



Naval Open Architecture

INFORMATION EXCHANGE AGREEMENT (IEA) ABCANZ-02 Meetings



May 21, 2008



Background



The ever-increasing costs of our weapon programs ...



“Investment in weapon acquisition programs is now at its highest level in two decades. The department expects to invest about \$900 billion (fiscal year 2008 dollars) over the next 5 years on development and procurement with more than \$335 billion invested specifically in major defense acquisition programs. Every dollar spent inefficiently in acquiring weapon systems is less money available for other budget priorities—such as the global war on terror.”

—Defense Acquisitions: Results of Annual Assessment of DOD Weapons Programs,
 —Statement of Michael J. Sullivan
 Director, Acquisition and Sourcing Management, GAO, 29 April 2008

“We must position ourselves such that future Congresses and future administrations will support our plans to build a 313-ship Navy, deliver the next generation of Naval aircraft, and fund the full complement of Marine Corps expeditionary assault capabilities that the Navy and Marine Corps depend on for the execution of our core missions..”

—Secretary of Navy Donald C. Winter, speech to Navy League Sea-Air-Space Expo, 20 March 2008

... threatens our plan for a 313-ship Navy



The Navy must build a fleet where our systems ...



... are modular, interoperable, and affordable to upgrade



Open Architecture is an enabler for meeting these goals

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 Itr Ser N6N7/5U916276 dtd 23 Dec 05



Leadership's priorities are focused on OA

*“Our Navy’s shipbuilding plans incorporate **open architecture** for hardware and software systems and they increase the use of system modularity. These initiatives reduce the cost of maintenance and system upgrades, and keep the Navy’s Fleet in service longer ... OA will drive us to commonality and standardization, introduce efficiencies, promote better data protection, and network security. It will also allow our future war fighters to fight collaboratively and more effectively.”*

—Chief of Naval Operations ADM Gary Roughead,
testimony before Senate Armed Services Committee, 28 Feb. 2008



*“**Open architecture** is a business model more than anything else. It separates the software from the hardware and allows you to upgrade the capability through software changes and upgrades without having [to upgrade] ... the entire infrastructure that goes along with it. It’s not proprietary, so if smaller companies have applications that could run on our systems and put capability into those systems, without having to [incur] a large middleware cost, then we increase capability as we decrease cost.”*

—VADM Mark J. Edwards, *Seapower Magazine*, April 2008



OA requirements are derived from three sources ...

5 August 2004 OA Policy Statement

THE ASSISTANT SECRETARY OF THE NAVY
Research Development and Acquisition
1000 Navy Pentagon
Washington DC 20350-1000
AUG 0 5 2004

MEMORANDUM FOR DISTRIBUTION **OA EXCOMM Action Items**

SUBJ: Naval Open Architecture Scope and Responsibilities

Encl: (1) Open Architecture E...

The purpose of this memorandum is to provide direction necessary for the success of the Open Architecture Strategy. This strategy is based on architectures and evolutionary "Acquisition programs shall be approach that optimizes total system architecture, open systems approach, open systems architectures in or consistent with the Navy's vision approach implementing open ar...

In light of this, I initiate for all war fighting systems development of a single Navy OA Architecture and conducting be progress to date and the results during the second Open Architecture modification to this plan is necessary. Architecture will be modified to unique requirements.

Effective immediately, directing the Navy's OA Enterprise. The Team shall be representatives, who will collect processes, business strategies, a requirements in addition to doing overarching OA acquisition strategy property issues, contracting strategy and applicable procurements. In addition, the Enterprise Team strategy. The primary focus of process with which to determine standards and software resea...

THE ASSISTANT SECRETARY OF THE NAVY
Research Development and Acquisition
1000 Navy Pentagon
Washington DC 20350-1000

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Summary of OA EXCOMM III of February 22, 2005

On Tuesday, February 22, 2005, I hosted a Committee Meeting (EXCOMM) at SPA. The intent of this meeting was to review the status of the Naval Enterprise and to review the results of the meeting.

There were four major goals identified:

- Update the status of the OA Initiative
- Outline a coordinated strategy for OA
- Approve requested decisions and actions
- Provide insight into current status of selected functional Domains.

The OA EXCOMM focused on current principles of system design and acquisition systems that is more affordable, agile, and (1). Key points made include:

- The Navy must transition to OA that enables a supportable Fleet, but do not develop an Enterprise framework that must ensure applications and function selection of programs to be opened Cross-Domain and Cross-Enterprise
- The Navy's organizational structure Systems Commands and PEOs should be reexamined. They shall also cooperate capabilities.
- Contract business models for program determine if they foster that transition
- There is an enterprise-wide need for and non-tactical IT, aligns Industry between C4I and combat systems, each other. I intend to engage the establish an enterprise-wide IT go
- FORCEnet and OA must map into
- The Enterprise will present a coordinated

23 December 2005 OPNAV Requirements

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
3300 NAVY PENTAGON
WASHINGTON, DC 20350-3000

MEMORANDUM FOR DISTRIBUTION

SUBJ: REQUIREMENT FOR OPEN ARCHITECTURE (OA) IMPLEMENTATION

Ref: (a) ASN(RDA) Memorandum on Naval Open Architecture Scope and Responsibilities dated 05 August 04

Encl: (1) OA Enterprise Team

1. **Purpose.** This letter establishes the requirement to implement Open Architecture (OA) principles across the Navy Enterprise. To deliver timely, affordable, interoperable warfighting capability to the fleet, made sustainable by the flexible integration of emerging capabilities, we must incorporate OA processes and business practices now.

2. **Background.** Warfare systems include hardware, software and people. Human factors, (i.e. such as training, education and doctrine) factor heavily in warfighting effectiveness. Naval OA transformation must match the rapid evolution in commercial and military technology. Not only must we shorten the kill chain across the family of systems; we must also shorten the time and cost it takes to deliver capability improvements. Our current process takes nearly a decade, costs hundreds of millions of dollars and delivers products that are commercially obsolete and have only incremental improvements in warfighting capability. That is not good enough, and must change in POM08. Acquisition processes and business practices must transition now in order to support POM 08 and implement agile changes that support rapidly evolving requirements.

OA Principles include:

- Modular design and design disclosure to permit evolutionary design, technology insertion, competitive innovation, and alternative competitive approaches from multiple qualified sources.

Statement A: Approved for Public Release; distribution is unlimited.

Naval OA Strategy

"Probably the biggest challenge I have is to get the ship building key right, to get the future capabilities right. We are at 281 ships today. We have come down, and I believe are projected to go up -- and we need to sustain that projection to a positive direction."
- ADM Mullen, Chief of Naval Operations, 26 Oct 2005

Navy leadership is faced with the challenge of modernizing and evolving national security systems and aging platform technologies into the Fleet imperative if we are to gain technologies and deliver the results we need. Naval Open Architecture (OA) is a technical strategy for acquiring interoperable systems that architectures. This initiative is part of the DoD focus on DoD Directive 5000.1 date application of a systems engineering ownership costs. A modular combat systems designed to incorporate insertion of new we must become leaders of This strategy lays out the 2

Naval OA Vision
To meet the CNO's priorities, the Naval OA vision is to transform our organization into an architecture principle war

Institutionalizing Naval OA

Align

- Align Requirements & Acquisition communities
- Align Domains across the Enterprise and with Joint
- Align Industry and Academic Partners

- **Goal 1.** Change the Naval processes and business practices to "utilize open systems architectures in order to rapidly field affordable, interoperable systems."
- **Goal 2.** Provide OA Systems Engineering leadership to field common, interoperable capabilities more rapidly at reduced costs
- **Goal 3.** Change the Naval and Marine Corps cultures to institutionalize OA principles

... that shape the Enterprise OA strategy

<https://acc.dau.mil/oa>



Implementing the strategy requires the commitment and participation of stakeholders across the Enterprise



Chief of Naval Operations



Assistant Secretary of Navy (Research, Development & Acquisition)

N6

N8

- Identify common requirements for rapid, cost-effective, interoperable warfighting improvements with the objectives of supporting OA

OA Enterprise Team

OA Enterprise Team Lead Council

AIR

SURFACE

C4I

SUB

SPACE

MARINE CORPS

- Lead the enterprise OA implementation
 - Development of business strategies, and technical solutions
 - OA Systems Engineering Leadership

PEOs

- Implement OA business and technical practices

SYSCOMS

- Provide technical, financial management and contracting support to PEOs
- Monitor and assess OA compliance



How We Are Adopting Open Architecture



We are changing our business and technical practices

Naval Open Architecture (OA) is the confluence of business and technical practices yielding modular, interoperable systems that adhere to open standards with published interfaces.

Business Practices

- Disclose design artifacts
- Negotiate appropriate data rights
- Increase enterprise collaboration
- Institute reviews of solutions
- Develop new business models
- Change contracts
- Increase competition
- Design for lifecycle affordability

Technical Practices

- Modularize systems
- Publish interfaces
- Isolate proprietary components
- Use widely adopted standards
- Re-use software components
- Build interoperable applications
- Ensure secure data exchange

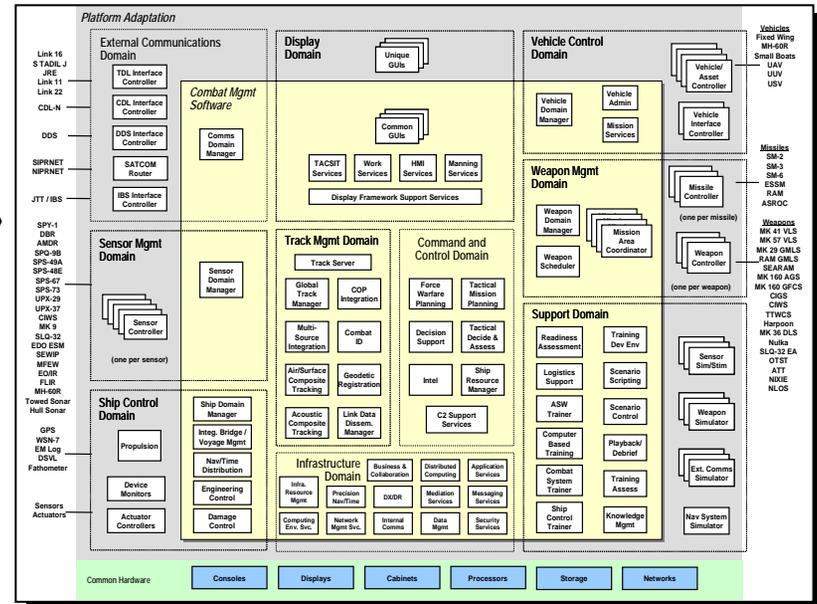


For example, PEO IWS is building a modular, common combat system architecture ...

Aligning platform combat systems ...



... to 1 common open objective architecture ...



"I expect us to compete whenever possible. Competition provides us with options to seek the best solution for the fleet and the taxpayer. ... I also expect us to foster an environment in which competition can be sustained over time. Competition once does not serve our interests."

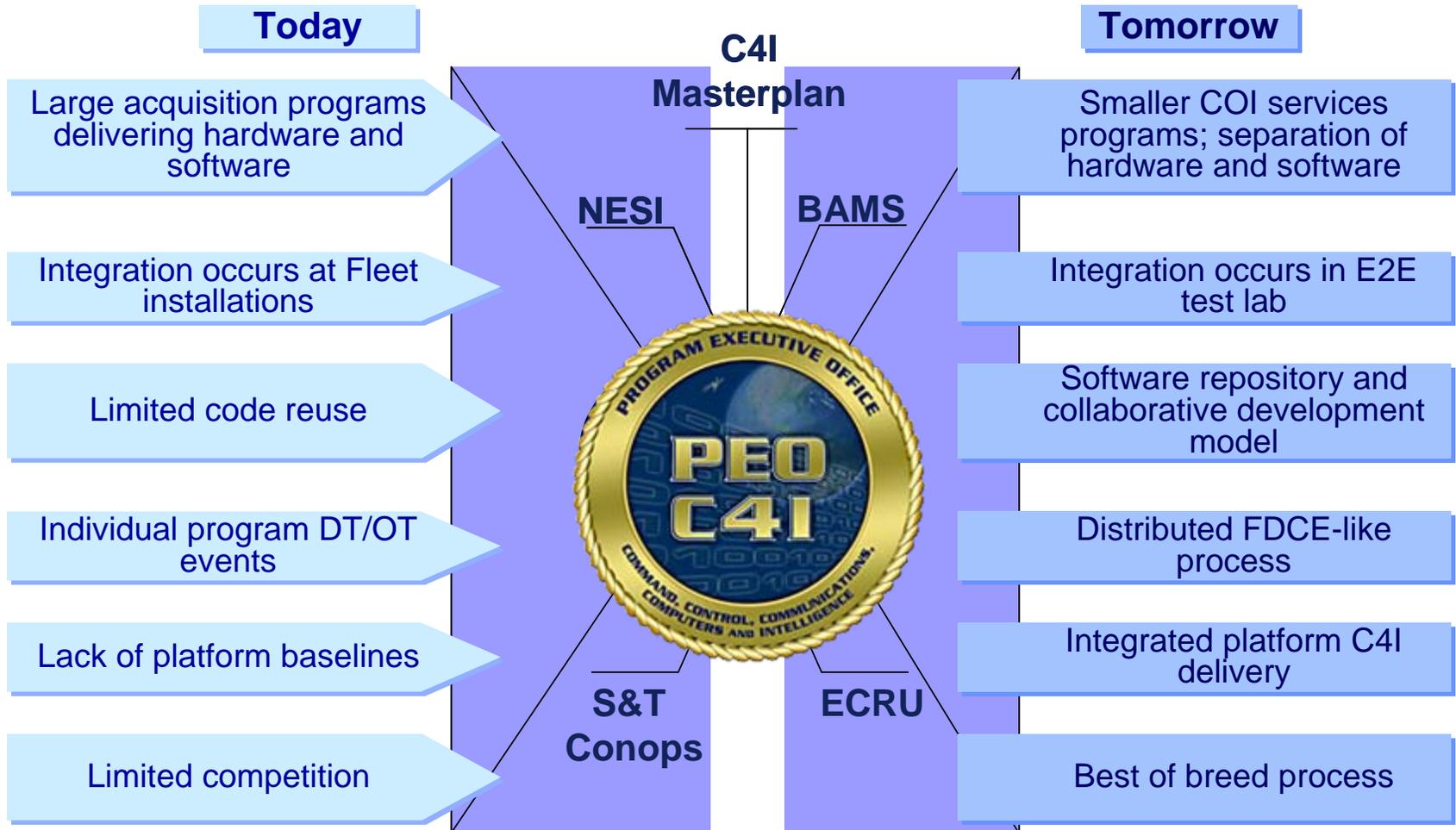
—VADM Paul E. Sullivan

... to achieve commonality across multiple ship classes where business case supports

... to help increase competition



PEO C4I is developing new business models ...



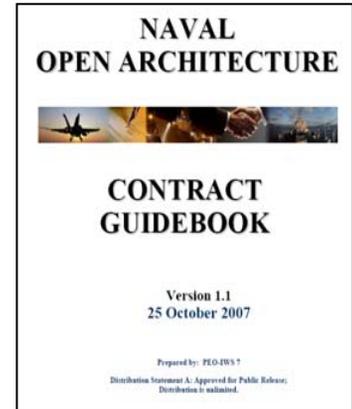
... to neck down and move towards common services



Some programs are changing their contracts ...

■ Contract Language

- Leveraging language in *Naval OA Contract Guidebook* to mandate adoption of OA principles
- In FY 07, 36 contracts incorporated OA language



■ Contract Award Evaluations

- Openness of proposed architecture for Ground/Air Task Oriented Radar was evaluated as a contract award selection criteria



■ Contract Incentives

- P8-A contract includes OA compliance as a specific award fee criteria
- 30% of \$261M award fee pool tied to technical criteria



... to include OA business and technical principles



The Navy is exercising its Intellectual Property Rights ...

- A key aspect to implementing OA is for the Government to **exercise** the intellectual property rights (IPR) it acquires
- Under the Federal Acquisition Regulations (FAR) and Defense Federal Acquisition Regulation Supplement (DFARS):
 - The Government gets **Unlimited Rights** in both Technical Data (TD) and Computer Software (CS) for noncommercial items **developed exclusively at the Government's expense**.
 - For noncommercial items developed with **mixed funding**, the Government gets **Government Purpose Rights (GPR)** in TD and CS.
- If a contractor asserts more restrictive rights over a system/component's IP and the Government fails to challenge such an assertion by exercising its rights, the contractor obtains the asserted rights
- It is imperative that the Government assert and exercise the IPR it acquires because it may lose the right to challenge after a period of time





... to re-use software to reduce costs



The P-8A re-uses 68% of mission software (over 2.5M software lines of code). The program is leveraging existing proven software from critical mission areas.

The Marine Air Ground Task Force Command and Control (MAGTF C2) incorporates components from eight DOD programs





Programs are disclosing designs to foster collaboration ...

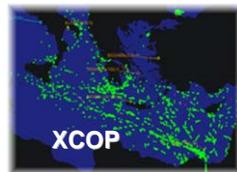
- Design artifacts from AEGIS, LCS, DDG 1000, SSDS, SIAP, IABM are available to qualified vendors in the IWS repository



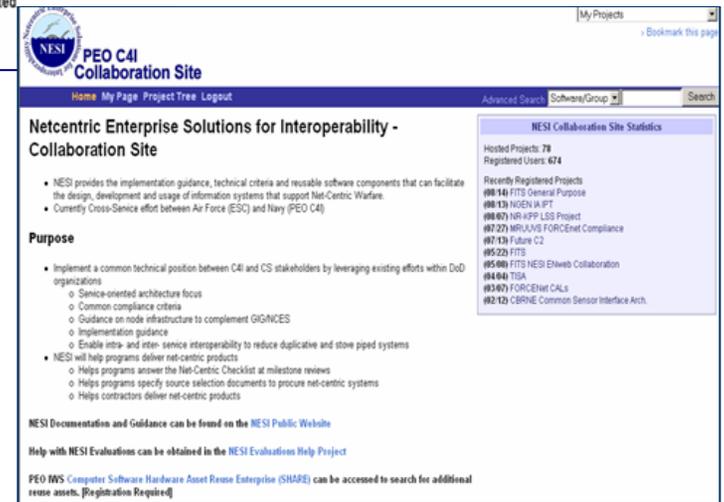
IWS SHARE REPOSITORY



- Project artifacts from CLIP, XCOP, and NITES-Next are available to qualified vendors in the C4I NESI collaboration site



C4I NESI COLLABORATION SITE



... and improve interoperability



Benefits of Implementing Open Architecture



Implementing OA yields many benefits

Reduction in Time to Field

- Decreased development and acquisition cycle times to field new warfighting capabilities
- Faster integration of open standards based systems

Increased Performance

- Improved operator performance thru delivery of cutting edge technologies and increased bandwidth capabilities from spiral developments and technology insertions

Improved Interoperability

- Use of common services (e.g. common time reference)
- Use of common warfighting applications (e.g. track mgr)
- Use of published interfaces to standardize collaboration

More Competition

- Modular architectures enable competition at the component level
- Sharing data rights allows third parties to compete

Cost Avoidance

- Cost avoidance from software reuse and use of commodity COTS products at optimum prices
- Reduced training and streamlined lifecycle support



For example, PEO C4I is fielding new capabilities

Requirement

- One common communications center for all submarine classes

OA Implementation

- Modular architecture
- Reuse of common communications components for all submarine classes such as antennae, transceivers, terminals and networks

Results

- One Common Submarine Radio Room
- Increased lifecycle affordability
- Full Rate Production granted Aug 07
- Successful OPEVAL on SEAWOLF, SSGN and SSBN platforms
- Successfully deployed on SSN21
- Investigating to extend this concept to all Naval vessels





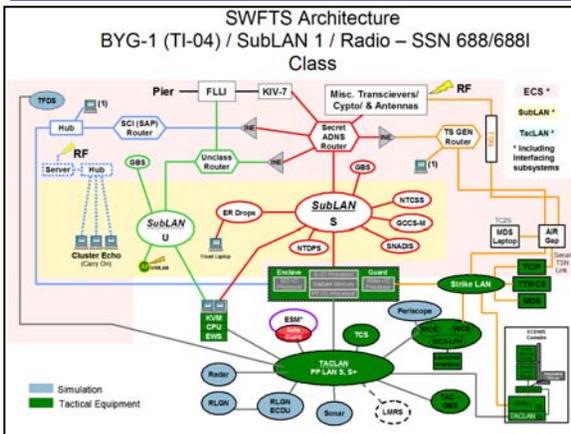
PEO Subs is reducing time to field capabilities

Requirement

- ❑ Implement enterprise business strategy with technical solutions

OA Implementation

- ❑ Apply an Open, Network Centric Architecture with Services and Applications
- ❑ Eliminate stovepipe, obsolete hardware and software
- ❑ Coordinate the development and definition of HW / SW Infrastructure Tech Insertion Baselines across SWFTS subsystems and platforms (currently used by BYG-1, ARCI, and Imaging)



Results

- ❑ Approximately 12-15 Platform Upgrades / Year
- ❑ Minimized number of configurations requiring support
- ❑ No maintenance actions required at sea (either planned or corrective)
- ❑ Integrated training approach (“train like you fight”)
- ❑ Development effort paces threat environment and technology evolution



PEO IWS is improving interoperability and expanding the battle space with NIFC-CA

Requirement

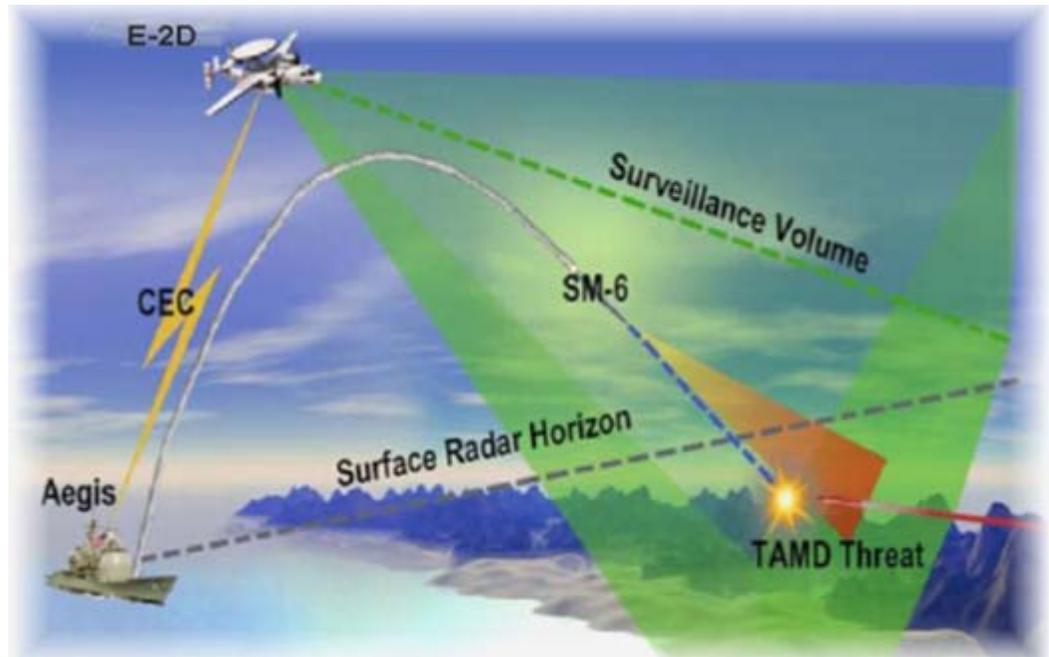
- Develop a **Naval Integrated Fire Control (NIFC-CA)** capability to expand battle space

OA Implementation

- Established peer reviews among multiple vendors
- Developed modular architecture
- Wide use of common-off-the-shelf (COTS) products
- Widely accepted standards

Results

- Integrated capabilities and technologies across multiple platforms from cooperative engagement capability, Aegis, SM-6, and E-2D
- Expanded battle space to maximum kinematic range of SM-6 missile





PEO C4I is improving operator performance

Requirement

- ❑ Increase Bandwidth to Ships at sea

OA Implementation

- ❑ Modular architecture / published interfaces
- ❑ Re-used a DISA certified Army off-the-shelf component



Results

- ❑ Doubled an Aircraft Carrier's SHF capacity to 4 megabytes per second by using an enhanced Bandwidth Efficient Modem (EBEM) with ADNS IIA

Future Plans

- ❑ Re-use EBEM as part of a Rapid Deployment Capability (RDC) Program, Commercial Broadband Satellite Capability (CBSP) – (planned in FY08)
- ❑ Re-use ADNS for the E2-C platform (for airborne networks) and for NCTAMS PAC (shore site) in FY08



Implementing Open Architecture

This section is intended to provide a high-level overview on steps to begin implementing open architecture. It is the responsibility of Program Managers and Resource Sponsors to implement OA across the Naval Enterprise.



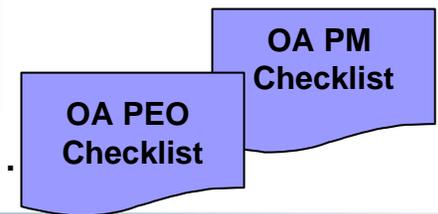
Implementing OA requires several steps

- 1 Understand the principles of Open Architecture
 - Visit the **OA website** to learn about policies & procedures....
 - Enroll in the **OA Learning Module** thru the OA website.....
 - Review the **OA Contract Guidebook**.....

- 2 Assess the openness of your program
 - Run your program thru the **OA Assessment Tool**.....
 - Conduct a **data rights assessment**.....
 - Review the **OA Checklists**.....



<https://acc.dau.mil/oa>





Implementing OA requires several steps (continued)

- 3 Determine business and technical alternatives for implementing OA
 - Review contract options to increase competition or incorporate OA language
 - Review technical options to open up the system or re-use existing assets
 - Explore options to re-use software from other programs

- 4 Coordinate OA strategic alternatives with your PEO and Sponsor
 - Present business and technical alternatives to MDA and resource sponsor
 - Align program goals with domain or enterprise OA strategy
 - Work with resource sponsor to adjust funding requests in POM cycle



Implementing OA requires several steps (continued)

- 5 Implement OA Practices
 - Insert OA language into contracts
 - Disclose design artifacts to other programs and third parties
 - Implement a peer review process
 - Implement a rapid capability insertion process
 - Involve the Fleet
 - Design modular architectures
 - Isolate proprietary components
 - Use widely accepted/supported standards
 - Use commodity commercial off-the-shelf (COTS) products
 - Publish interfaces
 - Contribute program artifacts to your domain's asset repository



Implementing OA requires several steps (continued)

6 Get Involved

- Work with your OA Action Officer and Representative
- Join a cross-domain community of interest.....
- Attend OA Industry Days.....



7

Document your results as an OA Success Story

Success Story	Key Takeaways
1. [Illegible]	[Illegible]
2. [Illegible]	[Illegible]
3. [Illegible]	[Illegible]
4. [Illegible]	[Illegible]



*“We are on a collective mission to sustain and recapitalize the fleet. **The acquisition strategies that we execute today will determine the quality and breadth of the Navy’s warfighting capabilities well into the 21st Century.** ... We must get our acquisition strategies right. Failure to do so will impair our ability to meet the needs of the warfighter and the expectations of the taxpayer.”*

—VADM Paul E. Sullivan, 15 Apr 08

