Adding Reports to Coalition Battle Management Language for NATO MSG-048

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09E-SIW-003
Presentation Overview

• C2 – Simulation Interoperability
• Background: BML and MSG-048
• Demonstration Overview
• National Contributions
  • Germany
  • France
  • Netherlands
  • Norway
  • UK
  • USA
• Experimentation Plans
• Conclusions
C2 – Simulation Interoperability

• Command and control – simulation is a long-time goal
  • Enable simulation in C2 for operations
  • Enable simulation in C2 for mission rehearsal
  • More realistic training using operational C2 system
  • Reduce cost of training by reducing support staff
• Individual systems have been interconnected but no standard way to interoperate exists
  • Battle Management Language (BML) aims to provide the capability
• A sequence of US projects has moved toward a standardized BML
  • Army BML – XBML – AOBML – JBML - geoBML
  • NATO MSG-048 has provided strong coalition input
BML and NATO MSG-048
BML Overview

• BML - an unambiguous language to:
  • Command and control live and simulated forces conducting military operations, and
  • Provide for situational awareness and a shared, common operational picture.
• BML orders based on “Who, What, When, Where and Why.”
• Orders are transferred among C2 and simulation systems through a database built on the JC3IEDM standard.

Shared Semantics between C2 and M&S via a Common Tasking Description
BML and NATO MSG-048

• NATO Modeling and Simulation Group (NMSG) is part of the NATO Research & Technology Organisation

• MSG-048 is a Technical Activity under NMSG

• Charter:
  • The requirement for improved M&S-C2 interoperability is well recognized by NATO bodies for defense planning, training, exercises and support to operations
  • A NATO effort is necessary to define and standardize M&S-C2 interoperability
  • The Coalition BML Technical Activity is based upon voluntary contributions from Nations and provides insights regarding the usefulness of M&S-C2 interoperability and capability it can offer to coalition forces
MSG-048 Objectives

• Provide support to the development of a NATO representation of digitized command and control information that is understood by military personnel, simulated and in future, robotic forces.

• Enable improved shared awareness and common operational picture through structured plans, reports and returns.

• Provide support to SISO in standardizing and improving M&S-C2 interoperability for automatic, rapid and unambiguous command and control of one by the other.
MSG-048 I/ITSEC-2008 Demonstration

• **Demonstrate 2-way C2-Sim interoperability**
  • 8 systems/components (from 6 different Nations)
  • Work in concert enabled by C-BML

• **Highlight improvements since last year**
  • automated generation of situation reports (spot and ground truth) from simulations using C-BML
  • display those reports in C2 systems to enable the commander to reflect on new orders or FRAGO as required
  • reduction of “man-in-the-loop”; the C2 interface being able to translate orders according to the C-BML grammar
  • introduction of air operations showing multiple domain coalition BML capabilities
Demonstration Overview
Demonstration Terrain
Demonstration Scenario

• “Operation Perseus”
  • Caspian Sea region
  • 2025 timeframe
• Fictional countries Donovia, Minaria, Gorgas and Atropia
  • Successor states to a collapsed empire
  • Long history of fighting, factionalism, unrest
• Area is a source of oil and gas resources
  • International interest lies in stability
  • Ariana government supported by Donovian rebels threatens oil-rich region of Atropia
  • Rebels expected to try to occupy airport and harass traffic between river and airport
• Commander Joint Forces Land Component responsible for security
  • Selects task forces from USA, Netherlands and Norway
  • Simulation of their plans is needed for COA analysis
Demonstration Task Organization

43 MNB

1 (USA) TF
- A/1-66 AR
- B/1-66 AR
- B/1-12 Mech
- C/1-22 Mech

2 (NOR) TF
- 1 MBT SQN
- 3 Mech Coy
- 4 Mech Coy

2 (NLD) TF
- A Team Mech
- B Team Mech
- C Team AR
Demonstration Opposing Military Forces
National Contributions
German Contribution: C2LG and GUI

• Command and Control Lexical Grammar (C2LG)
  • Based on work of Schade and Hieb
  • Tasking grammar formal language implementation looks forward to SISO C-BML Phase 2
  • C2LG GUI provides visualization of orders/tasks with plug-in interfaces
  • Augmented to accept incomplete JBML format and fill in missing elements
• Form of C2LG expressions:
  OB → Verb Tasker Taskee (Affected|Action) Where Start-When (End-When) Why Label (Mod)*
Some Examples of C2LG for Orders

OB $\rightarrow$ **advance** Tasker Taskee Route-Where
       Start-When (End-When) Why Label (Mod)*

OB $\rightarrow$ **ambush** Tasker Taskee Affected At-Where
       Start-When (End-When) Why Label (Mod)*

OB $\rightarrow$ **assist** Tasker Taskee Action At-Where
       Start-When (End-When) Why Label (Mod)*

OB $\rightarrow$ **rest** Tasker Taskee At-Where Start-
       When End-When Why Label (Mod)*

An actual order:

*pursue* BtlC CavB En **towards** Z *at* now
       **in order to** destroy En label_3_15;
C2LG Reports Grammar

• Minimal grammar that allows full tasking
  • Much simpler than natural language
  • Grammar incapable of ambiguity
    • Vocabulary is a separate issue

• Position reports
  • RB → Hostility *position* Who Where When Certainty Label
  • **Status-Report: own position** Coy2 at CP3 at now fact label-rp-289;

• General (operational status) reports
  • Hostility *status-general* Who Status-Value Where When Certainty Label
  • **Status-Report: own status-general** Coy2 OPR at CP3 at now fact label-rp-293;
C2LG GUI Screen
Enabling BML Generation with C2LG GUI

**Diagram Description:**

- **National C2 System**
  - C2 Format
  - C2 BML Order Output converter

- **Pre-fill**
  - Initialization Input Plugin
  - Pre-fill data
  - Complete BML (JBML push)
  - BML W/S Output Plugin

- **C2LG GUI**
  - Incomplete BML
  - Pre-fill data

- **JBML web services**
  - Central JC3IEDM

- **Simulator**
  - Sim format
  - BML sim interface

**Steps:**

1. **C2 Format** flows to the **National C2 System**.
2. From **C2 System**, C2 BML Order is output and converted to BML W/S.
3. **Pre-fill** stage involves initialization input plugin.
4. Pre-fill data is processed, leading to complete BML (JBML push).
5. Complete BML flows to **JBML web services**.
6. JBML web services interface with BML sim.
7. Sim format is sent to the **Simulator**.
French Contribution: SCIPIO/SWORD

Command post training system for Brigade and Division HQs
- Automated simulation control based on command agents
- Generation of formatted reports to C2IS (SICF)
- HLA interface
SCIPIO/SWORD Gaming GUI
Netherlands C2 System: ISIS

Integrated Staff Information System at Battalion and above.

- C2 Framework (C2FW) architecture.
- Baseline for a suite of C2 applications (OSIRIS, XANTHOS)
ISIS Display of Simulation Reports
Netherlands Simulation: Pollux
Norwegian Contribution: NORTaC-C2IS

- Tactical C2IS, supporting:
  - Situation awareness
  - Plan / Order
  - Intelligence
  - Order of Battle
- Supports NATO MIP data model and data replication
- Capable of creating basic BML orders (5Ws)
- Orders are stored in an unmodified C2IEMD database
- Interoperates with BML WS through FFI C2IEMD gateway (orders and reports)
UK Contribution: Air Scenario Reporting

- Used NATO C2IS ICC and US Simulation JSAF
- Added air component critical to coalition operations
- Demonstrated interoperation of Air and Ground Domains in C2 and Simulation
## Aircraft In-Flight Reports

<table>
<thead>
<tr>
<th>Aircraft call sign</th>
<th>Role</th>
<th>IFREP contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAGIC01</td>
<td>ARCCTL</td>
<td>Time on/off station</td>
</tr>
<tr>
<td>LION11</td>
<td>AERRFL</td>
<td>Time on/off station</td>
</tr>
<tr>
<td>NITRO21-24</td>
<td>AIRDEF</td>
<td>Time on/off station, any air defence activity</td>
</tr>
<tr>
<td>PAGAN31-34</td>
<td>OFFAIR</td>
<td>Time on/off station, targets attacked, target damage</td>
</tr>
<tr>
<td>VANDAL41-43</td>
<td>OFFAIR</td>
<td>Time on/off station, targets attacked, target damage</td>
</tr>
<tr>
<td>TRON51-52</td>
<td>WLDWSSL</td>
<td>Time on/off station, EW activity</td>
</tr>
<tr>
<td>MAUL61-62</td>
<td>WLDWSSL</td>
<td>Time on/off station, EW activity</td>
</tr>
</tbody>
</table>
TARGETS

SUPPLY DEPOT

ROAD / RIVER BRIDGE

Choke Point 1

Choke Point 2

Choke Point 3

Choke Point 4

TARGETS

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US Contribution: Scripted BML Web Services

- BML continues to grow and change
- Middleware basics remain the same
- Interpreted WS offers flexibility
  - Rapid implementation of new BML constructs
  - Easy to modify underlying data model (JC3IEDM also continues to change)
  - Reduces time and cost for prototyping
  - Scripting language provides a concise definition of BML-to-data model mappings
  - Script writer need not be proficient in Java
- Scripted operation may, however, be slower
Scripted BML WS Configuration

Two implementations: MySQL and SIMCI RI
Scripted Interpreter Advantages

- A way to implement composite transactions where:
  - Validation requires only understanding of the object and JC3IEDM (but not Java)
  - Changes to the mapping are simple to implement
  - New business objects are easy to define and implement
    - Student did six of them in two weeks while learning
  - Scripting language provides a highly concise definition of BML mapping
    - SISO C-BML should use it for that
Demonstration configuration #1

ISIS
C2LG

JC3I EDM +

IBML WEB SERVICES

POLLUX +

Netherlands
Germany
USA
Netherlands
Demonstration configuration #2
Demonstration configuration #3
Demonstration configuration #4
Demonstration configuration #5
Experimentation Plans
MSG-048 Plan for 2009

• Phase C – Soldier in the loop field experimentation
  • Operational evaluation by unbiased SMEs based on realistic scenario
  • Including publish/subscribe Web services
  • Develop MSG-048 study report and prepare follow-on NATO activity

• To be conducted at GMU Prince William Campus, Manassas Virginia, USA
  • 2 – 6 November 2009
New Technical Activity Program

• 2010 – 2013
  • Improve C-BML with Geo-BML, C2-C2 and Sim-Sim
  • Define, assess an operational architecture that will let commander to really use C-BML and MIP capabilities for collaborative planning and training/rehearsal
  • Cooperate with Common Ground JCTD
  • Address time synchronization, initialization, NATO OPORD
Conclusions

• This was second step in NATO MSG-048 experimentation with BML
• Produced more strong evidence in favor of the techniques employed
  • SOA for interoperation
  • Web Service Reference Implementation
  • C2LG-inspired schema
  • JC3IEdM database and vocabulary
• Network-centric development methodology allowed very rapid development
  • Four months requirements to demonstration
  • National development teams with highly cooperative spirit also were essential
  • As was availability of supportive military SMEs
• Increasingly experimental approach planned for 2009
  • Based on national work becoming available
  • Looking forward to SISO C-BML standard that can be evaluated experimentally by MSG-048 follow-on