



Digital Engineering Update

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Quality Measures for MBSE March 2020

<https://www.CTO.mil>

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Digital Engineering Strategy Overview



Digital Engineering Strategy

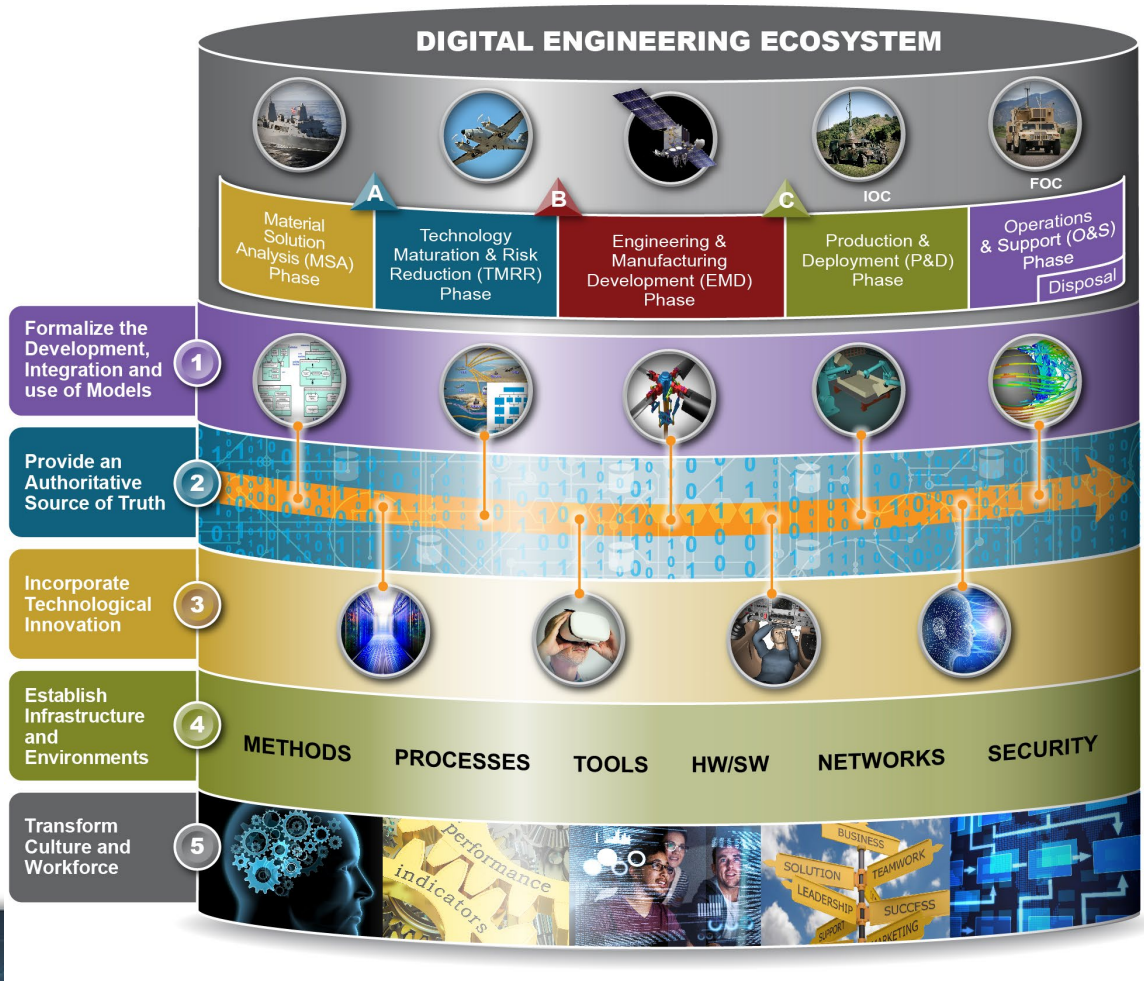
- Modernizes how we design, operate, and sustain capabilities to outpace our adversaries
- Released June 2018

Objective

- Sets the vision across 5 goals
- Guides the planning, development, and implementation

Expected Impact

- Reforms the Department's business practices for greater performance and agility





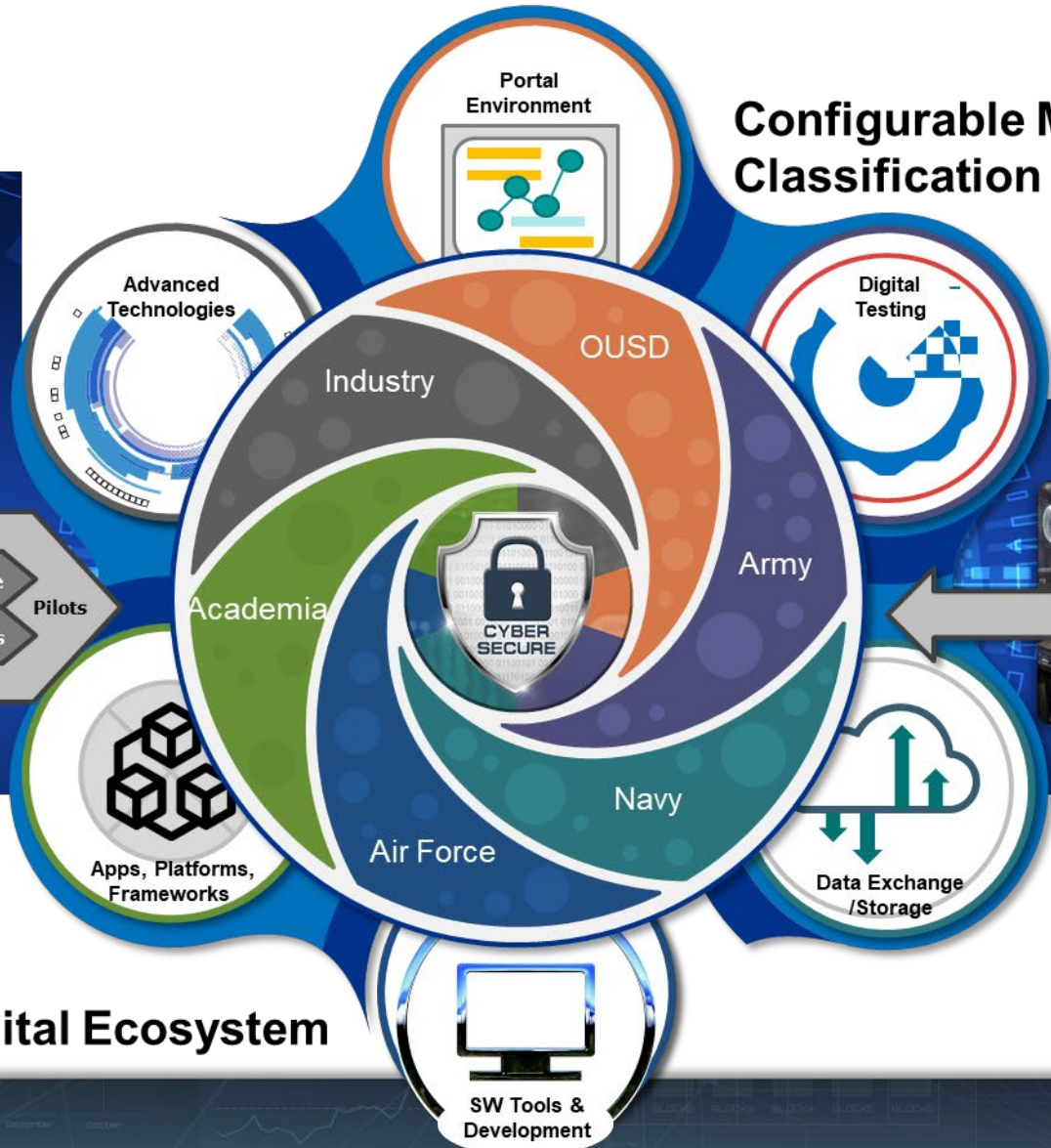
Digital Engineering Core Capabilities



Strategic Alignment

- DE Strategy
 - DE Body of Knowledge
 - DE Implementation Plans
 - DE Policy
- Pilots

Shared Digital Ecosystem



Configurable Multi-User & Classification Environment



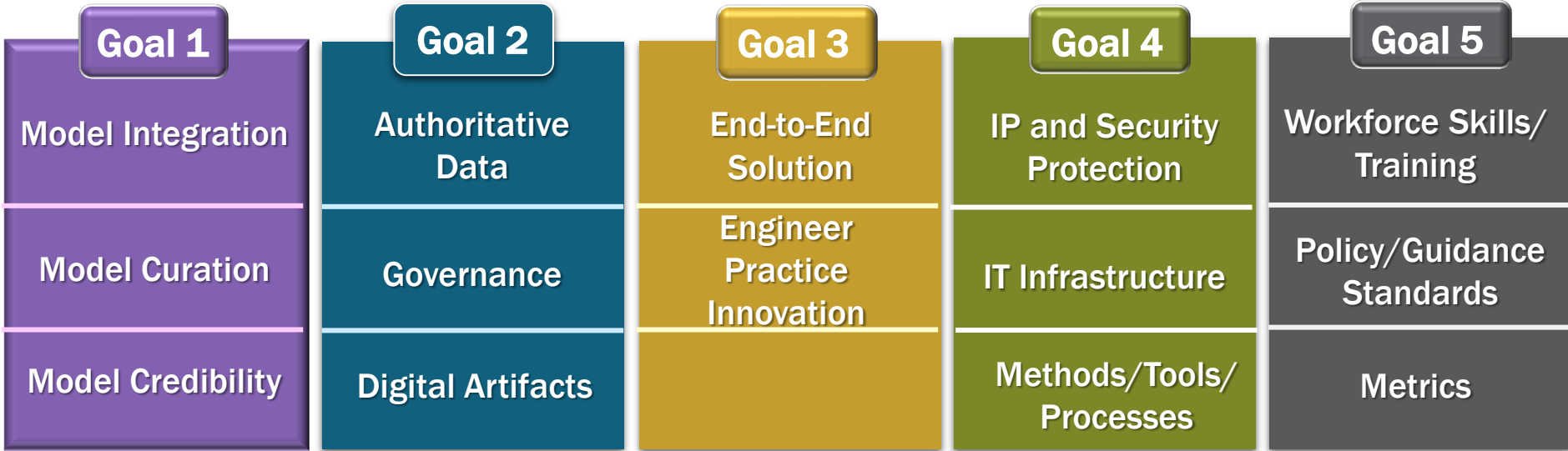
Digitally Enabled Capabilities



Digital Engineering Implementation



Identified cross-Service Challenges for each DE Strategy Goal



Topic	Short Description
Model Integration	Models are not developed or used across domains, acquisition phases, and programs.
Model Curation	Models are not curated such that information can be preserved, discovered and used across the lifecycle.
Model Credibility	Traditional V&A approaches do not account for model credibility and trust in the digital age.

Topic	Short Description
Authoritative Data	Vast amounts of data are scattered across multiple stove-piped systems and organizations in various forms
Governance	Managing and controlling data sources are fragmented or ad hoc
Digital Artifacts	Exchanging digital artifacts in a document-based culture

Topic	Short Description
End-to-End Solutions	Digital engineering activities are disjointed across the lifecycle
Engineering Practice Innovation	Transforming the way engineers leverage technology to be responsive to change

Topic	Short Description
IP & Critical Technology Protection	Limited strategies for protecting and securing the integrity of classified and proprietary digital data
IT Infrastructure	IT infrastructures not designed for complex digital model-based engineering activities
Methods, Tools, & Processes	Current methods process and tools do not holistically support the digital engineering activities

Topic	Short Description
Workforce Skills Training	Limited incentives workforce skills, insufficient training capacity and resources to meet the demand
Policy, Guidance, & Standards	Limited policies, guidance, and standards to comprehensively address digital engineering activities
Metrics	Lack of a common set of metrics that serve as leading indicators of adoption and effectiveness

Models

Authoritative Data

Technological Innovation

Supporting Infrastructure

Culture and Workforce



Summary DE Success Measures Framework



Models are used to inform enterprise and program decision making

An enduring, authoritative source of truth is used over the lifecycle

Use technological innovation to improve engineering practices

Infrastructure and environments support improved communication and collaboration

Transform culture and workforce engineering across the lifecycle

Quality:

- Reduce Errors/Defects
- Improve System Quality
- Improve Traceability
- Reduce Cost

Knowledge Transfer:

- Better access to information
- Better communication/info sharing
- Collaboration

Velocity/Agility:

- More Reuse
- Improve Consistency
- Increase Efficiency
- Support Integration
- Reduce Time

User Experience:

- Manage Complexity
- Improved System Understanding
- Automation

Adoption:

- Methods/Processes
- Roles/Skills
- Training/Tools
- Leadership support
- Change Mgmt Process
- Resources



NASA Sounding Rocket Program (SRP) Background



- **SRP MBSE pathfinder effort**
 - Short acquisition and high success rate
- **NASA and DoD collaboration**
 - DoD modeled the technical management aspects of the systems engineering processes from concept to launch for the SRP
 - Provided a controlled study to measure benefits and experiment with a model-based approach
- **Exploring priorities and avenues to publish results**

The graphic features a central image of a sounding rocket launch with a large plume of fire and smoke. To the left, a vertical banner reads "NASA GSFC Wallops Flight Facility". To the right, the text "Sounding Rockets Program Office" is displayed in red and black, followed by "50 Years as the World Leader in Sounding Rocket Technology". Below this, a list of capabilities includes "Worldwide Launch Sites", "Mobile Range Capabilities", "10 Existing Launch Vehicles", and "Custom Vehicle Configurations". A section titled "Complete Turnkey Services" lists "Design", "Testing", "Manufacture", "Launch", "Integration", and "Data Analysis". On the left side, four smaller images show different rockets: "Terrier Orion", "Black Brant XII", "Black Brant V", and "Terrier Lynx". On the bottom right, an image shows "Black Brant IX" being launched.



Digital Engineering Information Exchange Working Group

A Standardized way to Offer, Request and Exchange Digital Artifacts



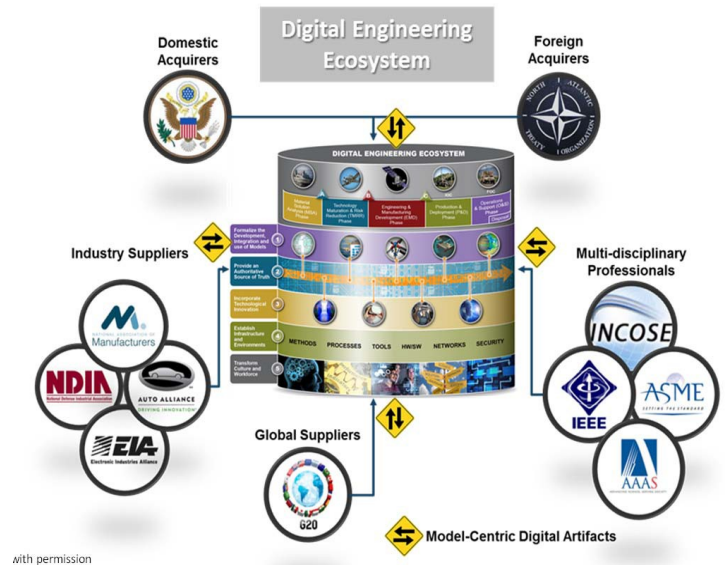
Products

- **DEIXPedia:** Micropedia of digital engineering topics to explain relevant DEIX topics. **STATUS: In place and Maintaining.** See link below
- **Primer:** A narrative that describes the concepts and interrelationships between digital artifacts, enabling systems, and exchange transactions **STATUS: In Process, DRAFT planned for IS2020**
- **Digital Engineering Information Exchange Model (DEIXM):** A prescriptive system model for exchanging digital artifacts in an engineering ecosystem **STATUS: In process, DRAFT planned for IS2020**
- **Digital Viewpoint Models (DVM):** Descriptive information models of digital views that form content for ISO 15288.2 reviews **STATUS: DRAFT DVM developed, working with TIMLM on DEIX challenge to Validate at IS2020**
- **DEIX Standards Framework (DEIX-SF):** A framework for official standards related to MBE Information Exchanges **STATUS: DRAFT DEIX-SF DRAFT developed, use in challenge**

Contributing Team:

- | | |
|---|---------------------------|
| • Sean McGervey, JHUAPL (Chairperson) | • Russell Peak, GTRI |
| • Chris Schreiber, Lockheed Martin (Co-Chair) | • Mark Blackburn, Stevens |
| • Frank Salvatore, SAIC (Co-Chair) | • Terri Chan, Boeing |
| • Tamara Hambrick, Northrop Grumman | • Ken Zhang, L3 Harris |
| • Celia Tseng, Raytheon | • Gan Wang, BAE Systems |
| | • Mike Vinarcik, SAIC |
| | • Mary Tolbert, MITRE |

Information Exchange Model for Digital Engineering Ecosystem



For more details see the Digital Engineering Information Exchange Working Group (DEIX WG) WIKI page at:
<http://www.omgwiki.org/MBSE/doku.php?id=mbse:deix>



Summary

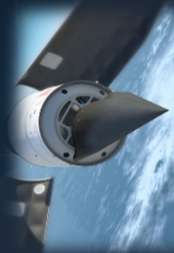
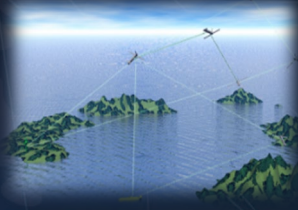


- **OSD has transitioned from the Strategy to Implementation**
- **Digital Engineering core capabilities are an enabler to execute the R&E mission and priorities**
- **OSD has begun to drill down on the challenges, and developed common pain points to solve across the Services**
- **Continued collaborations with NASA, NDIA, and INCOSE**



DoD Research and Engineering Enterprise

Creating the Technologies of the Future Fight



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For Additional Information



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