**Geospatial Battle Management Language (geoBML)**

A Geo-environmental Information Response to Net-Centric and Distributed Operations

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**Objective of Geo-environmental Information**

To increase the agility of Battle Command and the Military Decision Making Process (MDMP) ... through the effective characterization and application of geo-environmental data, information and knowledge ... across the greatest extent of the force ... addressing the full spectrum of employment

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**Current Force** & **Future Force**
Motivation for a geoBML

- Stove-piped geospatial and environmental data was not integrated across Battle Command enclaves
  - Maps became the dated wallpaper for the Common Operating Picture
    - Atrophy of integrated, common doctrinal geospatial concepts and lexicon
  - How do we reach our customers …. Re-invigorate relevance

- Belief … that geo-environmental information should be an integral component of Battle Command and MDMP
  - Fundamental enabler or constraint in military operations
  - Army Technology Objective … common decision tools and information

- Emergence of Net-Centric concepts
  - Distributed decision making … need for a unifying context and meaning for all information types to be shared
  - System of Systems use in Battle Command requires a common semantic foundation, shared and represented for both the soldier and the system to ensure effective interoperability
**Geo-environmental Information Role:**
Military Decision Making Process (MDMP)

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
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<tbody>
<tr>
<td><strong>Mission</strong> received from higher HQ or deduced by commander/staff</td>
<td>Cdr’s initial guidance</td>
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<tr>
<td>Higher HQ order/plan/IPB</td>
<td>Warning order 1</td>
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<td>Staff estimates</td>
<td>Initial IPB products</td>
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<tr>
<td>Facts &amp; Assumptions</td>
<td>Restated mission</td>
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<tr>
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<td>Cdr’s guidance</td>
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<tr>
<td>Cdr’s intent</td>
<td>Staff products</td>
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<td>Staff estimates &amp; products</td>
<td>Battlefield framework</td>
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<td>Enemy COAs</td>
<td>Preliminary movement</td>
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<tr>
<td>COA statements / sketches</td>
<td>COA statements and sketches</td>
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<tr>
<td>Staff COAs</td>
<td>War game results</td>
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<td>War game results</td>
<td>Task organization</td>
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<td>Establish criteria</td>
<td>Mission to subordinate units</td>
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<td>Decision matrix</td>
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<td>Approved COA</td>
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<td>- CCIR</td>
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<td>- Warning Order 3</td>
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<td>High pay-off target list</td>
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<td>OPLAN/OPORD/FRAGO</td>
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**Commander’s intent - Mission, Enemy, Terrain, Troops, Time & Civil (METT-TC)**

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**Network Centric Challenges**
(Design Constraints)

Potential value of a Net-centric force is theoretically $N^2$

- Metcalf’s Law

  *So the bigger the force the better my situational awareness …..right?*

- There are some assumptions that must be met

  1. **There is real potential in all transactions**
     - Geo-information product has utility to the functional MDMP processes of the recipient ……. automated systems and soldiers

  2. **All interactions have positive value**
     - As a function of value: Knowledge > Information > Data
     - Maximize OHIO / information should be “ready to use”

  3. **N-way interactions create the most value**
     - Design geo-information product utility for the broadest set of Battlefield Functional Areas (BFAs), their systems and processes

  4. **There will be both dense and sparse islands of interaction**
     - Design for varying organizational topologies

Derived from: “Network Centric Warfare, Developing and Leveraging Information Superiority”
Alberts, Garstka and Stein, 1999
geoBML is an Unambiguous Language

- Both domain specific and cross-cutting
- Defined by the role of actionable geo-information in the C2

Provides Unification...across

- Doctrine and terms
  - Explicit vocabulary and grammar
  - Specific context mapped to operations, missions and tasks
- Explicit Representation
  - Consistent extension to JC3IEDM
    - Standard framework / exchange model
  - Computational structure
  - Both necessary and sufficient for shared, common understanding
- Protocols
  - Explicit structure for transmission / sharing

Interoperability

(geospatial Battle Management Language (geoBML))

Architectural Framework

(Terrain and Weather)
Tier 1 Information Products

- 1st principle qualities or military value of terrain and weather effects on military operations
  - Value or use is independent of mission
  - Information Products
    - OCOKA – Natural Obstacles, Cover and Concealment, Observation, Key terrain Maneuver Networks
    - Weather impacts on mobility and sensor performance
  - Tier 1 reflects Gigabytes of data and analysis transformed into a few Megabytes of information
    - Still too large for JC3IEDM
    - Reference Tier 1 in JC3IEDM

Tier 2 Information Products

- Products suitable for a specific unit/force type/echelon or multiple force types to perform well defined military tasks or actions consistent with a mission or objective
  - Value or use based upon mission or objective
  - Information Products
    - OCOKA – Avenues of Approach
    - Routes / Axis of Advance
    - Battle, Attack, Assault and Attack by Fire and Indirect Fire Positions
    - Assembly and Engagement Areas
  - Tier 2 reflects Megabytes
    - Analyzing JC3IEDM impact
Tier 3 Information Products

- Products suitable for a specific unit/force type/echelon or multiple force types to perform well defined military tasks or actions specific to a mission or objective and refined by the current situation
  - Use based upon known and predicted situation
  - Information Products
    - Specific products selected as part of the OPLAN and OPORD
  - Tier 3 reflects Kilobytes
    - Analyzing JC3IEDM impact

Geo-Environmental Products (geoBML Use and Findings Regarding the JC3IEDM)

- geoBML Leverages the core semantics of JC3IEDM
- Comprehensive …
  - Geospatial elements are basic
    - Information and Geometry
  - Very well documented
    - Tables and Attribution
    - Relationships
- Allows for domain extension
  - geoBML
  - Empowered by a robust grammar
- geoBML experience
  - Initial Approach: Reference/map Tier geo-products from JC3IEDM to a Enterprise geo-database
  - For OPLANS and OPORDs: minimal set of extensions required within the JC3IEDM
Demonstration Architecture
(June 2006)

Web Service Interface

- Commanders Support Environment
- Battlespace Terrain Reasoning & Analysis System
- geoBML C2IEDM
- BML GUI
- Tasks Graphics Units
- OTB
- Route Planner

JBML Service Architecture
(FY08 Incorporation of geoBML)

- Web Service Exchange Interface
- BML Domain-Configured Service
- BML Base Service
- BML Common Data Access Software
- Geospatial Domain Knowledge
- JC3IEDM Domain Specific Extensions
- JC3IEDM Database
- Non-JC3IEDM Geospatial Databases
- Reference Implementation middleware common to all BML domains

- fully defines domain language
- 1 WSDL
- 2 XML/WSDL
- 3 XSD
- 4 API
- 5 XML/WSDL
- 6 API
- 7 SQL
**Reference Implementation**
(Distributed Battle Command and Experimentation)

Fall 2007

**BC System**
- BML & JC3IEDM
- CJMTK

**Bde Terrain Analysis Cell w/ Geo-Spatial DB**
(DTSS / BTRA and CJMTK)

Fall 2008

**BC System**
- BML & JC3IEDM
- CJMTK

**M&S** (Joint/Coalition)

**geoBML Way Ahead**

**C2 Services Layer**

**GIS Services Layer**

**M&S Services Layer**

**GeoSpatial**
Summary

• Way Ahead
  – GeoBML Technical Partnerships Forming
    • ERDC, ESRI, GMU, Systematic, Inc. and MÄK Technologies
    • geoBML becoming a standard TEC/ERDC business process
  – Current geoBML partners are not interested in being the sole source of the capability
    • Open invitation to interested parties
  – New domains emerging where we hope to infuse geoBML
    • Joint BML (Air and Naval (USMC))
    • Coalition BML (MSG-048)
    • Logistics (ERDC)
  – Experimentation addressing JC3IEDM content, exchange efficiencies
    • Task based architectural options: Products – Tiers vs Imagery-based

• Making it Real
  – How do we move forward: US Army, JFCOM, DISA or MIP
  – Single process or multiple threads …. One time or increments

BML Conference

Battle Management: Interoperability for C2,
Simulation and Geospatial Services

Date: October 16-17, 2007

Location: GMU Prince William
Campus, Manassas

Sponsored by:
  • US Army Engineer Research and Development Center
  • George Mason C4I Center
  • ESRI
  • MÄK Technologies
  • Systematic Software Engineering, Inc.