SYSTEMS ENGINEERING & ARCHITECTURE

TECHNICAL HIGHLIGHT:
SYSTEMS ENGINEERING

OCTOBER 2024

SYSTEMS ENGINEERING

Systems Engineering (SE) establishes the technical framework for delivering materiel capabilities to the warfighter. It provides the foundation upon which program technical activities are built and supports program success. SE seeks to ensure the effective development and delivery of capability through a balanced approach to cost, schedule, performance, and risk, using integrated, disciplined, and consistent activities and processes regardless of when a program enters the acquisition life cycle. SE enables the development of resilient systems that are trusted, assured, and easily modified.

❖ SYSTEMS ENGINEERING MODERNIZATION

SE&A focuses on modernizing SE practice, including using modular open systems approaches (MOSA) to build systems that can be upgraded to incorporate new technology and respond to emerging threats. The vision of the SE Modernization effort is to use data and models to create a more agile and responsive acquisition system that can quickly and effectively meet the needs of the warfighter. Figure 1 highlights SE Modernization concepts.

SE&A led the effort to envision a new mental model for SE in a fully digital, iterative world. In cooperation with a community of experts, we captured a set of interrelated pain points (challenges) to implement the model and drafted a roadmap of developmental needs and recommendations to improve the uptake of modernized SE.

Systems Engineering Modernization Roadmap Overview

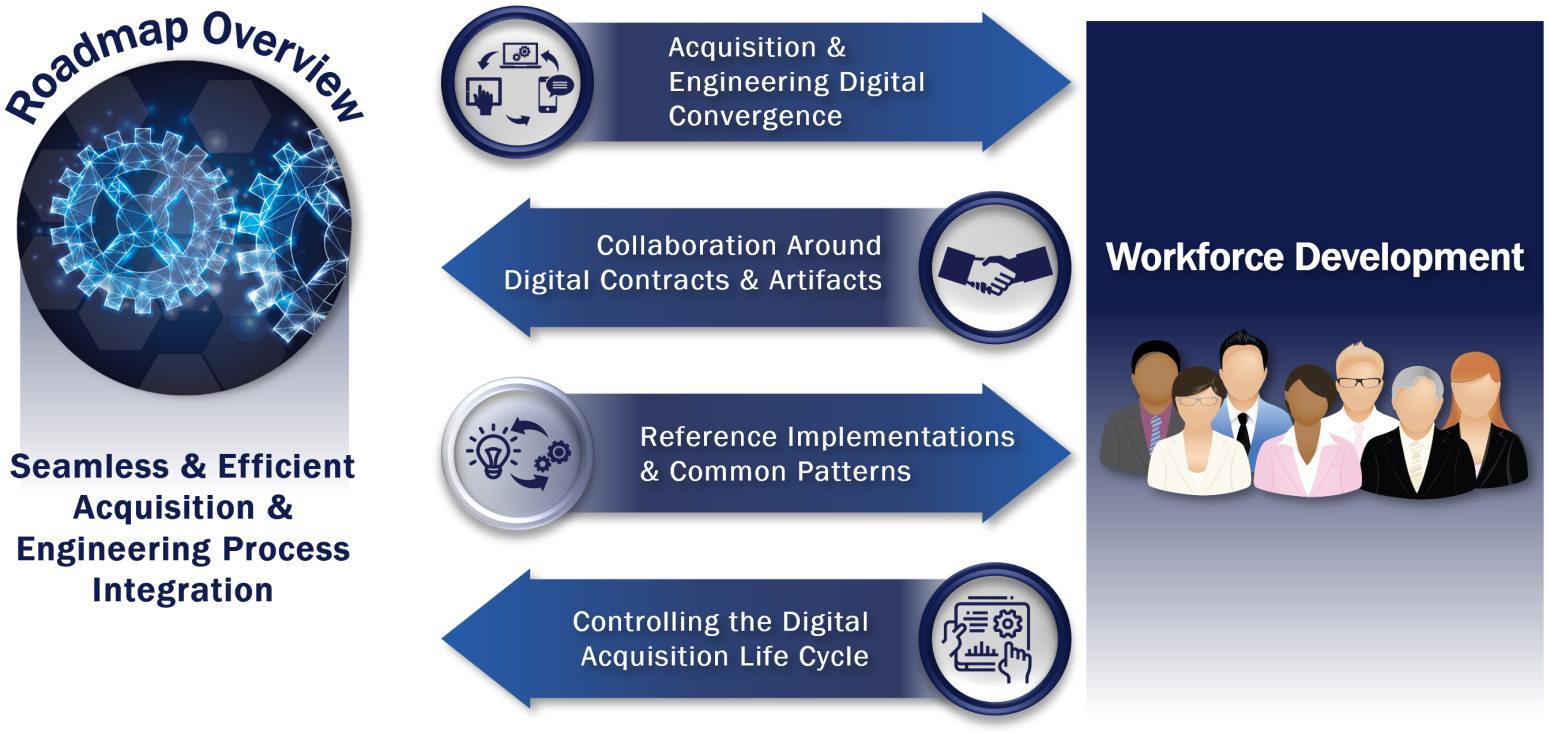

Figure 1. SE Modernization Roadmap Overview

TECHNICAL HIGHLIGHT:

SYSTEMS ENGINEERING cont'd

❖ MODULAR OPEN SYSTEMS APPROACH

In 2019, Congress mandated that all major acquisition defense programs be designed and developed with a MOSA to enable incremental development and to enhance competition, innovation, and interoperability. That requirement expanded in 2021 to include all other defense acquisition programs per 10 U.S.C. 4401-4403:

- 4401. Requirement for modular open systems approach in major defense acquisition programs; definitions.
- 4402. Requirement to address modular open systems approach in program capabilities development and acquisition weapon system design.
- 4403. Requirements relating to availability of major system interfaces and support for modular open systems approach.

DoD must acquire systems that can be upgraded or modified quickly to incorporate new technologies and respond to emerging threats. We are pursuing opportunities to ensure architectures are modular and open to enhance competition, incorporate innovation, support interoperability, and enable rapid insertion of technology in DoD acquisitions (Figure 2).

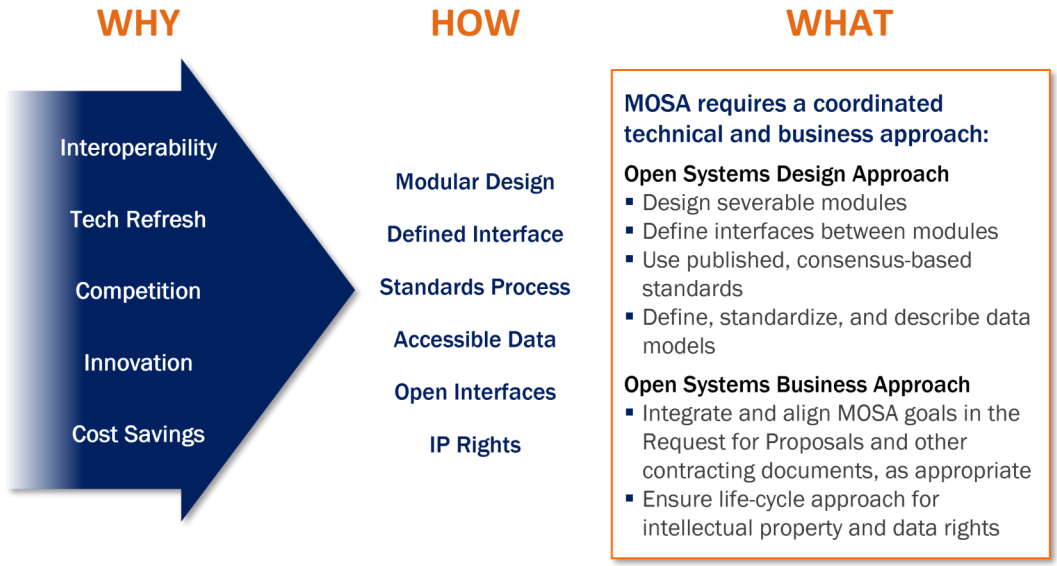

Figure 2. MOSA Considerations

❖ SYSTEMS ENGINEERING RESEARCH CENTER

SE&A serves as the DoD liaison with the Systems Engineering Research Center (SERC), a DoD University Affiliated Research Center (UARC). The SERC was established in September 2008 through a competitively awarded contract with the Stevens Institute of Technology to maintain university-based engineering and technology capabilities in systems engineering essential to the Department. As one of several DoD UARCs, the SERC includes a membership of more than 20 U.S. universities conducting SE research. SERC researchers focus on DoD strategic goals and challenges to improve the practice of SE in the defense community.

❖ RESOURCES

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

SERC: https://sercuarc.org/

MOSA Community of Practice: https://www.dau.edu/cop/mosa

Digital Engineering Body of Knowledge: https://de-bok.org

Email: osd-sea@mail.mil | Attn: SE Team