Open Architecture Ship Interface Standards

NSRP Panel Meeting
New Orleans, LA
December 9, 2009
OASIS Team

[Logos of various organizations related to naval systems and technology]
Participants

- PEO Ships / Subs / Carriers
- PEO C4I
- PEO LMW
- PEO IWS
- NAVSEA 05
- SPAWAR Charleston
- NSWC Carderock & Dahlgren
- NUWC
- NGSB Gulf Coast and Newport News
- General Dynamics (Bath Iron Works & EB)
- VT Halter
- Bollinger
Task Statement Overview

- Establish and provide support for an OASIS IPT
- Develop a Roadmap and Implementation Plan for achieving cross-platform C4I interface standards (Hardware focused)
- Conduct site visits to gather best practices from within and outside the shipbuilding industry
OASIS Purpose & Goals

• Currently, a significant portion of the cost of a C4I upgrade goes to HM&E modification
  – High change areas are Foundations, Electrical & HVAC
• The OASIS Team is working to create a process that mitigates the cost/schedule risk of C4I equipment installations and modernizations
• Goals:
  – Reduce cost of mission system ship modernization (ship changes, not new equipment)
  – Identify boundaries and interfaces between ship and mission systems
  – Enable more rapid technology refresh and insertion (including commercial equipment) to provide latest capabilities to the warfighter
What We’ve Done So Far

• Brainstormed at length on the problem (it’s larger than you think)
  – Shipbuilder perspective
  – Government perspective

• Researched current efforts and processes in physical modularity and standard interfaces

• Conducted site visits to view best practices

• Developed an iterative methodology that addresses the OASIS purpose and goals

• Held two meetings with System Integrators/Equipment Suppliers (via AFCEA) to receive their feedback
OASIS Methodology

Gather historical data
- DDG 51, CG 52 ShipAlts initially

Select Compartment
- Based on most/highest change space
- DDG 51’s CIC initially

Map data to SWBS
- Determine ShipAlt root cause and associated disruption SWBS areas

Select SWBS to analyze
- Based on most/highest root cause/disruption SWBS areas

Impacts
- Apply proposed processes, estimate return on investment
- TOC
- Ship impacts

Propose Solutions
- OASIS Process

Analyze SWBS data
- What were the root causes?
- Why did change occur?
- Impact of changes?
ShipAlt Analysis

• Looked at ShipAlts in CIC
  – DDG51, CG and CG52

• Majority of Root Causes were the installation of new technology or update of outdated electronics.

• Root Cause SWBS centered in the 400 series – Command and Control.

• Disruption SWBS is mostly the major interfaces: foundations, electrical, cooling, and paint/insulation/deck covering.
Current Efforts

• Flexible Infrastructure (CVN/AIMS)
  – Raised floor with track system for equipment mounting
  – HVAC fed from special floor grates
  – Cabling can be run below deck as well

• Design Budget Process
  – Just-in-time GFI process with shipyard/govt installation responsibilities delineated

• Structurally Integrated Enclosure w/ Hotel Services Working Group (VCS)
  – Enclosure framework that is integral to ship’s hull
  – Supports cabinet or workstation build
  – Boundary system between PARMs and SY actively managed
Current Efforts

• Common Display/Processor System
  – Standardized cabinet/workstation modules designed to be open architecture compliant
  – Workstation has 5 configurations

• AIMS
  – Modularity and Open Systems Architecture development for physical systems and applications
  – Technology and solution development to achieve cost avoidance throughout life cycle
  – Total ship design and life cycle impact determination
Proposed OASIS Roadmap

• The IPT is recommending the development and maintenance of a process that will...
  – Early in a ship class lifecycle, define and actively manage HM&E boundaries between a ship and its mission systems
  – Be supported by a phased GFI delivery plan
  – Be governed by a body comprised of shipyard, government and equipment supplier/integrator
  – Be scalable and flexible to allow expansion to other areas of a single shipbuilding program, or across multiple programs

Proposed Outline Format
OASIS Boundary Concept

• Boundary provides:
  – A clear **division of responsibility** between the shipbuilder and the system supplier.
  – A **location** for possible standard interfaces between ship and system
• Physical Characteristics
  – Weight & CG
  – KG
  – Dimensional characteristics
  – Location
  – Access

• Installation Characteristics
  – Time to install
  – Securing/foundations
  – Cabling
  – Physical security
  – Clearance/access
  – Safety
  – Grounding & bonding
  – RF & EMI
  – Shock & Vibration
Boundary Interface Examples

- **Services**
  - Electrical power
  - HVAC
  - Cooling water
  - Cooling air
  - Input/output (data, voice, video)
  - Structural Support

- **Human Factors Engineering**
  - Operations
  - Maintenance
Design Budget Overview

SCN integration process that allows C4I baseline to evolve _transparently to the shipbuilder_. Detailed information is phased to allow maximum flexibility for delivering the latest systems.

**Design Budget Components:**

- Phased GFI Deliveries
- ‘Just in Time’ GFE Deliveries
- C4I Test and Integration Facility (TIF)
  - Turnkey
  - Modified Turnkey
- Verbiage in Shipbuilding Contract

_C4I transforming into manageable and agile efforts to enable rapid development and fielding_
## Phased GFI/GFE Design Budget vs Conventional

### Phased GFI Delivery

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<thead>
<tr>
<th>Phased GFI Delivery</th>
<th>Conventional Approach</th>
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<tr>
<td><strong>COMPARTMENT LEVEL</strong></td>
<td><strong>ENVELOPE</strong> DATA</td>
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<td><strong>RACK-LEVEL ENVELOPE DATA</strong></td>
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### Potential Planned ECPs
- Topside
- Network
- ‘Clean-up’
Near-Term Plans

• IPT’s final meeting is right now in Charleston, SC
  – Team is smoothing the Roadmap
• Roadmap will be submitted to ECB for review and endorsement
• Roadmap is intended to be a public document and will be available for review after December.
Points of Contact

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