C2SIM Sandbox Initial Capability

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Presentation Overview

- Introduction: C2SIM Vision
- C2SIM in SISO and NATO
- C2SIM Development Environment
- C2SIM Sandbox Concept
- Conclusions

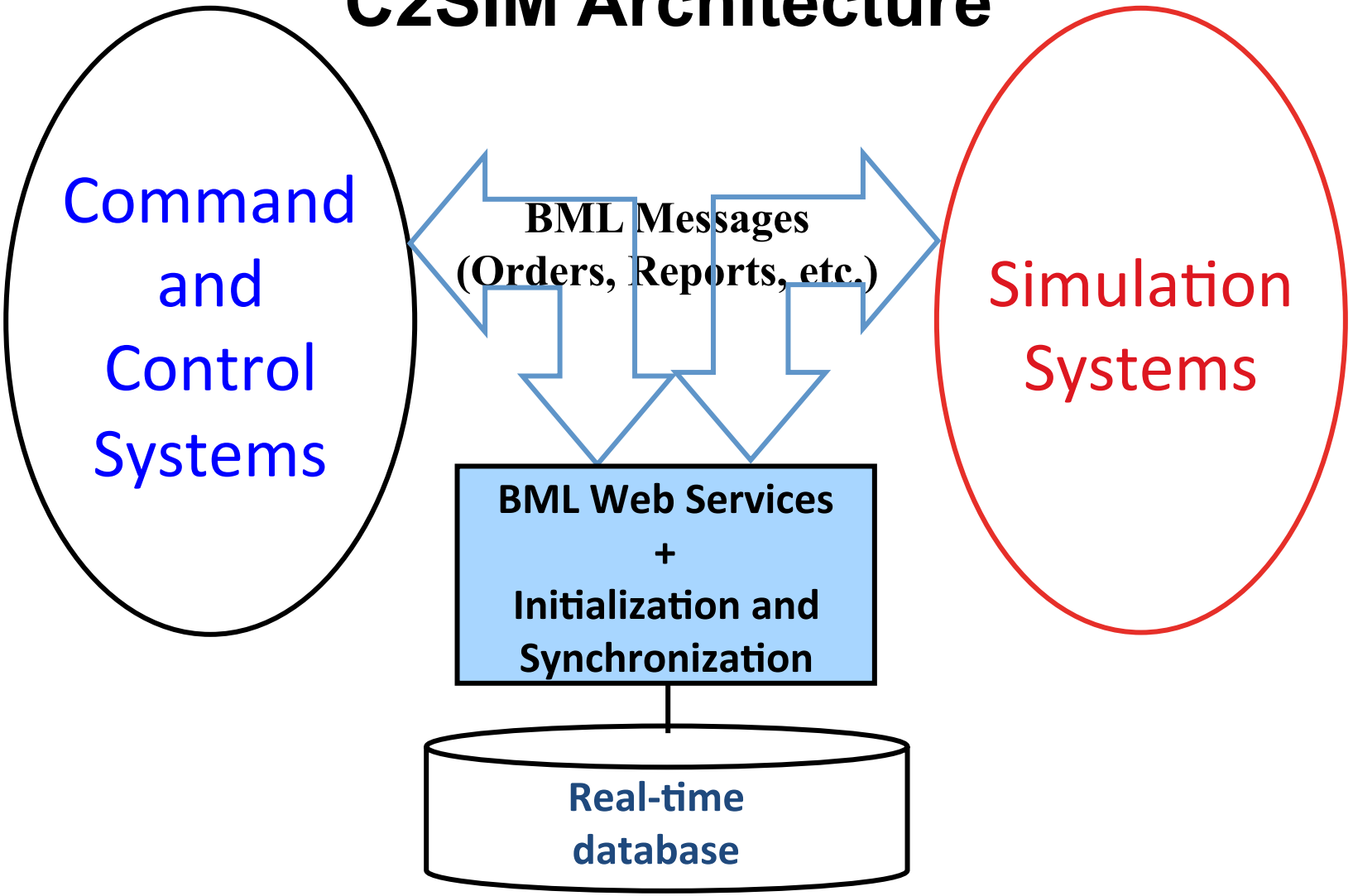
C2SIM Vision

We are working toward a day when the members of a coalition interconnect their networks, command and control (C2) systems, and simulations simply by turning them on and authenticating, in a standards-based environment.

What Does C2SIM Enable

- "Train as you fight"
  - Using operational C2 systems
  - Eliminating human between C2 and simulation systems saves $$$
- Operational planning: COA analysis
- Operational mission rehearsal
- For Service, Joint and Coalition
- Also using to support acquisition

C2SIM Architecture

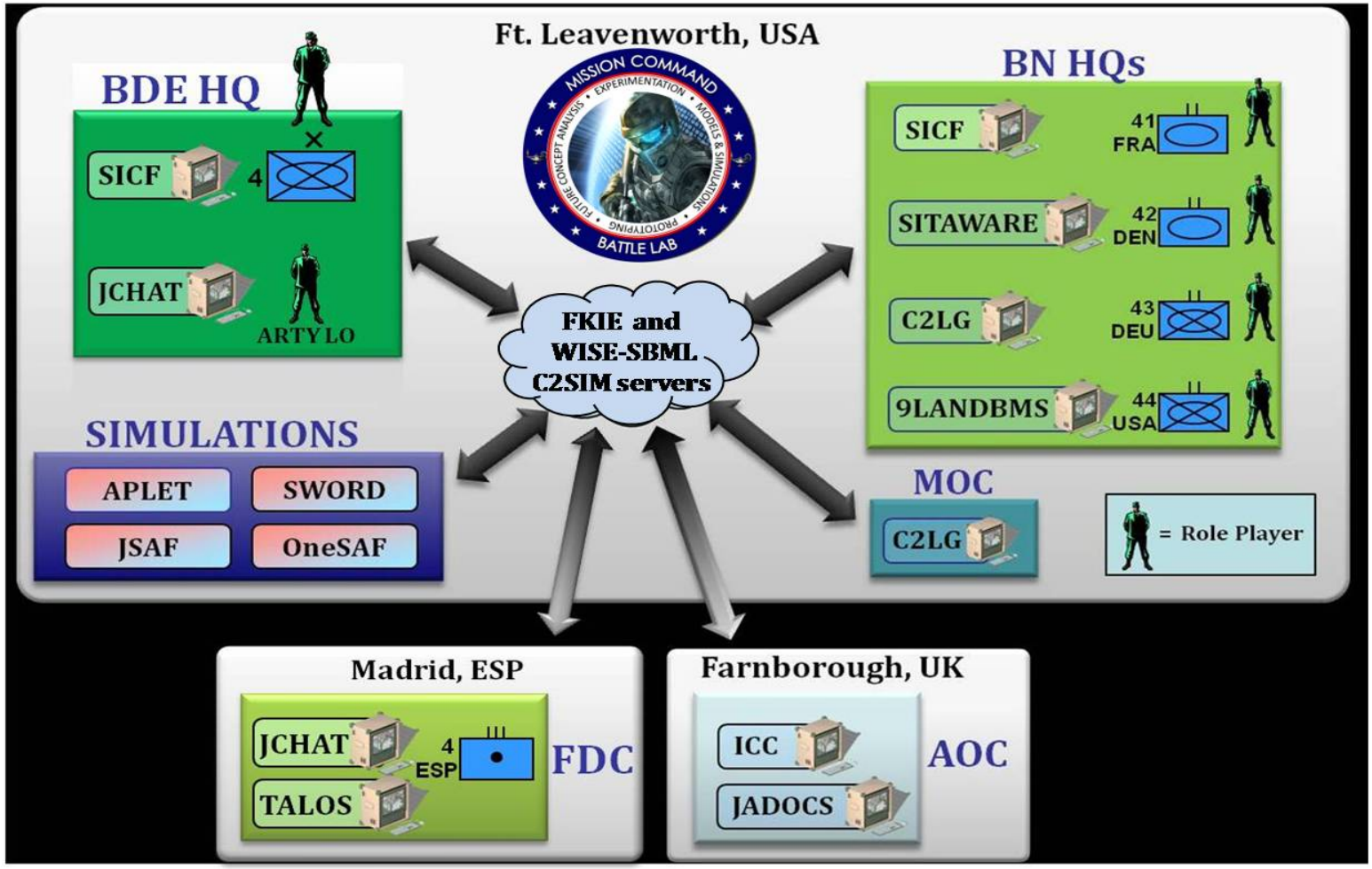


Roles of SISO and NMSG

NATO MSG-048 and MSG-085

- Multinational efforts to show technical feasibility and operational utility of Coalition BML (C-BML) and MSDL – roots of C2SIM
  - Canada, Denmark, Germany, the Netherlands, Norway, Spain, Turkey, UK and USA, Belgium and Sweden
  - Open framework to establish coherence C2 - M&S
  - New open, system-independent, community standards and protocols.
- Work areas:
  - Establish requirements for the C-BML standard
  - Assess its usefulness and applicability of C-BML in support of coalition
  - Educate and inform the C-BML stakeholders
- Highly successful final demonstration Ft Leavenworth December 2013
- Won NATO Scientific Achievement Award 2013

MSG-085 Final Demonstration Architecture



NATO MSG-145

- Charter effective 2016
- Leads: France, UK
- Participation: Canada, Denmark, Germany, Netherlands, Norway and USA
- Goal: Operationalise C2SIM
- Finished defining Program of Work June 2016
  - Seeking opportunities to demonstrate in operational military environment
  - Of interest: Viking 2018; NATO JWC

SISO C2SIM Standards

- International, open standards
- Initial versions
  - Military Scenario Definition Language (MSDL) supports initialization
  - Coalition BML (C-BML) provides for exchange of Tasking (orders and requests) and Reporting information
- Unified Version 2 under development as C2SIM
  - Logical Data Model (LDM)
  - Initialization
  - TaskingReporting
  - Extendable to many domains

Interdependency of NATO and SISO

NATO MSG depends on SISO for open industry-based standards

SISO depends on NATO Technical Activities to field and validate C2SIM technology

Second Generation SISO C2SIM

- MSG-085 showed that MSDL and C-BML could work together effectively, but with some difficulty.
  - They should be converged/harmonized
- Experience with C-BML "Full" schema indicates it is cumbersome to use.
  - Yet it only covers maneuver warfare – not all operations
- MSG-085 technical work indicated that the approach taken by Multilateral Interoperability Programme (MIP) is more useful.
  - Define data to be exchanged as data model, expressed as UML (not XML schema).
  - Extend data model to new domains as needed.
  - Derive XML schema from the data model.

SISO C2SIM Today

- SISO MSDL and C-BML Product Development Groups agreed to merge, forming C2SIM
  - Single Product Development Group; multiple Drafting Groups
    - Logical Data Model (LDM), Initialization, TaskingReporting
  - And a Product Support Group to maintain MSDL and C-BML
  - Reduced administrative overhead
- Current status:
  - Chartered Sep 2014; standard ballot due Dec 2017
  - Currently working on LDM draft, critical to all others
  - Must be consistent with NATO C2 and Simulation standards
  - Consistent with industry standards; informed by IEEE FIPA
  - Interoperation with national standards e.g. USA NIEM

C2SIM Standard Organization

- C2SIM-LDM (Logical Data Model)
  - Core set of data elements
  - Standard way of extending the core
- C2SIM-Initialize
  - Intended to supersede MSDL version 1
  - Defines startup and checkpoint information
- C2SIM-TaskingReporting
  - Intended to supersede C-BML phase 1
  - Major issue: be able to expand to new domains without being cumbersome
  - Derived from extended LDM
- C2SIM Maneuver Warfare Extension
- C2SIM Guidance Document

SISO C2SIM
Cooperation with NATO MSG-145

- Engaging operational military users
- Testing C2SIM with use cases:
  - Autonomous systems
  - Cyber Warfare
  - Future Mission Network mission threads
  - Information Operations
  - Army Mission Planning
  - Joint Mission Planning and Battlespace Management
  - Tactical Data Link
  - Command Post Army Training

C2SIM Standard Completion Schedule

- Fall 2016: release first draft
  - LDM, Initialize, Tasking-Reporting
  - Prototype Core-based system in MSG-145 "sandbox" with FKIE GUI and MAK VRForces
- Spring 2017:
  - prepare Maneuver Warfare extension and expand prototype to use it
  - Prepare guidance documents
- Fall 2017: submit documents for ballot
- 2018: balloting process
- Need modification to C2SIM Product Nomination

C2SIM Sandbox

Why Distributed Development Support is Needed

- MSG support teams are geographically distributed
  - Travel to bring them together is costly
  - Sometimes process takes longer than expected, as happened in MSG-048
- Open Internet is attractive for communication but unstable/insecure due to hackers
- Secure, established facilities operating 24x7 needed to reduce setup time for debugging/ testing/ demonstration/experimentation

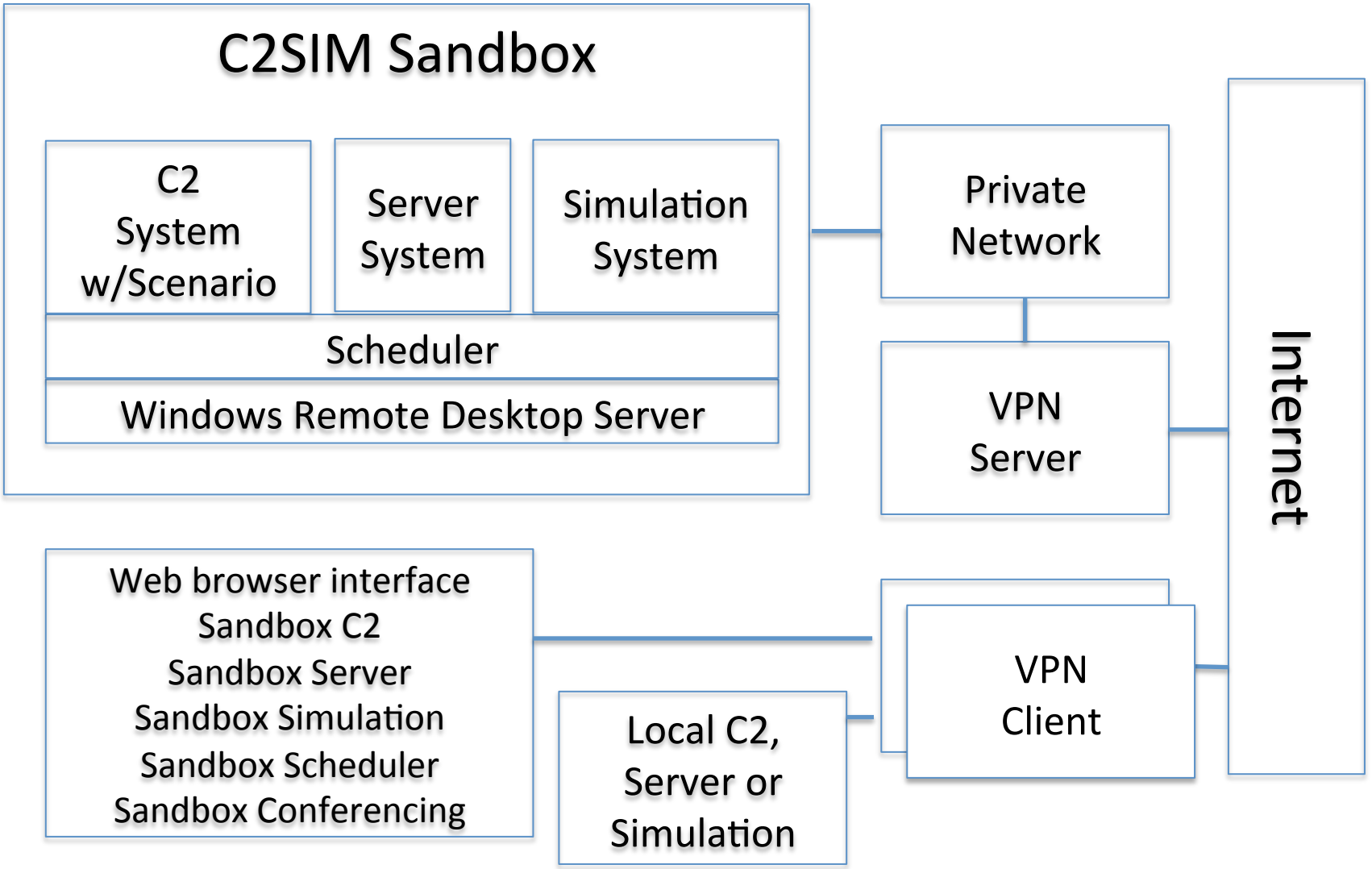
How Distributed Development Support Worked in MSG-085

- GMU C4I Center established a Virtual Private Network (VPN) using open source software
  - credentials for all TA participants
- GMU/Saab and FKIE servers running in Linux Virtual Machines under free license at GMU
  - Installed/managed by their authors
- Distributed testing scheduled by email
  - Individual or multi-site testing
- In some cases, accompanied by Internet conferencing
  - Otherwise, by telephone voice coordination and file transfer

C2SIM Sandbox Concept: Next Step in Distributed Development Support

- VPN-based collaborative environment
  - Credentials for all MSG-145 members
- Application GUIs available via Web browser
- Available to run on-demand 24x7
  - GMU Java-based reference implementation schema-translating server
  - GMU BML C2 GUI
  - MÄK VRForces with C2SIM interface
- Web-based scheduler (one-hour slots)
  - Includes ability to provide application parameters
- Financial support from NATO CSO

C2SIM Sandbox Architecture



Planned Future C2SIM Sandbox Mid-Term Resident Software

Software environment grows over time:

- Servers: FKIE and WISE/SBML
- C2: FKIE C2LG GUI
- Simulation: looking for volunteers

Documentation and any software GMU develops will be available on our website as open source.

Ways to Use C2SIM Sandbox

- C2SIM demonstrations
  - Initially IBML09
  - C2SIM standard as soon as we can prepare it
  - With generic scenario (others if contributed)
- C2SIM testing
  - Test C2 with Sandbox Server and Simulation
  - Test Server with Sandbox C2 and Simulation
  - Test Simulation with Sandbox C2 and Server
  - Test C2-Simulation Coalitions with the Server
  - Distributed configurations of all sorts
- C2SIM validation with SISO
- Limited-scope C2SIM-based exercises

Further Development of C2SIM as a Service

- MSG-145 expects to collaborate with MSG-136 "Simulation as a Service"
  - Possible demonstration at CWIX 2017
  - Work toward future where NATO FMN includes a 24x7 C2SIM capability affiliated with SaaS
  - Grow new capabilities as suggest in Hazen *et al.* paper "Evolution of CGF…" NMSG Symposium 2016
- Many issues to resolve
  - Funding, management, availability of GOS systems