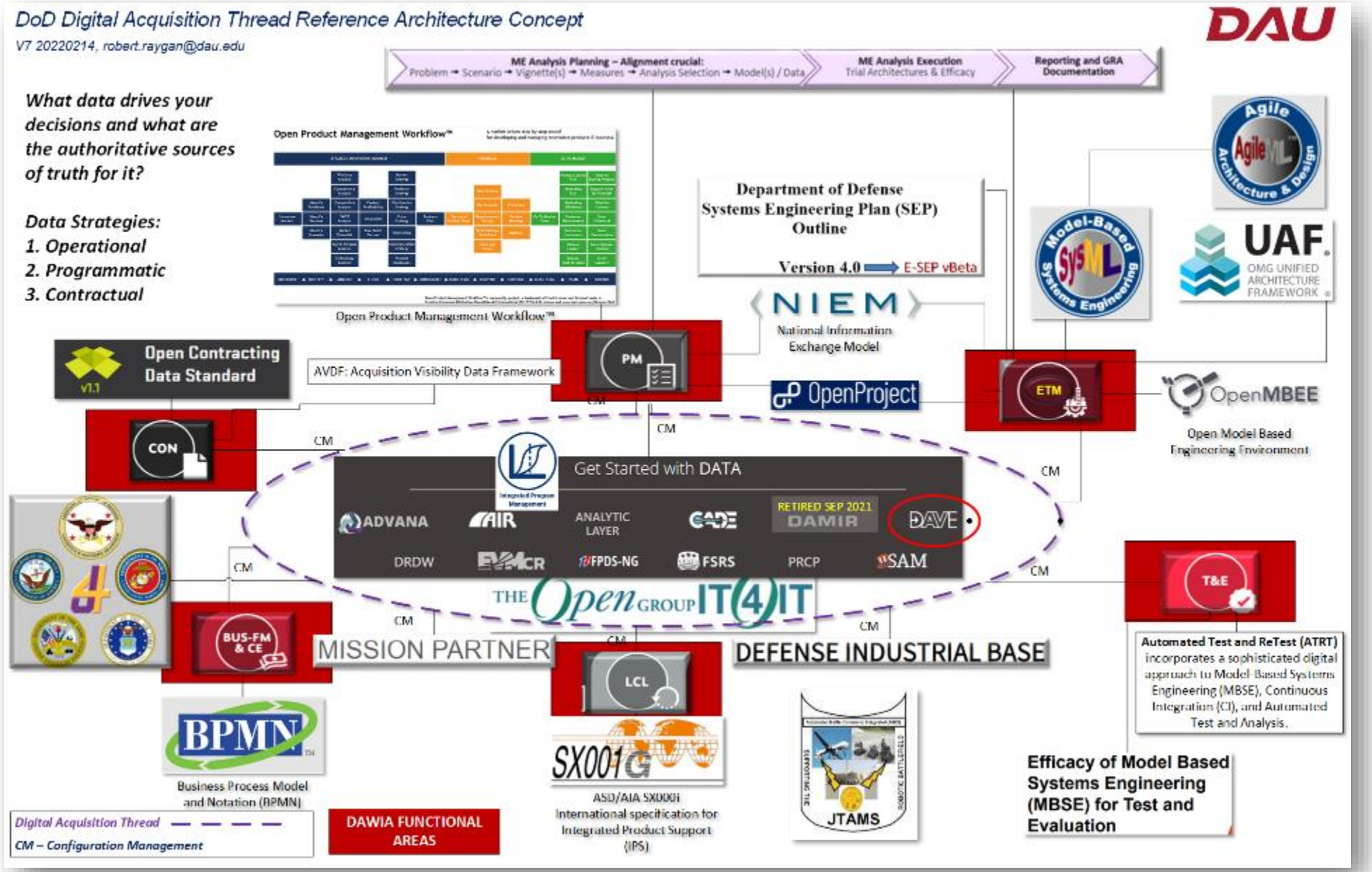
Name	Organization/Company	Email
Robert E. Raygan, Ph.D.	Defense Acquisition University (DAU)	robert.raygan@dau.edu
Dr. John Snoderly	Defense Acquisition University (DAU)	john.snoderly@dau.edu
Dr. Kenneth Nidiffer	Professor Emeritus of the DSMC Industry Advisor on George Mason's Computer Science Education Committee	knidiffe@gmu.edu
Garry Roedler	Former INCOSE President Retired Senior Fellow at Lockheed Martin	gjrjar@gmail.com
Dr. Cliff Whitcomb	Cornell SE Professor INCOSE Editor Systems Engineering Former Chair Department of Systems Engineering	
Mike Jones	Johns Hopkins University Applied Physics Lab	Michael.Jones@jhuapl.edu
Dr. Dale Moore	Founder and President, The Moore Group LLC Strategy, Innovation and Transformation Services	daleleemoore@gmail.com
Dr. Nicole Hutchison	Systems Engineering Research Center (SERC) Stevens Institute	Nlong@stevens.edu
Dr. Jim Roche	DAU (DE Credential Lead)	James.roche@dau.edu
Andrew R. Miller	Boeing and Architecture Committee	andrew.r.miller@boeing.com
Geoff Draper	L3 Harris	Geoff.Draper@L3Harris.com

"Exemplar Digital Acquisition Thread" Challenges and Results

Mission and Purpose	Desired Results	Stakeholders / Sponsors / Collaborators
Why "Exemplar Digital Acquisition Thread" project? SE Modernization (SEMod) pain points: A. Digital Processes and Products (Digital Acquisition / E-Programs) B. Enterprise Systems Engineering approach integrating: 1. Key areas: DE/MOSA/SWE-CID/ME/CM 2. Collaboration and Data Sharing challenges between Government and Industry 3. Digital Tools / Methods 4. Role of Reference Architecture **Desired Result:** A Digital Acquisition Thread Reference Architecture and Examples with Digital Artifacts for each RA Element.	**GOALS:** A. Create a government reference architecture for a cross-continuum digital acquisition thread. B. Collect exemplar reference architecture elements from mission partners, industry, and academia. C. Share exemplar acquisition thread with the community for education, training, and re-use. D. E-SEP: native digital systems engineering plan model with mission critical interfaces for data sharing **SUCCESS STATEMENT:** A. Deliver a digital acquisition thread reference architecture hosed on DoD web site and incorporated into training materials and workshops for the community. B. Reference architecture element models, formats, interfaces, etc. are collected and hosted on appropriate sources of truth.	**Customer:** OUSD R&E, Nadine Geier **Who Benefits?** DoD Acquisition Teams, ASD(A), DoD CIO **Team:** OUSD R&E, SERC, DAU, NDIA SED Committees, Mission Partners, and other DoD Agencies.

Measures of Success	Accomplishments
1. SERC SEMOD workshop pilot establishes survey questions and guidance for broader audience offering and feedback 2. DoD ASoT owners are identified with interface APIs cataloged. (NDAA21 Tasker 804.c.) 3. Digital Acquisition Thread Pilot with exemplar mission partners. 4. NDIA Project Team & OUSD R&E iteratively develops Digital Acquisition Thread Reference Architecture 5. NDIA delivers a digital acquisition thread reference architecture 6. Collected exemplar digital artifacts are hosted by DoD for education, training, and re-use. 7. NDIA SED M&SE Conference Panel Discussion on lessons learned and next steps for continuous improvement	1. SEMod Series added to DAU Events for webcasts and training reuse. 2. Big challenge for DoD, work around for training provided by NPS sharing their GitLab for "DoD Reuse and Sharing Training Program Artifacts" 3. Exemplar Mission Partners: AFSOC MAC, MCSC, AFC DE Cop, NAWCAD, PEO-IEWS, PEO-EIS, PEO-AVN, NAVWAR, ASA (ALT), ASN (RDA), DISA, … 4. What needs work? DoD public sharing policy and process. (Update for digital artifacts) 5. OMG UAF Working Group – Model Based Acquisition - RFP and Response plus 6. NPS GitLab: To be shared – Skyzer, Silverfish, CUI WOSA.mdzip, MITRE 5000 model, DAU Bulldog 7. What needs work? NDAA21 tasker: Were interface models considered rather than "documents? 8. DAU ME and MOSA workshops created in response to mission partner requests, integrated into SEMod awareness. CM workshop in development

Concept: What are the cross-functional dependencies / interfaces for Systems Engineering Modernization Focus Areas?



Exemplar Digital Acquisition Thread Collaborators

Key Collaborators

SERC
NPS
OMG

ME Exemplar
WSE 028 ME Workshop

DE / MOSA Exemplar
WOSA RA/Model

DE/MOSA Exemplar
SATCOM RA

DE Exemplar
MAC Project / SysML Guidance

Project Sponsor

MOSA Exemplar
RFP Verbiage

CID (agility)
SCRUM Agile
Webcast

MOSA Exemplar
PNT RA

WSE 027 MOSA Workshop

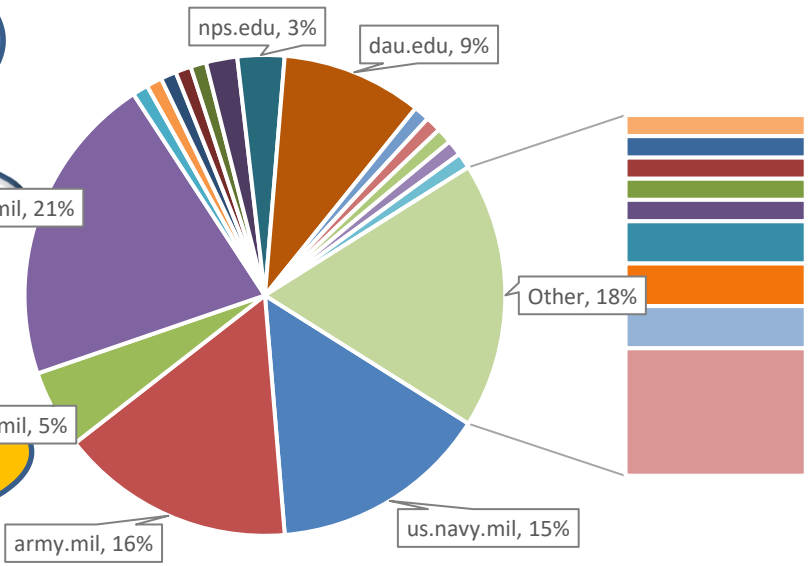
LSI Exemplars
Gov and Organic LSI
Webcast

WSE xxx LSI Workshop

WSE xxx EntCM Workshop

- CO MCSC
- DCMA BAE (USA)
- DISA EM (USA)
- OSD DOD CIO (USA)
- OSD OUSD A-S (USA)
- OSD OUSD R&E (USA)
- USAF AFRL
- USAF AFSOC A5-8 (USA)
- USAF AFSOC AFSOC A5-8-9/A8I1
- USAF AFSOC AFSOC A5-8-9/A8IS
- USAF HAF SAF/SAF/AQRE
- USAF OSD OUSD R-E (USA)
- USAF SAF/CN (USA)
- USARMY DEVCOM C5ISR (USA)
- USARMY PEO AVN (USA)
- USARMY PEO EIS (USA)
- USARMY PEO IEWS (USA)
- USN (USA)
- USN COMNAVAIRSYSCOM PAX (USA)
- USN COMNAVSEASYSCOM DC (USA)
- USN NAVAIRWARCENACDIV MD (USA)
- USN NAVSUP WSS PHIL (USA)
- USN NAWCAD (USA)
- USN NIWC PACIFIC CA (USA)

Over 95 Collaborators Across Defense, Industry, and Academia Supporting SEMod and Exemplar Digital Acquisistion Thread

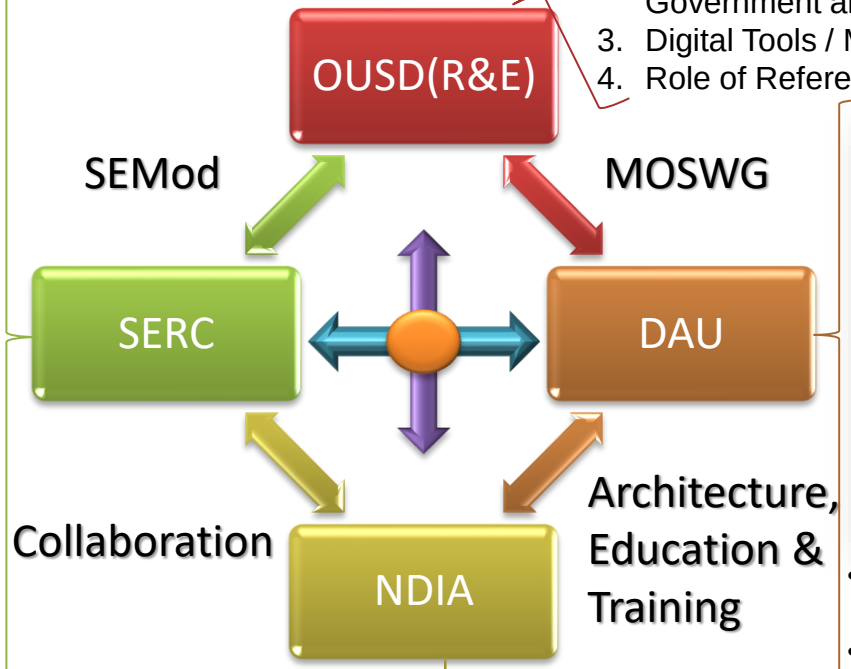


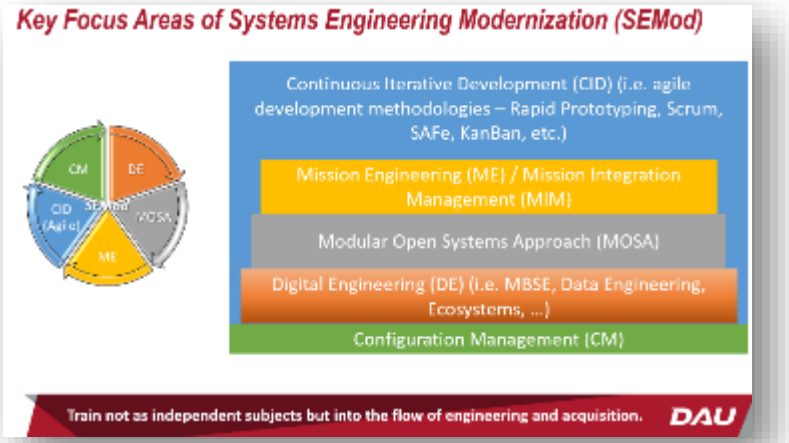
From email domains

SEMod Collaborative Results

1. Get the integration framework into the flow down of policy and guidance to training.
2. ME, MOSA, and Agile need to be trained not as independent subjects but into the flow of engineering and acquisition.
3. Creating versions of that “bomb cyclone” model with accompanying narratives to describe this flow for different acquisition pathways as well as different functional areas.
4. Compiled a list of ~600 lessons learned from open literature at the detailed process level. This is not ready to be distributed yet but as SERC abstracts them upward they hopefully will provide more detail on the activities across the focus areas that are useful learning in a training setting.
5. Studying a digital ontology that relates military doctrinal language to acquisition language to systems engineering language. These are horribly disconnected right now. Hopefully this can also help with the background. (This includes the DAU definitions and taxonomy now but we are looking more broadly)
6. Collaborate with DAU on training how to define and contract for an appropriate digital infrastructure that looks forward toward the digital transformation.

A. Digital Processes and Products (Digital Acquisition / E-Programs)
B. Enterprise Systems Engineering approach integrating:
   1. Key areas: DE/MOSA/SWE-CID/ME/CM
   2. Collaboration and Data Sharing challenges between Government and Industry
   3. Digital Tools / Methods
   4. Role of Reference Architecture (RA)





- Identified many exemplar programs and organizations across the community.
- DoD CIO identified DISA native digital SATCOM RA created to publicly share - stimulating innovation and non-traditional industry contributions.
- Identified DoD policy gap preventing public sharing of digital artifacts like DISA SATCOM RA
- NDIA Cross-committee, cross-community collaborative project led by OMG UAF developing “Model Based Acquisition” digital artifacts and guidance

- Created “Systems Engineering Modernization,“ Webcasts Series
- Created: WSE027 MOSA and WSE028 ME Workshops, Developing CM and Architecture Workshops
- Delivered SEMod concept to Defense Acquisition Executives, Executive PMs, ACQ1700 Agile, WSA004 Cloud, ETM2020 Mission and Systems Thinking, ETM2070 Digital Literacy, ETM2080 Software Literacy and Army Agile / Software Pathway cross-functional teams.
- Awareness and Sharing: AIR FORCE MATERIEL COMMAND (AFMC) , GUIDEBOOK FOR IMPLEMENTING MODULAR OPEN SYSTEMS APPROACHES IN WEAPON SYSTEMS, 12SEP22

Conference Panel: Systems Engineering Modernization (SEMOD) Key Enablers for System Development on DoD Programs

Title: Systems Engineering Modernization (SE MOD) Key Enablers for System Development on DoD Programs

Short Summary: The OUSD(R&E) Systems Engineering Modernization (SE MOD) initiative focuses on identifying and integrating advances in SE that enable DoD programs to develop systems more quickly, effectively, at lower cost, with reduced risk. In this panel, Service leaders will share approaches and lessons learned.

Abstract: OUSD(R&E) presented systems engineering modernization "Pain Points" at the 2022 NDIA Systems Engineering Division (SED) annual kickoff meeting. The SED Education and Training (E&T) Committee initiated a joint project to address those pain points with DoD programs and organizations, the Defense Acquisition University (DAU), Stevens Institute of Technology Systems Engineering Research Center (SERC), Naval Postgraduate School (NPS), MITRE, and many other community collaborators. This panel has identified several programs and organizations as exemplars for their approaches and actions implementing policy and guidance for the SE MOD Focus Areas (Digital Engineering, Mission Engineering, Modular Open Systems Approach, Agile SE) as well as continuous iterative development and modern software acquisition practices.

Effective systems engineering practices and approaches are considered “enablers” in that they enable DoD programs to develop systems and solutions more quickly, effectively, at lower cost, and with reduced risk.

Dr. Robert Raygan of DAU, NDIA SED E&T Committee Chair, will moderate the panel.

Panelist

MOSA	PEO AVN	Stough, John T CTR USARMY PEO AVN (USA) Chief Architecture Officer (CAO), JHNA Supporting US Army PEO Aviation MOSA Transformation Office
DE	Air Force Institute of Technology (AFIT)	Richard Sugarman Dept Head – Systems & Software Engr Mgmt School of Systems and Logistics Air Force Institute of Technology
Agile & MBSE	AFSOC	BRANDON P. FROBERG, Maj, USAF Integration & Interoperability Branch AFSOC/A8II
ME & SoSE	Israeli Air Force	Maj Tzvika Kaminisky Chief System Engineer IAF Helicopter Programs Branch

Results

- NDIA S&ME Conference E&T Comm. SEMod Panel Discussion: PEO AVN, AFIT, AFSOC, Israeli Air Force, …
- NDIA Architecture Comm. MOSA Metrics integrating SEMod key enablers
- DoD CIO identified DISA SATCOM Reference Architecture Exemplar and Public Sharing Policy GAP
- OMG UAF “Digital Acquisition Model” project, ETA June 2023
- Discovered and shared contracting language for MOSA with OUSD(R&E) Modular Open Systems Working Group (MOSWG), DAU workbooks, DSMC PMT-4020, WSE027, and NDIA.
- AFRL MBSE exemplar illustrating challenges in sharing CUI WOSA model
- AFSOC MC130J Amphibious Capability (MAC) DE, MBSE, CID, Rapid Prototyping exemplar
- Exemplars: PEO IEW&S request for MOSA workshop / MCSC request for ME Workshop
- DAU Created new Integrated Training Opportunities leveraging Customer Implementation Guidance, Mission Assistance, Webcasts, and Workshops
  - WSE 027 Modular Open Systems Approach (MOSA) Awareness and Planning Workshop (dau.edu), MA request from PEO-IEWS to address ASA (ALT) and PEO implementation guidance. July first offering, November 17th next offering.
  - WSE 028 Mission Engineering (ME) Awareness and Planning (dau.edu), MA request from Marine Corps Systems Command to define integrated Marine approach to both POM and Gaps Assessment mission engineering. October 20th next offering.
  - WSE xxx Enterprise Configuration Management (ME) Workshop, MA request from NAVWAR / ASN (RDA) to train CM warrant holders and practitioners for the digital domain. Meeting every other Monday, August 15th next meeting.
- DAU Created Systems Engineering Modernization (SEMod) - Defense Acquisition University (dau.edu) webcast series. Event Series (dau.edu)
  - May 05, 2022 01:00 PM ET PEO-EIS “SCRUM Implementation for Army Lessons Learned”
  - Jul 28, 2022 01:00 PM ET NAWCAD AIRWorks “Government Lead Systems Integrator: Benefits and Fundamentals”
  - Sep 29, 2022 01:00 PM ET NAWCAD WOLF “organic Lead Systems Integrator (oLSI)”
  - Oct 13, 2022 01:00 PM ET Lockheed “The Digital T’s - Threads, Twins, Technology and Transformation””
  - Oct 27, 2022 01:00 PM ET Boeing “Industry Insights on Effective Data-Driven Product Sustainment ”
- Data Item Descriptor for Digital Systems Model in ASSIST
  - SERC created rapid prototype of models
  - Army has used language in RFI/RFP
  - LM recommended use of language to USAF

Configuration Management in Digital Domain?

SE Process Questions

1. What is the approach to model management (CM of models)?
2. What is the approach to merging branches and baselines? (i.e. cross-continuum of government/industry)
3. How does a program close out a (S&T) branch that may not be assimilated immediately?

REF.

- SEP v4 Appendix E
- Title: DIGITAL SYSTEM MODEL

Number: DI-SESS-82364 Approval Date: 20220201

NEXT

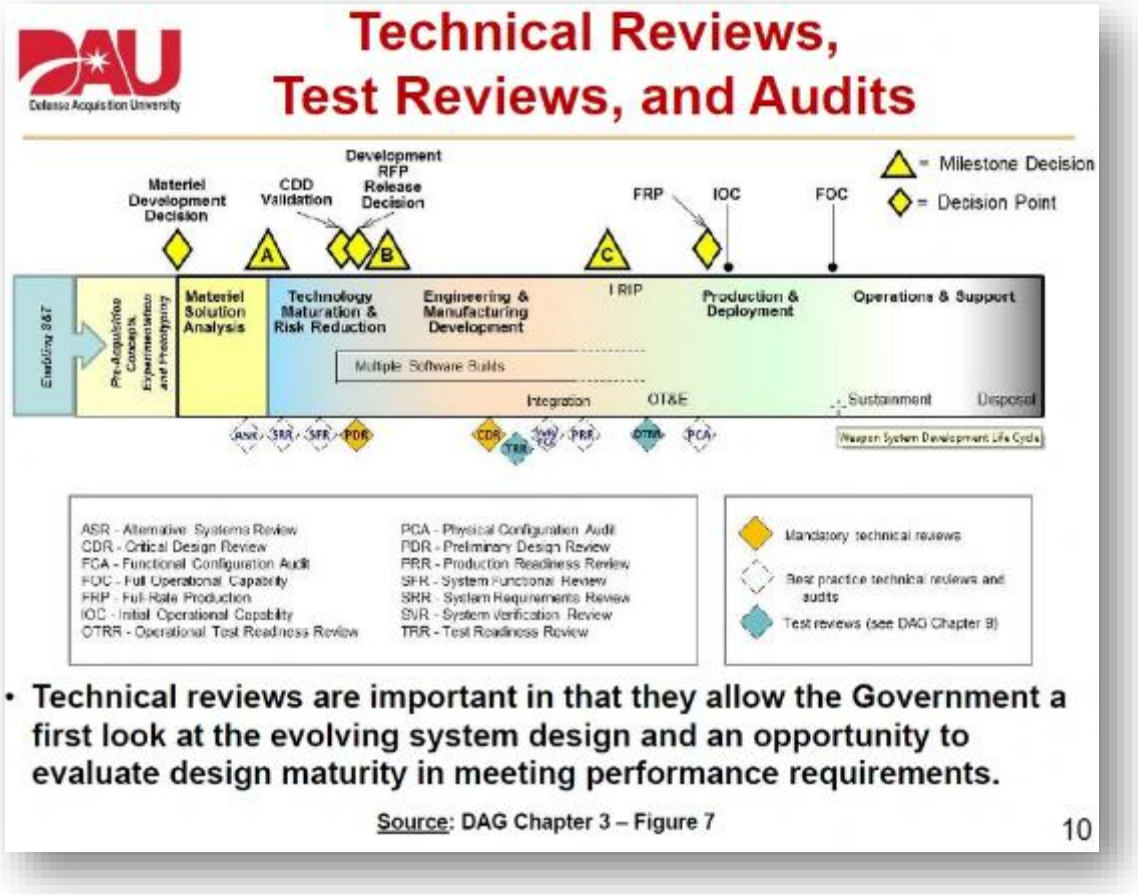
- **Space Force Collaboration**
- **PEO Soldier Collaboration**

How are government and industry teams doing this?

***NAVWAR Engineering & Technical Management CM Vignette Series Request*:**

1. Application of CM for Modeling
2. Application of CM for Cybersecurity
3. Application of CM in ITIL
4. Application of CM in PLM (What does that mean)
5. Application of CM in SETR/TA, what to expect?
6. Conducting a CM program/process self - assessment
7. Developing a CMP, It is not for the faint of heart!
8. What to expect in a CM Audit, Every 3 years the CM TWHs are coming for you!
9. Application of CM in the OSA pipeline/SECDEVOPS
10. Application of CM to Software & COTS Systems
11. Discuss the different paradigms; such as acquirer - supplier/product – platform/Data – Document/ SOS – FOS/Acquisition – Operational Paradigm/
12. CM Contract Language – what you need to know and how to accept those deliverables
13. Now you're a CMGR and you have to get folks trained - Planning your CM Training
14. Moving from traditional CM (paper based) to Digital CM (data driven), what does that entail.
15. CM COI/COP – why join?
16. Configuration Identification - approaches to identification
17. Working through/Eliminating Roadblocks for CM Processes
18. Change Management (deviations, waivers and variances)
19. CM Process Assess and Improvement

Handling Technical Reviews in Digital Environment?

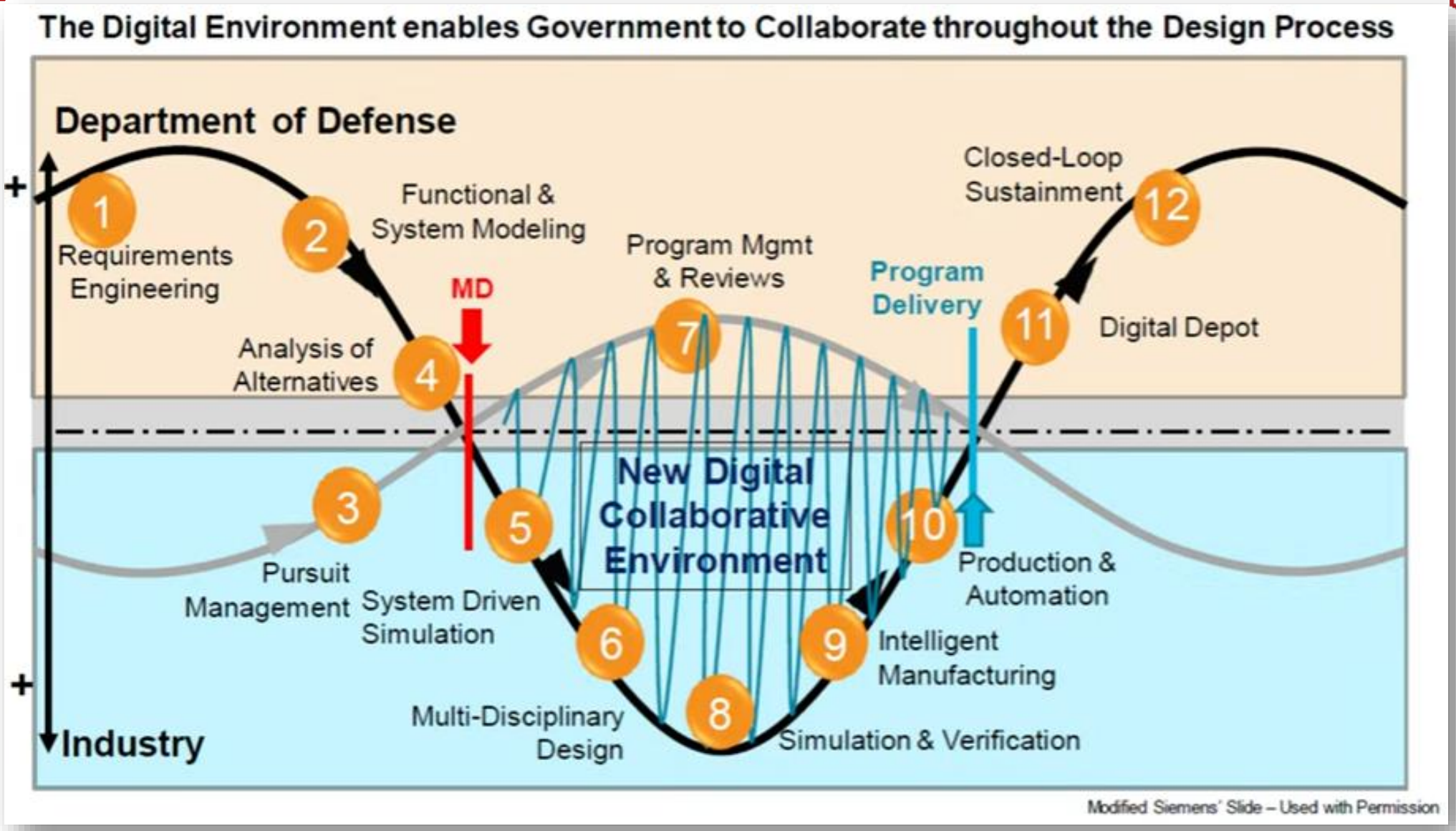


Current State "as is"

Perhaps known locally but not to the broader community?

Future State "to be"

Is this close to your “new” System Development Life Cycle (SDLC)?



Product Life Cycle Management (PLM)?

Next Steps

- Continue discovery of exemplar mission partners
- Begin discovery of industry exemplar partners
- Continue Education and Training collaboration with community
- Invite SEMod webcast series presenters to share with the community and their organizations
- Align MOSWG initiatives and guidance with WSE 027 MOSA Workshop – Provide feedback to MOSWG from WSE 027 Delivery
- Request similar feedback loop with ME and DE