

# Test & Evaluation in the Virtual World

David R. Pratt, PhD

Robert W. Franceschini, PhD

Science Applications International Corporation (SAIC)

prattda@saic.com

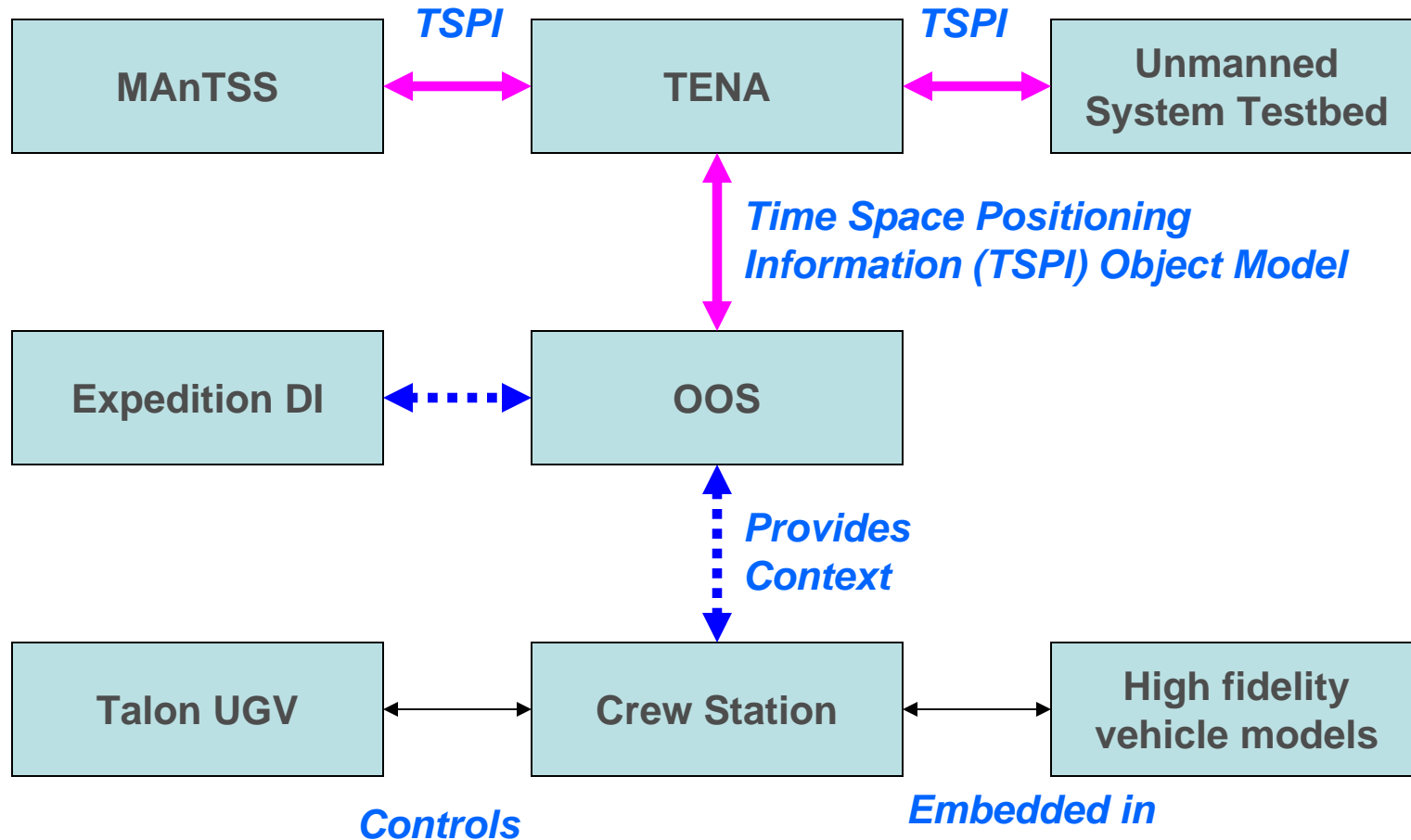
# Motivation

- **Changes in weapons systems**
  - Increased ranges
  - Complexity of environment
- **Horizontal convergence**
  - Live – Virtual – Constructive
- **Vertical convergence**
  - Analysis
  - Testing
  - Training
  - Mission rehearsal
  - Operations

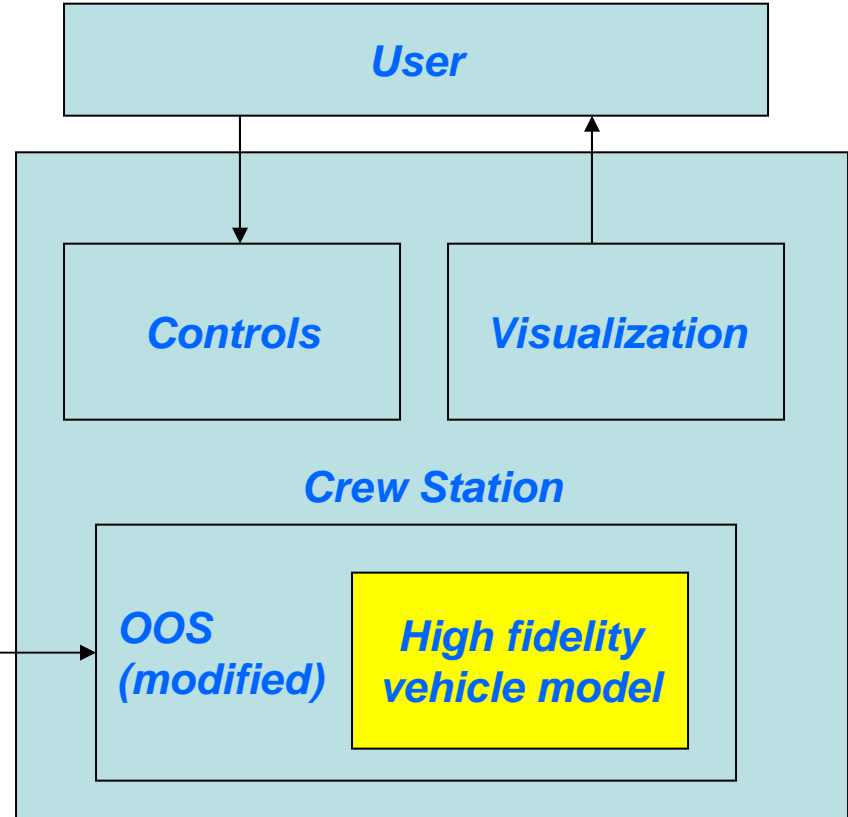
# Component Systems

- **OneSAF Objective System (OOS)**
  - Provides context, environment and synthetic convoy
- **Common Architecture Desktop/Embedded Trainer (CADET)**
  - Provides a virtual simulator with the embedded high fidelity vehicle simulation using MATLAB/C++ model
- **Talon Robot**
  - A live robot that is capable of interacting in the synthetic environment
- **Expedition Dismounted Infantry (DI) representation**
  - Provides a dismounted infantry immersive environment
- **Test and Training Enabling Architecture (TENA)**
  - Functions as middleware for live testing
- **Unmanned Systems Test Bed (USTB)**
  - Emulates an unmanned aerial vehicle (UAV)
- **Modular Analysis Test Support System (MANtSS)**
  - Collects and analyzes testing data

# Notional System Architecture

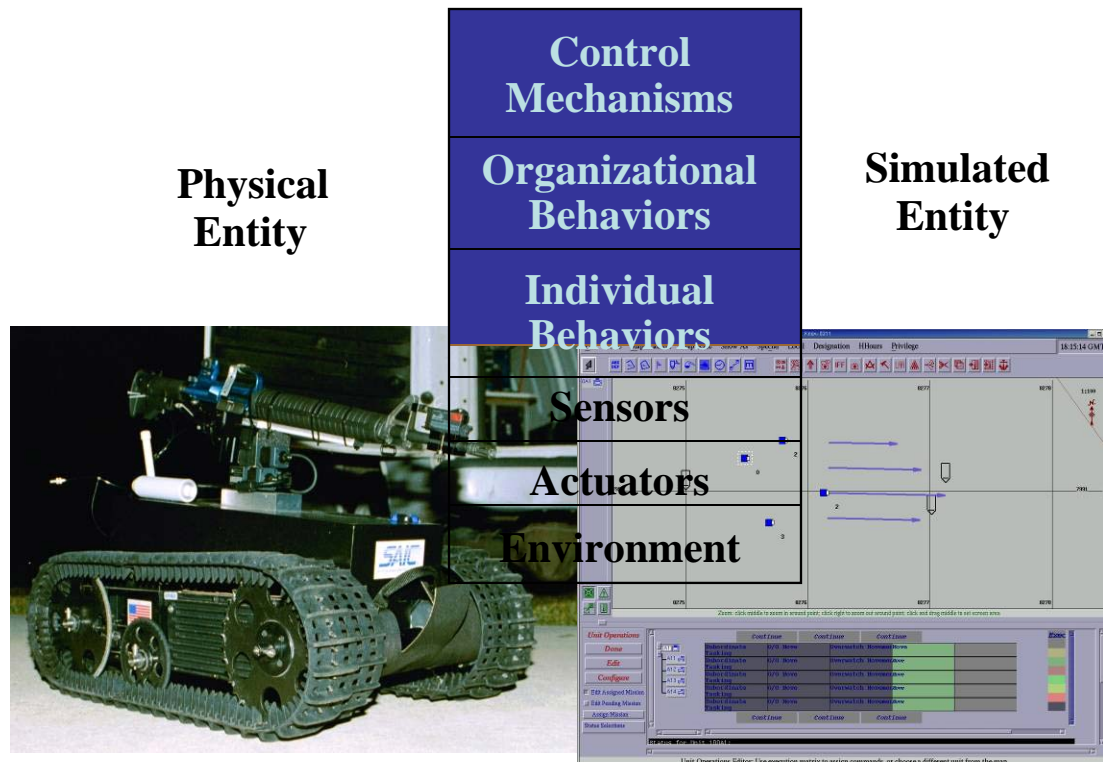


# CADET Crew Station



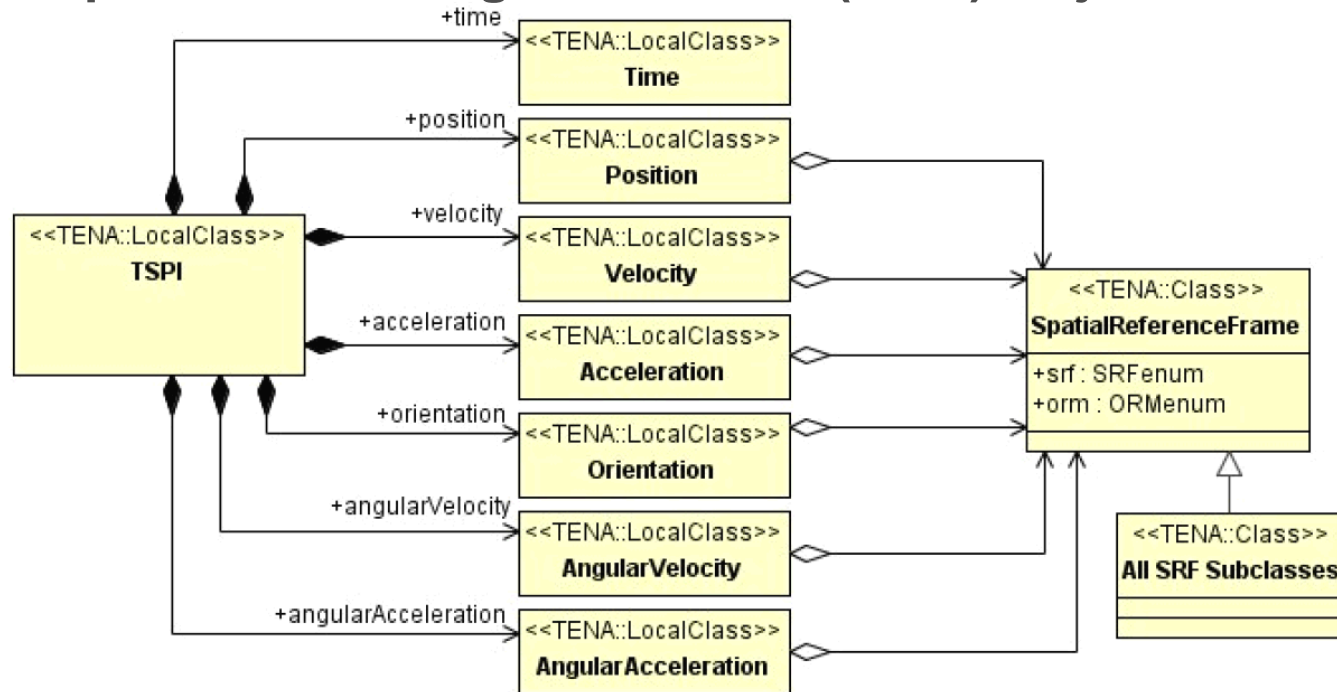
# Talon UGV

- Live system
  - Controlled by OOS
    - Replaced lower level synthetic elements with actual drivers
  - Teleoperated by joystick
- Turret
  - Remote camera
  - Blank firing M-16
- Wireless Networked
  - 802.11



# TENA

- Lightweight communication designed to connect live systems
- Domain specific optimization over traditional interoperability protocols
- Emerging standard for range systems
- Time Space Positioning Information (TSPI) Object Model



# Notional Scenario

## ■ Location

- Kauai Pacific Missile Range Facility (PMRF)

## ■ Entities

- UAV (synthetic from USTB)
- Robotic entity (live on blocks)
- Stryker variant (controlled by crew station)
- Trucks / Targets (synthetic from OOS)
- Human (synthetic from Expedition DI)

## ■ Actions

- The UAV sees a small (3-4) convoy of trucks
- The Stryker moves to and engages the trucks
- The human and robot inspect the damage to the trucks



# Scenario Participants

- **Vigilante UAV**
  - Driven from the USTP
  - In reconnaissance mode
- **Four trucks (targets)**
  - Generated from OOS
  - Convoy driving down road
- **Stryker Vehicle**
  - Driven by the crew station
  - Hybrid electric drive model controls dynamics
  - Attacks convoy
- **UGV**
  - Physical device on blocks
  - Tasked by OOS/Crew Station
  - Inspects convoy after attack by Stryker

# Scenario



# Interoperability Issues

## ■ TENA

- TSPI object model
- Reference version was used

## ■ HLA

- TBD FOM
- Version: RTI-1.3, Matrex version 4.2

## ■ Terrain Data

- Kauai Pacific Missile Range Facility (PMRF) High Res
- The digital raster graphics is at:  
<http://www.hinhp.org/website/hawaii/kauai/data/drg.zip>.
- Shape files and some others are at:  
<http://www.hinhp.org/website/hawaii/kauai/data.html>.

# Results

- **Success!**
  - By the time the show opened everything worked
  - And then extended on the show floor
- **Terrain registration**
  - Common source
  - Control over generation process
- **OOS Modular Communication Interface modification**
  - Modified HLA interface with TENA
- **High Fidelity Engine/Suspension Model**
  - Wrapped in OOS component model
  - Proxy implementation to remote computer
- **Transparent interaction among elements**