

## **The Need for Common Information Ontologies**

Large organizations that employ many different computer systems often face the problem of integrating data from multiple sources into useful information. The United States Marine Corps must deal with these issues, but in an unforgiving, battlefield environment. The information required by a Marine in the field is currently dispersed across many heterogeneous, independent systems. This information includes location and status of friendly assets, hostile troops, noncombatants, weather, terrain, intelligence and other types of reports. To make effective, timely decisions and to prevent information overload, what is presented to the decision maker must be relevant to his needs. Space exploration and the Interplanetary Network face similar problems in integration and efficient exchange of information between distributed assets and existing systems. This approach lays the foundation for agent based reasoning and automated decision support that are necessary for monitoring conditions in a complex, dynamic environment.

Current solutions to integrating the data from the different computer systems in support of tactical operations are message based. This is adequate for many situations for the transfer of data between systems, but does not readily lend itself to providing a common tactical picture or automating decision support. The USMC has sponsored JPL and several other organizations, to develop an advanced information sharing and decision support system.

At the core of this new system is a common ontological object model representing the characteristics and complex relationships among real world entities. The object model is designed to contain data from existing independent systems, but augments this information with the ability to establish associations with data from other sources. This provides a true information system to the USMC by fusing the representation of data from different sources into a single model and providing the ability to relate data within the model.

JPL's contribution to this system is a generalized middleware layer of software that is adaptable to many different object models and provides standardized services to access and distribute the objectified information. A subscription and alert service provides notification whenever important conditions are satisfied. Query and object management services allow discovery and manipulation of objects. This generalized approach provides a framework to support agent based reasoning in many different fields.

The system architecture developed for the USMC lends itself to other applications, particularly ones that require the fusion of information from dissimilar data sources into a common representation for agent based reasoning.

# SEADRAGON

USS Coronado



SHARED NET (API)

Query Services  
MTR SERVICES (TCP, UDP, MTC)

OBJECT DATA-BASE  
SUBSCRIPTION SERVICES

SHARED NET

RF Comm

High Speed Networks

RF Comm

INMARSAT

Remote Sensors



BV I (GMD)



SXM (Next-Gen) External

UAVs, helicopters

ships

At Sea & Ashore

Simple Handheld

HMS Marlborough near Jamaica

## IMMEDIATE ACCESS VIA SHARED NET

Earth

Science Planners

Operations Planners

Telemetry & Science Processing Software

Shared Network Middleware



DATA DISTRIBUTION

Mars



## COOPERATING MARTIAN ASSETS VIA SHARED NET

