



Naval Open Architecture

Annual Science and Technology Conference



April 18, 2007

*Distribution Statement A: Approved for public release;
distribution is unlimited.*

*Captain James Shannon, USN
Program Manager, Future Combat Systems
Open Architecture
PEO IWS 7.0*



Captain Jim Shannon

Program Manager, Future Combat Systems

The Navy currently is transitioning to a state of “continuous readiness.” Instead of cyclical preparations before deployments, the Global War on Terrorism requires constant operational capability. “Whether it’s a warfight or a natural disaster—and they seem to be coming more frequently—we must be much more ready for responding to this very uncertain world than the regimented fashion in the past.”

~ Remarks by Adm. Mullen, December 2006



Global trends will continue to impact how we build systems today and in the future

DEFENSE LANDSCAPE

- **Net-centric warfare** requires greater information superiority
- A **1,000-ship Navy** requires a global maritime network of sharing
- The **Global War on Terror** and new emerging threats will shift priorities in the Defense budget

TECHNOLOGY LANDSCAPE

- **Open standards and systems** will surpass closed proprietary systems
- **Service Oriented Architectures** will create new business models that increase competitive pressures on companies
- Exponential rates of advancement in **digital technologies** is facilitating “faster, better, cheaper” production of the global digital infrastructure

BUSINESS LANDSCAPE

- **Intensified competition**, customer expectations, and unexpected market shifts are forcing industry changes
- Traditional approaches to **R&D** will not be sufficient when it comes to fostering and sustaining innovation
- Global connectivity is making new skills and partners accessible to employ which is creating new forms of collaboration and **business models**



As new operational requirements emerge, we are shifting our acquisition model...

PAST – MILSPEC MODEL

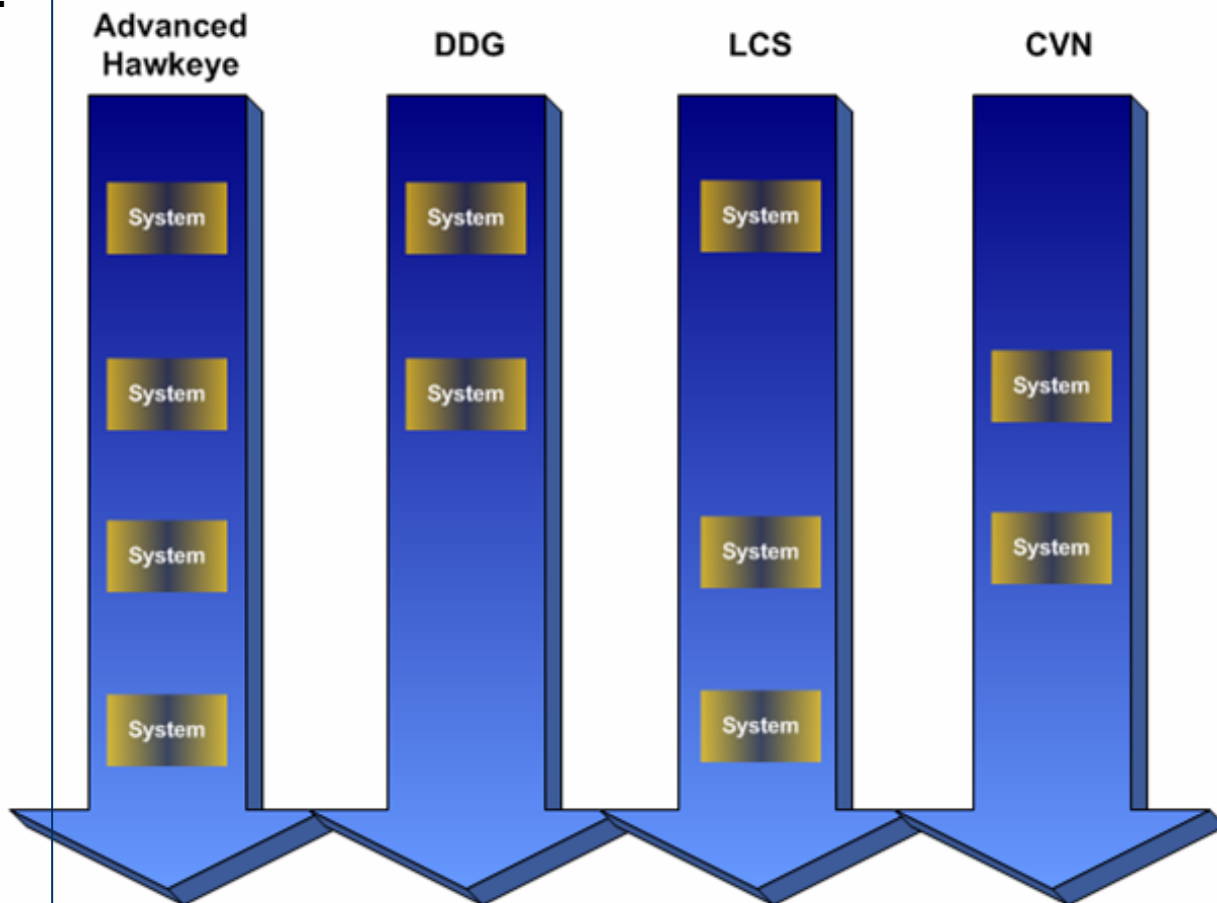
Business Model Attributes:

- Platform Focused
- Owner controls evolution
- Cost emphasis
- Develop software
- Make custom hardware

System Model Attributes:

- Requirements driven
- Specification focus
- Rigid requirements
- Unique / monolithic architectures
- Stable design
- Ignore evolution
- Obsolescence
- Waterfall-style development

Platform-focused model





...to a model that better aligns to capabilities across multiple platforms, families of systems, and system of systems

PRESENT – OA MODEL

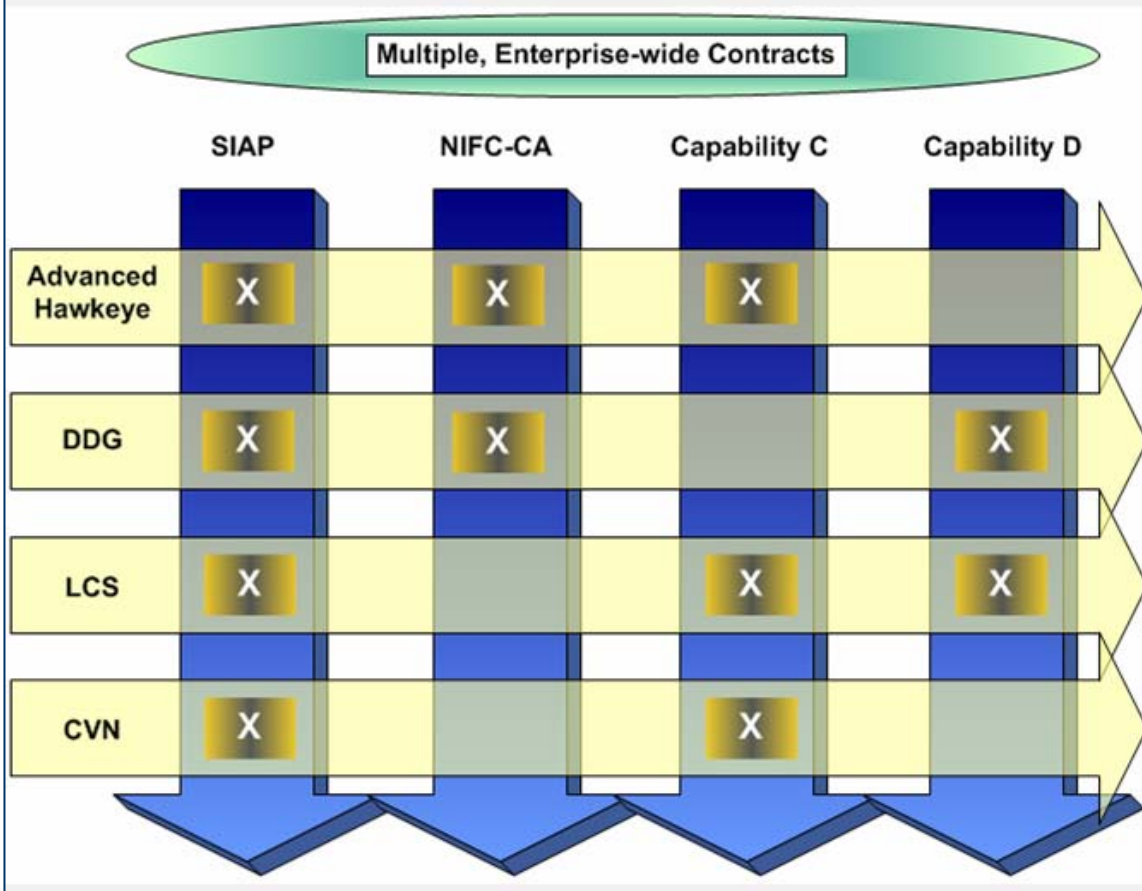
Business Model Attributes:

- Capability / Systems Focused
- Market controls evolution
- Total Ownership Cost emphasis
- License or Reuse software
- Leverage COTS or Reuse

System Model Attributes:

- Market driven
- Business plan focus
- Flexible requirements
- Modular open architectures
- Constant changes
- Design for tech refresh
- Early-managed obsolescence
- Spiral development

Capability / System–Based vice Platform–Based





Our goal is to build and sustain a fleet capable of meeting new and emerging threats while leveraging technology advances

TYPE / CLASS	REQUIRED
Aircraft Carriers	11
Surface Combatants	88
Littoral Combat Ships	55
Attack Submarines	48
Cruise Missile Submarines	4
Ballistic Missile Submarines	14
Expeditionary Warfare Ships	31
Combat Logistics Force	30
Maritime Prepositioning Force	12
Support Vessels	20
TOTAL NAVAL FORCE	313





This requires modernizing existing ships to get full service lives...

- It is critical to get full service life from existing ships
 - CG and DDG Modernization
 - LSD 41/49 Mid-Life Program
 - LHA Mid Life

- Avoiding early-retirement requires commitment to keeping these ships relevant



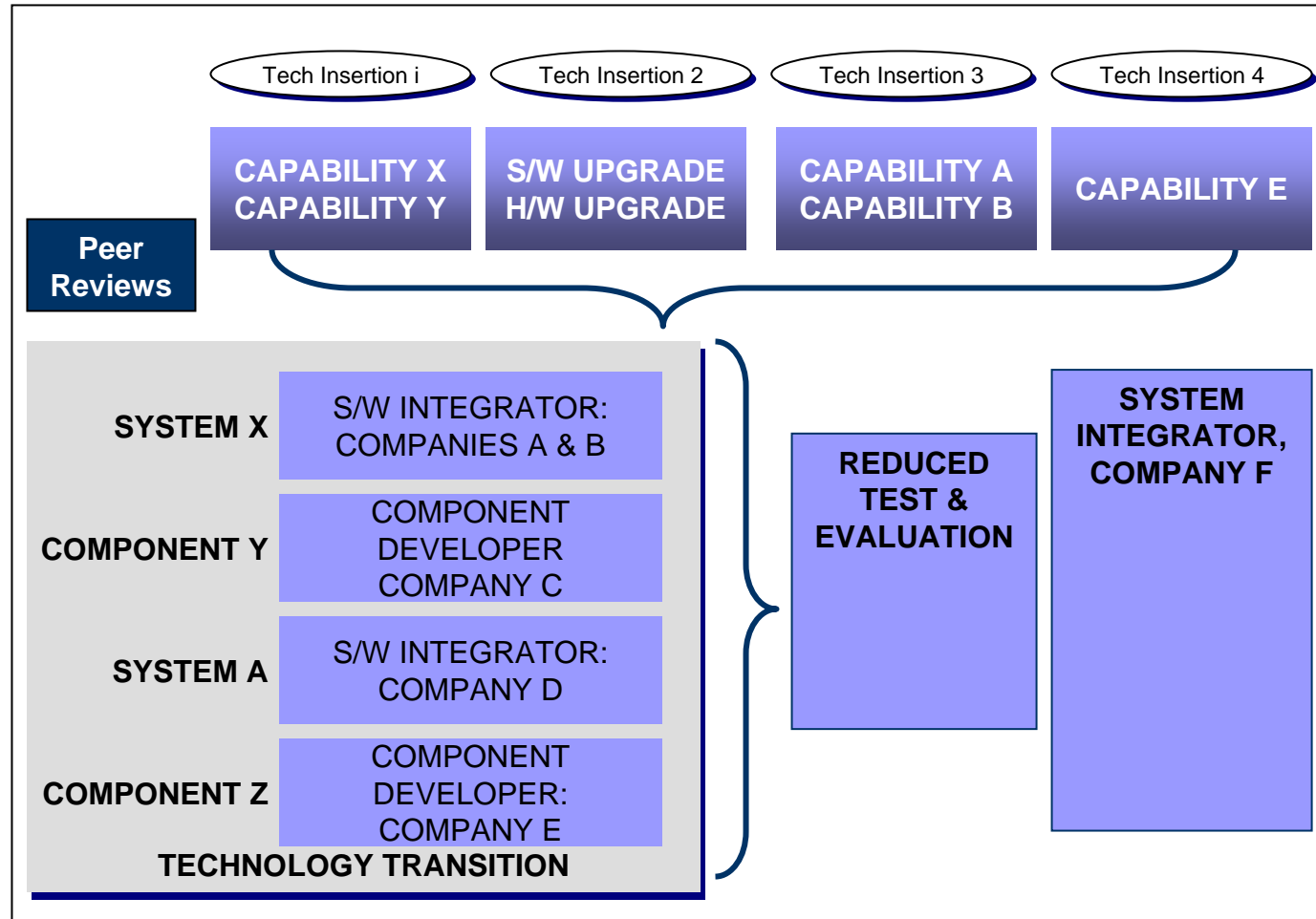
Getting full service lives from existing ships is a critical component of the 313 Ship Plan



...and enabling the rapid insertion of capabilities from multiple systems and system components at reduced costs

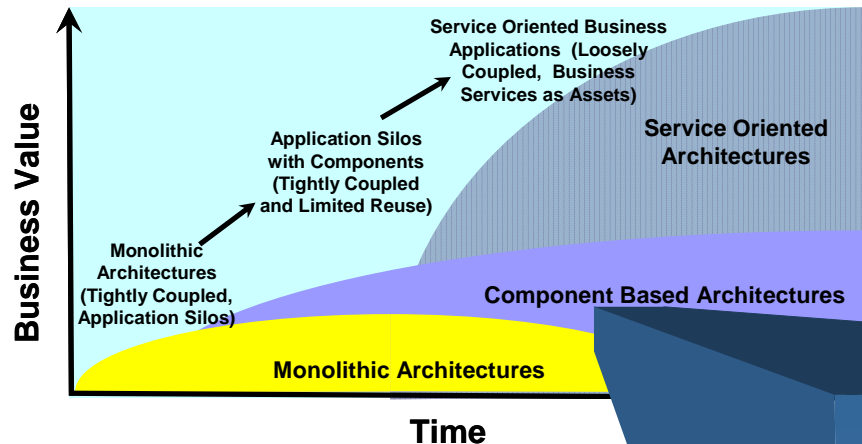
Our process must:

- Identify affordable solutions
- Be open and collaborative
- Enable rapid insertions of new technologies
- Include peer reviews to select best of breed solutions when necessary
- Support component reuse across multiple platforms
- Adhere to DOD regulations



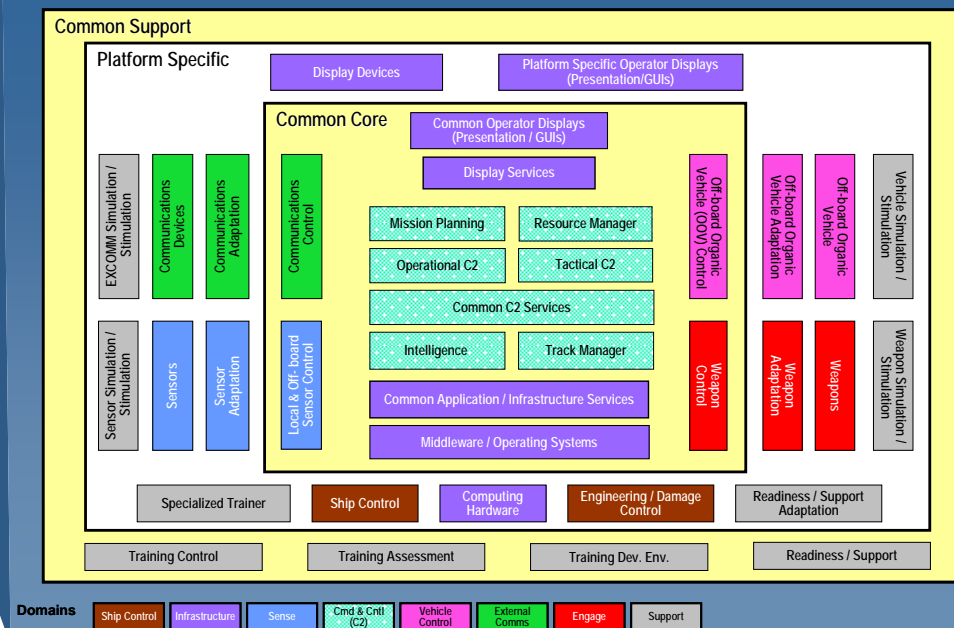


Modular component architectures will be essential to this new model and will impact how we acquire weapon systems



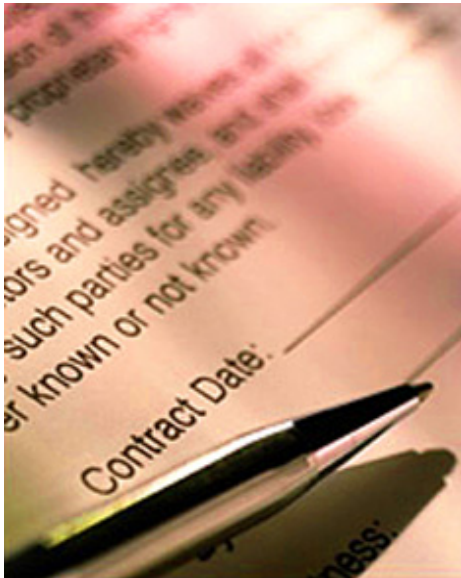
Preliminary Surface Combat Component Architecture

Defining a standard common component architecture is critical for surface ship combat systems in order to identify the major components of surface ship warfighting systems, decompose them, and provide a stable framework into which S&T activities can transition





The key to this new model is changing contracts...



“Our contracts need to be written where we have the ability to have the integrator that is designing the architecture in an open way so we can do competition for various pieces. So [that it is] easier to update with new functionality later on.”

- ASN (RDA), Defense Daily , 10 October 2006

We must negotiate to:

- Employ modular architectures
- Allow for components to be decoupled and reused
- Secure appropriate data rights
- Allow for sharing of design artifacts
- Increase the use of peer reviews
- Facilitate tech insertions

“The goal now is to write open architecture requirements into contracts and provide companies incentives to meet the goals.”

- ASN (RDA), Defense News , 01 November 2006



...obtaining and enforcing Intellectual Property Rights...

ISSUES WITH INTELLECTUAL PROPERTY RIGHTS

- Programs do not anticipate long-term or enterprise-wide implications when developing their acquisition strategies that address Intellectual Property Rights (IPR)
- Funding is not aligned to build and maintain “families of components” and acquire the appropriate IPR, hindering reuse
- The full impact of IPR often does not manifest itself until programs attempt to upgrade systems, at which point they learn how IPR restricts upgrade options
- The lack of a clearly defined IPR strategy before contract award complicates system certification. Procurement documents must clearly specify how the Navy will get access to source code and related information and that these materials must reside with the government for an unlimited amount of time to allow for system certification and other purposes.

We strive for Government Purpose Rights (GPR) in contracts to facilitate movement towards common solutions and reuse among systems ...



... However, we will accept more restrictive rights when the business case warrants and allow proprietary solutions to ride on the Navy-owned architecture.



...and reducing Testing & Evaluation costs and schedule— beta testing is one method under review



- Beta Testing, or elements thereof, can provide benefits
 - Information Advantage: greater range of data; useful data earlier in development
 - Time Advantage: Shortened schedule or more efficient use of available time
 - Cost Advantage: Contribute to reduced testing costs

- Beta-like activities have been used primarily to contribute to broader testing programs that usually include formal TECHEVAL and OPEVAL

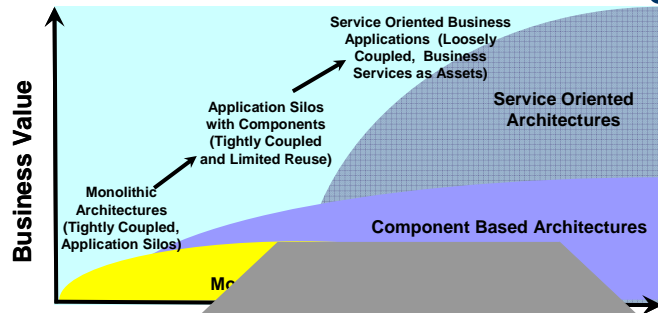
- Beta-like activities tend to be most appropriate for :
 - Smaller programs: i.e. ACAT III, ACAT IV, and non-ACAT programs
 - Information-technology items
 - Items that are largely COTS or GOTS
 - Upgrades, spiral developments, or incremental developments

- Beta Testing is not appropriate for full range of Navy Testing
 - It is not suitable for wartime systems, safety systems, emergency equipment
 - It cannot substitute formal DT/OT data in satisfying formal testing needs but can supplement that data and reduce requirements for collection of formal testing data

Source: Center for Naval Analyses, "Minimally Supervised User Testing: The Potential for Exploiting Beta Test Practices Within Integrated Testing"

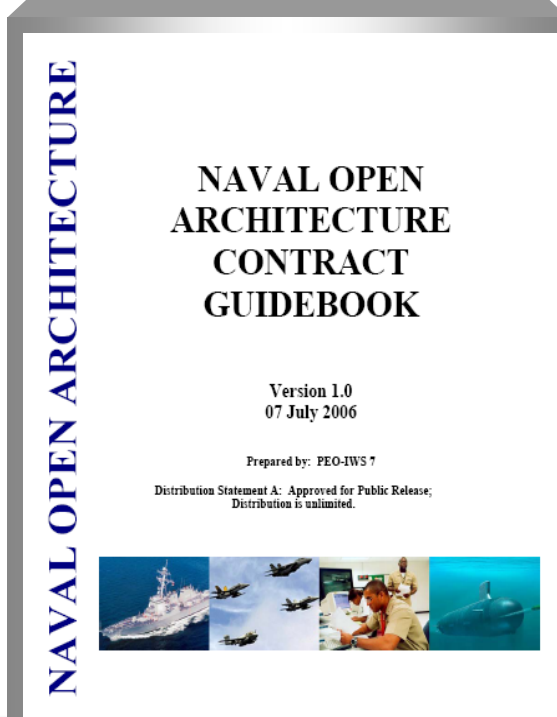


In July 2006, PEO IWS released the Naval OA Contract Guidebook for Program Managers to support this model



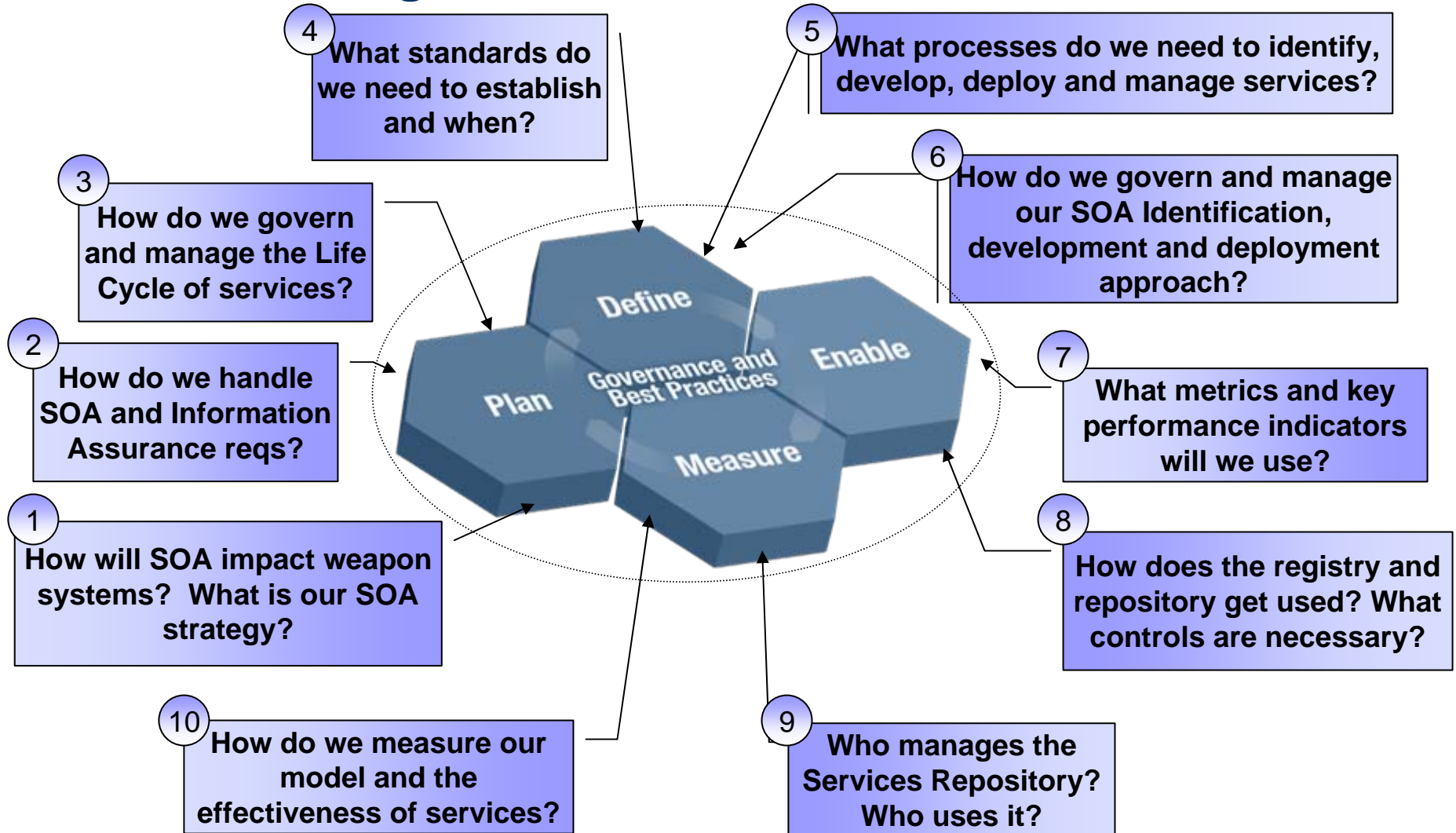
The Guidebook is primarily for development contracts for component based architectures and includes:

- Recommended language for Sections C, L, and M
- Recommended award fee criteria for “Performance and Schedule” and “Work Relations”
- Appendices:
 - Recommended Naval OA Contract Data Requirement List (CDRL) and deliverable items
 - Recommendations for assessing a program’s intellectual property rights needs
 - Recommendations for using Small Business Innovation Research contracts to support Naval OA goals
 - Naval OA “Quick Checklists” to help drafters and reviewers



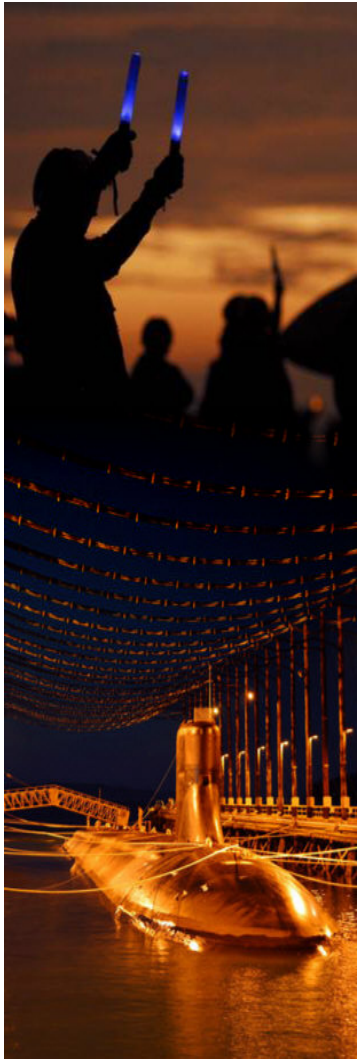


Beyond OA, there are new approaches to building systems that we must begin to better understand - SOA





We do not know what the future holds but we do know that insight which will prevail over many years is a challenge



Although many leaders have been successful, some of their predictions have been proven wrong!

“I think there is a world market for maybe five computers.”

Thomas Watson, chairman of IBM, 1943

Even if a submarine should work by a miracle, it will never be used. No country in this world would ever use such a vicious and petty form of warfare!” - William Henderson, British admiral(1914)

“Computers in the future may weigh no more than 1.5 tons. ”

Popular Mechanics, 1949

Another popular fallacy is to suppose that flying machines could be used to drop dynamite on an enemy in time of war. -

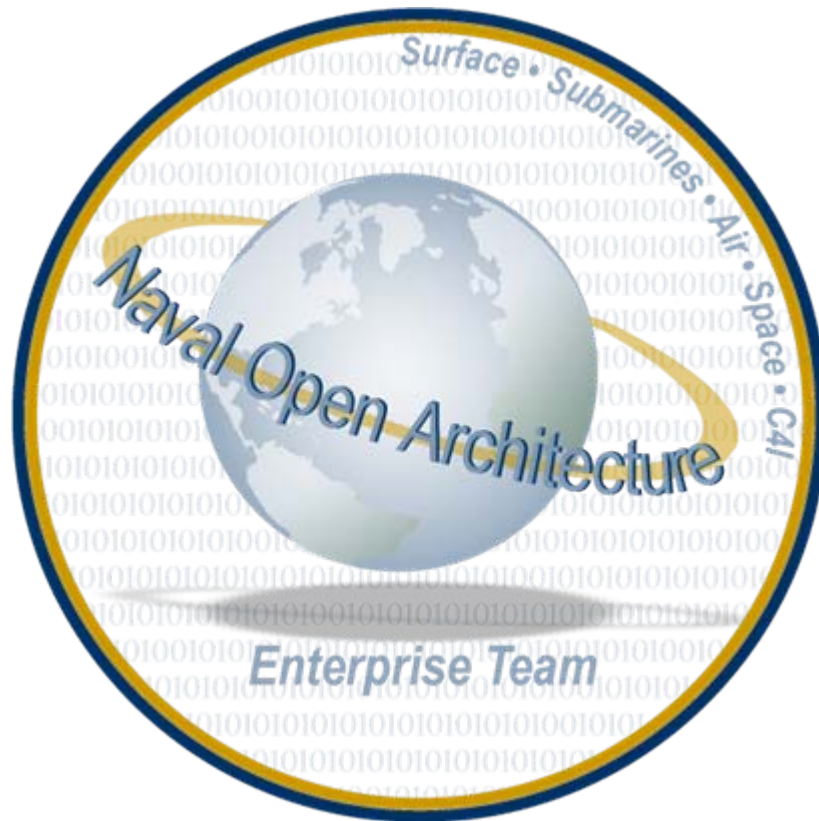
William H. Pickering, 'Aeronautics,' 1908

“640K ought to be enough for anybody. ” Bill Gates, 1981



If we are to keep pace with new fleet requirements and global trends we must be able to quickly adapt our acquisition models

- In summary, we must:
 - Align our model to support capabilities across multiple platforms, families of systems, and system of systems
 - Change our contracts to enable the capability to quickly upgrade systems and leverage technology advances at reduced costs
 - Obtain and enforce intellectual property rights
 - Change our culture and align our industry partners
 - Explore avenues to reduce T&E cost and schedule
 - Gain a better understanding of future system development approaches that will impact how we build and sustain systems today





The guidebook includes recommended language to help the Navy advance towards open modular systems

Key Requirements for Contractors

- Define and follow an open systems approach
- Develop an open layered, modular architecture
- Describe rationale for modular choices
- Ensure system requirements are accounted for
- Document and model the component
- Minimize inter-component dependencies
- Support rapid, affordable technology insertions
- Use Commercial-Off-the-Shelf (COTS) products
- Employ open, published standards
- Define interfaces between modules, components, and subcomponents
- Limit use of proprietary or vendor-unique elements
- Negotiating appropriate intellectual property rights and patent rights
- Reusing pre-existing or common components
- Supporting third-party development to foster collaboration and competition
- Promote the identification of multiple sources of supply and promote flexible business strategies



Changes in legislation will also impact our acquisitions



OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

JAN 18 2007

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
ATTENTION: SERVICE ACQUISITION EXECUTIVES
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: Limitations On Contractors Acting as Lead System Integrators

This memorandum implements section 807 of the John Warner National Defense Authorization Act for Fiscal Year 2007, Public Law 109-364. Effective for contracts entered into after December 31, 2006, no entity performing lead system integrator functions in the acquisition of a major system by the Department of Defense may have any direct financial interest in the development or construction of an individual system or element of a system of systems. This applies to lead system integrators as defined in section 805 of the National Defense Authorization Act for Fiscal Year 2006:

"Lead system integrator with system responsibility" means a prime contractor for the development or production of a major system if the prime contractor is not expected at the time of award to perform a substantial portion of the work on the system and the major subsystems.

"Lead system integrator without system responsibility" means a contractor under a contract for the procurement of services whose primary purpose is to perform acquisition functions closely associated with inherently governmental functions with regard to the development or production of a major system.

When the acquisition strategy calls for use of a lead system integrator for a major system, contracting officers shall address whether the contractor has a direct financial interest in the development or construction of an individual system or element of a system of systems when making the responsibility determination. The offeror may be considered eligible for award of a contract if it has no direct financial interest in development or construction of an individual system or element of a system of systems. If the offeror has such a direct financial interest, the contracting officer may request an exception from the Secretary of Defense. The request will be submitted to the Deputy Director, Program Acquisition and International Contracting, and it must explain that:

1. The offeror was selected to develop or construct the system or element concerned through the use of competitive procedures and that appropriate steps were taken to prevent any organizational conflict of interest; or

Limitations on Contractors Acting as Lead System Integrators

- No entity performing lead system integrator functions in the acquisition of a major system by the Department of Defense may have any direct financial interest in the development or construction of an individual system or element of a system of systems effective for contracts entered into after December 31, 2006
- "Lead system integrator with system responsibility" = a prime contractor for the development or production of a major system if the prime contractor is not expected at the time of award to perform a substantial portion of the work on the system and the major subsystems.
- "Lead system integrator without system responsibility" = a contractor under a contract for the procurement of services whose primary purpose is to perform acquisition functions closely associated with inherently governmental functions with regard to the development or production of a major system