Military Modeling & Simulation Systems Oriented Architecture Concepts Pilot

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Pilot Objectives

■ Goal
  – Provide the DoD M&S Community with:
    ■ Relevant information for decision makers
    ■ An education vehicle about SOA
    ■ A practical application of an LVC Architecture
      that employs SOA commercial practices and technology

■ Approach
  – Examine SOA within context of DOD M&S environment
  – Design and produce a pragmatic tutorial
  – Provide the SOA framework to interoperate two disparate federations

The technical approach, while incomplete with regards to Live and Virtual, never-the-less exercises the technology required to integrate all three in a non-trivial fashion
Process:

- ID Common Services
- Decompose Federation (toggle off services that will be SOA based)
- Establish a SOA environment
- Compose federation around the SOA kernel
Importance of the CDA

- The Common Data Abstraction (CDA) is a:
  - combination of public services
  - Has an underlying data model
  - Supports interoperability between two or more systems

- With the CDA all systems interface with a single external data model
  - The data model has a semantic and logical aspect
  - The underlying logical data model is accessed via public services
  - Allows changes to the underlying data model while maintaining the existing publicly defined interfaces
  - Supports addition of new public services to provide controlled access to new data
Evolved Pilot Architecture
Implemented Services

■ Order Battle Services (OBS) Data
  – Centralized service-based access to initialization data

■ Situational Awareness
  – Provides centralized service-based access to ground truth

■ Entity Cache
  – Provides centralized service-based storage and access of real-time entity information

■ Aggregate Cache
  – Provides centralized service-based storage and access of real-time unit information

■ Enumeration Service
  – Provides centralized service-based translation service from native to common data semantics

■ Management
  – Provides centralized service-based storage of common participant system monitor and control information
Situational Awareness (SA) provides data from the CDA

Convert native data into Universal Core XML

Convert uCore XML to KML

An application (in this case, Google Earth) renders KML

White Cell or others requiring complete ground truth

Operator
Google Earth: SA Feed
Summary

■ Demonstrates SOA capabilities
  – Composition of services
  – Re-usability
  – Future flexibility

■ Created a pilot that provides services using industry best practices
  – Order Battle Services (OBS) Data, Situational Awareness, Entity Cache, Aggregate Cache, Enumeration Service, Management

■ The pilot is capable of reasonable performance with a non-trivial dataset
  – System easily support a 120K entity scenario on a Dell 690 quad-core workstation
  – Plugin/Adapter and Application Server on the same platform
  – Design provides for ‘expedient adaptability’
Potential Next Steps

- Explore applicability to domains other than training

- Further performance testing and tuning

- Publish aggregate objects to the CDA to enable bidirectional exchange of aggregate and entity data

- Further refinement of the CDA
  - Enhanced scalability
  - Explore impact of more diverse endpoints
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BACKUP
Service Composition within CDA

Vertical Composition

Provides scenario meta information, such as human-readable unit name, icon representation, etc.

Horizontal Composition

Unless otherwise noted, all are implemented as EJB3 entity and stateless session beans (JSR-220)

OBS

Interface (Stateless Session Bean)

Situation Awareness

uCore Generator

uCore to KML Transform

Entity Cache

Basic Entity Interface (Stateless Session Bean)

Basic Entity Entry

Combat System

Combat Systems List

Side

Unit

Persistence

JPA
Situational Awareness Feed Service Composition

UCoreGenerator
REST-based Servlet

Request: REST query
Response: UCore

UCoretoKMLTransformer
REST-based Servlet

Request: Dynamic bounding box
Response: KML

EntityDetails
REST-based Servlet

Request: Embedded REST query
Response: HTML

Google Earth

EJB3 – JPA

CDA (Persistence)