



# International Technology Alliance
## In Network & Information Sciences

# Holistan Revisited: Demonstrating Knowledge-Based Capabilities for Coalition Military Operations using the ITA Holistan Scenario

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# Background

- Provide a basis for technology demonstration and inter-project collaboration within TA4
- Constraints
  - suitable alignment with existing scenario specification efforts
  - alignment with coalition planning scenarios in Project 12
  - must provide demonstration opportunities for (at least) TA4 projects
- Initial scope extended to support elements of TA3

# Scenario Background (1)

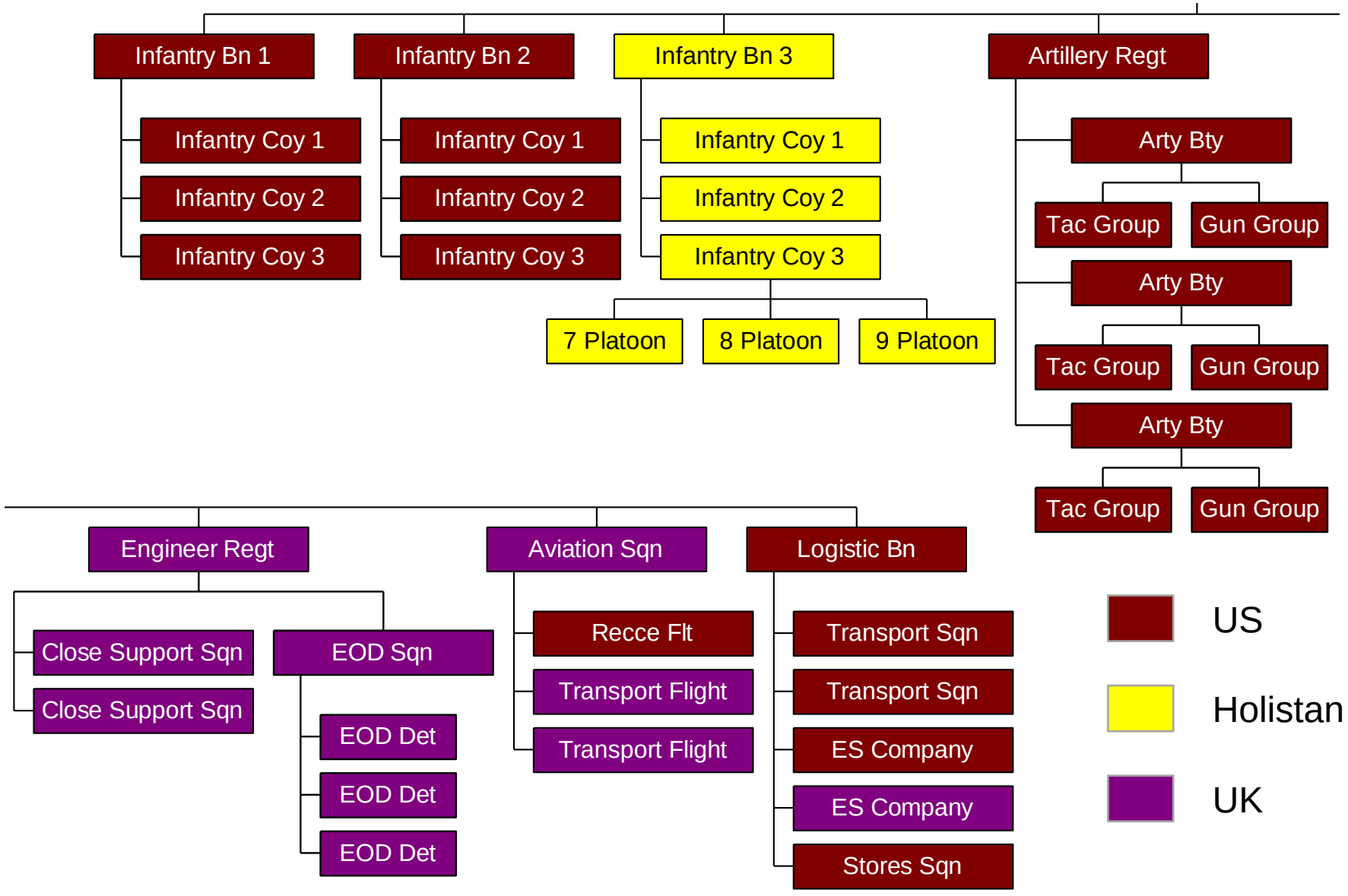
- Holistan
  - history of violent conflict
  - insurgency against government forces
- US and UK forces deployed under UN mandate
- Pockets of resistance in Mantristan province

# Scenario Background (2)

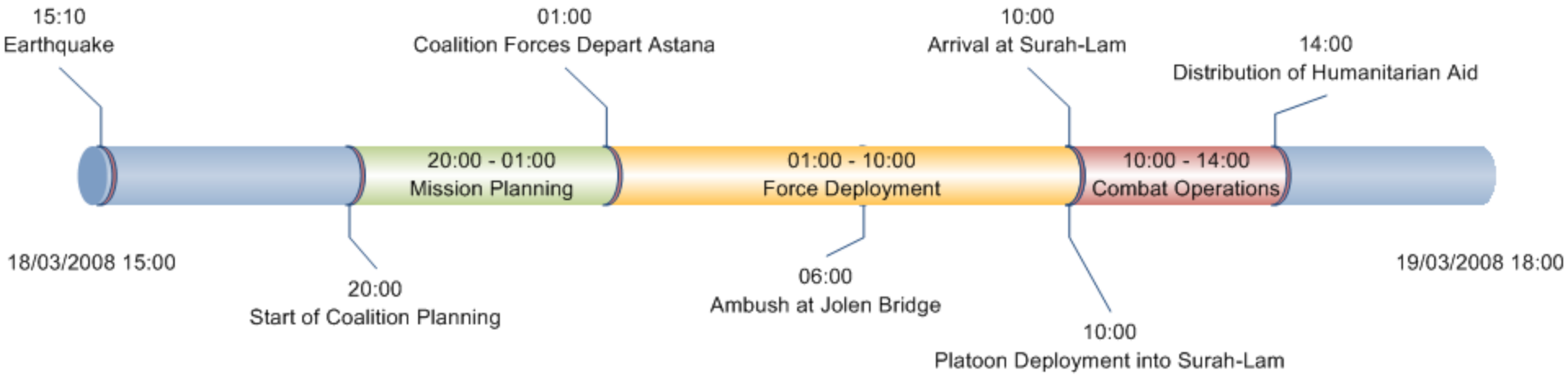
- Earthquake
- Calls for humanitarian intervention
- Coalition forces called on to assist with emergency relief efforts
- Affected area divided into number of AoRs

# Area of Responsibility

# Coalition Task Force



# Timeline


15:10
Earthquake
01:00
Coalition Forces Depart Astana
10:00
Arrival at Surah-Lam
14:00
Distribution of Humanitarian Aid
20:00 - 01:00
Mission Planning
01:00 - 10:00
Force Deployment
10:00 - 14:00
Combat Operations
18/03/2008 15:00
20:00
Start of Coalition Planning
06:00
Ambush at Jolen Bridge
10:00
Platoon Deployment into Surah-Lam
19/03/2008 18:00

# Mission Planning (1)

- Goals
  - create a coalition plan to coordinate military action
  - identify the resource requirements (both military and civilian) for the mission
  - understand the constraints on military action imposed by the operational environment, e.g. the effect of weather on sensor selection and deployment

# Mission Planning (2)

- resource requirements
  - what humanitarian aid resources are required to deal with the crisis?
  - blankets, food, fuel, power generators, etc.
- logistical constraints
  - mine clearance; repairs to transportation routes
- security situation
  - what is the threat to coalition forces?
- information and surveillance requirements
  - what kinds of situation monitoring capabilities need to be established?
- communication requirements
  - how can we ensure high-quality comms links with forces in the mountainous terrain?

# Mission Planning (3)

- Analysis and retrieval of situation-relevant information
  - explosive remnants of war (ERW)
    - assume multiple sources (military / humanitarian)
    - requires integration
  - meteorological information
    - assume multiple sources (civilian)
    - requires integration
  - intelligence information
    - assume single source (military)
  - sensors
    - assume multiple sources (military)
    - requires integration
    - need for capability analysis
    - matching of sensor capabilities to mission requirements

# Mission Planning – Demo Opportunities

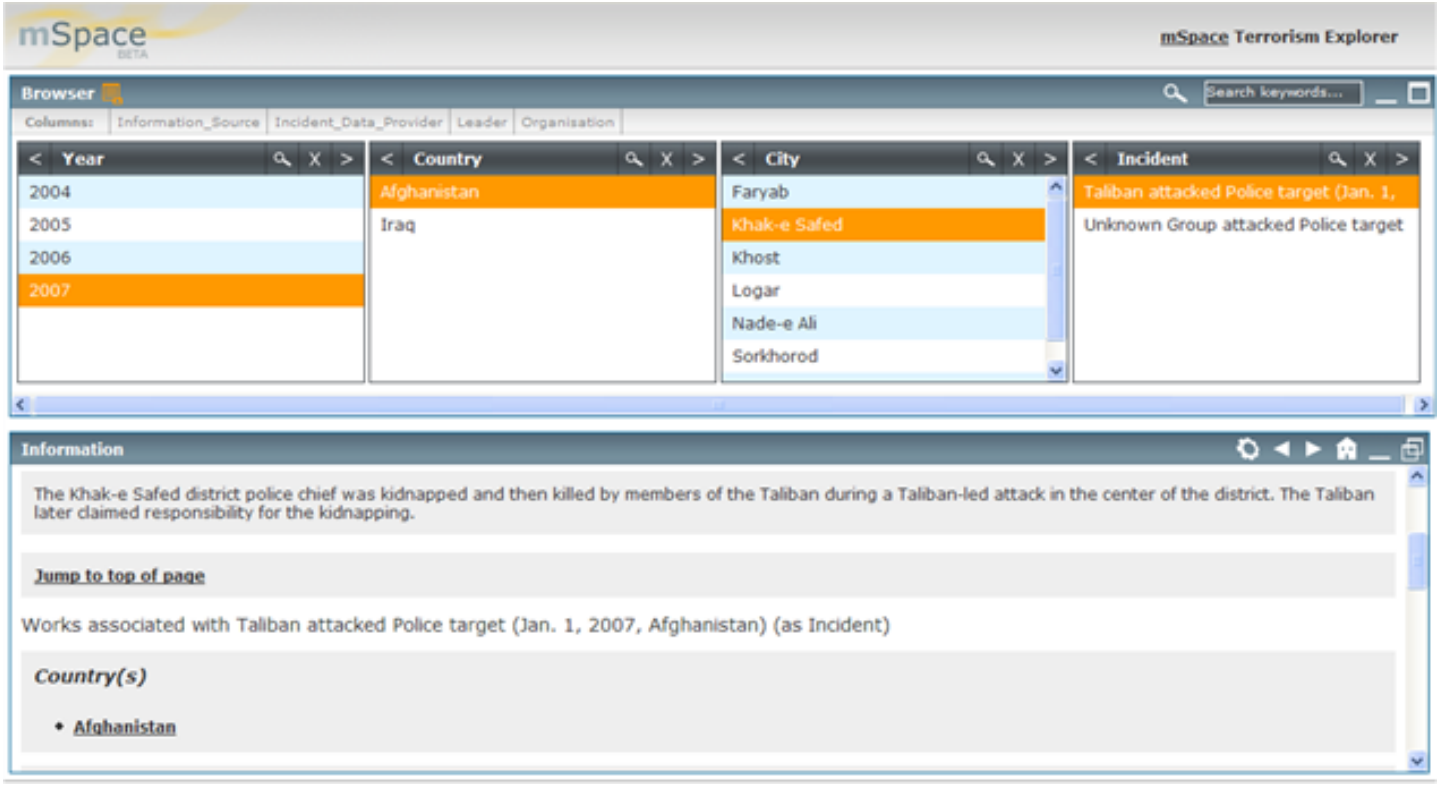
- Semantic Integration (P12)
  - integrate information from disparate data sources
  - humanitarian demining + military EOD ontologies
    - link-up with UK DIFDTC SEMIOTIKS project
  - meteorological information
    - use of pre-existing weather ontologies
  - sensor ontologies
    - multiple ontologies for sensors and sensor platforms
    - need to align and integrate these ontologies as a precursor to sensor selection decisions

# Mission Planning – Demo Opportunities

- Sensor-Mission Matchmaking (P8/P12)
  - use semantic match-making techniques (P8) to select sensors and sensor platforms
  - multiple sensor ontologies – use ontology alignment and semantic integration techniques (P12) to merge US/UK sensor repositories
  - use sensor-mission matchmaking techniques to select sensors
    - need to monitor vehicle transits on A76 north of Surah-Lam
    - meteorological data suggests heavy fog in this region for the following day
    - fog-penetrating electro-optic sensors are unavailable
    - use ground-based vibro-acoustic sensors instead of optical sensors
    - necessitates use of UAV as comms relay platform

# Mission Planning – Demo Opportunities

- Information Retrieval (P12)
  - facilitate information retrieval and analysis using semantic information browsers, graphical query tools and natural language question-answering capabilities



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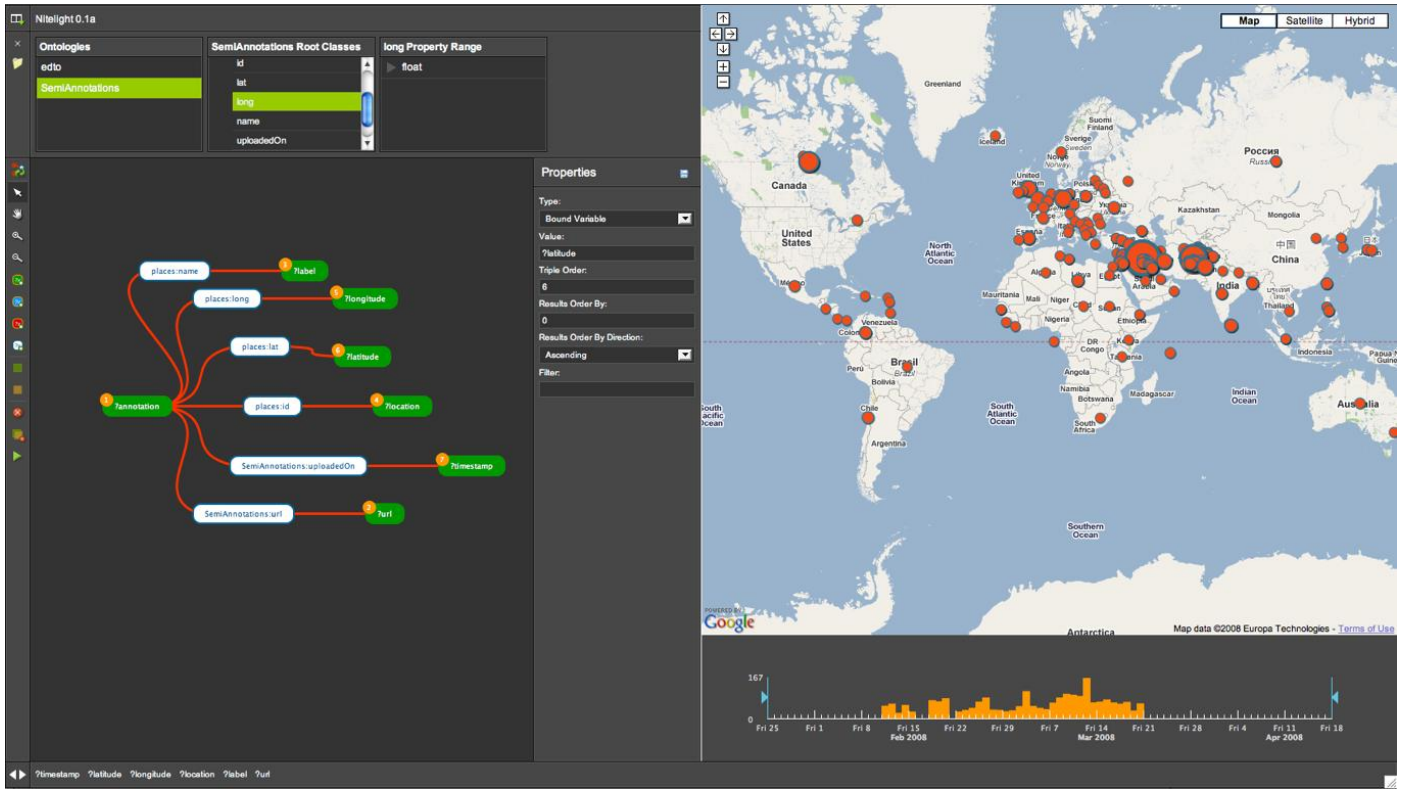
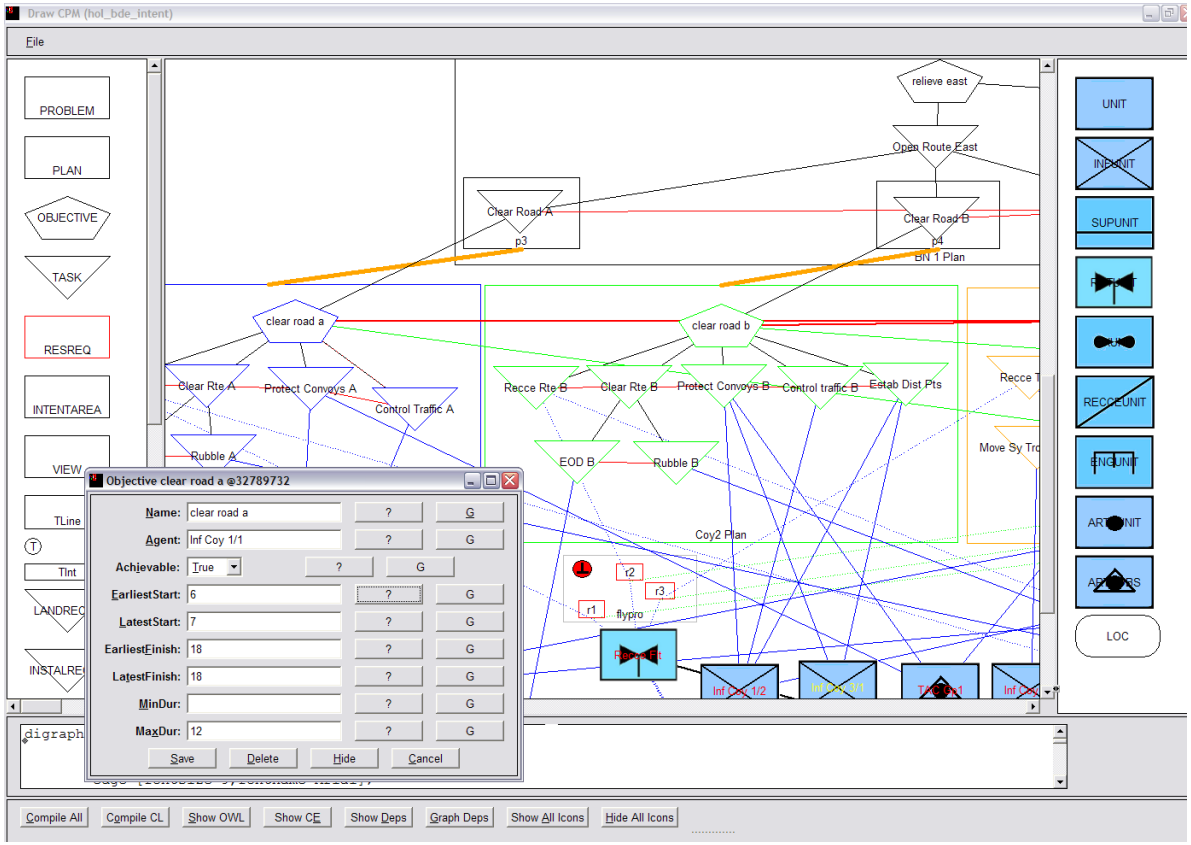


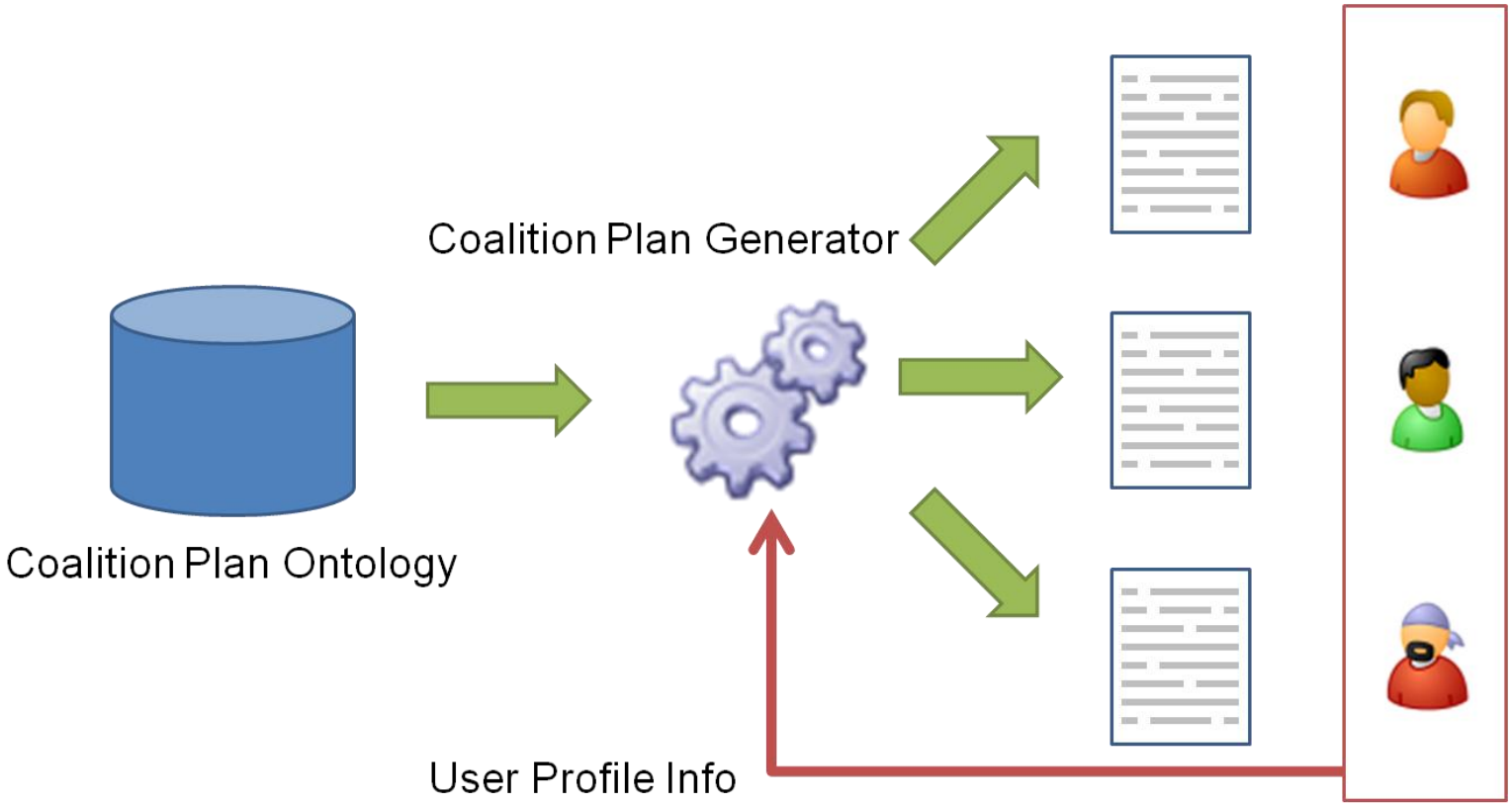
# Mission Planning – Demo Opportunities

- Plan Representation (P12)
  - use the CPM to create semantically-enriched representations of plan-relevant information
    - resources
    - tasks
    - agents
    - rationale
    - constraints
    - assumptions



# Mission Planning – Demo Opportunities

- Culture-Sensitive Plan Generation (P11/P12)
  - use plan ontologies, cultural network analysis and report generation techniques to create custom coalition plans



# Force Deployment (1)

- Goals
  - deploy coalition forces to humanitarian target locations
  - monitor the progress of troop movements
  - protect deployed forces and alert them to any threats

# Force Deployment (2)

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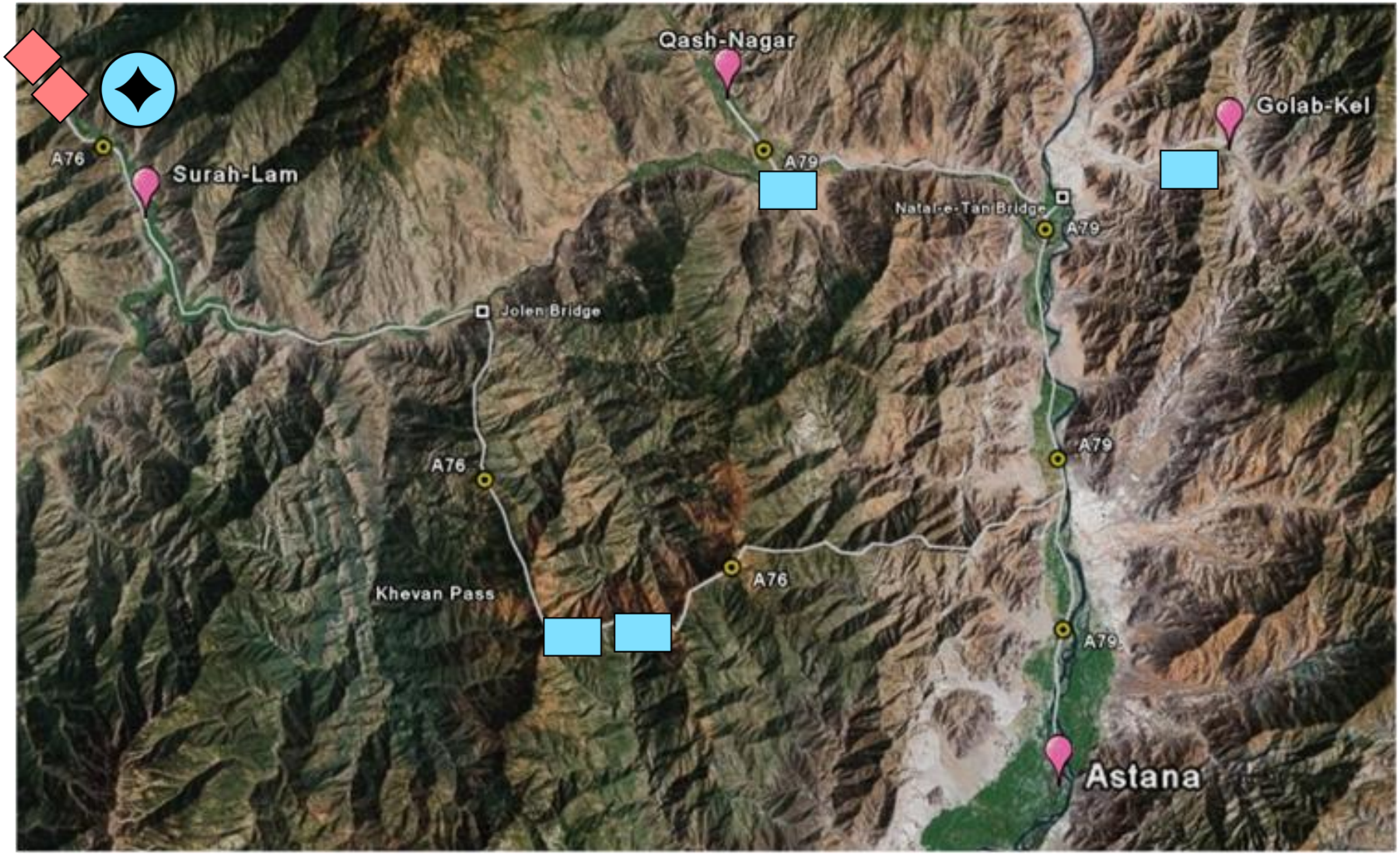

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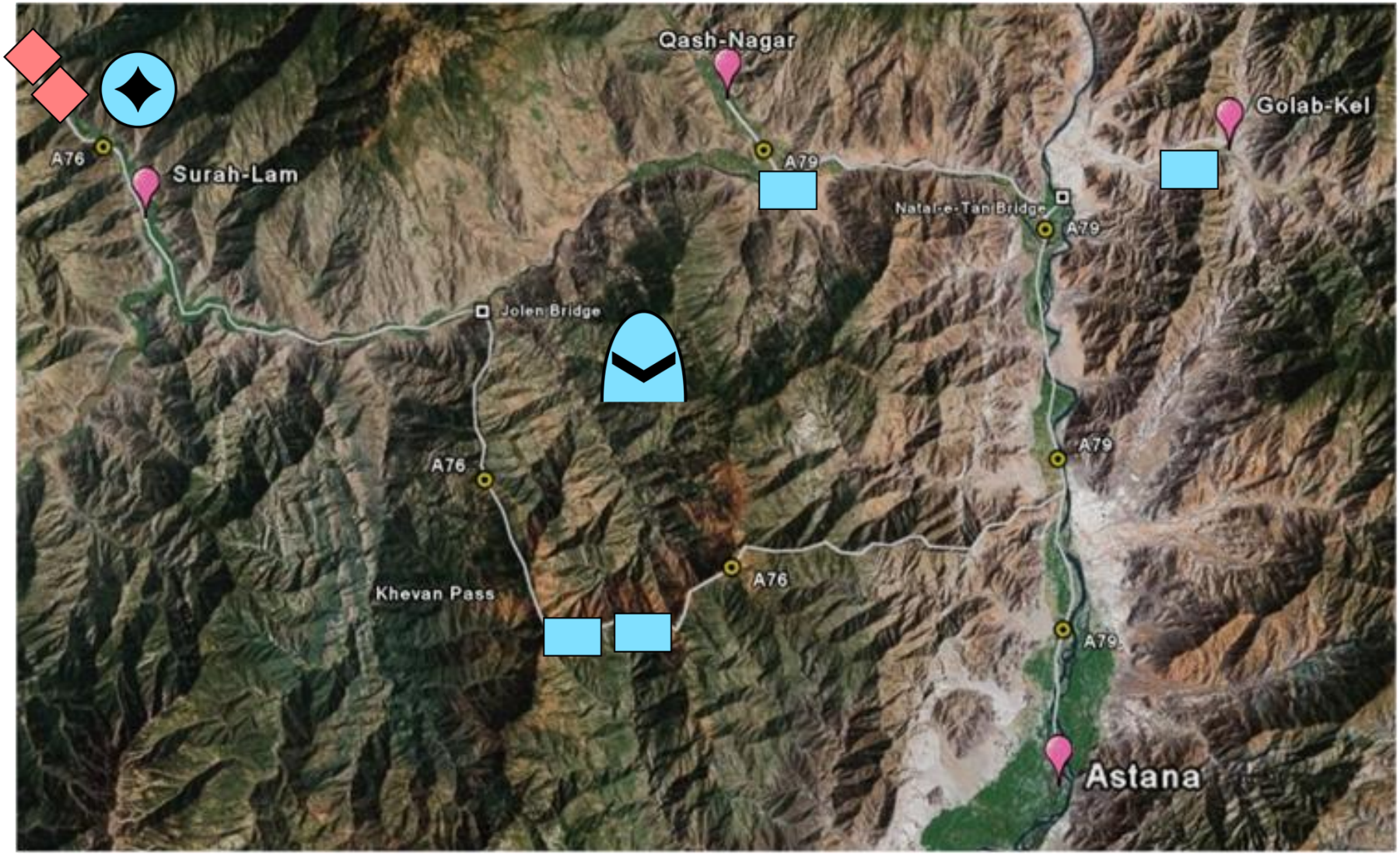

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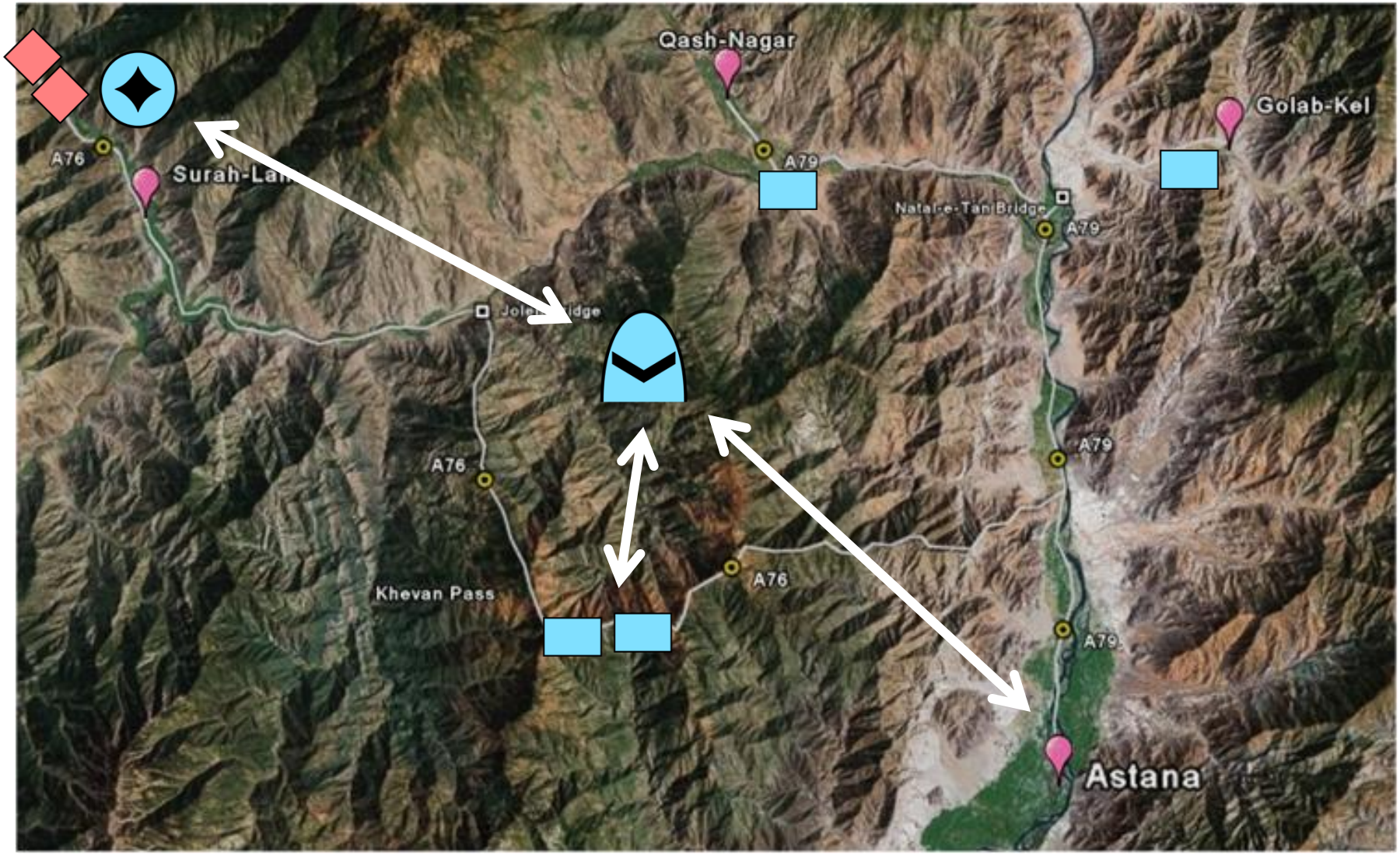

# Force Deployment – Demo Opportunities

- Semantic Data Fusion (P9/P12)
  - fusion of vibro-acoustic sensor data to support ground vehicle classification
  - fusion context (semantically-enriched)
    - road surface type
    - intelligence info
    - environmental factors (weather, terrain, vegetation)
    - sensor device features (e.g. transduction capabilities)
  - fusion outcomes
    - mediated by P9 fusion processors
    - vehicle type (e.g. SUV)
    - threat classification (e.g. hostile)
    - variable certainty in fusion outcomes – linked to fusion context

# Combat Operations (1)

- Goals
  - secure settlement for aid distribution
  - negate any threat to coalition forces
  - monitor ongoing engagements
  - maintain awareness of combat situation

# Combat Operations (2)

# Combat Operations – Demo Opportunities

- Monitoring of BF2 Event Streams(P10/P12)
  - monitor Battlefield 2 event streams; alert commanders to events/contingencies of interest
  - create a semantic wrapper for the BF2 game environment
  - store RDF event streams in semantic data repository
  - support retrieval of BF2 information using semantic queries
    - use P12 knowledge access tools, e.g. NITELIGHT query tool
  - enable users to create ‘knowledge monitors’
    - daemons that monitor RDF event streams and alert user to events or contingencies of interest
    - can exploit a variety of output formats, e.g. RSS, SMS, voice alerts.

# Technology Demonstrator

- P12 actively engaged in coordinating technology demonstration effort
- Initial demonstrator has been developed
- Provides basis for continued collaboration across Projects 8, 9, 10, 11, and 12

# Summary

- Humanitarian assistance/disaster relief scenario to support collaboration and technology demonstration
- Multiple opportunities for technology demonstration across TA3 and TA4
- Initial technology demonstrator has been developed to support the demonstration of scientific and technical outcomes

## Technology Demonstration Opportunities

| Project 8 | Project 9 | Project 10 | Project 11 | Project 12 |
|---|---|---|---|---|
| Semantic integration of sensor asset datasets; application of match-making techniques to sensor ontologies. | Use of semantically-mediated information fusion algorithms to process acoustic sensor data. | Development and utilization of dynamic mission context models using the Battlefield 2 simulation environment. | Generation of culture-specific coalition plans using cultural network analysis techniques and cultural models. | Information retrieval; semantic integration and inter-operability; representation of plan-relevant information. |

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