Considerations for Next Generation Combat Systems

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Current Navy Combat Systems

- Aegis Cruisers and Destroyers almost complete
  - Modernization programs will increment capability
- Ship Self-Defense Systems being installed on CVNs and Amphibs
- Cooperative Engagement Capability (CEC) being installed as is
- Open Architecture (OA) is not a Combat System
  - Focus is more on affordability through commonality
- SIAP is only one dimension of combat system capability
- DD(X) Combat System is an evolutionary step to OA
- LCS Combat System resulted in insufficient littoral defense

Where are we going? What is the future of combat systems?
Future Combat System Challenges

- Multi-unit, cross mission real-time planning
- Net-centric Command and Control
  - Control of multi-unit, dispersed and different forces
- Use of wide-band information
  - ISR Sources and GIG databases
  - Maritime Domain Awareness
  - NCID and discrimination
- Radar resource management
- Weapons resource management
- Reduced Manning compatibility with high intensity multi-dimensional warfare
Evolution to Open Architecture

1990
- CEC
  - COTS HW
  - Production COTS HW
  - Distributed architecture

1995
- SSDS
  - COTS Networking
  - COTS HW

2000
- AEGIS Baseline 7
  - All COTS HW
  - COTS Networking

2005
- DDX
  - TSCE Environment Definition
  - COTS HW/SW
  - Middleware
  - Open interfaces

- SIAP / IABM
  - Open Standards
  - Open Technology Insertion

- SSDS OA
  - COTS HW/SW
  - CAT3 OA Compliance

- APB / ARCI
  - COTS HW & SW
  - Open development process

- CS@SE
  - COTS Displays
  - Open Standards
  - Open Technology Insertion

- HiPer-D
  - AEGIS COTS HW & Middleware performance demos

Common Display Kernel
- COTS HW & SW
- Open development process
Advances and Challenges in Pursuing Open Architecture
A Navy Combat System Perspective

- **Advances**
  - Capitalize on COTS HW
    - though each program is independent
  - Use of COTS middleware and standards
  - Application of modern software development and testing techniques

- **Challenges**
  - Achieving “plug and play” compatibility
  - Ensuring interoperability
  - Testing efficiency
  - Industry incentives
  - Training, maintenance, and logistics
  - Forward / backward interoperability
Current APL-related OA Activities

A Brief Summary

- ARCl and APB processes for submarine community
- Common SIAP
  - IABM concept, development, and testing
  - JTM (Joint Track Manager) Architecture
- Support to IWS-7
  - ARCl process expertise
  - Proposals for prototyping open process:
    - MMSP, surface tracking, performance based engagement
- AAW / BMD baseline merge (OA compliance)
- Aegis OA technical review
- APL IRAD: Next Generation Combat Systems
  - Common components and systems engineering process
Next Generation Combat Systems Attributes

- NOT Single Unit/System Centric
- Joint – from the Start
- GIG Compliant
- IAMD Architecture Compliant
- Multi-mission
Next Generation Combat Systems

- Global Command and Control
- Distributed Collaborative Mission Planning
- Mission Sensor Planning & Asset Stationing
- Real-time Intelligence and Crisis Action Planning
Next Generation Combat Systems

- Single Integrated Picture
- Net-Centric, Globally Integrated
  - Air, Maritime, Space
- Consistent Combat ID
- Real-time ISR and All Source ID and Tracking
- Netted Early Warning (Space, Air, Ground)

Deployed Forces

E2C, DDG 1000, CV, CG/CG(X), LCS, Mission Ops, JSTARS, Global Hawk, PAC-3, DSP/SBIRS, Deployed Forces, National Assets, National Intel
Next Generation Combat Systems

- Advanced Battle Management
- Integrated Fire Control
- Distributed Weapons Control
- Distributed Sensor Control
- Real-Time Coordinated Engagement Planning

Deployed Forces

- JSTARS
- THAAD
- PAC-3
- Global Hawk
- National Assets

Mission Ops

- E2C
- DDG 1000
- CV
- CG/CG(X)
- LCS

CG/CG(X)

Mission Ops

DDG 1000

JSTARS

Global Hawk

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Next Generation Combat Systems

- Coordinated Attack Operations
  - Air, Strike, Artillery, etc
- Information Operations
- Ship, Air, Ground Maneuvers
- Time-Critical Strike
  - Real-time ISR to shooter control loop
Conclusions

- We are very focused on the present systems and requirements
  - Affordability trumps capability considerations
- Historical sponsored work on advanced combat system capabilities has diminished significantly
  - Even S&T efforts are difficult to sustain
- It is time to do a forward look at future combat system architectures and characteristics
  - Start to work on key enabling technologies
  - Create a vision that will inspire sponsors to invest limited funds
- Need to take advantage of our collective experience Lab-wide
  - Multiple warfare areas
  - Different acquisition approaches
  - Various sensor and weapon technologies
  - Innovative processing and HMI