US Army Digital Engineering Implementation

3 April 2019

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Army Digital Engineering Vision

- Link *Operational Concepts* to *Requirements* to *Acquisition* to *Fielding*
- Bring Concepts and Requirements Definitions Together with Engineering and Acquisitions Functions
- Small Agile Headquarters Focused on Flexibility, Collaboration, and Speed
- Focus on Faster Innovation, Experimentation, and Demonstration
- Enable Rapid Prototyping -- Failing Early and Cheaply, and Then Increase Learning with Increased Operational Inputs
- Develop and Implement the Army Architecture Enterprise
- Follow the Army Goals Stated in the 2018 Army Strategy

Integrating the Future Operational Environment, Threat, and Technologies to Develop and Deliver Future Force Requirements, Designing Future Force Organizations, and Delivering Materiel Capabilities

Army Digital Engineering Implementation Challenges

- Legacy Systems and Legacy System Upgrades (e.g. New Avionics on Existing Aircraft)
- Integrating New Capabilities with Existing Systems (e.g. Manned – Unmanned Teaming)
- Inter-Service Integration (e.g. Command And Control Systems)
- Logistics and Sustainment Functions (e.g. Field Operations)
- Culture of Focusing on Individual Programs Goals (e.g. Cost, Risk, Schedule)
- Resources to Transition to Digital Engineering (e.g. Funding, Schedule)
- Data Rights, Proprietary Information, etc.
- Others Yet to be Discovered

Army Digital Engineering Initiatives

- MBSE/DE Efforts have been Ongoing with the Army as "Grass Roots" Activities Pre-dating the OSD DE Strategy
- ASA(ALT) OCSE Formed a DE Working Group Composed of Representatives from OCSE, R&D Centers, PEOs, and PMs
  - Recurring Coordination Telecons to Promote Collaboration and Sharing
  - Face-to-FACE DE Information Sharing Meeting 13-14 September 2018
- OSD DE Strategy
  - Endorsed by the Services with the Commitment to Develop an Implementation Plan by Dec 2018
  - Provided Validation and Motivation to Continue Efforts, to Collaborate Across Efforts, to Initiate New Efforts, and to Develop a Streamlined Approach for End-to-End Digital Engineering Across Materiel and Capability Areas
- Army's Implementation Plan
  - Currently Draft, and intended to be a Living Document
  - Not prescriptive; Documents the Ongoing DE Efforts within the Army

AMRDEC ARDEC ASA(ALT) CERDEC ECBC CCDC TARDEC PEO Aviation PEO Missiles & Space

  - Addresses Objectives, Methodology, Metrics/Benefits, Challenges/Way Ahead, and DE Strategy Goals
- Several Army Organizations Have Also Started Developing an Integrating Strategy Across Their Activities

Goal: Integration/Interoperation Across Army Organizations

Army Digital Engineering Way Ahead

- Continue to Work with OSD
- Guidance and Technical Support From OSD Have Enabled the Army to Leverage the Knowledge and Expertise Necessary to Bring the Army Multiple MBSE/DE Initiatives Together and to Gain an Awareness of Efforts in the Other Services
- Work with the Army Futures Command to Identify “New Start” Opportunities (e.g. CFTs)
- Work with the Army Materiel Command to Identify Opportunities and Impediments for Implementing DE with Existing Systems
- Continue to Work with Existing Army DE and MBSE Efforts, and…
- Identify New Activities across the R&D Centers, Labs, Test Centers, and the PEOs/PMs to…
- Obtain a Good Understanding Of Processes, Products, Issues, and Collaboration Opportunities, in Order to be Able to…
- Reach the Goal of Integration/Interoperation Across the Army and Ultimately Across all the Services

The Army is Committed to Digital Engineering as a Means to Facilitate Reaching our Modernization Goals

Back up Information

U.S. Army Modernization

- ESTABLISHMENT OF THE UNITED STATES ARMY FUTURES COMMAND: GENERAL ORDERS NO. 2018-10
- ARMY MODERNIZATION PRIORITIES: CROSS FUNCTIONAL TEAMS: ARMY DIRECTIVE 2017-24
  - Long-Range Precision Fires
  - Next Generation Combat Vehicle
  - Future Vertical Lift
  - Network Command, Control, Communication, and Intelligence
  - Assured Positioning, Navigation and Timing
  - Air and Missile Defense
  - Soldier Lethality
  - Synthetic Training Environment
- 2018 ARMY STRATEGY SIGNED OUT BY MR. MARK ESPER, SECRETARY OF THE ARMY
- ASA(ALT) SoSE&I RE-ORGANIZATION:
  - Rapid Capabilities Office (RCO)
  - Office of the Chief Systems Engineer (OCSE)

Rapidly Evolving Threats, Warfighting Concepts, and Technologies Require Us to Innovate, Engineer, and Integrate Quickly. Authoritative and Accessible Data, Models, and Architectures Must Underpin Modernization

Army Digital Engineering Activities List (FY18)

Organization	Topic Title	DE Goals
AMRDEC	MBSE Workforce Development	#5
AMRDEC	Infrastructure Development	#4
AMRDEC	Next Generation Future Unmanned Aircraft System	#2,3,4,5
AMRDEC	Multi-Mission Launcher	
AMRDEC	Mission Systems Architecture Demonstration	#1,2,3,4,5
AMRDEC	Architecture Centric Virtual Integration Process	#1,2,3,4,5
AMRDEC	The Digital Manufacturing & Design Innovation Institute	#1,2,3
AMRDEC	ePDM: Product Data Management	#3
AMRDEC	POC: Mr. Tom Channell: thomas.c.channell.civ@mail.mil	
ARDEC	Armament Virtual Collaborative Environment	#1,2,3,4,5
ARDEC	Enterprise Data sharinG Environment (EDGE)	#1,2,3,4,5
ARDEC	Model Based Systems Engineering (MBSE)	#1,2,3,4,5
ARDEC	POC: Mr. Jeff Dyer: jeffrey.c.dyer.civ@mail.mil	
ASAALT	Support to E-LPDM	#2,4,5
ASAALT	Support to Army Acquisition Enterprise Business Environment	#2,3,4
ASAALT	POC: Mr. Art Clark: arthur.l.clark.civ@mail.mil	
CERDEC/OCSE	Cyberspace Model Study	#1
CERDEC	POC: Mr. Matt Picerno: matthew.j.picerno.civ@mail.mil	
OCSE/CERDEC	Architecture & Model-Based Engineering	#1,3,4,5
OCSE	POC: Ms. Nickee Abbott: nickee.l.abbott.civ@mail.mil	
ECBC	Analytical Framework	#1,4
ECBC	Augmented Reality Design Review for NBCRV AXIS	#1.3,3.2,4.1,4.2
ECBC	Individual Protection System Performance Model (IP SPM)	#1,5
ECBC	Sensor Networks & UAV	#2,3,4
ECBC	Virtual Reality Design Review for CDTF	#1.3,3.2,4.1,4.2
ECBC	POC: Mr. Kevin Wallace: kevin.s.wallace6.civ@mail.mil	
RDECOM	Soldier and Squad Tradespace Analysis Framework	#1
RDECOM	POC: Mr. Ron Bowers: ronald.a.bowers2.civ@mail.mil	
TARDEC	Digital Physical Thread	#1,2,3,4,5
TARDEC	POC: Ms. Christine Brennan: Christine.k.Brennan.civ@mail.mil	
PEO Aviation	Digital Engineering Transformation	#1,2,3,4,5
PEO Aviation	POC: Mr. Jeremy Turner: jeremy.s.turner8.civ@mail.mil	
PEO Missiles & Space	PEO Missiles and Space Digital Enterprise	#1,2,3,4,5
PEO Missiles & Space	POC: Mr. David Bailey: robert.d.bailey.civ@mail.mil	

OSD Digital Engineering Strategy

Definition: Digital Engineering is an integrated digital approach that uses authoritative sources of systems' data and models as a continuum across disciplines to support lifecycle activities from concept through disposal.

Five Goals:

1. Formalize the development, integration, and use of models to inform enterprise and program decision making
2. Provide an enduring, authoritative source of truth
3. Incorporate technological innovation to improve the engineering practice
4. Establish a supporting infrastructure and environments to perform activities, collaborate, and communicate across stakeholders
5. Transform the culture and workforce to adopt and support digital engineering across the lifecycle

DIGITAL ENGINEERING GOALS AND FOCUS AREAS

Digital Engineering (DE) Vision:
Modernizes how the Department conceives, builds, tests, fields, and sustains our national defense systems.

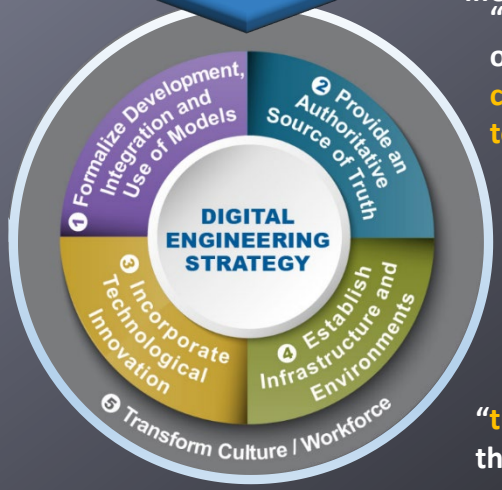
	1	2	3	4	5
GOALS	**Formalize the development, integration, and use of models to inform enterprise and program decision making**	**Provide an enduring, authoritative source of truth**	**Incorporate technological innovation to improve the engineering practice**	**Establish a supporting infrastructure and environments to perform activities, collaborate, and communicate across stakeholders**	**Transform the culture and workforce to adopt and support digital engineering across the lifecycle**
FOCUS AREAS	Formalize the planning for models to support engineering activities and decision making across the lifecycle	Plan and develop the authoritative source of truth	Establish an end-to-end digital engineering enterprise	Develop, mature, and use digital engineering IT infrastructures	Improve the digital engineering knowledge base
	Formally develop, integrate, and curate models	Govern the authoritative source of truth	Use technological innovations to improve the digital engineering practice	Develop, mature, and use digital engineering methodologies	Lead and support digital engineering transformation efforts
	Use models to support engineering activities and decision making across the lifecycle	Use the authoritative source of truth across the lifecycle		Secure IT infrastructure and protect intellectual property	Build and prepare the workforce
MEANS	METHODS, PROCESSES, TOOLS, TECHNOLOGY, DATA, PEOPLE				

Army Aviation Example

Strategic Alignment

DoD Digital Engineer Strategy & the PEO Aviation Strategic Plan

DoD's 2018 Digital Engineering Strategy



Integrate models as part of engineering across the lifecycle

Current, authoritative, & consistent digital models & data over the lifecycle

"rapid implementation of innovations within a connected digital end-to-end enterprise"

"robust infrastructure & environments…that enforce protection of IP, cybersecurity, & security classification"

"transform the culture & the workforce… to digital engineering"

PEO Aviation Strategic Plan

Enterprise Goals

- Support Army Aviation's needs with an **aligned, integrated**, and operationalized PEO
- **Foster ingenuity** across the aviation industry and enable the Army to remain ahead of evolving threats
- Achieve CAB **interoperability** through open systems architecture
- Provide indispensable value to the Warfighter, DOD, Congress, and our allies.

Strategic Objectives

- **Integrate technology** processes and products to **enable rapid and effective capability delivery** to customers
- Build a **workforce** that is **focused on delivering value** to the Warfighter, and **has the skills** it needs to do so
- Streamline acquisition processes to enable an efficient capability delivery to customers

- Delivering Capability to our Soldiers
- Efficient Acquisition Processes
- Communications and Engagements
- Sustainable and Affordable
- Enhancing Partner Nation Capabilities
- Building our Bench

Improve engineering capabilities to rapidly equip the warfighter in the face of evolving threats

PEO Aviation Digital Engineering Transformation

Transformation drivers

- Rapid threat adaptation
- Accelerated delivery of disruptive technologies
- FVL
- DoD DE Strategy Alignment

"Digital Engineering" today

- Programs executing as individual "Cylinders of Excellence"
- Disconnected collection of models, tools, and SE processes

Tomorrow

- Enhanced requirements definition through models
- Standardized SE methodologies for aviation platforms and enablers
- Cohesive, enduring system knowledge base
- Enhanced stakeholder and industry collaboration using transferable models

Initiatives that drive alignment across PEO Aviation

- Comprehensive PEO Aviation Strategy & Transition to a DE Environment
- Full integration of Model Based Systems Engineering (MBSE) with focused training program
- Establish IT Backbone/Tools/Shared Models/Single Source of Truth (SSOT)
- Model-based communication and collaboration with Stakeholders and Industry

Foster Collaboration, Enable Rapid innovation & Accelerate Delivery of Disruptive Capability

DE/MBSE Lessons Learned … So far

- **Develop a plan and execute**
- Define a common lexicon
- **Pick a tool**
- Infrastructure must allow and encourage collaboration
- **Cybersecurity is a cornerstone**
- Open lines of communication with S&T
- **Manage expectations**
- Everyone faces the same challenges

United States Army
PROGRAM EXECUTIVE OFFICE AVIATION
Critical then, critical now, critical tomorrow
2018 Strategic Plan

OUR MISSION
Serve Soldiers and our nation by designing, developing, delivering, and supporting advanced aviation capabilities for operational commanders and our allies.

OUR VISION
Design the future Combat Aviation Brigade and provide integrated sets of capability to yield enhanced reach, reliability and lethality to combat commanders

ACHIEVE CAB INTEROPERABILITY THROUGH OPEN SYSTEMS ARCHITECTURE

SUPPORT ARMY AVIATION'S NEEDS WITH AN ALIGNED, INTEGRATED AND OPERATIONALIZED PEO

FOSTER INGENUITY ACROSS THE AVIATION INDUSTRY AND ENABLE THE ARMY TO REMAIN AHEAD OF EVOLVING THREATS

PROVIDE INDISPENSABLE VALUE TO THE WARFIGHTER, DOD, CONGRESS, AND OUR ALLIES