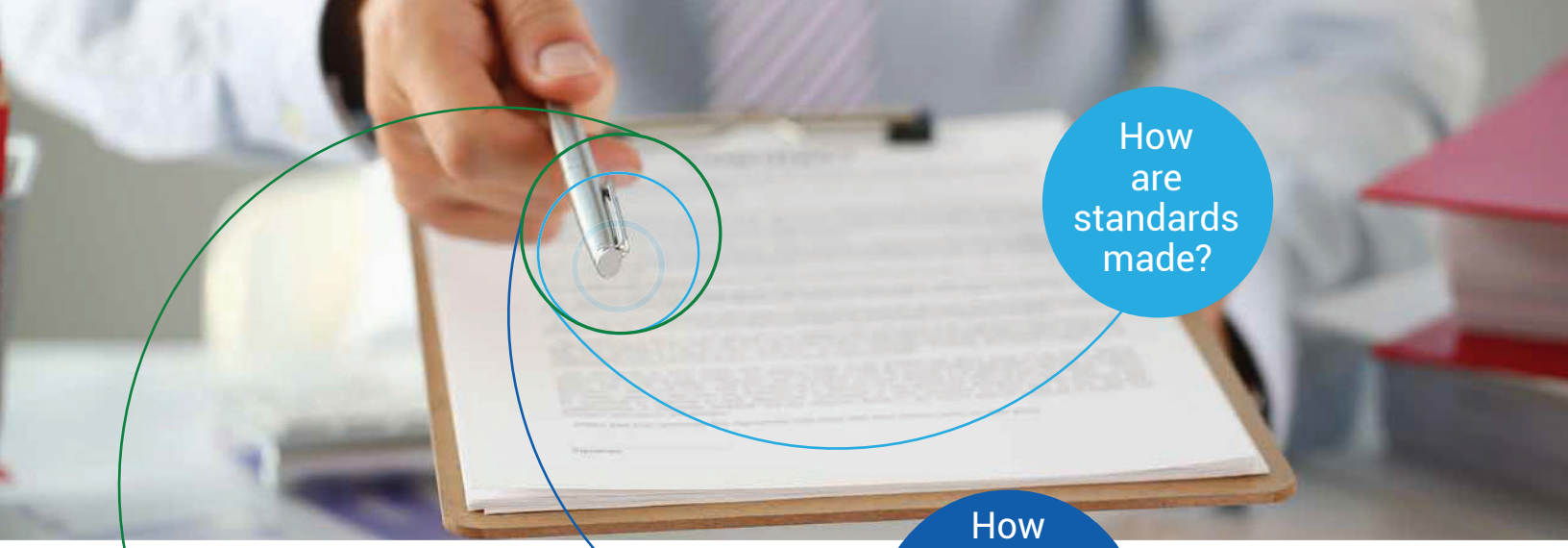
Making the Most of Modular Open Systems Approach Standards

John Bowling

The standardization of parts, processes, and specifications enabled the industrial revolution. It should be no surprise that standardization continues to be essential for success in the information revolution. Now, we must standardize information interfaces as well as data exchange methods (syntax) and meanings (semantics). Rapidly reconfiguring and modifying systems is essential to support the emerging doctrine of multi-domain operations (MDO). Modular open systems approaches (MOSAs) can enable these capabilities by relying on open standards at key interfaces.

In 10 USC 2446c.(2), we are required to "ensure that major system interfaces incorporate commercial standards and other widely supported consensus-based standards that are validated, published, and maintained by recognized standards organizations to the maximum extent practicable." This guidance leaves important questions. How are standards made?



How do you select the right standards? How do we know whether standards are sufficiently mature for use? This article walks through these questions to help you get the most out of MOSA standards.

HOW ARE STANDARDS MADE?

Standards are created by those who see a need for them. Standards bodies recruit members with an interest in seeing a standard developed for a business purpose; most commonly, that purpose is interoperability between vendors at a well-defined open interface. We rely on numerous open standards every day, from the Schrader valve on car tires to National Electrical Manufacturers Association 5-15 duplex electric receptacles in homes and the Institute of Electrical and Electronics Engineers 802.11ac wireless network standard in smartphones. In the cell phone industry, carriers saw a good business case for data interoperability. From 2G through 5G data standards, carriers have created common standards supporting data transmission. Common carrier interfaces and a common set of data capabilities in phones translates to lower per tower costs for carriers, cross-provider service agreements for better data coverage, and happy streaming customers.

All the services are increasing their participation in standards development, often jointly. Standards development organizations (SDOs), such as the Object Management Group® (OMG), SAE International®, and The Open Group® work with DoD on various open standards from standard languages, like OMG® Systems Modeling Language™ (SysML), to software standards, like Unmanned Systems (UxS) Command and Control Segment (UCS) and the Future Airborne Capability Environment™ (FACE) Technical Standard. One tri-service effort of note is The Open Group's Sensor Open Systems Architecture™ (SOSA) Consortium. The consortium is developing the SOSA™ technical standard as an integrative standard. This means other efforts, like Naval Air Systems Command's Hardware

Open Systems Technology and the Army's Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance/Electronic Warfare Modular Open Suite of Standards are contributing content to and harmonizing with the SOSA technical standard. The consortium is aligning its effort with the FACE and Open Mission Systems standards as well as other standards.

DoD's work with SDOs has been an ad hoc process. In 10 USC 2446c.(1), service secretaries are directed to coordinate in "specification, identification, development, and maintenance of major system interfaces and standards for use in major system platforms." Such SDO participation must become an ongoing, planned part of our engineering and acquisition mission. For example, tri-service participation in development of the OMG SysML standard and the SAE International Architecture Analysis and Design Language drives better modeling for shareable systems architectures and interfaces. The widely supported, consensus-based standards development process doesn't usually occur within program execution timeframes. Thus, proactive development of open interface and data model standards is required to meet the needs of multiple future programs.

ARCHITECTURE
standards

HOW DO YOU SELECT THE RIGHT STANDARDS?

In a word, architecture.

1. Capture what you know (or think you know) about your effort, such as capabilities required, constraints, and operational environments. Hire a systems architect and a modeler; you are unlikely to have the needed skills in-house.

2. Build a model and some views with the data you have and start asking questions. You'll discover actors, capabilities, connections, dependencies, flows, interfaces, modules, and requirements.

3. Iterate a few times with broader and broader reviews.

4. Send out a request for information or a draft request for proposals with the draft architecture and process the comments you get back.

5. Decide which interfaces need to be open to meet the intent of Section 2446c. Where will change occur most often? Where will maintenance responsibility change hands? Where do third parties need to quickly develop and integrate capabilities? How will the MDO doctrine affect your program? The answers to these questions will point toward the open standards you need.

So, you found a standard, but you're not sure it's right for your program. Who do you ask? That's a good question but one that doesn't always have a good answer. You can ask the SDO for assistance. Typically, some members of the SDO offer consulting services on the use of the standard. For the Air Force, the Air Force Life Cycle Management Center (AFLCMC) has established an Open Architecture Management Office (OAMO), which supplies initial consulting on standards selection and use. As a new capability with limited manning, the OAMO is supported by the engineering home office. In the Army, the Vertical Lift Consortium advances the state of the possible for rotorcraft. This includes support to open standards development (including the FACE™ and SOSA™ standards) and technology demonstrations, such as joint multi-role. The Program Executive Office Aviation and Army Futures Command Combat Capabilities Development Command Aviation and Missiles Center have employees involved with open standards. In the Navy, PMA-209, the Air Combat Electronics program, is a key point of contact for open avionics standards.

Discover who else has used the standard; ask for their advice to avoid pitfalls or mitigate schedule challenges. Try a small risk reduction effort to rapidly prototype a subsystem using the new standard. Test it out, learn about it, and supply feedback, questions, and recommendations to the SDO. This will improve your understanding of the standard and the feedback will improve the standard for future users. Create your own lessons learned to benefit the next user of the standard. Remember, despite our silos of excellence and funding segregation, we are all in the fight together.

HOW DO WE KNOW WHETHER STANDARDS ARE SUFFICIENTLY MATURE FOR USE?

Standards maturity is an interesting and troubling concept. Standards mature through use, feedback, and revision. When is a standard mature enough? Does anyone trust version 1.0? Should we wait for versions 1.1, 2.0, or 3.0? Can parts of a standard be reliably used while other parts are less mature? Waiting is only for those

that have the luxury of time—defense programs usually don't have that luxury. It is the goal of every SDO to furnish a useful standard with each release. It's also reasonable to expect some ambiguity and imperfections in every version. We must use the tools we have, not the tools we wish we had. Standards are less than perfect, but they are still useful.

Using mature standards is preferable, but not always possible. Each program must assess the risk of using a standard versus the risk of not using the standard, remembering that MOSA is a requirement. In most cases, the risk of not using an open standard will be greater than the risk of using an immature standard. Standards reduce risk at an interface by furnishing guidance and restrictions that reduce ambiguity. System integration resolves remaining ambiguities into a working system.

Using open standards that have a well-defined conformance or compliance method further reduces program risk. If that process uses an independent third-party assessor, even more risk is mitigated. Just like standards, conformance and compliance methods are developed over time, but lag behind the standard. Resources are limited in SDOs and development of the conformance and compliance method can't be completed until the standard version is finalized. Assessment of compliance or conformance to a standard does not replace a test program. These assessments may augment your test program, but they do not assess performance.

While it's reasonable to expect open standards will reduce the burden of system integration, it's unreasonable to expect to eliminate integration in complex systems with standards. Interface standards supply specifications and guidance to limit choices, thus reducing ambiguity at the interface. Interfaces also have layers. The Open Systems Interconnect model describes seven layers of a communications interface. Most standards reasonably focus only on a subset of these layers, so their use may be broader than one specific case.

SUMMARY

Open standards come from those who get involved and develop them. You can discover which standards are applicable to your program by looking for information and asking about open standards. MOSA is a new slice to the standardization process and we all bear a responsibility for seeking out and developing standards. We'll know which standards to use by staying connected and getting involved in standards efforts. Get out there and make open standards and MOSA the new normal!

ABOUT THE AUTHOR

John C. Bowling *is an Air Force civilian electronics engineer serving as technical expert for Avionics Architectures and Interoperability in the Engineering and Technical Management/Services directorate of AFLCMC. His role encompasses participation in standards bodies, aircraft program office support, and technical support to the airworthiness process. He advises Air Force acquisition programs on open systems architecture and interoperability requirements and methods throughout the acquisition lifecycle*