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

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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:

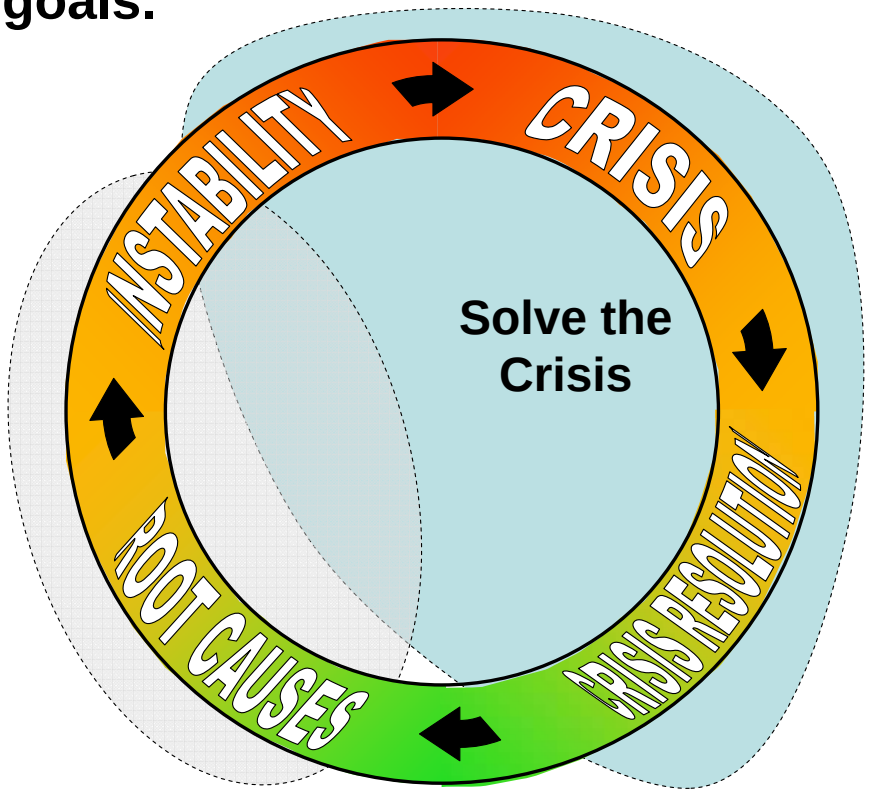
Today's virtual environments focus chiefly on attrition and the causal effects associated with kinetic interactions.

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.**

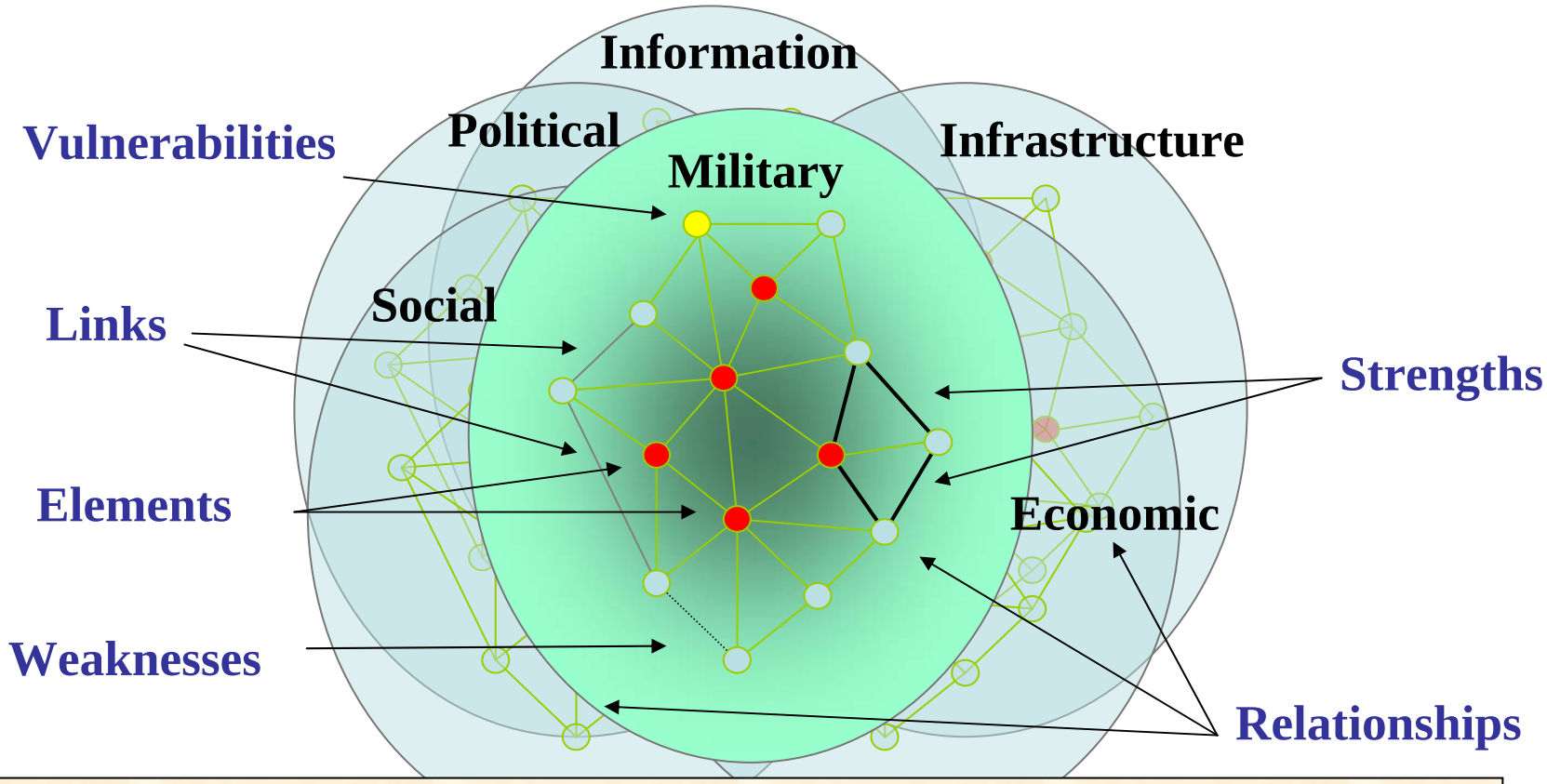


- **Reconstruction**
  - **Provide security**
  - **Humanitarian assistance**
  - **Limited governance**
  - **Restore public services**

- **Goal: Facilitate transition to a local civil governance.**

PmESII Operational Environment

Adversary and Coalition National Power



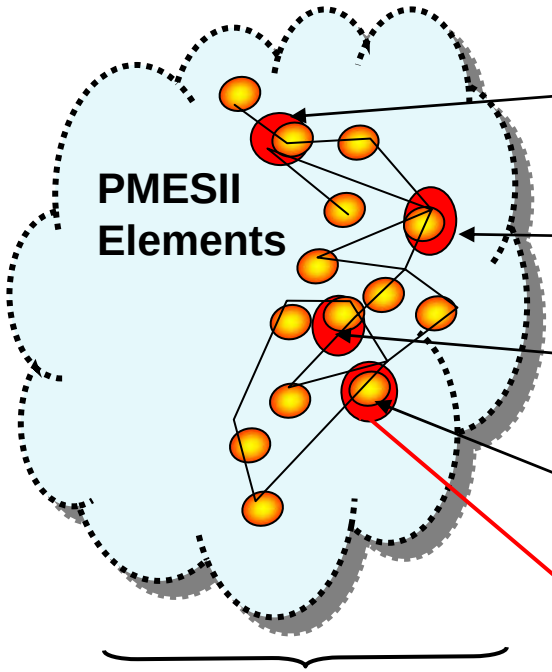
Today's **adversary is a** ***dynamic, adaptive*** **foe who operates within a** ***complex, interconnected*** **operational environment.**

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)

Instruments of national power: DIME = Diplomatic, Information, Military & Economic

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

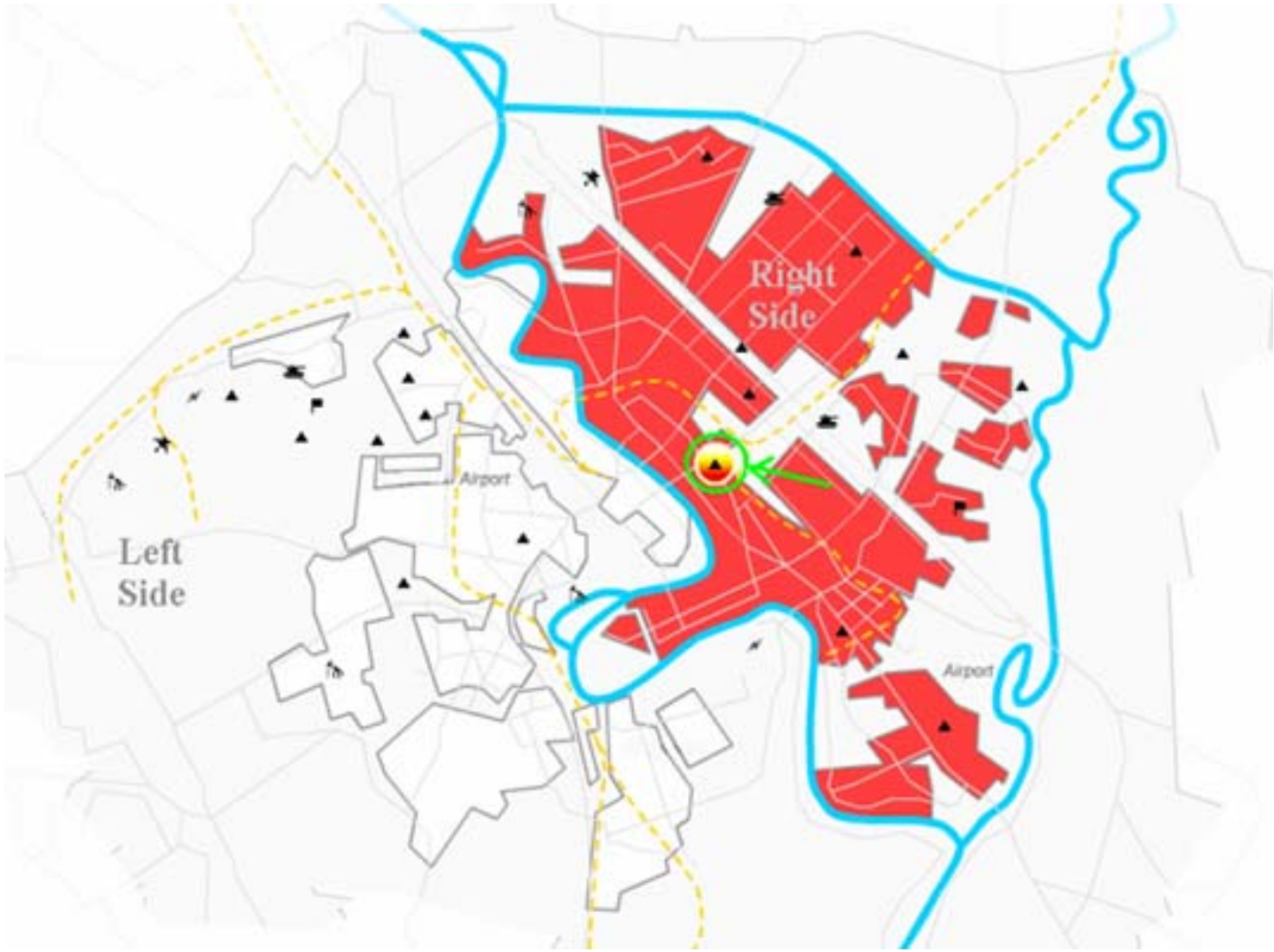
- **Joint Semi-Automated Forces (JSAF):**
  - Federation of simulations, uses High Level Architecture (HLA).
  - **CultureSim:**
    - Light-weight model of movement in urban environment.
    - Pedestrians & vehicles.
  - **Dynamic Terrain Simulation (DTSim):** Collateral damage & building repairs.
  - **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.

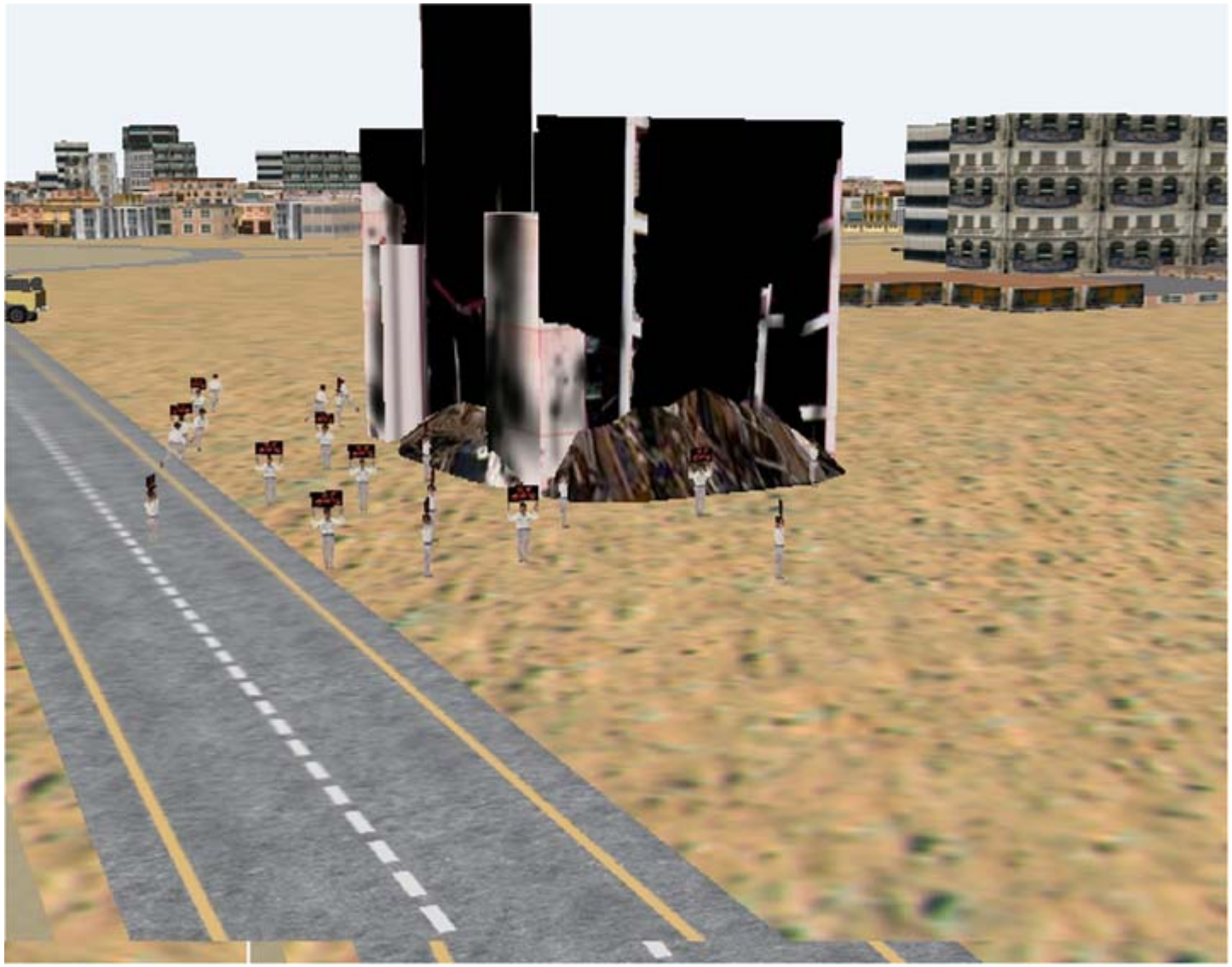
Illustrative Urban Scenario

- **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

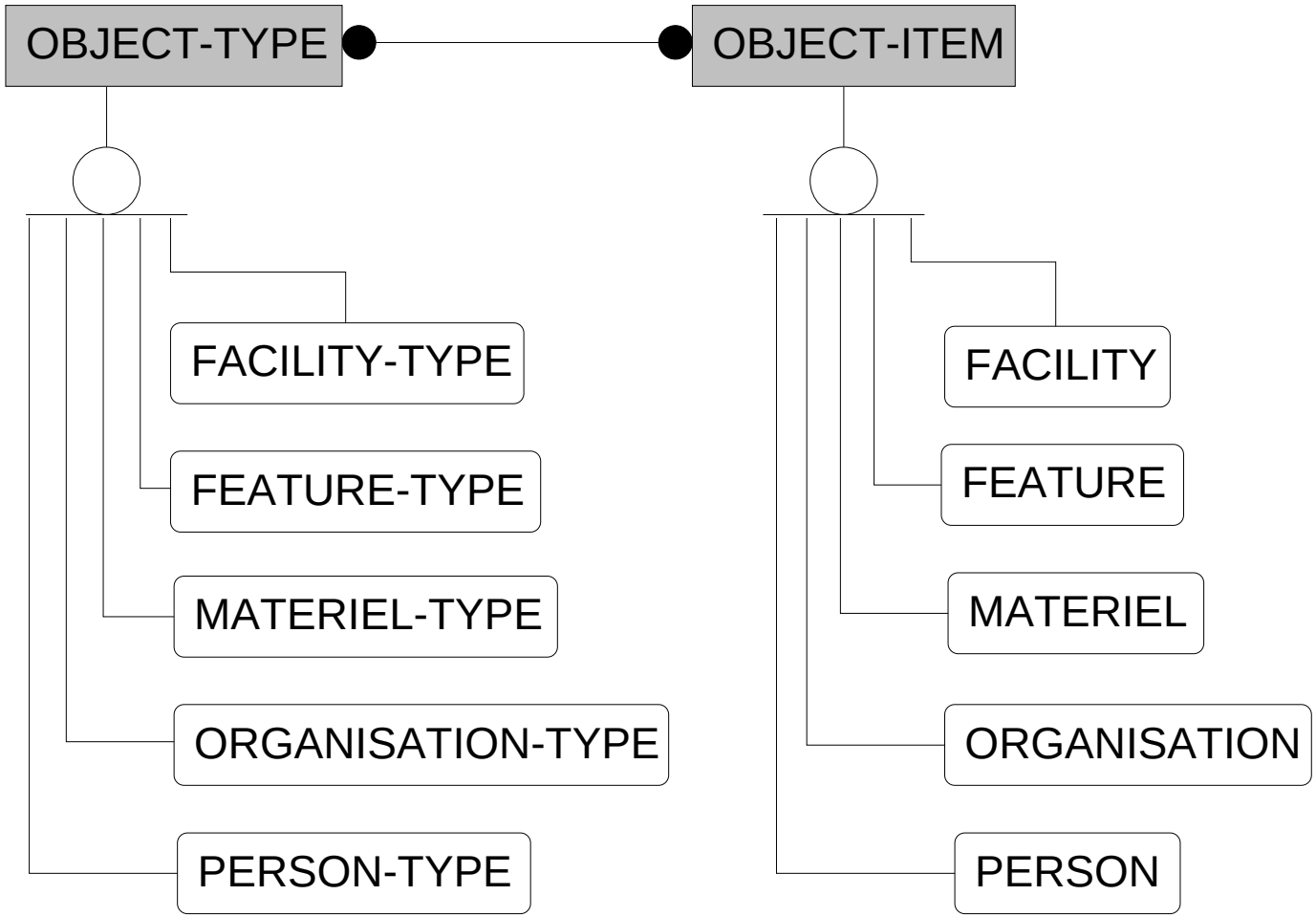
- **Within the JC3IEDM data specification, the entity is the basic concept.**

- **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 JC3IDEM 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.**

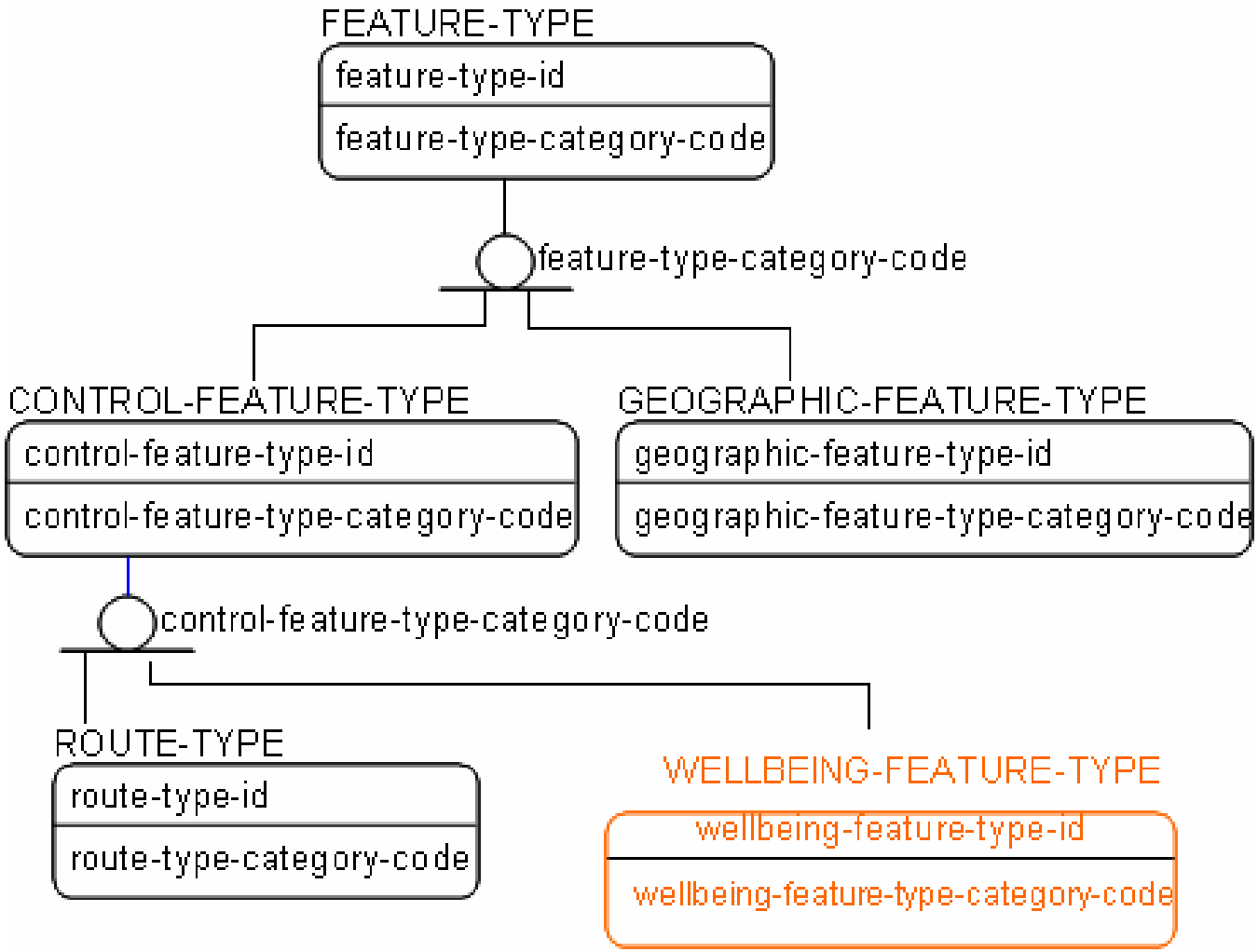
Addressing JC3IEDM Taxonomy

- JSAF represents the kinetic simulation aspects of the battle-space 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



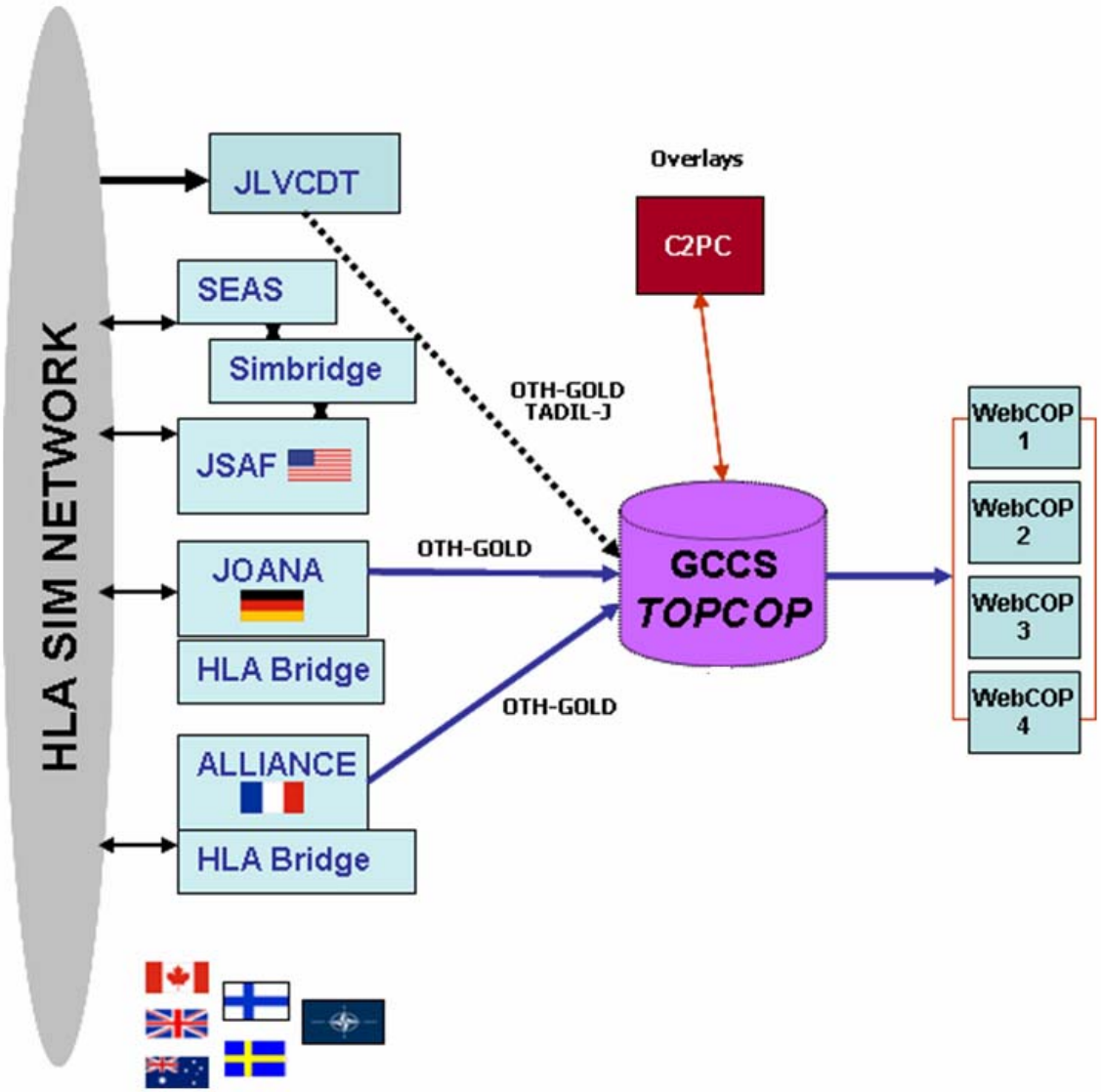
Multinational Federation

- 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 militare)**
  - **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.**

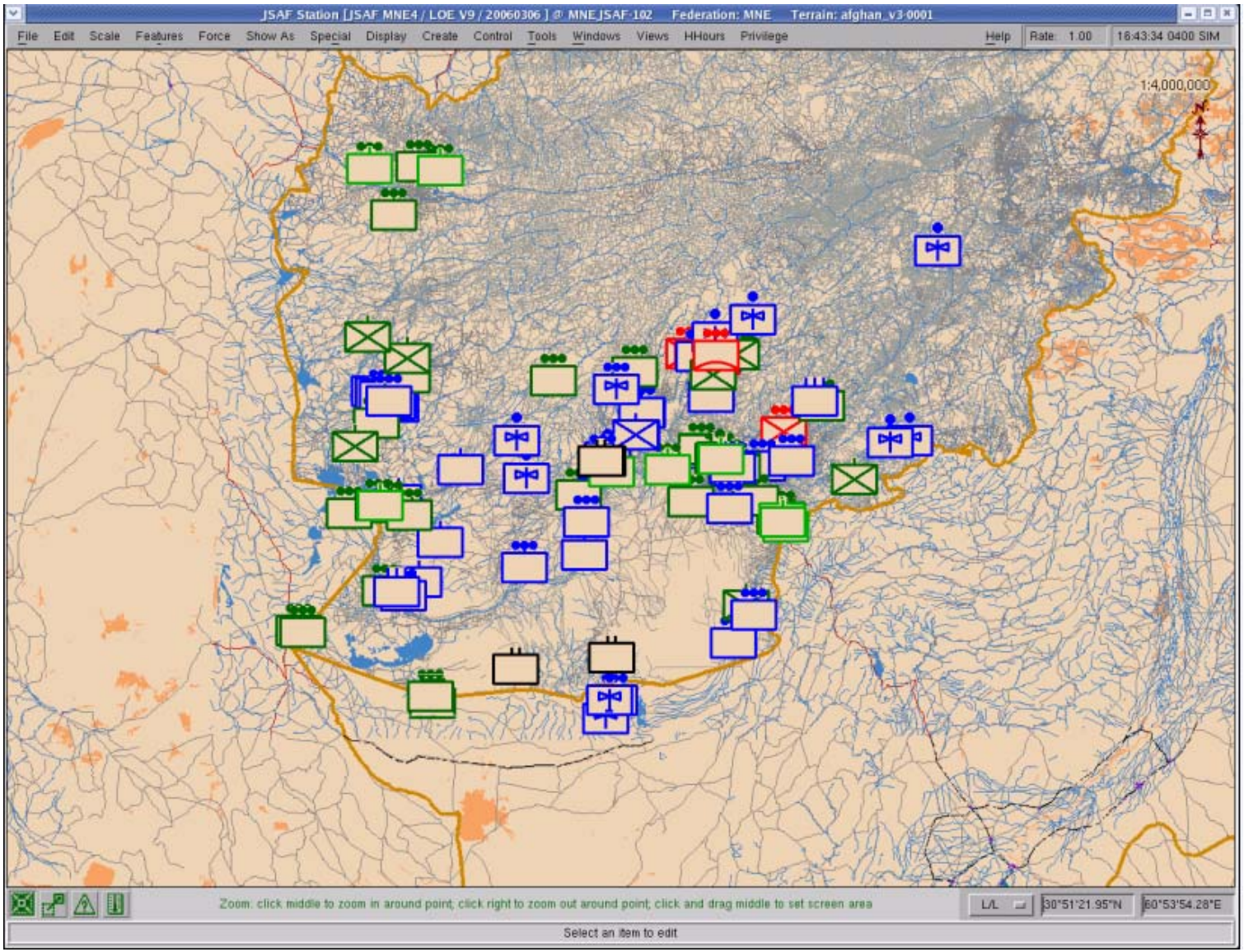
Multinational Federation



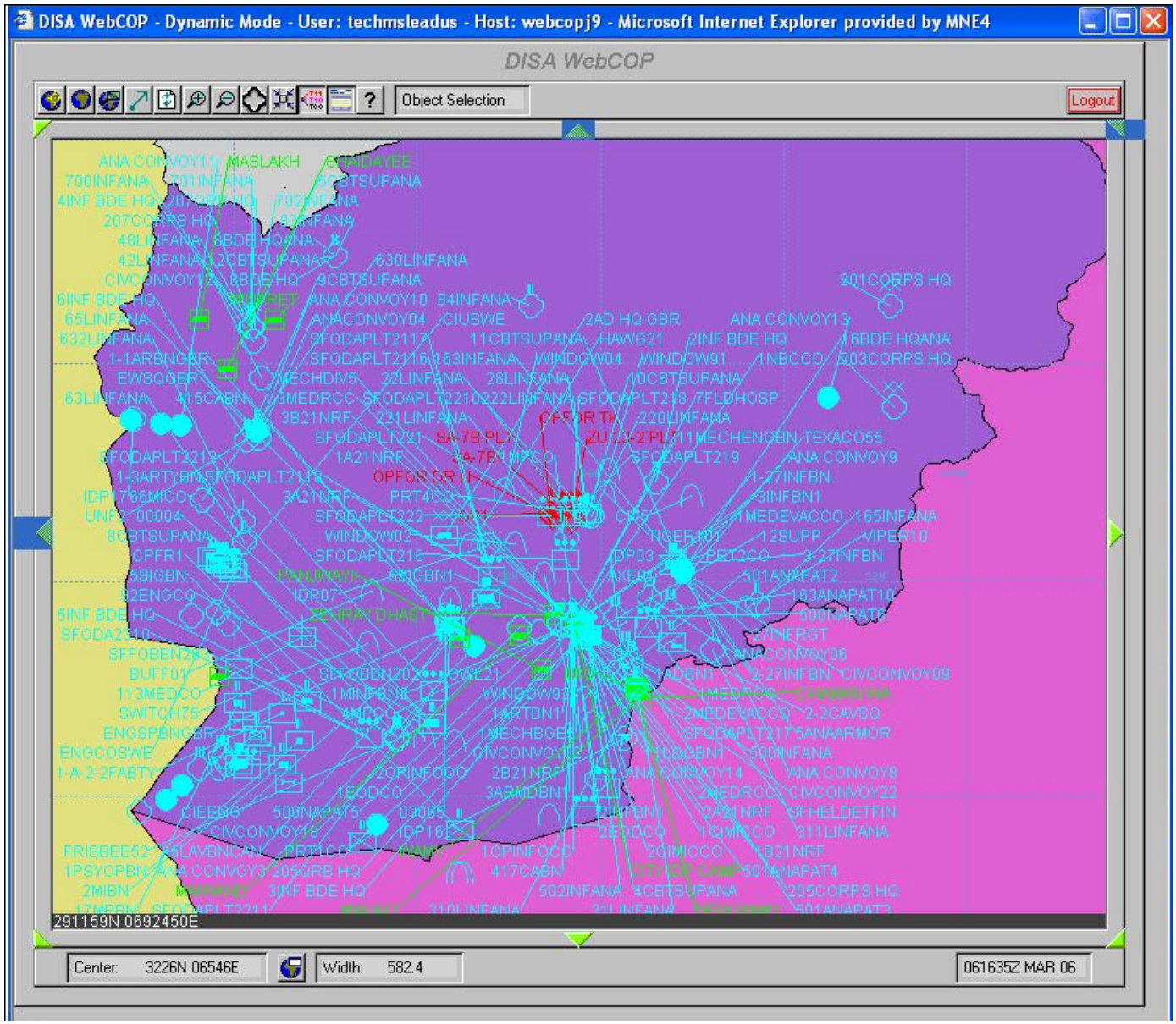
Exchanging Commander's Intent

- **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 .**

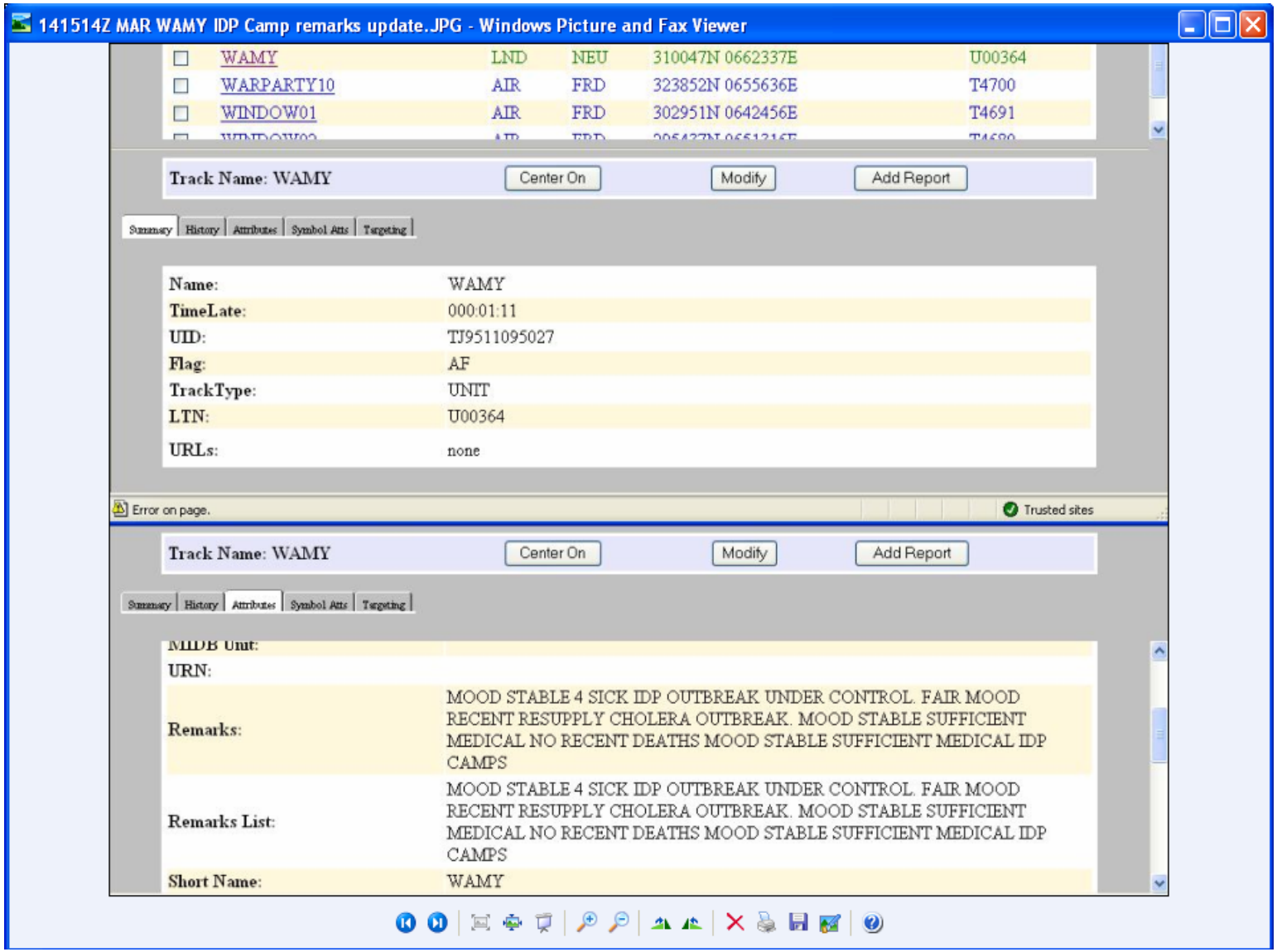
Exchanging Commander's Intent



Exchanging Commander's Intent



Exchanging Commander's Intent



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.**