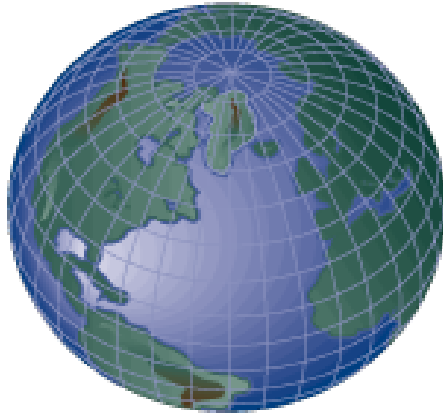


Adding Reports to Coalition Battle Management Language for NATO MSG-048



Dr. Mark Pullen, Douglas Corner, Samuel Singapogu
and Nicholas Clark, GMU C4I Center, USA

Nicolas Cordonnier and Mohammad Mennane, Thales Communications, France
Lionel Khimeche, Délégation Générale pour l'Armement, France

Dr. Ulrich Schade and Dr. Miloslaw Frey, FGAN-FKIE, Germany

Nico de Reus, Paul de Krom and Nanne LeGrand, TNO, The Netherlands

Ole Martin Mevassvik and Anders Alstad, FFI, Norway

Adam Brook, QinetiQ, UK

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.

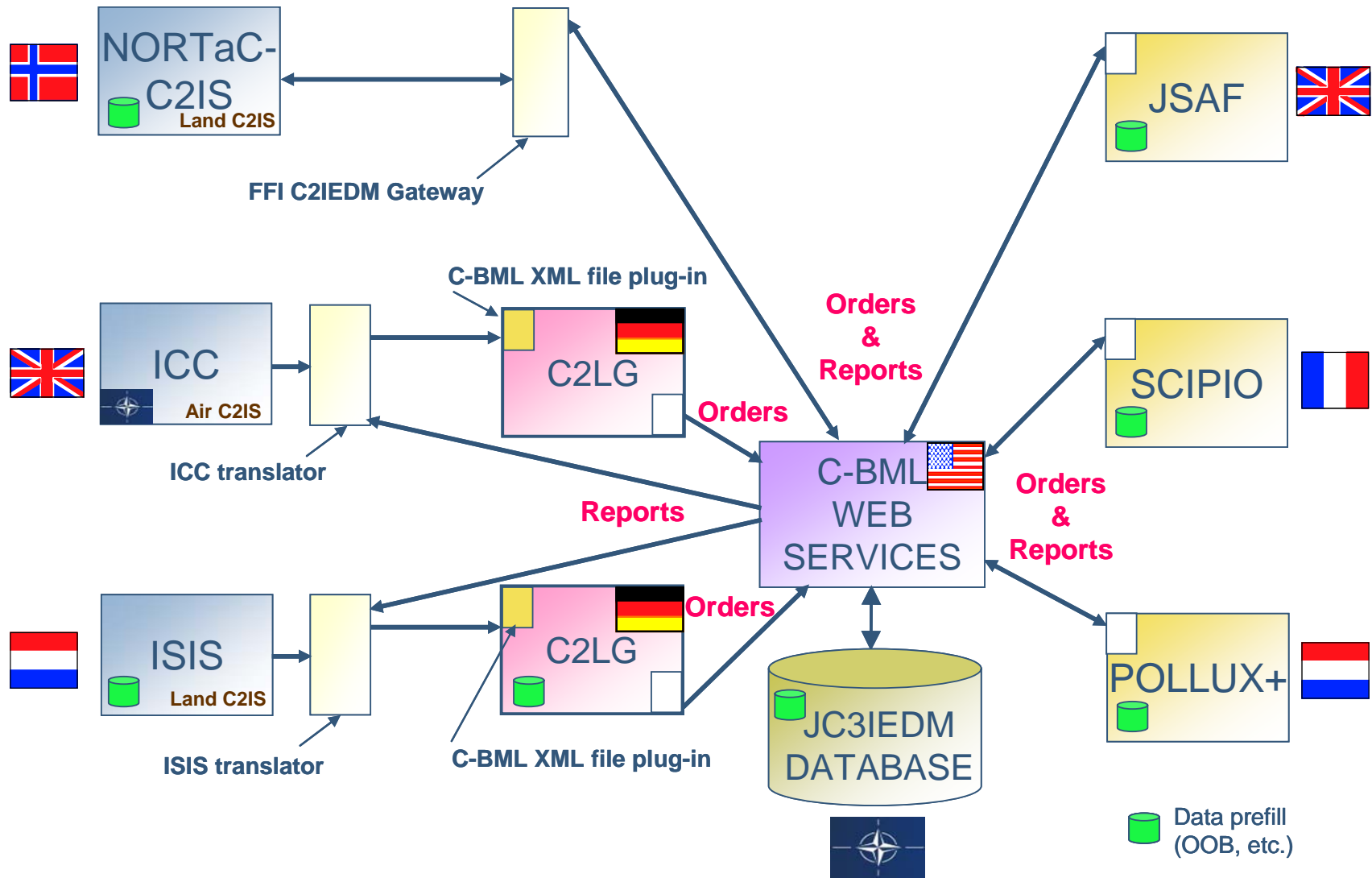


MSG-048 I/ITSEC-2008 Demonstration

- **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



BML Demonstration System



Demonstration Overview



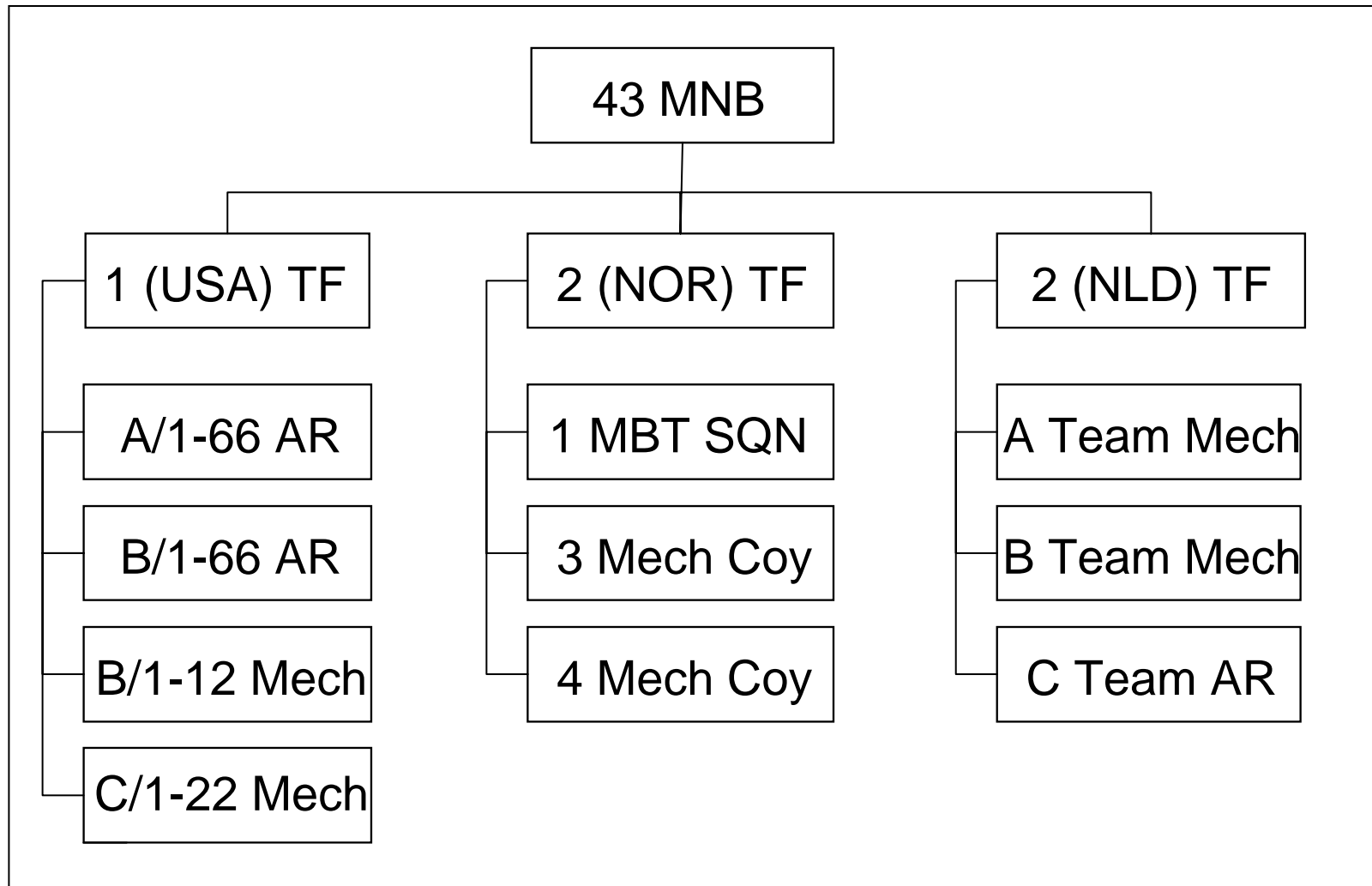
Demonstration Terrain



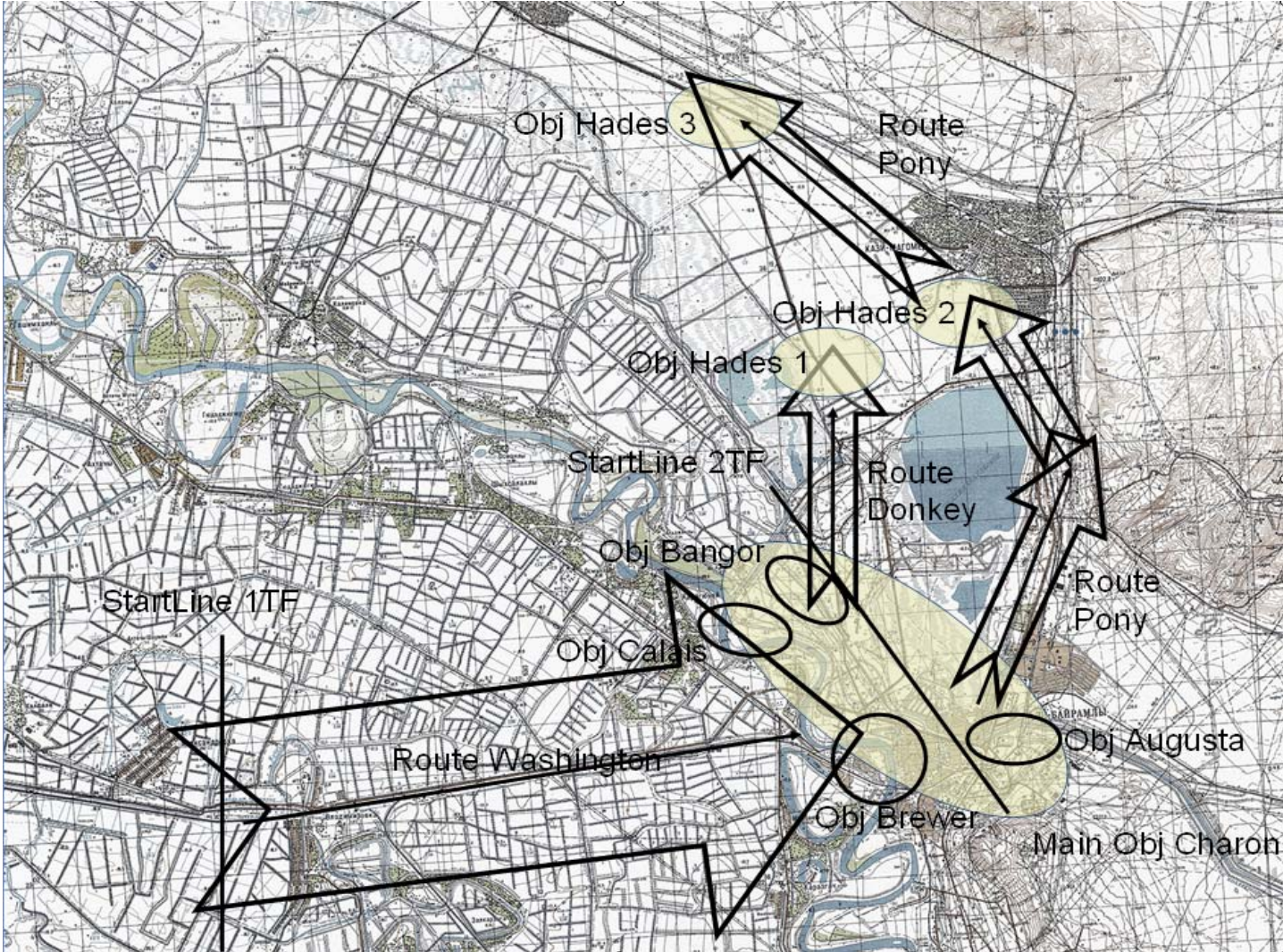
Demonstration Scenario

- “Operation Perseus”
 - Caspian Sea region
 - 2025 timeframe
- Fictional countries Donovan, 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 Donovanian 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

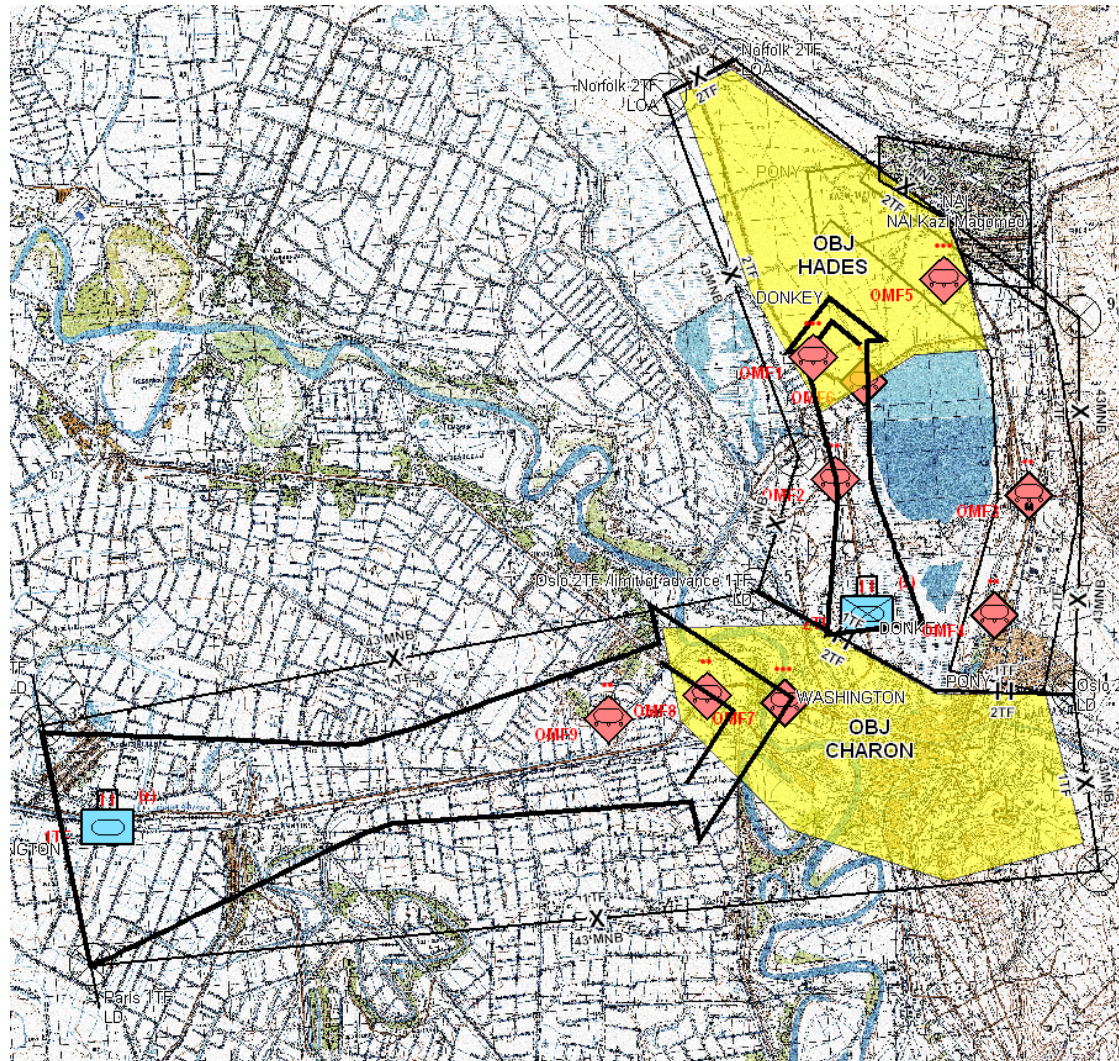
Demonstration Task Organization



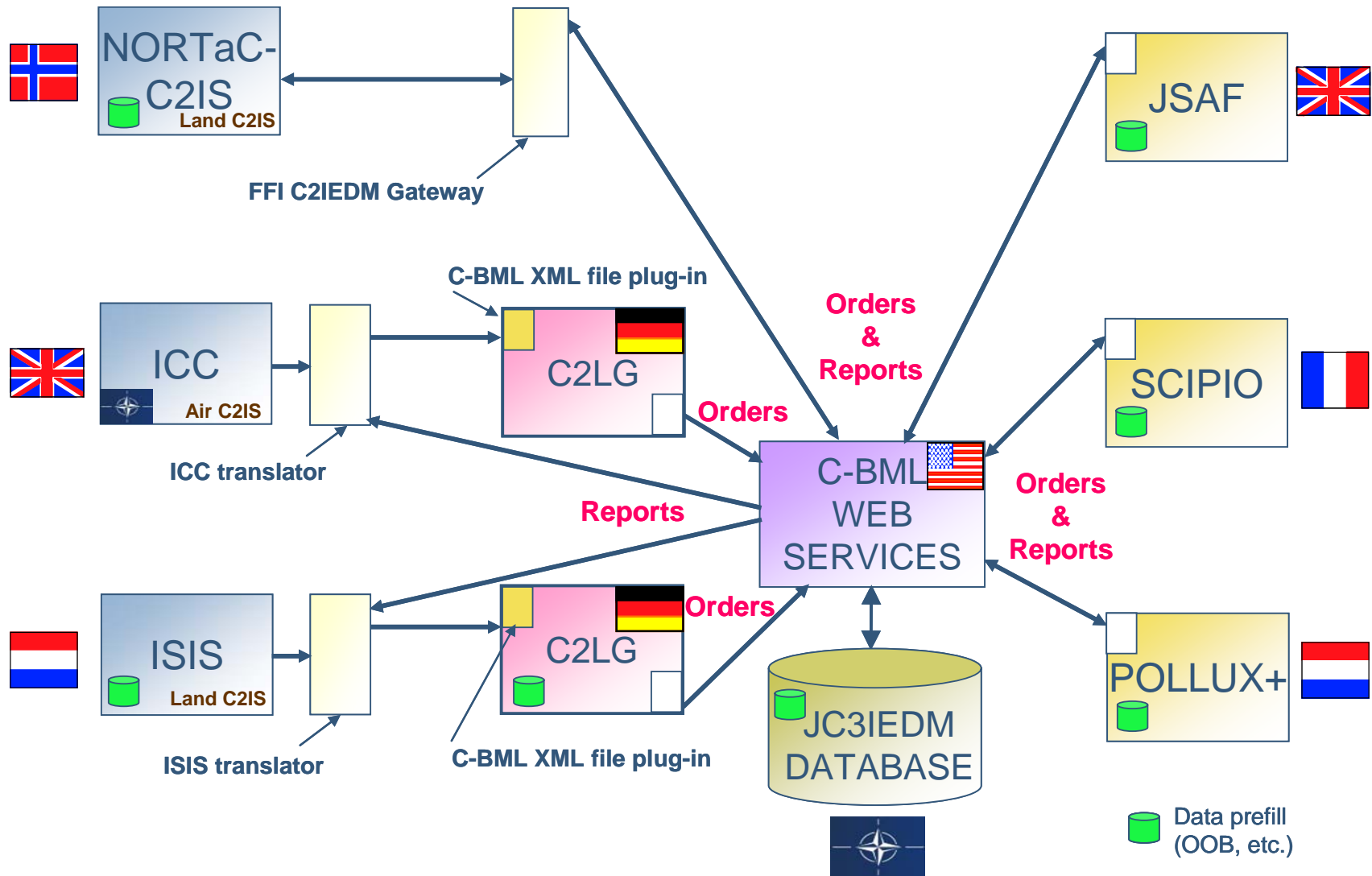
Demonstration 43 MNB Plan



Demonstration Opposing Military Forces



BML Demonstration System



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 → **advance** Tasker Taskee Route-Where
Start-When (End-When) Why Label (Mod)*

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

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

OB → **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

C2LG-GUI ver. 1.5 alpha: Order

File BML Console

Choose task
patrol

Units
Tasker 3Kp_PzGrenBtl332
Taskee 2Zug_3Kp_PzGrenBtl332

Info
Route-Where along 5, controlPoint6, controlpoint7
Start-When AFT 261124ZOCT07
(End-When) AFT
(Instrument)
(Formation)
(In manner)
Why in-order-to protect area-136
Label patrol-1193390668218
Task CM

Test Append to list Update list item
Send task

Order
Header
Sender 3Kp_PzGrenBtl332
Addressee 2Zug_3Kp_PzGrenBtl332
(Send time) 231356ZAUIG2007 Now!

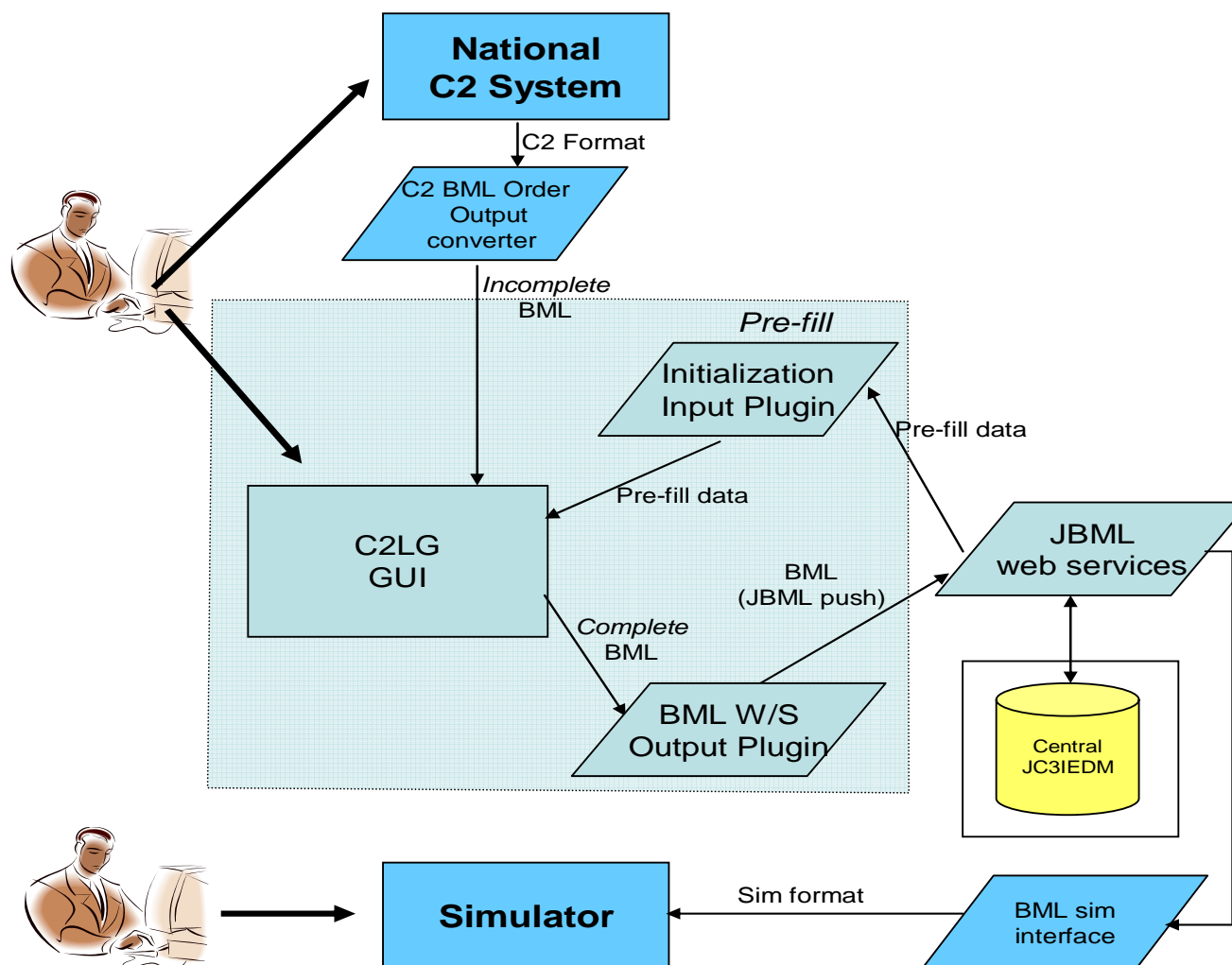
Tasks
advance 3Kp_PzGrenBtl332 2Zug_3Kp_PzGrenBtl332 toward
attack 3Kp_PzGrenBtl332 2Zug_3Kp_PzGrenBtl332 enemy
defend 3Kp_PzGrenBtl332 2Zug_3Kp_PzGrenBtl332 yourself

New order Load order Save order
Send order

Order queue
process delete

Germany BML Projekt FGAN FKIE

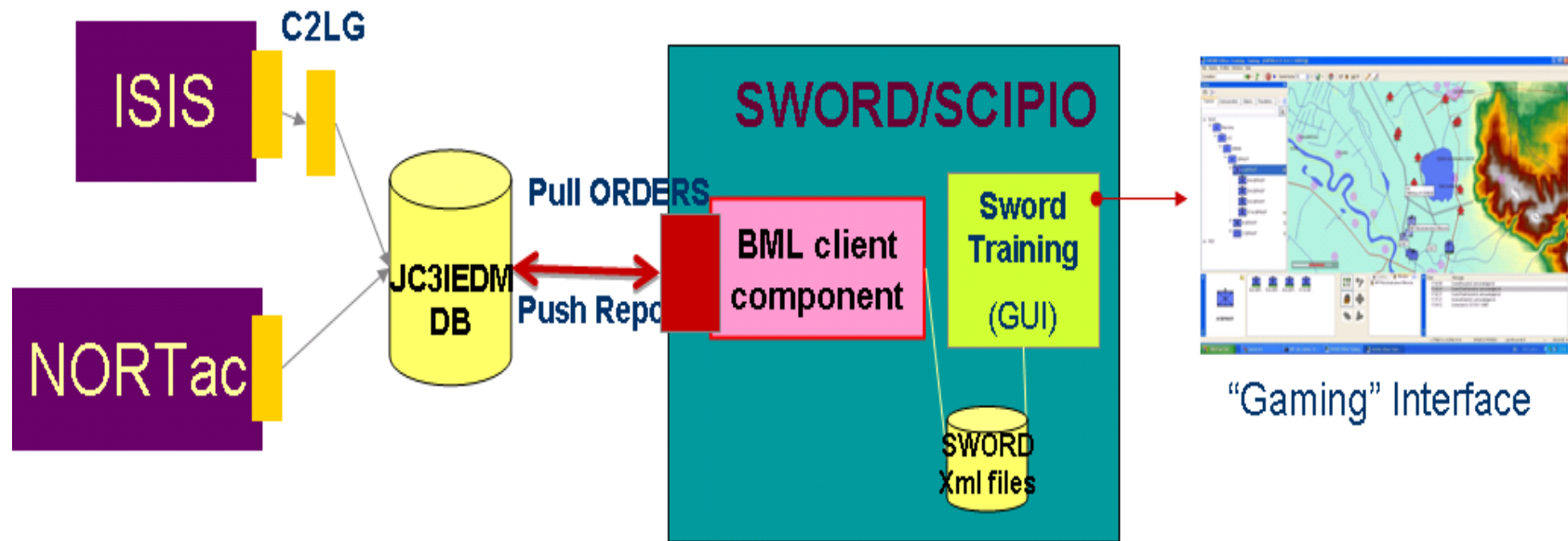
Enabling BML Generation with C2LG GUI



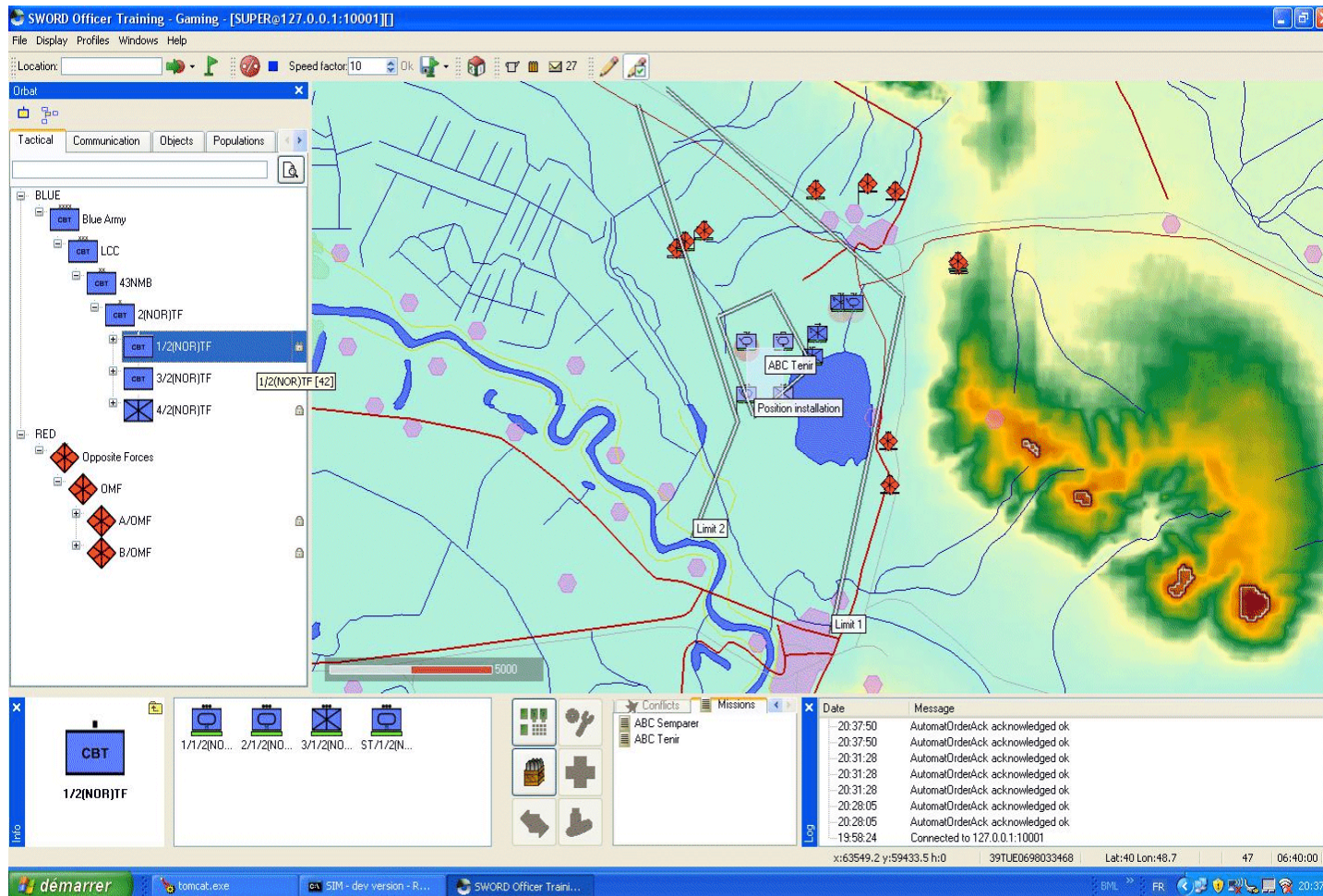
French Contribution: SCIPPIO/SWORD

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



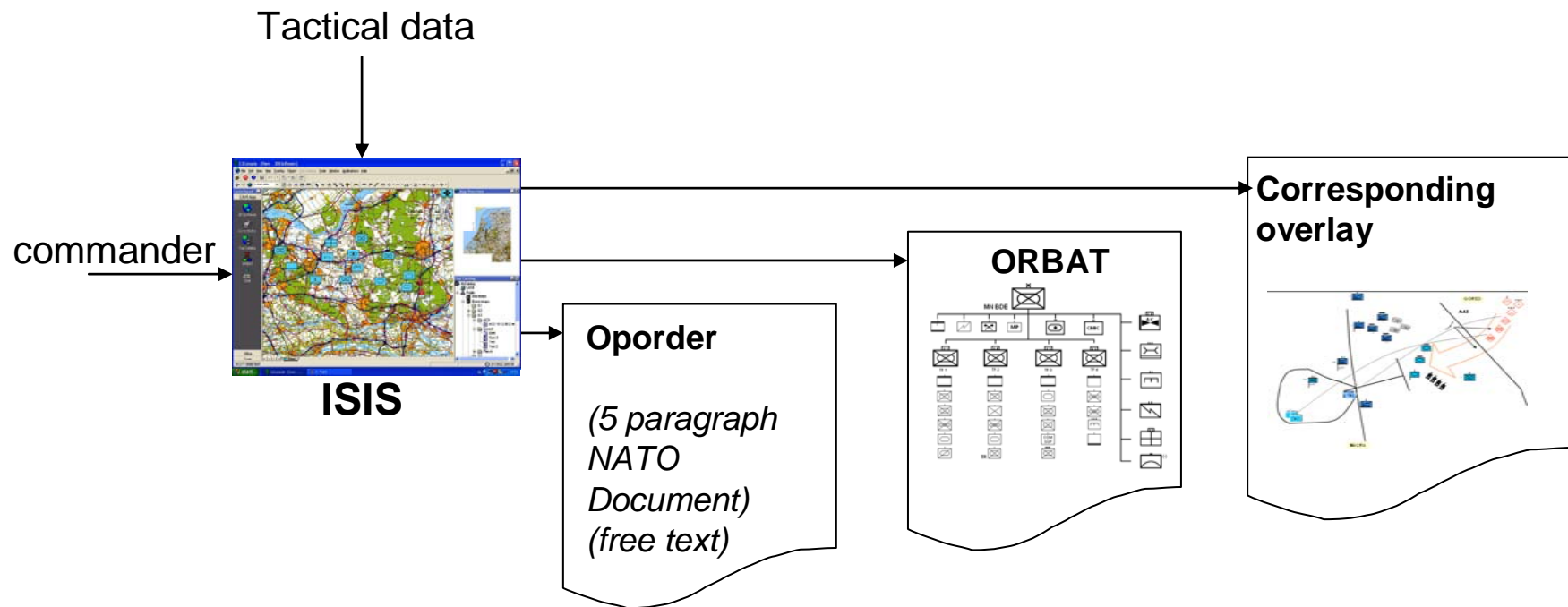
SCIPPIO/SWORD Gaming GUI



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

The screenshot shows the ISIS software interface with a simulation report displayed on a topographic map. The map features several red diamond markers and blue rectangular markers, likely representing simulation results or data points. The interface includes a menu bar (File, Edit, View, Object, GIS, Tools, Applications, Window, Help), a toolbar, a Launchpad on the left with icons for GIS, Context Editor, Library, Orbat, and Chat, and a Library on the right showing a list of simulation tasks. The status bar at the bottom displays coordinates (40° 4' 10.73"N, 48° 53' 48.49"E), a zoom instruction, and a timestamp (TNO-907CE39B69A\C2 sim 211336Z APR 09). The Windows taskbar at the bottom shows the Start button, a software folder, and open applications including Console, ISIS - [sim_f...], and Microsoft PowerPoint...



Netherlands Simulation: Pollux

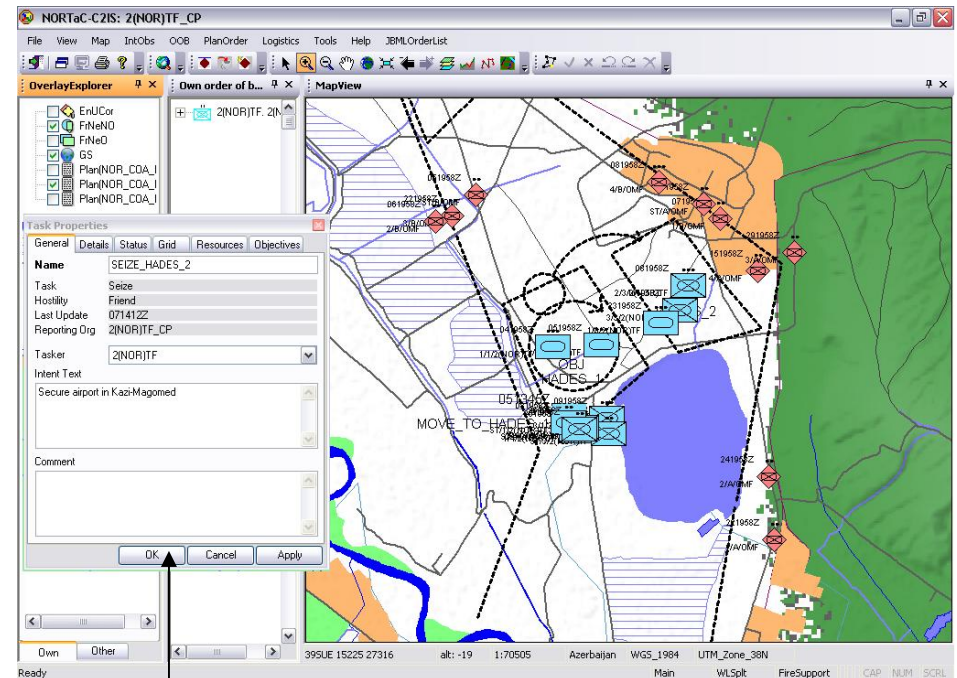
The screenshot displays the Pollux simulation software interface. The main window is titled "Control Station [0.7.6.B] - Admin" and features a map of a simulated environment with various terrain features and units. The interface includes several panels:

- Spel controle (Game Control):** A small window with controls for "Fase" (Soelend), "Snelheid" (5x), and "Stap grootte" (1 min).
- Agent monitor:** A panel showing a list of agents and their attributes. The "Messages" tab is active, displaying a table of agent data.
- Berichten (Messages):** A panel showing a log of simulation events with columns for "Simulatielijd", "Level", "Eenheid", and "Bericht".
- Aggregate:** A panel on the right showing a hierarchical tree of units, including "2TF", "2TF A team", "2TF B team", and "2TF C team", with sub-units like "A Painpel4", "A Painpel5", "A Painpel6", "A Tlspel1", "B Painpel4", "B Painpel5", "B Tlspel1", "C Painpel4", and "C Tlspel1".

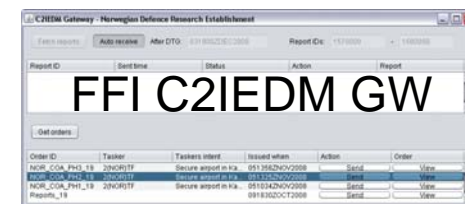
The map shows a central blue lake, orange terrain, and various units represented by icons. The interface also includes a standard Windows taskbar at the bottom with the Start button and several open applications.

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 C2IEDM database
- Interoperates with BML WS through FFI C2IEDM gateway (orders and reports)



Order GUI

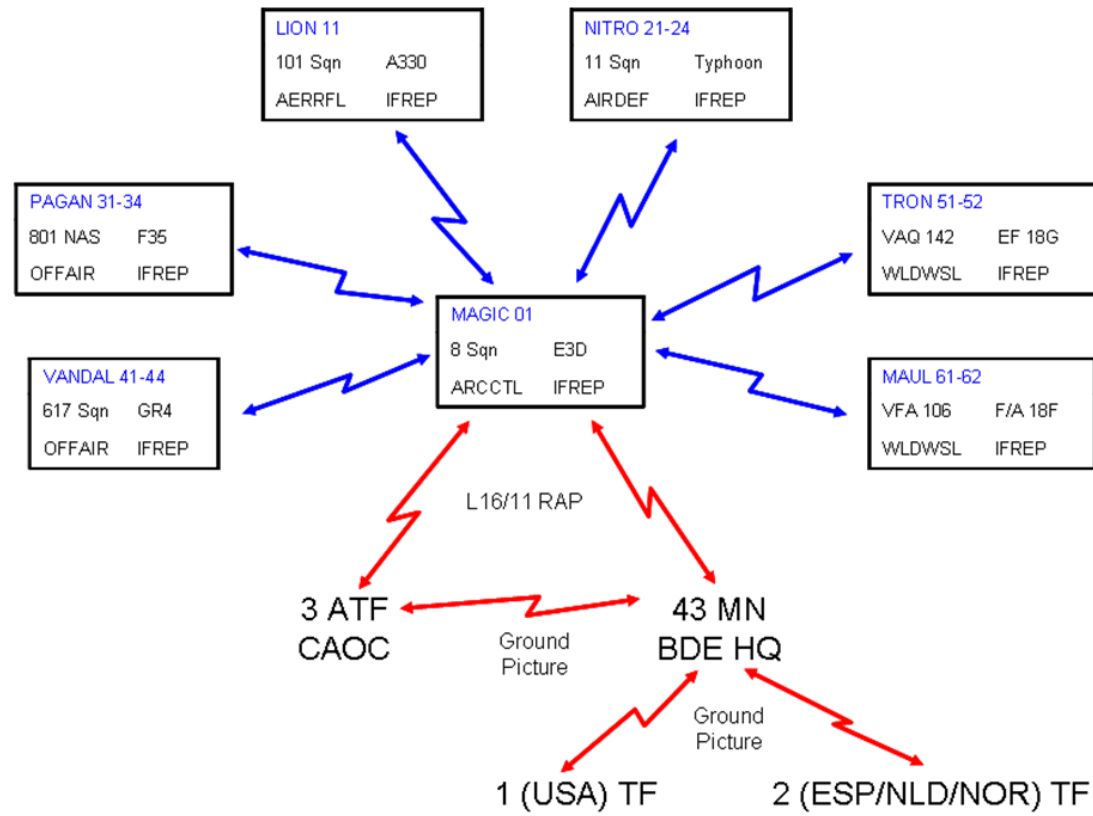


BML WS



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



U9E-SIVV-U03



Aircraft In-Flight Reports

Aircraft call sign	Role	IFREP contents
MAGIC01	ARCCTL	Time on/off station
LION11	AERRFL	Time on/off station
NITRO21-24	AIRDEF	Time on/off station, any air defence activity
PAGAN31-34	OFFAIR	Time on/off station, targets attacked, target damage
VANDAL41-43	OFFAIR	Time on/off station, targets attacked, target damage
TRON51-52	WLDWSL	Time on/off station, EW activity
MAUL61-62	WLDWSL	Time on/off station, EW activity

TARGETS

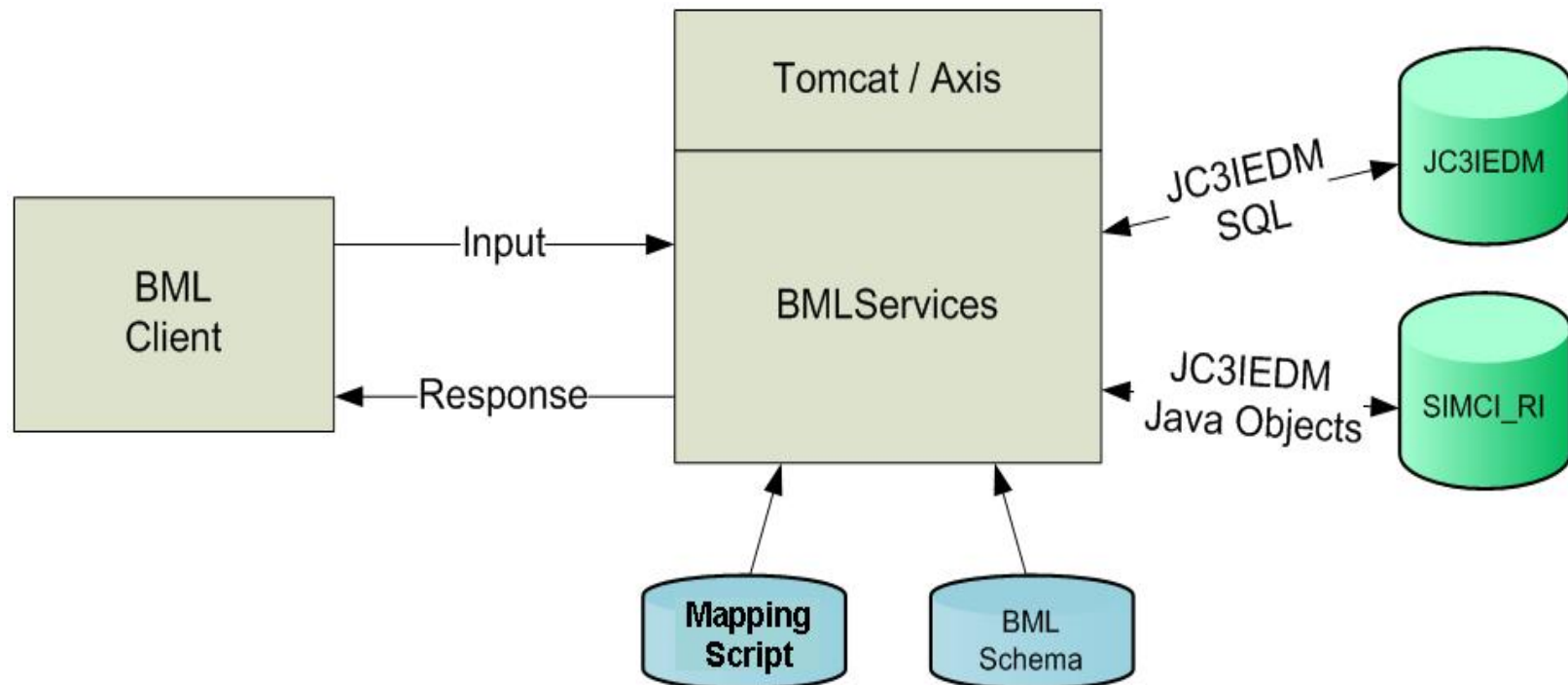


US Contribution: Scripted BML Web Services

- 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



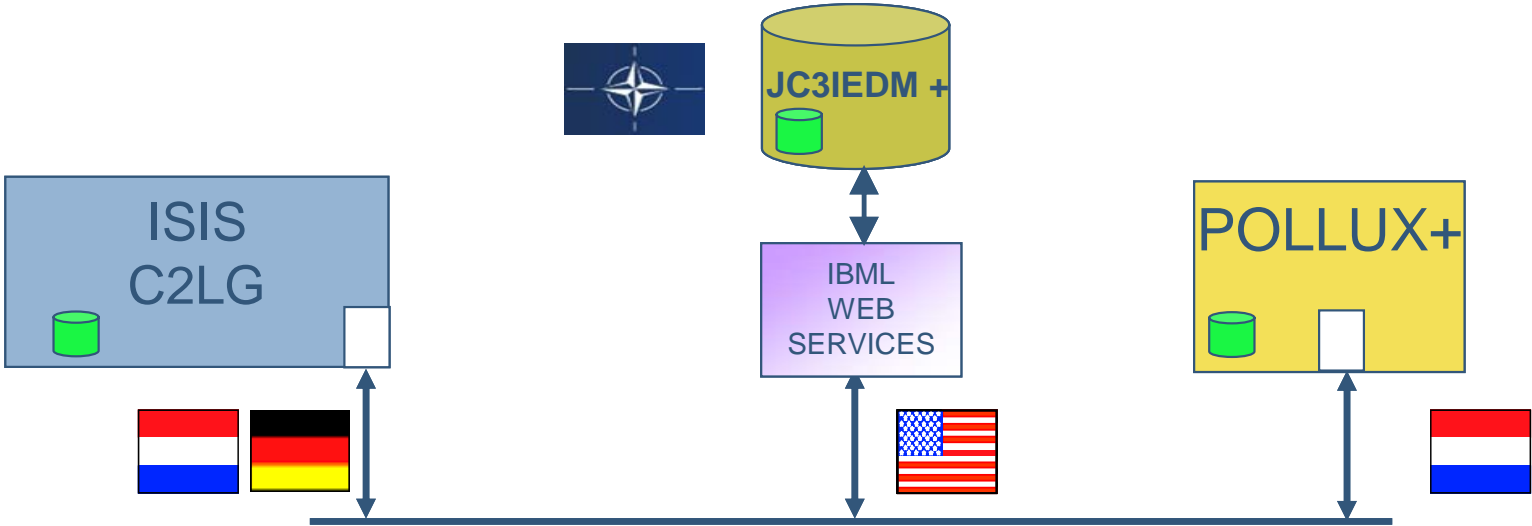
Two implementations: MySQL and SIMCI RI

Scripted Interpreter Advantages

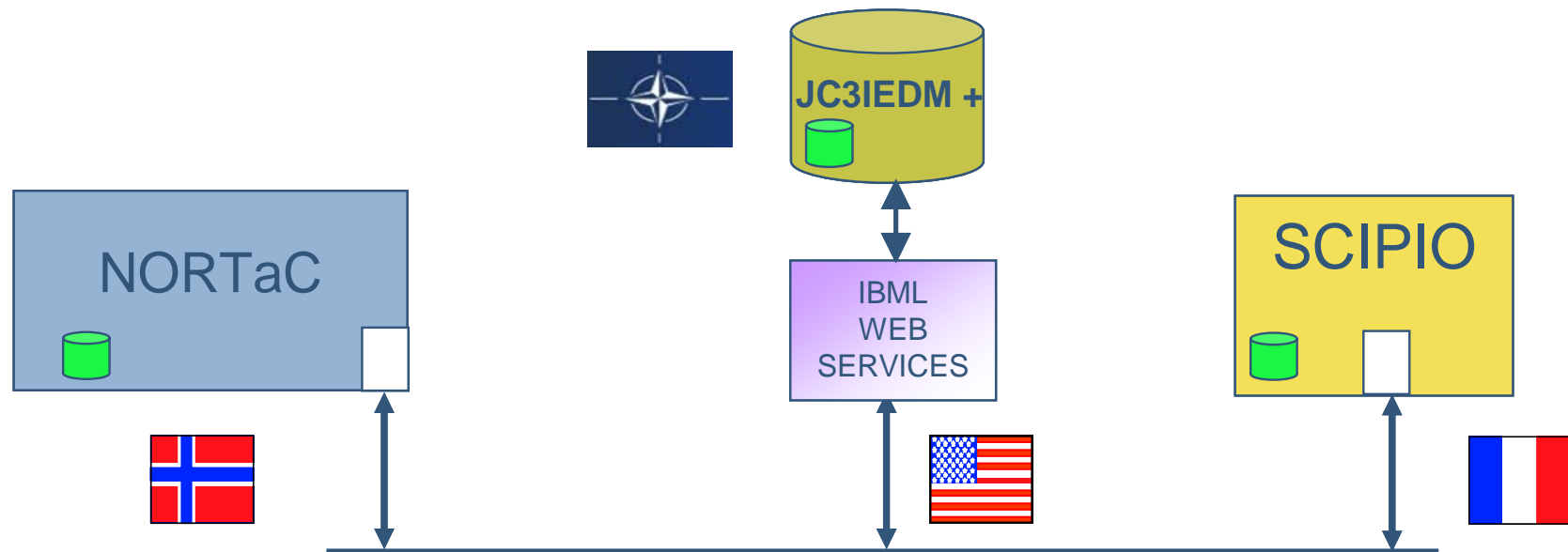
- A way to implement composite transactions where:
 - Validation requires only understanding of the object and JC3I EDM (but not Java)
 - Changes to the mapping are simple to implement
 - New business objects are easy to define and implement
 - Student did six of them in two weeks while learning
- Scripting language provides a highly concise definition of BML mapping
 - SISO C-BML should use it for that



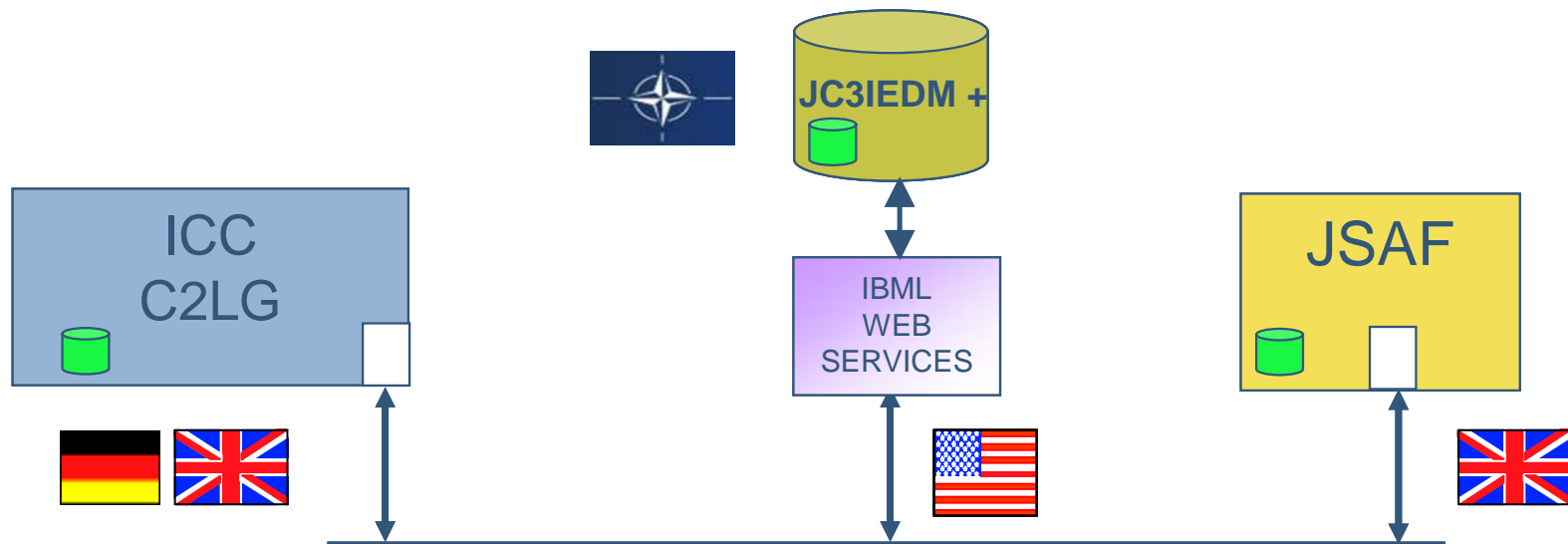
Demonstration configuration #1



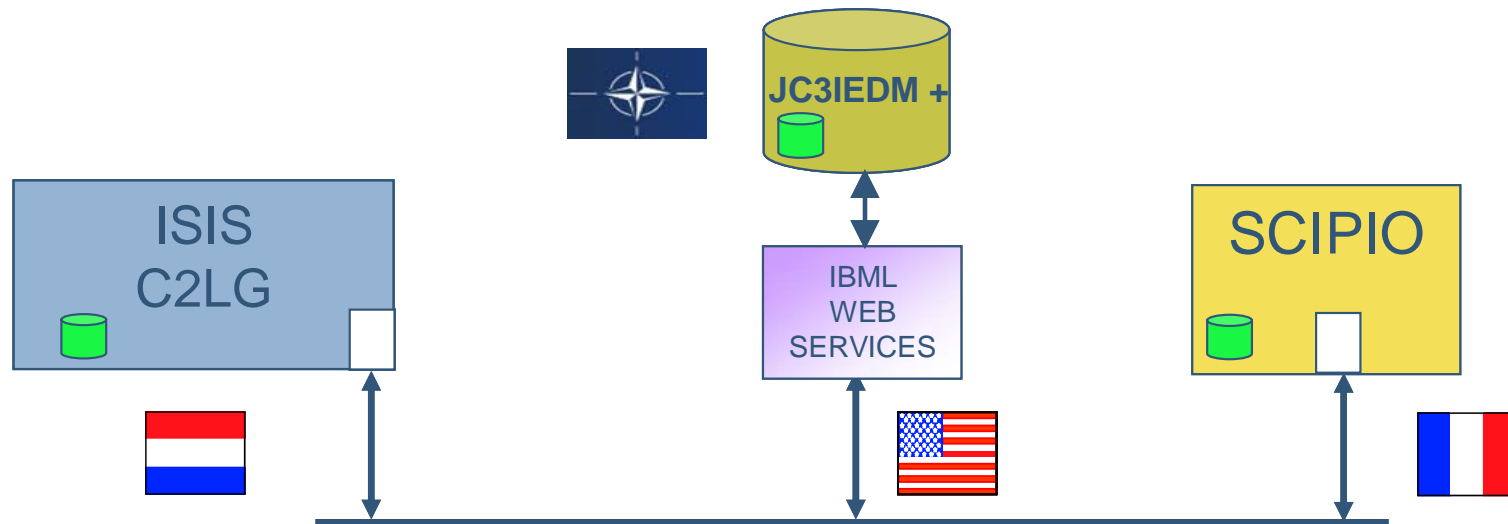
Demonstration configuration #2



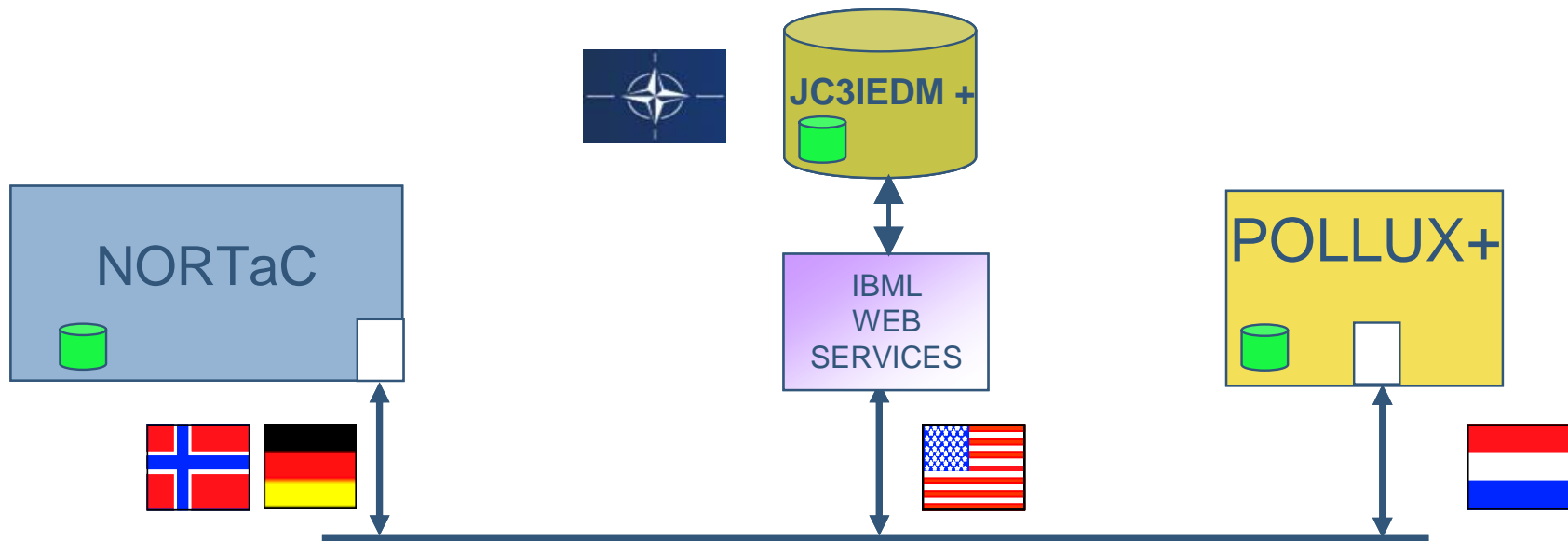
Demonstration configuration #3



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