



# Exchanging PMESII Data to Support the Effects-Based Approach (EBA) to Operations

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# Report Documentation Page

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# Outline

- **Stability Operations**
- **Effects Based Approach to Operations**
- **Joint Consultation, Command and Control Information Exchange Data Model (JC3IEDM)**
- **State of the Art Simulations**
- **Illustrative Urban Scenario**
- **Addressing JC3IEDM Taxonomy**
- **Multinational Federation**
- **Exchanging Commander's Intent**
- **Future Work**
- **Conclusions**

# Introduction

## Problem:

Today's **virtual environments** focus chiefly on **attrition** and the causal effects associated with **kinetic** interactions.

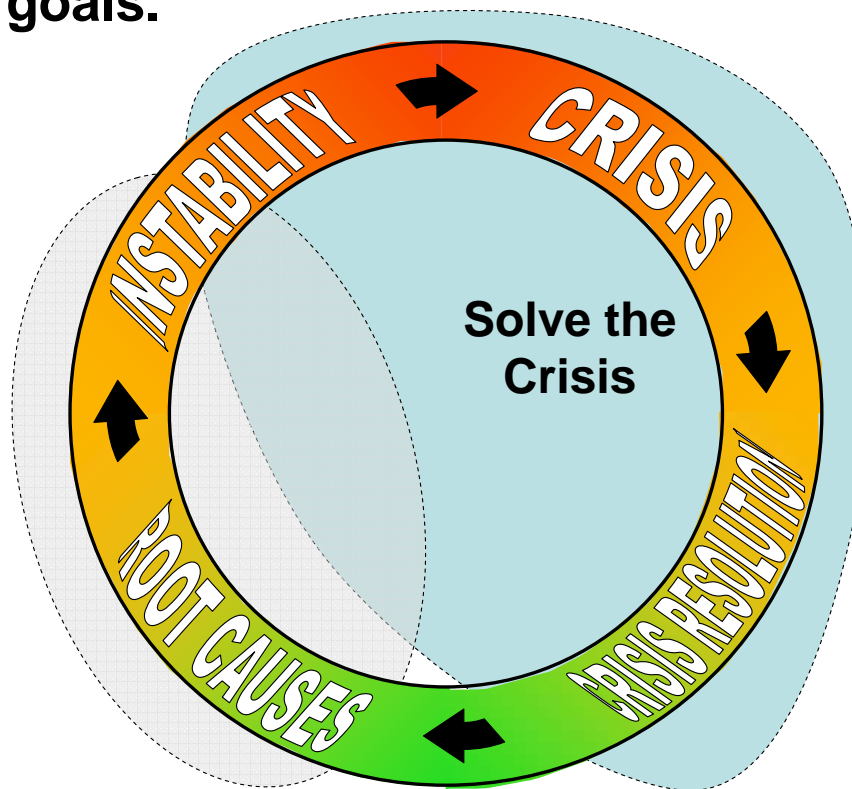
## Premise:

By using **simulations** to generate new data types that support **non-kinetic aspects** of Stability Operations (SO) and Effects-Based Approach (EBA), C4ISR developers can use this data for improving their components to better serve the **warfighter**.

# Stability Operations

- **Stability Operations (SO) are required, even after achieving political goals.**

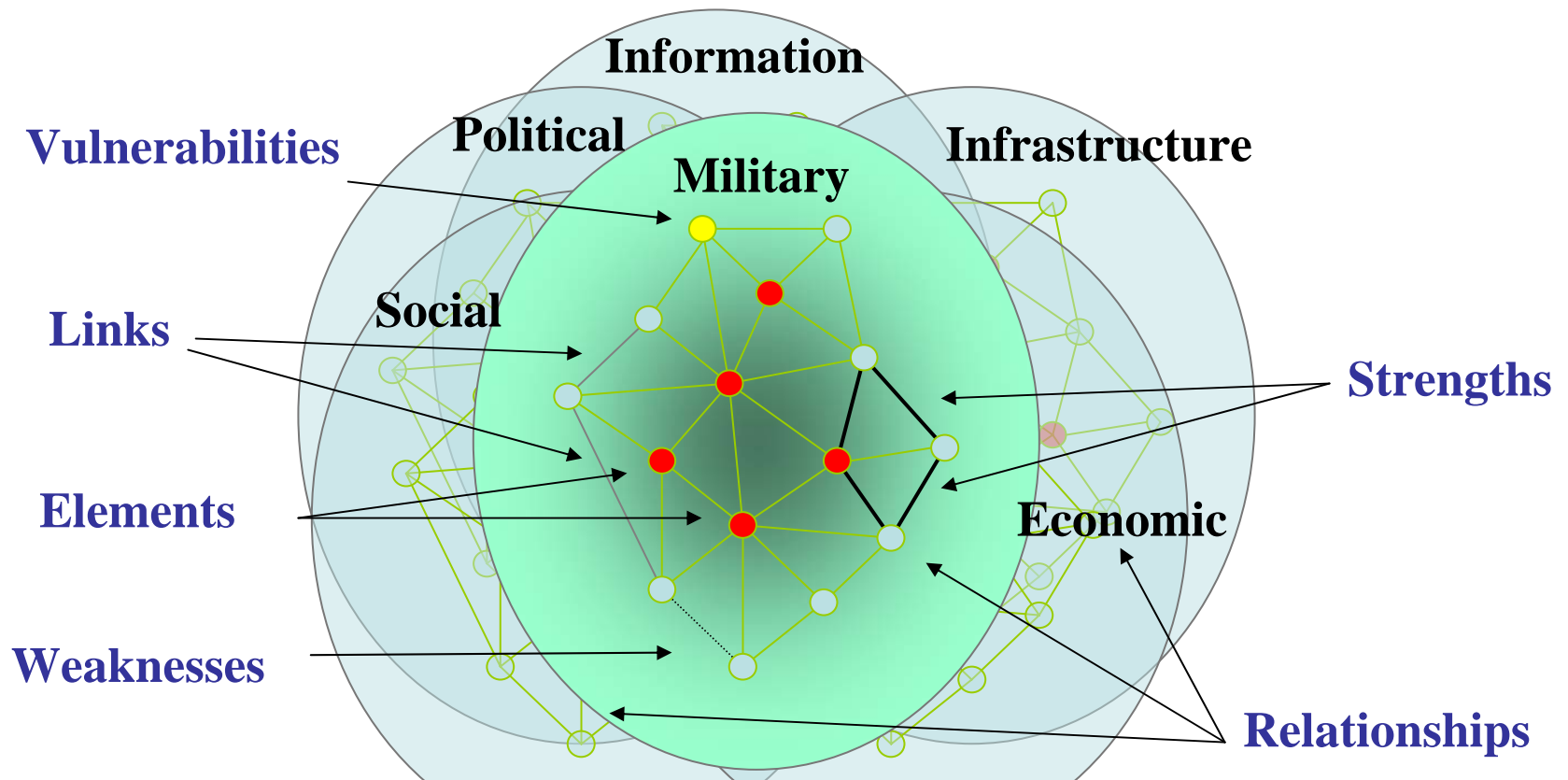
Reduce the  
Likelihood of  
Reemergence



- **Reconstruction**
  - Provide security
  - Humanitarian assistance
  - Limited governance
  - Restore public services
- **Goal: Facilitate transition to a local civil governance.**

# PmESII Operational Environment

## Adversary and Coalition National Power



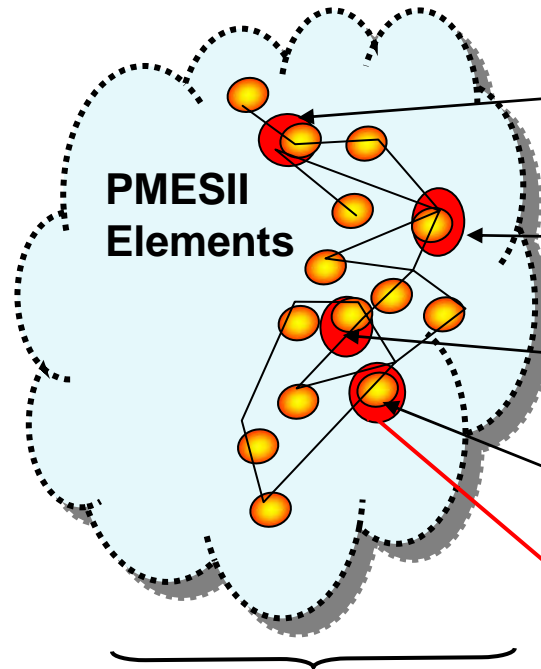
*Today's adversary is a dynamic, adaptive foe who operates within a complex, interconnected operational environment.*

# Effects-Based Approach to Operations

*Changing the Way We Think ...*

## Objective

Destroy  
Global Terrorist  
Networks



## Actions

### Diplomatic

(build & sustain coalition)

### Information

(“not a war on Islam” message)

### Military

(remove Taliban regime)  
(destroy terrorist cells)

### Economic

(cut off funding)

## Resources

Integrated  
**DIME**  
Actions

## Effects

Key **Elements** & Vulnerabilities

What has to happen to Red to achieve Blue objectives  
(no longer able to operate as an adaptive network with  
global reach)

# JC3IEDM

- JC3IEDM is an evolving **data specification** to enable **information exchanges** among national command and control systems.
- Represents years of data modeling efforts under the administrative management of the **Multilateral Interoperability Program**.
- JC3IEDM is the result of the **merging** of Command and Control Information Exchange Data model (**C2IEDM**) and the NATO Corporate Data Model (NCorpDM).
- Significance of JC3IEDM is highlighted as the **U.S. Army** recently adopted C2IEDM as the **standard** for information exchanges among command and control applications.
- Leveraging **years of cooperation** from among dozens of participating nations and organizations, JC3IEDM has the potential to become a truly robust **information repository** to support **combined joint operations**.

# State of the Art Modeling

- Attrition simulations **synchronize** on causal effects to model conventional combat operations.
- Processes of acquiring and engaging entities in the virtual environment are modeled as independent and **explicit occurrences**, enabling a quantified comparison of engagement protocols.
- Military organizations and **civilian populations** are represented for target identification and measure effectiveness of **kinetic actions** against targets.
- **Behavior** of civilian populations and reactions of the population to kinetic actions are subject to an operator's discretion.

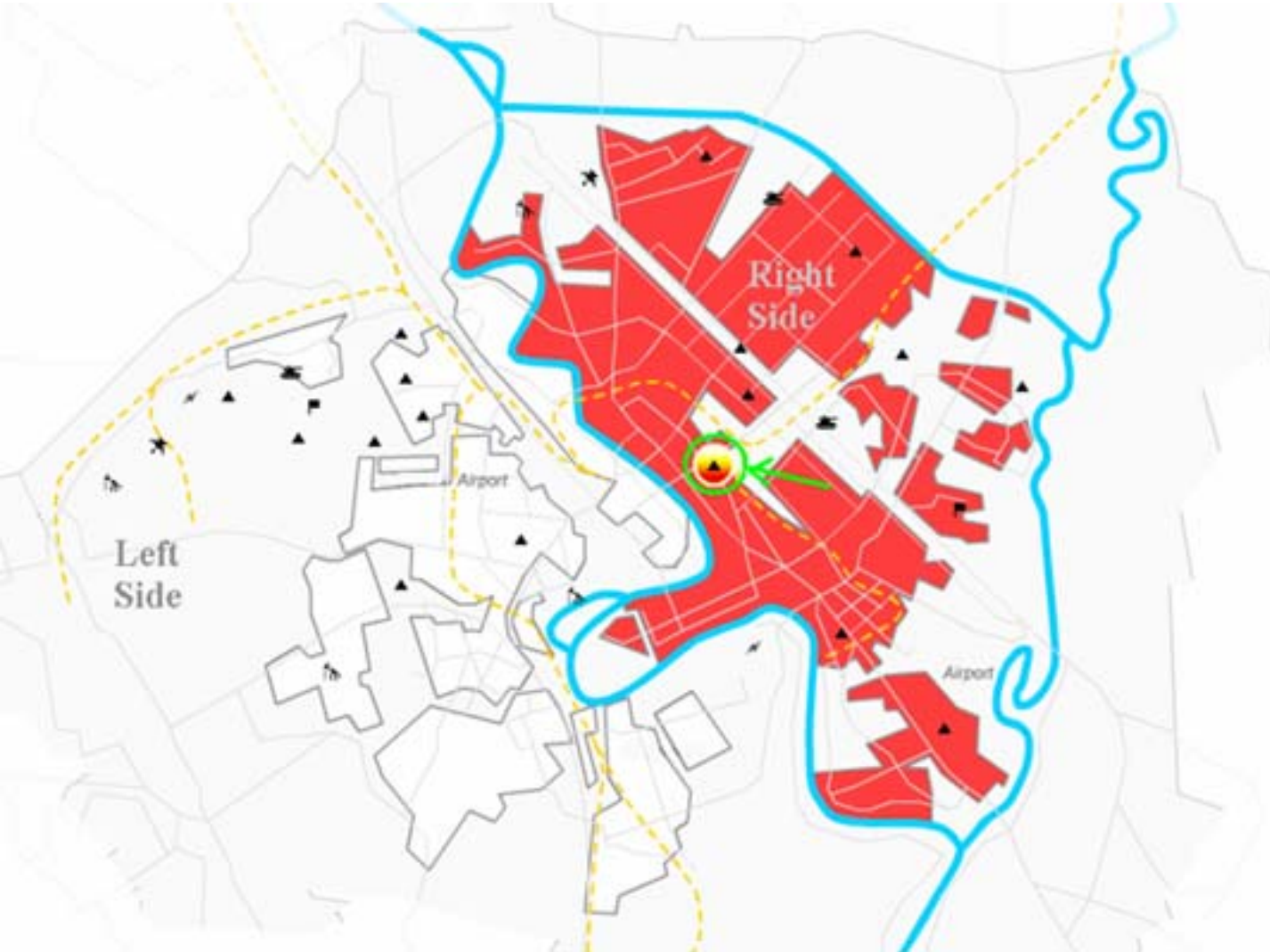
# State of the Art Modeling

- **Joint Semi-Automated Forces (JSAF):**
  - Federation of simulations, uses High Level Architecture (HLA).
  - **CultureSim:**
    - Light-weight model of movement in urban environment.
    - Pedestrians & vehicles.
  - **Dynamic Terrain Simulation (DTSim):** Collateral damage & building repairs.
  - **ModStealth:** 3D visualization.
- **SEAS: Synthetic Environments for Analysis and Simulation**
  - **Virtual International System (SEAS-VIS):**
    - Intra and inter-nation dynamics, leaders.
    - Citizens' expectations, goals, and desires for well-being.
  - **Near Real-Time (SEAS-NRT):** Irregular actions of individuals.

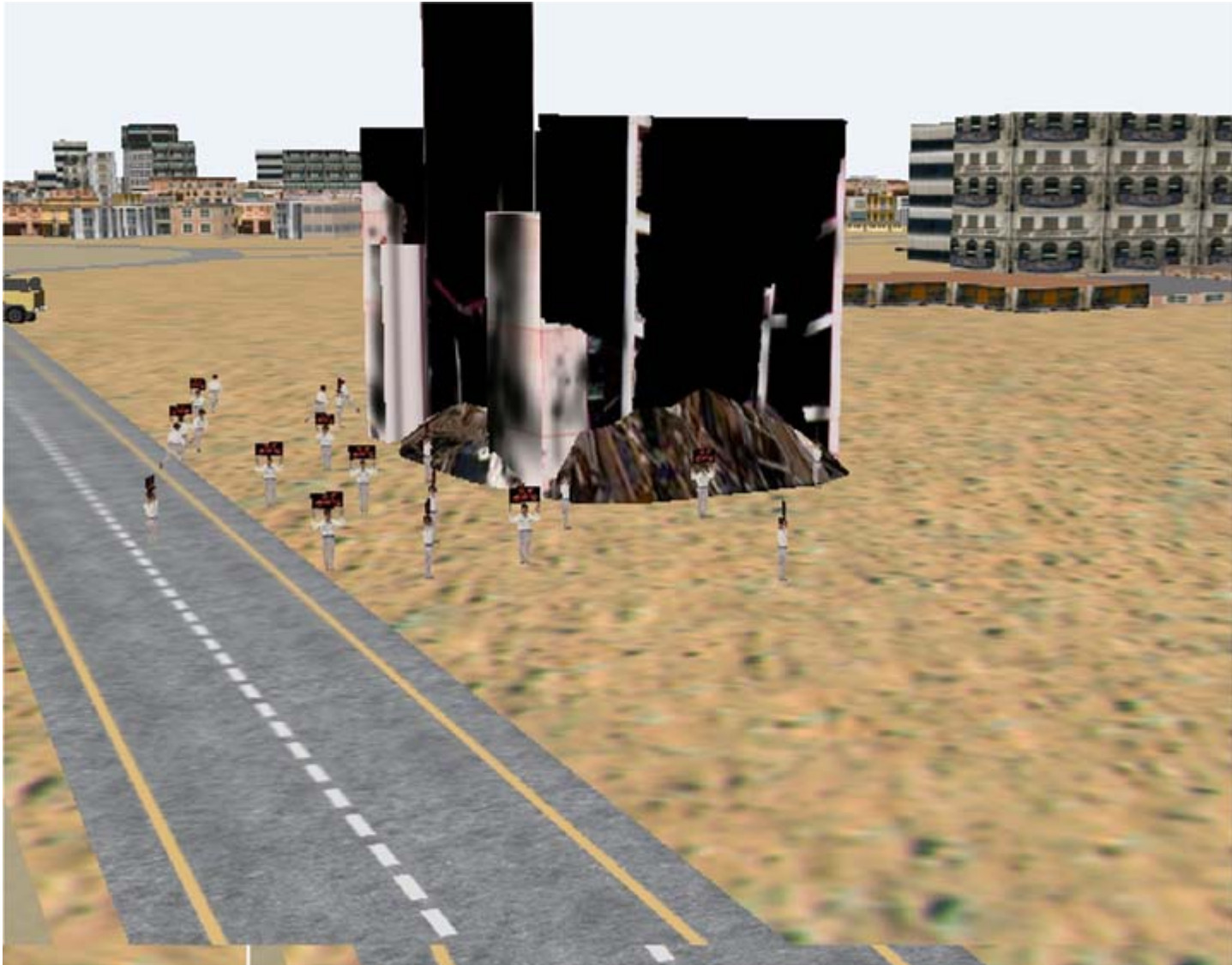
# Illustrative Urban Scenario

- Demonstrates that population mood and subsequent behavior are influenced by kinetic actions.
- Urban area was divided into two regions.
- People **initialized as neutral** with regards to both Foreign Security Forces (FSF) and insurgencies.
- Explosions caused **building damage**, representing local events that influence the population.
- **Building repairs** represent actions taken by military decision makers in support of SO.
- Population perceived all detonations and repairs as related to the **presence of FSF**.
- Civilian behavior surfaced in the formation of curious or volatile crowds.

# Hostile Environment



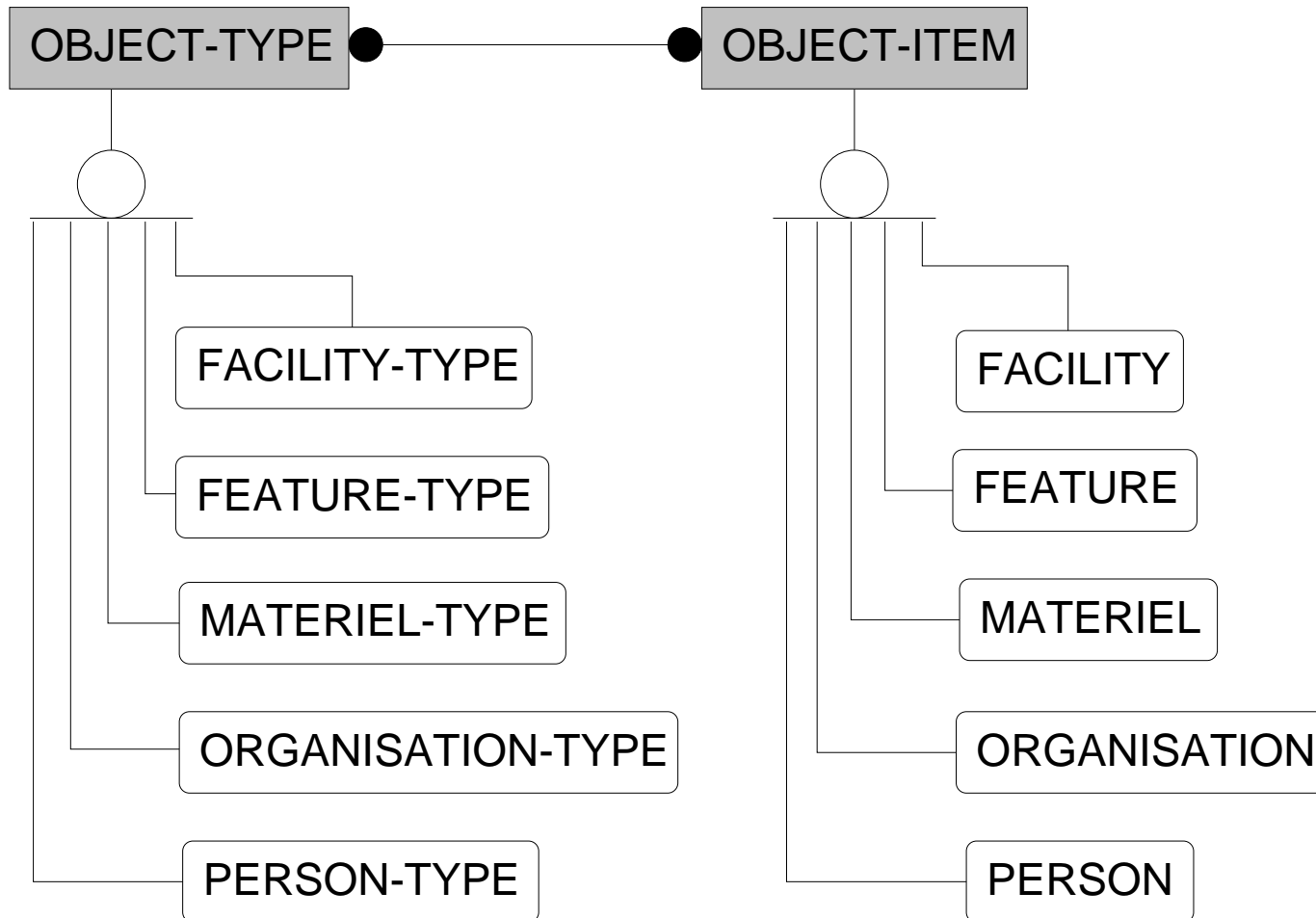
# Hostile Environment



# Addressing JC3IEDM Taxonomy

- Within the JC3IEDM data specification, the **entity** is the basic concept.
- Different attributes among the 194 JC3IEDM entities allow them to be **distinguishable**, 15 are **stand alone entities** and are grouped into information concepts.
- Of the JC3IEDM's **five fundamental information concepts**, two are central for discussions to extend the model for EBA:
  - Object-type
  - Object-item

# Addressing JC3IEDM Taxonomy



# Addressing JC3IEDM Taxonomy

- Associated with the **measure of effectiveness** for stability are seven **normality indicators**.
- Some of these indicators map directly to the JC3IEDM topic area of **Environment Conditions – Civil**.
- Within this topic area, there are several related IERs known as the Peacetime Support Operations that later evolved into the **Crisis Response Operations (CRO)**.
- This set of IERs was created from the information exchange needs to coordinate and integrate the joint use of **lethal and non-lethal assets**, which extended earlier terrestrial-centric versions of the JC3IEDM like the C2IEDM.

# Addressing JC3IEDM Taxonomy

- A **taxonomy** consists of a tree classification for an established set of objects usually starting at a **single classification** that relates together all other objects.
- Based on the identified need for CRO, the **object-type** can be considered the **root node** for extending the JC3IEDM from a kinetic to a non-kinetic realm.
- Since each CRO IER is supported by corresponding **operational level message types**, then these IERs serve as a method to exchange information on non-kinetic objects.
- Additionally, it is possible to relate selected object subtypes to the previously mentioned **illustrative scenario** and CRO IERs.

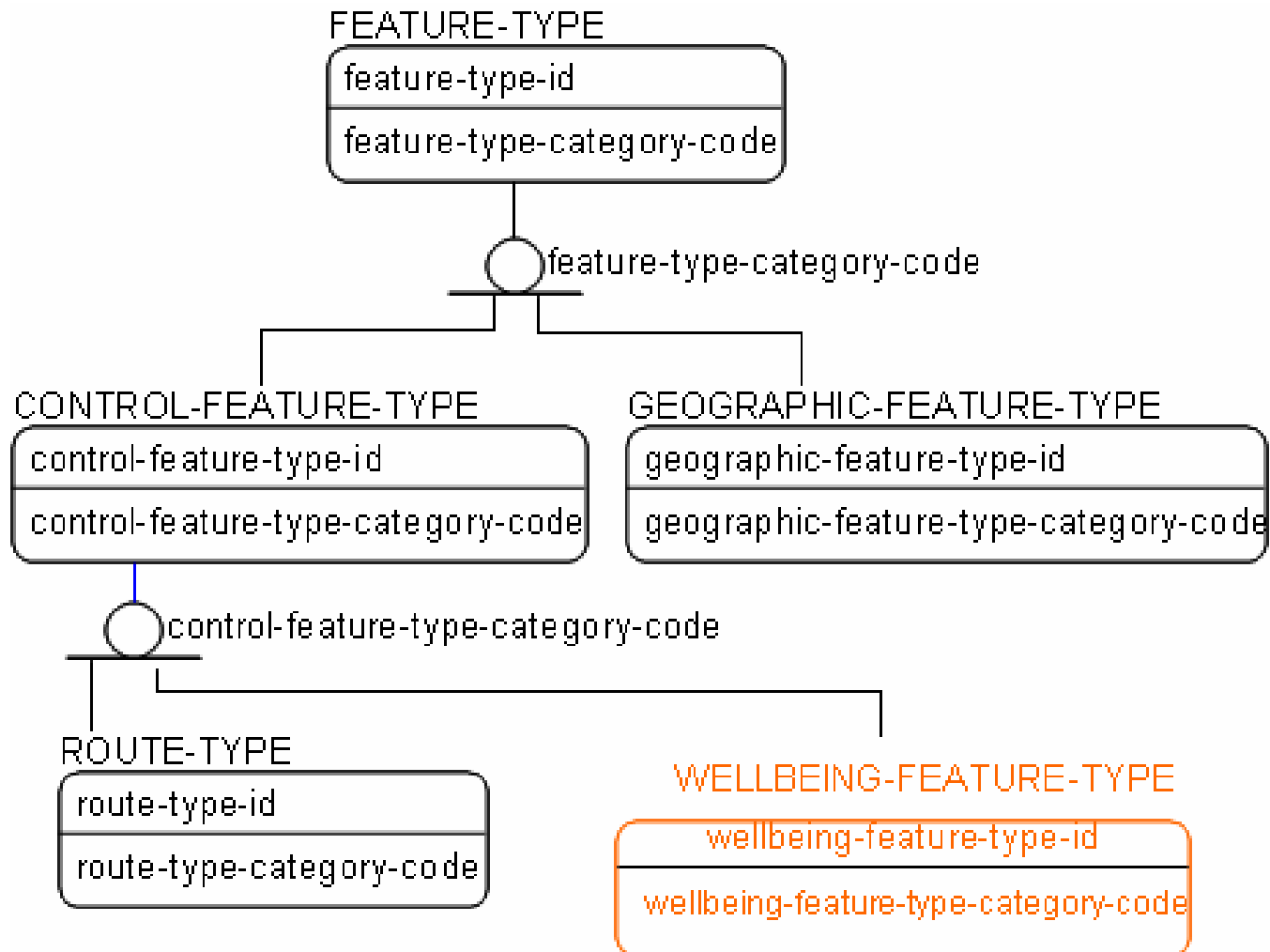
# Addressing JC3IEDM Taxonomy

- JSAF represents the **kinetic simulation** aspects of the battlespace by rendering crowds that **display well-being** as either anger or curiosity.
- **Person-type** represents regional, ethics and demographic characteristics of populations, JC3IEDM can be a means to relate these characteristics to a virtual crowd.
- Since crowds' respective moods can be **visualized in a virtual environment**, then the region's general state of well-being can be inferred by inspection.
- Crowd formations can be identified under the **organization-group** to provide indicators of potential **demonstration or riot** formations due to the leaders influence and the mood of the region.
- Thus via a **combination of object-type specifications** can capture simulation generated data that models different types of population groups and their **perceived well-being**.

# Addressing JC3IEDM Taxonomy

- Simulations can generate **visual cues** to emulate battle-field assessments of the progress of actions to achieve that desired end state.
- Many of these EBA assessments can be transmitted via the reporting-data and its subtypes specification that captures **temporal status** updates and the reporting source information.
- The observed **well-being of a region is not easily transmitted** via the reporting-data specification in the JC3IEDM.
- A method to display perceived well-being is the **user graphics attributes** as specified in the **feature-type specification**.
- User graphic features, such as **lines and overlays with differentiating color shaded regions**, can capture simulation generated data.

# Addressing JC3IEDM Taxonomy



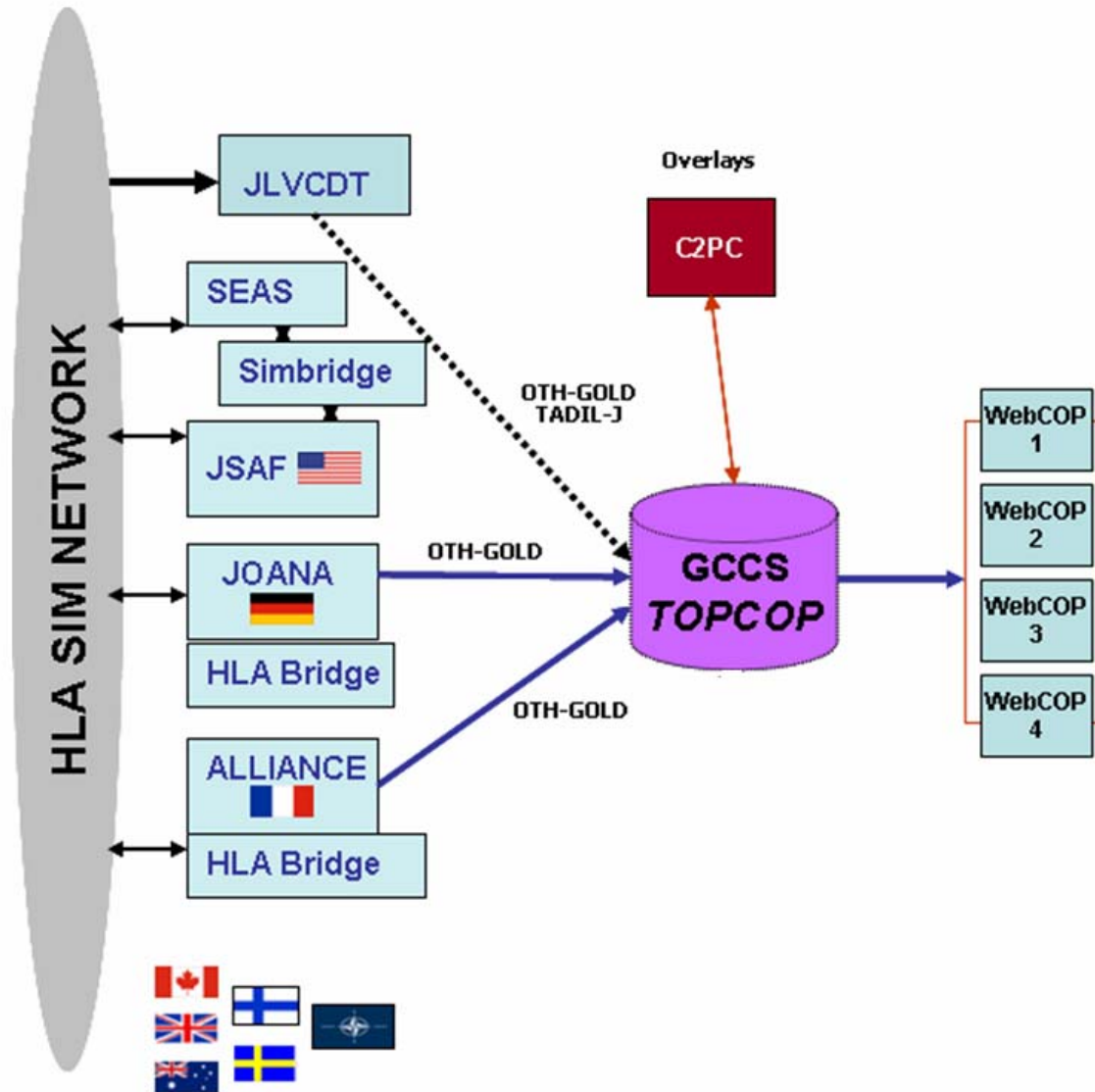
# Multinational Federation

- A major J9 experiment to investigate EBA was **Multinational Experiment 4 (MNE4)**.
- MNE4's aim was to explore concepts and supporting technologies for **EBA within a coalition environment involving SO** with increasing levels of violence to assist the development of future processes and tools at the operational level of command.
- Simulating the characteristics and traits of battle-field entities was necessary to enable the **stimulation of C4ISR systems**.
- **Simulations** parsed data into structured messages formats to **emulate** unit location and status reporting by stimulating the **Common Operational (COP)**.
- Web-enabled components of the **Global Command and Control System (GCCS)** allowed remote international users **situational awareness and situational understanding (SA/SU)**.

# Multinational Federation

- **Four constructive simulations** provided the MNE4 virtual environment:
  - Previously mentioned kinetic JSAF and non-kinetic SEAS
  - France's ALLIANCE (Application Logciele InterArmees Nationale pour l'entainement Au Commandement d'un Engagement militaire)
  - Germany's JOANA (Joint Operations Army, Navy, Air Force).
- ALLIANCE, JOANA and JSAF used **bridges** to send emulated message traffic to the GCCS server.
- All three kinetic simulations stimulated **GCCS with OTH-Gold reports while a JSAF bridge (JLVCDT)** generated TADIL-J detentions.
- **Track management** occurred to correlate the various tracks at the GCCS server called **TOPCOP**.

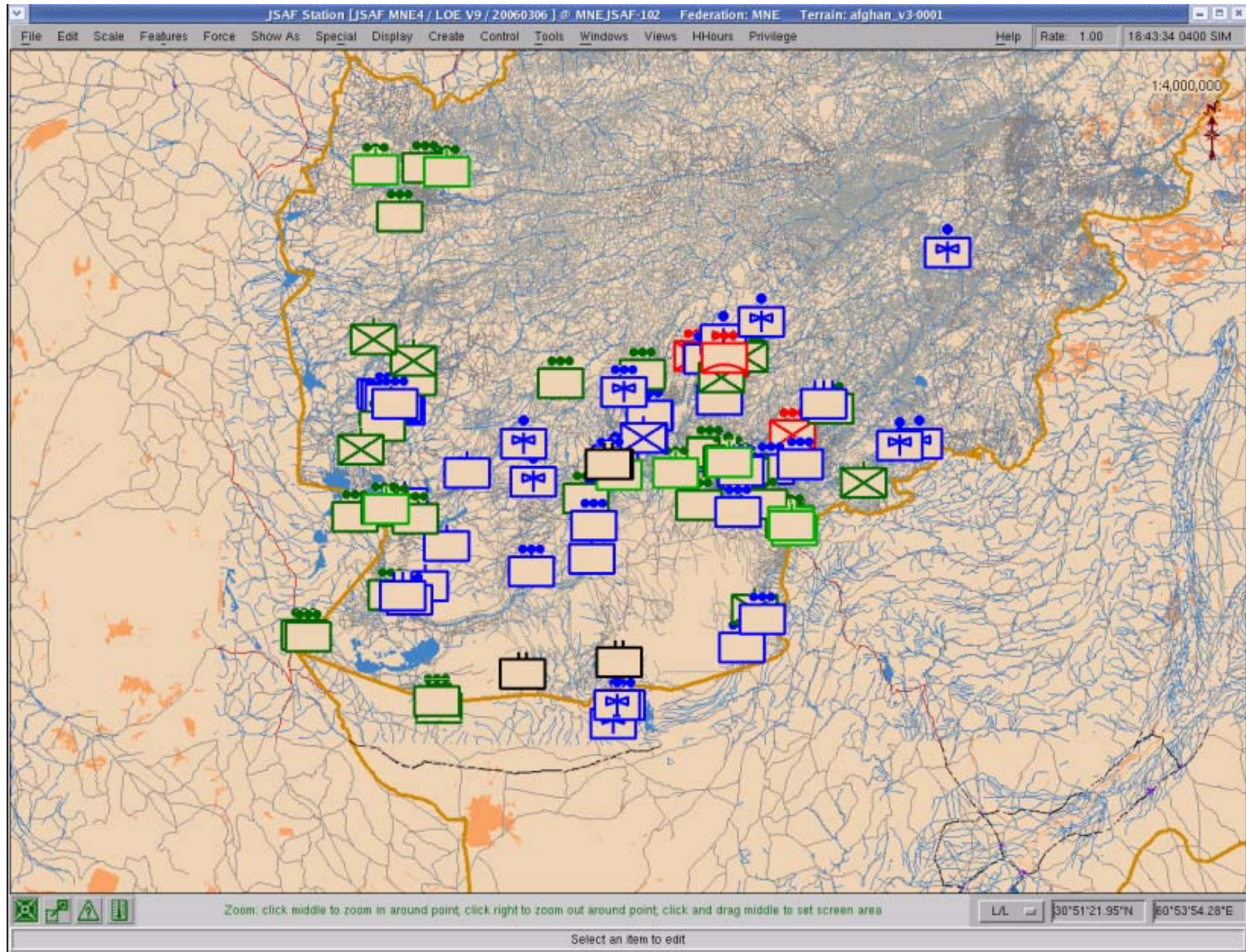
# Multinational Federation



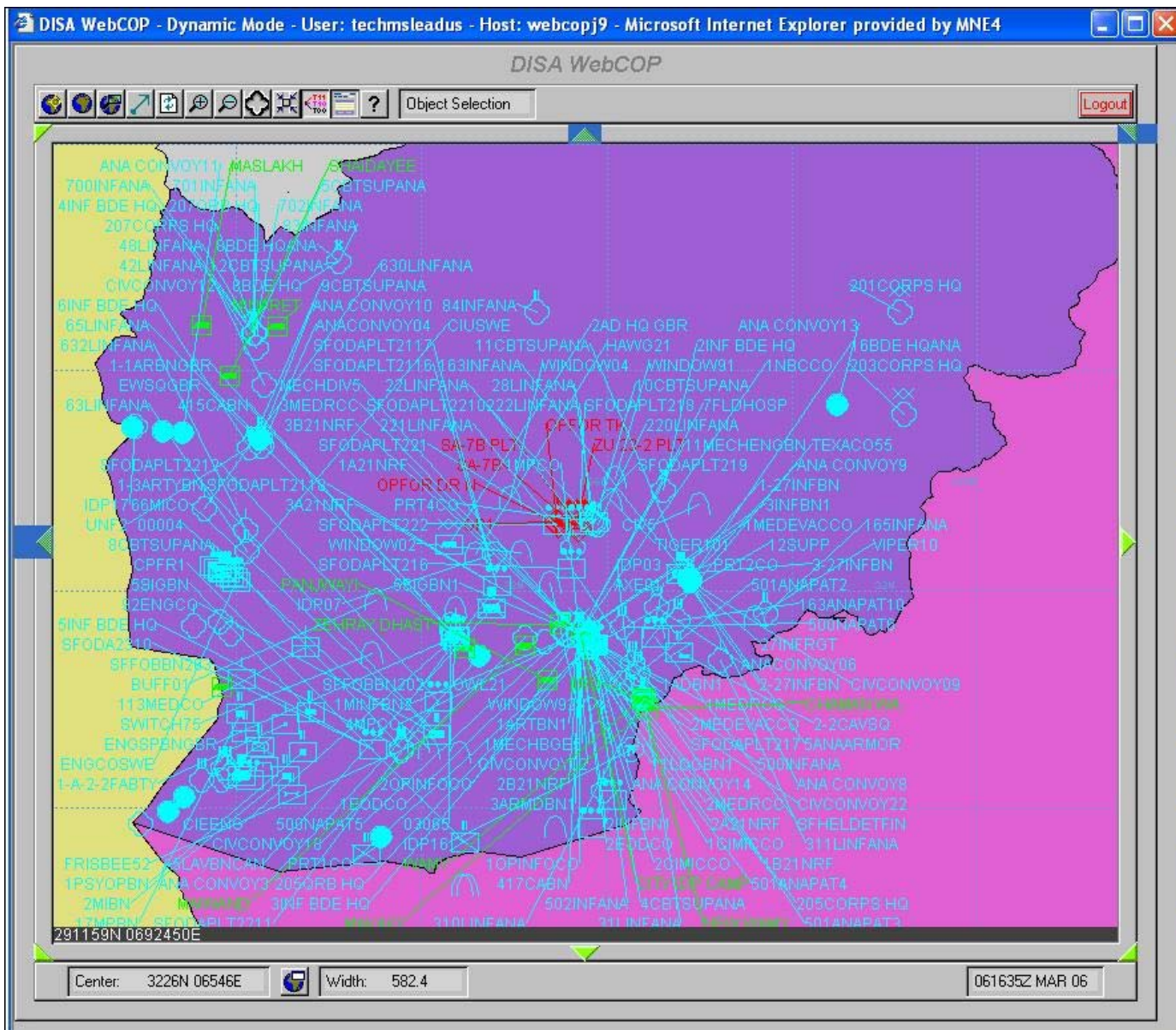
# Exchanging Commander's Intent

- MNE4 simulations sent **free text message** associated with the reporting features of the respective simulation entities .
- JSAF implemented this feature after the operator fills out the **mission attribute** option via the **JSAF Plan View Display (PVD)**.
- JSAF orders assigned to a simulation entity were passed as free text messages through the JLVCDT to become viewable in the **GCCS/WebCOP remarks field** of the respective track.
- **ALLIANCE and JOANA** had a similar capability to report commander's intent via their respective bridges to GCCS.
- These **free text messages** were viewed as a **means to communicate commander's intent** via the C4ISR displays which were **stimulated by the M&S** .

# Exchanging Commander's Intent



# Exchanging Commander's Intent



# Exchanging Commander's Intent

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Summary   History   Attributes   Symbol Attr   Targeting

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Track Name: WAMY    Center On    Modify    Add Report

Summary   History   Attributes   Symbol Attr   Targeting

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 Short Name: WAMY

# Future Work

- Potential to do more complex population modeling by providing a means to relate an **insurgent population's** characteristics to the number of **human generated intelligent reports**, and the impact of leaders on the general public mood.
- Extending the **refugee and displaced persons** camp representations in **JOANA** to allow regional leaders to be influenced by the media's reporting of the perceived camps' frustration level based on shortages.
- Combine the capabilities of the JC3IEDM and Coalition –Battle Management Language , the resultant may actually evolve into a **multinational knowledge base of the future**.
- Serve as a standard to allow other technologies canvas the **world's media and C4ISR sources** to dynamically capture **cultural information**.

# Conclusions

- **Agent-Based simulations** may be useful to evolve the **taxonomy** of the JC3IEDM to further the advancement of JC2 IERs.
- Proposed extensions to the JC3IEDM can tie **commander's intent to tracks** in a web-enabled C4ISR environment, and help to assist in **visualizing regions** that non-kinetic effects are occurring.
- **Normality indicators** not currently support by current day C4ISR systems can be investigated using M&S to help identify and prioritize, and the JC3IEDM has the extensibility to support these investigations.
- JC3IEDM can assist in evolving **multinational knowledge bases**.
- A closer **relationship between M&S and C4ISR** can assist in evolving systems that provide greater SA/SU for the warfighter, and the JC3IEDM may help to foster that tie leading us closer to the realization of a **GIG enabled environment**.