Naval Open Architecture

Avoiding Cost Growth through Open System Architecture

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Dr. A. Wayne Meeks
Executive Director, Ships/Submarine,
Integrated Warfare Systems

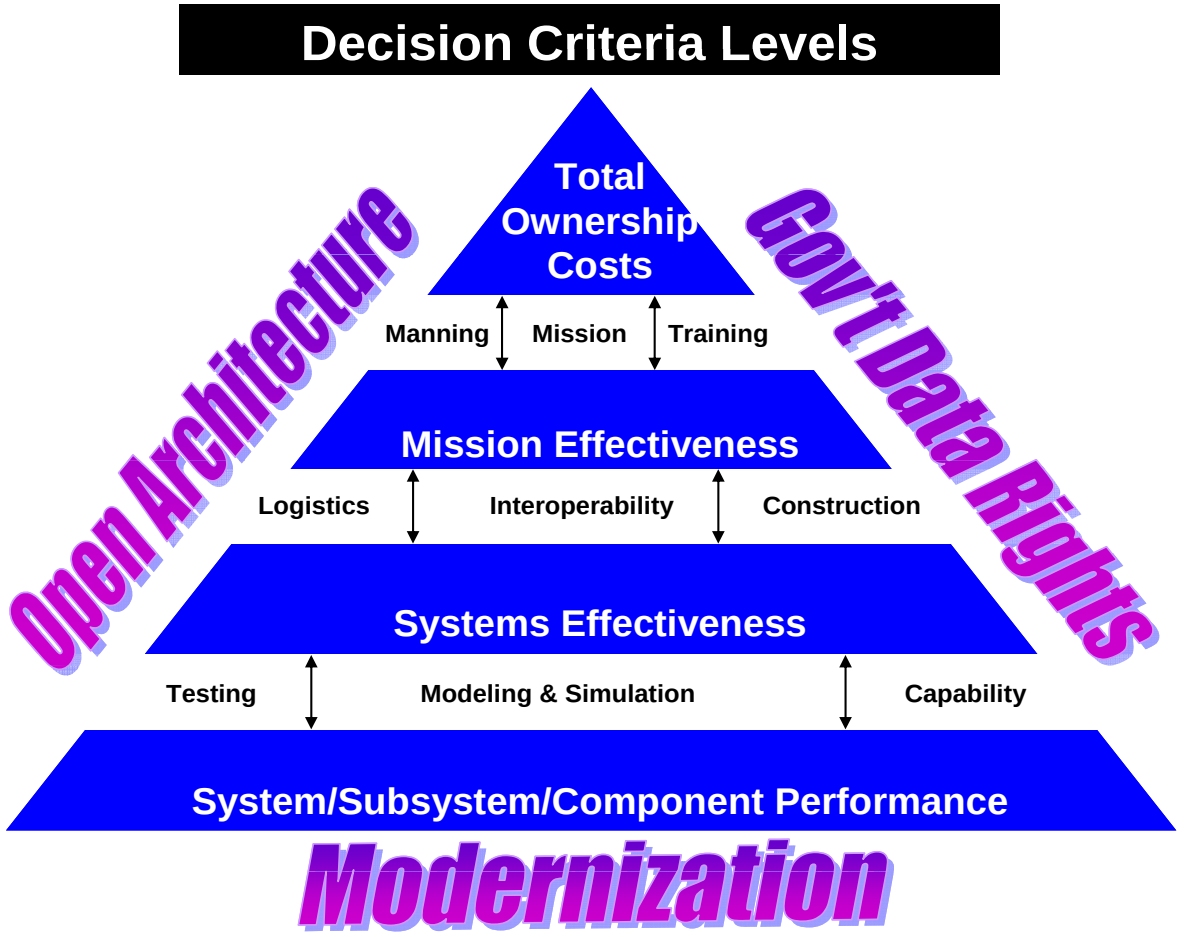
New Threats…Changing Requirements—Demands A Different Approach

"We must rebalance this department's programs in order to institutionalize and enhance our capabilities to fight the wars we are in today and the scenarios we are most likely to face in the years ahead, while at the same time providing a hedge against other risks and contingencies. In order to do this, ***we must reform how and what we buy, meaning a fundamental overhaul of our approach to procurement, acquisition, and contracting.***

—Secretary Gates, "Gates Unveil Overhaul of Weapon's Programs, Wall Street Journal, April 6, 2009

Rising Costs…Requires Focus on Total Ownership Costs

The System Engineering focus is on Total Ownership Costs



Source: Surface Warfare Enterprise Chief Technology Officer, RDML Shannon

How do we do it? We change how we build systems by adopting OA Principles

***Naval Open Architecture** is the confluence of business and technical practices yielding modular, interoperable systems that adhere to open standards with published interfaces. OA delivers increased warfighting capabilities in a shorter time at reduced cost.*

OA CORE PRINCIPLES

- ***Modular design and design disclosure***
- ***Reusable application software***
- ***Interoperable joint warfighting applications and secure information exchange***
- ***Life cycle affordability***
- ***Encouraging competition and collaboration***

Source: OPNAV ltr Ser N6N7/5U916276 dtd 23 Dec 05

Everyone has a role in Open Architecture

Chief of Naval Operations

N43 | **N6** | **N8** | **OA CROSS FUNCTIONAL BOARD**

- Provide Naval requirements and POM/PR guidance to acquisition community
- Identify requirements for rapid, cost-effective, interoperable warfighting improvements with the objectives of supporting OA

Assistant Secretary of Navy (Research, Development & Acquisition)

OA Enterprise Team Lead Council

OA Enterprise Team (OAET)

- Air
- IWS
- C4I
- USMC
- LMW
- Carriers
- Subs
- Space
- ASW COI
- MIW COI
- Ships

- Lead the enterprise to OA implementation
- Oversee the development and implementation of the processes, business strategies, and technical solutions for implementing OA
- Provide OA Systems Engineering Leadership to PEOs, Warfare Centers, Industry, etc.

PEOs

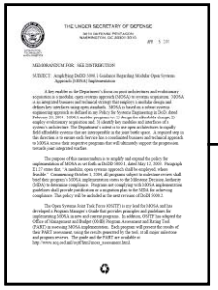
- Implement OA business & technical practices

SYSCOMS

- Provide technical, financial management and contracting support to PEOs
- Establish OA technical processes
- Monitor and assess compliance with OA standards and processes

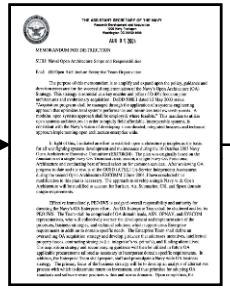
OA policy progression since 2004

Apr 2004 USD (AT&L) issues Modular Open Systems Approach Implementation Memo



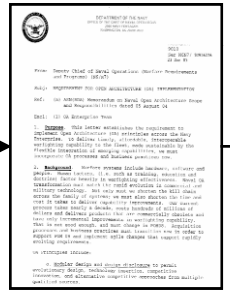
OSD OA Policy

Aug 2004 Navy issues Open Architecture policy



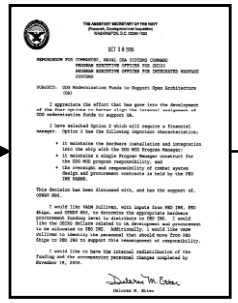
Naval OA Policy

Dec 2005 OPNAV issues OA Requirements



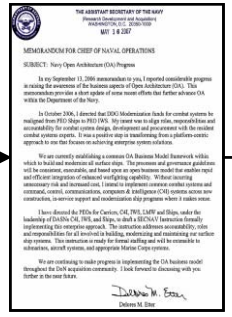
Navy OA Requirements

Oct 2006 ASN RDA issues DDG Mod Funds to Support OA



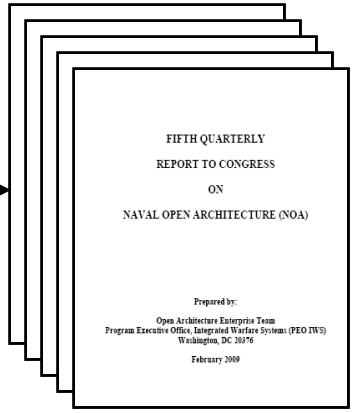
Navy OA Alignment

May 2007 ASN RDA issues Memo to CNO on OA progress



Navy OA Progress

Feb 2008 – Present OA Reports to Congress



Navy OA Reporting

OA progress and results

DOMAIN	RESULTS
	**E-2D** ■ OA approach **reduced computer acquisition timeline from 7 to 2.5 years**. Employs **70% software reuse** from the E2-C mission/display computers
	**Electronic Warfare Self-Protection Systems Program Office** ■ Provide Interface Control Documents as Government Furnished Information (GFI) in all new Request for Proposal packages. The defined interfaces enable an environment where a **variety of material solutions can be incorporated (plug'n protect) in Light Aircraft survivability suites** without modification to the existing CIs.
	**EA-18G** ■ Mission computer software is approximately **90% common with the F/A-18 E/F and 82% common with the EA-6B ICAP III ALQ-218**
	**F/A-18 E/F** ■ Since incorporating High Order Language (HOL) mission computer software has provided a significant ROI with a **75% reduction in man hours and a 50-90% improvement in defect closure rate** when compared to Legacy mission computer software development

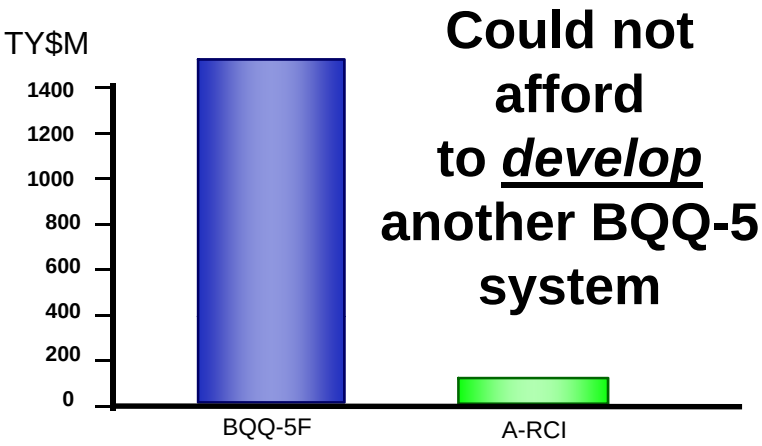
OA progress and results

DOMAIN	OA Progress / Results
C4I 	**CANES:** Continued ISNS–to–CANES migration efforts, which is **reducing four separate shipboard networks down to one**. Migration efforts focused on risk reduction, CANES early adopter process, and early installations in operational strike group ships
	Communications at Speed & Depth S&T Program: Identified areas through an OA Assessment where **openly available interface standards can be more extensively used**
	ADNS Program: **Reused 128k lines of Navy-owned code & 25k lines of U.S. Army-owned code** to deliver new capabilities.
	Multiple C4I Programs: **Incorporated OA Language in several contracts** including Future Command & Control System; ADNS; Global Positioning System Based Positioning, Navigation & Timing Services; Naval Integrated Tactical Environmental Subsystem Next Generation (NITESNext); Distributed Information Operations (DIOS); Distributed Common Ground System ((DCGS) Info Backbone (DIB); Digital Modular Radio (DMR); Submarine High Data Rate Program; and Net Enabled Command Capability (NECC)
	Contracts: Developing logical decision tree to **determine requirements for inserting OA language into solicitations and standard CDRLs**.

OA progress and results

DOMAIN	OA Progress / Results
	**Submarine Sensor Systems Program Office (PMS – 435)** ▫ Joined PMS 401 and PMS 425 in adoption of the submarine ARCI model to **open up the system both technically and programmatically**
	■ **Changing contracts** ▫ Adapting a common business strategy by participating in a **joint contracting approach across two program offices** (PMS 401 and PMS 425).
	■ **Increasing Lifecycle Affordability** ▫ Implemented capability insertion processes which in turn is limiting cost growth. Developed the acoustic rapid costs insertion process (ARCI) and the advanced processing build process (APB). A key element of this process is the **competitive software development guided by an open and collaborative peer review** that includes industry, academia, warfare centers, and government labs.

PEO Subs has demonstrated significant results by adopting OA —COTS/OA vs. Legacy Cost Efficiencies



Could not afford to *develop* another BQQ-5 system

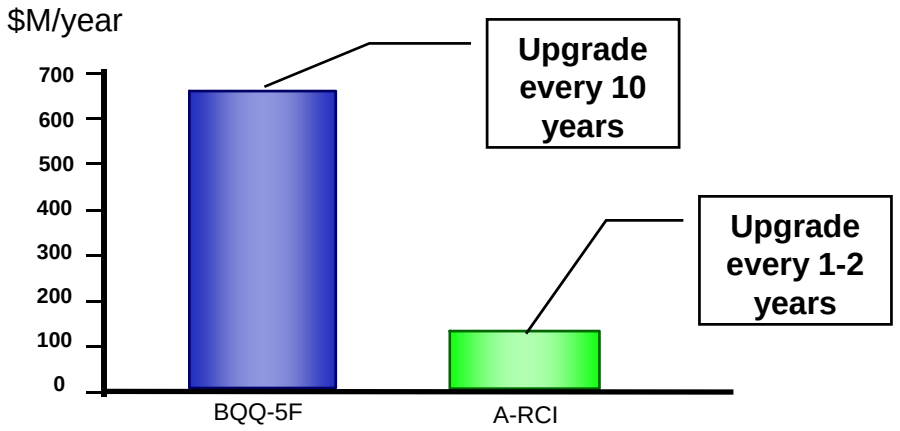
Development Cost

Total Buy: ~$5B for 55 SSNs

Could not afford to *buy* new BQQ-5 shipsets

Shipset Cost

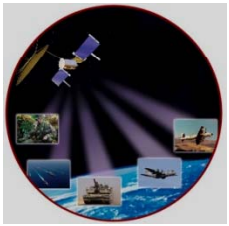
Ten Year Comparison Development, Installation & Support Cost



OA progress and results

DOMAIN	OA Progress / Results
	**Aegis Modernization** ■ USS BUNKER HILL (CG 52) – **separated hardware and software and introduced a Commercial Off-The-Shelf (COTS) based hardware** infrastructure in Advanced Capability Build 08 / Technology Insertion 08
	**Common Display Systems (CDS)** ■ Held a **full and open competition for CDS in support of the DDG 1000 and Aegis Modernization**. The CDS is a family of displays that will be implemented across platform systems on Navy surface ships, submarines, and aircraft.
	**Ship Self Defense System Mk2** ■ Use a **distributed, open system design and employ COTS electronics** in rugged cabinets; POSIX Compliant Operating Systems; distributed processing using COTS devices and commercial standards; and modularized software. Introduction to the fleet of SSDS Mk 2 began with USS NIMITZ (CVN 68) in FY 2008. The software for all ship classes employing SSDS comes from a **single source library that allows reuse** across all SSDS ships.

OA progress and results

Program	OA Progress / Results
	**LCS Mission Module Program Office** ■ **Reused several subsystems** across the Navy to build the 3 Mission Modules ■ **Assessed openness** of the Mission Package Computing Environment, Multi-Vehicle Communication System, and Mission Modules (Surface Warfare, Anti-Submarine Warfare, Mine Counter Measures MM) ■ **Provided components to Aegis and DDG** from MPCE for reuse ■ **Identified key interfaces** to enable "plug and play" at lower level ■ Developed **Technology Transition Development Plan**
	**Space Mobile User Objective System Program** ■ Deposited MUOS Common Air Interface (CAI) Waveform in the JTRS Information Repository and **provided assets to Nine (9) developers for possible integration** into their terminal product lines ■ CAI Waveform and Satellite Bus are Based on **Commercial Standards** resulting in over **85% Reused or Modified Software**
	**Marine Corps** ■ Incorporated components from eight other programs developed by two other domains into Marine Air Ground Task Force Command and Control (MAGTF C2)

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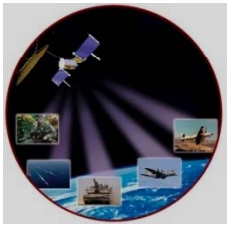	**Space Mobile User Objective System Program** ■ Deposited MUOS Common Air Interface (CAI) Waveform in the JTRS Information Repository and **provided assets to Nine (9) developers for possible integration** into their terminal product lines ■ CAI Waveform and Satellite Bus are Based on **Commercial Standards** Resulting in Over **85% Reused or Modified Software**
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“We have to be prepared for the wars we are most likely to fight -- not just the wars we're best suited to fight, or threats we conjure up from potential adversaries with unlimited time and resources.”

—Secretary Gates, 15 Apr 09