

Test & Evaluation in the Virtual World

David R. Pratt, PhD

Robert W. Franceschini, PhD

Science Applications International Corporation (SAIC)

prattda@saic.com

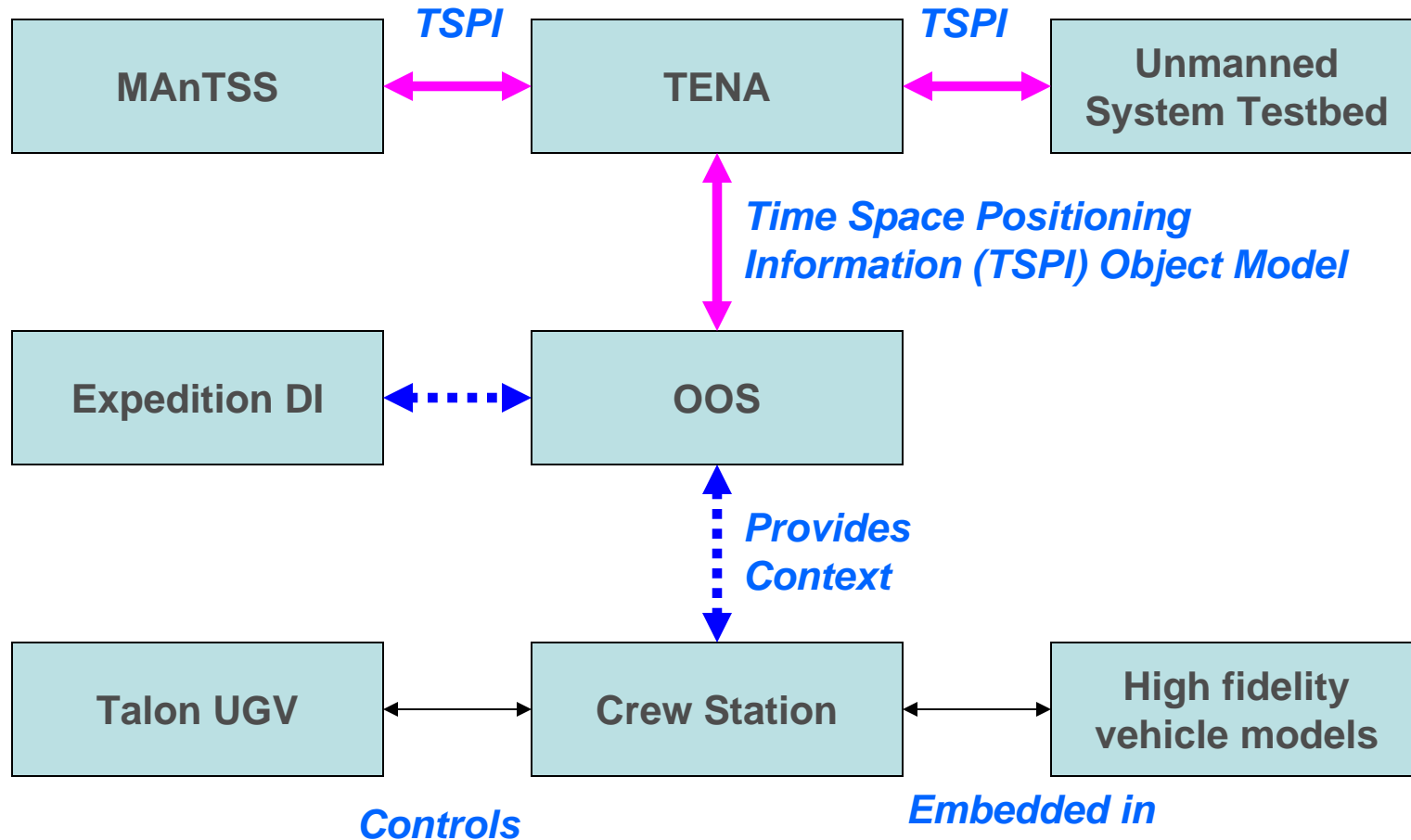
Motivation

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

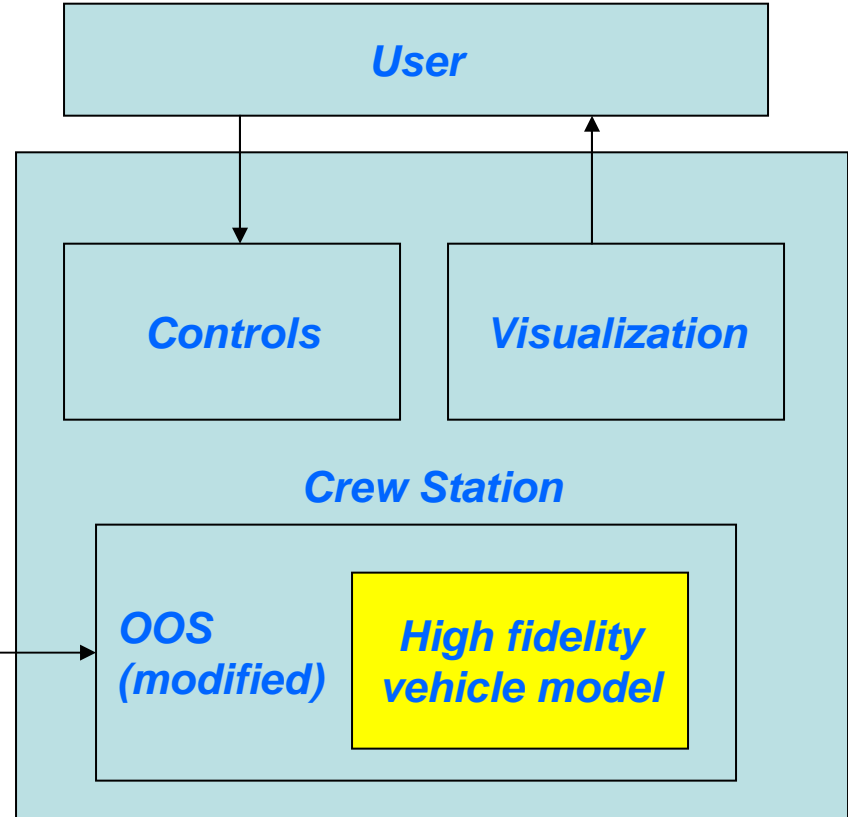
Component Systems

- **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

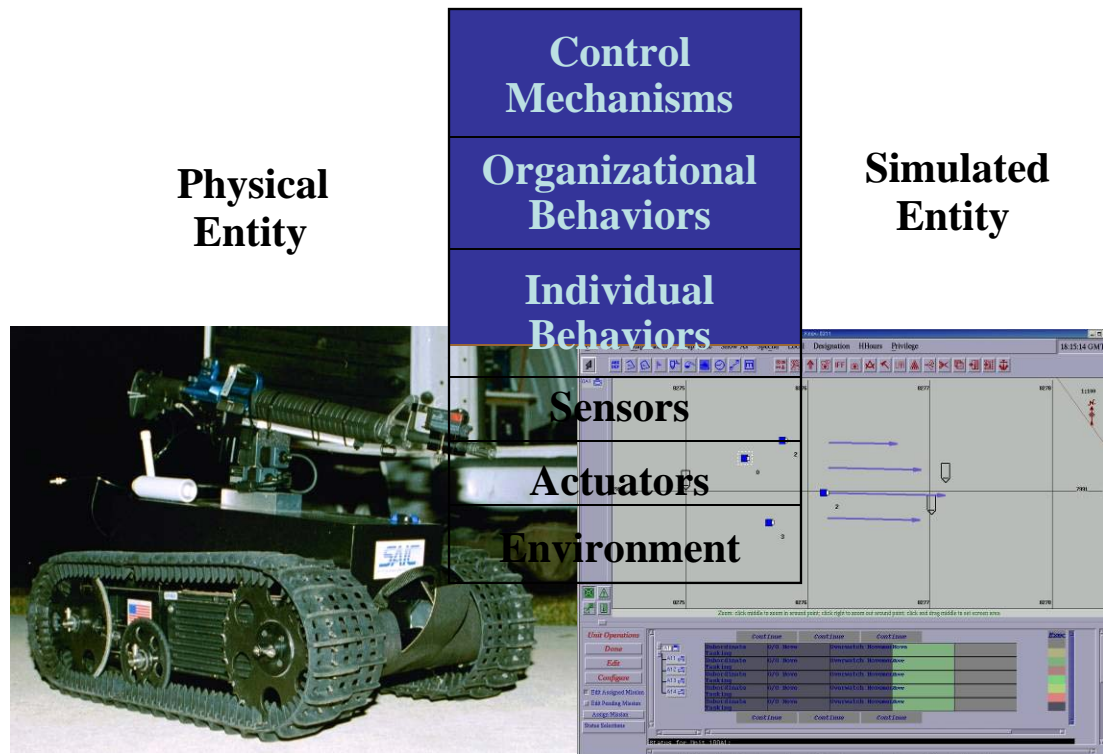


CADET Crew Station



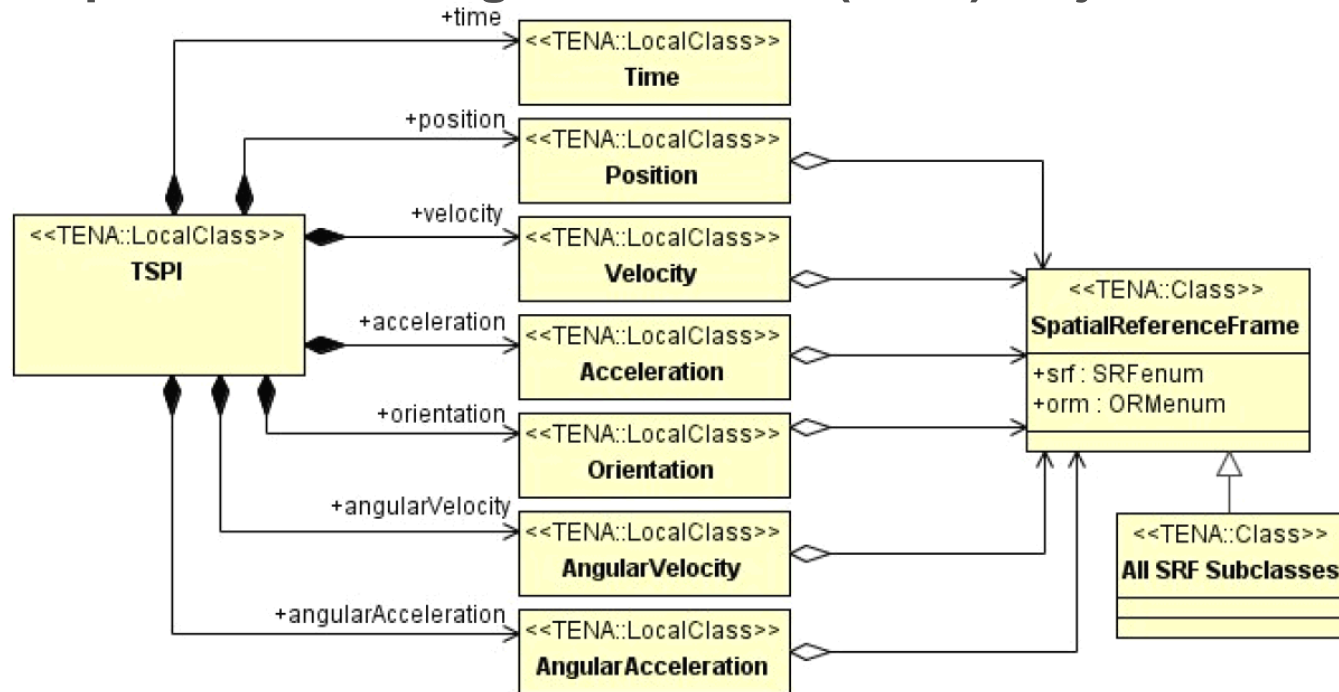
Talon UGV

- 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**