



Defense Information Systems Agency

**A Combat Support Agency**

**Defense Information Systems Agency**  
**Joint Interoperability Test Command**

# **Decoupled Test, Evaluation, and Certification of a System of Systems (SoS)**

**15 March 2011**



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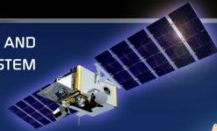


- **This presentation outlines the use of agile testing concepts, decoupled testing, to reduce risk and accelerate a Joint Interoperability assessment/ characterization of a highly complex System of Systems (SoS) that does not have an overarching Joint Staff (JS)-approved set of requirements**
- **Our example is the Ballistic Missile Defense System (BMDS), which has no JS-approved requirements, and its elements (THAAD, Patriot, JTAGS, AEGIS, etc.), which do have JS-approved requirements**

## BMDS - THE BALLISTIC MISSILE DEFENSE SYSTEM

### SENSORS

SPACE TRACKING AND SURVEILLANCE SYSTEM



SEA-BASED X-BAND RADAR



AEGIS BMD SPY-1 RADAR



FORWARD-BASED RADAR



EARLY WARNING RADAR

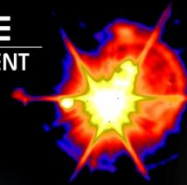


### BOOST/ASCENT DEFENSE SEGMENT



POTENTIAL NEW TECHNOLOGIES

### MIDCOURSE DEFENSE SEGMENT



### TERMINAL DEFENSE SEGMENT

SEA-BASED TERMINAL



AEGIS BALLISTIC MISSILE DEFENSE STANDARD MISSILE-3



SM-3

GBI



GROUND-BASED MIDCOURSE DEFENSE



TERMINAL HIGH ALTITUDE AREA DEFENSE



PATRIOT ADVANCED CAPABILITY-3



### C2BMC

COMMAND, CONTROL, BATTLE MANAGEMENT AND COMMUNICATIONS

NMCC

USSTRATCOM

USNORTHCOM

USPACOM

EUCOM

CENTCOM

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10 MDA-5362 (19 MAR 10)



- **Secretary Rumsfeld memo dated 2 January 2002:**
  - **Directed that the BMDS will not be subject to the traditional requirements generation process**
  - **Directed a capability-based requirements process for MD**
  - **Directed the Services to procure the BMDS elements**
  - **Directed that Service BMDS elements will enter the formal DoD acquisition cycle at MS C**
  - **Directed use of rapid decision making cycles for MD**



## Background (cont.)



- Individual elements of the BMDS have gone through the Joint Capabilities Integration Development System (JCIDS) process and developed applicable architecture documents, etc.
- BMDS has no Joint Staff (JS)-approved requirements and no intention to develop “JCIDS-like” documents
- Assess-to Criteria (AtC) document
  - BMDS Warfighter-developed requirements document
  - Development is on hold and future is unknown
  - Unlikely it would be formally approved by the JS





- **DECOUPLED TESTING:**

- Each component/element test stands on its own, not dependent upon or being impacted by the results of other tests
- Identifies the separation of capability blocks whose development shouldn't depend on each other
- Allows system designers to have as little dependencies as possible
- Reduces the risk of malfunction in one part of a system of systems when other parts are changed
- Does not need a detailed requirements specification/speculation
  - Need architecture diagrams
  - Need a scope overview
- Instead of testing against the specification, the independent testing effort will focus on:
  - production-level system integration testing
  - formal usability testing
- Supports DoD 5000.02 concept of Integrated T&E





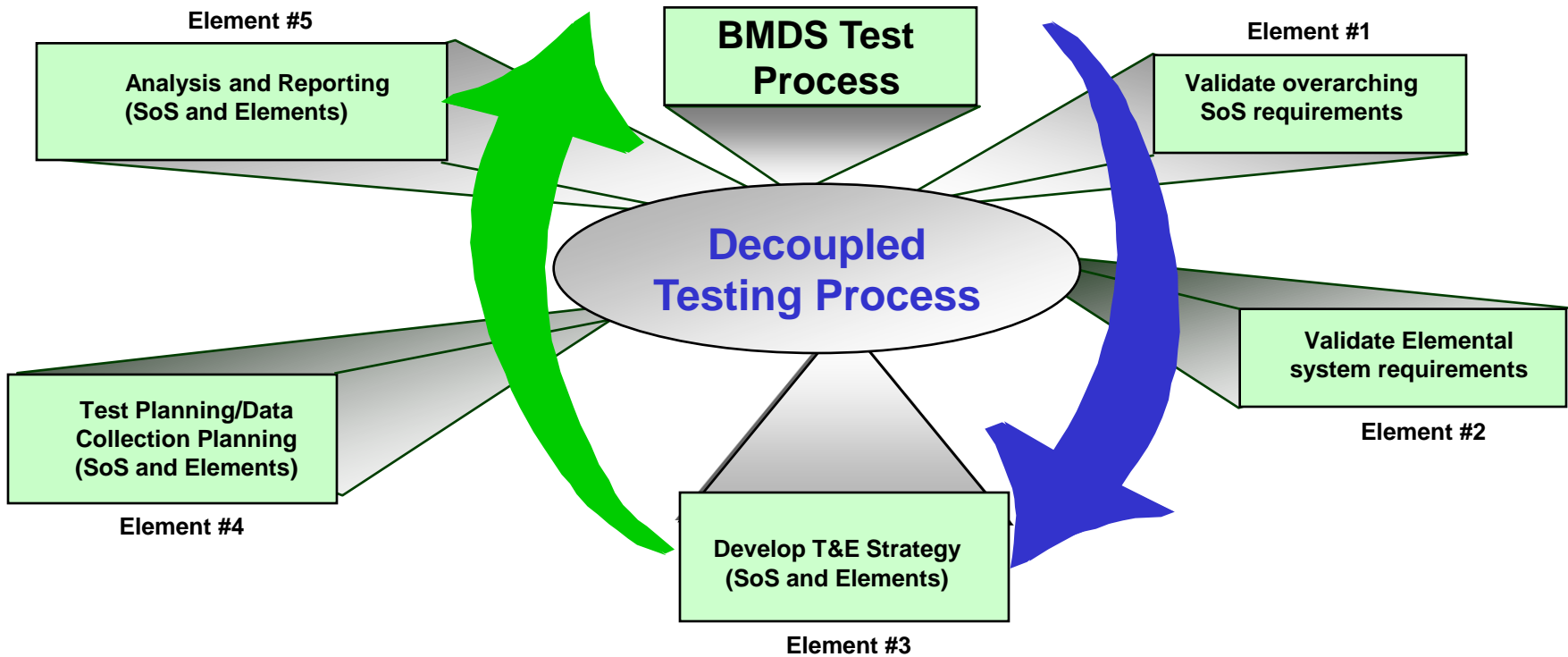
- **JITC develops an Interoperability Assessment Plan (IAP) to look at System of System BMDS interoperability requirements**
- **Similar in concept to the JITC Interoperability Certification Evaluation Plan (ICEP)**
  - **Establishes a test and evaluation strategy for evaluating interoperability requirements in:**
    - **the most efficient and effective manner**
    - **in an operationally-realistic environment**
  - **Test and evaluation strategy identifies:**
    - **Data necessary to support an interoperability evaluation**
    - **Test events/environments planned to produce that data**
  - **Certification vs. Assessment**



## Elements of the IAP



JITC, Fort Huachuca, AZ



# Element #1: Validate Overarching SoS Requirements



- **JCIDS**
- **Capability Portfolio Manager (CPM)**
- **Communities of Interest (COIs)**
- **Department of Defense Technology Standards and Profile Registry (DISR)**
- **Concept of Operation (CONOP)**
- **Concept of Employment (CONEMP)**
- **Joint Mission Threads (JMT)**
- **Meta Data Registry (MDR)**
- **Tactics/Techniques/Procedures (TTPs)**
- **IMTP**
- **M&S Plan**



## Element #2: Validate Elemental System Requirements



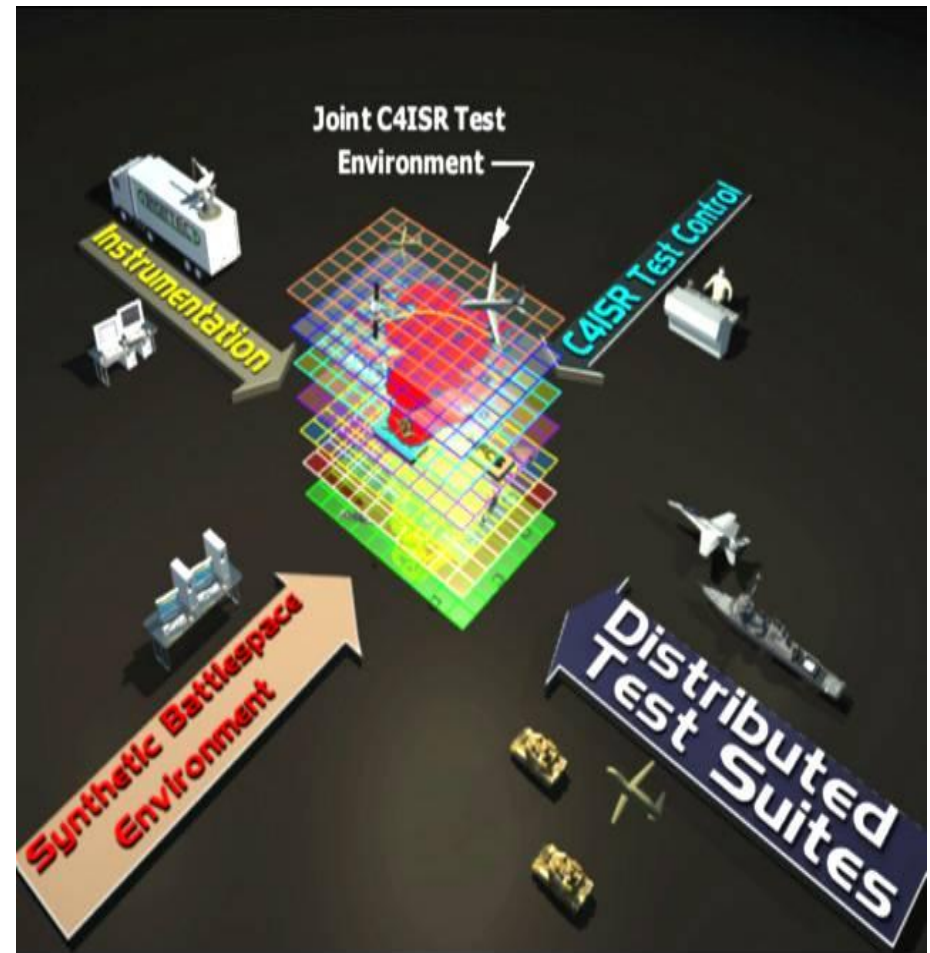
- Same as SoS requirements for each elemental system multiplied (times the number of associated component systems)
- Must identify commonality and deltas between each element requirements and the SoS requirements (times the number of associated component systems)
- Must identify commonality and deltas between each element requirements and the requirements of other elements of the SoS (times the number of associated component systems)

## Element #3: Develop T&E Strategy (SoS and Elements)



- Test and Evaluation Master Plan (TEMP)
- Combined Test Team (CTT)/Integrated Test Team/Integrated Product Team, etc
- Development Test (DT) Test Organization documents
- Operational Test (OT) Test Organization documents
- Interoperability Test Organization documents
- Modeling and Simulation Analysis (Do models and simulations exist which support test requirements?)
- Major Range and Test Facility Base (MRTFB) analysis (What existing infrastructure exists to support test requirements?)
- Analysis of emerging technologies (What new test methods and equipment might be required to support test requirements?)

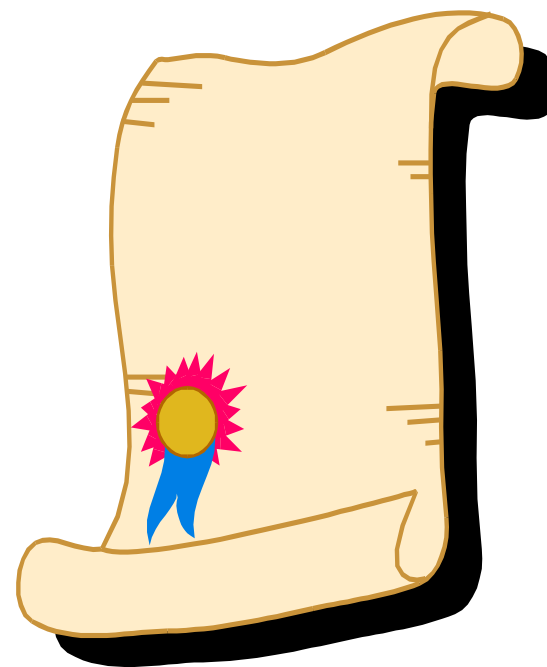
- **Develop IAP**
  - Standards Conformance Testing Requirements and testing organizations
  - Interoperability Testing Requirements and testing organizations
  - OT Requirements and testing organizations
  - Service Level Testing and Developmental Testing
  - Test Venues
    - Laboratory (Contractor/Government)
    - Service Level Testing and DT
    - JITC
    - Operational Test
    - Combined/Joint exercises
    - Post fielding assessment in the theater
  - Types/amount/formats of data
  - Use of Design of Experiments
  - Tools (Data Collection & Analysis)



## Element #5: Analysis and Reporting (SoS and Elements)



- Information Assurance Results
- Spectrum Results
- Standards Conformance Testing Results
- Interoperability Testing Results
- Capabilities and Limitations
- Data Analysis Group (DAG)/Data Analysis Working Group (DAWG)
- DT Results
- OT Results
- Net Readiness – Key Performance Parameter (NR-KPP) Status
- Status of Interoperability Report (SIR)
- Test Incident Report Database
- System Tracking Program





- **MDA/Element Events**

- FTG
- FTD
- GTD/GTI
- FTT
- FTM
- FTP
- FTO
- Exercises/Live Events
- Element LUTs



- **JITC Events**

- TDL JIT
- DICE
- GCN Testing



- **Other Events**

- IA Testing
- Juniper Cobra



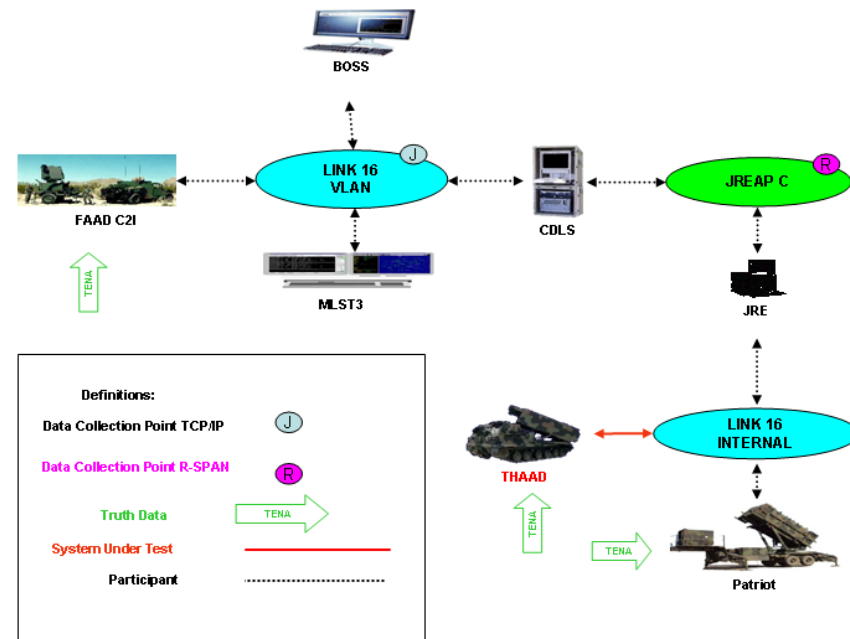
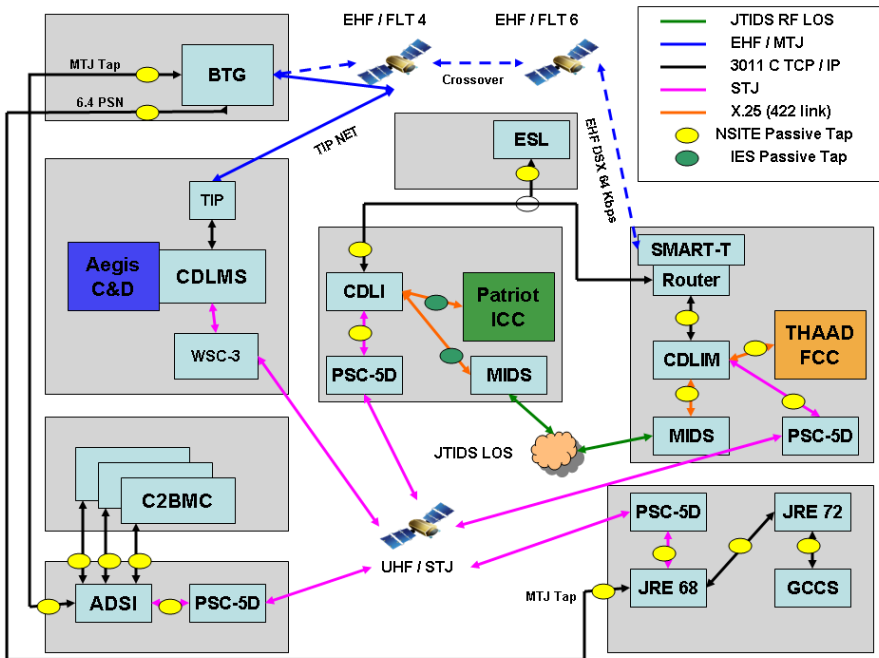
**LEGEND:**

DICE – DoD Interoperability Communications Exercise  
 FTD – Flight Test Distributed  
 FTG – Flight Test GMD  
 FTM – Flight Test Standard Missile  
 FTO – Flight Test Operational Patriot

FTP – Flight Test Patriot  
 FTT – Flight Test THAAD  
 GCN – GMD Communication Network  
 GTD – Ground Test Distributed  
 GTI – Ground Test Integrated

JIT – Joint Interoperability Test  
 LUT – Limited User Test  
 TDL – Tactical Data Link

## IAP Test Venues





# Summary



- **Use of decoupled testing will reduce risk and accelerate a Joint Interoperability assessment/ characterization of the BMDS System of Systems**
- **The development of the BMDS IAP will enable JITC to provide a more thorough assessment and characterization of BMDS capabilities and limitations, and provide the BMDS Warfighter a better understanding of the systems they are using.**



# Questions?

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