Modular Open Systems Architecture in DoD Acquisition

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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**

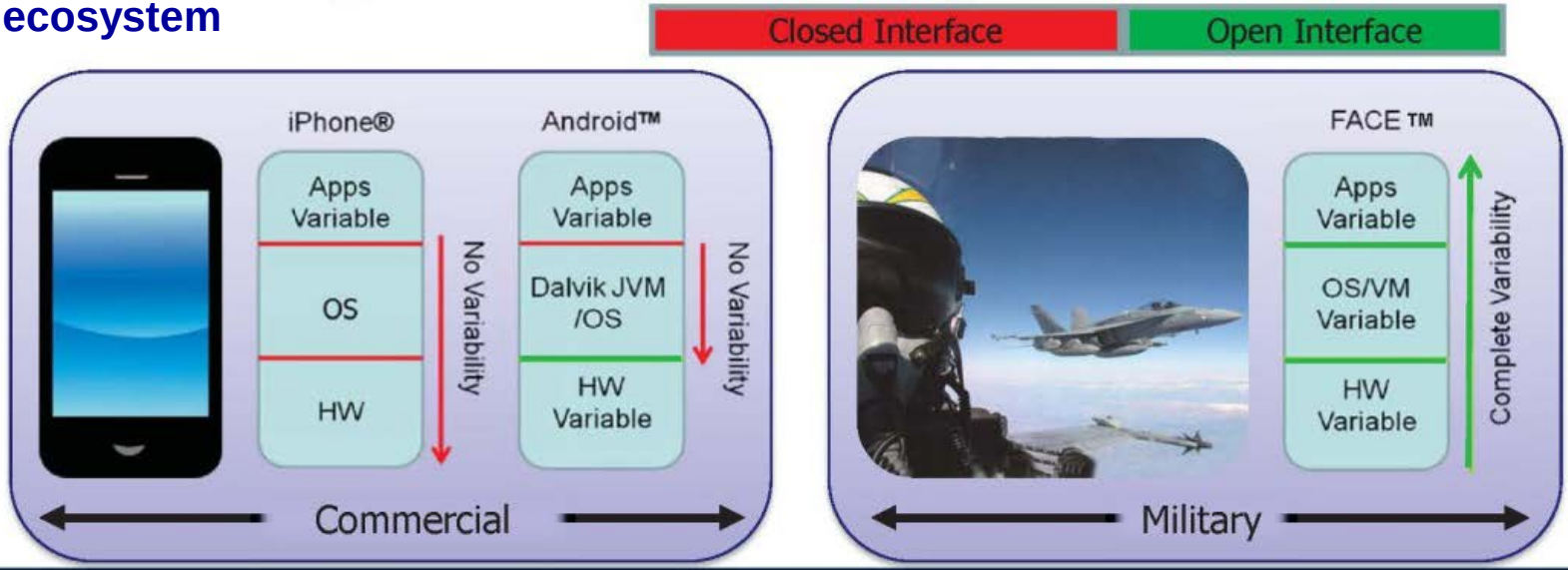
Key MOSA Implementation Gap: Lack of Domain-Specific Common Standards

- **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**



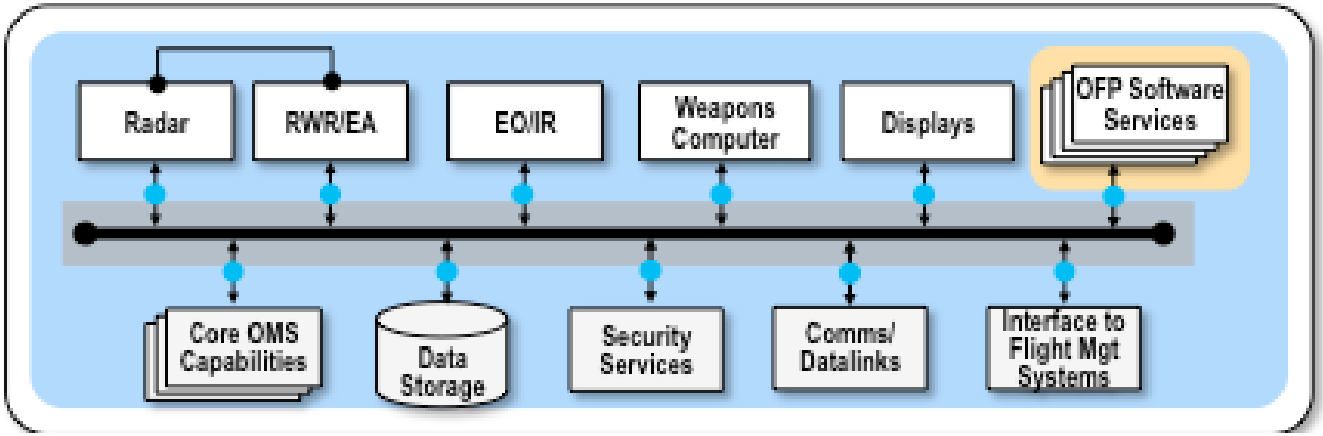
FACE is a bold new step in establishing greater Open System Architecture benefits in Defense Acquisition

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



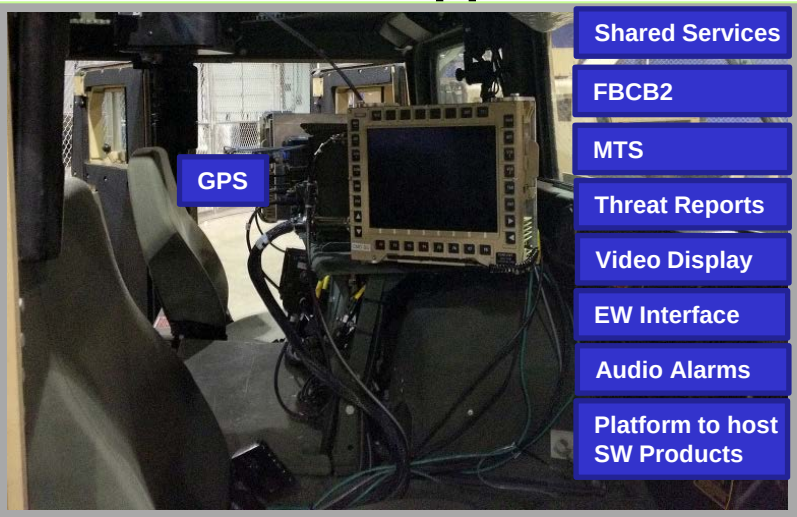
Key-interface definition + common composition rules = "acquisition efficiency"

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

Benefits Both Platform and Mission Equipment Design Implementation

We can't afford not to do VICTORY

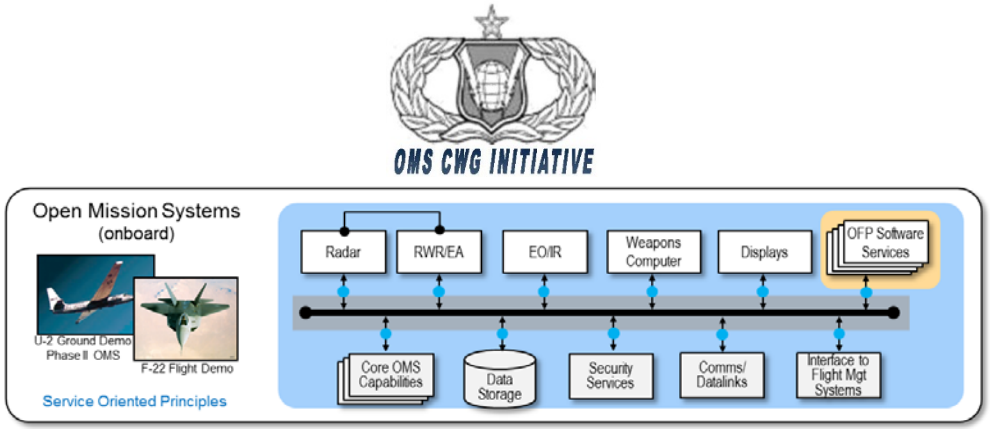
Soldier Benefits

- 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

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

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Highlighted items are key opportunities for engineering community engagement

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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
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