System of Systems Interoperability
- Evolving Capability to Support the Warfighter -

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### System of Systems Interoperability - Evolving Capability to Support the Warfighter

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System of Systems Interoperability - Evolving Capability to Support the Warfighter

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**Abstract:**
What is Interoperability? Ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together.

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What is Interoperability?

“Ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together.”

*(JCS Pub 1)*

- Interoperability today is the number one problem in joint force & combined operations -- CINC’s top issue
- Getting worse, not better, as new coalition partners develop, complex systems are acquired, and “fixes” to past problems are applied in stove-piped fashion
- Joint Vision 2010 calls for increasingly network centric warfare, dependent upon fully interoperable systems
Help enable the full range of joint and combined operations, through Interoperability and Coalition Warfare initiatives, providing an acquisition focus, and working with C³I, the Joint Staff, JFCOM/CINCs, the test community, the Defense Agencies, the Services, and Coalition Partners.
Key Initiatives

- **Mission Capability Management (MCM)**
- **Family of Interoperable Operational Pictures (FIOP)**
- **Joint Distributed Engineering Plant (JDEP)**
Mission Capability Management (MCM)
The Need to Evolve to MCM

Gulf war, Kosovo, Bosnia, and Y2K all demonstrated the criticality of systems interoperating within a dynamic model

- Improve Interoperability
- Support CINC’s Operations
- Improve Coalition Capability

“Key to capitalizing on these assets is interoperability among the Services” - Vice Adm. William J. Fallon, Commander of the U.S. Second Fleet and Striking Fleet Atlantic
Mission Capability Management (MCM)
(Implementing System-of-Systems Capability)

PROCESS

IDENTIFY MISSION AREAS

IDENTIFY MISSION AREA LEADERS

IDENTIFY MISSION AREA SYSTEMS ARCHITECTS

DEVELOP/UPDATE SYSTEMS ARCHITECTURES

IDENTIFY DEFICIENCIES

IDENTIFY GAPS

IDENTIFY NON-MATERIAL SOLUTIONS

One-Time Tasks

Recurring Tasks

Decisions

DAB etc.

JROC etc.

CIO EB etc.

A

B
Mission Capability Management (MCM)
(Implementing System-of-Systems Capability)

IMPLEMENTATION

* The Defense Acquisition Board is augmented as necessary by PSAs, Joint Staff, CINCs, and Service representatives to discuss the issues.
Key Initiatives

- Mission Capability Management (MCM)
- Family of Interoperable Operational Pictures (FIOP)
- Joint Distributed Engineering Plant (JDEP)
The Problem (1 of 2):

No Coherent View of the Battlespace from CINC to Soldier/Sailor/Airman
Inability to Prosecute a Coordinated Strategy

- The cause: multiple systems, conceived and developed individually
- Compounding the problem: systems, TTP, missions are changing continuously, new coalition partners, and stovepiped intelligence dissemination

Non-interoperable operating pictures = fratricide & leakers
The Problem (2 of 2)

• Individual system requirements have been generated vice SoS required capabilities for the “family of pictures”
  – Ideally, required capabilities should drive system requirements

• No “big picture” assessment for this family of relevant operating pictures has been done in the Department
  – We need to call attention to it and move forward!
The Solution (1 of 2)

“A Family of Interoperable Operational Pictures” (FIOP)

– More than just situational awareness - includes battlespace management, fire support, logistics, intelligence, etc.

– Name is in line with a potential ministerial initiative, synonymous with the Common Relevant Operating Picture (CROP), JFCOM J9 initiative
The Solution (2 of 2)
How to Implement the FIOP Concept

Optimum horizontal and vertical system connectivity across Service lines and between echelons.

"TO BE": Family of Interoperable Operational Pictures

What does “glue” mean?

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What does “glue” mean?
Key Initiatives

- Mission Capability Management (MCM)
- Family of Interoperable Operational Pictures (FIOP)
- Joint Distributed Engineering Plant (JDEP)
Distributed Engineering & Test Environments

NAVY DEP

THEATER MISSILE DEFENSE SYSTEM EXCERCISER

JITC
JOINT TACTICAL DATA LINK LABORATORY

USMC TERPES

USMC TAOOC, JTAOM, ADCP, METCAL, ATACC

NSA SIS Senior Troupe

NSA SIS Senior Scout Rivet Joint

JCS GCCS

JITC Central Test Facility

USAF JSTARS

Army Patriot, FAAD, JTADS

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Navy ACDS, CV/LDH, MLDS, E-2C, F-14

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JDEP CONCEPT
(Combat Systems/BMC4I Hardware in the Loop)

Sensor / Weapons SIM/STM Connectivity (Ground Truth)

Tactical Slim/Driver
AF Systems
Communications

Tactical Slim/Driver
Army Systems
Communications

Tactical Slim/Driver
Joint Systems
Communications

Tactical Slim/Driver
Marine Systems
Communications

Tactical Slim/Driver
Navy Systems
Communications

JDEP Ops Center(s)
- Test Control
- SIM Control
- Data Extract
- Data Reduction

2003 JTAMD Family of Systems

Tactical Connectivity (JPN,JDN,JCTN)

Collaborative Engineering Environment

Voice
VTC

Admin
Tools

Scheduler

Network
Mgmt

Test
Planning

Data Tools
Repository

Test
Analysis

Doc
Mgmt

Shared
Apps

Process/
Workflow

Visualization

Built upon Collaborative Engineering Environment, and migrates from DIS to HLA
So, where does M&S come in?

- There is a “blurring of the lines” between real systems and simulations
- Simulation is the only feasible way to develop & test a system-of-systems
- M&S interoperability is fundamental to success
  - Simulation Based Acquistion (SBA) is the future for systems acquisition
  - Joint Distributed Engineering Plant (JDEP) is a primary contributor developing new systems and fixing legacy systems
    - Both of the above will improve systems interoperability
- Exploiting HLA will aide systems interoperability
Clearly, if we want to achieve 100% of warfighting capability -- we must develop, test, operate and sustain fully interoperable weapons systems.

Function
• Requirements Analysis
• System Design & Test
• Legacy System Fix
• Certification
• Training Exercises
• Contingency Planning
• Operations

Essential Tools
• M&S
• SBA
• Collaborative Eng Env
• JDEP
• HLA
Summary

- Modeling and Simulation Indispensible
- “Coalition Friendly” Strategy
- Partnership with Industry