

# **Session 3: Joint Distributed Testing/ Lessons Learned**

**- Overview of Joint Distributed Testing -**

**Mark Smith  
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# Overview

- **Overview of Joint Distributed Testing**
- **Status Check: Where's the Beef?**
- **Good News: Some Recent and Future Efforts**
- **Some Recent Lessons Learned**
- **Food for Thought**

# Overview of Joint Distributed Testing

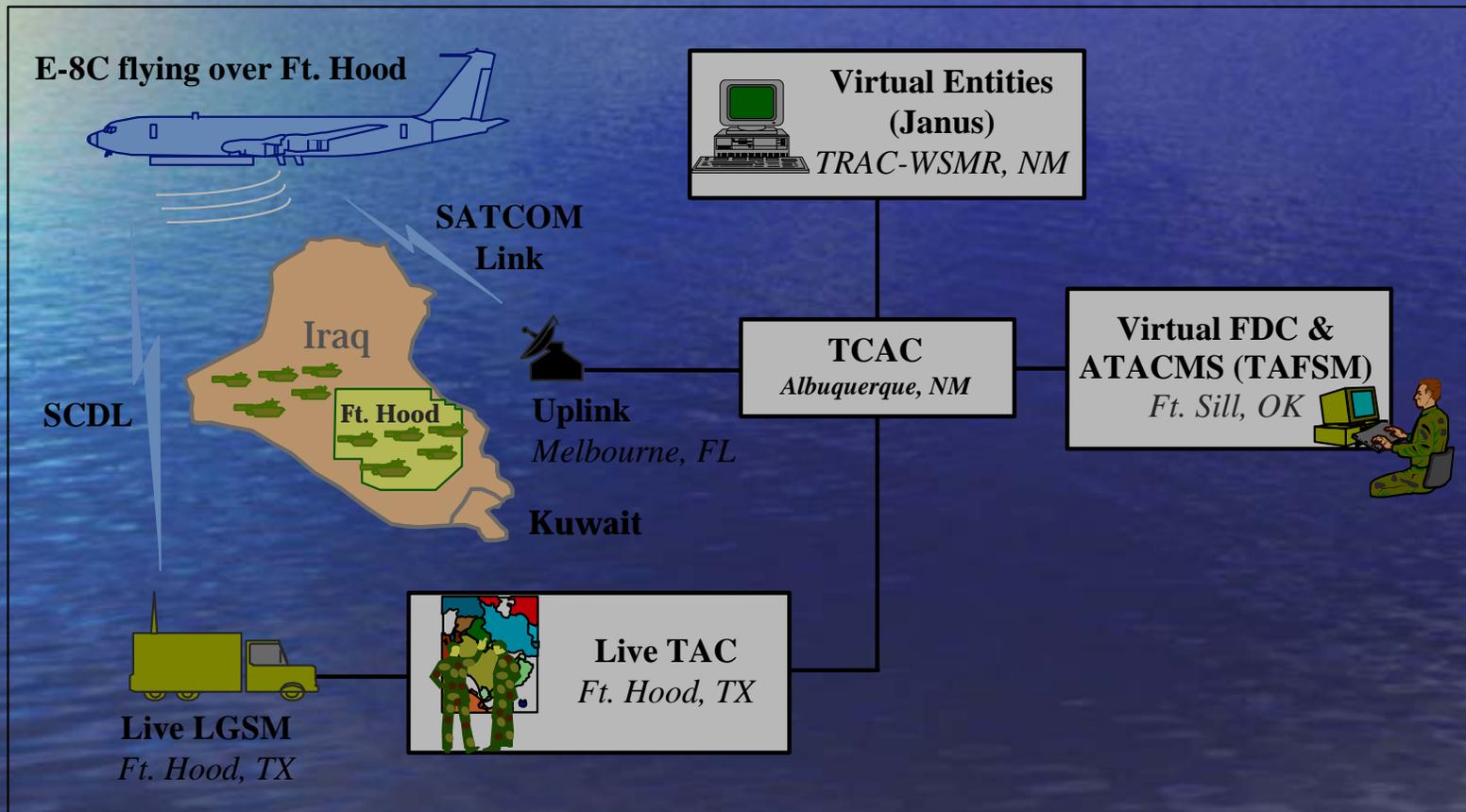
- Distributed Testing links geographically separate resources together into a common environment for a series of test events
  - “Live” players are real players in a real environment
    - Examples are obvious: real planes, tanks, ships, C4ISR systems, systems-of-systems
  - “Virtual” players are real players, or parts of real players, in a virtual environment
    - Examples: Human-in-the-Loop/Hardware-in-the-Loop facilities, Systems Integrations Laboratories
  - “Constructive” players are virtual players in a virtual environment
    - Examples: MODSAF, Janus, Suppressor, JMASS, JSIMS

# Overview of Joint Distributed Testing

- Architecture to link these players can be a combination of terrestrial land lines, data links, SATCOM, etc.
- "Protocols" to link can be
  - Native language (e.g., JSTARS-GSM language), or
  - A standard, such as Distributed Interactive Simulation (DIS) or High Level Architecture (HLA)
  - My bias? Use real machine-machine language when able
- Individual nodes and linked environment undergoes VV&A
- Thoroughly constructed test plans are executed and real data gathered to address real test issues

# Overview of Joint Distributed Testing

Example: C4ISR System Operational Test and Evaluation –  
Geographically Dispersed Distributed Test  
(JADS End-to-End Test, Phase 4 – 1999)



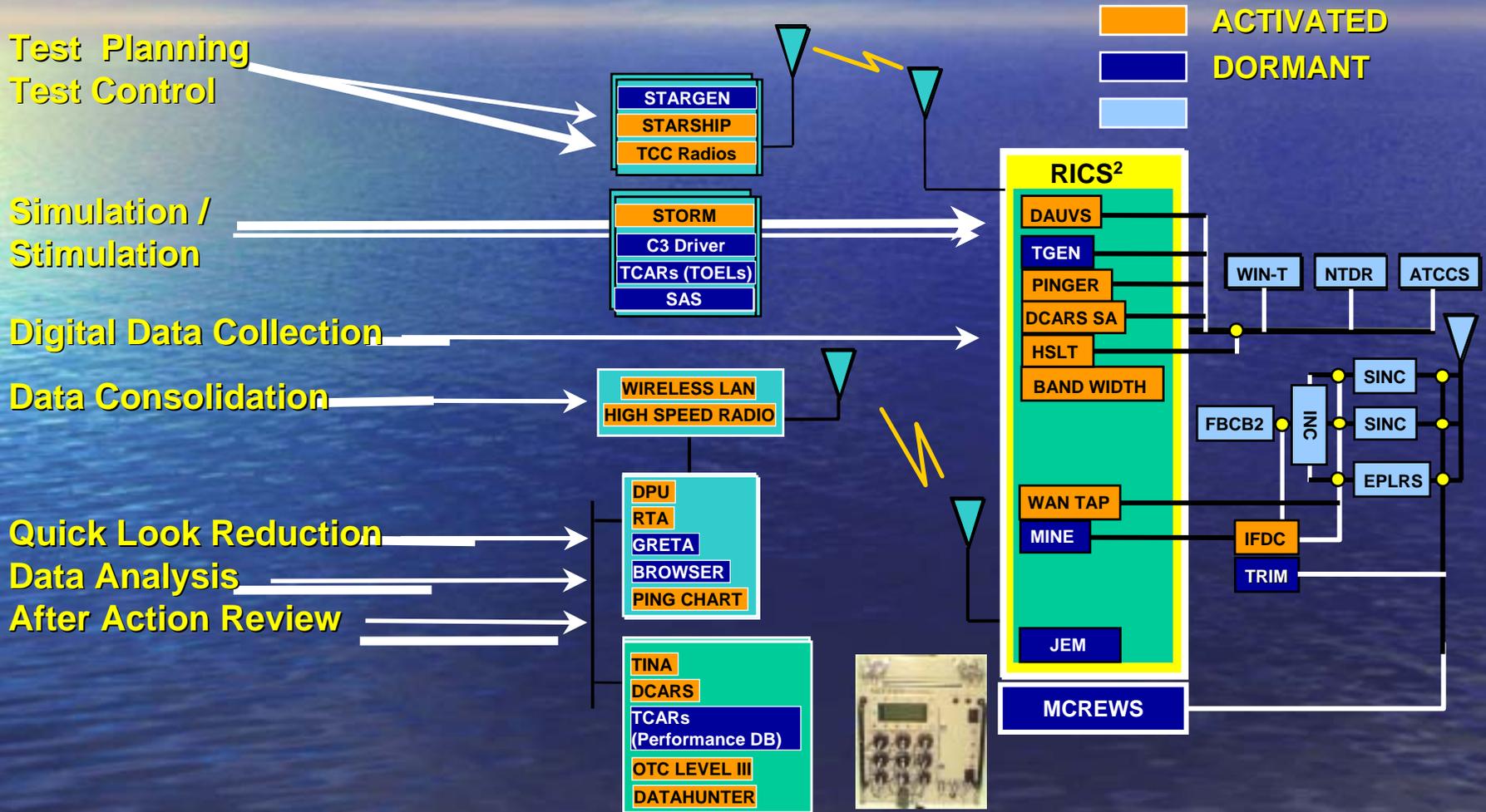
# Overview of Joint Distributed Testing

Example: Aircraft System Combined Developmental and Operational Test and Evaluation – Distributed Test Within a Single Facility (F-22 Air Combat Simulator)



# Overview of Joint Distributed Testing

## Example: Joint Contingency Force (JRTC)



# Status Check

- **Distributed Testing has been with us for 10+ years – has it amounted to anything?**
  - **From a senior civilian at an Operational Test Agency:**
    - **“Large investments in equally large Power Point files”**
    - **“A number of solutions searching for problems”**
    - **“No change in T&E that actually gets executed”**
    - **“No coherent strategy to use distributed testing”**
- **As the old commercial said, “Where’s the beef?”**

# Proven Technology With Potential to Make the Difference

- Traditional DT&E limitations overcome by distributed testing
    - Inability to integrate avionics testing
    - Incompatibility of collected data
    - Human interaction not represented
    - Non-representative force levels
    - Inadequate quantity/types of threat systems
    - Electronic combat testing not allowed, is limited or restricted
    - Lack of systems for compatibility testing
    - Real-time M&S not available
  - Traditional OT&E limitations overcome by distributed testing
    - Inadequate quantity/types of targets
    - Inadequate quantity/types of threat systems
    - Inadequate quantity/types of friendly systems
    - Electronic combat testing not allowed, is limited or restricted
    - Non-representative force levels
    - Human interaction not represented
    - Insufficient test articles
    - Unrealistic test scenarios
    - Insufficient number of test events
- Largest areas of payoff: C4ISR systems and system-of-system testing

Source: Joint Advanced Distributed Simulation Joint Test and Evaluation (JADS JT&E)

- 361 DT&E and OT&E limitations compiled from study of test reports and TEMPS
- "Top" limitations, as shown above, the result of ranking by tri-Service panel of testers
- Evaluation of ability of distributed testing to overcome the above limitations was conducted using data from JADS' nine phases of testing, 1995-2000

# Good News – Increasing Level of Distributed Test Activity

- **Some Past Activities:**
  - JADS JT&E
  - Joint Theater Missile Defense – Attack Operations JT&E
  - Joint Strike Fighter Visual Strike Warfare Environment (VSWE 7)
- **Some Recent Activities:**
  - Millennium Challenge 2002
  - Force XXI Battle Command Brigade and Below (FBCB2) Field Test 5
  - F-22 Air Combat Simulator

# Good News – Increasing Level of Distributed Test Activity

- **Some Architecture/Tool Initiatives:**
  - Foundation Initiative 2010/TENA (Test and Training Enabling Architecture)
  - Joint Distributed Engineering Plant
  - Air Force's Joint Synthetic Battlespace (JSB) work with NEXRI (NEXT Range Instrumentation) – Effort to provide underlying synthetic environment for flight test ranges and AFOTEC support
- **Future Activities: Great Potential**
  - From one colleague: GMD will perform a distributed test in FY 09/04 with players such as Aegis (Navy), Cobra Dane (Air Force) and UEWR (Air Force)
    - "This will be the largest distributed test attempted"
  - Another Colleague: MDA is using considerable distributed testing via M&S – primarily MDWAR tying together JNTC, labs, field agencies (e.g., PAC-3, ABL, etc.). Will probably be the main mechanism for validating initial readiness as proposed by the President for October 2004.

# Some Recent Lessons Learned (Courtesy Electronic Proving Grounds)

- Prior to the start of test agreements concerning lines of authority, responsibility, and “rules of engagement” must be in place; decision authority must be delegated to the lowest possible level. “Everyone is on the same sheet of music with one conductor.”
- Distributed tests are very complex to plan, manage, execute, and report, because of the complexity, instrumentation and M&S tools must be developed to function in a distributed environment.
- The harvest and aggregation of test data collected from distributed locations is always more complex and difficult than expected. Both the instrumentation and the M&S network architecture must be planned and sized to adequately satisfy requirements.

# Some Recent Lessons Learned (Courtesy Electronic Proving Grounds)

- Coordination is critical between all parties involved (contractors, government, multiple agencies and commercial firms).
  - Distributed instrumentation, frequency clearance, real estate issues, basic infrastructure or “test lines of communication” for equipment, personnel, instrumentation is a must; test items, equipment, people, instrumentation get “sick,” “hungry,” and “replaced or repaired” - all must be coordinated prior to test start. All rules of engagement must be spelled out and well known to all that “will play” in the test.
  - Support personnel must be kept on standby for quick deployment from rear or base of operations in the event of unexpected H/W and S/W difficulties and problems.

# Some Recent Lessons Learned (Courtesy Electronic Proving Grounds)

- Test situational awareness is critical to insure that valid test data is collected and causality of failure and success is understood. Test tools must be developed to specifically support a distributed environment and thus feed the situational awareness of the test directors test control system.
- Technical understanding of the "System of Systems" connected by a "network of networks," distributed geographically, down to the system level is paramount, for test design, data collection and data analysis. The test director and the user of the test data must understand the systems, the system of systems, the architecture and the test design to understand and make sense of the results.
- "Never assume" is valid for all tests, but is critical for distributed tests due to "guest status" at remote geographical locations.
- And many more...

# Food For Thought

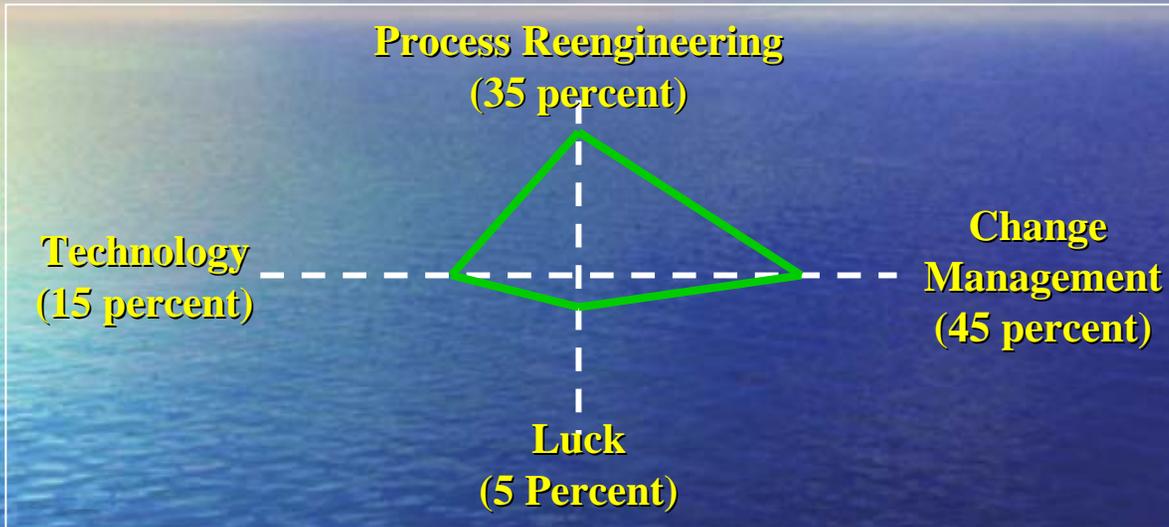


Figure from "Andhara Pradesh: Lesson for Global Software Development", Kyle Eischen, Computer Magazine, June 2003, Page 35

- Can't rely on technology itself to drive the change
- Must be balanced with process and organizational changes
- This requires commitments at all levels
  - Senior leadership to make the change
  - Mid-level to worker bees to actively implement the changes
- More proven performance (valid and valuable data for test events) will lead to more outfits committing their programs to distributed testing

# Wrap Up

- **Overview of Joint Distributed Testing**
- **Status Check: Where's the Beef?**
- **Good News: Some Current and Recent Efforts**
- **Some Lessons Learned**
- **Food for Thought**
- **Great Lessons Learned Presentations to Follow:**
  - **Joint Theater Air and Missile Defense SoS/Next Generation Interoperability Testing**
  - **Multifunctional Information Distribution System**
  - **Millennium Challenge 2002**
  - **TENA – The Foundation for DoD Range Interoperability**
  - **Joint Distributed Virtual Combat Range**
  - **NAVAIR DNet Experience**

Thanks!

[mark.e.smith-2@saic.com](mailto:mark.e.smith-2@saic.com)

505-830-6757