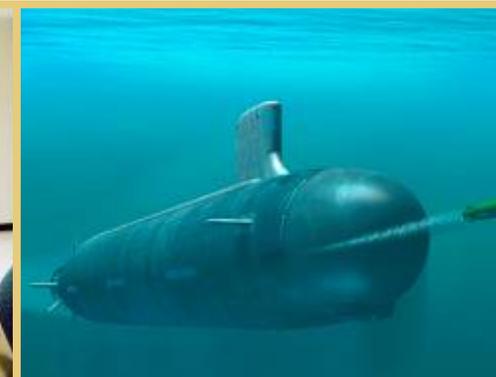




Naval Open Architecture



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PEO IWS 7.0 DEP**



Imagine a military where our systems were **modular...**



...and **affordable** to upgrade



**Could we accommodate
changing technology
and requirements?**



**Could we provide
interoperable capabilities
to our warfighters?**



Could we build a better force for tomorrow?



Imagine an environment where our **contracts** were flexible...



Could we **increase competition** to foster innovation?

Could we **share components** across our services?

...and secured the appropriate **data rights**



How will we get there?

NAVAL OPEN ARCHITECTURE

A multi-faceted **strategy** providing a framework for developing joint interoperable systems that adapt and exploit open-system design principles and architectures

OPNAV NAVAL 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

Open Architecture is our path forward!



Naval Open Architecture is defined through the 5 principles cited by OPNAV and by a descriptive model and tool

0 – Isolated

- Exclusive use of closed sole source contracts
- Proprietary interface, no access to systems

1 – Connected

- Initial OA language in contracting and acq docs
- Program (gov't/industry) educated on FORCENet/OA
- Initial use of commercial standards and best practices
- Program has achieved "Marginal" level for MOSA business indicators

2 – Migrating to Openness

- Program has validated NR-KPP
- Transitioning to JCIDS capability needs documents
- Contracting approach maximizes cost competitiveness and innovation
- Use of commercial standards based COTS products
- Some market research employed to leverage commercial investment
- Completed FIBL Survey and verified information
- Program has achieved "Satisfactory" level for MOSA business indicators

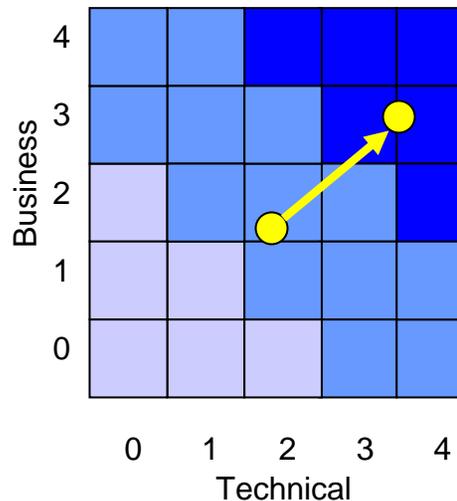
3 – Common

- Spiral development/evolutionary acquisition employed to facilitate rapid technology insertion
- Applicable program acquisition and engineering documentation (AS, SEP, ISP, etc) includes OA language
- Integrated team approach to development involving requirements, resource, testing, user community members
- "Community of Interest" teams employed to develop system
- Program has robust FORCENet/OA implementation roadmap

4 – Open and Net-Centric

- OA compliance metrics part of PM processes and program reviews
- Extensive use of commercial standards and best practices across Enterprise
- Program conducts continuous market research
- Continuous process for FORCENet/OA improvement
- Program has achieved "Exemplary" level for MOSA business indicators

Version 0.1 (8 March 2005)



Business and Acquisition Strategy Characteristics refer to the processes & documentation programs employ to acquire and manage systems;

Architecture and Technical characteristics are the technical features of computing environments and application software

Openness Characterization

- Low
- Moderate
- High

0 – Closed

- Proprietary Hardware or API (O/S or middleware)
- Predominant number of point to point legacy interfaces
- Highly integrated applications with integral middleware

1 – Layered

- Standards-based COTs Hardware & O/S
- Specialized middleware
- Highly integrated monolithic applications isolated from Computing environment
- Standard communications between layers
- Program has achieved "Marginal" level for MOSA technical indicators

2 – Layered & Open

- Computing Environment / App. S/W independence
- Open published APIs
- Modular application components
- Facilitates technology insertion/replacement
- Standard communications between layers
- Exposes data to network via I/Fs to legacy system/subsystems
- Separates operator, application, and data
- Program has achieved "Satisfactory" level for MOSA technical indicators

3 – Common

- Discovers/publishes capability using standards (where applicable)
- Adheres to a common architecture across multiple programs
- Uses common services (such as security)
- Common semantics and data model
- Ability to Interact with GIG/FORCENet

4 – Enterprise

- Adheres to a common architecture across multiple domains
- Data exchange between domains via std interface
- Commercially accepted services or data model
- Uses core services (e.g., NCES, DIB)
- Exposes services and data to GIG/FORCENet
- Program has achieved "Exemplary" level for MOSA technical indicators



How will we change?



Naval OA Vision

We must transform our organization and culture and align our resources to adopt and institutionalize open architecture principles and processes throughout the Naval community in order to deliver more warfighting capabilities to counter current and future threats

Align

- Align Requirements and Acquisition Communities
- Align Domains across the Enterprise **and with Joint Services**
- Align Industry and Academia Partners

...to OA Vision

Share

- Share products and assets across the enterprise
- Share knowledge and ideas through communities of interest
- Provide easy access to products through government data rights

Collaborate

- Reduce risk thru end-to-end collaborative experimentation
- Harmonize standards and guidance
- Reduce T&E expenses through common modular designs and standard interfaces



How will OA benefit the services?

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 through improved delivery of cutting edge technologies and increased bandwidth capabilities

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

Reduction in Risk

- Leverage proven reusable components
- Test early and often in the developmental cycle to minimize risk of delivering non-interoperable products

Cost Avoidance

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



What will leadership require from us?

Commitment & Dedication

- Commitment from all services to implement OA
- Dedication to the long-term objective to achieve jointness

Innovation & Change

- Innovate the way we do business and change our cultures to adopt and institutionalize OA
- Break down barriers to build affordable systems

Coordination & Integration

- Coordinate OA activities across all services
- Work across boundaries to identify common solutions
- Share ideas and knowledge through communities

Execution

- Acquire systems using open business models
- Build interoperable technical solutions using widely adopted standards

Results

- Accelerate the introduction of new technologies
- Reduce lifecycle costs to maintain systems
- Manage risks to system development



What will we require from Industry?

Innovation

- New products and services
- Changes in business models and cultures to meet the Services' needs

Collaboration

- Work with all Services and third parties
- Share access to products and data
- Share ideas through community of interests

Componentization

- Define component and system interfaces
- Identify and evaluate existing components that can be reused

Justification

- Justify the use of proprietary, vendor-unique or closed components or interfaces
- Justify the need for restrictive data rights

Education

- Train business and technical employees on OA
- Provide feedback on lessons learned, success stories, and best practices



Current Activity in OA

- **ADM Mike Mullen, CNO** - "...**my vision** for OA is not limited to systems built to a set of open standards, but rather **is focused on open business models** for the acquisition and spiral development of new systems that enable multiple developers to collectively and competitively participate in cost-effective and innovative capability delivery to the Naval Enterprise." *Memo for ASN(RD&A) of 28 Aug 2006*

- **GAO** -
 - "Current DOD acquisition policies do not specifically address long-term technical data rights for weapon system sustainment."
 - "Unless DOD assesses and **secures its rights for the use of technical data early in the weapon system acquisition process when it has the greatest leverage to negotiate**, DOD may face later challenges in sustaining weapon systems over their life cycle."
 - "[F]ailure to negotiate adequate technical data rights may impede the **government's ability to sustain the weapon system**. For example, DOD would need technical data rights to develop new sources of supply, to re-compete follow-on procurements of equipment, or to develop depot-level maintenance capabilities."

U.S. GAO Report GAO-06-389, "WEAPONS ACQUISITION: DOD Should Strengthen Policies for Assessing Technical Data Needs to Support Weapons Systems" July 14, 2006



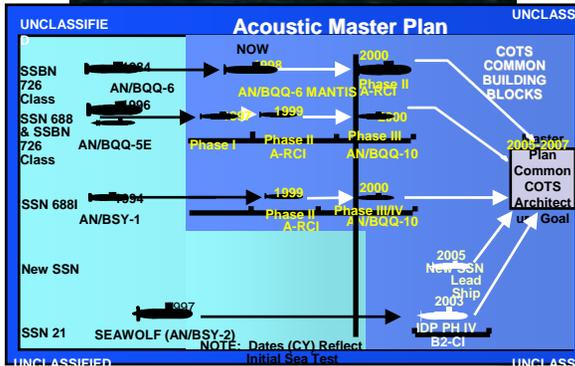
Some examples of successful implementation of OA principles

- A submarine acoustic program
- An aviation program that successfully transitioned from a Mil-Spec computing environment to a COTS based environment



Example of a successful OA implementation - the Acoustic Rapid COTS Insertion (A-RCI) program

SSN-21 Submarine



Virginia Class Submarine

Issue: In the mid-1990s, the Navy discovered that the U.S. submarine fleet's acoustic advantage over new Russian submarines was eroding. This was particularly alarming because it occurred at a time when resources available for upgrading the fleet in the traditional manner were diminishing. A creative solution had to be found in order to address the situation – one that did not require an inordinate amount of time and money but that could still achieve the desired result.

Solution: Through new acquisition and management processes, the Submarine Acoustic-Rapid Commercial-Off-the-Shelf Insertion program, enabled the Navy to rapidly insert new technologies. The result was a **seven-fold increase in submarine towed array sensor performance** (towed array sensors are submarine listening devices towed from surface ships), and a **60-fold decrease in real processing costs**.

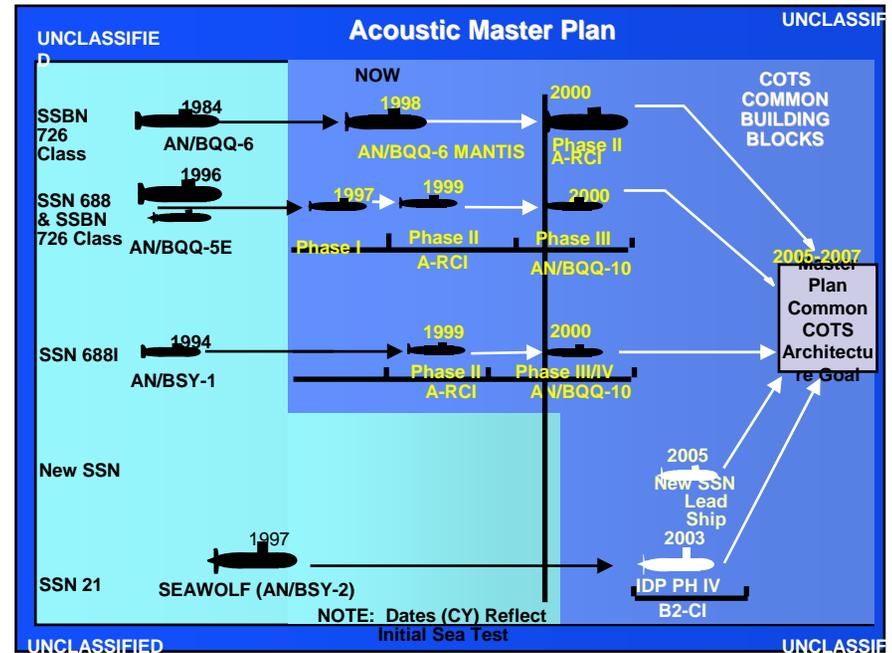
Key Outputs

- Increased capabilities
- Reduction in processing costs
- Exploitation of new technologies
- Use of SBIRs
- Increased vendor competition
- Increased interoperability
- Tech refresh cycles every 2 years



Objectives of A-RCI

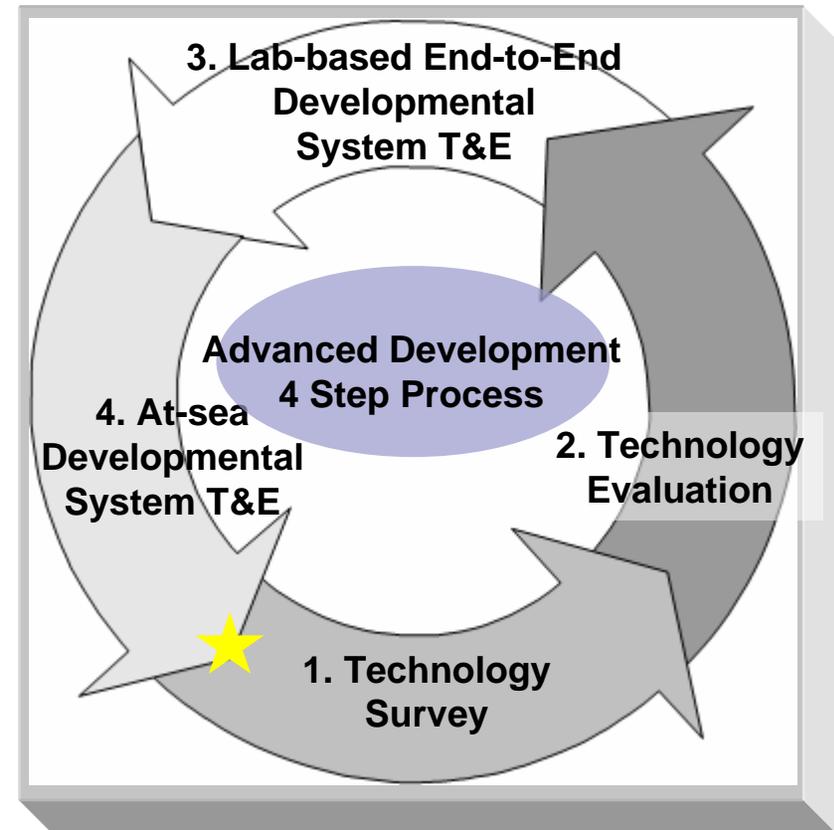
- Achieve dB Gain Faster
- Deliver additional acoustic improvements
- Make improvements applicable to all SSN 688, 688I, and SSBN 726 Class Submarines
- Implement COTS Based Open System
 - Increased Processing Capacity
 - Growth Potential
 - Reduced Cycle Time for Future Upgrades
 - Better return on Development Dollars
 - Space/Weight Reduction





A-RCI Application of Principles – Modular Design and Design Disclosure

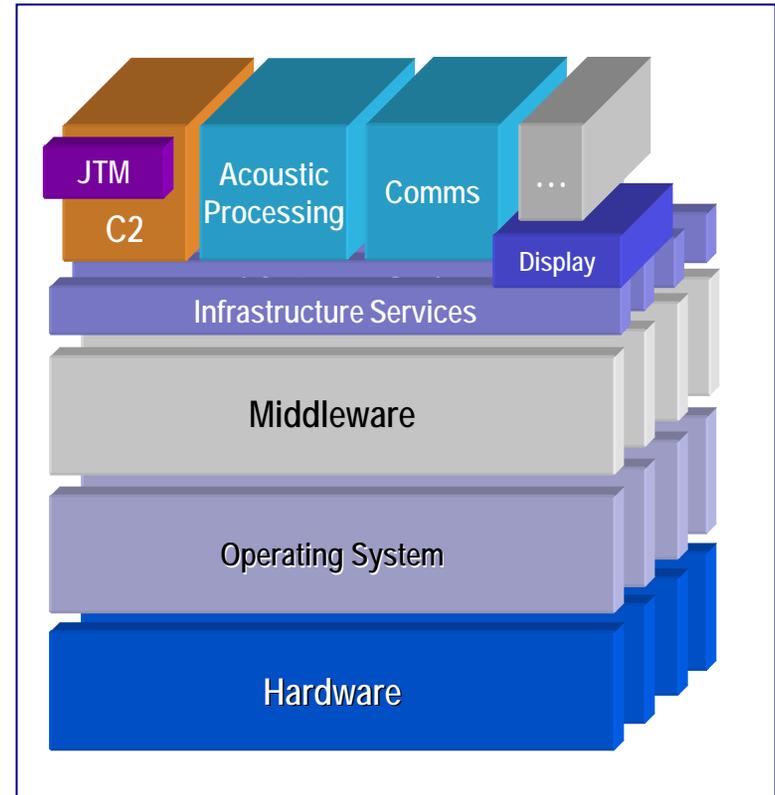
- **A new business model** that leveraged continuous competition reduce cost and foster innovation
- **A peer review process** to broaden participation and provide the “best of the best” applications to the fleet user
- **An accelerated cycle time** that ensured that the fleet units deployed with the latest technology and operational capability for each deployment





A-RCI Application of Principles – Reusable Application Software

- By implementing a **modular architecture**, the A-RCI program segregated applications from the underlying computing environment.
- This allowed the program not only to **compete and develop software applications separately**, but also to make them available for use in programs with similar requirements.
- The surface ship and aviation ASW programs have been able to **reuse these applications** effectively.





A-RCI Application of Principles – Life Cycle Affordability

Implementing an open architecture in the A-RCI program has had a profound effect on life cycle supportability.

- Decoupling the application layer means that **software maintenance can take place without affecting other system components**, reducing cost and shortening cycle time.
- **The modular nature of the system** and implementation of COTS has enabled a **Maintenance Free Operating Period (MFOP)** concept.
- **Distance support** concepts have complemented the MFOP concept to streamline processes and significantly alter the need for sailor training.
- **Use of Integrated Electronic Technical Manuals (IETMs)** and computer based training has streamlined the maintenance training process.
- **Direct vendor delivery of spares** has reduced the Navy's need to stock most parts, reducing the investment necessary to support the Fleet.



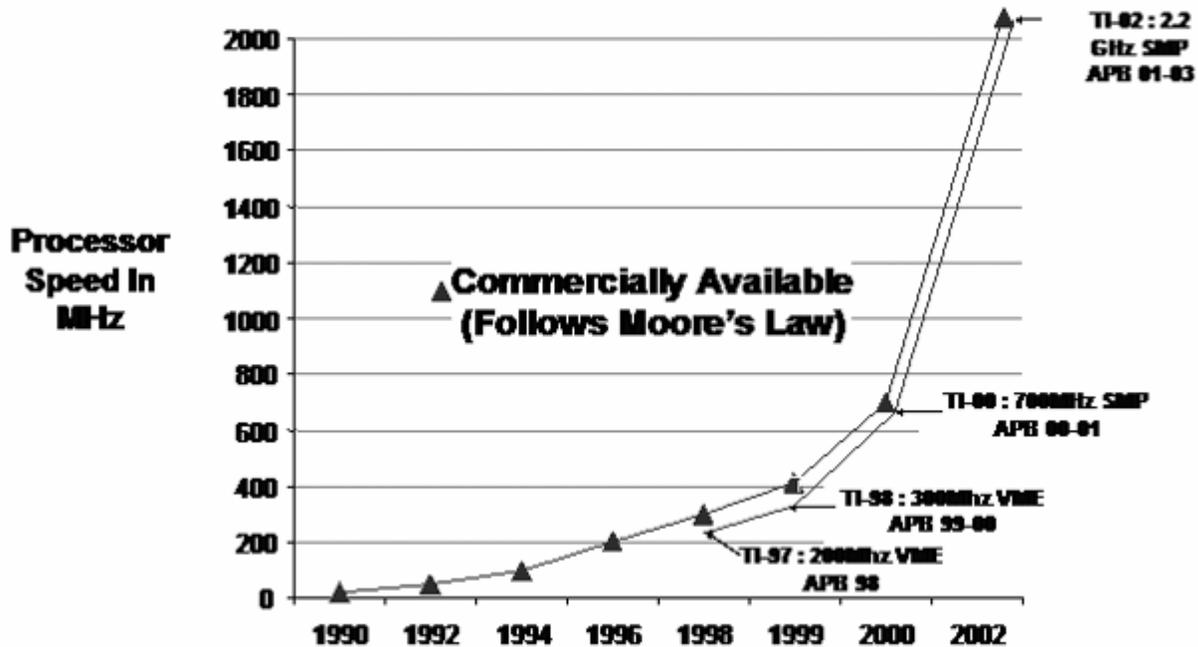
A-RCI Application of Principles – Encouraging Competition and Collaboration

- Fleet participation
- Emphasis on real encounter data
- Distribution of open data sets
- Accessible read/write formats and utilities
- Published metrics
- Open competition, attribution of contributions
- Developer participation in evaluations
- Elevated standards for S&T maturity
- Transition recommendations that include technologies from inside and outside the peer group membership
- The system integrator and application developers are ***incentivized for mutual success*** – all succeed for one to succeed.



A-RCI provided real results in leveraging commercial capability improvement ...

A-RCI Achieves Rapid COTS Insertion Fleet Deliveries Mirror Commercial Availability

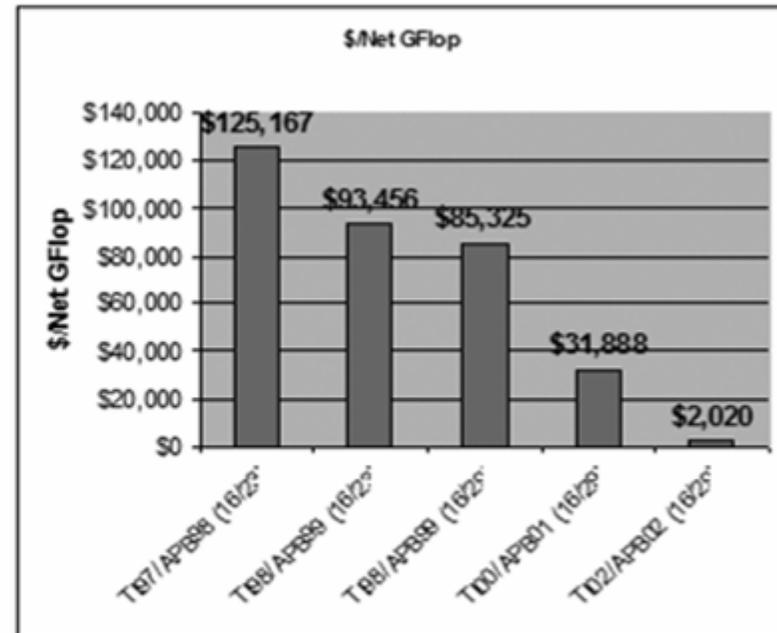
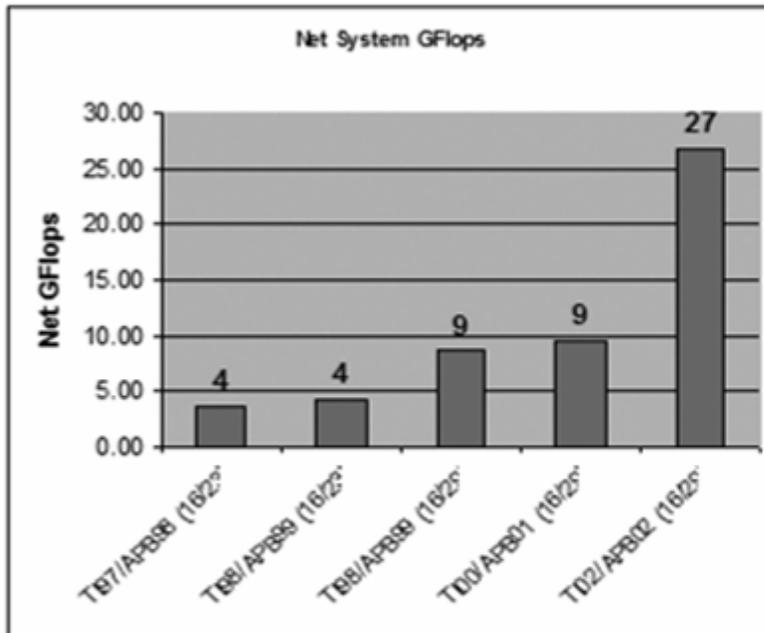


**A-RCI Delivers Latest Commercially Available
Processing Capability to the Fleet as Tech Insertions (TI)**



... and achieving real processor performance at significant cost savings.

A-RCI System Processing Improvement and Cost Savings



7x Increase in Real Processing from TI 97 to TI 02
60x Decrease in Real Processing Cost from TI 97 to TI 02



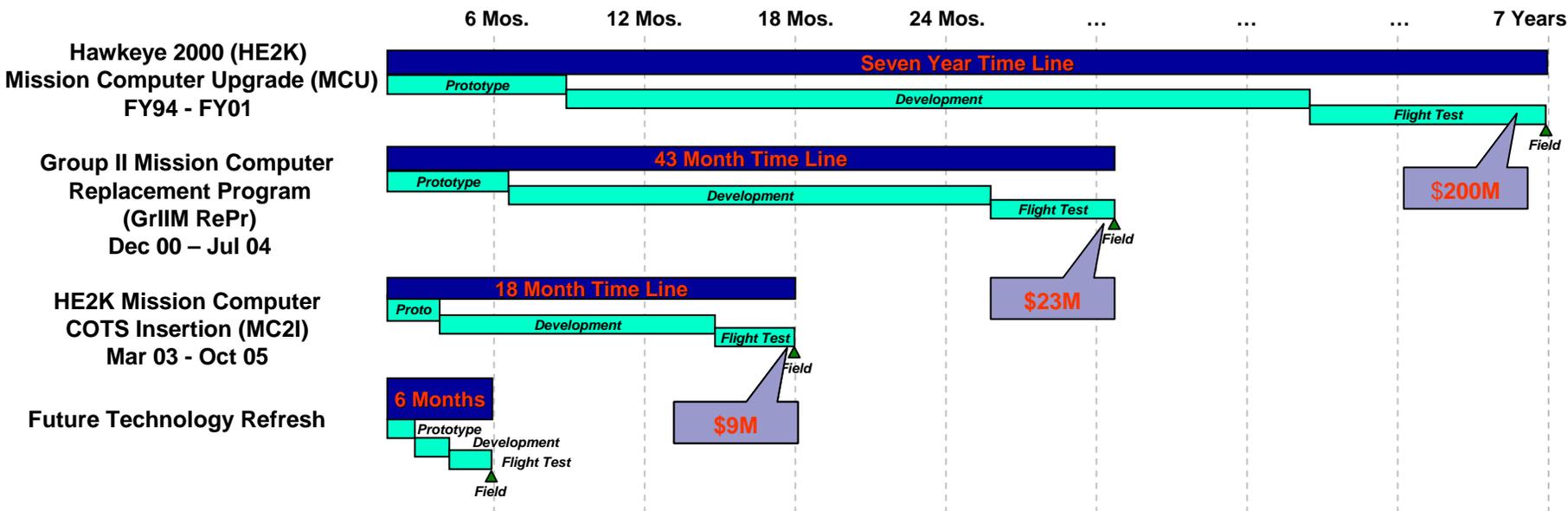
The E2 acquisition approach

- Develop an overarching roadmap that leads to the **convergence of the fielded baselines** into a common build
- Develop a **modular component based software architecture** that supports evolving warfighter needs
- Invest in an open systems infrastructure to enhance **life cycle affordability**



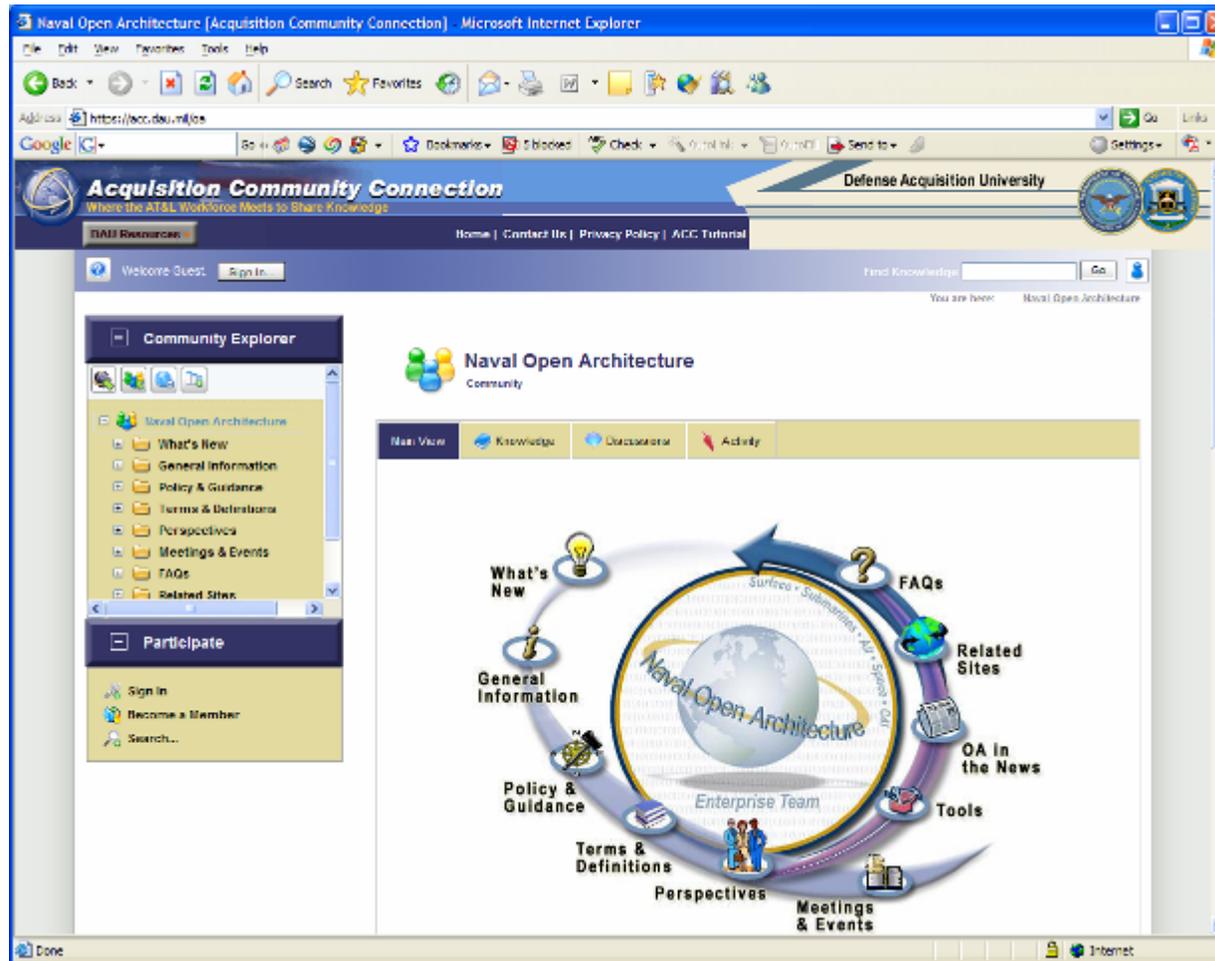
E-2 Business Case for OA

- Reduction in Acquisition Cycle Time
 - **7 years to < 2 years**
- Lower Cost - **\$200M to < \$9M**
 - Integration vs. Development
 - Technology Refresh (Installation vs. Integration)
- Interchangeability between Platforms and Services
- Non-Proprietary Nature Creates an Environment that Allows for Innovation (Endless Possibilities)
- E-2 Real Life Examples:





For more information please visit our Naval Open Architecture Special Interest area on the ACC (<https://acc.dau.mil/oa>)...





For More Information Contact the OA Enterprise Team

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