Digital Engineering Strategy and Implementation

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Office of the Under Secretary of Defense for Research and Engineering

National Institute of Standards and Technology
Model-Based Enterprise Summit 2019 | April 3, 2019
The World Today
Technology Is Transforming the Battlespace

- The proliferation of knowledge and technology erodes historic U.S. advantages
- Our near-peers are increasing their rate of investment in military R&D
- A hyper-competitive environment for National Security technologies
- The discriminators are speed and cycle time

- 2017 GLOBAL R&D FUNDING FORECAST WINTER 2017 Industrial Research Institute, R&D Magazine

R&D – Research & Development
NSB – National Science Board

U.S. R&D Investment (Actual and Projected)

- NSF 2015 data predicted R&D investment parity with China in 2020
- Feb 2018, NSB estimates China R&D investment parity with U.S. by end of 2018
National Defense Strategy and Digital Engineering Strategy

Reform the Department for Greater Performance and Affordability:
- The current bureaucratic approach, centered on exacting thoroughness and minimizing risk above all else, is proving to be increasingly unresponsive. We must transition to a culture of performance where results and accountability matter.

Our Response:
- to prioritize speed of delivery, continuous adaptation, and frequent modular upgrades.

Objective:
- Guide the planning, development, and implementation of digital engineering across the services and agencies.

Expected Impact
- Increase technical cohesion and awareness of system in lifecycle activities.
- Reform the Department’s business practices for greater performance and agility.

https://www.acq.osd.mil/se/initiatives/init_de.html
“The strategy sets a new vision for the way we conceive, build, test, field, and sustain our national defense systems.”

“It also transforms how we must train and shape the workforce to use digital engineering practices...”

“We will convene a Digital Engineering Summit...”

“We invite the Services and Agencies to share their Digital Engineering Implementation initiatives...”

Separate memo to DEPSECDEF:

“I expect the first implementation plans from each Service by end of December 2018”
Digital Engineering Overview

- **What is Digital Engineering?**
  - Combines model-based techniques, digital practices, and computing infrastructure
  - Enables delivery of high payoff solutions to the warfighter at the speed of relevance

- **Reforms Business Practices**
  - Digital enterprise connects people, processes, data, and capabilities
  - Improves technical, contract, and business practices through an authoritative source of truth and digital artifacts

*Modernizes how we design, operate, and sustain capabilities to outpace our adversaries*
Goal 1: Formalize the development, integration, and use of models to inform enterprise decision making

Challenges

<table>
<thead>
<tr>
<th>Topic</th>
<th>Short Description</th>
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</thead>
<tbody>
<tr>
<td>Model Integration</td>
<td>Models are not developed or used across domains, acquisition phases, and programs.</td>
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<tr>
<td>Model Curation</td>
<td>Models are not curated such that information can be preserved, discovered and used across the lifecycle.</td>
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<tr>
<td>Model Credibility</td>
<td>Traditional VV&amp;A approaches do not account for model credibility and trust in the digital age.</td>
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Focus Areas:

1. Formalize the planning for models to support engineering activities and decision making across the lifecycle
2. Formally develop, integrate, and curate models
3. Use models to support engineering activities and decision making across the lifecycle
Goal 2: Provide an enduring authoritative source of truth

Focus Areas

1. Plan and develop the authoritative source of truth
2. Govern the authoritative source of truth
3. Use the authoritative source of truth across the lifecycle

Challenges

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<tr>
<td>Authoritative Data</td>
<td>Vast amounts of data are scattered across multiple stove-piped systems and organizations in various forms</td>
</tr>
<tr>
<td>Governance</td>
<td>Managing and controlling data sources are fragmented or ad hoc</td>
</tr>
<tr>
<td>Digital Artifacts</td>
<td>Exchanging digital artifacts in a document-based culture</td>
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Goal 3: Incorporate technological innovation to improve the engineering practice

Challenges

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<td>End-to-End Solutions</td>
<td>Digital engineering activities are disjointed across the lifecycle</td>
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<tr>
<td>Engineering Practice Innovation</td>
<td>Transforming the way engineers leverage technology to be responsive to change</td>
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Focus Areas

1. Establish an end-to-end digital engineering enterprise
2. Use technological innovations to improve the digital engineering practice
Goal 4: Establish a supporting infrastructure and environments to perform activities, collaborate, and communicate across stakeholders

Focus Areas

1. Develop, mature and use digital engineering IT infrastructures
2. Develop, mature, and use digital engineering methodologies
3. Secure IT infrastructure and protect intellectual property

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<td>IP &amp; Critical Technology Protection</td>
<td>Limited strategies for protecting and securing the integrity of classified and proprietary digital data</td>
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<tr>
<td>IT Infrastructure</td>
<td>IT infrastructures not designed for complex digital model-based engineering activities</td>
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<tr>
<td>Methods, Tools, &amp; Processes</td>
<td>Current methods process and tools do not holistically support the digital engineering activities</td>
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Goal 5: Transform the culture and workforce to adopt and support digital engineering across the lifecycle

Focus Areas
1. Improve the digital engineering knowledge base
2. Lead and support digital engineering transformation efforts
3. Build and prepare the workforce

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<td>Workforce Skills Training</td>
<td>Limited incentives workforce skills, insufficient training capacity and resources to meet the demand</td>
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<tr>
<td>Policy, Guidance, &amp; Standards</td>
<td>Limited policies, guidance, and standards to comprehensively address digital engineering activities</td>
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<tr>
<td>Metrics</td>
<td>Lack of a common set of metrics that serve as leading indicators of adoption and effectiveness</td>
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Collaborators/Partnerships

- Armed Services
- DoD Components
- Interagency
- Industry/OEMs/Industrial Orgs
- Academic

Strategy & Service Plans

Outlines DoD’s five strategic goals for Digital Engineering initiatives

Service Implementation Plans

Next Steps

- Regular monitoring of Service Implementation Plans by USD(R&E)/AC leadership
- Service, Industry, Academic, and Standards organization collaborations to further the Digital Engineering implementations
- Address challenges
- INCOSE/NDIA Digital Engineering Information Exchange Working Group to advance concepts
- Research areas initiating in curation and credibility

Implementing Digital Engineering Across the Department
DoD Research and Engineering Enterprise
Solving Problems Today – Designing Solutions for Tomorrow

DoD Research and Engineering Enterprise
https://www.acq.osd.mil/chieftechnologist/

Defense Innovation Marketplace
https://defenseinnovationmarketplace.dtic.mil

Twitter
@DoDInnovation
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# Digital Strategy Goals and Focus Areas

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

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<td>4</td>
<td>Develop, mature, and use digital engineering IT infrastructures</td>
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<td>Improve the digital engineering knowledge base</td>
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**FOCUS AREAS**

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Challenges

• Identified cross-Service Challenges for each DE Strategy Goal
  • Working with Services to develop way ahead to address challenges