



# SYSTEMS ENGINEERING & ARCHITECTURE

ORGANIZATIONAL HIGHLIGHT:

JUNE 2024

## DIGITAL ENGINEERING, MODELING AND SIMULATION

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MODELING AND SIMULATION

The union of Digital Engineering (DE) and Modeling and Simulation (M&S) enables the Department of Defense (DoD) to achieve the objectives outlined in the 2022 National Defense Strategy (NDS). Digital engineering supports the strategy by improving the speed and efficiency of defense system development, allowing for rapid prototyping and iterative design processes through enhanced interoperability and information sharing as well as effective collaboration across the Department. Modeling and simulation aid in risk assessment, decision making, and operational planning through cost-effective alternatives to physical testing. The DE ecosystem, combined with M&S, allows DoD assessments of new technologies and operational concepts in simulated environments, enhancing readiness and ensuring the optimal allocation of resources. These advances align with the NDS goals of modernization, lethality, and readiness, driving innovation and agility in defense capabilities.

### ❖ MISSION

Digital Engineering, Modeling and Simulation (DEM&S) supports the Office of the Under Secretary for Research and Engineering (OUSD(R&E)) by providing DE and M&S strategy, policy, guidance, and leadership for DoD and the industrial base, elevating practitioners in DE and M&S, promoting an updated workforce and culture, and investing in the future.



Figure 1. Enabling the Digital Thread and the Digital Twin

### ❖ THE DIGITAL THREAD AND DIGITAL TWINS

DE and M&S align and coordinate best practices for digital twins, enabling the digital thread by establishing a comprehensive framework for system development and management. DE provides the foundation, creating accurate digital models of assets or systems, setting standards for data exchange and interoperability. M&S complements DE, offering virtual environments for iterative testing, analysis, and validation. Together, DE and M&S improve collaboration and information exchanged throughout the life cycle. This alignment facilitates efficient design, optimized performance, reduced costs, and informed decision making, fostering innovation in complex system development.



Figure 2. Digital Engineering Goals



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## DIGITAL ENGINEERING, MODELING AND SIMULATION cont'd



Figure 3. The digital mind-set will drive future engineering practices

### ❖ POLICY AND GUIDANCE

A digital mind-set will drive future engineering practice as prioritized in the 2022 National Defense Strategy (NDS). The NDS aims to create a future force that is “lethal, sustainable, resilient, survivable, and agile and responsive.” The Department is establishing a new framework for strategic readiness, ensuring greater alignment with the NDS priorities. The National Defense Science and Technology Strategy emphasizes the importance of technology standards and protocols to our digital infrastructure and national security. DEM&S initiatives include revisions to DoD Instruction (DoDI) 5000.70, Management of DoD Modeling and Simulation Activities, and DoDI 5000.61, DoD Modeling and Simulation Verification, Validation, and Accreditation. The DoD Modeling and Simulation Strategy is planned for release in FY 2024, and the Digital Engineering Strategy will be reviewed and revised as well. Systems Modeling Language version 2 (SysML v2) is a generational change, substantially improving utility across the DoD. The SysML v2 Transition Guide, written by DEM&S, is an opportunity to lower the barrier and achieve greater results through a coordinated transition. The recently published DoDI 5000.97, Digital Engineering, establishes policy, assigns responsibilities, and provides procedures for implementing and using digital engineering in the development and sustainment of systems.

### ❖ SUPPORT FOR STANDARDS

DEM&S is the M&S committee lead for the Joint Enterprise Standards Committee (JESC), as part of the governing body for DoD Information Technology Standards. Approved M&S and related M&S interoperability standards can be accessed in the DoD Information Technology Registry (DISR). DEM&S also engages closely with other standards organizations such as Simulation Interoperability Standards Organization (SISO), the Object Management Group (OMG), and other affiliations in support of existing and new standards, focused on enabling and improving digital engineering.

### ❖ ELEVATING PRACTITIONERS THROUGH ENGAGEMENT

DEM&S established the DEM&S Community of Practice (CoP), sharing digital engineering and modeling and simulation concepts and best practices across engineering functions. The CoP explores ways to transition traditional acquisition processes to a digital model-centric environment, engaging with systems engineering and acquisition professionals. Expediting the digital engineering transformation is key to obtaining and maintaining our global advantage. The Director, DEM&S will host the next multi-agency Federal Digital Engineering Forum (FED DEF) for decision makers and practitioners in Spring 2025, to share best practices and lessons learned. Tools presented at International Council on Systems Engineering events include the DE Primer, the DE Tool Selection Guide for IEEE, the DE Taxonomy for IEEE, the Digital Engineering View Model, and the Decision Analysis Data Model. DEM&S has submitted papers to the American Institute of Aeronautics and Astronautics Digital Engineering Integration Committee on the Digital Twin, Digital Thread, Digital Ecosystem, Digital System Model Implementation, and Workforce Development.

### ❖ RESOURCES

OUSD(R&E) SE&A: <https://www.cto.mil/sea>

Email: [osd-sea@mail.mil](mailto:osd-sea@mail.mil) | Attn: DEM&S

DEM&S CoP: [https://www.cto.mil/sea/dems\\_cop/](https://www.cto.mil/sea/dems_cop/)

DEBoK: <https://de-bok.org>



*A digital mind-set will drive future engineering practice.*