Live, Virtual, Constructive Architecture Roadmap Implementation (LVCAR-I) - Improved Interconnectivity Using Gateways/Bridges

NDIA SE M&S and DTE Committee Meeting
August 10, 2011
LVCAR-I Drivers

- Growing Demand for LVC Interoperability
- Redundancy of Tools, Gateways & Repositories
- Numerous, Parallel Architectures (HLA, DIS, CTIA, TENA)
LVCAR Study Framework

- **Purpose:**
  “Develop a future vision and supporting strategy for achieving significant interoperability improvements in LVC simulation environments.”

- **Focus:**
  - Technical Architecture
  - Business Models
  - Standards Evolution
  - Management Process

- **Precepts:**
  - Do no harm
  - Interoperability is not free
  - Start with small steps
  - Provide central management
LVCAR Progression

- Standards - FEAT & DSEEP Overlay
- Tool Set Design -
  - Common Data Formats
  - Reuse & Repositories
  - Gateways & Bridges
  - Common Object Models
- Net-Centric SOA Concept Pilot

LVCAR Study Recommendations

Implementation & Transition

Engagement Activities with M&S COIs

(FY08)  (FY09-10)  (FY11-13)
Gateway Challenges

- Gateways provide the most widely used means of addressing interoperability concerns in multi-architecture LVC environments.
- Despite the many documented success stories associated with the use of gateways to facilitate LVC interoperability, there are also some significant issues that impact technical, schedule, and cost risk.
- Examples of known gateway issues include:
  - No central “marketplace” of gateways
    - Few mechanisms for user to determine what reuse opportunities are available
    - No mechanisms for direct comparisons of gateways
    - Integrators committing to building their own
  - Gateways built for specific needs
    - Increased intellectual expenditure on ad hoc solutions
    - Not built for reuse/not built for extensibility
    - Extensive duplication of existing gateway capabilities
  - Broad proliferation of gateways
    - Redundant maintenance costs
The Gateways component to the LVCAR Implementation (LVCAR-I) project initially focused on two products:

- **Gateways Characterization Report (May 2010)**
  - Designed to identify areas where gateway capabilities are not well aligned with user needs
  - Identified capabilities offered by a wide range of different existing gateways, based on on-line questionnaires and site visits to numerous user sites
  - Mapped user requirements to these capabilities to identify gaps

- **Gateways Execution Plan (June 2010)**
  - Identification of viable strategies to address gateway issues and capability gaps
Strategy Dimensions

Educate

• Tutorials
• Classes
• Help Desk

Current State

Enhance

• Machine-readable gateway languages
• Architecture-neutral SDEM representation
• Performance Benchmarks

Create

• Fund existing & enhance
• Fund new
• New business models

Looking for the “sweet spot” that addresses the issues in a timely fashion, for reasonable cost, enacts positive change that is long-lasting, and has a credible business model.
LVCAR-I Gateways Effort: Completed Product Development Activities

- Develop a *Gateway Configuration Model* that identifies an explicit set of gateway requirements, and discusses how the emerging gateway products and processes will address those requirements.
- Develop a *Gateways Capability Description* document, which formally delineates the various capabilities that individual gateways can offer to user programs, along with specific levels of implementation for each unique capability.
- Assess the *Architecture-Neutral Data Exchange Model (ANDEM)*, originally developed by the Joint Composable Object Model (JCOM) Program, to support Simulation Data Exchange Model (SDEM) mapping and/or translation in gateways.
- Develop a set of *Gateway Performance Benchmarks (GPBs)* to identify specific gateway performance measures, along with use cases that describe how and where these measures should be applied.
LVCAR-I Gateways Effort: In-Progress Product Development Activities

- Develop a common *Gateway Description Language* (GDL), in a machine-readable format/syntax, for describing both user gateway requirements and the capabilities that individual gateways can offer
  - Supports user discovery of needed gateway capabilities
- Develop a common *SDEM Mapping Language* (SML) to formalize format and syntax of mappings between different SDEMs
  - Reduces number of required mappings, and supports reuse of mapping data
- Develop repository for GDL-based gateway descriptions. Incorporate applicable search and requirements-to-capabilities matching algorithms
- Develop tools for GDL and SML file creation/editing
- Develop SML Translators for selected gateways
  - JBUS, GWB are initial targets
- Socialize draft GPBs with gateway developer organizations. Incorporate feedback and prepare formal specification
- Develop Gateways tutorial
FY12:

- Develop a Gateway Configuration Language (GCL) which standardizes the format and structure of gateway configuration files
  - Supports reuse of gateway configuration files
  - Continue development of supporting automated tools
  - Capability demonstrations with “early adopter” gateway organizations

Potential:

- Gateway Testing Laboratory (GTL)
- Gateway language standardization
1. Create metadata files describing gateway products and configurations using Gateway Description Language (GDL)

2. Search database via tool that allows selection of gateway requirements via high priority capabilities

3. Best Matches from Search
   - Gateway 1:
   - Gateway 2:
   - Gateway 3:
   etc.

4. Discussion with Community of Interest: Gateway Developers & Vendors, and other Gateway Users

Selected Gateway(s)

Mapping Rules
Filtering Rules
Filtering Rules

1. Define/Reuse Mapping using SDEM Mapping Language (SML) Editor

GDL Editor

Initial Gateway

Gateway Configuration written in Gateway Configuration Language (GCL)

Gateway Configuration

SML Editor

SML Translator

SML files for all required mappings

2. Create/modify Gateway Configuration using GCL Editor & Configuration Tool

GCL Editor

All Files Stored

Searchable GDL, SML, GCL, Local Library

Simulation Component Simulation Component Simulation Component Simulation Component

Network

Gateway

Filtered Rules

Searching and Distribution Point Standards

Gateway Developers & Vendors

Selected GDL, GML, GCL Local Library

Local Library

Remote Repository Library

Gateway Components

Configure Gateway

GDL Editor

GDL, GML, GCL Editor & Configuration Tool

GDL, GML, GCL Remote Repository Library

Searchable GDL, SML, GCL Remote Repository Library

Searchable metadata files describing gateway products using GDL based on Gateway Capabilities List

Searchable web (or equivalent) interface

Matching Tool

Reevaluate

Selected Gateways

Gateway

Configuring Gateway

Selecting Gateway
Questions and Feedback