Convergence of Distributed Simulation Architectures Using DDS

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Evolution of the S&T industry

Simulation in the Cloud
(Simulation as a Service)

Simulation for Team Training
(LVC interop)

Simulation for Joint Training
(DIS, HLA,...)

Simulation for Individual training

Simulation for CD&E
(Compliance with Net-Centric systems)
Concept of Distributed Simulation

Simulations are interactive through current state-of-the-art communication systems

- Simulation environments that are distributed across multiple computers, potentially at different locations
- Often referred to as “federations”
Distributed Simulations enable Joint Mission Training

CONSTRUCTIVE SIMULATION
BLUE FORCES
Injecting Blue Forces in the scenario

VIRTUAL SIMULATOR
FORWARD AIR CONTROLLER
Mission: Reconnaissance & Designing Targets

CONSTRUCTIVE SIMULATION
RED FORCES
Injecting Red Forces in the scenario. Human behaviour represented by agents & IA

VIRTUAL SIMULATOR
APACHE LONGBOW
Mission: CAS

VIRTUAL SIMULATOR
A10 Thunderbolt
Mission: Observation & CAS
But Reality is Complex:

* Different Standards for interoperability
* Too many COTS hard to interoperate between them
* Different Data & Voice Communications
* Legacy vs. COTS based Systems
* Heterogeneous simulation ecosystems
* Scaling-Up to Very Large Exercises
Defense Administrations have invested a lot in simulation systems for weapon systems but:
* Poor use of existing simulation assets
* Distributed Mission Training is very difficult
* Interoperability is very limited
* Tied hands with HLA COTS vendors
Because of this problems, SISO starts a new Study Group: LSA, looking to solve many of this pains.

SISO LSA is looking to customize DDS for the simulation domain, providing the foundation for a Layered Simulation Architecture.
Why use DDS in Simulation?

COMMUNICATION

- DDS is centered in controlling the communication
- HLA tries to minimize the communication. It cannot control it
- DIS trust the communication

SCALABILITY and FAULT TOLERANCE

- DDS has automatic discovery, is fully publish-subscriber, no single point of failure
- HLA is central server based: scalability and fault tolerance are difficult
Why use DDS in Simulation?

LESS-TAN-PERFECT COMMUNICATIONS

- DDS has been proved over small bandwidth (4800 bps in digital network radios)
- DDS can cope with heterogeneous networks

REAL TIME SIMULATION

- Military platforms use DDS as the communication backbone
- Simulating with DDS can incorporate this data in real time
CONVERGENCE OF DISTRIBUTED ARCHITECTURES WITH SISO LSA

SISO LSA

DIS

HLA

TENA

Legacy Applications

Legacy Application

Gateway

Legacy Architecture

Gateway Built-in

Legacy Architecture

Open-Wire DCM Plus Simulation Services
HLA and DIS cover more than the 70% of the demand. Both are standards embraced by IEEE and SISO and known worldwide.

These architectures have significant overlap in capabilities and requirements.
An assessment of HLA present capabilities

- A IEEE and NATO (Stanag 4603) standards
- An accepted standard for interoperating simulators
- Has meta-data model (OMT)
- Define rules for interoperability
- Many COTS from different vendors
- Services are part of HLA

- Wire protocol does not exist
- The entire standard tries to limit communication
- QoS are very limited.
- Lack of plug&play capacities.
- Performance is not enough for massive data distribution across heterogeneous networks.
- API is hard to use
- No security standard
- Model is rigid
When worlds collide
LSA looks to improve ROI in the S&T industry

Many architectures in use reduce reusability, interoperability and composability

LSA tries to improve this three key parameters
Concept #1: Interoperability

Simulator A

Simulator B
Concept #2: Reuse

same weapon model runs in both simulators

Simulator A

Simulator B
Concept #3: Composability

Sim Assets

Scenario built from simulation assets
With LSA you could have Simulations as Services in the Cloud

Injecting Simulation Entities in Real Time

LVC Simulation in progress
LSA Use Case

SP Battle Lab Prototype (NOGESI)
Try out LSA's flavors with Simware
Please address any questions about this presentation to: