The Modular Open Systems Approach (MOSA) to Defense Acquisition: OS vis-à-vis OA

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Agenda

• Open Systems at OSD - ODUSD(A&T)/SSE
• Perceptions…Reality???
• MOSA Background
• National Research Council (NRC) Inputs on Business Issues
• Parting Thoughts
Systems and Software Engineering
Organizational Core Competencies

Under Secretary of Defense
Acquisition, Technology and Logistics

Deputy Under Secretary of Defense
Acquisition and Technology

Director, Systems &
Software Engineering

Deputy Director
Enterprise Development

Deputy Director
Developmental
Test & Evaluation

Deputy Director
Software Engineering &
System Assurance

Deputy Director
Assessments & Support

Acquisition program excellence through sound systems and software engineering
OS vis-à-vis OA: What’s the Difference?
Perceptions...Reality...maybe a little of both?

- Many open systems definitions & related terms
- At OSD, our focus is on “the Approach” and specific goals
- MOSA is DoD’s “umbrella” term for collecting and abstracting OS concepts
  - Many implementation details are left to the Services
The Department’s Vision for Open Architectures (and MOSA)

“... we are moving from a framework that focuses in the past on known threats, to a more flexible framework based on capabilities to defend ourselves from shifting and uncertain threats ... from a focus simply on programs and platforms, to a focus on results ... from segmented information and closed information architecture, to network information and open architectures … … and from what is called “deliberate planning” ... to ...“adaptive planning.”

Source: DepSecDef Keynote on Transformation to The Heritage Foundation, 27 Feb 2004

“A modular, open-systems approach shall be employed, where feasible.” (DoDD 5000.1)
Acquisition Challenges: Commercial Dominance

DoD no longer “drives” development. Instead, it must leverage what industry has developed for commercial applications.
**Military Trends:**
**Losing Market Leverage**

### Declining Defense Spending

**Defense Outlays As a Share of Gross Domestic Product**

- **2003 Total Worldwide Merchant Semiconductor Usage**
  - **Total $140.7 Billion**
  - **Computer:** 53%
  - **Consumer:** 17%
  - **Communications:** 15%
  - **Industrial:** 9%
  - **Auto:** 5%
  - **Military:** <1%

### Decreasing Market Share

- **DoD budget (as % of GDP) near its lowest level since after WWII!**
- **Obsolescence is market driven**
  - It won’t go away
  - We can’t change the environment
- **Results in unaffordable Non-Recurring Engineering (NRE) costs**

**Source:** Air Force Magazine, April 2007
(data from US Department of Defense)
Commercial Technology Trends:
Reduced Cost & Cycle Time

- Shorter Product Lifetimes

<table>
<thead>
<tr>
<th>Technology Evolution</th>
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<tr>
<td>Technology Growth:</td>
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<tr>
<td>- Doubles Every 2 Yrs</td>
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<tr>
<td>- Cost/Part Decreases</td>
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<td>- 10,000:1 in 20 Yrs</td>
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- Device Density (Transistors Per Die)

- Production (Millions)

- Time to Obsolescence (Years)

- Military Vs Commercial

- Components
  - Processors
  - Board Level Products
  - Software Tools
  - Interfaces (H/W & S/W)
  - Software Language / Applications

- Source: Dataquest Inc.
Acquisition Cycle Time:
Reversing the Trend

Acquisition Cycles Now *Exceed* Commercial Technology Periods

Commercial Technology Period
- F-15
- F-22
- UAV?

DoD Acquisition Cycles

Responsive Acquisition?

Over History

Time to Acquire (years)
An integrated business and technical strategy that:

- provides an enabling environment,
- employs a modular design and, where appropriate,
- defines key interfaces,
- using widely supported, consensus-based (i.e., open) standards that are published and maintained by a recognized industry standards organization
- and uses certified conformant products.

A foundation for effective systems engineering for rapid delivery of enhanced combat capability to the Warfighter:

- Enhanced Interoperability
- Reduced Life cycle Costs
- Reduced Cycle Time
MOSA Application: All Levels of Indenture

Increasing government responsibility

Level 1: Force Structure/System of Systems

Level 2: Weapon System/e.g. JSF

Level 3: Major Subsystem/e.g. Avionics Suite

Level 4: Functional Area/e.g. Integrated Core Processing

Level 5: Hardware/Software e.g. Building Block

Level 6: Hardware/Software e.g. Component

Increasing opportunity to use commercial developments

Increasing government responsibility

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Increasing opportunity to use commercial developments
A Real-World MOSA Example

- **What**
  - Predator UAV was augmented with Hellfire missile in just over 30 days for rapid deployment in Afghanistan.

- **How**
  - Critical target tracking software was easily rehosted from LOSAT (Line of Sight Anti-Tank) computing environment to Predator’s because it was built upon the Army’s open Weapon System COE API.
  - The WSTAWG COE specifies common services for managing the 1553 bus and for handling digital video.

**Resulted in:**
- A New Capability - fielded rapidly
- Significant Cost Avoidance - 75% of typical software development costs
- Enhanced Interoperability - by re-using a proven weapon systems product

**Enabled by MOSA using:**
- Modular Design
- Key Interfaces
- Open Standards
Focus on Business Issues:
A Brief Look Back at the NRC Aging Avionics Study

Aging Avionics in Military Aircraft

Committee on Aging Avionics in Military Aircraft, Air Force Science and Technology Board, National Research Council


This PDF is available from the National Academies Press at: http://www.nap.edu/catalog/10108.html
Specific Findings in Key Areas:

Business Issues (1/3)

Finding 14 - New Acquisition Approaches
MOSA challenges the traditional military procurement model in several ways:

• With a modular, open-structured avionics system, Air Force (and DoD) would, in theory, be able to solicit supplier competition at a variety of systems architecture levels:
  – Component level
  – Circuit-board/module level
  – Subsystem level.
• The level must be High Enough to provide Incentives for qualified suppliers to participate, take advantage of local openness, and encourage suppliers to invest in research to improve avionics systems and stimulate innovation.
Specific Findings in Key Areas: 
Business Issues (2/3)

Finding 14 (Cont)

- The traditional mindset of acquiring hardware and software will have to be changed to one of *Acquiring Functionality* (an approach in keeping with acquisition-reform precepts).
- The protection and value pricing of a supplier’s *Intellectual Property* will be a key to success, and will require workable business models.
- *Business Incentives* must be defined and provided to suppliers that will motivate use of MOSA in avionics system design.
Specific Findings in Key Areas:
Business Issues (3/3)

Finding 15 - Reliance on the Private Sector

As the Air Force and DoD rely more heavily on commercial derived or off-the-shelf hardware and software in avionics systems—and less on Mil Spec components and DoD-unique software languages—the expertise and intellectual property necessary to develop and maintain these systems will increasingly reside in the Private Sector.
Recommendation 10 - Other OSD Initiatives
The Air Force should recommend:
OSD form *Joint Working Groups* with Industry to address policy and business concerns involved in the resolution of aging avionics problems:

- An *Industry/Government Steering Group* should be formed as a focal point for addressing:
  - Issues raised by MOSA procurement models and related modifications to the acquisition process
  - Business/competitive models
  - Intellectual property rights
  - Management/pricing, 50/50 rule, & related issues.
MOSA in a “Nutshell”

- **Vision**: MOSA is an integral part of all acquisition strategies to achieve affordable, evolutionary, and joint combat capability.

- **Principles**:
  - Establish Enabling Environment
  - Employ Modular Design
  - Designate Key Interfaces
  - Select Open Standards
  - Certify Conformance

- **Benefits**:
  - Ease of Change
  - Reduced Total Ownership Cost
  - Reduced Cycle-Time
  - Enabling Joint Integrated Architectures and Interoperability
  - Risk Mitigation

**Business** to **Technical** Indicators
Parting Thoughts

• We’ve been at this for over 13 years… (some say longer)
• Transition to open systems in DoD requires a cultural change, i.e., the “will to change”
• Business issues tend to overrun the technical “art of the possible”
• MOSA Continuous Learning Module under development for Defense Acquisition University
• We need continued collaboration to meet the challenge and achieve a “Win-Win-Win”
The Department’s intent is to use open architectures to rapidly field affordable systems that are interoperable in the joint battle space. A required step in this direction is to ensure each Service has a coordinated business and technical approach to MOSA across their respective programs that will ultimately support the progression towards joint integrated warfare.

Commencing October 1, 2004, all programs subject to milestone review shall brief their program’s MOSA implementation status to the Milestone Decision Authority (MDA) to determine compliance.

OSJTF has adapted the Office of Management and Budget (OMB) Program Assessment and Rating Tool (PART) in assessing MOSA implementation. Each program will present the results of their PART assessment, using the results generated by the tool, at all major milestone and program reviews.