

Open Architecture Conference

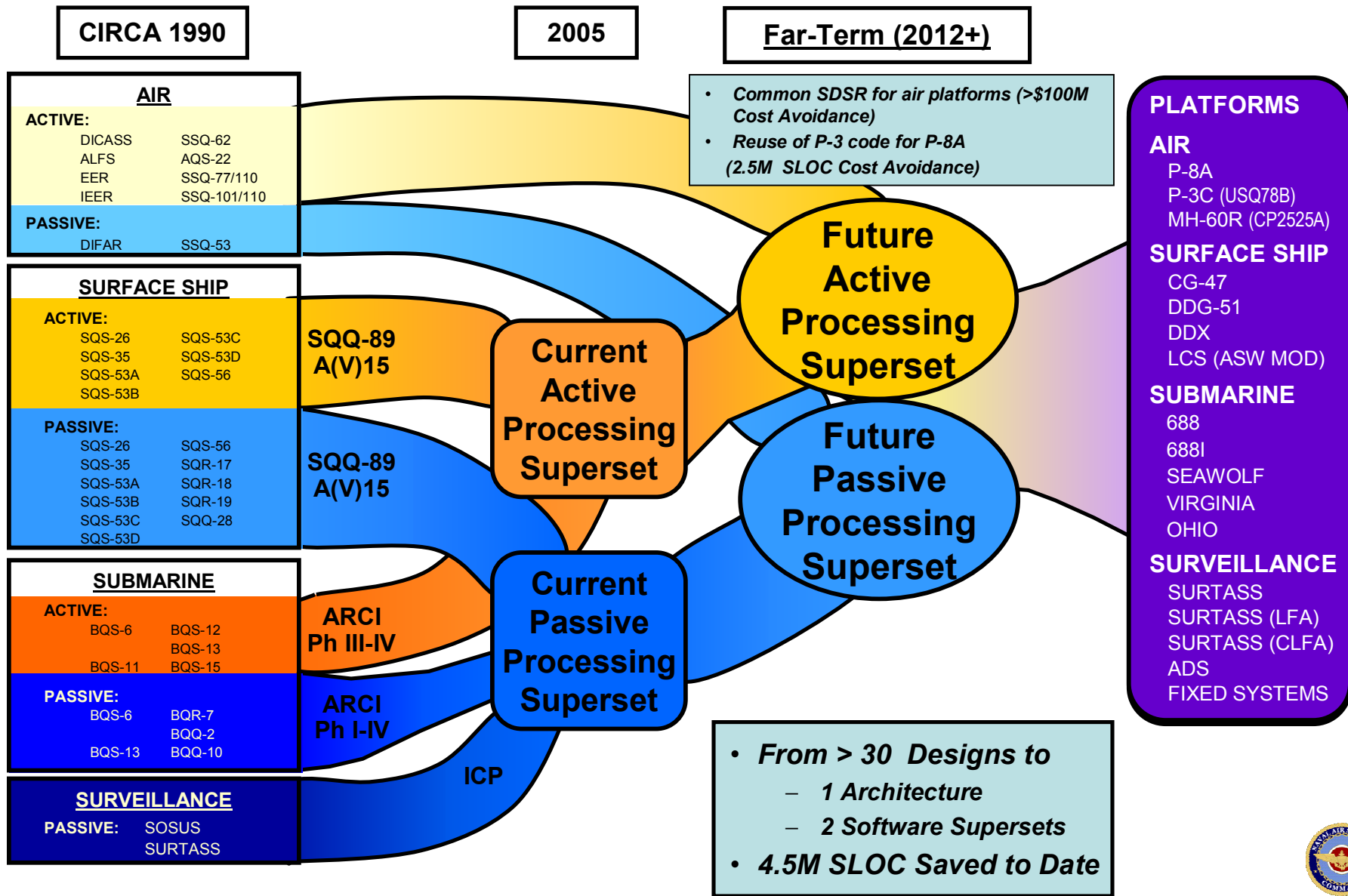
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ASW OPEN ARCHITECTURE

Common Software & Architecture – ASW Sensors



Open Architecture Efforts

- **Open Architecture is a focus for all Air ASW platforms**
 - Requires balance with safety of flight for air platforms
 - Contract structure important to achieving openness and commonality
 - DoD Open System Joint Task Force self assessment in 2005
 - PEO (IWS-7) OAAT assessment tool complete for MH-60R, P-8A, P-3C
- **Hardware**
 - *Elements of commonality across platforms*
 - Software Defined Sonobuoy Receiver (SDSR) – P-8A, P-3C, MH-60R
 - Common Avionics Interfaces – P-8A, P-3C, MH-60R
 - Signal Processor – P-8A, P-3C
- **Software**
 - Assessing common ASW algorithms and OMI features
 - Lean Six Sigma project to identify BCA options



Air ASW Open Architecture

- Open Architecture: one which employs commercial open standards for key interfaces within a system
 - Evolving definition of “openness”
- Examples on Air ASW platforms (MH-60R, P-3C, P-8A)
 - Commercial standard PowerPC processors
 - Ethernet physical interfaces
 - STANAG logical interfaces
 - Use of middleware
- Continuing focus on compliance with DoD/DoN guidance



Air ASW Commonality

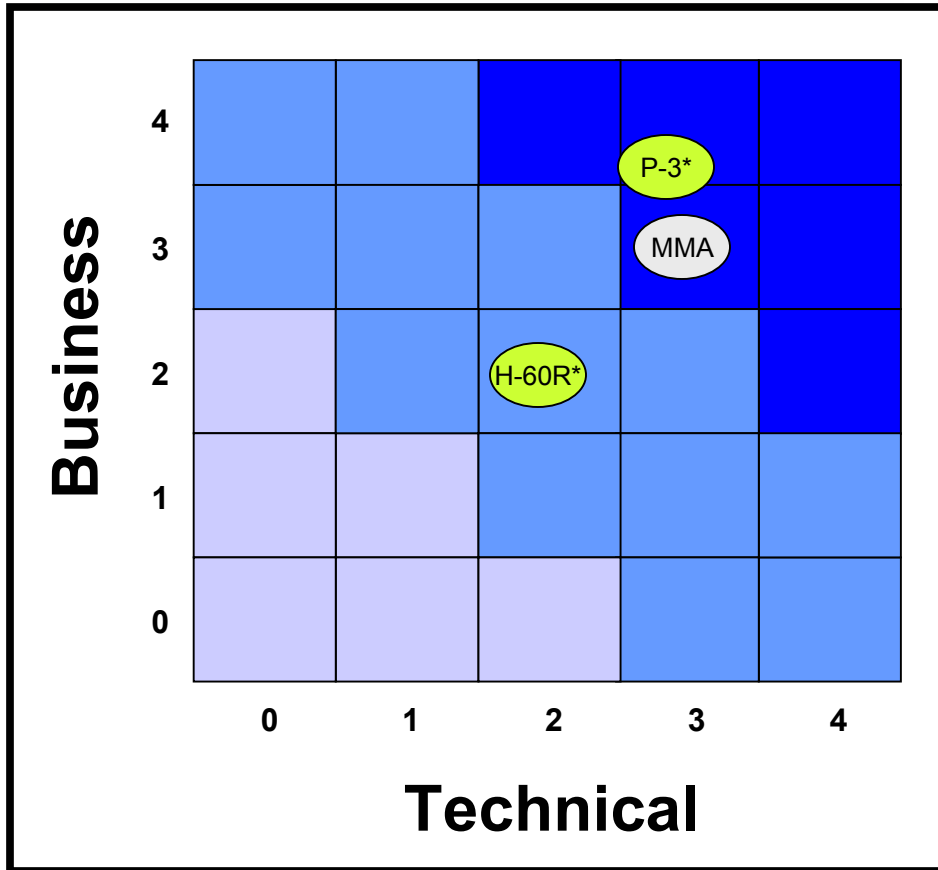
- Commonality: cross platform use of same configuration items, processes
- Multiple examples in cross domain hardware, software, training, and processes include:
 - Software-defined sonobuoy receiver (MH-60R, P-3C, P-8A)
 - Acoustic signal processing (P-3C, P-8A)
 - Target Acoustic Generator Sub system/Ocean characterization simulator for Training systems (Surface (SSQ-89), MH-60R, SH-60B, P-3C, P-8A)
 - NAVSEA Advanced Processing build process adopted by NAVAIR
 - Air multi-statics, Submarine, Surface
- Challenges
 - Unique factors for airborne platforms – volume, power, humidity, shock, weight, cooling, vibration
 - Computing hardware will never be common across all platforms
 - No funded Air ARCI/APB program to directly promote commonality and open architecture (OA)

Multiple Cross-Domain Working Groups Driving Commonality



ASW OA Assessment

OA Assessment Tool



- Open Architecture Assessment Tool provided by PEO IWS 7
- OA Assessment will be completed for key ASW programs
- Many ASW related programs will rate high in this model due to:
 - *Business Practices*
 - Prime Integrators
 - Small Business
 - Multiple Contracts
 - Continuous competition
 - Incentives for OA
 - Peer Review
 - Community Open Source
 - *Technical Implementation*
 - Open Standards
 - Adopt emerging standards
 - Modular Software
 - Highly portable
 - Competitive upgrades
 - Publish/Subscribe communications
 - Planned Tech Insertions
 - Uses commodity hardware

MH-60R Open Architecture

Assessments Results:

- OA assessment completed JUN06 received programmatic level 3 (0 – 4 scale) and technical level 2 (0 – 4 scale)
 - *On par with other NAVAIR programs (E-2, F/A-18E/F, and EA-18G)*
- Modular Open Systems Approach Program Assessment and Rating Tool (MOSA PART) resulted in satisfactory rating

Features

- MH-60 hardware architecture uses open interfaces
- Major processing, I/O components based on commodity processors, COTS SRAs in industry-standard VME/PMC form factors
- Data buses permit integration of upgraded mission equipment and weapon systems as they evolve
- MH-60R/S share common core avionics architecture/components including cockpit, COMM and NAV systems



P-8A Open Architecture

MMA Open Architecture Attributes:

- **Openness**
 - *Standard interfaces, platform independent, No propriety hardware, COTS usage, industry standards, layered SW architecture*
- **Scalability**
 - *Workstations, CPUs, Memory, Applications, Networks added with minimal impact*
- **Evolvability**
 - *Distributed applications, common APIs, dynamic addition of applications*
- **Robustness**
 - *Fault tolerance, extensive health monitoring*
- **Information Assurance**
 - *Cross domain solution, multiple security levels*

Commonality in MMA

- **Infrastructure** (440K)
 - *AWACS 40/45, Boeing Commercial, AEW&C, Phantom Works, COTS, etc.*
- **Application** (1685K)
 - *AWACS 40/45, F/A-18, AV-8B, F-15, B-2, F-22, JUCAS, AEW&C, Nimrod*
- **Simulation** (335K)
 - *AWACS 40/45, F/A-18, AV-8B, F-15, JUCAS, F-22, AEW&C*
- **Reuse** 2.5M Lines of Code ~ 68% of MS SLOC



Evolution of MMA Open Architecture

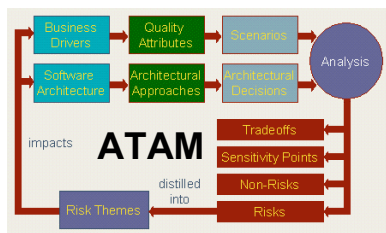


Network Centric Operations Industry Consortium (NCOIC)

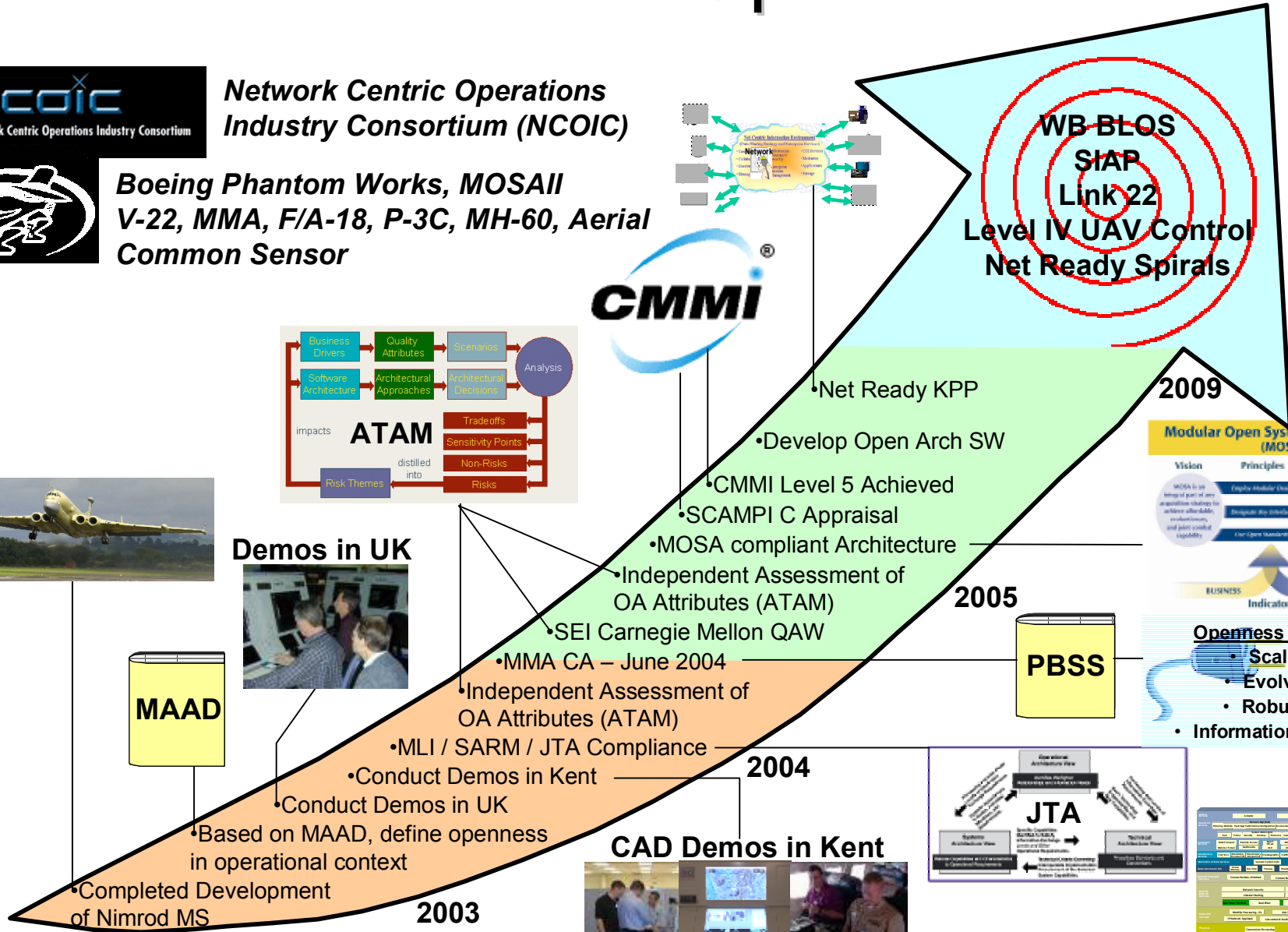
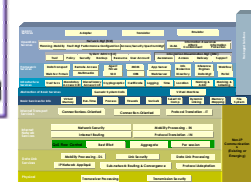
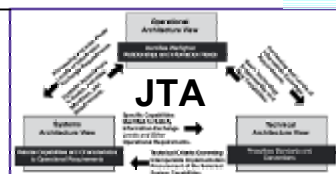
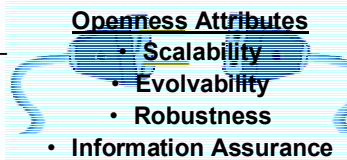
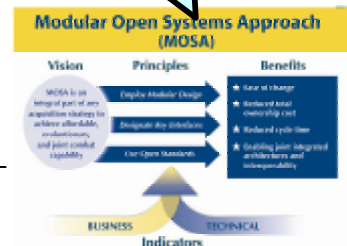
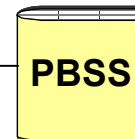
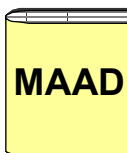
Boeing Phantom Works, MOSA II
V-22, MMA, F/A-18, P-3C, MH-60, Aerial Common Sensor



WB-BLOS
SIAP
Link 22
Level IV UAV Control
Net Ready Spirals



Demos in UK



2001

2003

2004

2005

2009

Completed Development of Nimrod MS

Based on MAAD, define openness in operational context

Conduct Demos in UK

Conduct Demos in Kent

• MLI / SARM / JTA Compliance

Independent Assessment of OA Attributes (ATAM)

• MMA CA – June 2004

SEI Carnegie Mellon QAW

Independent Assessment of OA Attributes (ATAM)

• MOSA compliant Architecture

• SCAMPI C Appraisal

• CMMI Level 5 Achieved

• Develop Open Arch SW

Net Ready KPP



Open Architecture Challenges

COTS application

- **COTS and commercial practices limitations**
 - *May bring lower quality attribute levels than DoD mission critical systems require*
- **Understanding the initial COTS design point**
 - *May require considerable integration efforts*
- **COTS is a tradeoff higher risk for technology versus the low cost for HW/SW development**
 - *Understand and plan for COTS pros/cons*



NAVAIR Support to ASW Community of Interest Commonality Efforts

- **Undersea FORCEnet Working Group (UFnEWG)**
 - *OPNAV ASW-CFT(N874)/N6/FASWC sponsored*
 - *Implement of Net-centric ASW/MIW capabilities*
- **Collaborative ASW System Development Team (CASDT)**
 - *FASWC sponsored; supported by Fleet acoustic operators*
 - *Develop ASW solutions across the Naval Enterprise with focus on OMI*
- **ASW Executive Steering Group (ASW ESG)**
 - *PEO(IWS-5) sponsored; supported by Fleet reps and all AW PM's*
 - *Coordinate ASW programs across the Naval Enterprise*
- **ASW Systems Engineering Team (ASSET)**
 - *PEO(IWS-5) sponsored; supported by Syscom/Program engineers*
 - *Review ASW family of systems/system of systems for commonality approach*
- **Common Acoustic Processing Working Group (CAPWG)**
 - *PMA-264 and PEO(IWS-5) sponsored; supported by PEO(A), PEO(IWS), SPAWAR, NAWC, NUWC*
 - *Establish a single acoustic source code baseline*
- **Air ASW Technology Advisory Group (AATAG)**
 - *PMA-264, PMA-290, and PMA-299 sponsored*
 - *Rigorously evaluate and share new technology*



Summary

- PEO(A) is actively advancing implementation of Open Architecture/Commonality on ASW Aircraft across air/surface/sub platform domains
- Critical ASW IPCL requirements being addressed
 - *Appropriate material solutions being provided in priority mission need areas*
- Platform and sensor programs performing well and delivering advance capability
- Ongoing Fleet involvement essential to delivering the right Warfighting solutions



Questions

