



U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC)



Briefing for the SAS Panel Workshop on SMART Cooperation in Operational Analysis Simulations and Models 13 October 2015

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Purpose and Outline



Purpose: Describe U.S. Army use of operational analysis (OA) simulations.

Outline

- Simulation Types.
- U.S. Army Analytic Agencies.
- TRAC Mission.
- Operational Analysis Simulations.
 - Advanced Warfighting Simulation (AWARS).
 - Combined Arms Analysis Tool for the 21st Century (COMBATXXI).
 - Logistics Battle Command (LBC).
 - One Semi-Automated Forces (OneSAF).
- Sharing M&S.
- Closing.



U.S. Simulation Types



- The U.S. Department of Defense manages models and simulations (M&S) by communities (e.g. Training, Acquisition, Analysis).
- Communities develop and use M&S according to their specific community needs...there are several M&S out there.
- Operational analysis simulations can be *categorized* based upon their *intended use*:

– **Force Level Simulations:** Enables analysis of how changes in capabilities or force structure impact *how well the force accomplishes the mission*.

Joint Operational

Army Operational

– **Functional Level Simulations:** Enables analysis of how *alternative procedures / systems impact* a warfighting function (e.g. intelligence or fires).

System / Process

– **Performance Level Simulations:** Enables *analysis of the performance characteristics* of a specific item of equipment.

Platform / Sub-Component

Physics

U.S. Operations Analysis may use simulations from one or all of the categories.



U.S. Army Analytic Agencies



- RAND:
 - Strategic level analysis.
 - Special topics.
- Center for Army Analysis (CAA):
 - Theater campaign level analysis.
 - Total Army Analysis.
- TRADOC Analysis Center (TRAC):
 - Tactical and operational level analysis.
 - Analysis of alternatives.
- Army Material System Analysis Activity (AMSAA):
 - System / item performance level analysis.
 - Technology assessments.

**Where we will focus
this OA Simulation brief**



TRAC Mission



TRAC's mission is to produce relevant and credible **operations analysis** *to inform decisions*.

TRAC Mission Essential Tasks

- Conduct **studies** that inform key decisions made by TRADOC, Army, and Joint leaders.
- Lead analysis of **current operations**.
- Develop and maintain the **scenarios** to underpin Army concepts & requirements.
- Develop, configuration manage and apply verified and validated **models and simulations** (M&S).
- Research, develop, and share **new analytic methods** and modeling.

Our number one shareholder is the US Army Soldier!



Types of TRAC M&S



TRAC is responsible for OA Simulations *at the tactical and operational* levels for the Army...but they are de facto standards in the U.S. Department of Defense.

- **Force-on-force, constructive simulations** investigate operational and tactical warfighting.
 - Represents Soldier up to Division / Corps.
 - Models in detail complex lethal (“kinetic”) operations.
 - Includes network, precision fires, sensors, unmanned systems, logistics.
- **Concept of support simulation** examines sustainment issues.
 - Focuses on maintenance, reliability, and maintainability modules.
 - Links dynamic sustainment operations to situational awareness.
- Increasing use of **scheduling and goal programming tools** to evaluate capability “mixes” and investment options.
 - Determines satisfaction of mission demands within constraints.
 - Informs by-year investment strategies subject to funding profiles.

TRAC researches and develops its simulations *in-house*.

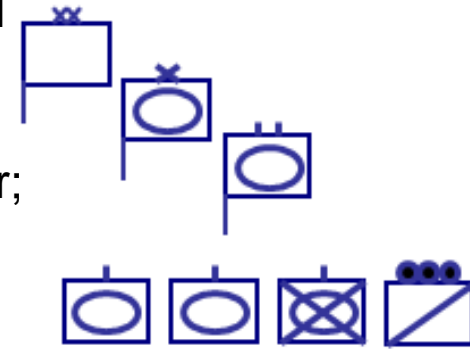


UNCLASSIFIED AWARS Description



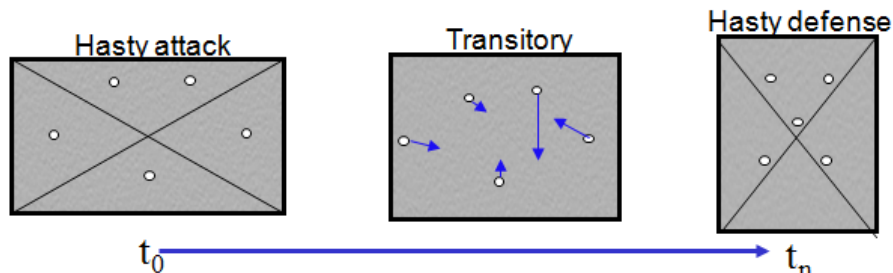
Advanced Warfighting Simulation (AWARS)

- Constructive, deterministic simulation representing combined arms warfare from Brigade to Division/Corps level with Joint considerations.
- Resolution down to Battalion/Company/Platoon for maneuver; lower for special units.
- Simulation normally operated closed-loop; but can be used HITL* to support operational plan (OPLAN) development.
- Perceptions influence command decisions and plan execution.
- Units represented geometrically as rectangles with quadrants representing front, flank, and rear (template).
- Subunit methodology enables:
 - Dynamic unit formation changes based on operational activity.
 - Implied one level lower unit representation.



Key Functionality

Joint Sensors
 Fixed Wing
 Rotary Wing
 Communications
 Direct/Indirect Fires
 Amphibious Opns
 Dismounted Opns
 Sustainment
 Maintenance



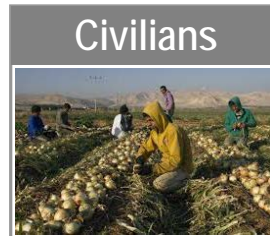
*HITL – Human In the Loop

COMBATXXI Description



Combined Arms Analysis Tool for the 21st Century (COMBATXXI)

- Constructive, stochastic simulation representing land and amphibious warfare focused on tactical combat and operations from Soldier to Brigade.
- Uses sophisticated behaviors to exploit information shared over the network.
- Represents a highly resolved physical operating environment to include urban and complex terrain.
- Dynamically models individual combatants, noncombatants, and insurgents (as friends, foes, neutrals; even switching from neutral to hostile and back).
- Includes individual air/water/ground platforms; each entity keeps its own state, independent of all others.



No other analytical tool provides this high fidelity, physics based, behavior driven environment.

Key Functionality

Joint Sensors
Fixed Wing
Rotary Wing
Communications
Direct/Indirect Fires
Amphibious Opns
Dismounted Opns



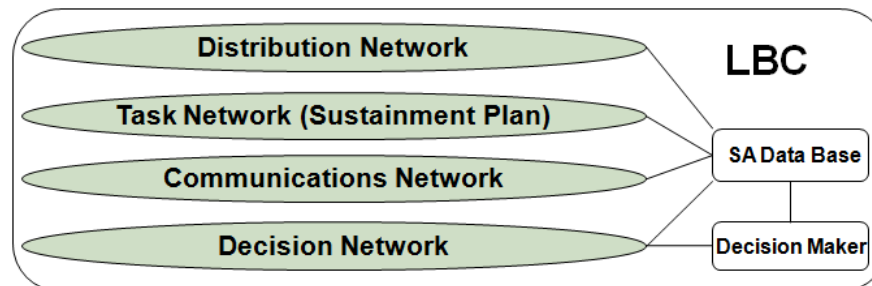
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LBC Description



Logistics Battle Command (LBC)

- Constructive, stochastic simulation representing logistics concept of support.
- Scalable to represent Brigade and below or Corps / Division level scenarios to the sustainment platform/entity level.
- Represents transportation networks, sustainment planning, and rudimentary communications.
- Leverages a flexible input format (Excel spreadsheets or a Graphical Users Interface (GUI)).
- Represents both reliability and maintainability used to analyze maintenance operations (reliability, operational availability, maintenance man-hours).
- Discrete event simulation, implemented as a layered architecture.





OneSAF Description



One Semi-Automated Forces (OneSAF)

- Constructive, stochastic simulation that is a current generation Human-in-the-Loop (HITL) simulation supported by semi-automated forces (SAF) operations.
- Driven by HITL, operational plan, tactics, techniques, and procedures (TTP), and integrated rules sets.
- Provides a full range of operations and systems and the methods to control them.
- Supports modeling from an entity up to echelons above Brigade (resource dependent).
- Represents dynamic environmental conditions (e.g., terrain, variable light conditions).
- Provides optional tools to support closed-form execution.
- Includes representation of maneuver, indirect fire, reconnaissance and surveillance, aviation, air defense, sustainment and maneuver support, and communications.

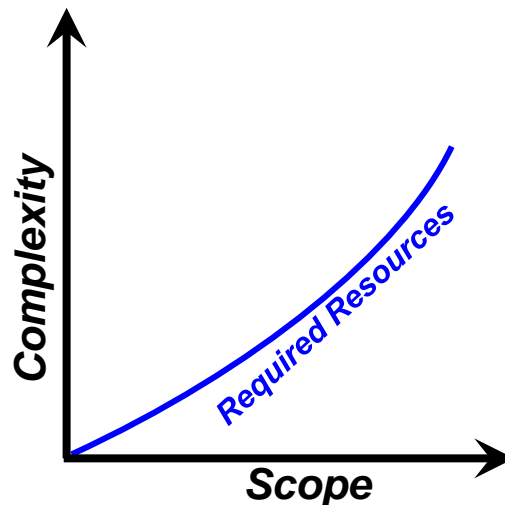
OneSAF provides a HITL tool capable of relatively quick turn-around from scenario development to analysis.



Maintaining an M&S Capability



- Regardless of size, resolution, scope, and purpose, all modeling and simulation requires specific expertise:
 - Technical development.
 - Wargaming / scenario integration.
 - Data support.
 - Configuration management.
 - Military doctrine, tactics, techniques, and procedures.
 - Information technology.
- Greater complexity, fidelity, and scope increases personnel and technology infrastructure required to develop, maintain, and operate M&S.





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Sharing M&S



- Potential barriers to fully sharing M&S:
 - Respective national and organizational laws, policies and regulations governing the release of M&S.
 - Software language differences.
 - Differing requirements for the employment of military forces, specifically tactics, techniques, and procedures.
 - Information classification.

- Potential areas of promise:
 - Mutual M&S support.
 - Algorithmic solutions to specific representation challenges.
 - Group brainstorming on new methodologies.
 - Data sources.

It is considered best practice to initiate requests for M&S through the US Foreign Military Sales office.



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Closing



- TRAC has a long history in analytical simulations development, use, and collaboration.
- U.S. analytic agencies have more than one simulation to meet requirements (no one system does everything).
- Lessons learned from previous collaborations include:
 - Collaboration requires commitment and comes with a cost (e.g. time, resources, infrastructure).
 - Each agency's or country's needs will always come first unless there is a team dedicated to provide support services.
 - There is a learning curve. Depending on the complexity of the simulation it could be as much as a year before a user is fully trained.