BUILDING THE JOINT SIMULATION SYSTEM (JSIMS)

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Introduction

The operational tempo (OPTEMPO) and the growing complexity of military operations demand more robust simulation training systems. Thus, DOD is taking major strides to field the Joint Simulation System (JSIMS) to answer the warfighter's need for better training by providing valid computer-simulated environments for use by commanders-in-chief (CINCs), their components, other joint organizations, and the individual Services.

As noted in the *Secretary of Defense Annual Report to the President and the Congress, April 1997*, the primary purpose of JSIMS is to support training and education of ready forces by providing realistic joint training across all phases of military operations for all types of missions. A distributed, constructive wargaming simulation, JSIMS is designed to create a single, seamlessly integrated joint synthetic battlespace (JSB). JSIMS will provide command, control, communications, computers, and intelligence (C4I) training in a simulated, full-range military operations environment using joint and combined force capabilities.

Initially, JSIMS will support joint, Service, and agency training. Eventually, it will include doctrine development and validation, mission rehearsal, joint experimentation, and professional military educational objectives. Above all, it is an "alliance," a formal agreement establishing an association of groups to advance common interests.

Program Manager (PM)

The PM, JSIMS reports directly to the Army Acquisition Executive, and is supported by an Alliance Executive Office staffed by DOD civilians, military officers, and contractors. The Alliance Executive, a Senior Executive Service billet staffed by the Navy, performs JSIMS development and system integration management that includes coordination of design and development of the architecture, the system common components, and the warfare domains' integration.

The JSIMS Memorandum Of Agreement (MOA) establishes policy, assigns responsibilities, and establishes a management and administrative structure for oversight, coordination, and communication of JSIMS issues across the program. This agreement results in the JSIMS organization known as the alliance.

Partners

JSIMS partners include the Office of the Secretary of Defense (OSD), the joint staff, each of the Services, Defense agencies, and the U.S. Joint Forces Command (USJFCOM) Joint Warfighting Center (JWFC). The MOA designates executive agents (EAs) and development agents and their respective roles and responsibilities. EAs provide resources and functional management for development of their respective domains and act as Service or agency points of contact for requirements. EAs include the Army, the Navy, the Marine Corps, the Air Force, the USJFCOM, the Defense Intelligence Agency, the Defense Information Systems Agency, the U.S. Transportation Command, and the U.S. Special Operations Command. The USJFCOM JWFC serves as the JSIMS Program user advocate by representing the CINCs and integrating the requirements of the CINCs, Services, and Defense agencies in the development of JSIMS.

Management

On Dec. 16, 1999, JSIMS was designated an acquisition category (ACAT) ID Program (after achieving Milestone II in October 1998 as an ACAT II Program). With this designation, JSIMS integrated product teams (IPTs) were reorganized under an overarching IPT (OIPT). The Assistant Secretary of Defense for Command, Control, Communications, and Intelligence chairs the JSIMS OIPT with appropriate participation by OSD and Army acquisition representatives from each of the JSIMS EAs.

Tenets

Three key tenets of JSIMS listed in the Operational Requirements Document, V3.0, of June 23, 1999, are tailorability, composability, and efficiency. JSIMS tailorability refers to the objects and architecture enabling it to create the realistic environment for the unique requirements of each user. Composability encompasses the technical aspects that allow the "construction" of JSIMS to meet user needs. In other words, tailorability aims for the operational flexibility while composability addresses system management and interfaces. The third tenet, efficiency, refers to the responsiveness in presenting an environment useful to the user. An example of efficiency is the need for JSIMS to reduce the number of personnel required to operate and control the simulation.

Development

JSIMS is currently in full-scale development and has a March 2002 target date for V1.0 release. The application of JSIMS in a major training event in March 2003 will demonstrate JSIMS' initial operating capability. The development methodology consists of an overlapping sequence of events containing elements of requirements definition, design, development, integration, and test. These events occur over a 2-year period and culminate in release of a new version. Each version overlaps the previous version by 6 months and allows for a concurrent, iterative development approach incorporating user feedback and new technologies as they become available. Therefore, subsequent version releases are planned in 18-month intervals following the March 2002 initial or V1.0 release.

Architecture

The JSIMS architecture includes planes, tanks, ships, and intelligence sensors that interoperate in a JSB. This synthetic operational environment must be coherent between the levels of war, synchronized between types of events, and realistic in the context of the specific joint training scenario.

JSIMS uses high level architecture (HLA), the DOD standard for modeling and simulation interoperability. HLA provides the flexibility not only for development by the partners within JSIMS, but also for JSIMS to interact with other simulations as required. HLA also provides the means by which JSIMS can interface with C4I systems. Additionally, HLA provides JSIMS the following:

• A standard mechanism to record alliance-wide decisions on how domain objects and their relationships are characterized,

• A software integration framework for major components of JSIMS,

• A standard means to extend JSIMS through the addition of non-JSIMS developed federates, and

• Cost reduction by using existing government and commercially developed HLA tools.

Component Classes

The JSIMS system/subsystem design description defines four JSIMS component classes as follows:

• *Domain Federate*. This simulates combat environments such as land, water, air, and space;

• *Support Federate*. This provides functions other than those included in a domain federate, such as the technical control federate that is used to perform technical management of the federation;

• *Library*. This directly links into one or more other components but is not a federate (e.g., synthetic natural environment models or the HLA runtime infrastructure); and

• *Application*. This stands alone and is not a federate (e.g., scenario-generation tool).

Each component class has one development agent responsible for its construction. The primary responsibility of these development agents is to build the "model" that provides the objects and functionality for their specific areas.

Extensibility And Security

Use of HLA makes JSIMS extensible by the user community with minimal assistance from JSIMS developers. Users can also extend JSIMS by adding federates and extending the federation object model by adding new object or interaction classes or new attributes to existing object classes.

JSIMS must support exercises running two enclaves at different security levels (e.g., secret and sensitive compartmented information).

Interoperability

The training audience does not interact with any component of JSIMS directly. Furthermore, the training audience uses only those systems they have available during live operations (i.e., C4I systems). Each C4I system, with a single development agent responsible for JSIMS interface, connects to JSIMS in one of three ways to accomplish interoperability: as a federate; via an adapter federate acting as its surrogate in the federation; and, in rare cases, via a direct, point-to-point connection with a single domain federate.

Integration Events

To mitigate integration risks and ensure that each development agent stays on schedule, JSIMS integration consists of mini events that gradually increase in size and functional capability as the system matures. These events are characterized as prototype, federate, and federation integration events.

Each federation integration event adds new federates and applications, increases the operational capability of each domain federate, and/or increases the technical capabilities of each federate and other applications.

Developmental Tests

Below is a description of the types of developmental tests:

• Technical verification tests are conducted to ensure that JSIMS components meet specific technical requirements for operating in the JSIMS federation and ensure that federates are HLA compliant.

• Functional verification tests ensure that all functionality described in an object set is operating as designed.

• Load tests measure the ability of the JSIMS federation to operate at real time and identify bottlenecks that require software optimization.

• The systems test ensures that JSIMS requirements and key performance parameters are met to culminate in a version-release milestone.

OT&E And System Validation

The operational test and evaluation (OT&E) agent for JSIMS is the Air Force OT&E Center (AFOTEC). While traditionally the operational test activity for an ACAT ID program is the same Service as the PM, AFOTEC's involvement maintains previous program agreements with the intent of achieving a truly multi-Service program.

JSIMS multi-Service OT&E will be conducted in conjunction with a CINC/Joint Task Force training exercise with a live training audience and will involve multiple sites.

Conclusion

JSIMS is the largest modeling and simulation program ever undertaken by DOD. Continual support by the Joint Chiefs of Staff, the Services, numerous Defense agencies, and OSD attests to its important role in meeting future military readiness requirements.

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