

Modular Open Systems Approach Overview and Efforts A DSPO and Office of the Secretary of Defense Perspective

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DoD has employed Modular Open Systems Approaches (MOSAs) for the last 20 years; however, recent legislation has mandated the use of MOSA in programs across DoD. The Office of the Secretary of Defense (OSD) has concluded that continued implementation and further development of MOSA-enabling standards is needed to ensure rapid sharing of information across domains with quick and affordable updates or improvements to hardware and software components. Under the direction of the Office of the Under Secretary of Defense (Research and Engineering) (OUSD[R&E]), the director, Engineering Tools & Environments and DSPO have taken the lead on MOSA efforts across DoD, based on the FY17 National Defense Authorization Act (NDAA). OSD established three MOSA tiger teams (Standards, Implementation Guidance, and Requirements and Programming Functions) and is working with the Modular Open Systems Working Group (MOSWG) to create maturity assessments, deliver

MOSA-specific standards, analyze gaps, define standard profiles, and deliver a MOSA standards needs assessment. In addition, OSD established and defined a Modular Open Systems Standards and Specifications (MOSS) Standardization Area, which is to be populated with DoD-wide MOSA-enabling standards in DSPO's centralized tool, ASSIST. DoD is transitioning from monolithic closed systems and mandating the use of MOSA to facilitate technology refresh, increase competition, encourage innovation, reduce cost, and improve interoperability. In accordance with the statutory provision of Title 10, U.S. Code, Chapter 145, Sections 2451–2457 of the Cataloging and Standardization Act, DSPO, with the services and MOSA community, is standardizing MOSA using flexible, cost-effective, open, and consensus-based standards. This article discusses current and future OSD MOSA efforts across DoD and the challenges that come with them.

MOSA DIRECTION

The OSD-developed MOSA Glossary defines MOSA by referencing 10 USC 2446a.(b), Section 805, as follows: “with respect to a major defense acquisition program, an integrated business and technical strategy that—

- (A) employs a modular design that uses major system interfaces between a major system platform and a major system component, between major system components, or between major system platforms;
- (B) is subjected to verification to ensure major system interfaces comply with, if available and suitable, widely supported and consensus-based standards;
- (C) uses a system architecture that allows severable major system components at the appropriate level to be incrementally added, removed, or replaced throughout the life cycle of a major system platform to afford opportunities for enhanced competition and innovation while yielding—
 - i. significant cost savings or avoidance;
 - ii. schedule reduction;
 - iii. opportunities for technical upgrades;
 - iv. increased interoperability, including system of systems interoperability and mission integration; or
 - v. other benefits during the sustainment phase of a major system; and


(D) complies with the technical data rights set forth in section 2320 of this title.”

Where and how do we start? In the first quarter of 2019, the service secretaries of the Army, Navy, and Air Force signed a MOSA tri-service memo, “Modular Open Systems Approaches for our Weapon Systems is a Warfighting Imperative.”¹ The memo directs that MOSA standards should be included in all requirements, programming, and development activities for future weapon system modifications and new development programs to the maximum extent possible. It also cites successful MOSA efforts and standards—Sensor Open Systems Architecture™ Consortium, Open Mission Systems/Universal Command and Control Interface, Future Airborne Capability Environment™, and Vehicular Integration for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance/Electronic Warfare Interoperability standards—as “vital to our success.”

APPROACH

The tri-service memo, along with the existing MOSWG, has been the driving force behind OSD’s MOSA efforts in 2019, and led to the formation of three MOSA tiger teams. First, the Standards Tiger Team surveys current MOSA efforts in DoD, uncovers common standards and practices, and finds gaps. Second, the Implementation Guidance Tiger Team creates service-specific implementation guidance through cross-service

¹ Office of the Secretary of the Navy, Office of the Secretary of the Army, and Office of the Secretary of the Air Force, Memorandum for Service Acquisition Executives and Program Executive Officers, “Modular Open Systems Approaches for our Weapon Systems is a Warfighting Imperative,” January 7, 2019, available at https://www.dsp.dla.mil/Portals/26/Documents/PolicyAndGuidance/Memo-Modular_Open_Systems_Approach.pdf.



collaboration to support future acquisition programs. Lastly, the Requirements and Programming Functions Tiger Team ensures MOSA is reflected in requirements and programs to enable communication and cross-domain sharing for future weapons systems.

To facilitate the inevitable sharing of MOSA-enabling standards across domains in a centralized location, DSPO worked with OSD leadership to establish a MOSA Standardization Area, and assigned ownership to the director, Engineering Tools & Environments with OUSD(R&E) as the lead standardization activity (LSA). This area, known as the MOSS, is defined in DSPO's Standardization Document 1 (SD-1) as follows:

"This AREA covers the specifications, standards, best practices and compliance testing guidance that form a framework for a Modular and Open Systems Approaches (MOSA) that can be applied to the development, operation, upgrade and maintenance of defense systems. These products include:

- Technical specifications that define system architectures that support severable and composable components, parallel [sic]
- Standards for interfaces, data exchanges, physical connections (electrical, mechanical, etc.) and data models,

- Best practices for implementing MOSA architectures and frameworks, and
- Compliance testing for implementations of standards that support the MOSA practice."

These criteria, which can be modified by the LSA, are used select the MOSA-enabling standards and specifications that are suitable for populating the MOSS in ASSIST.

CURRENT AND FUTURE CHALLENGES

MOSA was often referred to as a buzzword or fad. The definition of MOSA and what was truly modular or open presented challenges. Now that MOSA is encoded in the law (FY17 NDAA) and DoD acquisition programs are mandated to implement it, things are changing. While MOSA-related definitions have become clearer and efforts stated in the tri-service memo have gained visibility, new challenges and questions have arisen: Now that I have to implement MOSA, how do I evaluate compliance? Is there a way to measure or score MOSA? Who would establish such a metric? Should there be a metric if it might make implementing MOSA more difficult for the services, contrary to OSD's goal of using MOSA to help the services without program intervention?

One of the biggest challenges has been leveraging existing successful MOSA efforts without breaking them. Several programs are implementing MOSA in creative and useful, yet different, ways across different platforms (for example, air, land, and sea). One of OSD's goals with the MOSA tiger teams is to find MOSA lessons learned and best practices and supply a creative environment where another program, perhaps with a different service and platform, can implement MOSA. This process has brought up new questions. How can existing programs modify their change management process to incorporate MOSA? Are there situations where MOSA is not practical? Academic institutions have studied the cost of MOSA, and DSPO has created a draft MOSA document to help program managers answer some of these questions.

Additional challenges include how MOSA-enabling standards will be populated in the MOSS within ASSIST. What information will be available? Would all MOSA standards and specifications be converted into defense standard formats or should some of them be adopted by a recognized standards body, such as ANSI or IEEE, and then by DoD through a longer overall process? How important is it for one to retain ownership of a standard versus sharing it through a large standards body? Will implementation guidance be supplied? Currently, ASSIST is not a one-stop shop for implementation guidance nor does ASSIST host non-government standards. However, ASSIST modernization efforts could facilitate these improvements in the future.

To address some of these challenges, OSD has created a consolidated list of MOSA-enabling standards to aid in a gap analysis and referenced existing policy and guidance on standards, architectures, interfaces, and data rights. OSD has also facilitated numerous MOSA tiger teams with briefings from all DoD services, industry, and academia. Awareness of the DSPO, ASSIST, and LSA roles have increased, but one thing is certain—the challenges will require continued collaboration with the services while roles and responsibilities are defined at all levels.

ABOUT THE AUTHOR

Himanshu Patni is a MOSA standards engineer for DSPO under OUSD(R&E). He supports efforts on DSPO policy and procedures and how they pertain to MOSA standardization across DoD. He has more than 15 years of experience as an engineer, including supervisory experience with local government and 2 years of naval acquisition and systems engineering experience.