Extensible Battle Management Language (XBML)
A Methodology for Web Enabling Command and Control for Network Centric Warfare

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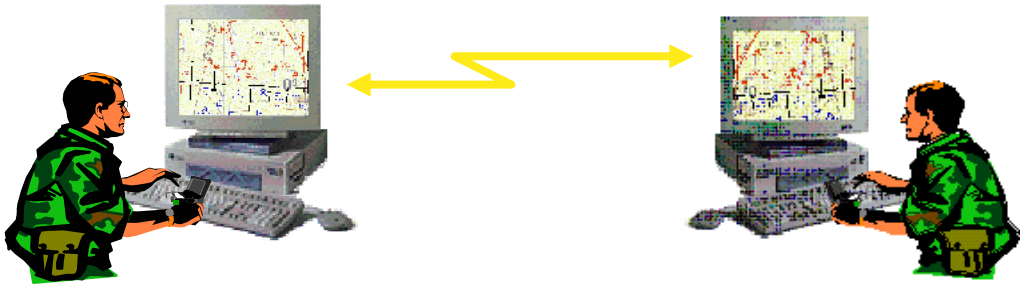
What Is Battle Management Language (BML)?

- BML is the unambiguous language used to:
  - Command and control forces and equipment conducting military operations, and
  - To provide for situational awareness and a shared, common operational picture.

Current Situation

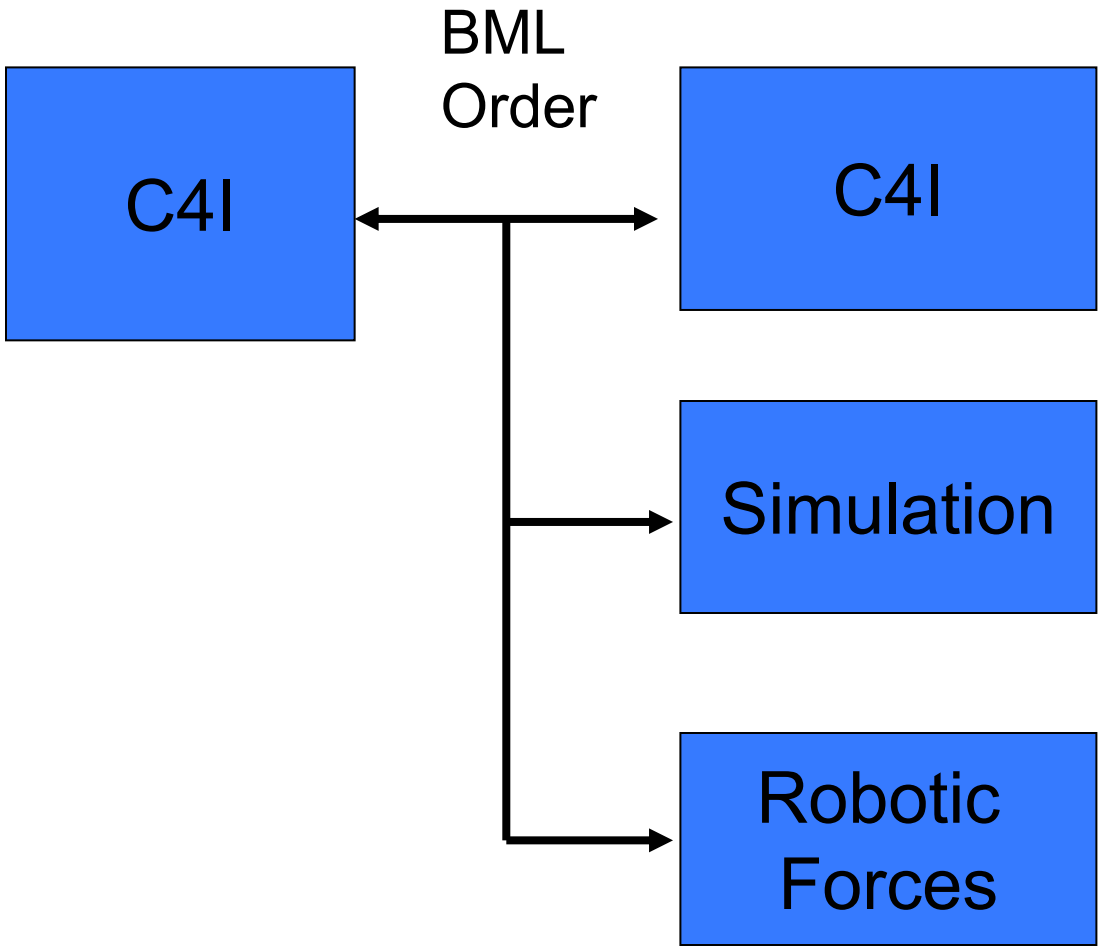
- What we use today for “BML” is a loosely knit “language” tailored to interpersonal communication.
- Its vocabulary is found in Doctrinal Manuals, but it lacks clearly delineated rules governing its use (semantics and syntax).
- It is riddled with ambiguity and overlapping definitions.
- As such, it is incapable of transitioning to the full range of automation that the DoD is implementing.
- It will not support the integration of advanced modeling and simulation with “digitized” command and control.



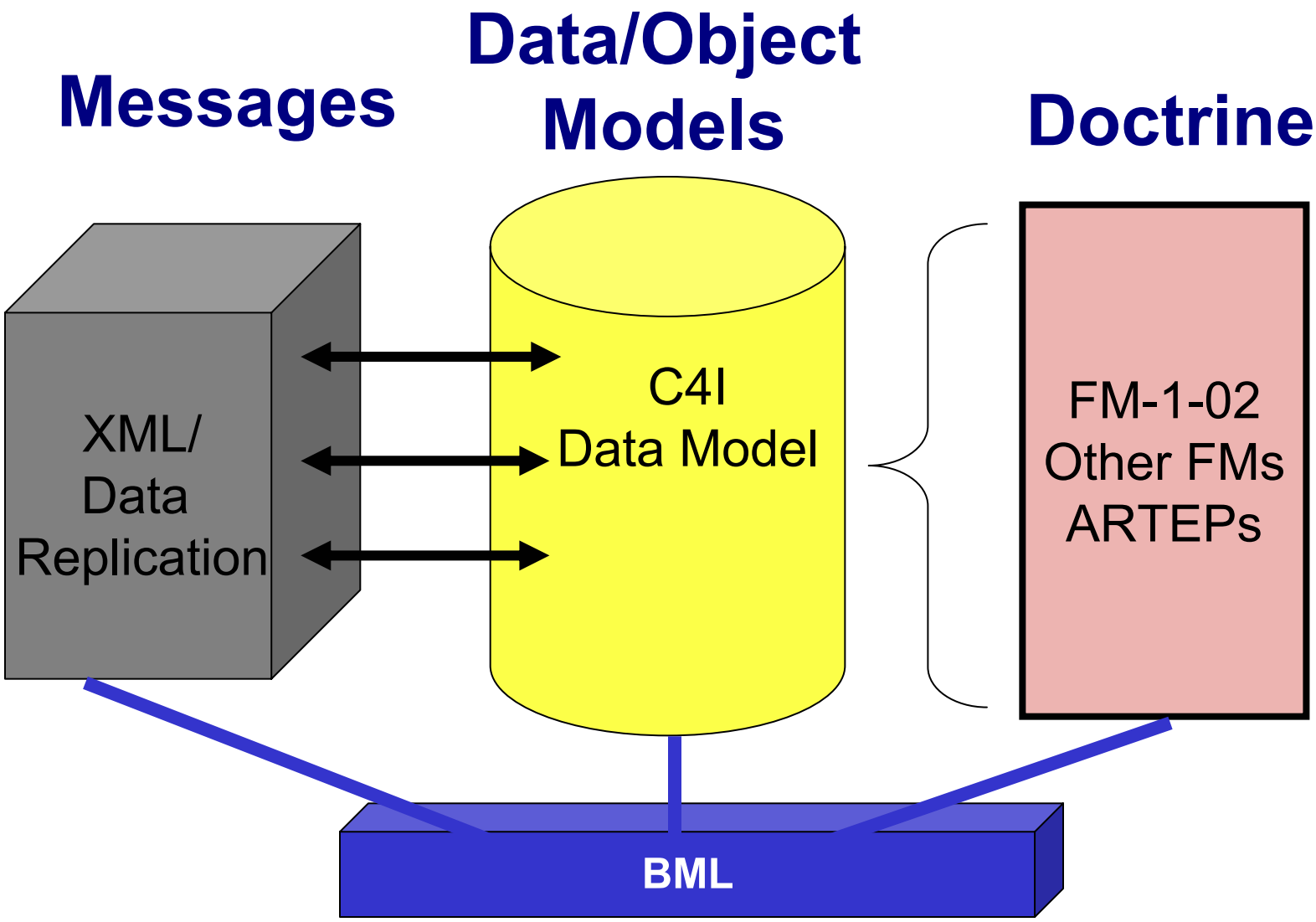
Principles of BML

- BML must be unambiguous
- BML must not constrain the expression of a commander's intent
- BML must use standardized C4I data and message representations
- BML must allow forces to communicate information pertaining to their mission, their status and their environment

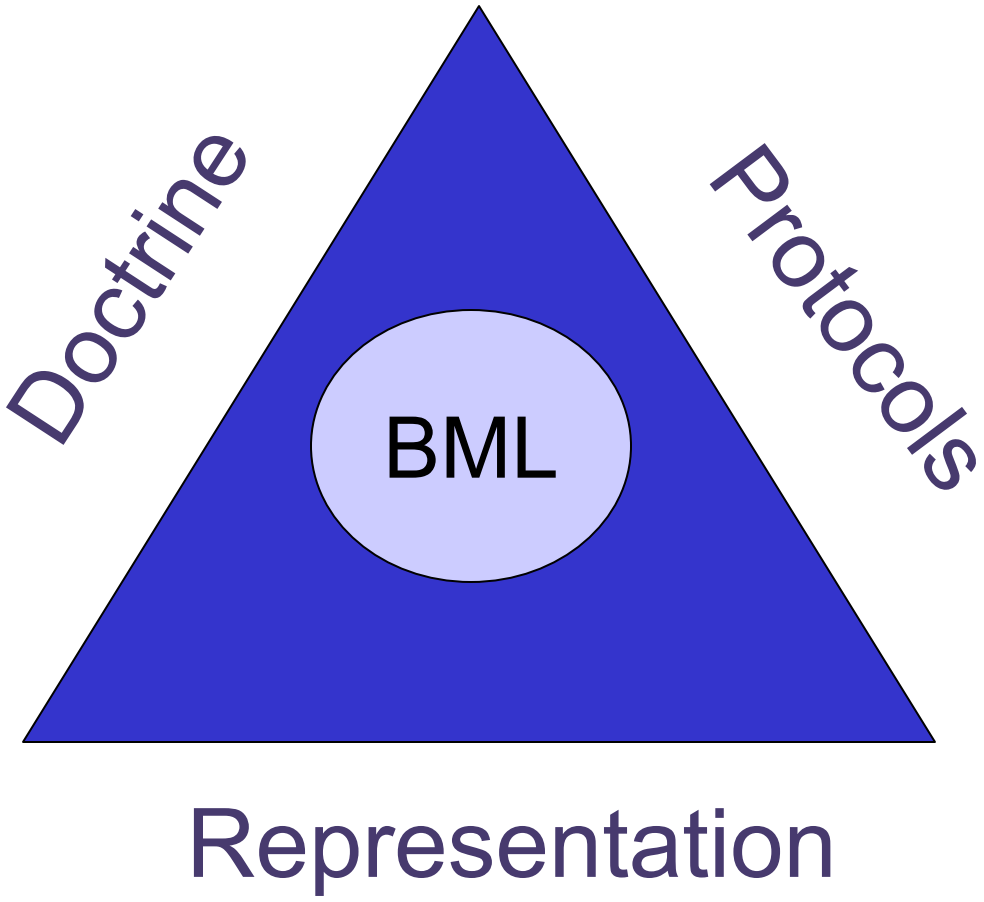
BML Scope



BML Concept

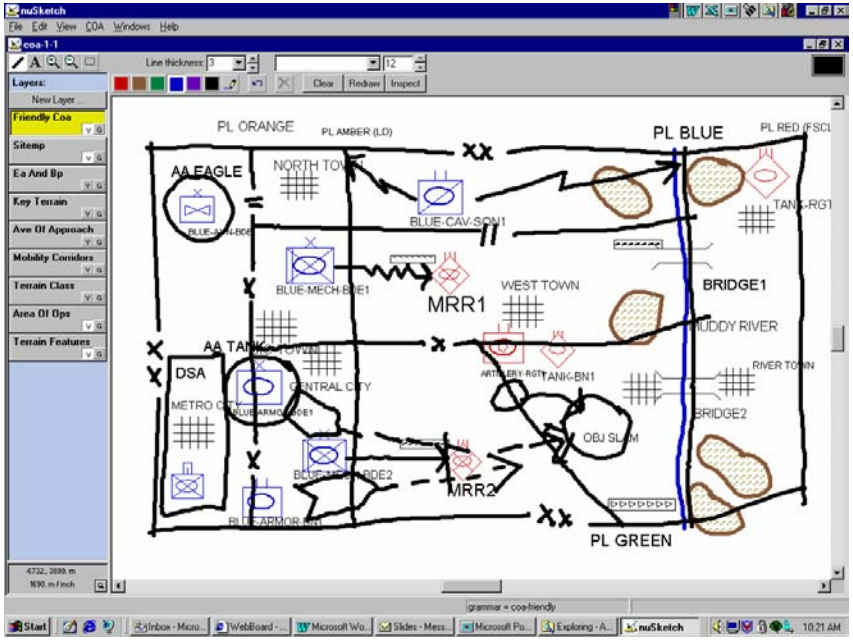

Messages
Data/Object Models
Doctrine
XML/ Data Replication
C4I Data Model
FM-1-02
Other FMs
ARTEPs
BML

BML Views



Course of Action Analysis Example

Graphics convert to BML



Division Mission

Division attacks on order in zone to seize OBJ SLAM.

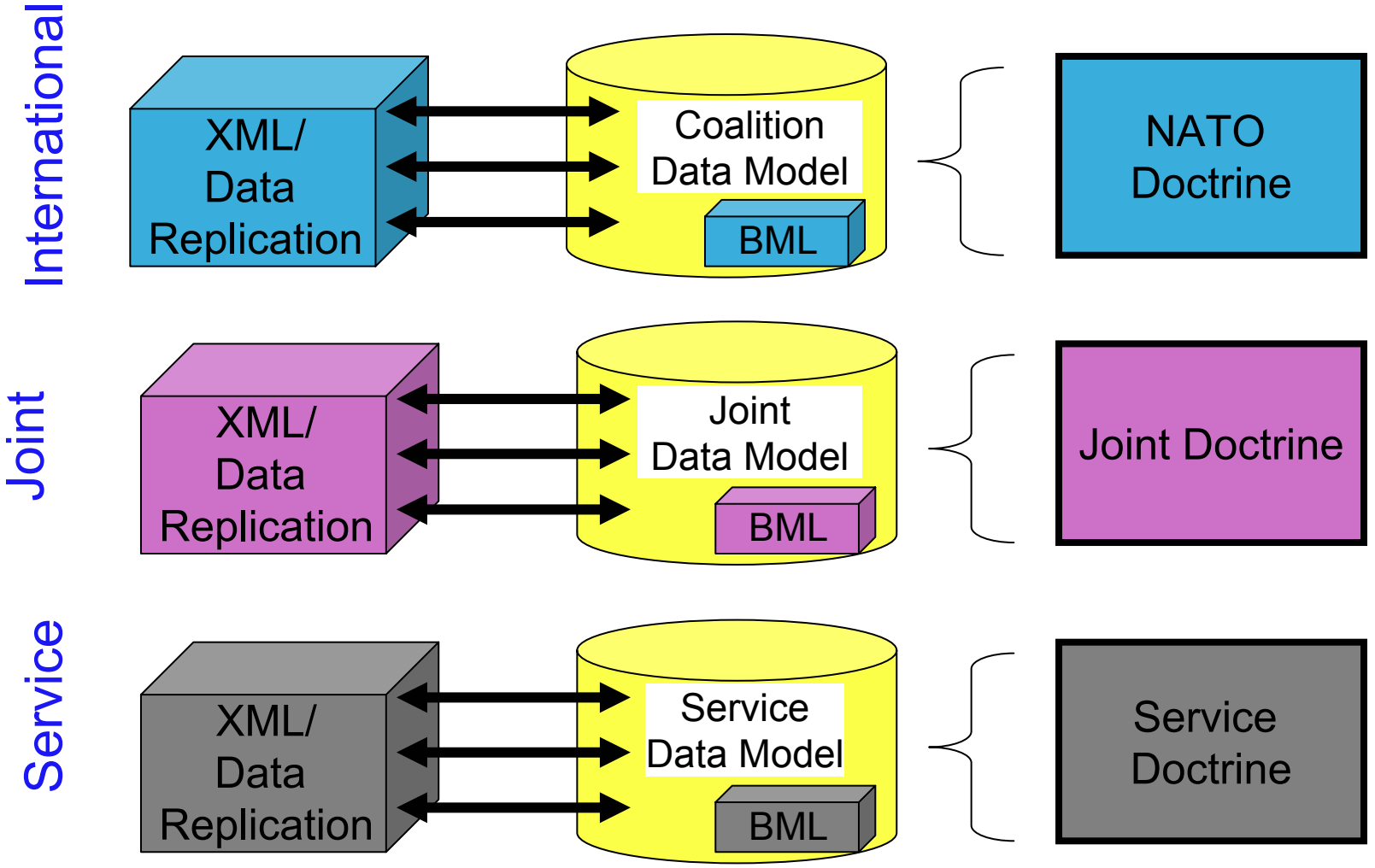
Division Concept of Operations

Form of maneuver: Penetration
Main effort: BLUE-MECH-BDE2,
on order BLUE-ARMOR-BDE1
Supporting effort: BLUE-MECH-BDE1
BLUE-ARMOR-BN1
Deep: None
Reserve: BLUE-AVN-BDE1
Security: BLUE-CAV-SQN1
Tactical Combat Force: BLUE-MECH-TM1

Tasks to Subordinates

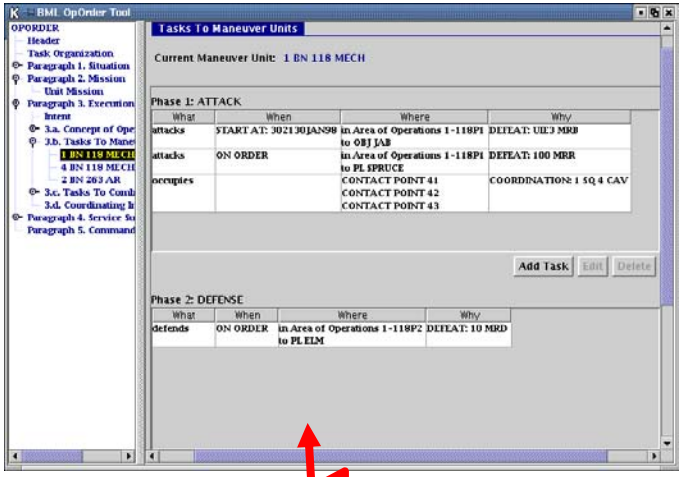
•Who	•What	•When	•Where	•Why
•BLUE-MECH-BDE1	•Attacks	•On order	•Zone	•Fix (MRR1)
•BLUE-MECH-BDE2	•Attacks	•On order	•Zone	•Penetrate (MRR2)
•BLUE-ARMOR-BDE1	•Follows and Assumes (B-M-BDE2)	•On order	•Zone	•Seize (OBJ SLAM)
•BLUE-AVN-BDE	•Occupy	•On order	•AA EAGLE	•Reserve
•BLUE-ARMOR-BN1	•Follow and Support (B-A-BDE1)	•On order	•Zone	•Support (B-A-BDE1)
•BLUE-CAV-SQN1	•Screen	•On order	•Zone (PL AMBER to PL BLUE)	•Protect (Division left flank)
•BLUE-MECH-TM1	•Tactical Combat Force	•On order	•DSA	•Protect (Division Rear Area)

BML Scalability



US Army BML Proof of Principle

BML GUI

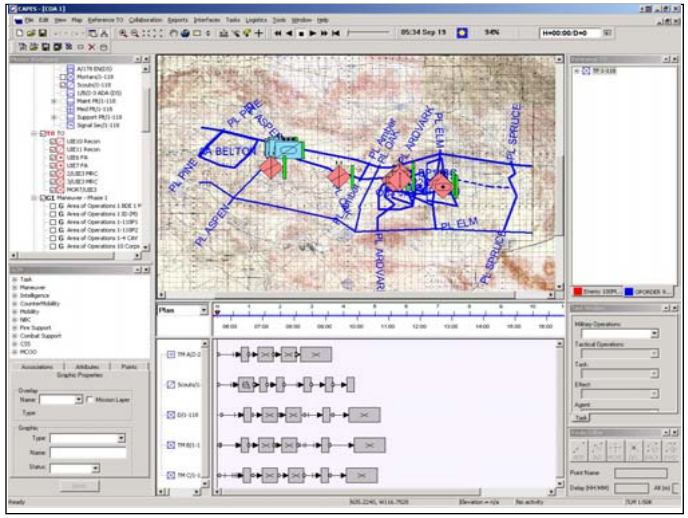


XML – BML Parser

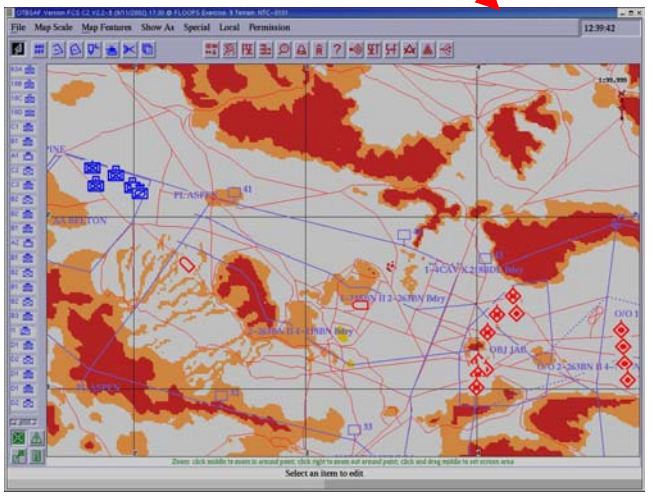
Multi-Source Database Augmented with BML

C4ISI

CAPES



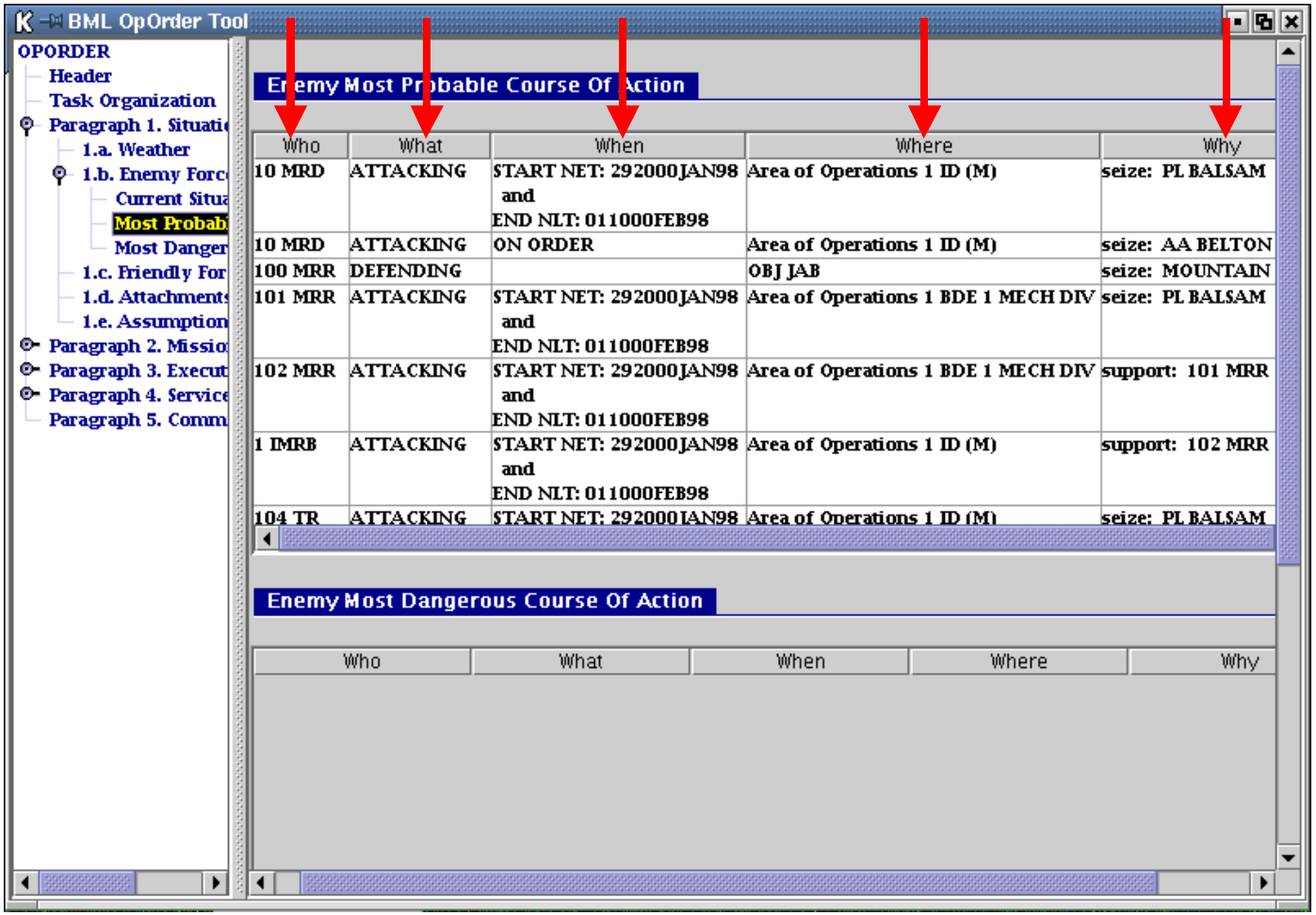
OTB



BML acts as the common denominator

Paragraph 1: Enemy Most Probable CoA

Who What When Where Why



Extensible Modeling and Simulation Framework

- **What is XMSF?**
  - The Extensible Modeling and Simulation Framework (XMSF) is defined as a set of Web-based technologies and services, applied within an extensible framework, that enables a new generation of modeling & simulation (M&S) applications to emerge, develop and interoperate.

- **XMSF Precepts**
  - Web-based technologies can provide an extensible modeling and simulation architecture, to support a new generation of interoperable applications
  - Simulation support is needed for operational warfighting capabilities
  - XML-based architecture can provide a bridge between emerging rehearsal/reality/replay requirements and open/commercial Web standards
  - Web = best tech strategy + best business case

What Is XBML?

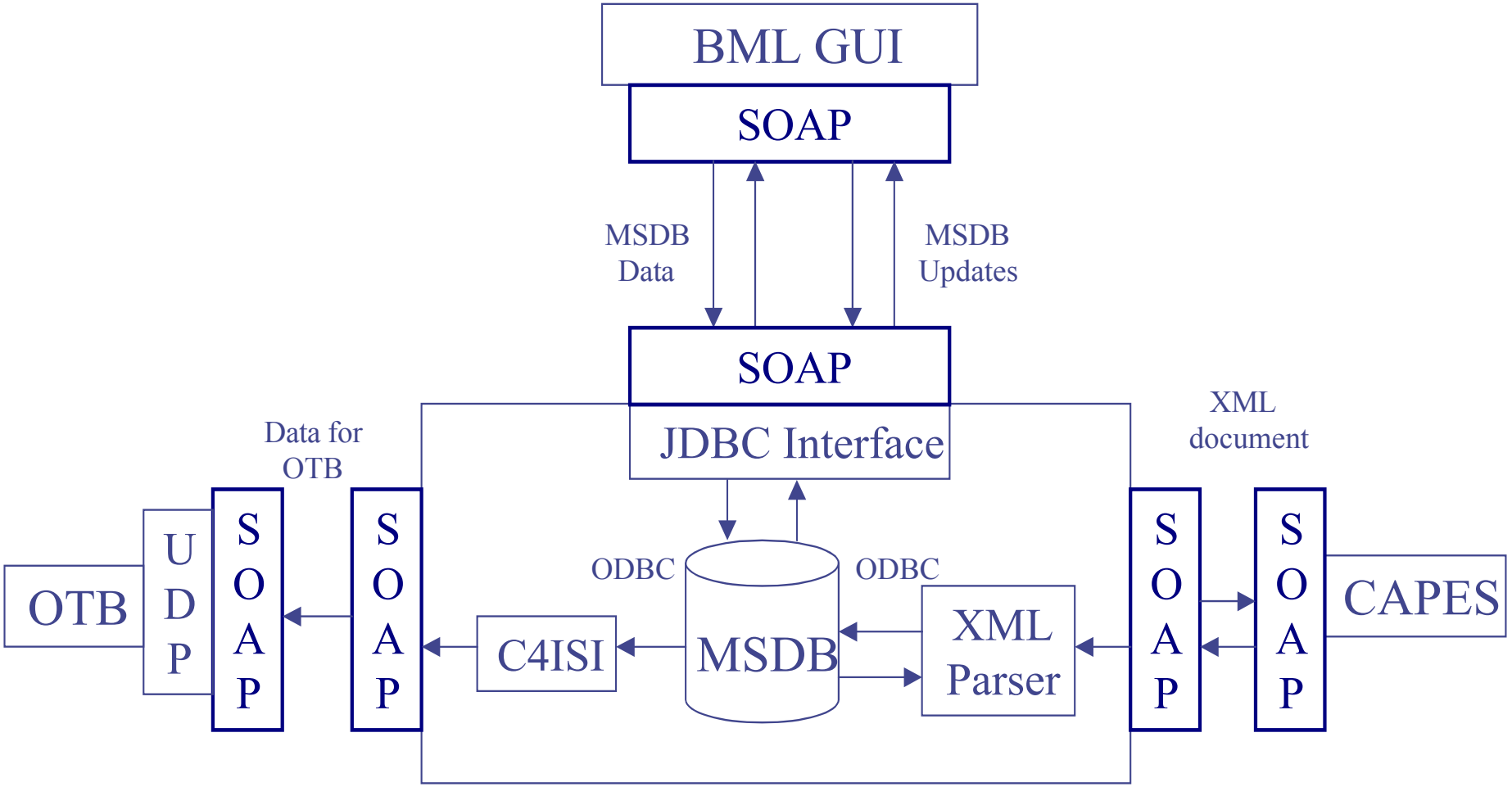
- XBML is BML provided as Web services
- XBML is being developed as an integral part of the Extensible Modeling and Simulation Framework

Applying XMSF Principles to BML

- BML must utilize Web Standards for Message Transmission
  - SOAP
  - XML
- BML must use a standard “vocabulary”
  - the Command and Control Information Exchange Data Model (C2IEDM)
- This results in:

- Distributed, Flexible Interfaces
- Common Syntax and Semantics between Services, and Coalition Partners
- Unambiguous terms needed for Simulation Execution

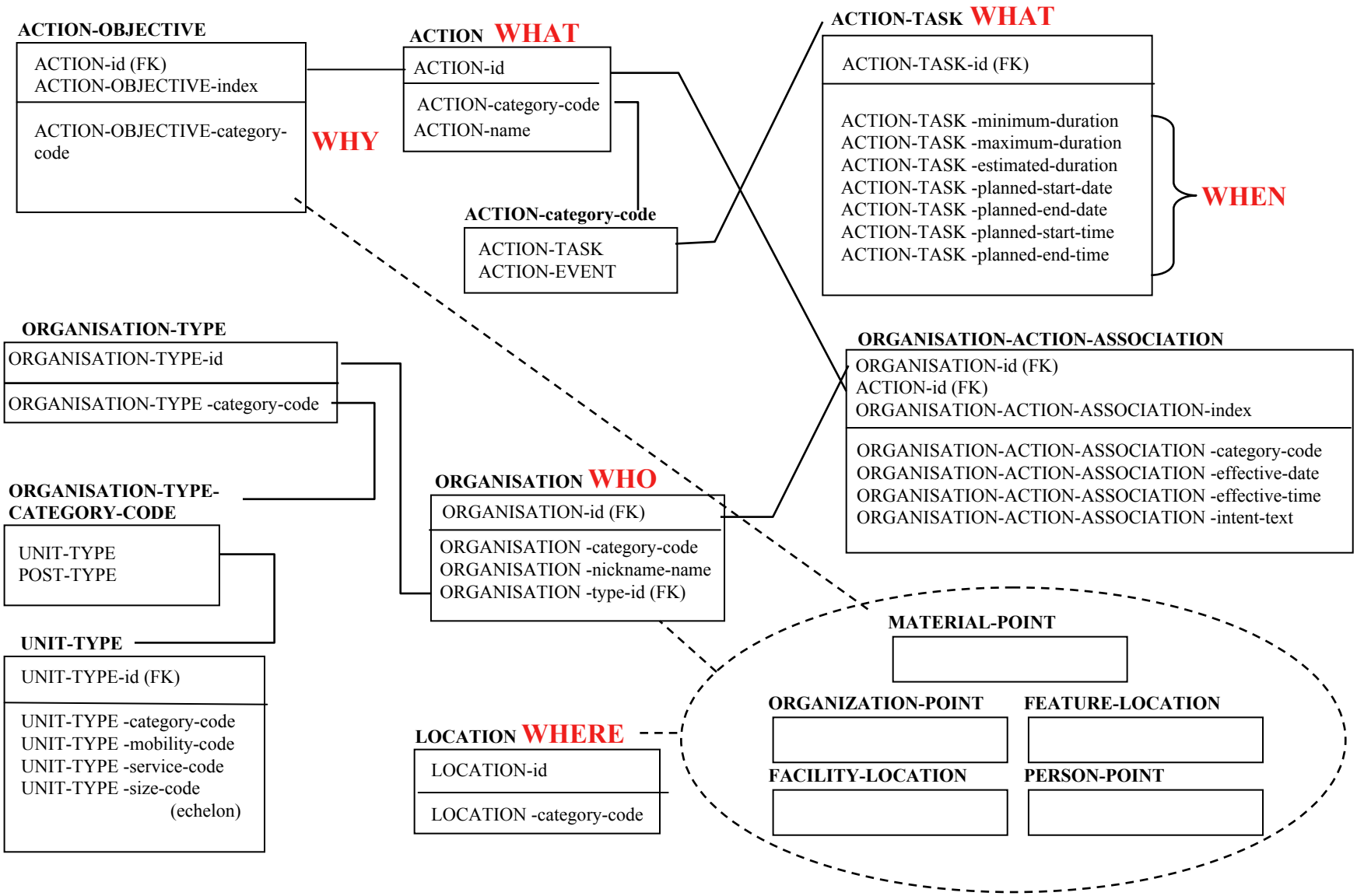
XBML Testbed Distributed Interfaces



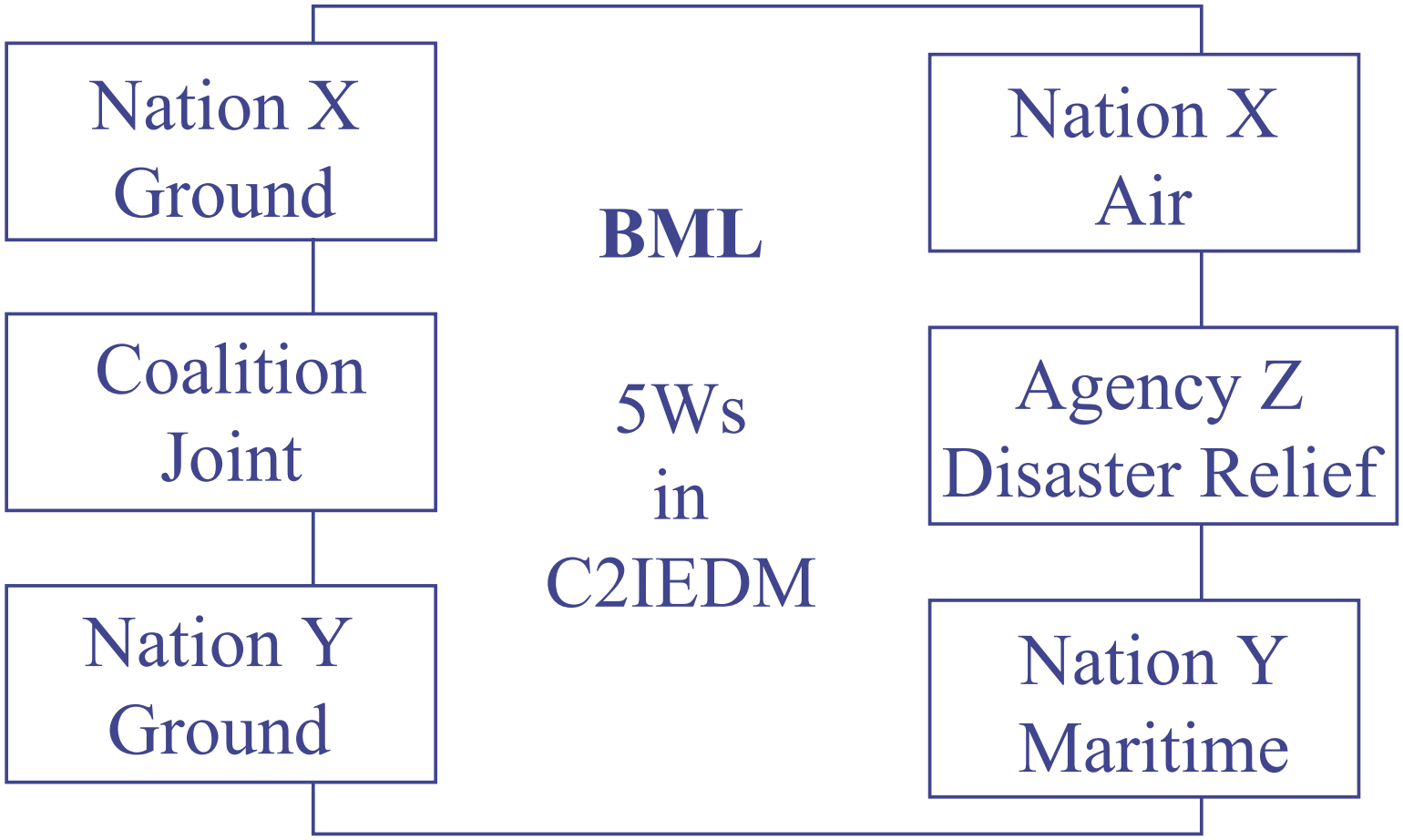
Why use the C2IEDM for XBML?

- Developed by NATO data modeling experts (ATCCIS Permanent Working Group)
- Based on the Information Exchange Requirements on the Battlefield
  - *Unambiguous Representation of Information*
  - *Extensible Data Model*
- NATO Standard ADatP-32
- Used by the NATO Data Administration Group
- Core Data Model for various C4I Systems
- Reference Data Model for various Simulation Systems
- Data Model for Multilateral Interoperability Program (MIP)

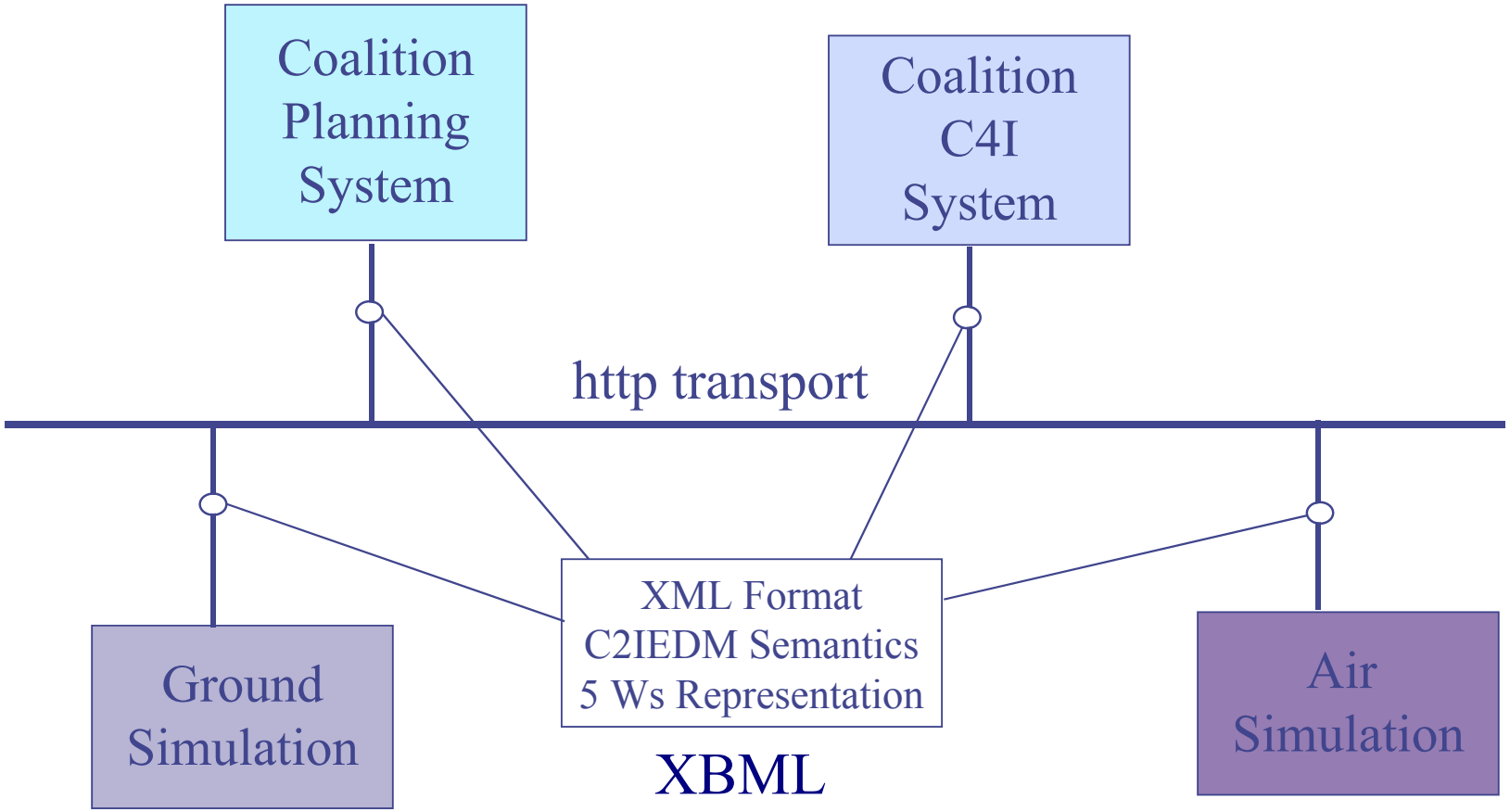
5 Ws in C2IEDM



Joint BML Implementation Concept: Extend the C2IEDM



XBML Coalition Concept



BML as a Domain Ontology

Upper Level Ontology

BML as a Domain Ontology

C2IEDM as an Underlying Data Model

BML Developments

- **Simulation Interoperability Standards Organization (SISO) Coalition BML Initiative**
  - **United Kingdom**
  - **France**
  - **Germany**
  - **Strong Interest from other nations**

- **Other Services**
  - **Currently developing Air Tasking Order in BML**
  - **Working with JFCOM to demonstrate BML in large scale exercise**

Conclusions

- **BML can provide a true common language among humans, machines, Services and national militaries**
  - **Will enable command and control interoperability within Joint and coalition environments**
- **The concept of simulation applications implemented as Web services will support future network centric operational concepts**
- **We have demonstrated the capability of distributed, remote operation of web-enabled components**

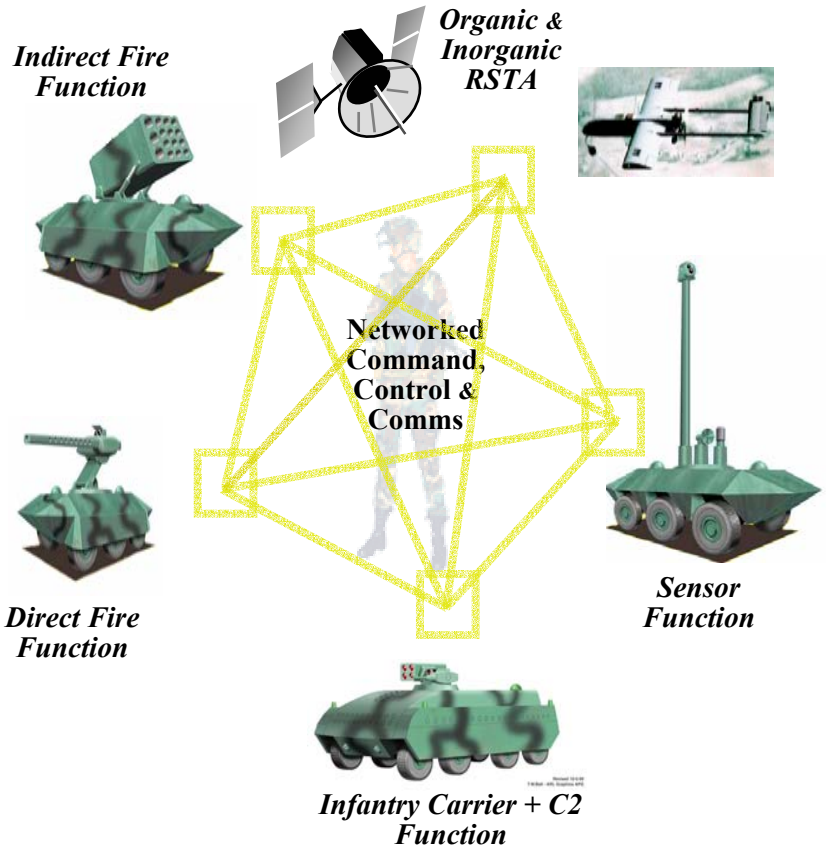
Backups

The Problem

- Current and emerging simulations do not have the capability of directly interacting with C4I systems.
  - They require the development of unique interfaces (“black boxes”) for each pairing of a simulation and a C4I system
  - They require significant non-training audience intervention in order to support digital battle staff training and they will continue to do so until a standardized Battle Management Language is developed for communicating between these systems.
  - The most difficult aspect of this problem is in communicating mission type orders from the command nodes to the supporting simulations. Generically this is known as the “Free Text Problem.”

BML as an Enabler for Network Centric Operations

- **Network Centric**
  - ✓ Know precisely, in real-time, location of all friendly and enemy forces
- **Robotics Integrated into Force**
  - ✓ Amplify capability of manned elements
  - ✓ Multi-functional (RSTA, armed, sustainment)
- **Increased Reliance on Extended Range Engagement**
  - ✓ Organic plus strategic and tactical support
  - ✓ Long range ISR and precision fires
- **Capable of Air-Mobile Operations**
  - ✓ Commercial and minimum DoD strategic and tactical lift



Extending the BML Vocabulary to Air Operations

- Begin with Air C2DIF (Command and Control Data Interchange Format)
  - Developed by Gestalt – AF/ESC Sponsorship (1998)
  - Vetted in over 120 Exercises/Events/Demonstrations/Tests
- Includes the Following Categories
  - Air Battle Plan
    - Air Tasking Order (ATO)
    - Airspace Control Order (ACO)
    - Special Instructions (SPINS)
    - Mission Feedback
    - Friendly Order of Battle (FRoB)
    - Scenario Data (UOB)
  - Mission Representation
    - Includes More Detailed Mission Planning Aspects of ATO Directed Missions
    - Supports the “Decrease of the Controller Footprint Goal”

Army, Joint and NATO Doctrine Hierarchies