RAMS Advisory Board Panel

The Digital Transformation of R&M

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R&E / Advanced Capabilities / Engineering /
Engineering Policy & Systems / Specialty Engineering

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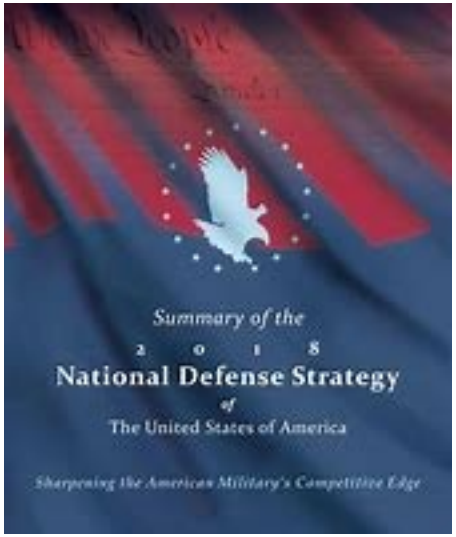
Overview

- Digital Engineering (DE) in DoD
- Current R&M policy
- Ongoing prioritized R&M engineering initiatives
- Future digital transformation of R&M in the DoD

National Defense Strategy and Digital Engineering Strategy

National Defense Strategy

"A **more lethal force**, **strong alliances and partnerships**, American **technological innovation**, and a **culture of performance** will generate decisive and sustained U.S. military advantages." **– National Defense Strategy**



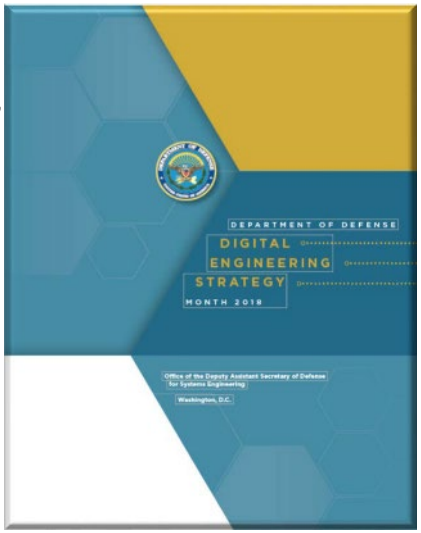
We need to:

- Bridge the invention-operations divide as the primary technology transition enabler
- Identify and support relevant, high pay-off, cost-effective cross-component technology efforts
- Plan and prioritize research and development of advanced capabilities

Digital Engineering (DE) Strategy

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

"Deliver Cost-Effective Performance at the Speed of Relevance"

"Reality of Competition"

Invest in technologies that mitigate our strengths

Erode traditional U.S. advantage in conventional Warfare

Exploit U.S. vulnerabilities

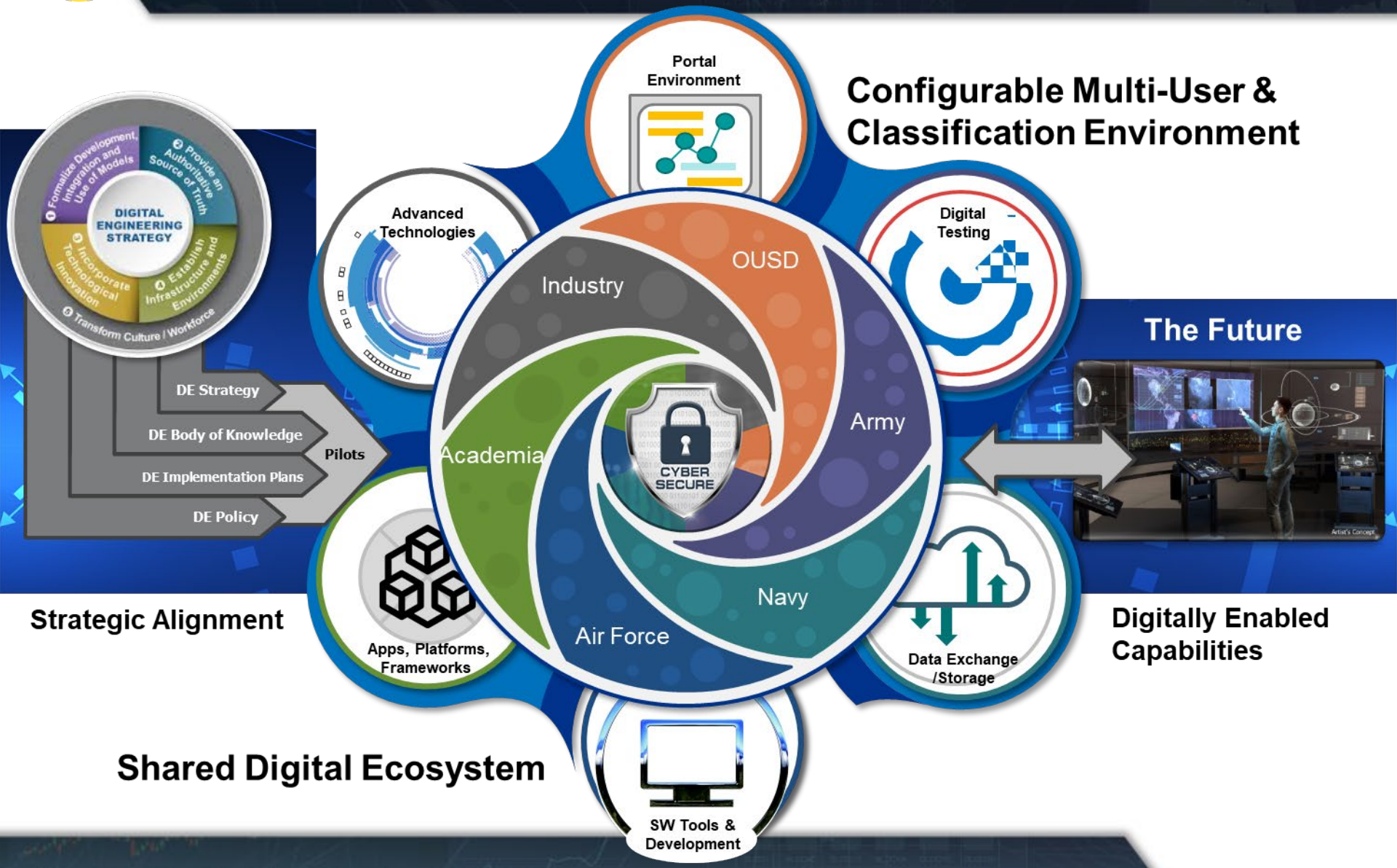
Field systems more rapidly

Digital Engineering (DE) Strategy

"What" NOT "How"

"We cannot expect success fighting tomorrow's conflicts with yesterday's weapons or equipment." – National Defense Strategy

Digital Engineering Core Capabilities



DE Strategy and Challenges

STRATEGY	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
CHALLENGES	**Model Integration**	**Authoritative Data**	**End-To-End Solution**	**IP and Security Protection**	**Workforce Skills & Training**
	Model Curation	**Governance**	**Innovate Engineering Practice**	**IT Infrastructure**	**Policy & Guidance Standards**
	Model Credibility	**Digital Artifacts**		**Methods, Tools, & Processes**	**Metrics**

DoDI 5000.88 – Engineering of Defense Systems

b. Reliability and Maintainability (R&M).

(1) For all defense acquisition programs, the LSE, working for the PM, will integrate R&M engineering as an integral part of the overall engineering process and the digital representation of the system being developed.

(a) The LSE will plan and execute a comprehensive R&M program using an appropriate strategy consisting of engineering activities, products, and digital artifacts, including:

1. R&M allocations, block diagrams, and predictions.

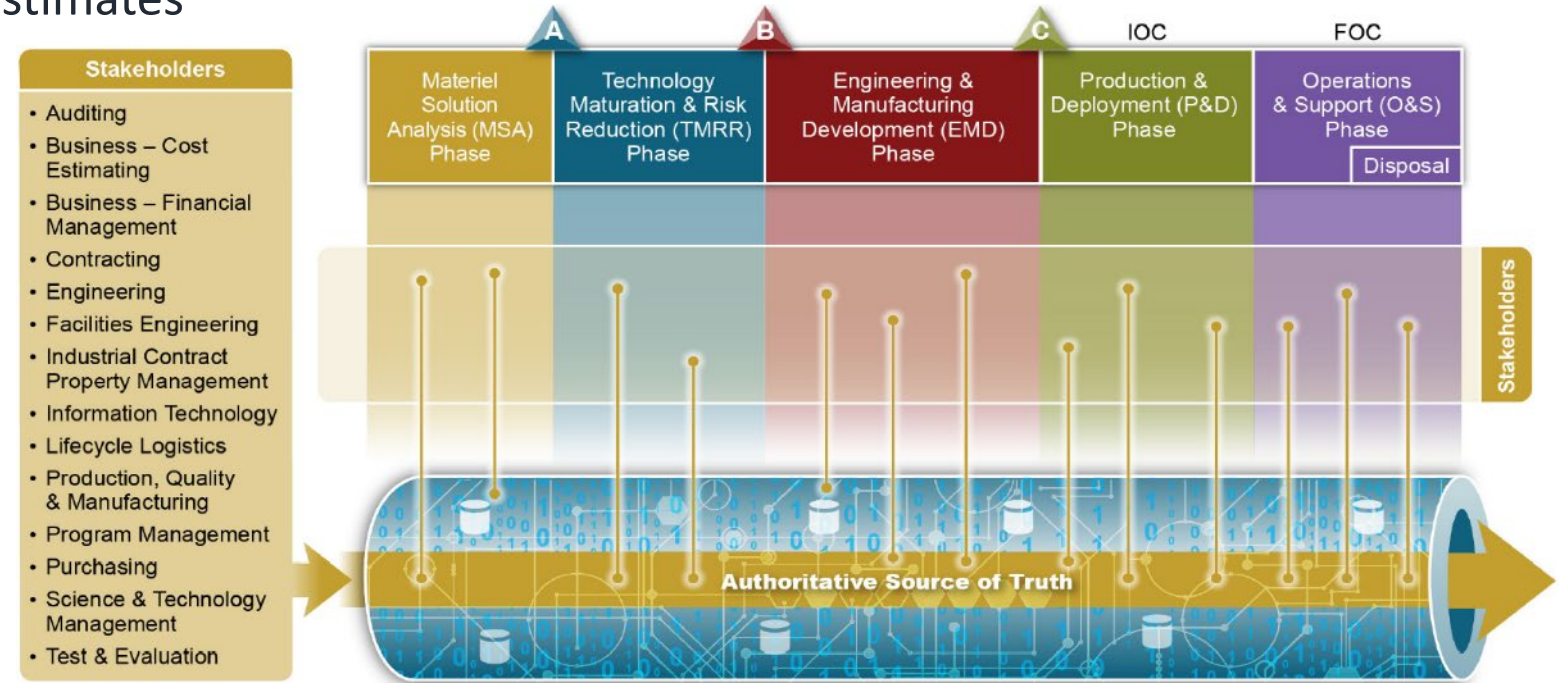
2. Failure definitions and scoring criteria.

3. Failure mode, effects, and criticality analysis,

- "...integral part of the overall engineering process and the digital representation of the system"
- "...strategy consisting of [...] digital artifacts"

Digital Transformation of R&M in the DoD

- Instantiate DE in all R&M engineering activities
- Establish contracting methods and tailoring guidance to flow R&M data from design to manufacturing to product support
- Use of modern data analysis techniques to obtain better failure rate estimates



[1] Office of the Deputy Assistant Secretary of Defense for Systems Engineering, 2018. DoD Digital Engineering Strategy.

BACKUP

Digital Engineering (DE) Strategy: "What" NOT "How"

Describes an integrated digital approach that uses authoritative sources of systems' data and models as a continuum across disciplines to support life cycle activities from concept through disposal

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 link digital models of the actual system with the physical system in the real world
4. Establish supporting **infrastructure and environments** to perform activities, collaborate, and communicate across stakeholders
5. Transform a **culture and workforce** that adopts and supports Digital Engineering across the lifecycle

Modeling, Simulation, and DE

- Model is a representation of reality
- Simulation is a model executed over time

MODEL is key

- DE emphasizes that a model can be data, process, or mathematics, formatted in a way that can be used in execution
  - Models of components
  - Model of components within a system
  - Model of a system (form and fit)
  - Model of system performance (function)
  - Model of system performance as part of a scenario in a mission
  - Model of mission as part of campaign

R&M Engineering Prioritized Pain Points

FY19, FY20

- R&M Standards Mapping
- R&M Contract Language
- Model-Based Engineering (MBE) FMECA*

FY21, FY22

- Instantiate Digital Engineering into R&M
  - Develop New Course: R&M Engineering Interface with Product Support
  - Instantiate DE into R&M Engineering Activities and Existing Courses
- Reliable Software
- Reducing Risk with Better R&M Estimates (Using AI & ML)

**Challenges and Lessons Learned presented yesterday*