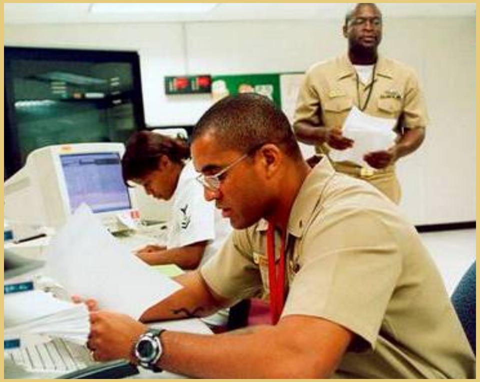
Instigating a Critical Paradigm Shift in the Defense Industry

Why Defense Organizations Must Move Towards Contracting Systems and Capabilities on an Open Architecture Platform



International Defense Logistics Conference

4 June 2008

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Open Architecture is the confluence of business and technical practices yielding modular, interoperable systems that adhere to open standards with published interfaces. This approach significantly increases opportunities for innovation and competition, enables reuse of components, facilitates rapid technology insertion, and reduces maintenance constraints. OA delivers increased warfighting capabilities in a shorter time at reduced cost.

The focus of Open Architecture discussions is often on systems acquisition…

… but OA provides a path to significantly alter the way we sustain systems in the field.

The U.S. Navy is working to requirements that recognize five principles of Open Architecture

1. Modular Design and Design Disclosure
2. Reusable Application Software
3. Interoperable Joint Warfighting Applications and Secure Information Exchange
4. Life Cycle Affordability
5. Encouraging Competition and Collaboration

Numbers 1, 2, and 5 will impact life cycle support planning and enable the achievement of number 4.

Of the ten elements of Integrated Logistics Support (ILS), implementation of an OA approach can significantly affect nine

- Maintenance Planning
- Manpower and Personnel
- Supply Support
- Support and Test Equipment
- Training and Training Support
- Packaging, Handling, Storage and Transportation
- Facilities
- Computer Resources Support
- Technical Data
- Design Interface

Where ILS planning has traditionally been done at the system or platform level, a modular approach means that logistics products must be provided at the modular level to enable effective reuse of components.

- Reusable components must be developed considering not only the strategic reuse of component itself, but also the efficient integration of sustainment into the system or platform
- An analysis of the required data rights to all development products must be conducted to enable effective reuse and achievement of savings
- Common components can leverage common training and sustainment options that can reduce
  - Support infrastructure (e.g., warehousing, tech support, trainers, and schoolhouses)
  - Manpower required at the operational level
  - Overall life cycle cost

Proper application of OA principles during acquisition and life cycle support planning can result in increased operational availability in addition to significantly reduced life cycle cost

- Use of Commercial Off the Shelf (COTS) computing plants provides the opportunity to:
  - Refresh technology and mitigate obsolescence;
  - Leverage commercial sources of support, spares and training for maintainers;
  - Take advantage of Moore's law to continuously increase the power of installed computing resources and;
  - Affordably provide for redundant computing infrastructure to increase operational availability and reduce maintenance burden afloat
- OA practices and modular open systems design provide the ability to rapidly develop and field sustainment applications such as distance support, remote diagnostics, prognostics, and more efficient software upgrade processes

Analyses of actual programs, as well as potential benefits have shown significant cost savings enabled by OA over the life cycle of the systems.

- A comparison of cost for the U.S. Navy's submarine sonar systems in the ten years before and ten years after implementation of an OA approach demonstrated validated cost savings of $4 Billion in total ownership cost.
- A Naval Postgraduate School study of alternative approaches for software upgrade for the AEGIS weapons system demonstrated a potential cost savings of ~$27M per year if processes enabled by an Open Architecture were employed.

These savings can be realized through a process of concurrent engineering during the design process that plans for the system sustainment.

To illustrate how an OA approach can be leveraged to increase operational availability and decrease onboard maintenance, we'll examine one U.S. Navy submarine program

- The Maintenance Free Operating Period (MFOP) was a demonstration project fielded in the Los Angeles Class submarine
- Goals of MFOP were to:
  - Eliminate open cabinet maintenance during the deployment cycle while
  - Assure system availability over the specified operating period

MFOP was implemented in two test submarines

- The size, power and affordability of COTS computing was leveraged to add redundant servers with a fail-over capability to the computing plant
- A distance support (DS) capability with provisions for remote control of the on-board system was put in place
  - This capability enabled provision of technical support and assistance to the crew without the necessity to dispatch a technician to the submarine’s physical location
  - Technical support through DS methods allowed leveraging the technical capability of the development contractor to directly support the Fleet user
- OA principles were the enabling characteristics
  - DS applications were easily added to the system because of its modular design
  - Modularity and isolation of the computing plant from software permitted ready modification of the underlying hardware

After one year, MFOP's results included…

- Operational Availability for the MFOP modules was 100% while the ships were at sea
- Eliminated 100% of open cabinet maintenance for the modules within the MFOP boundary during the MFOP pilot program period which resulted in:
  - Operators more focused on system employment as measured by interviews and no man hours expended on open cabinet maintenance at sea
  - No system Casualty Reports (CASREPS) for modules within the MFOP boundary
  - No Fleet Technical Assistance visits to address issues with elements within the MFOP Boundary
  - Recovery (Software Reconfiguration) procedures replacing trouble shooting and repair procedures for identified system faults which dropped the Mean Time to Recovery/Repair from 20 minutes to 2 minutes (a ratio of 10:1) while the ships were deployed
- Virtually every aspect of the "Logistics Tail" was reduced including, man-hours expended, travel costs, operational down time, and hardware replacement costs.

Leadership support is an essential part of the OA equation

- Requirements and budgets must be aligned to support the strategic reuse concepts
- Program Mangers must be incentivized to pursue reuse rather than specialized development of components
- Contracts must be executed that contain the appropriate deliverables and data rights to enable the government to use the products they pay for across the enterprise
- Collaborative toolsets and reuse repositories must be in place to facilitate:
  - Design disclosure
  - Discovery of assets
  - Mechanisms for delivery of products
  - Fault reporting and coordination of updates to products that are being reused

Questions and Discussion