A Soldier System Engineering Architecture (SSEA) Modeling and Simulation Application

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Purpose/Topics

- Purpose: Provide an information on the Soldier Systems Engineering Architecture Science and Technology Objective (SSEA STO) and its Modeling and Simulation (M&S) activities

- Topics:
    - SSEA Overview
    - SSEA M&S Pillars
    - SSEA Live-Virtual-Constructive (LVC) Desired Capabilities
    - SSEA LVC Available Tools
    - SSEA Use Case and M&S Requirements Traceability
    - Path Forward

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The Problem

- "Historically a non-anthropocentric (human centric) approach has been of scientific concern to United States Army and its researchers since the 18th century."

  ➢ Borden Institute Monograph Series : Load Carriage in Military Operations 2010

- "This concern and Army senior leadership acknowledgement that the Soldier, with their intelligence, flexibility, and adaptability, who ultimately accomplish the Army's missions and function, has spawned numerous official and unofficial recommendations/studies in order to refocus its enterprise to become more human centric."

  ➢ Soldier as a System TRADOC Pamphlet 525-97

- "Among the studies and recommendations of the last 40 plus years a central theme has arose: a system approach is mandatory."

  ➢ Army Science Board: The Objective Force Soldier/Soldier Team Report 2001

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U.S. ARMY **RDECOM** **ARL** **SSEA Overview**

Conduct prototype development activities & research in support of the SSEA Enterprise tradespace capability
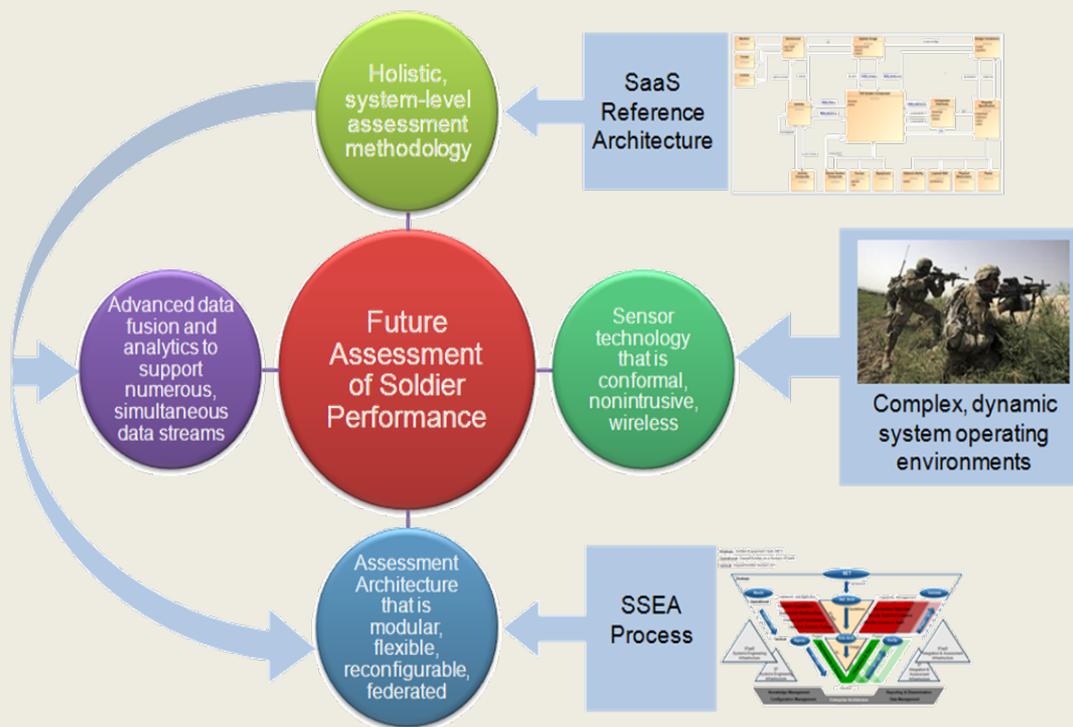
SSEA is an Army Science and Technology Objective (STO) at Natick Soldier Research, Development, and Engineering Center (NSRDEC) with the purpose of creating a principle-based Soldier architecture and framework to <u>enable system level tradeoff analysis</u> and <u>create the foundation for design parameters</u> for next generation soldier systems and subsystems based on human performance capabilities, the full complement of equipment, and mission tasks.

Partners Funded: Army Research Laboratory (ARL), Communications and Electronics Research, Development and Engineering Center (CERDEC), Medical Research and Materiel Command (MRMC)

Collaborators: Army Capabilities Integration Center (ARCIC), Maneuver Center of Excellence (MCOE), Program Executive Office (PEO) Soldier

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Caveats

- SSEA is not a M&S program
- SSEA will use M&S
  - in support of concept exploration
  - to aid in understanding the decomposition of the soldier
  - to support analysis in SSEA projects
- Current soldier M&S does not effectively model the soldier as a complex human being
- M&S will be made available within the SET framework via a Combat Simulation as a Service (CSaaS)

SET Framework

Soldier – Equipment – Task Framework balances human an technical capabilities within Mission context

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SSEA M&S Pillars

M&S Implementation Plan
Establish an Iterative M&S Process in Support of
Enterprise Decision Management Through Evolving, &
Reusable Capability
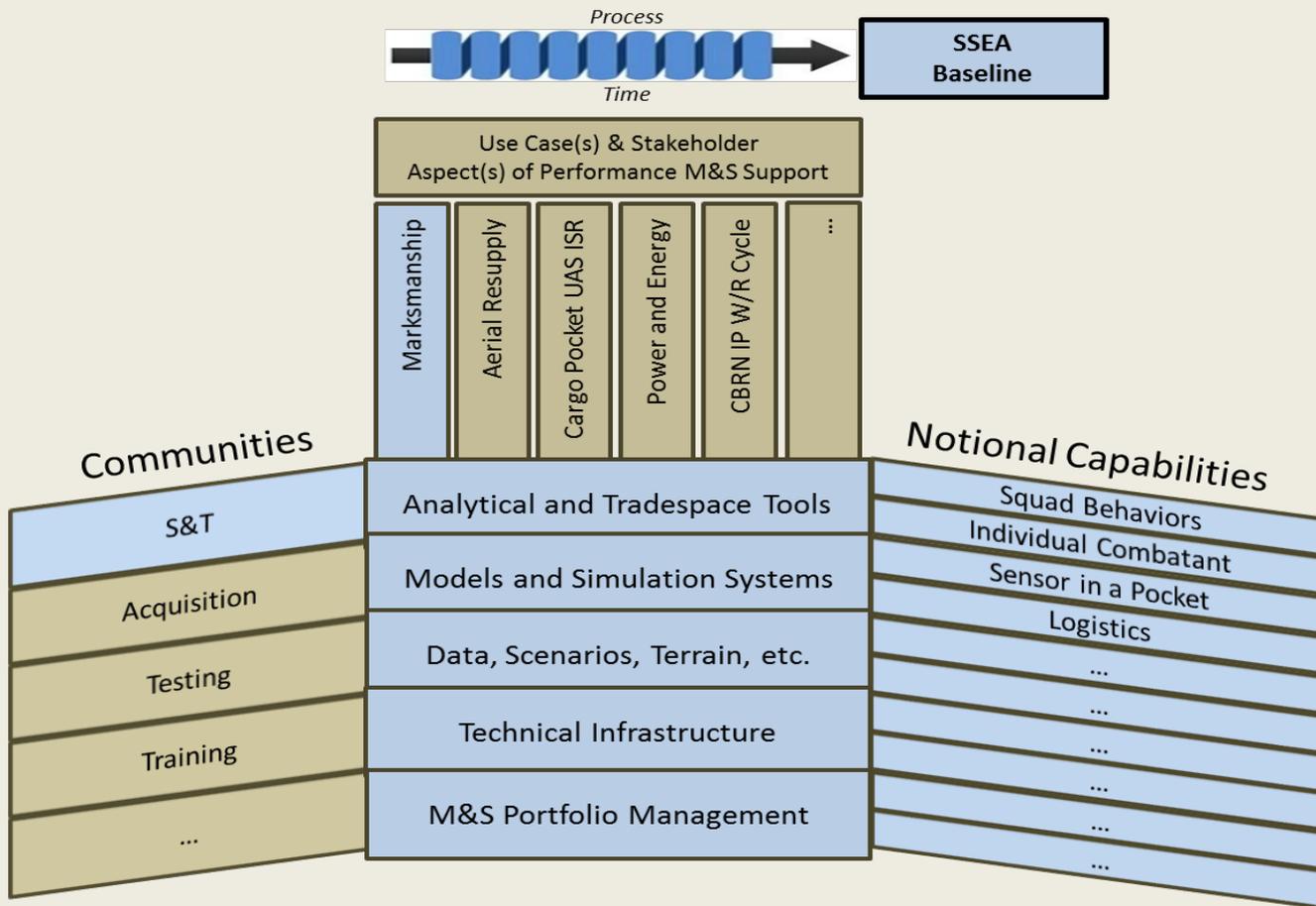
UAS: Unmanned Aircraft System
ISR: Intelligence, Surveillance, Reconnaissance
IP W/R Cycle: Individual Protection Work/Rest Cycle

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SSEA LVC Capability
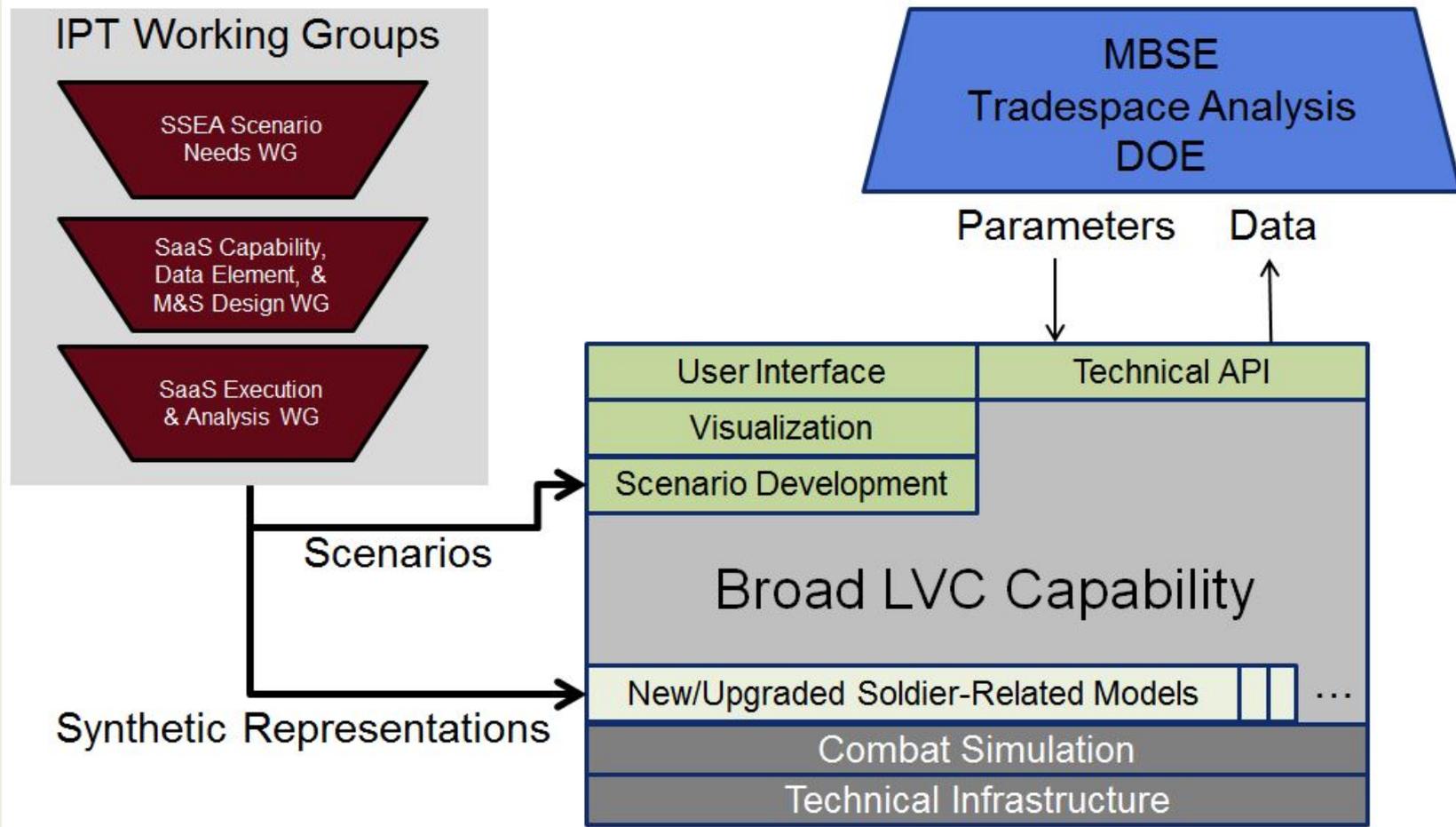
Notional Broad Live, Virtual, and Constructive M&S Capabilities For the Near Term

API: Application Programming Interface
DOE: Design of Experiments
MBSE: Model-Based Systems Engineering
WG: Working Group

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SSEA LVC Tools

IPT Working Groups

- SSEA Scenario Needs WG
- SaaS Capability, Data Element, & M&S Design WG
- SaaS Execution & Analysis WG
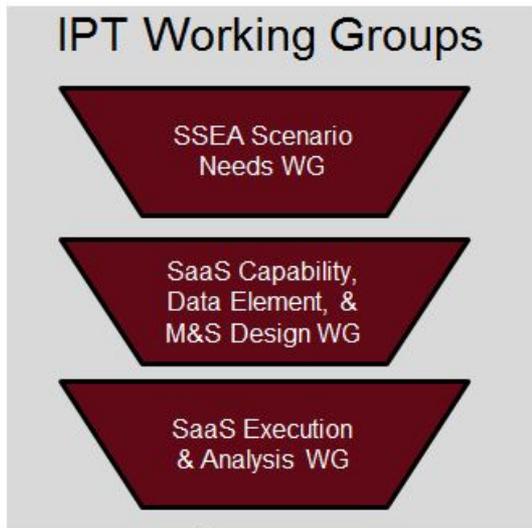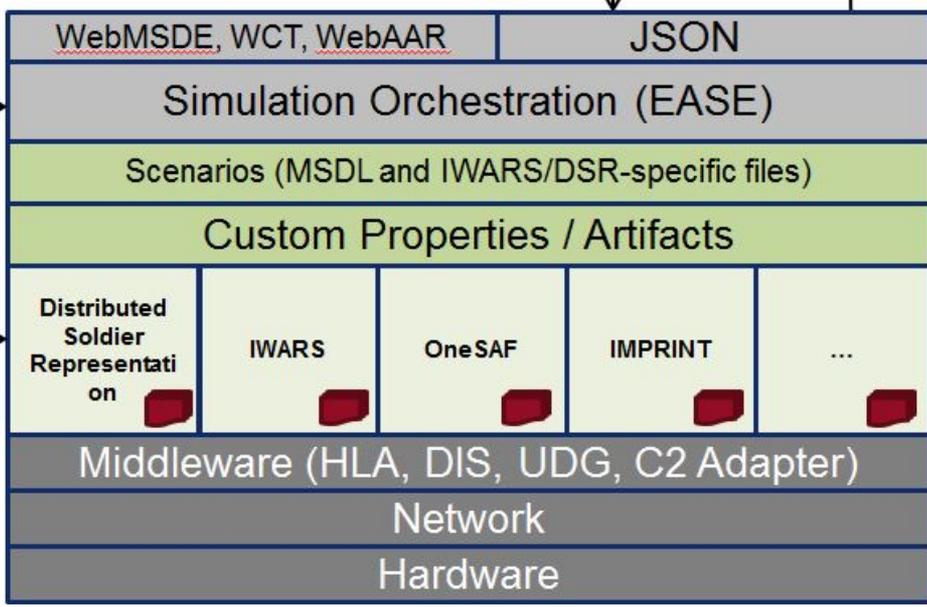
Scenarios

Synthetic Representations

MBSE Tradespace Analysis DOE

Parameters → Data

WebMSDE, WCT, WebAAR	JSON
Simulation Orchestration (EASE)	
Scenarios (MSDL and IWARS/DSR-specific files)	
Custom Properties / Artifacts	

Distributed Soldier Representation	IWARS	OneSAF	IMPRINT	...

Middleware (HLA, DIS, UDG, C2 Adapter)

Network

Hardware

Specific LVC Capabilities Available For the Near Term

C2: Command and Control
DIS: Distributed Interactive Simulation
DSR: Distributed Soldier Representation
EASE: Executable Architecture Systems Engineering
HLA: High-Level Architecture
IMPRINT: Improved Performance Research Integration Tool
IWARS: Infantry Warrior Simulation
JSON: JavaScript Object Notation
OneSAF: One Semi-Automated Forces

UDG: Unit Data Gateway
WCT: Web Control Tool
WebAAR: Web-based After Action Review
WebMSDE: Web-based Military Scenario Development Environment

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SSEA Use Case and M&S Requirements Traceability

SSEA Identified Use Cases

Capability Needs

Needs are gathered, consolidated and correlated into discrete items. These items are linked to HLRs, which are then linked to LLRs. Full traceability from need to technical implementation and back.

High Level Requirements (HLRs)

Low Level Requirements (LLRs)

Need to analyze Soldier load effect on mobility and lethality.
- TPM – MOE – MOP
- WBS alignment
- Conditions
- Scenario

SSEA M&S Framework shall provide individual Soldier modeling and its impact on combat simulation.

MSDE shall … (scenario)
DSR shall … (Soldier)
EASE shall … (framework)
IWARS shall … (simulation)
OneSAF shall … (simulation)

MOE: Measures of Effectiveness
MOP: Measures of Performance
TPM: Technical Performance Measurement
WBS: Work Breakdown Structure

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Path Forward

- An initial set of soldier specific M&S capabilities is scheduled to be available for SSEA users in 2015.

- These capabilities will be exercised for pilot projects chosen by SSEA to improve the processes, systems engineering, technical implementation, and analysis capabilities of SSEA.

- Five STO Exit Criteria Capabilities are currently being developed
  - Soldier as a System Representation
  - Soldier-Centric Reference Architecture
  - Soldier-Centric System Models
  - Requirements, Configuration Management, and Decision Making Capabilities Based on the SET Framework
  - Comprehensive Soldier Assessment Capability

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Questions/Comments?

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