Test & Evaluation in the Virtual World

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Motivation

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

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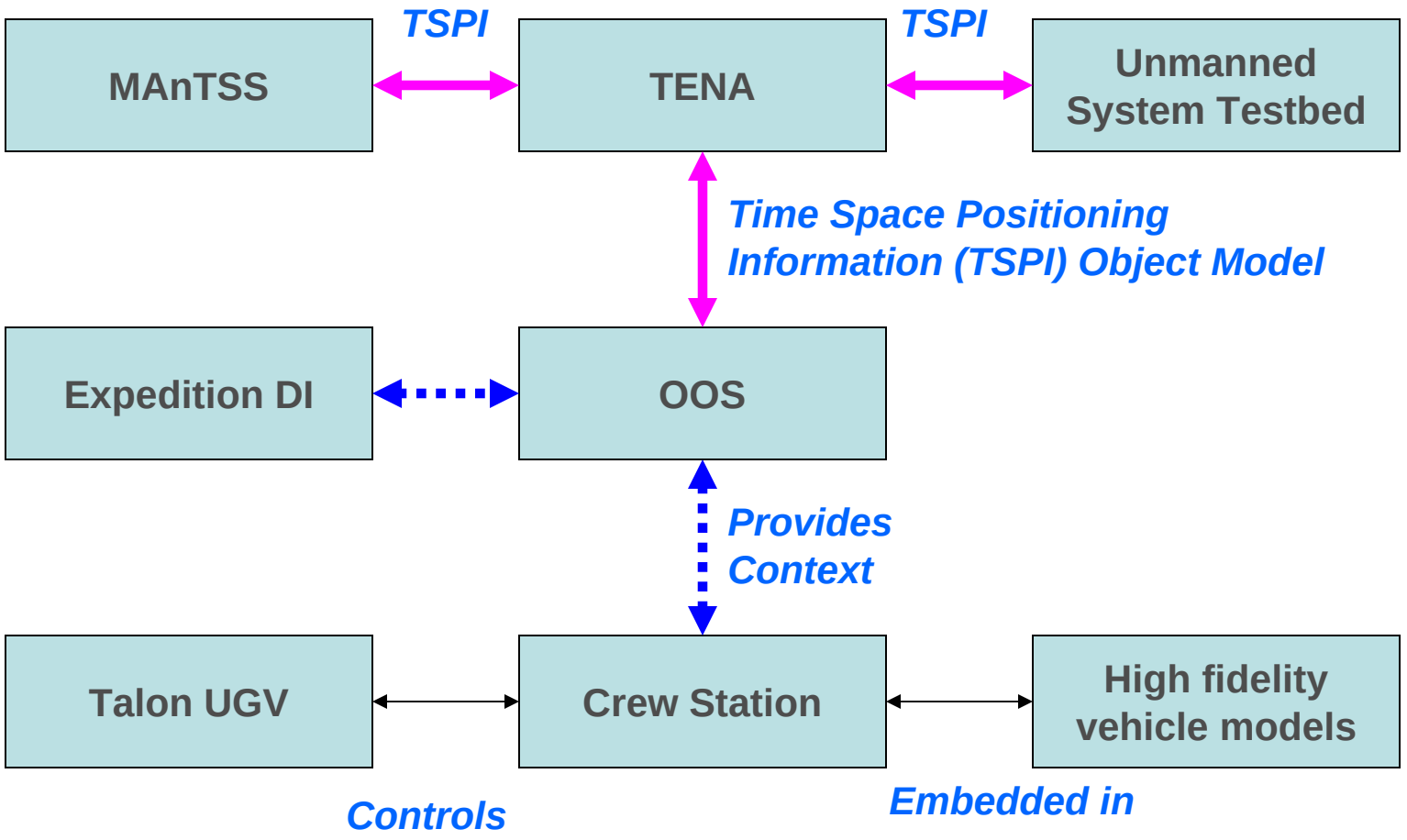
Component Systems

- 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



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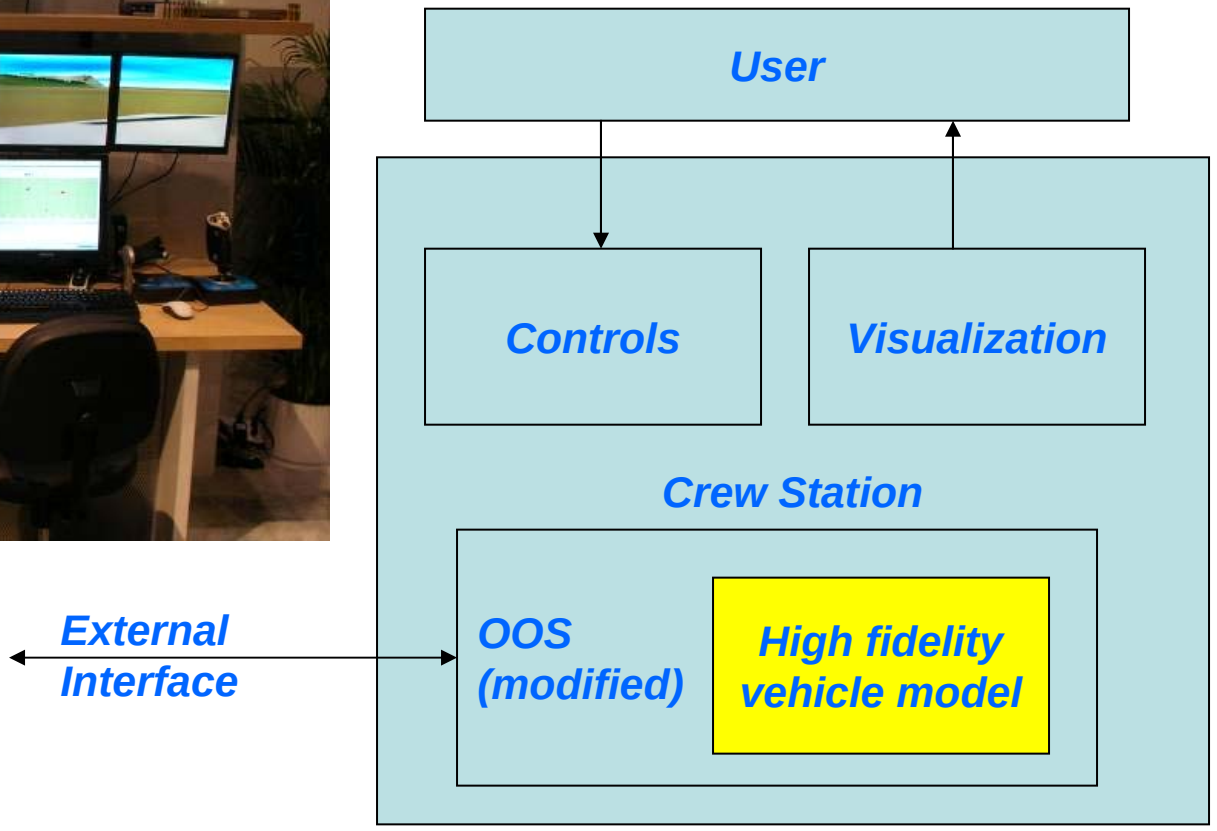
CADET Crew Station



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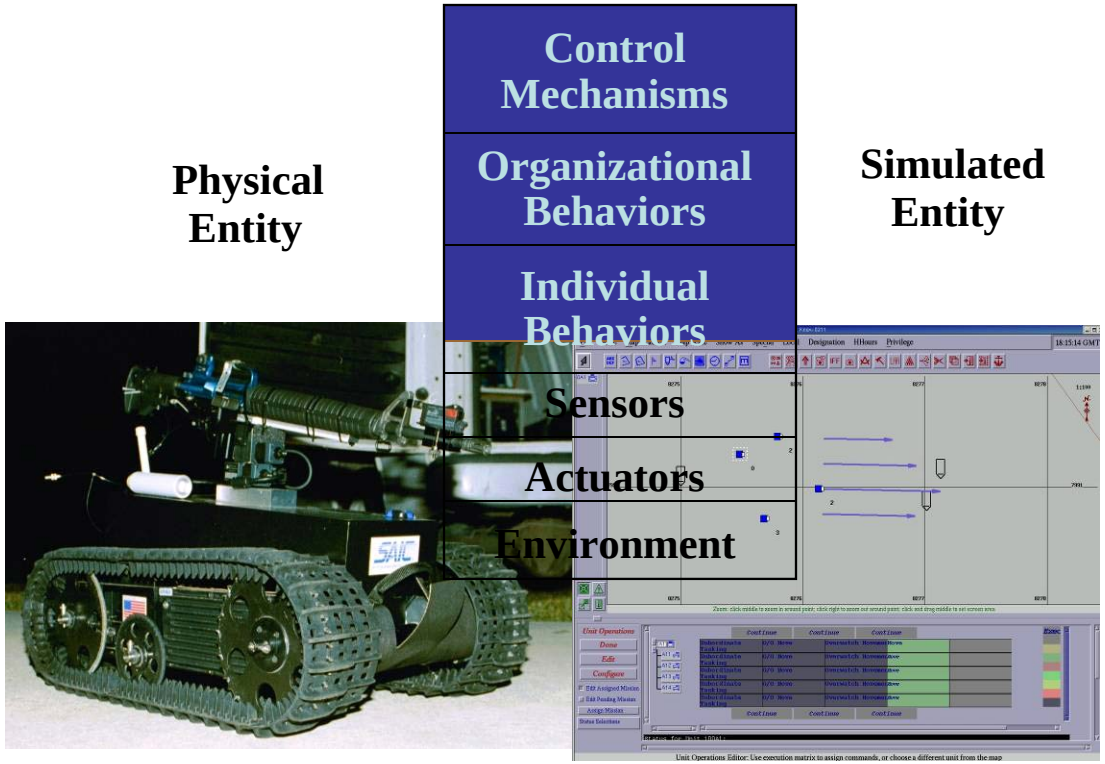
Talon UGV

- 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



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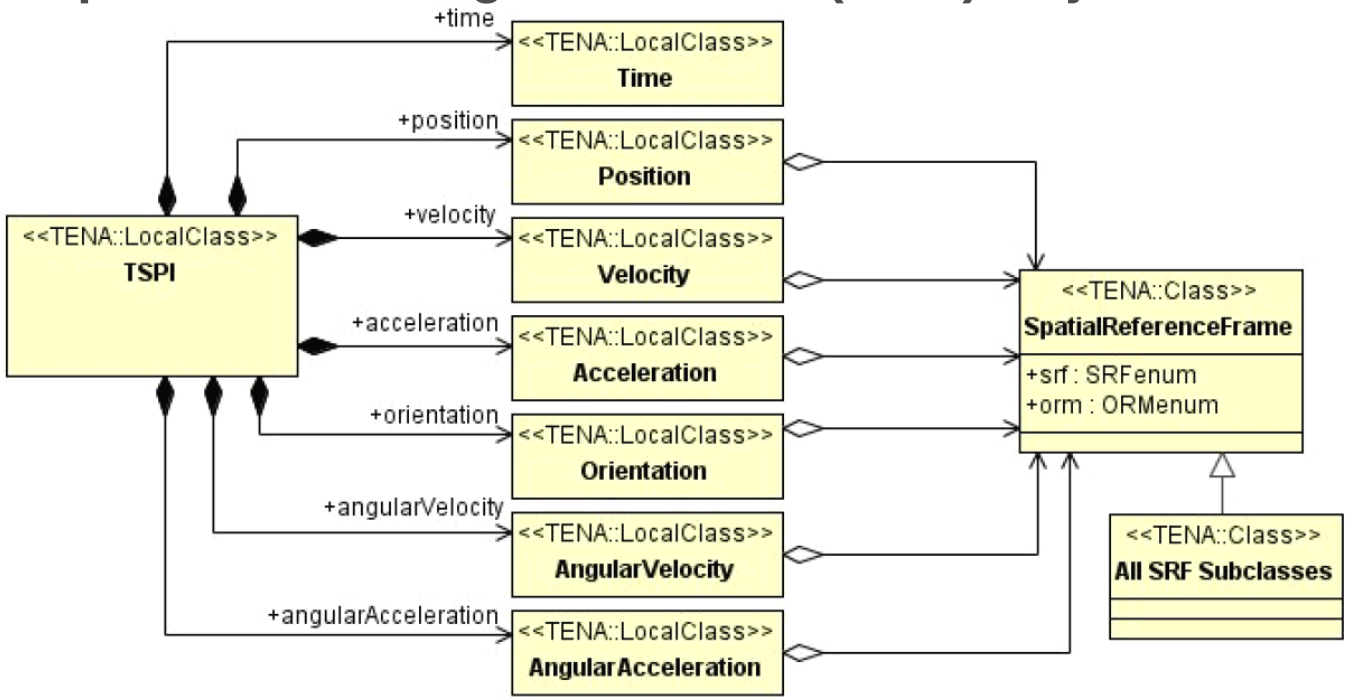
TENA

- 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



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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

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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

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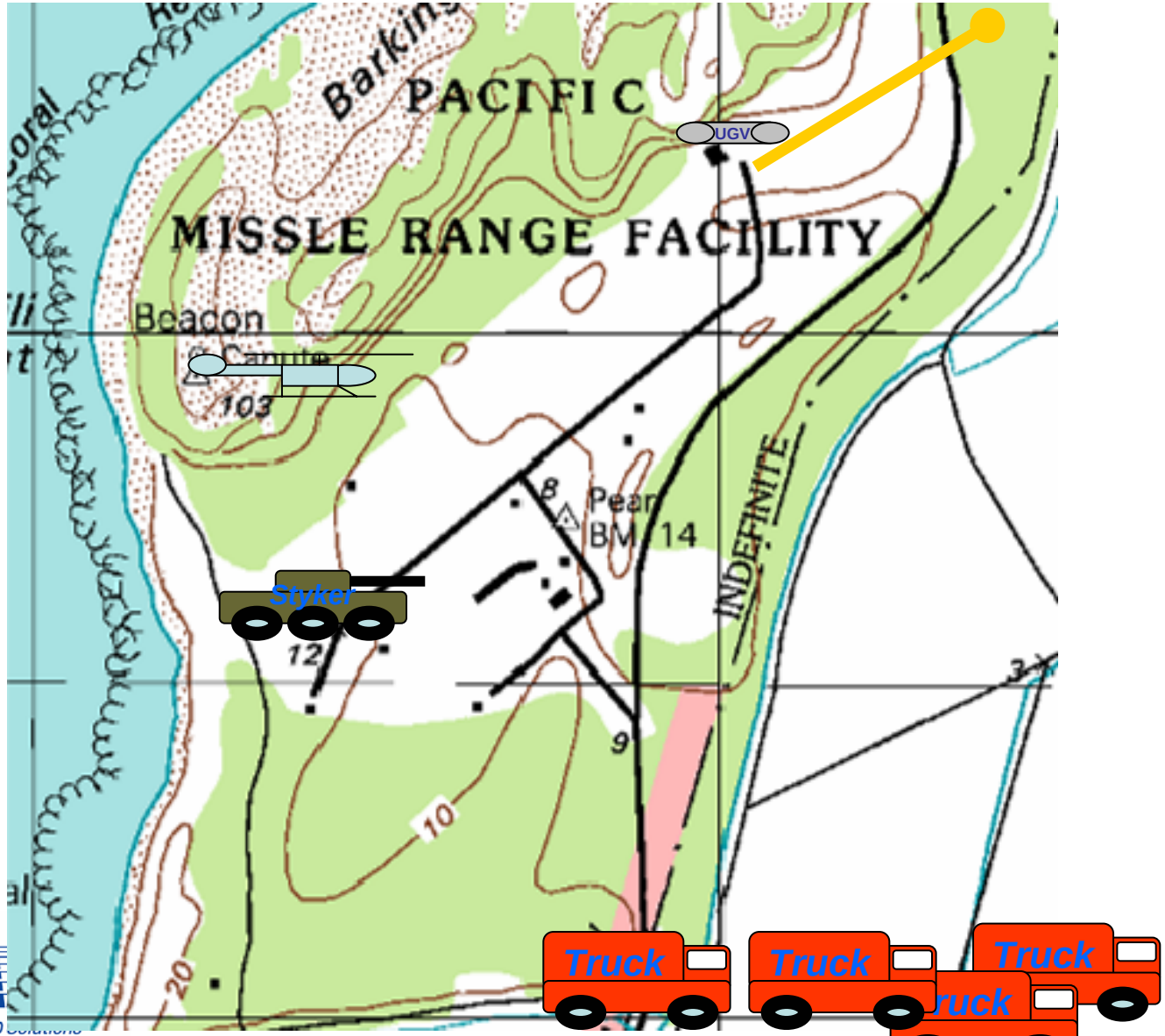
Scenario



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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.

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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

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