Lessons learned from NMSG-085 / CIG Land Operation demonstration
OUTLINE

• **CIG Overview**
  – CIG Objectives
  – Participation, Level of Effort
  – CIG Timeline and Methodology

• **Demonstration**
  – Ops Organization
  – Scenario
  – Architecture (cloud & local)
  – Use-cases

• **Highlights of Capabilities Achieved**
  – MSDL Enrichments
  – C-BML Expressions / Improvements
  – Operational Messages Covered
  – C-BML web-server

• **Way Forward**
  – Experiences, challenges and findings
  – Lessons learned
  – Way ahead
CIG Objectives and priorities

• **Land maneuver**
  – Enhance land maneuver logistics (sustainment of fuel and personnel)
  – Request/order/report for Artillery Support
  – Extend list of tasks that CBML is able to support (with low intensity missions)

• **Other operational considerations**
  – Exchange with legacy C2 systems with respect to operational interfaces that comply with CP flow of information

• **Infrastructure and technical issues**
  – Refine Initialization process of systems
CIG Use Case: Battalion CP Training
CIG Methodology : CD&E Process

- Identification of goals and priorities with stakeholders
- Experimentation & Demonstration
- Development of scenario OPORD
- Integration sessions and Identification of issues
- Development of systems interfaces
- Development of schemas
- Development of interface specifications document

2013 Spring
## 2012 CIG Timeline

<table>
<thead>
<tr>
<th>Month</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>February</td>
<td>Definition of objectives</td>
</tr>
<tr>
<td>March-June</td>
<td>3 conf calls</td>
</tr>
<tr>
<td>June @ Paris</td>
<td>Use cases Development Interface specifications review</td>
</tr>
<tr>
<td>June-September</td>
<td>3 conf calls 5 days of remote integration Experimentation programme Development Interface specifications update</td>
</tr>
<tr>
<td>September @ Istanbul</td>
<td>1st face to face integration Story board definition</td>
</tr>
<tr>
<td>October-November</td>
<td>1 conf call 3 days of remote integration</td>
</tr>
<tr>
<td>November @ Fairfax</td>
<td>Last face to face integration and rehearsal Experimentation programme update</td>
</tr>
</tbody>
</table>
## Collaborative Environment

<table>
<thead>
<tr>
<th>Tools</th>
<th>Used...</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;TO SharePoint</td>
<td>to share documents</td>
</tr>
<tr>
<td>CASSIDIAN services (Arkadin anytime)</td>
<td>for conference calls</td>
</tr>
<tr>
<td>MASA group servers</td>
<td>to host FKIE BML server and SWORD simulation server</td>
</tr>
<tr>
<td>Skype</td>
<td>for chat during remote integrations</td>
</tr>
<tr>
<td>Teamviewer</td>
<td>to display screens of distant systems in the main audience room during 1\textsuperscript{st} demo</td>
</tr>
<tr>
<td>LogMeIn</td>
<td>to create a VPN over internet, in order to build easily an HLA federation</td>
</tr>
</tbody>
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  – Experiences, challenges and findings
  – Lessons learned
  – Future works
4 demonstrations
3 different context

<table>
<thead>
<tr>
<th>Demonstration</th>
<th>Hosting event</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st}, at Fairfax</td>
<td>NMSG-085 meeting #9</td>
<td>Battalion Command Post training (1 hour)</td>
</tr>
<tr>
<td>2\textsuperscript{nd}, at NATO booth</td>
<td>I/ITSEC 2012</td>
<td>Battalion Command Post training (15 minutes)</td>
</tr>
<tr>
<td>3\textsuperscript{rd}, at NMSG-119 workshop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4\textsuperscript{th}, at NATO booth</td>
<td></td>
<td>Battalion Command Post planning (15 minutes)</td>
</tr>
</tbody>
</table>
VIKING 2011 Scenario

TF V MZ OOB

SIR

SITWARE

C2LG-GUI

TALOS
Scenario – Phase 1 Movement to APOD

Starts with progress axe M1, M2 and M3 and ends with Unit deployment near APOD

- **Land maneuver**
  - Enhance land maneuver logistics (sustainment of fuel and personnel)
  - Request/order/report for Artillery Support
  - Extend list of tasks that CBML is able to support (with low intensity missions)

- **Other operational considerations**
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- **Infrastructure and technical issues**
  - Refine Initialization process of systems
Scenario – Phase 2.1 Deployment to AOR

Starts with control and isolation of our STF AOR and ends putting check points in P1, P2, P3 points

- **Land maneuver**
  - Enhance land maneuver logistics (sustainment of fuel and personnel)
  - Request/order/report for Artillery Support
  - Extend list of tasks that CBML is able to support (with low intensity missions)

- **Other operational considerations**
  - Exchange with legacy C2 systems with respect to operational interfaces that comply with CP flow of information

- **Infrastructure and technical issues**
  - Refine Initialization process of systems
Scenario – Phase 2.2 Control the main areas of the APOD

Begins with APOD authority contacts and ends with APOD controlled

- **Land maneuver**
  - Enhance land maneuver logistics (sustainment of fuel and personnel)
  - Request/order/report for Artillery Support
  - Extend list of tasks that CBML is able to support (with low intensity missions)

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- **Infrastructure and technical issues**
  - Refine Initialization process of systems
Command Post Training Organization

**TRAINING AUDIENCE**
- TF V* (BN HQ)
- SIR

**LOCION**
- Mortar
- STF A, B
- STF C
- Recce
- Artillery

**Automated RC**

**VR-FORCES**

**TALOS-SIM**

**DISTAFF**

**HICON**

**SICF**

**OPFOR**

**SITWARE**

**C2LG-GUI**

**SWORD**

**Artillery**

**TALOS**
Integrated Systems

Distributed

SIR - TRAINING AUDIENCE

Full Automation

SITAWARE LOCON

C-BML

C2LG LOCON

C-BML

TALOS LOCON

C-BML

Multi-level

SWORD

C-BML

VR-FORCES

C-BML

HLA

Full Automation

C-BML

HLA

2013 Spring
Cloud training architecture (Fairfax)

- **The Netherlands**: VR-Forces (Simulation)
- **Spain**: TALOS (C2 system)
- **France** (PARIS): Pitch RTI 1516e
- **USA (Fairfax)**: SWORD server, HLA interface, BML server, SWORD BML client, SIR, SITAWARE, C2LG, C2 systems
- **USA (Fairfax)** (Google Earth): SWORD Client
- **USA (Fairfax)** (Ipad COP): COP

**FAIRFAX, Virginia (USA)**
Initialization of Systems

Brigade

SICF

SIR

TF V* (BN HQ)
STF A, B
Mortar, Artillery

1

SITAWARE

STF C

1

C2LG-GUI

Recce and red units

1

TALOS

Artillery

4

MSDL units

1

C2LG-GUI

2

SWORD

MSDL units

2

MSDL units

1

MSDL units

3

MSDL + NSN

3

2013 Spring
Information exchanges during systems execution

- TF V* (BN HQ)
- SIR
- STF A
- STF C
- Recce
- Artillery
- SWORD
- VR-FORCES
- TALOS-SIM
- SITAWARE
- C2LG-GUI
- Mortar
- Orders / Reports
- Call for fire / Reports fire started or ended

- TRAINING AUDIENCE
- LOCON
- Automated RC
- BML
- HLA

2013 Spring
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C-BML / MSDL Enhancements

- Clarification of MSDL process to initialize all systems

- **C-BML Message header and meta-data**
  - conforms to operational messages flow
  - use of several C2 systems in a training

- **C-BML Acknowledgement message and TaskReport**
  - conforms to operational messages flow
  - share information between simulation and C2 system

- **C-BML TaskRequest and TaskRequestCommand**
  - execute call for fire (artillery or mortar)

- **WhoHoldingStatusReport using NSN codes**
  - share information about personnel
MSDL Enrichments

- Same schema as in COMELEC 2011 (see paper 12S-SIW-012)
- Extend use of NSN codes for personnel

<table>
<thead>
<tr>
<th>1005</th>
<th>13</th>
<th>1234567</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATO Supply Classification Code (NSC)</td>
<td>NATO Code for National Codification Bureau (NCB)</td>
<td>Non-Significant Number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>NSC code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civilian</td>
<td>…</td>
</tr>
<tr>
<td>Military</td>
<td>Air Force</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOS</td>
</tr>
<tr>
<td></td>
<td>Coats guard</td>
</tr>
<tr>
<td></td>
<td>Joint/HQ</td>
</tr>
<tr>
<td></td>
<td>Army</td>
</tr>
<tr>
<td></td>
<td>Marines</td>
</tr>
<tr>
<td></td>
<td>Navy</td>
</tr>
<tr>
<td></td>
<td>Special Forces (SOF)</td>
</tr>
<tr>
<td></td>
<td>NOS</td>
</tr>
<tr>
<td>Prisoners of war</td>
<td>NOS</td>
</tr>
<tr>
<td>Refugee</td>
<td>NOS</td>
</tr>
<tr>
<td>NOS</td>
<td>NOS</td>
</tr>
</tbody>
</table>

NATO Stock Number (NSN)
C-BML Improvements (message)

- C-BML Message header and meta-data
  - conforms to operational messages flow
  - use of several C2 systems in a training

- C-BML Acknowledgement message
  - conforms to operational messages flow
  - share information between simulation and C2 system
## Operational Messages and C-BML expressions Mapping

<table>
<thead>
<tr>
<th>Operational Messages</th>
<th>CBML expressions involved</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commandment domain</strong></td>
<td></td>
</tr>
<tr>
<td>Warno / Order / Frago</td>
<td>CBML order</td>
</tr>
<tr>
<td>SITREP</td>
<td>CBML reports</td>
</tr>
<tr>
<td>Apercu (Acknowledgement)</td>
<td>CBML Acknowledgment</td>
</tr>
<tr>
<td><strong>Intelligence domain</strong></td>
<td></td>
</tr>
<tr>
<td>CrDeRenseignement (Intel Report)</td>
<td>CBML reports</td>
</tr>
<tr>
<td><strong>Artillery domain</strong></td>
<td></td>
</tr>
<tr>
<td>DemandeDeTir (Call for Fire)</td>
<td>TaskRequest</td>
</tr>
<tr>
<td>CompteRenduDeTir (Fire Status)</td>
<td>Acknowledgement message</td>
</tr>
<tr>
<td>DirectiveDeTir</td>
<td>TaskRequestCommand</td>
</tr>
<tr>
<td></td>
<td>TaskReport</td>
</tr>
<tr>
<td><strong>Logistic domain</strong></td>
<td></td>
</tr>
<tr>
<td>SIT_LOG (Log Report)</td>
<td>WhoHoldingStatusReport using NSN codes <strong>with extended values</strong></td>
</tr>
<tr>
<td>SITEFF (Personnel report)</td>
<td></td>
</tr>
</tbody>
</table>
## C-BML Operational Capabilities

<table>
<thead>
<tr>
<th>Operational capabilities</th>
<th>CBML and MSDL improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exercise initialization</strong></td>
<td></td>
</tr>
<tr>
<td>Initialization of units and an OOB with:</td>
<td>MSDL enhanced for unit’s holdings and NSN codes</td>
</tr>
<tr>
<td>- Equipments,</td>
<td></td>
</tr>
<tr>
<td>- Resources (fuel, ammunitions),</td>
<td></td>
</tr>
<tr>
<td>- Personnel</td>
<td></td>
</tr>
<tr>
<td><strong>Commandment domain</strong></td>
<td></td>
</tr>
<tr>
<td>Conformance to the operational workflow</td>
<td>Message header and meta-data</td>
</tr>
<tr>
<td>(messages sent from one unit to real or</td>
<td></td>
</tr>
<tr>
<td>simulated units)</td>
<td></td>
</tr>
<tr>
<td>Operational message ‘Roger’ / ‘Apercu’</td>
<td>Acknowledgement message. It reports the status of orders</td>
</tr>
<tr>
<td></td>
<td>(simulation warns when an order failed)</td>
</tr>
</tbody>
</table>
## C-BML Operational Capabilities (Cont’d)

<table>
<thead>
<tr>
<th>Operational capabilities</th>
<th>CBML and MSDL information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Artillery domain</strong></td>
<td></td>
</tr>
<tr>
<td>• Call for fire (Neutralize, Destruction, Illuminate, Obscur),</td>
<td>• TaskRequest</td>
</tr>
<tr>
<td>• Fire accepted / rejected</td>
<td>• Acknowledgement message</td>
</tr>
<tr>
<td>• Start Firing / Suspend firing,</td>
<td>• TaskRequestCommand</td>
</tr>
<tr>
<td>• Firing reports</td>
<td>• TaskReport</td>
</tr>
<tr>
<td><strong>Logistic domain</strong></td>
<td></td>
</tr>
<tr>
<td>Reports for:</td>
<td>WhoHoldingStatusReport using NSN codes with extended values</td>
</tr>
<tr>
<td>• Equipments,</td>
<td></td>
</tr>
<tr>
<td>• Resources (fuel, ammunitions),</td>
<td></td>
</tr>
<tr>
<td>• Personnel</td>
<td></td>
</tr>
<tr>
<td><strong>Intelligence domain</strong></td>
<td></td>
</tr>
<tr>
<td>Intelligence report</td>
<td>CBML reports</td>
</tr>
</tbody>
</table>
C-BML CIG Web Server Functionalities

Requirements

- Support Exchange of MSDL
- Support Exchange of new Reports
- Support of Request
- Support Acknowledgments
- Handle Adjusted Schema (IBML++)

Arguments to develop CIG server

Old GMU Server was
- very slow after some time
- not well adjustable to our needs

Reuse old GMU Server
- Uses Java Message Service for Publish/Subscribe mechanism
- Implements the same WSDL File as the 2.5 GMU Server
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Issues

• Configuration of Pitch booster between with 3 sites in a short time frame ➔ VPN (Log me in) has been used instead

• BML missions’ required parameters not yet standardized ➔ Parameters and geometry of tasks is defined in the specifications interface document

• C2 systems overwhelmed by C-BML messages sent by simulation, when simulation run faster than real time ➔ simulation must time regulate messages generation

• Systems are very sensitive with time
  – Future DTG messages are cancelled and thus not displayed
  – Past DTG orders are cancelled by the simulation and thus not displayed

 ➔ Initialization deals also with sharing of consistent DTG
Lessons learned

• Schema is necessary but not sufficient

• Its development must be understood, reproducible and its enrichment over years must be traced

• Its use must be part of a general process where Federation agreement document is mandatory

• Operational benefits are becoming more and more important when budget are nowadays cut

• Continuation of work is important, but it is also time to deploy first instantiation for operational use
Way ahead

• Develop an engineering process for the construction and maintenance of a unified C2-Simulation (C2SIM) model
  – SINEX = Scenario Initialization and Execution
• Propose a DSEEP overlay to support implementation for a C2-Simulation Federation

Provide user community a better understanding how C2-simulation interoperability standards are intended to be used