Distributed Soldier Representation: M&S Representations of the Human Dimensions of the Soldier

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Purpose/Topics

- Purpose: Provide an update of the Distributed Soldier Representation (DSR) project and initial prototype efforts to apply Effects of Stress (EoS) and Physiological Burden on entities within Simulation Environment(s).
- Topics:
  - DSR Concept & Motivation
  - Initial Steps for soldier Decomposition
  - Soldier Load & Augmented Training Environment (SLATE)
  - DSR EoS Module Development & One Semi-Automated Forces (OneSAF)
    - Impact on Small Arms Accuracy
  - Path Forward & Conclusion

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DSR Motivation

AAR from BLCSE 2013

"Overall using OneSAF in the capacity as we did during this exercise failed to correctly represent the actual combat effectiveness of each unit or entity. No sustainment activities were executed, routes were used only one way, and weather was not considered. Super soldiers who could stand face to face with a Shark-nado shed only tears of joy, needed no rest or sleep, and effectively executed tasks after being in MOPP 4 for the duration of the exercise."

"I did not gain any information or experience that would be useful in my current assignment."

"Bad decisions will be made for the future [redacted] because all the false representations of a smaller force being able to fight effectively. It seems too many people already decided before this exercise started what the outcome would be and will fail to see the real failure of this exercise. Any person in their right mind can see that the information gained in the exercise should not be used for any decision making in future force structuring."

AAR: After Action Review
BLCSE: Battle Lab Collaborative Simulation Environment
MOPP: Mission Oriented Protective Posture
OneSAF: One Semi-Automated Forces

Distributed Soldier Representation (DSR) Concept

- The soldier, as a complex human, is not sufficiently represented in models and simulations
- The Army Research Laboratory, Human Research and Engineering Directorate, Simulation and Training Technology Center (ARL HRED STTC) initiated the Distributed Soldier Representation (DSR) research project to:
  - Investigate those factors that affect soldier effectiveness
  - Identify where there are gaps in modeling those factors in current soldier representations
  - Offer a service-oriented, distributed Modeling and Simulation (M&S) environment able to assist in filling those gaps.
- The DSR long range plan is to provide a capability to represent those human aspects that affect soldier performance with greater fidelity and an increased realism in the representation of the soldier within simulations.

DSR Initial Areas of Interest

- Cognition
- Morale
- Soldier Resilience
- Human Physiology
- Human Psychology
- Unit Cohesion
- Stress
- Unit as a Complex Adaptive System
- Leadership
- Decision Science
- Effects of the soldier as a Family Member

Need to better understand terminology for improved soldier decomposition and proposed encapsulation within a service-oriented architecture

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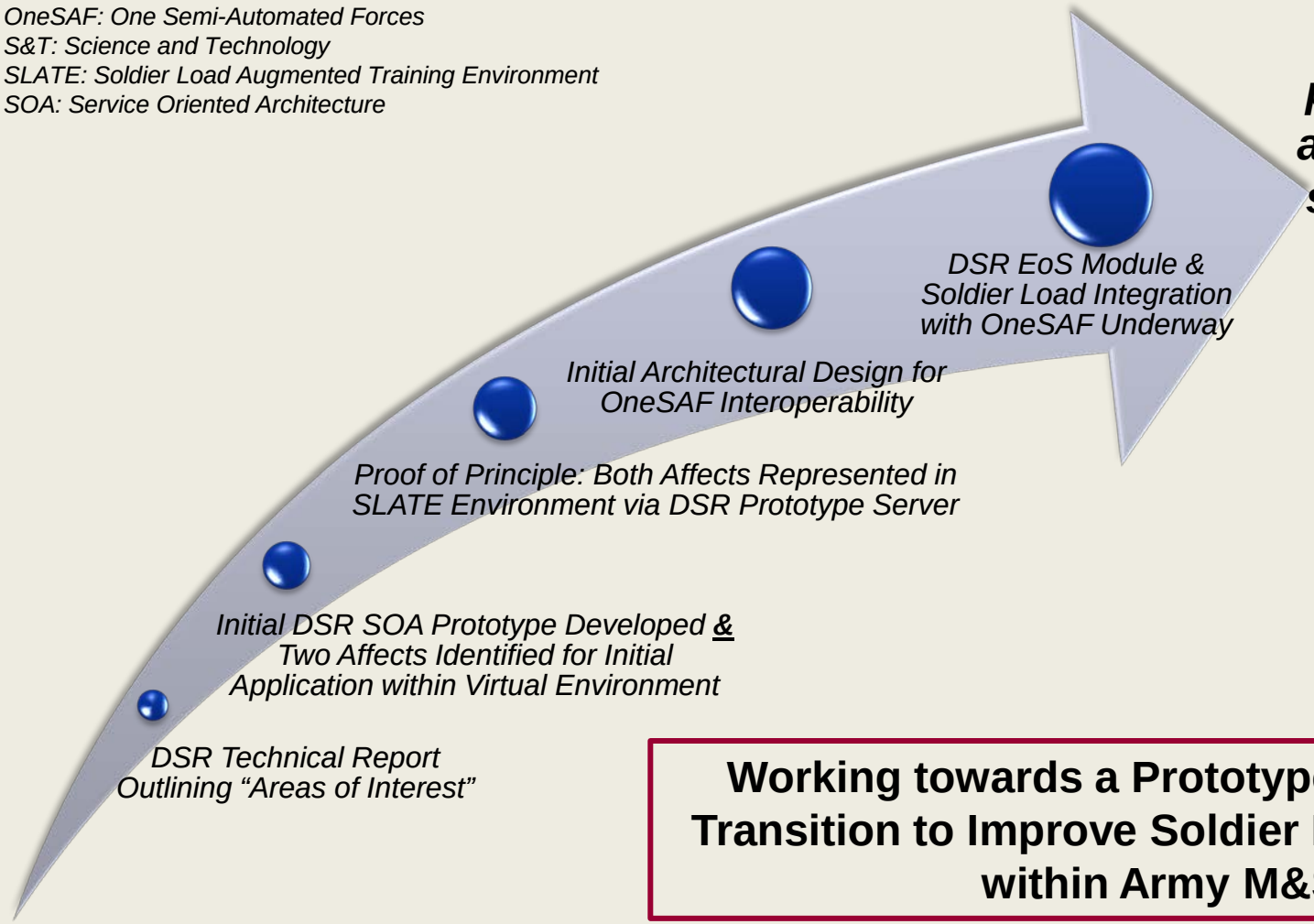
Progress-to-Date

OneSAF: One Semi-Automated Forces
S&T: Science and Technology
SLATE: Soldier Load Augmented Training Environment
SOA: Service Oriented Architecture



Robust S&T portfolio providing models and capabilities to support a diverse simulation set

Working towards a Prototype, Mature and Transition to Improve Soldier Representation within Army M&S

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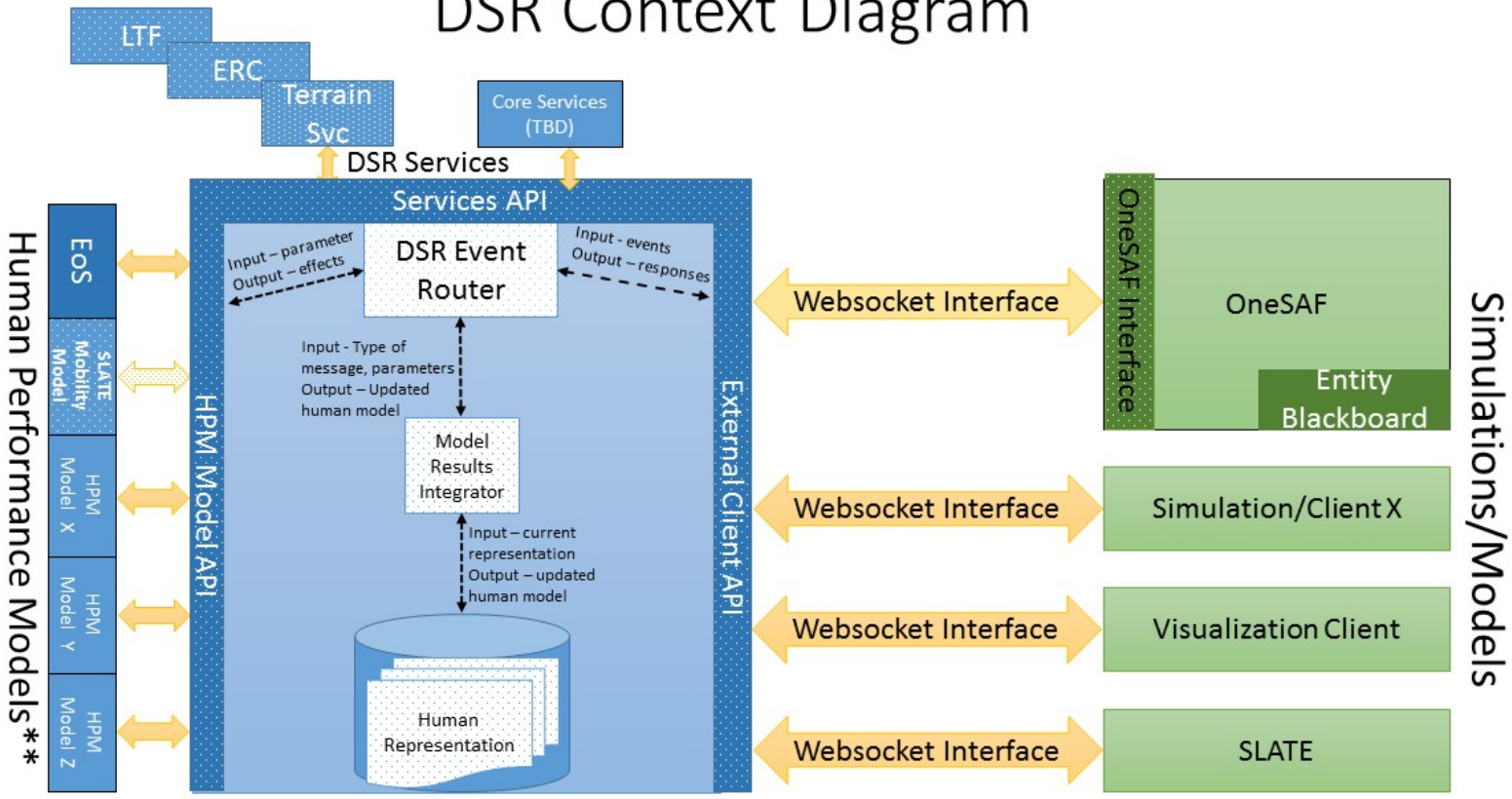
DSR Context Diagram



*Denotes that more than one can be executed simultaneously

**Human Performance Models will represent some aspects of the DSR identified Areas of Interest (AoI) with respects to a Soldier

Dotted areas denote areas where modifications are being made

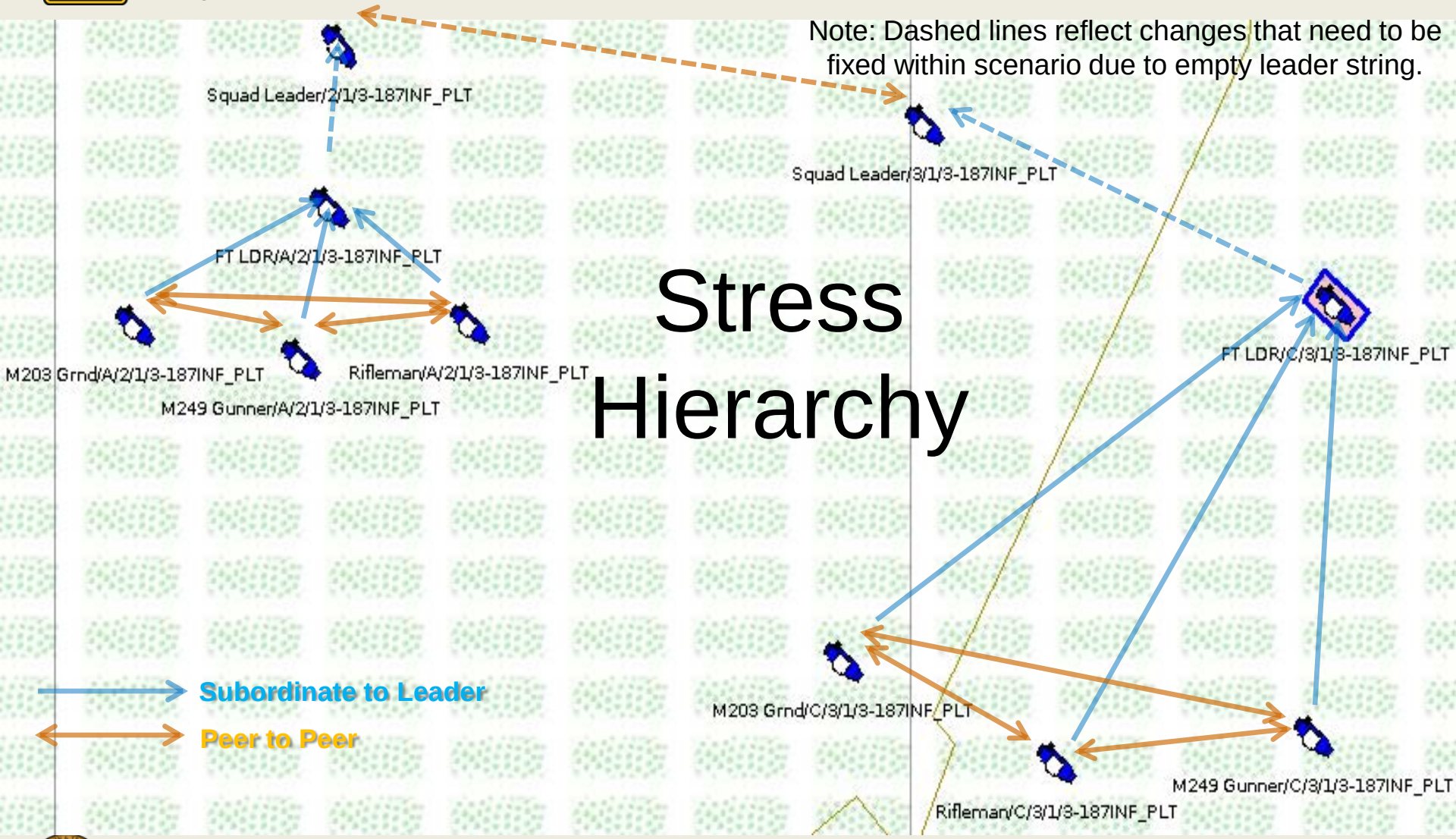
LTF: Layered Terrain Format
ERC: Environmental Runtime Component

EoS First Steps

- During the DSR literature search it was determined that two of the eleven areas of interest (human physiology and stress) seemed mature enough to support the initial DSR prototyping and demonstration effort.
- The DSR Effects of Stress (EoS) Module provides a “proof of concept” application for generating a higher fidelity representation of individual, dismounted soldiers employing small arms (M9, M16, M4, M203, M249 and M2).
- The EoS Module within DSR provides for decreasing levels of soldier small arms accuracy with increasing levels of individual soldier stress.
  - EoS has been integrated with OneSAF via the DSR Sever.
- The Soldier Load Augmented Training Environment (SLATE) physiology model was integrated with DSR Sever for the Inter-service/Industry Training, Simulation, and Education Conference (I/ITSEC) 2014.
  - It is being integrated with OneSAF in FY15.

Hierarchy Stress

Note: Dashed lines reflect changes that need to be fixed within scenario due to empty leader string.



Stress Hierarchy

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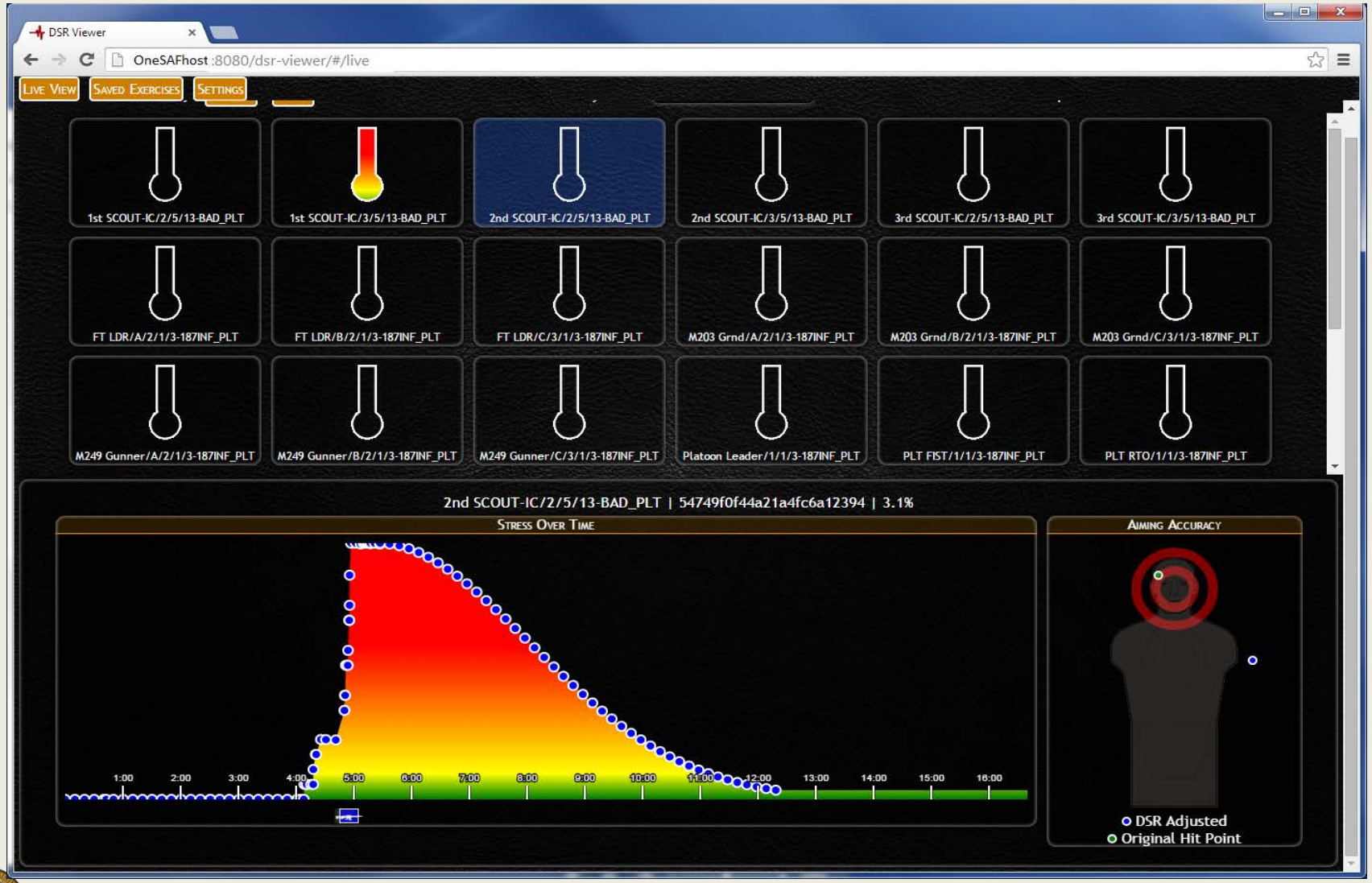
OneSAF DSR View



SFC Paul Ray Smith Simulation & Training Technology Center

NOTE: Notional Data

Data Collected

- Scenarios run 5 times for 10 minutes at variable accuracy modifier settings (0.0m – no stress, 0.1m, 1.0m, 5.0m, and 10m)
- Entities: 38 (19 Blue, 19 Red)

Accuracy Modifier	Average Shots	Average Hits	Average Misses	DSR changes from hit->miss	DSR changes from miss -> hit
0.0m (no stress)	121.8	59.4	62.4	0	0
0.1m	127.2	57.6	69.6	1.6	1
1.0m	122.4	49.4	73	21.2	11.2
5.0m	196.2	24.8	171.4	83	8
10.0m	210	11.8	198.2	97.2	5

NOTE: Notional Data

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Prototype Proof of Principle

Time Step(s): 1 2 3 4 n

Effects of Stress on Small Arms Accuracy

Time Step(s): 1 2 3 4 n

Soldier Load & Physiological Effects

DSR Applies Effects of Stress and Soldier Load to a Virtual Soldier within the Soldier Load Augmented Training Environment (SLATE) Mobile Application

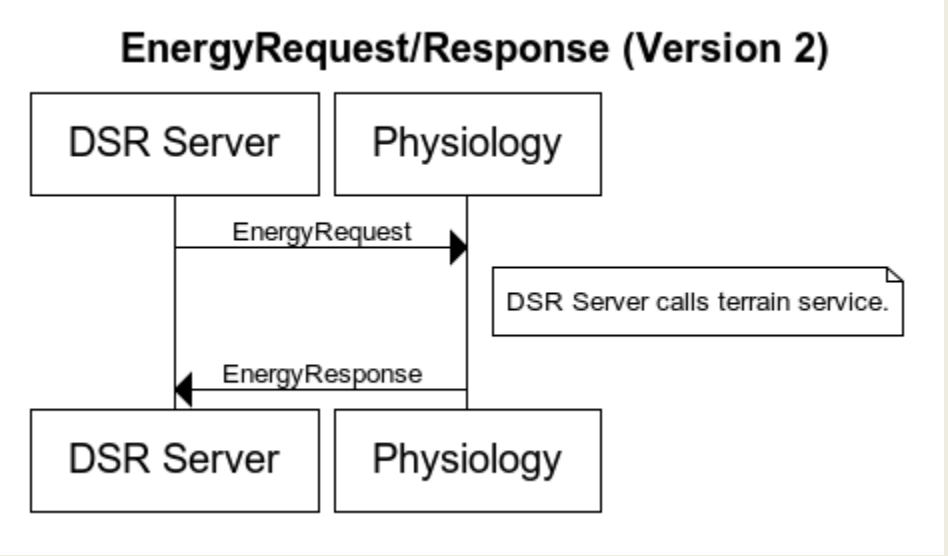
NOTE: Notional Data

SFC Paul

Physiology

Provides energy for soldiers based on their weight, load, posture, health and terrain. Operates in real time based on soldier location and heading.

- This EnergyRequest/Response message is based on the physiology module having access to a terrain service (therefore the calls don't need to be made by the DSR Server to get soil type and elevation values (from a terrain service).



Current Activities

- Coordinating with Army's Soldier Systems Engineering Architecture Science and Technology Objective (SSEA STO)
- Funded and evaluating Academic Year 2014-15 United States Military Academy Cadet Capstone project
- Searching out current research in the 11 areas of interest
  - Discussed fatigue with NTSB
  - Beginning process of updating our Tech Report
- Actively soliciting partners to accurately capture current human performance research and modeling and simulation

In Summary

- The soldier, as a complex human, is not sufficiently represented in models and simulations.
- The DSR long range plan is to provide a capability to represent those human aspects that affect soldier performance with greater fidelity and an increased realism in the representation of the soldier within simulations.
- DSR represents an opportunity to bring human performance research to a community that is currently not benefiting from it.
- ARL HRED STTC is actively soliciting partners to accurately capture current human performance research and modeling and simulation.

Questions/Comments?

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