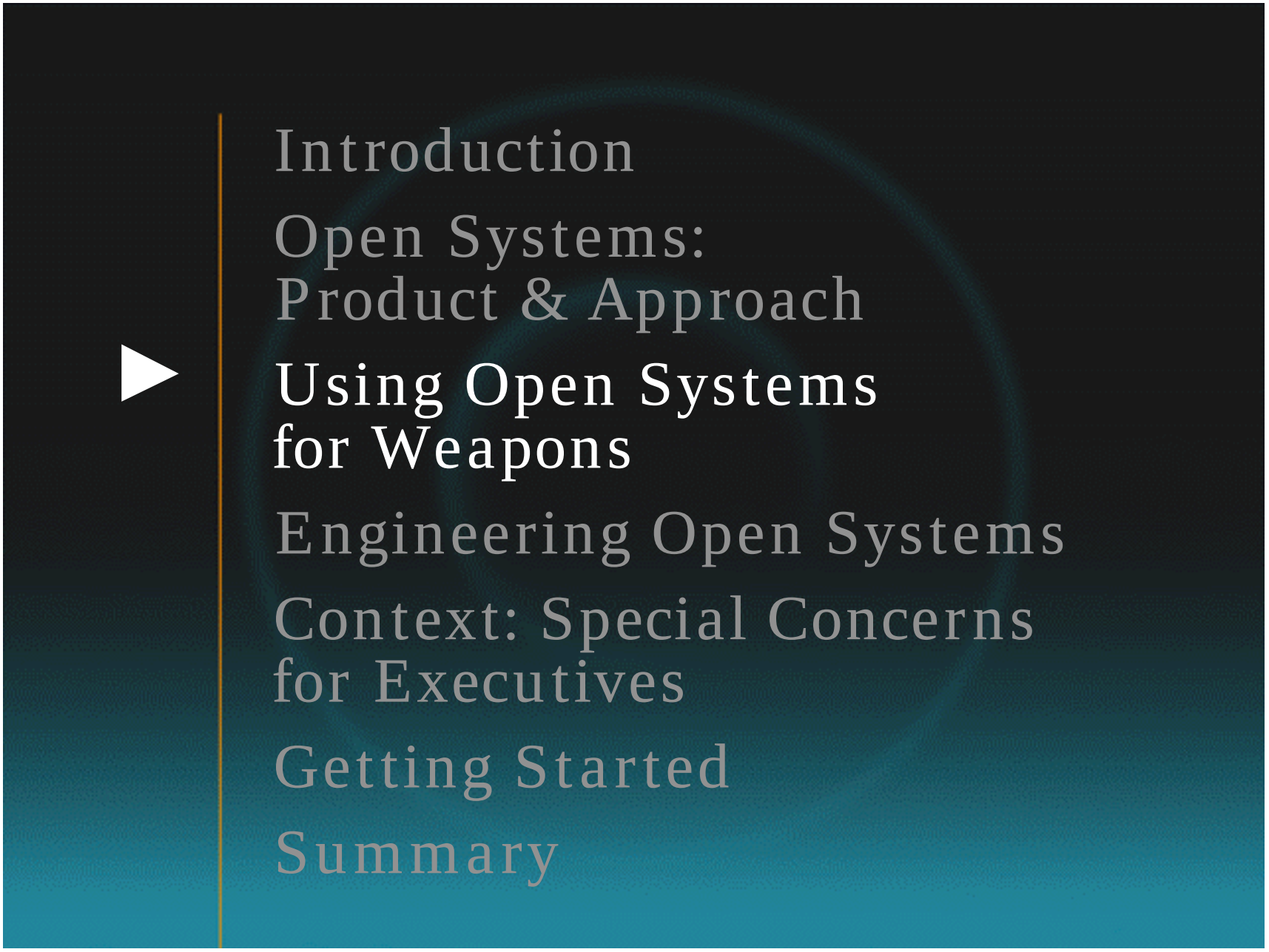
Introduction
Open Systems: Product & Approach
Using Open Systems for Weapons
Engineering Open Systems
Context: Special Concerns for Executives
Getting Started
Summary

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You are not the first.

“Open systems are the underpinnings of the Army Technical Architecture, the hedge to keep up with the commercial marketplace’s technology investments, and the key to achieving the Army’s vision of seamless interoperability for the warfighter.”

—Major General Joe W. Rigby

Director,
Army Digitization Office

Programs using elements of an open systems approach.

Intelligence and Electronic Warfare Common Sensor (IEWCS)

New Attack Submarine (NSSN)

Multi-Sensor Torpedo Recognition and Alertment Processor (MSTRAP) System

Examples of programs using the open systems approach

Joint Surveillance Target Attack Radar System (JSTARS) Common Ground Station (CGS) program

Navy Area Theater Ballistic Missile Defense (TBMD) (Block IVA) program

JSTARS

LPD 17

Joint Strike Fighter

IEWCS

“Open Systems Architectures are the only way to go in designing C³I systems. These architectures enable us to leverage commercial technology, to reduce support costs, and to continuously improve our war-fighting systems through product improve-ment. Only in clearly justified circumstances should we use either proprietary architectures or military only form factors for electronic equipment. I consider proprietary hardware and software to be a garbage game in most circumstances.”

–Major General William H. Campbell, Program Executive Officer, Command, Control and Communications Systems

IEWCS platforms

The challenge for IEWCS

To achieve commonality and interoperability with

- **increased supportability**
- **substantially expanded capability**
- **improved performance**

in an atmosphere of substantially increased military and commercial threat,

to support

- **light division**
- **heavy division**
- **airborne division**

IEW program strategy

A system vision to
- **consolidate mission requirements/functions**
- **support light and heavy forces**
- **rapidly identify, accurately locate, report, and/or jam**
- **reduce personnel required for operation and maintenance**
- **reduce skill levels required**

by creating robust, more deployable, supportable, and cost-effective systems,

using sensor subsystems on weapon platforms that are
- **standardized**
- **commercialized**
- **interoperable**
- **interchangeable**

Weapon platform evolution

TRAFFICJAM

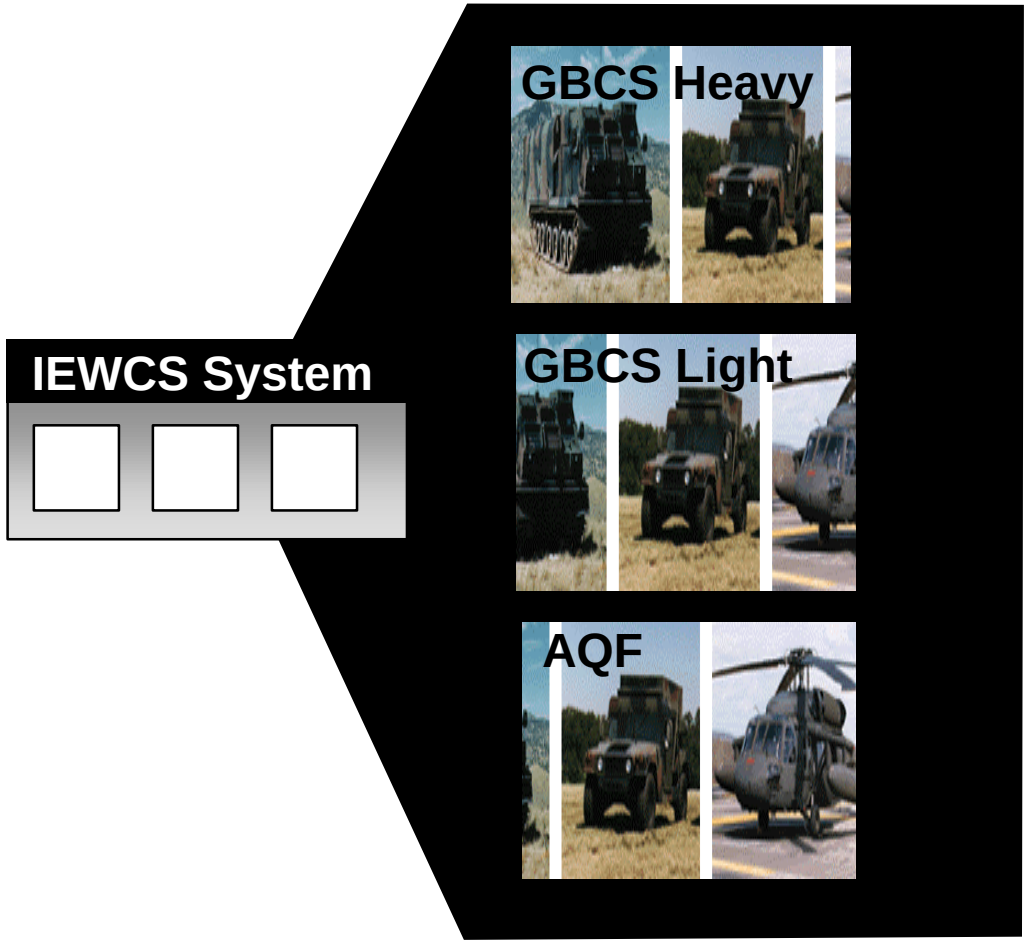
TEAMPACK

TEAMMATE

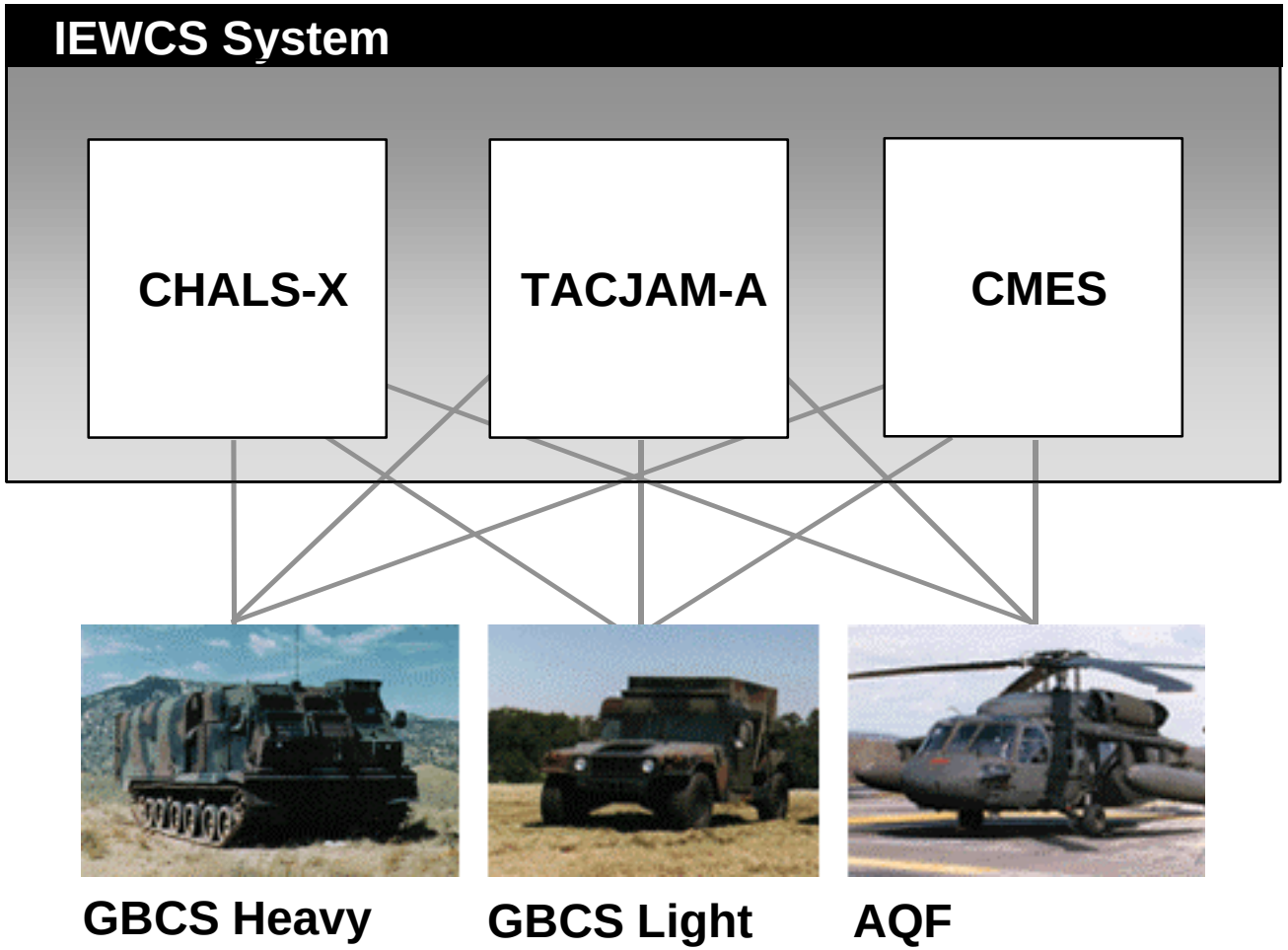
TACJAM

TRAILBLAZER

QUICKFIX



IEWCS



The open system solution for IEWCS

Build individual subsystems and components that are open systems and are
- **interchangeable and interoperable**
- **installable in any IEWCS configuration**

Design each sensor platform.
- **industry standard open systems architecture with a common bus**
- **common operator workstation**

Use standardized interface specifications.

Benefits of an open systems approach to IEWCS and the Army -1

Anticipated acquisition reforms

Lower cost and improved schedule

Ability to incorporate advancing technology

Full interoperability between IEWCS subsystems and between platforms

Maximum commonality with the supported force

Benefits of an open systems approach to IEWCS and the Army -2

Evolvable, supportable systems

- **commonality of commercial hardware, firmware, and software**
- **component and subsystem interchangeability**
- **easily upgraded systems**
- **support for evolutionary growth**
- **easily configurable systems for special mission needs**

Acquisition benefits

Vendor-proposed commercial items working in accordance with the agreed standards for open systems avoid limited competition and high-cost system improvements.

Common sensor subsystems (CSS) simplify the acquisition process.

Integrate GFE CSS into all IEW platforms.

GBCS Heavy

GBCS Light

AQF

Budgetary planning benefits

The flexibility to respond to POM reductions.

- **ability to defer GBCS Heavy**
- **manageable because of systems vision and open systems architecture**

The ability to maintain budget through revenue from other programs.

The ability to demonstrate support of other programs to Congress.

Cost benefits

Army total cost avoidance for IEWCS $865.6M

Operational ROI: about 50% fewer operators, vehicles, airlift capacity

Economies of scale through sharing, for example, Airborne Reconnaissance, Low (ARL)

Technology insertion reduced number of boxes and cards required

Commonality of boxes and cards reduced number of spares types

Shared acquisition, testing, training, and logistics costs

Minimized maintenance tasks and skills, personnel, facilities, etc.

Schedule benefits

E&MD for GBCS Light reduced by 39% (101 months to 62 months).

E&MD for AQF reduced by 29% (101 months to 72 months).

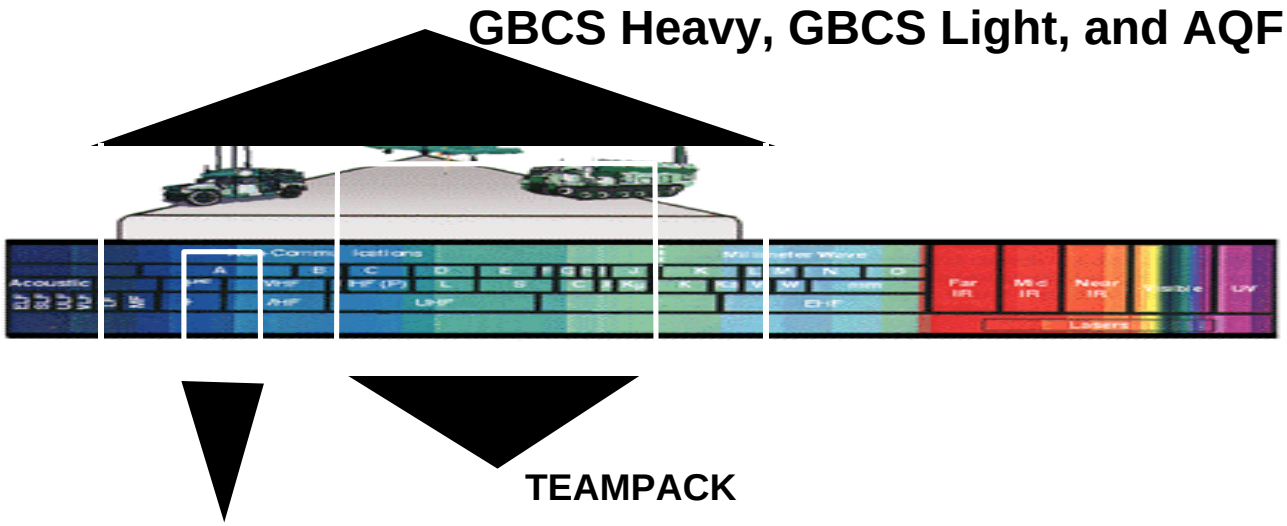
E&MD for GBCS Heavy reduced by 18% (101 months to 83 months).

RDA cycle time to meet the next generation threat reduced by 64% (101 months to 36 months).

Performance benefits -1

Increased common subsystem performance

- **expanded coverage of electromagnetic spectrum**
- **ability to handle newer forms of modulation**



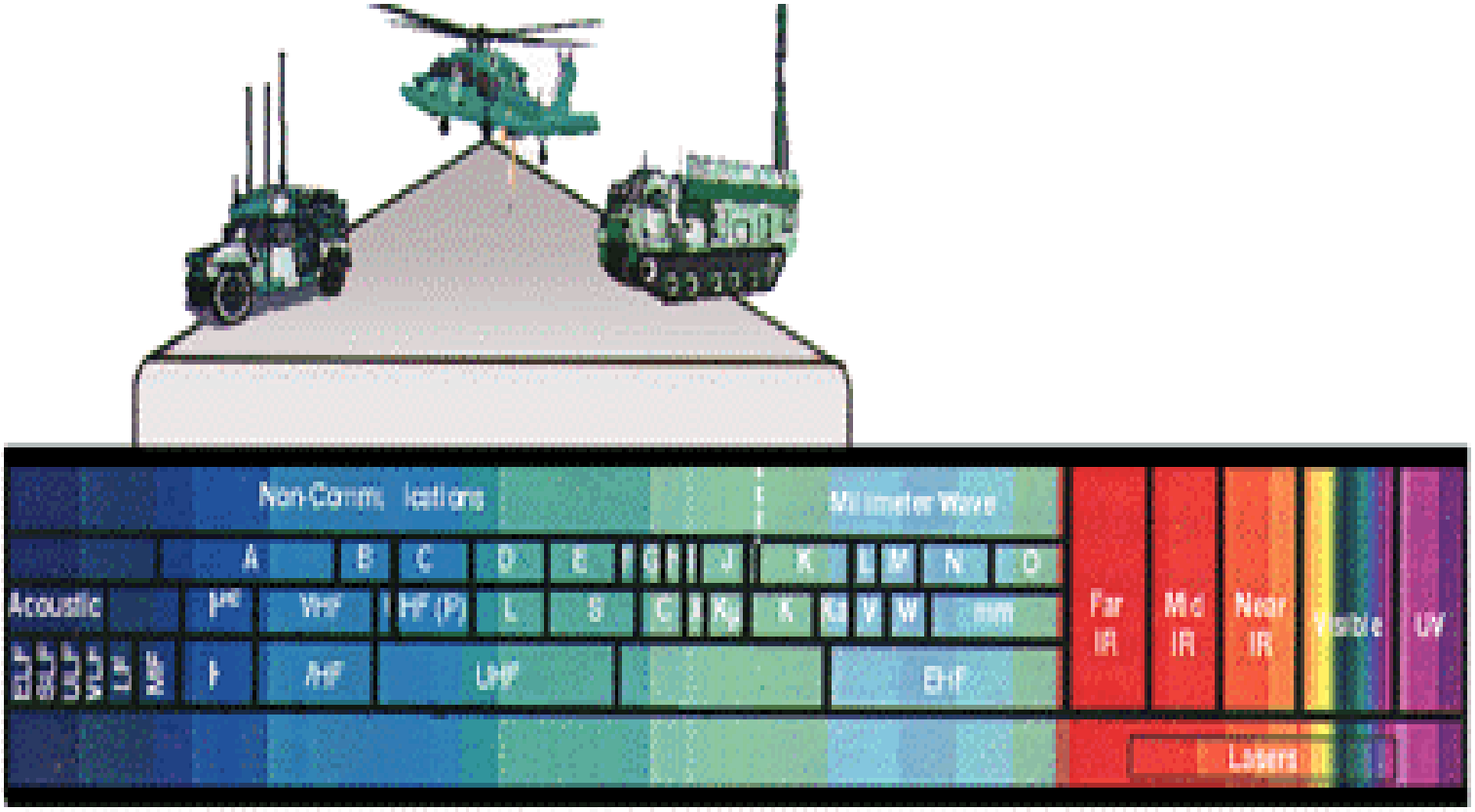
Performance benefits -2

High level of system integration

Evolvable capabilities to meet evolving threat through technology insertion, primarily through software library upgrades

- **for example, migration path to more powerful processors especially important for computationally intensive algorithms**

IEWCS as a multiplier: MEWSS



MEWSS open system solution

System perspective

- **found existing technology that met requirements**
- **adopted technology advancements of Army**

Benefits of IEWCS to MEWSS

MEWSS R&D cost was only $12.6M.

They were able to leverage off $362M Army investment in R&D.

The cost avoidance total was $328.7M.

The schedule was accelerated.

The capability was enhanced, for example, precision targeting.

There was leap-ahead operational capability.

There was a 50% reduction in support.

Benefits of IEWCS to other programs

Navy
- **Airborne (CMES)**
- **Surface (CHALS-M [future])**
- **Subsurface**
  - **Seawolf submarine (TACJAM-A ESM)**

Special Operations Force (buyer)
- **Navy Special Warfare (SEALs)**
  - **PCF-1 ships**

Air Force
- **Airborne (CMES, CHALS-M [future])**

NSSN

Open systems facilitates teaming with industry, encouraging the formation of partnerships across the public and private sector bridge. This was seen in the highly successful NSSN Critical Item Test conducted at the NUWC in 1995 and illustrates the Navy's firm commitment to open systems as the foundation for all of our weapon systems' designs and future decisions.

RADM John F. Shipway, Commander, Naval Undersea Warfare Center

The challenge for NSSN

To meet the objectives of
- **affordability**
- **ship schedule**
- **performance requirements**
- **mission flexibility**

in a demanding, real-time, multi-level secure submarine combat system environment,

in the prevailing atmosphere of acquisition reform, the use of COTS, and open systems approaches,

with a scheduled initial delivery in 2004 and retirement after 2035.

The open systems solution for NSSN -1

Key factors

- **open systems architecture, developed with significant industry participation**
- **detailed profiles of commercial standards**
- **critical item tests**
- **RFP features**

The open systems solution for NSSN -2

RFP features

- **contractor-proposed alternatives to specifications and standards**
- **contractor demonstration of method of software selection and development**
- **contractor demonstration of approach to open systems and system features for portability, interoperability, maintainability, vendor independence, technology insertion, etc.**

The open systems solution for NSSN -3

RFP features

- **contractor market research**
- **contractor inputs on economic purchase quantities**
- **contractor risk management plan with respect to NDI and commercial standards**
- **life-cycle management and open systems evaluation factors**

The open systems solution for NSSN -4

Synergistic with

- **acquisition reform**
- **IPPD practices**
- **early industry and customer involvement**
- **risk mitigation through open systems architecture and critical item tests**

Benefits to the NSSN -1

NSSN not yet built, but critical item tests demonstrated the validity of the architecture's openness.

- **rapid integration**
- **utilization of commercial items**
- **software reuse**

Benefits to the NSSN -2

Open systems approach and critical item tests combined prove to be a substantial risk mitigation approach.

- **open systems architecture is the basis of decision making and system evolution planning**
- **demonstrations show where the hard spots are**
  - **this is fed back into the open systems architecture, profile, and guidance**

Benefits to the NSSN -3

Real benefits will occur when they have to upgrade commercial products.

- **open system approach helps to structure "technology refresh windows"**
  - **built into the plans before NSSN is ever launched**
  - **continues to provide real basis for examining alternatives**

David Packard Award for Acquisition Excellence

To the NSSN C^3I System Program Team in May 1996

For the team's many management and technological innovations

- **overall acquisition strategy**
- **the use of integrated teams (including a strong partnership with industry)**
- **implementation of contracting innovations**
- **use of commercial off-the-shelf electronics**
- **unprecedented application of the concept of cost as an independent variable**

Best of Open Systems Solutions (BOSS) Award

Awarded

- **to the Open Systems Architecture Phase II Demonstration in 1994**
- **for top federal project in the category of Planning and Migration to Open Systems**

MSTRAP

Programs such as the Multi-Sensor Torpedo Recognition and Alertment Processor (MSTRAP) vividly demonstrate the vision and implementation of open systems, and how the resultant benefits to the Navy can be quickly realized.

RADM John F. Shipway, Commander, Naval Undersea Warfare Center

The challenge for MSTRAP

Create next generation torpedo defense
- **process information from sensors to detect and identify an incoming torpedo**
- **direct evasive action or countermeasure**

Reduce time to procure and develop

Reduce cost

Conform to defense acquisition reform

The open systems solution for MSTRAP

Commercial standards and specifications

Commercial hardware produced by multiple vendors

Ability to leverage off of acquisition reform

Operational user participation in system design and development

Benefits to the MSTRAP

Time to procure and develop was reduced by two-thirds.

- **18 months from conception through design, development, and manufacturing**

Cost was reduced by a factor of four.

- **less than $300K versus over $1M**

Non-proprietary commercial products were provided by multiple vendors.

The open systems approach fields new technology faster.

IEWCS

Power of system vision

Evolution of legacy to an evolvable system

Incredible multiplier
- **intra-service**
- **inter-service**

NSSN

Whether new or legacy, there are things you can emulate, for example, the NSSN RFP.

This is illustrative of how to use an open systems approach for new acquisitions and upgrades.

You can use standards and commercial products to prototype.

You can integrate rapidly by using standards in critical item tests.

MSTRAP

A small program can derive benefits.

It evolved from a legacy system.

It is illustrative of significant cost avoidance and schedule improvement.

Summary of IEWCS, NSSN, and MSTRAP

The three examples demonstrate how the open systems approach was used

- **by programs of different sizes**
- **from different branches of the service**
- **in varying technology domains**
- **for new, legacy, and upgrade systems**

Examples of tangible benefits of the open systems approach

Supports evolutionary acquisition for the warfighter.

Yields an understanding of legacy systems.

Facilitates migration to commercial items.

Reduces costs through use of standardized, interoperable, and interchangeable (sub)systems.

More examples of tangible benefits

Improves capability through ease of technology insertion.

Shortens schedule over the life cycle.

Results in cost avoidance for other programs.

Improves supportability.