Update on the Modeling & Simulation Strategy for Engineering in the Department of Defense

27th Annual National Defense Industrial Association Systems and Mission Engineering Conference

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Office of Systems Engineering and Architecture
Office of the Under Secretary of Defense
for Research and Engineering

Norfolk, Virginia
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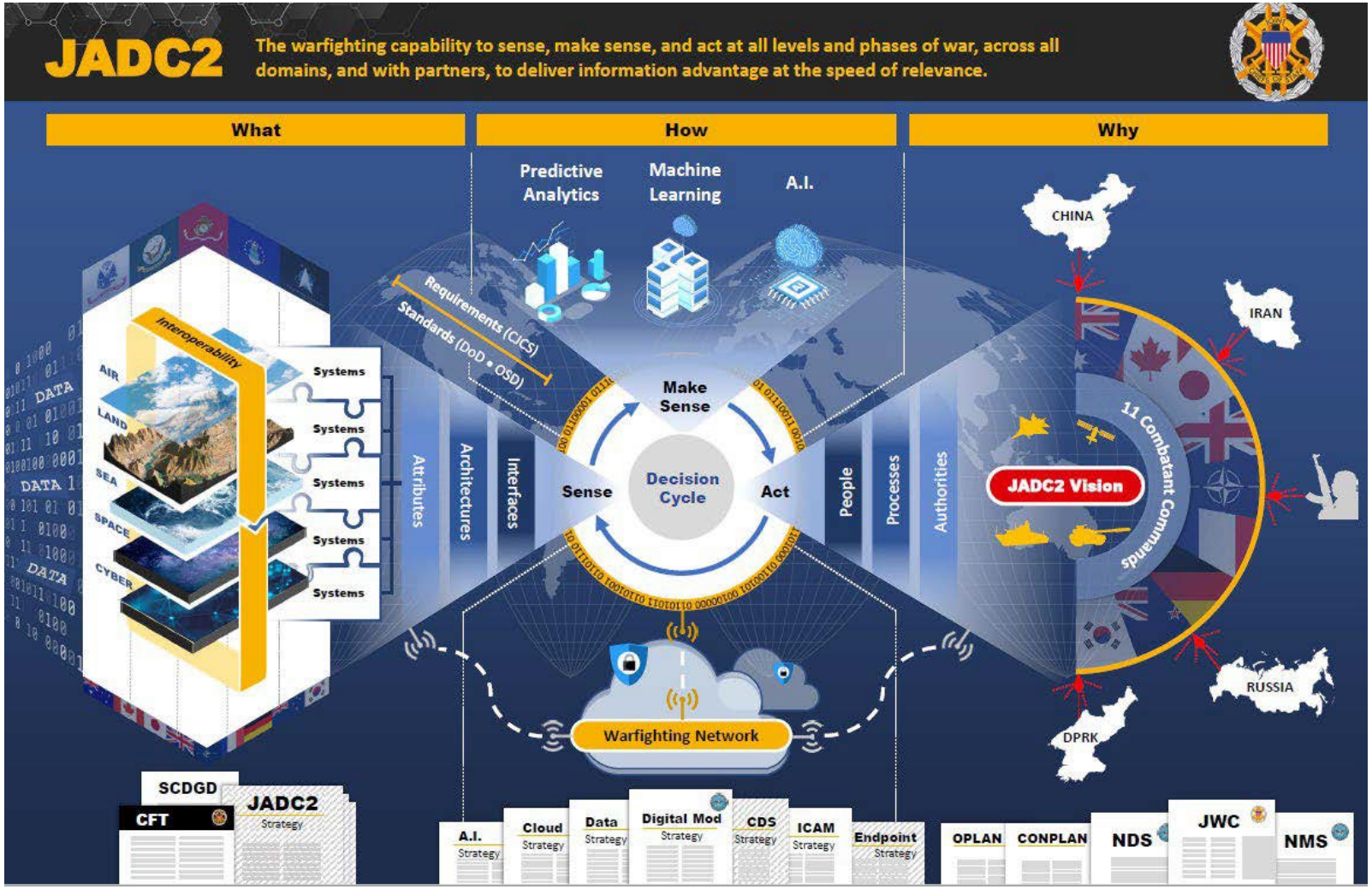
SETA Support: Darryl Howell

Technology Is Transforming the Battlespace



Source: DoD Summary of JADC2 Strategy, March 2022

Office of the Under Secretary of Defense for Research and Engineering OUSD(R&E)

Leaders

Heidi Shyu
DoD Chief Technology Officer, OUSD(R&E)

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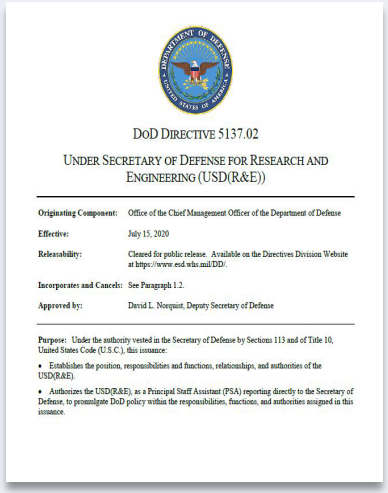
Deputy OUSD(R&E)

Authority From DODD 5137.02



DoD DIRECTIVE 5137.02

UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (USD(R&E))

Originating Component:	Office of the Chief Management Officer of the Department of Defense
Effective:	July 15, 2020
Releasability:	Cleared for public release. Available on the Directives Division Website at https://www.esd.whs.mil/DD/.
Incorporates and Cancels:	See Paragraph 1.2.
Approved by:	David L. Norquist, Deputy Secretary of Defense

Purpose: Under the authority vested in the Secretary of Defense by Sections 113 and of Title 10, United States Code (U.S.C.), this issuance:

- Establishes the position, responsibilities and functions, relationships, and authorities of the USD(R&E).
- Authorizes the USD(R&E), as a Principal Staff Assistant (PSA) reporting directly to the Secretary of Defense, to promulgate DoD policy within the responsibilities, functions, and authorities assigned in this issuance.

https://www.esd.whs.mil/DD/

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Priorities

Importance of Modeling and Simulation

Message to the Force – March 4, 2021
Secretary Lloyd Austin

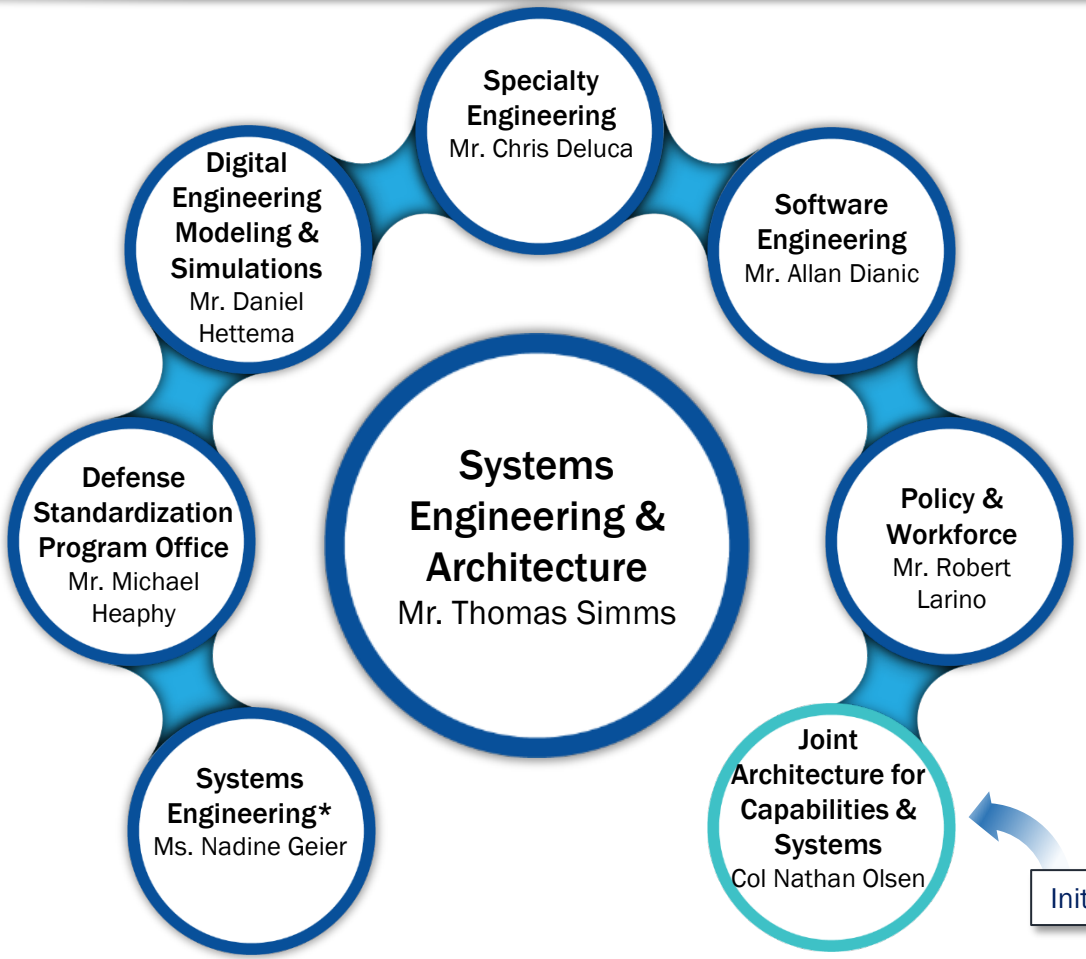
Remarks from Honorable Heidi Shyu
DoD Chief Technology Officer, OUSD(R&E)
- Basic Defense Research Conference (2022)

Innovate and Modernize the DoD. The Department will innovate at a speed and scale that matches a dynamic threat landscape. This will require advances in our joint warfighting concepts and a commitment to rapid experimentation and fielding of capabilities. Where necessary, we will divest of legacy systems and programs that no longer meet our security needs, while investing smartly for the future. In turn, we will improve the efficiency of the force and guarantee freedom of action in contested, complex operating environments.

"Modeling and simulation capabilities are foundational for developing and refining the National Defense Strategy. By enabling detailed campaign-level modeling, the Department of Defense can identify and address capability gaps and explore asymmetric countermeasures to adversaries' strategies."

Overview of Systems Engineering & Architecture (SE&A)

SE&A develops and promotes advanced engineering principles, techniques, and practices to improve joint warfighting capabilities.



Initial Start-up Funding (FY 24)

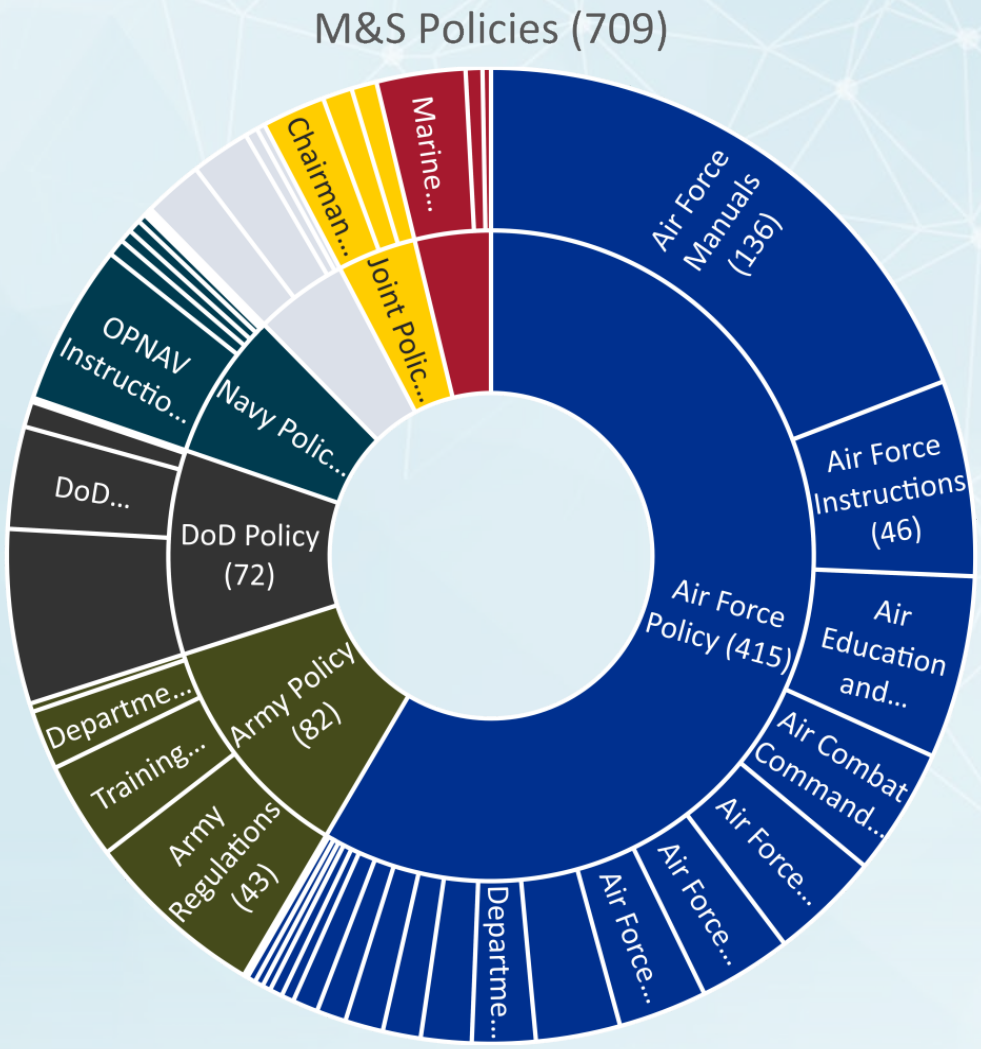
Lines of Effort

1. Advance the Engineering Practice
2. Connect & Strengthen the Technical Community
3. Develop the Workforce
4. Advance and Manage Standards
5. Provide Technical Expertise for Independent Engineering Assessments
6. Provide System of Systems (SoS) Architectures Guidance

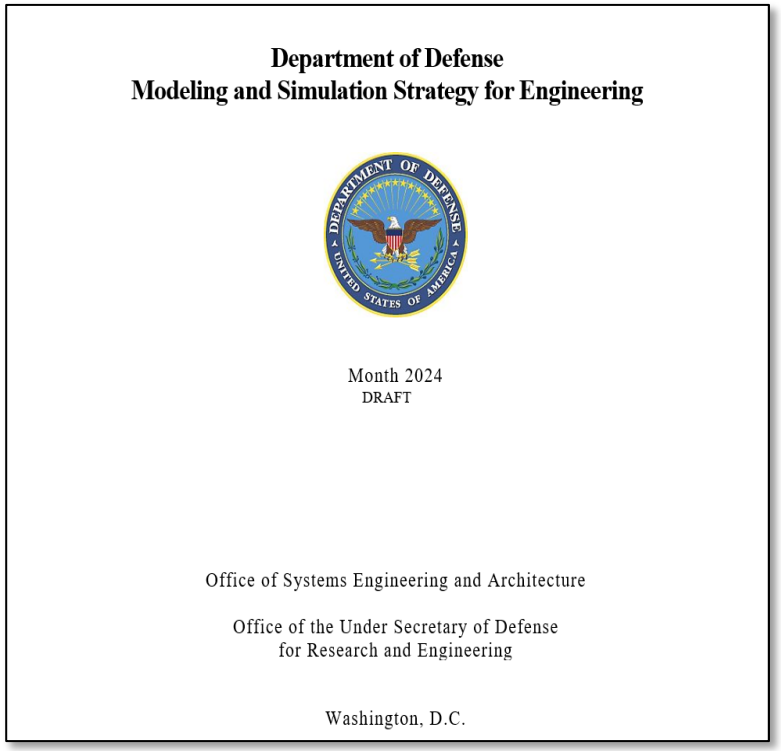
*Includes Modular Open Systems Approach (MOSA)

Modeling & Simulation Policy Challenges

- **Policies are broad and do not solve every issue.**
- **Policy development is a slow process.**
  - Empower the practitioner
  - Focus on interfaces / boundaries
  - Update / Improve Standards
  - Educate on right sizing
- **There is no policy that stops digital engineering.**
- **Policy isn't a life vest.**
- **Connect policy to guidance.**



Modeling & Simulation Strategy for Engineering in DoD Overview

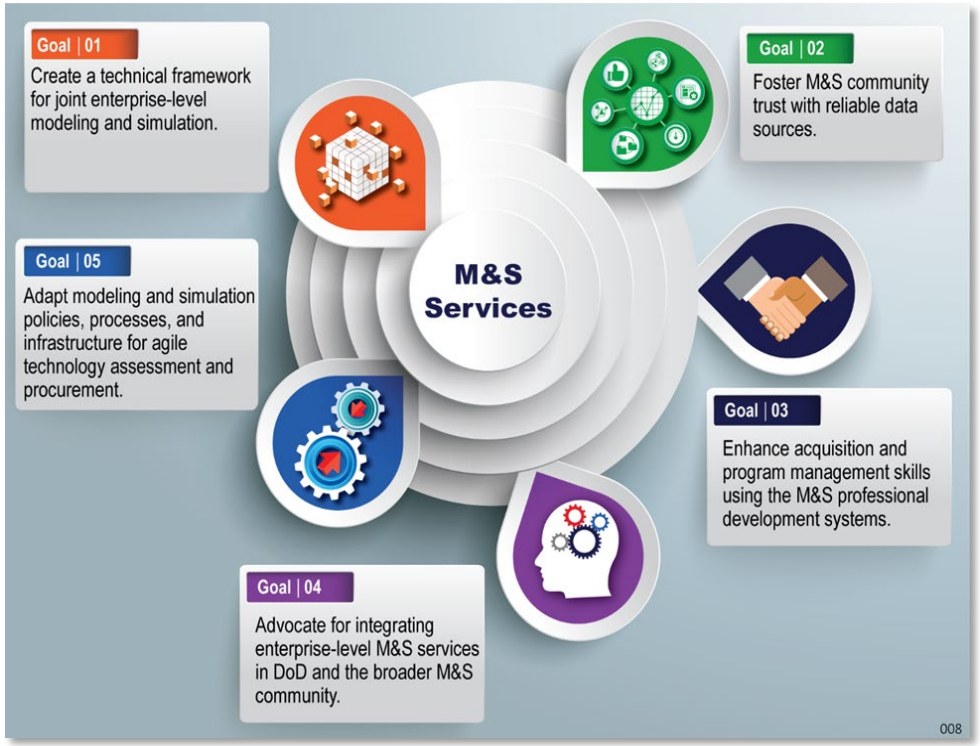

Department of Defense
Modeling and Simulation Strategy for Engineering

Month 2024
DRAFT

Office of Systems Engineering and Architecture

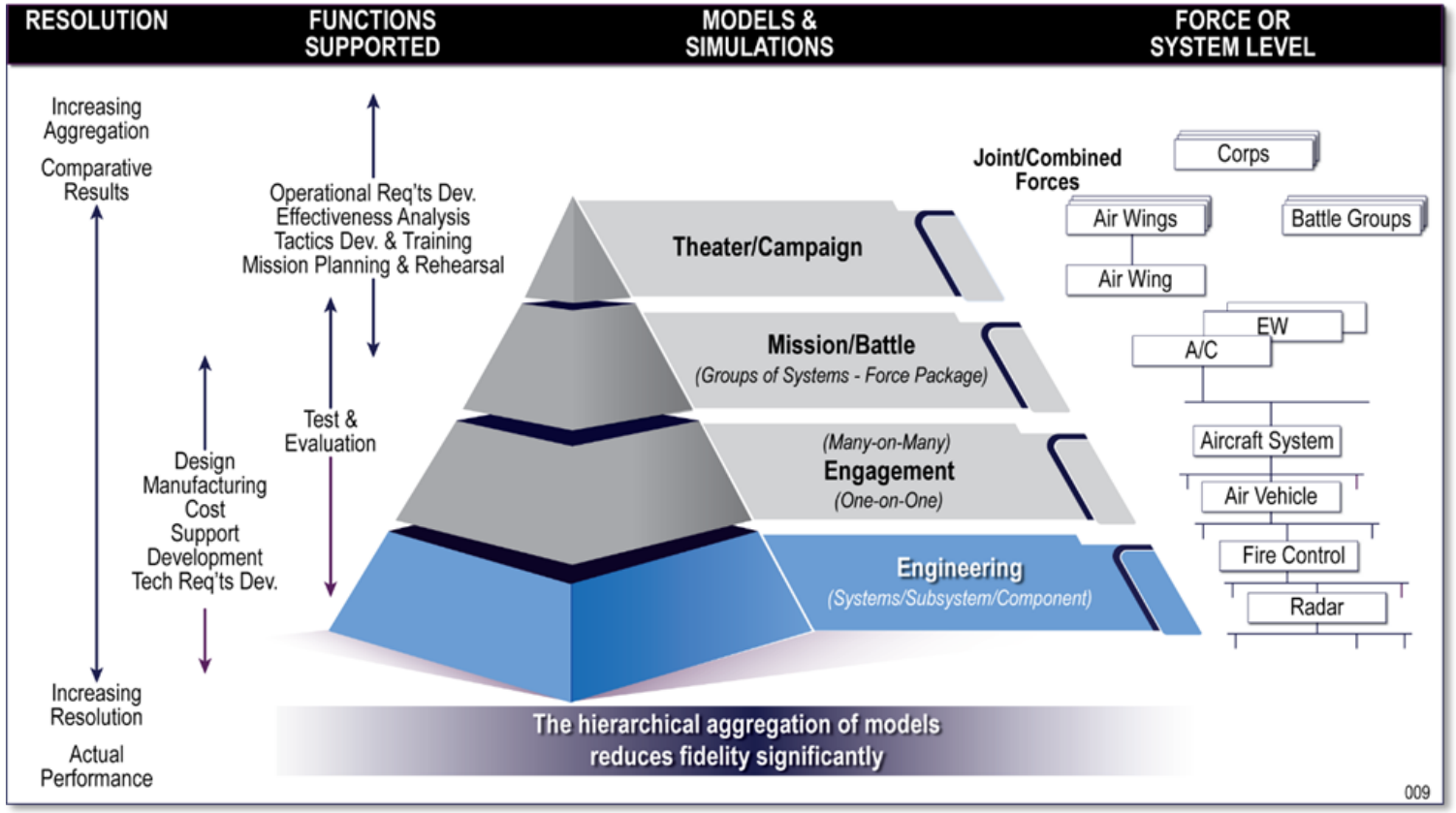
Office of the Under Secretary of Defense
for Research and Engineering

Washington, D.C.



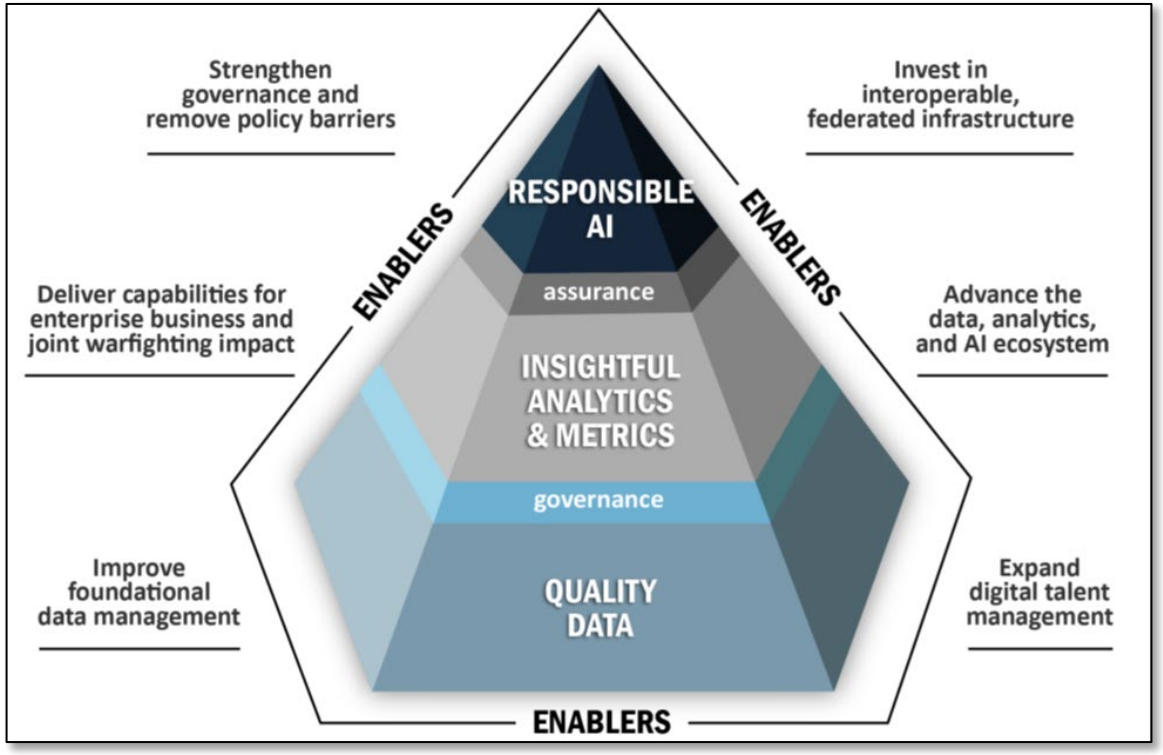
Responds to demand signal from 2023 S&T Strategy and requests from the Components. Establishes a collaborative foundation for DoD engineering M&S, particularly focusing on acquisition processes. The key is to connect specialized tools through data, standards, and collaboration capabilities rather than through systematic unification, all-purpose federation, or a direct integration for its own sake.

DoD Vision for Modeling and Simulation



The DoD strategic vision is to equip the DoD enterprise with adaptable, integrated, and reusable M&S supporting the full spectrum of the Department's activities and operations.

Influence of Artificial Intelligence (AI) on M&S



AI plays an increasingly vital role in M&S by enhancing accuracy, speed, and efficiency while unlocking new capabilities previously unattainable. AI transcends mere algorithms; it embodies scaled statistics and an engineering approach aimed at enhancing human life

Goal 1: Create a technical framework for joint enterprise-level modeling and simulation

- Make models and simulations available for use and sharing on demand among accredited users
- Migrate toward Data as a Service (DaaS) for effective enterprise data management
- Plan and execute the migration from existing M&S capabilities to the new paradigm, and beyond
- Ensure seamless compatibility and interaction from applied engineering to strategic analysis

Goal 1: Create a technical framework for joint enterprise-level modeling and simulation

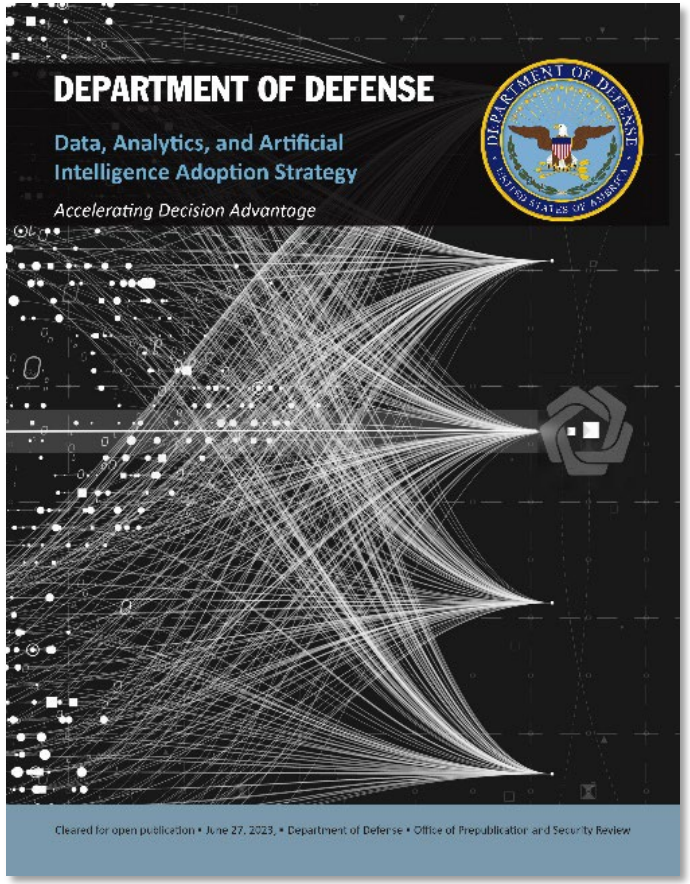
Example

The High-Performance Computing Modernization Program (HPCMP) provides supercomputers, a national research engineering network, and high-end software tools within a secure environment. HPCMP plays a significant role in creating a technical framework for joint enterprise-level modeling and simulation by providing a centralized platform for data sharing and computational resources, while ensuring that different service branches can work together seamlessly on joint projects.

Goal 2: Foster M&S community trust with reliable data sources

- Determine the verification, validation, and accreditation (VV&A) authoritative sources of data for the Department's M&S needs
- Adapt authoritative representations and data, available at different levels of fidelity
- Make authoritative representations and data available at different levels of classification

Goal 2: Foster M&S community trust with reliable data sources



Example

The DoD Data Analytics and Artificial Intelligence Adoption Strategy supports fostering trust within the M&S community by emphasizing the integration of reliable, high-quality data sources and transparent, ethical AI practices. By promoting rigorous data governance and ethical AI implementation, the strategy builds confidence among stakeholders in the fidelity and dependability of M&S tools and their outcomes, ultimately strengthening trust across the community.

Goal 3: Enhance acquisition and program management skills using the M&S professional development system

- Revise M&S workforce policies and programs as needed to facilitate the recruitment, retention, skill development, and certification of both civilian and uniformed DoD personnel
- Equip the acquisition workforce by maintaining an updated curriculum supporting Modeling and Simulation throughout a product's life cycle
- Maintain current M&S engineering knowledge and preserve, update, and make it available to the workforce

Goal 3: Enhance acquisition and program management skills using the M&S professional development system

Example

Defense Acquisition University (DAU) offers comprehensive training and educational resources using modeling and simulation (M&S) professional development systems. These systems provide hands-on, scenario-based learning experiences that enable professionals to better understand and manage complex defense acquisition projects. This targeted training ensures that professionals are adept at leveraging M&S tools to optimize defense acquisition processes and deliver superior program management results.

Goal 4: Advocate for integrating enterprise-level M&S services in DoD and the broader M&S community

- Update and maintain policy guiding DoD M&S
- Prioritize collection, curation, discovery, and sharing of models, tools, data, and capabilities
- Promote the development and adoption of M&S standards, standardization activities, and an M&S standards profile
- Coordinate, publish, and maintain a DoD M&S glossary to provide uniform definitions for M&S terminology

Goal 4: Advocate for integrating enterprise-level M&S services in DoD and the broader M&S community

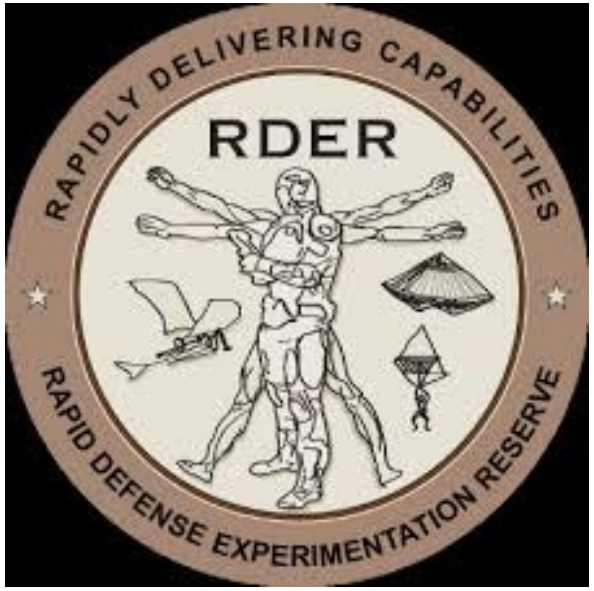
Example

Systems Modeling Language Version 2 (SysML V2) helps advocate for integrating enterprise-level M&S services in the DoD and the broader M&S community by providing a more robust and standardized modeling language. SysML V2 enhances interoperability, precision, and scalability, allowing for more effective communication, collaboration, and integration across diverse systems and teams.

Goal 5: Adapt modeling and simulation policies, processes, and infrastructure for agile technology assessment and procurement

- Apply guidance from the Technology Readiness Assessment Guidebook to address issues specific to M&S tool development
- Enable rapid procurement of tools developed by non-DoD entities to improve and enhance M&S development
- Rapidly educate the workforce on life cycle policies and practices as they evolve, to procure and evaluate M&S for the intended use

Goal 5: Adapt modeling and simulation policies, processes, and infrastructure for agile technology assessment and procurement



Example

The Rapid Defense Experimentation Reserve (RDER) program assists DoD in adapting its policies, processes, and infrastructure to enable agile technology assessment and procurement. The RDER initiative was established to address critical joint warfighting gaps, promotes collaboration among military services, combatant commands, industry, and coalition partners. The OUSD(R&E) Mission Engineering team uses models and simulation in the development of End-to-End Mission context and Experimentation Campaigns to support RDER. This effort ensures that technologies and strategies are integrated effectively across domains and services, enhancing interoperability and mission effectiveness.

Development of Modeling & Simulation Strategy for Engineering

Primary Goals:

Goal 1 Develop a joint, enterprise-level common technical framework and infrastructure, supporting modeling and simulation.
Goal 2 Promote trust within the M&S community through authoritative sources of data.
Goal 3 Leverage the professional development system supporting modeling and simulation.
Goal 4 Cultivate integration of enterprise-level management within the DoD and the larger M&S community.
Goal 5 Adapt policies, processes, and infrastructure enabling rapid (agile) assessment and procurement of emerging technologies and tools.

2022
Initial Draft

MAY 2023
Revise Draft

JUL 2023
CATMS Review

OCT 2023
Re-Scoped to focus on Engineering, Acquisition and Program Lifecycle Management (PLM)

JAN 2024
One-on-One Meetings with key stakeholders to review re-scoped goals.

MAR 2024
Completed New Draft Content

APR 2024
Graphics Finalized

SEP 2024
Final Preparation

FY 2025
Planned Release

FY 2025
Road Show

Next Steps

- OUSD(R&E) and the DoD Components will collaborate on the M&S enterprise by implementing this M&S Strategy for Engineering
- DoD Components will own their implementation
- OUSD(R&E) will coordinate efforts to ensure the DoD engineering enterprise progresses throughout the Department, our allies, partners and across industry and academia
- As the DoD Components create, share, and execute their implementation plans, the OUSD(R&E) will work to close gaps, eliminate duplication, and share best practices

Contact Information

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DEBoK
Digital Engineering Body of Knowledge