Modular Open Systems Architecture in DoD Acquisition

Mr. Stephen P. Welby

Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE))

17th Annual NDIA Systems Engineering Conference

Springfield, VA | October 29, 2014

Resilient Design

- **The only constant for DoD systems is change:**
  - Evolving threats
  - Strategic and Tactical Innovation
  - Rapid technological change
  - Increased Defense leverage of commercial systems
  - Resource and demand uncertainty
- **These factors all demand increased resilience – the ability to explicitly design military systems to have capacity to adapt and adjust to maintain relevance and operational advantage in an environment of change**

Modular Open System Architecture is a key contributor to Resilient Design

Defining Modular Open Systems Architecture

What: *A technical architecture that leverages technical standards to support a modular, loosely coupled and highly cohesive system structure*

How: *Customer definition and ownership of product architecture; publication of key interfaces within the system*

Why: *Enables Open, Competitive Business Model – allowing components to be added, modified, replaced, removed or supported by different vendors throughout the life cycle – driving opportunities to enhance competition and innovation*

DoD Interest in Modular Open Systems Architecture

- Drives risk-prudent competition
- Enables Business Architectures that mirror Technical Architectures
- Provides a constant battle rhythm of competition
- Levels playing field; reduces barriers to market entry
- Addresses obsolescence risk
- Promises wider access to innovation

Modular Open Systems: Enabling New Business Models

Objective: Competition at the sub-system level

- **Government must be able to share:**
  - Design documentation, specifications, interfaces, tools, etc.
  - Architecture definition
  - Established sub-systems boundaries that are defined, coherent and loosely coupled
- **Focus on what is needed for competition:**
  - Scale sufficient to attract competitors
  - Scoped to accept innovative offerings
  - Support for innovation through appropriate licensing of IP
- **Government must be a smarter buyer.**
  - Creates significant new demands on government in-house engineering capabilities and capacity

Modular Open Systems Considerations in Development

Establish an Environment for Change

- Be clear about intent to compete/recompete
- Establish a flexible contracting approach
- Incentivize good behavior among contributing contractors

Focus Systems Engineering for Openness

- Develop common architectures across a product line or across related product families
- Functionally decompose legacy capabilities

Leverage and Exercise Data Rights

- Assess current and needed data rights
- Be a better customer: confirm that data rights restrictions are correct and assert data rights
- Use government purpose rights (GPR) for next competition

Explore Business Architectures and Sound Competition Approaches

- Create alternatives
- Inject MOSA through technical insertions
- Consider alternative integrations concepts
- Ensure incentives align with desired behaviors
- Reward reuse

Balancing Potentially Conflicting Goals

Customer

- **Cost of Data Rights**
- **Typical Engineering Deliverables**

Vendor

- **Competitive Advantage**
- **Financial Return on Research Investment**

Use of Modular Open Systems must be driven by a value-focused business case.

Technical Data, Computer Software, and Intellectual Property Rights

- **Data rights are considered up-front when developing an acquisition strategy; if critical data and software are not be specified for delivery, they may be unavailable (or unaffordable) years later for use on a program during its sustainment phase.**

- **Some Technical Data Rights Strategy considerations:**
  - Data deliverables included in the RFPs and subsequent contracts
  - Data rights, including the responses to the contractor's data assertion lists
  - Data management approach including how the data will be delivered, accessed, maintained, and protected

Diminishing Manufacturing Sources and Material Shortages (DMSMS): An Emerging Crisis

- **Likely impact of current fiscal environment:**
  - Fewer new-start development programs
  - More Service Life Extension Programs (SLEP)
- **Accelerating technology life cycles means fewer sources for "pin-compatible" replacement parts**
- **Driving SLEP cost and risk:**
  - Loss of OEM sources
  - Obsolete parts
  - Loss of component pedigree
  - Loss of key manufacturing expertise

Modular open systems principles mitigate much of DMSMS risk

Some MOSA Challenges

- **Lack of key technical insight by government customers**
- **Risk of Government acting as integrator**
- **Inability to project long-term DoD plans = uncertain business cases**

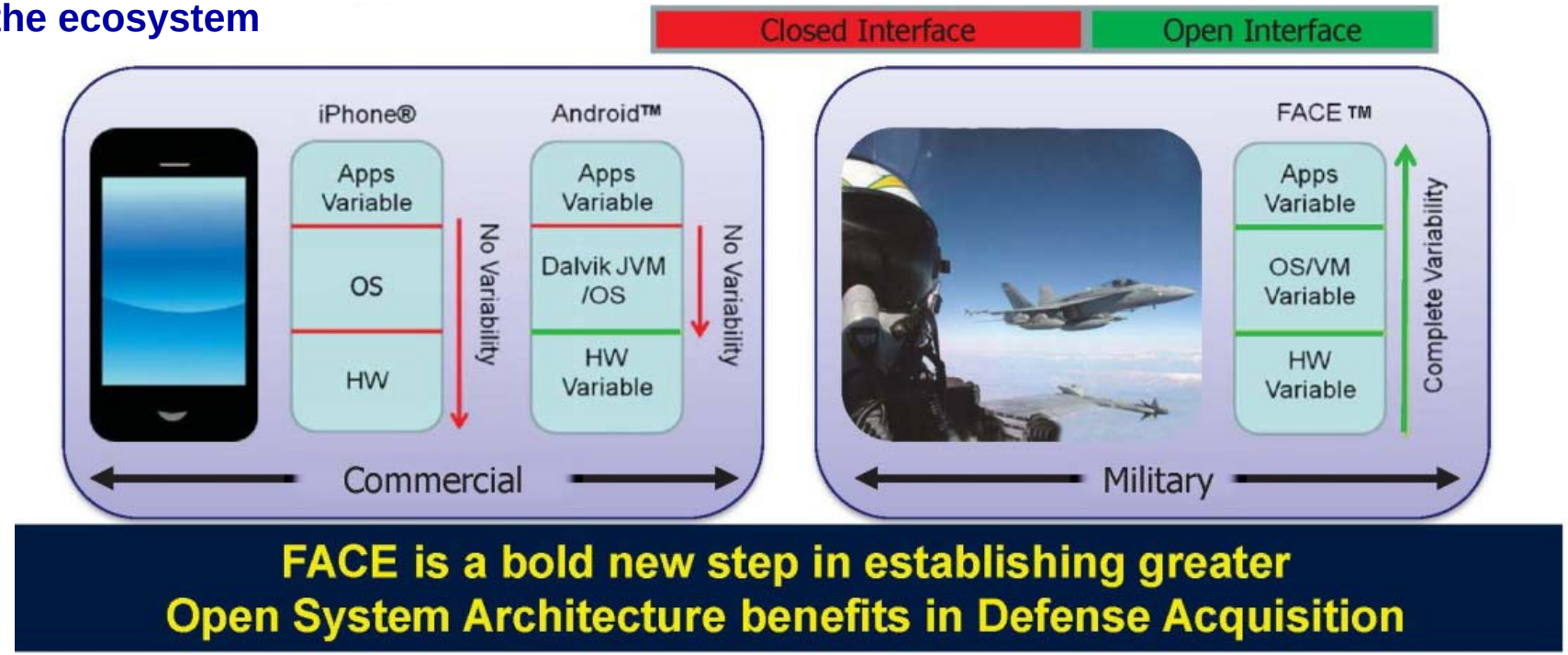
Key MOSA Implementation Gap: Lack of Domain-Specific Common Standards

- **Standards critical to allow comparisons across vendors/systems**
- **Standards create shared competitive ecosystem**
- **Standards ensure adequacy of technical interface definitions**

Strong Service support for MOSA standards provides opportunity to converge on common approaches

Navy Open Systems Effort: Future Airborne Capability Environment (FACE)

- **The FACE technical standard is a standard of standards with a business strategy that is set to completely re-architect the acquisition of aircraft software systems**
- **FACE Conformance Program provides testable requirements to MOSA principles**
- **FACE aligns with and supports other Open Architecture initiatives**
- **FACE addressing business and technical requirements in developing the ecosystem**



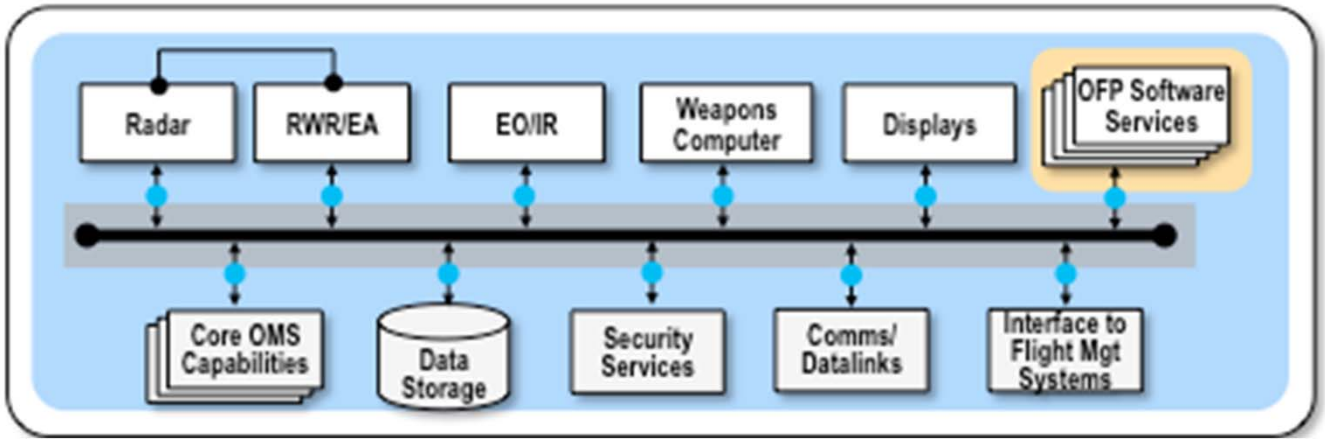
FACE is a bold new step in establishing greater Open System Architecture benefits in Defense Acquisition

Air Force Open Systems Effort: Open Mission Systems (OMS) Project

U.S. AIR FORCE

- **Develop industry consensus, non-proprietary mission system architectural standard**
  - Enable affordable capability evolution
  - Sustained competition across the life cycle
  - Simplify mission system integration
  - Isolate the effects of change
  - Do not stifle innovation
  - Options for legacy aircraft and NDI items
- **Build an OMS ecosystem to enable Family-of-Systems enterprise-level acquisition strategies**

Service Oriented Mission System Architecture



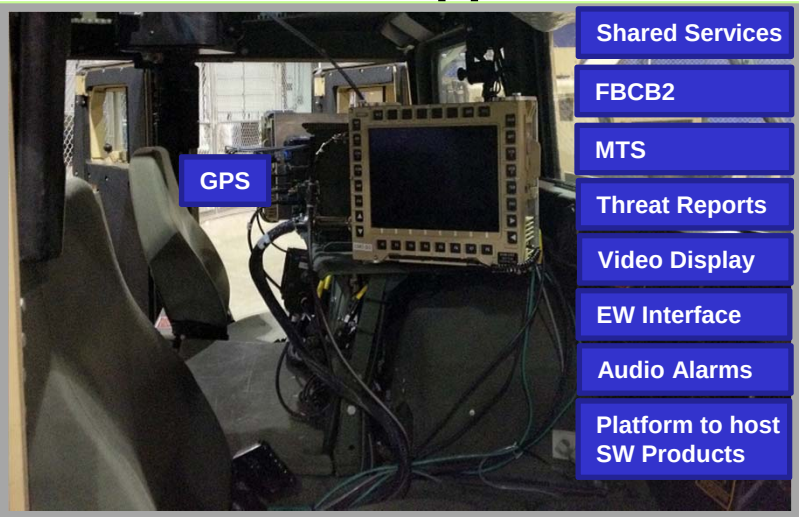
Key-interface definition + common composition rules = "acquisition efficiency"

Army Open Systems Effort: C4ISR/EW Integration in Ground Platforms

Traditional Approach

"Bolt On" Mission Equipment Integration

VICTORY Approach



VICTORY Data Bus enables interoperability across C4ISR/EW and platform systems

VICTORY Standards

Soldier Benefits

- Less Crowded Crew Area
- Enabled New Capabilities
  1) Single Sign-On
  2) Access to shared info at all Crew Stations w/in security boundary
  3) Remote Configuration
- Potential for Mission Flexibility

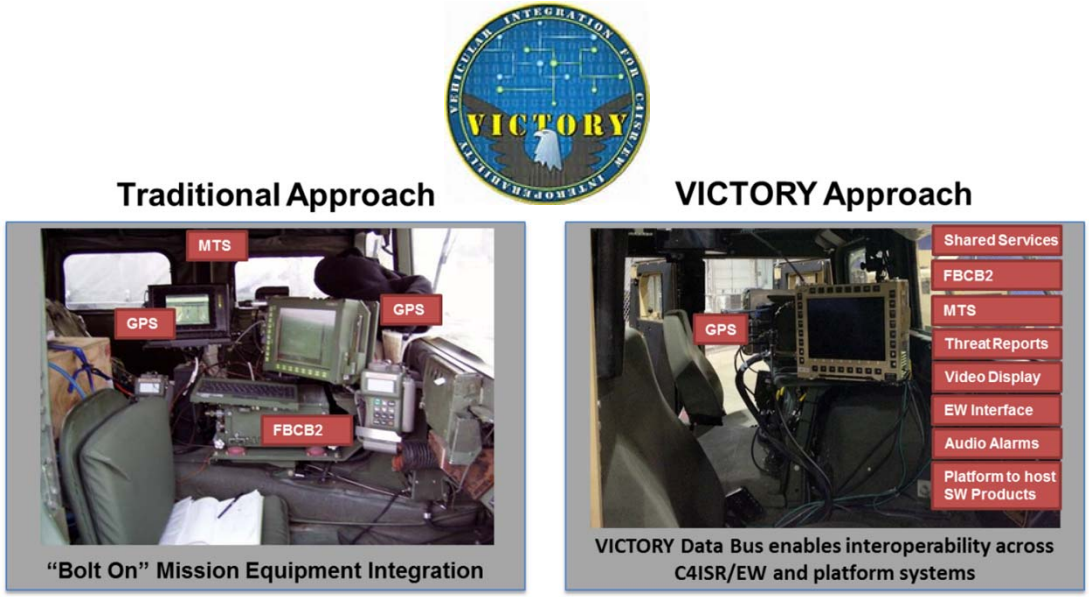
Benefits **Both Platform and Mission Equipment Design Implementation**

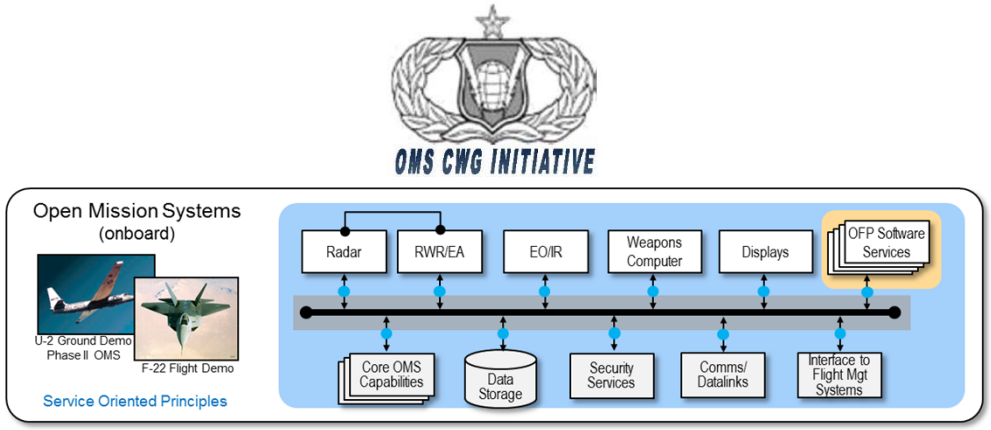
We can't afford not to do VICTORY

Enterprise Benefits

- Commonality
- Third Tier Vendor Competition
- Reduced Acquisition Cycle Times
- Reduced Logistics Burden
- Reduced Integration Costs
- Reduced Life-cycle Costs

Opportunity for the Community: Convergence





Defense Standardization Council

Opportunities and Challenges

- **DoD is looking to innovative acquisition models to achieve increased efficiency and effectiveness**
- **Open Systems Architectures offer great opportunities to leverage sub-system-level competition to future-proof systems, provide a pathway for innovation and drive down cost over time**
- **Open Systems business models are dependent on detailed engineering designs that incorporate and define open systems architectures, standards and interfaces**
- **These designs will increase demand on DoD engineering competence, capability and capacity**
- **Adoption of open systems approaches should only be made where a well defined business case and acquisition strategy support this approach**

Better Buying Power 3.0 (Draft)

Achieving Dominant Capabilities Through Technical Excellence and Innovation

Achieve Affordable Programs

- Continue to set and enforce affordability caps

Achieve Dominant Capabilities While Controlling Lifecycle Costs

- Strengthen and expand "should cost" based cost management
- Build stronger partnerships between the acquisition, requirements, and intelligence communities
- Anticipate and plan for responsive and emerging threats
- Institutionalize stronger DoD level Long Range R&D Planning

Incentivize Productivity in Industry and Government

- Align profitability more tightly with Department goals
- Employ appropriate contract types, but increase the use of incentive type contracts
- Expand the superior supplier incentive program across DoD
- Increase effective use of Performance-Based Logistics
- Remove barriers to commercial technology utilization
- Improve the return on investment in DoD laboratories
- Increase the productivity of IR&D and CR&D

Incentivize Innovation in Industry and Government

- Increase the use of prototyping and experimentation
- Emphasize technology insertion and refresh in program planning
- Use Modular Open Systems Architecture to stimulate innovation
- Increase the return on Small Business Innovation Research (SBIR)
- Provide draft technical requirements to industry early and engage industry in funded concept definition to support requirements definition
- Provide clear "best value" definitions so industry can propose and DoD can choose wisely

Eliminate Unproductive Processes and Bureaucracy

- Emphasize Acquisition Executive, Program Executive Office and Program Manager responsibility, authority, and accountability
- Reduce cycle times while ensuring sound investments
- Streamline documentation requirements and staff reviews

Promote Effective Competition

- Create and maintain competitive environments
- Improve technology search and outreach in global markets

Improve Tradecraft in Acquisition of Services

- Increase small business participation, including more effective use of market research
- Strengthen contract management outside the normal acquisition chain
- Improve requirements definition
- Improve the effectiveness and productivity of contracted engineering and technical services

Improve the Professionalism of the Total Acquisition Workforce

- Establish higher standards for key leadership positions
- Establish stronger professional qualification requirements for all acquisition specialties
- Strengthen organic engineering capabilities
- Ensure the DoD leadership for development programs is technically qualified to manage R&D activities
- Improve our leaders' ability to understand and mitigate technical risk
- Increase DoD support for Science, Technology, Engineering and Mathematics (STEM) education

Continue Strengthening Our Culture of Cost Consciousness, Professionalism, and Technical Excellence

Better Buying Power 3.0 (Draft)

Achieving Dominant Capabilities Through Technical Excellence and Innovation

Achieve Affordable Programs

- Continue to set and enforce affordability caps

Achieve Dominant Capabilities While Controlling Lifecycle Costs

- Strengthen and expand "should cost" based cost management
- Build stronger partnerships between the acquisition, requirements, and intelligence communities
- **Anticipate and plan for responsive and emerging threats**
- **Institutionalize stronger DoD level Long Range R&D Planning**

Incentivize Productivity in Industry and Government

- Align profitability more tightly with Department goals
- Employ appropriate contract types, but increase the use of incentive type contracts
- Expand the superior supplier incentive program across DoD
- Increase effective use of Performance-Based Logistics
- **Remove barriers to commercial technology utilization**
- **Improve the return on investment in DoD laboratories**
- **Increase the productivity of IR&D and CR&D**

Incentivize Innovation in Industry and Government

- **Increase the use of prototyping and experimentation**
- **Emphasize technology insertion and refresh in program planning**
- **Use Modular Open Systems Architecture to stimulate innovation**
- Increase the return on Small Business Innovation Research (SBIR)
- **Provide draft technical requirements to industry early and engage industry in funded concept definition to support requirements definition**

Highlighted items are key opportunities for engineering community engagement

Eliminate Unproductive Processes and Bureaucracy

- Emphasize Acquisition Executive, Program Executive Office and Program Manager responsibility, authority, and accountability
- **Reduce cycle times while ensuring sound investments**
- Streamline documentation requirements and staff reviews

Promote Effective Competition

- Create and maintain competitive environments
- **Improve technology search and outreach in global markets**

Improve Tradecraft in Acquisition of Services

- Increase small business participation, including more effective use of market research
- Strengthen contract management outside the normal acquisition chain
- Improve requirements definition
- **Improve the effectiveness and productivity of contracted engineering and technical services**

Improve the Professionalism of the Total Acquisition Workforce

- Establish higher standards for key leadership positions
- Establish stronger professional qualification requirements for all acquisition specialties
- **Strengthen organic engineering capabilities**
- **Ensure the DoD leadership for development programs is technically qualified to manage R&D activities**
- **Improve our leaders' ability to understand and mitigate technical risk**
- **Increase DoD support for Science, Technology, Engineering and Mathematics (STEM) education**

Use Modular Open Systems Architecture to Stimulate Innovation

- **Challenges**
  - DoD is challenged to affordably address emerging threats, component obsolescence, and loss of critical suppliers, and to conduct planned technology insertion/upgrades into tightly coupled, highly integrated systems
  - DoD seeks to drive innovative technology into platforms at the subsystem level through competition – enabling affordable capability refresh and engaging the largest possible competitive base
  - Standardized, documented modular interfaces enable “plug-and-play” insertion of new/upgraded capabilities on existing platforms – but current standards are of limited utility in supporting definition of modular interfaces in complex military systems

- **BBP 3.0 Opportunity**
  - Support incorporation of modular design features in new DoD designs
  - Develop common technical standards to support specification and interface control of modular interfaces

Systems Engineering: Critical to Defense Acquisition










Defense Innovation Marketplace
http://www.defenseinnovationmarketplace.mil

DASD, Systems Engineering
http://www.acq.osd.mil/se