

HLA Integration Employing Web Services for Federate Communications

The Extensible Modeling & Simulation Framework (XMSF)

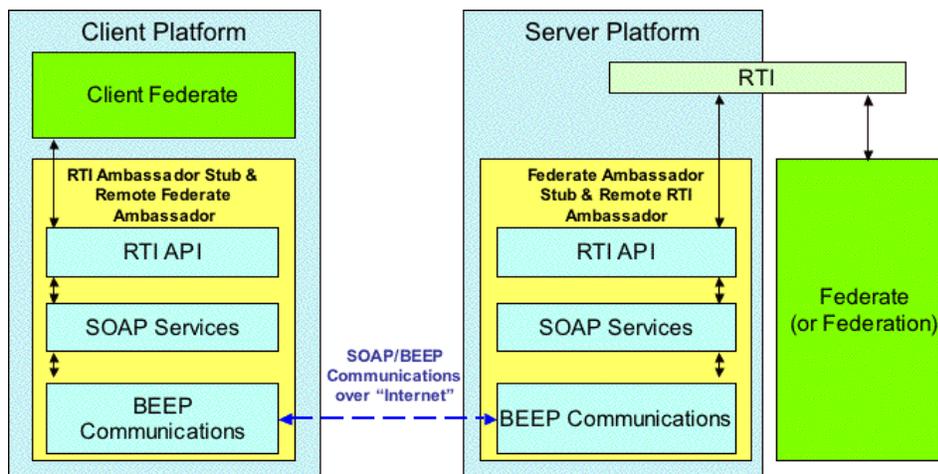
As DoD Modeling & Simulation (M&S) and C4I transform, they are converging on Web based solutions to meet the requirements for network centric warfare. The Extensible Modeling and Simulation Framework (XMSF) provides a framework which allows both Department of Defense (DoD) and non-DoD Modeling and Simulation (M&S) projects to take advantage of Web based technologies. XMSF enables M&S application interoperability and development. As a founding XMSF partner, SAIC is a pioneering innovator in the design, development, integration, deployment, and standardization of Web enabled M&S. SAIC partnered in XMSF with the MOVES Institute at the Naval Postgraduate School, George Mason University, and Old Dominion University's Virginia Modeling, Analysis & Simulation Center.

Web Enabled RTI

SAIC's initial XMSF exemplars use Web based communication protocols, SOAP and BEEP, to allow an High Level Architecture (HLA) compliant simulation to communicate with the DMSO/SAIC Runtime Infrastructure (RTI) over the Web. The Web Enabled RTI enables multiple federates to reside as web services on a Wide Area Network (WAN), permitting an end-user to join a federation over the Internet. The Web enabled federate can be everything from a lightweight Java applet running within a browser to a full blown legacy federate simply relinked with the Web Enabled RTI libraries. SAIC has successfully produced federations at both of these extremes, in the latter case only changing a *single line of code in an existing federate*.

Benefits of Web Enabled Simulation

- *No need to move dedicated hardware*
- *No need to create a new installation*
- *Simulations can stay home-based with technical support and configuration management*
- *Rapidly support different federations simultaneously*
- *Supports the separation of GUI from simulation*
- *Enables immediate simulation accessibility by lightweight clients*



The preceding diagram illustrates the architecture of the Web Enabled RTI. The Web Enabled RTI uses XMSF compliant Web Services for communication between the federates, in this case the Simple Object Access Protocol (SOAP) and the Blocks Extensible Exchange Protocol (BEEP). The RTI interfaces are consistent with the Java bindings for the DMSO/SAIC RTI. The RTI parameters are mapped to SOAP-wrapped XML and transmitted via BEEP. BEEP allows bi-directional calls through the interface, enabling Federate Ambassador call backs. This approach is superior to HTTP's uni-directional initiation that makes it unsuitable for supporting simulation communication patterns. This architecture enables encapsulation of non-reentrant RTI libraries. A single Web Enabled RTI Service can connect multiple Client Federates to a single federation or to separate federations.

This technology enables existing HLA compliant federates to be integrated easily over the Internet or any WAN such as the SIPRNET. This same approach can also be applied to DIS and ALSP.

The seminal XMSF report, "Extensible Modeling and Simulation Framework (XMSF): Challenges for Web-Based Modeling and Simulation," can be found at <http://www.xmsf.org>.

New Technical Directions

In keeping with the goal of supporting the operational warfighter, SAIC is investigating additional Web enabled simulation technologies, particularly in the area of composability and repositories. SAIC is investigating architecture issues with composability of server-hosted components, including architecture issues with replacing Federation Object Models/Federation Execution Detail files (FOM/FED) for server-hosted federates, and executing multiple, simultaneous federate instances potentially employing different FOMs/FEDs. SAIC is integrating agile FOM concepts into a mapping layer to support composability of semantically close federates with disjoint data types for some elements. SAIC is also investigating metadata standards to support automated reasoning about the composability of federates into meaningful federations.



David L. Drake
Phone: (858) 826-2278
E-Mail: drakedavid@saic.com

Dr. Katherine L. Morse
Phone: (858) 826-6728
E-Mail: morsek@saic.com

<http://www.xmsf.org>