THE JOINT SIMULATION SYSTEM (JSIMS) ENTERPRISE - SUPPORTING JOINT DEVELOPMENT THROUGH COLLABORATION

Drew W. Beasley
Joint Simulation System Joint Program Office
12249 Science Drive, Suite 260
Orlando, Florida 32826 USA

John M. Gormally
TRW Systems Integration Group
3045 Technology Parkway
Orlando, Florida 32826 USA

ABSTRACT

This paper describes the JSIMS Enterprise approach to Joint development and reviews progress and lessons learned from the past year. The description identifies program challenges and roles and responsibilities of the Joint Program Office (JPO), Integration & Development (I&D) contractor, warfare domain Executive Agents (EA), and Development Agents (DA) and their contractors. Both the DoD oversight mechanism and the Enterprise organization are also discussed.

The most significant management challenges were buy-in and cooperation from the Service and Agency partners, harmonization of user requirements, and contractual and geographic diversity of participants. Success in Enterprise start-up depended on effective use of working groups sponsored by permanently established product teams. These groups had broad participation, focused agenda, defined products and duration.

Major achievements include integration of numerous service requirements into a single specification, leveraging the results of government and contractor sponsored technology programs, and management of distributed, Joint and Service-focused engineering and development. Defined standards and handoffs assure that successes and shortfalls are both visible. Development plans are based on incremental delivery and demonstrations that involve the multiple Service DAs and user sites.

Drew W. Beasley

CAPT Beasley is the Program Manager for the Joint Simulation System (JSIMS) Joint Program Office in Orlando, Florida. He has been the Commanding Officer of two ships of the line, the USS Pegasus (PHM 1) and the USS Stump (DD 978). He has had numerous program management and policy level positions within the Department of Defense. CAPT Beasley's academic achievements include a BS in Oceanography from the United States Naval Academy, graduate of the National Defense University, Industrial College of the Armed Forces, and a Master of Public Administration degree from the George Washington University. He is an inducted member of PI Alpha Alpha, the National Honor Society for Public Administrators.

John M. Gormally

Dr. Gormally served as the Deputy Program Manager for Integration on the JSIMS Integration & Development (I&D) Contract. While at TRW he managed numerous large-scale system development contracts for military and agency customers. Other positions included Division Chief Engineering and Coordinator of Modeling and Simulation technology. He has been on the Board of the Virginia Senate Productivity Award and the Software Productivity Consortium. His academic background includes a doctorate from Cornell University.

JSIMS PROGRAM OVERVIEW

JSIMS Mission

Current simulation systems do not provide the Joint Warfighter the capability to conduct joint and service training across the full range of military operations in a cost-effective manner.

The Joint Simulation System (JSIMS) Program was created to address the shortcomings of existing systems, implement a collaborative development strategy for Joint and Service-specific capabilities, reduce the resource overhead required to conduct training exercises, and incorporate the common compliance paradigm for applicable standards and guidelines.

JSIMS supports training, rehearsal, doctrine development, analysis and professional military education. Such events can be distributed locally across machines and distantly across theatres. It interoperates with live, virtual and constructive participants (Figure 1).

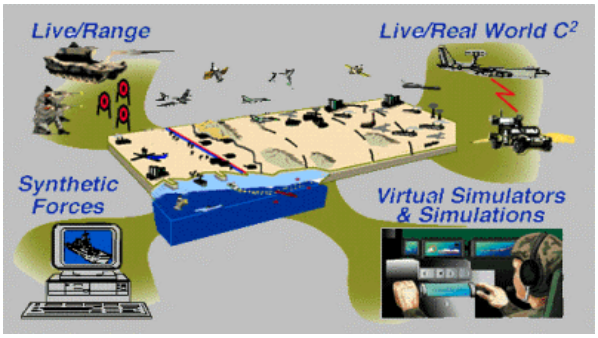


Figure 1. JSIMS Interoperability

It will eliminate numerous, redundant modeling and simulation systems that are not interoperable. It is designed to mate with Go-to-War C4I systems and prepare commanders to coordinate their forces for whatever warfare is required.

The JSIMS vision is threefold. First is the Warfighter vision that identifies how JSIMS will be utilized while the second, a Technical vision, identifies how JSIMS will be engineered. The third vision – Enterprise - unites program participants into a single enterprise, fully committed to successful development, fielding and operation.

Warfighter Vision

The Warfighter vision is that JSIMS is a simulation system that supports the twenty-first century warfighter's preparation for real world contingencies. The system provides garrison and deployed exercise capability to meet current and emerging training and operational requirements in a timely and efficient manner. By interfacing to the warfighter's real go-to-war systems, the view into the simulation world mirrors that of the real world.

JSIMS will support Unified Combat Commands, Services and Joint Task Force training in all phase of military operations. It will also support specific Universal Joint Task List (UJTL) requirements for strategic-theater, operational and tactical tasks.

Technical Vision

The Technical vision is that JSIMS is a single, distributed, seamlessly integrated simulation environment. It includes a core infrastructure and mission space objects, both maintained in a common repository. A common simulation engine includes system software to run on commercially available, open architecture hardware and networks. These can be composed to create a simulation capability to support joint or service training, rehearsal, or education objectives.

Event planners compose applications by selecting objects from the JSIMS Modeling and Simulation Resource Repository (JMSRR). This allows rapid scenario generation to support changes in event configurations and schedules.

Enterprise Vision

JSIMS is being developed collaboratively between the JSIMS Joint Program Office (JPO) and the Development Agents (DA) for Services and applicable agencies. The Integration and Development (I&D) Contractor has responsibility for systems engineering, systems integration and test, development of Core and Common Services, and Joint Models and C4I Interfaces. Warfare Domain DAs and their contractors are responsible for development of Mission Space Objects and portions of the Common Services.

JSIMS MANAGEMENT OVERVIEW

JSIMS Memorandum of Agreement (MOA)

The JSIMS MOA establishes policy, assigns responsibilities, and prescribes procedures for its management. The Air Force provides the Component Acquisition Executive and the JSIMS Program Executive Officer with the Program Manager rotating between the Navy and Army.

A updated MOA was signed on 20 Dec 96 between the Director Defense Research and Engineering (DDRE), Director Joint Staff, Deputy Undersecretary of Defense (Readiness), US Air Force Deputy Chief of Staff Plans and Operations, US Army Deputy Chief of Staff for Operations and Plans, US Navy Director of Naval Training, and US Marine Corps Commanding General Marine Corps Combat Development Command.

This assures continuing high level oversight on JPO and Service activities. It explicitly recognizes the *duality* of commitments by all participants to both Joint and Service-specific needs. It also defines participation of the Joint Warfighting Center (JWFC) as the focal point for user requirements, interfaces with JWARS, and the technology role of the Defense Modeling and Simulation Office (DMSO).

Acquisition Reform

Acquisition Reform is a driving force in the Department of Defense (DoD). It created the JSIMS program to eliminate redundant development, assure seamless integration of Joint and Service training and rehearsal systems, expedite acquisition by multiple government activities, and reduce operating costs. These goals are major challenges under any circumstance.

One initiative adopted from industry that has fundamentally changed the way DoD does business is the Integrated Product and Process Development (IPPD) approach. Its Integrated Product Team (IPT) process has matured to the point where it is a routine practice for managing specific, component level product development where "integration" is needed. They have also been successfully established for Family of Systems applications where the challenge is "interoperability."

However, they are less effective at handling complex organizational, policy, infrastructure and geographic distribution situations – such as JSIMS – where funding top-level IPT does not have program fiscal responsibility and the technical challenge is to "Instantiate" multiple configurations on a continuing basis. JSIMS has adopted another paradigm – the Enterprise – as a cost effective method to address these *meta* issues.

JSIM Management Challenges

The most significant management challenges were buy-in and cooperation from the Service and Agency partners, harmonization of user requirements, and contractual and geographic diversity of participants.

The JSIMS Enterprise vision is inclusive: all Government and contractor organizations involved in sponsoring, planning, developing, coordinating, funding, testing, verifying, validating, accrediting, and using JSIMS.

Getting and keeping meaningful buy-in and cooperation is the principal program leadership challenge. It is probably a larger challenge than the technical ones.

The power of leadership in the Enterprise is not directive but derived from the desires of Congress, OSD, JCS, and the Services to leverage modeling and simulation (M&S) for improved training and acquisition, and reduce duplication in service and CINC M&S efforts. The MOA defines commitments to these objectives.

The JSIMS Joint Program Office (JPO) role is central in the Enterprise. Its task is to lead, gaining participant commitments to common plans and track key aspects of the program. The JPO management challenge is to achieve technical excellence, while convincing participants that the collaborative developed Joint path is truly the best path.

All of these challenges were compounded by the unique state of each partner's development and contractual activities. They ranged from pre-RFP to one year post-award stages of acquisition. Some contracts did not include JSIMS' impact and many had firm budget commitments and delivery dates. The DA baselines were Service-focused and manifested differing technical approaches, tools, hardware environments, and acquisition and contractor cultures.

Realizing the Enterprise vision required jump-starting the integration of these diverse elements and establishing a course of action that would

sustain the efforts over the subsequent period of development, test and delivery was a key issue. Therefore, chartering the Enterprise product organizations was an early step after award of the I&D contract.

Working groups sponsored by the integration product organizations were the primary mechanism for getting products generated and problems solved. The wide scope of activities required major resource commitments by DA organizations and their contractors.

Key requirements activities centered on a close working relationship with the JWFC to harmonize and consolidate JSIMS requirements. It also involved extensive and continuing efforts with the DAs to generalize and specialize requirements from the various program sources into a single systems specification. Sequencing of capabilities for incremental (Versions) deliveries to customer sites required painful trades by all participants.

Key engineering efforts pushed the Enterprise members to pursue numerous areas in parallel and expose requirements, design and implementation issues simultaneously.

JSIMS Enterprise Oversight

JSIMS is a Special Interest M&S Program and is subject to oversight through cooperating chains of oversight leading to the JROC (Figure 2).

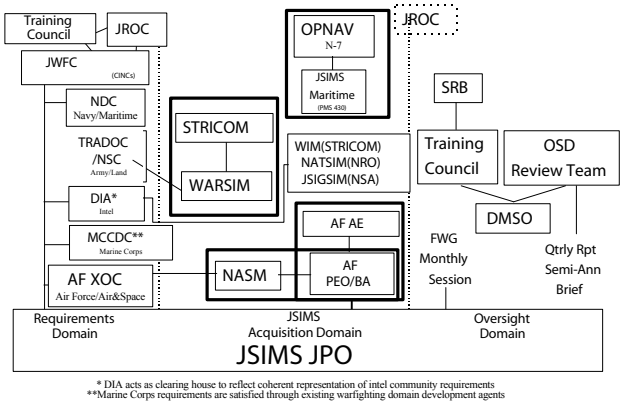


Figure 2. JSIMS Enterprise Oversight

Senior Review Board (SRB) - The SRB is the executive level body charged with functional oversight of the JSIMS program. As such, it is the final authority for resolving JSIMS issues. The SRB is chaired by the Director, Defense Research and Engineering (DDR&E) and the membership is limited to the signatories of this MOA (and their successors).

EXCIMS (Executive Council for Modeling and Simulation) Training Council - The EXCIMS Training Council is an advisory body to the SRB charged with functional oversight of the JSIMS program and authority for resolving JSIMS issues. The EXCIMS Training Council is co-chaired by the Joint Staff J-7 and the Deputy Under Secretary of Defense (Readiness) (DUSD(R)). This body meets on a quarterly basis.

Milestone Decision Authority (MDA) - The milestone decision authority for JSIMS is Air Force Acquisition Executive (SAF/AQ).

Program Executive Officer ñ The JSIMS PEO (Air Force PEO for Battle Management) provides acquisition oversight and monitors the JSIMS acquisition and development efforts to ensure that overall program cost, schedule, and performance objectives are being met.

ENTERPRISE MANAGEMENT

The JSIMS Enterprise is comprised of the National, Joint and Department of Defense Organizations, Executive Agents (EA), and Development Agents (DA). Executive Agents provide resources and functional management for their respective domain areas, and act as Service/Agency focal points for requirements (Figure 3).

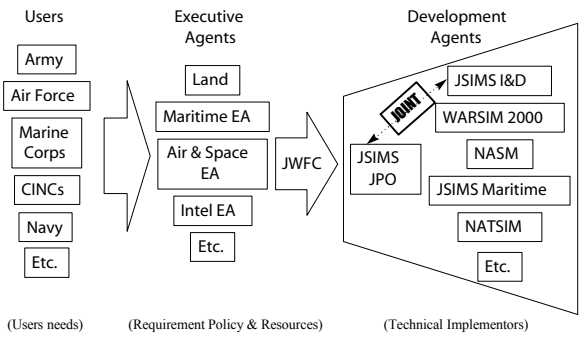


Figure 3. Enterprise Management

The JSIMS approach to Enterprise management provides proactive, comprehensive leadership through the sharing of five essential elements shown in Figure 4.

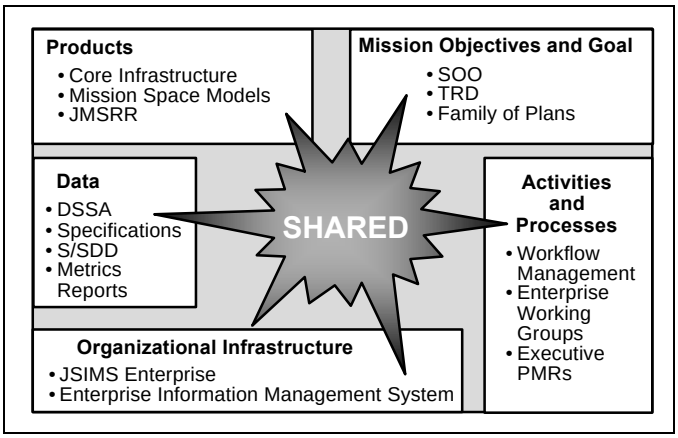


Figure 4. Enterprise Integration Enables Collaborative Development

This is the foundation for unifying the contractually and geographically distributed Enterprise partners in a focused, collaborative, synchronized, and coordinated effort. Especially when each DA determines the priority of funds application within their respective domain.

Underlying these elements is a set of Enterprise management processes and tools that provide a foundation for collaborative development. They are backed by a set of Enterprise standards that provide a common orientation and language.

All participants who have a role or stake in the development and fielding of JSIMS are included in the JSIMS Enterprise. The user community through JWFC is essential because of the evolution of requirements, identification of use cases for system validation, and the identification of opportunities for reducing training support .

Enterprise Needs Framework

We believe that a successful JSIMS requires both powerful information systems and management technologies. This requires moving beyond the traditional realm of organizational communication and cooperation into the domain of true collaboration. Collaboration that is enabled by information technology, but sustained by relationships.

Figure 5 is a model of the progression of information and management technologies in terms of the logical concepts of connectivity, communications, cooperation, and collaboration. We call this the Enterprise Needs Framework where each level is a foundation for the next. State-of-the-art is the cooperative level. JSIMS is following plans consistent with the collaborative level.

The Framework describes several key dimensions of the needs hierarchy: Information Technology, Task Focus, Relationship Focus, and Management Technology. Within each dimension, the successive levels of processes, tools, methods and technologies are identified. The JSIMS collaborative approach will leverage object, network, and distributed computing technology for implementing both the Enterprise and
the JSIMS. It will provide “anytime, anywhere” development and training capability. It will sustain a focus on Enterprise goals, manage dependencies on DA contractors through high-performance teams, and reengineer key processes.

Deliberated dependence is manifested by the fact that the EAs and DAs control their development resources, but cannot satisfy their Service or Joint needs without the contributions (products) of the other partners.

Hierarchy of Enterprise Needs	Information Technology	Task Focus	Relationship Focus	Management Technology
Collaboration	• Network-centric • Distributed computing • OOT,OOA,OOD, OOP	• Anytime, anywhere • Strategic intent • Logical integration	• Deliberate dependence • Enterprise goals • High-performance teams	• Theory E (Enterprise) • Learning organization • Reengineering
Cooperation	• Client-server • Groupware • Distributed data	• JPO/EA/DA/PEO • Improved processes • Resource support • Milestones accomplished	• Teamwork • Shared goals • Structure • Participation	• Theory Z • Process-centric • Empowerment • Flat organizations
Communication	• Workstations, minis • E-mail, VTC, Internet • LAN/WAN	• Standard processes • Requirements • Schedule and funding • Physical integration	• Shared interests • Common language • Two-way • Listening, sharing	• Theory Y • Resource-centric • Leadership • Power sharing
Connectivity	• Mainframes • Telex, POTS • FedEx, USPS	• Organization assignments • TDY	• Consciously independent • Centrally directed • Distributed or collocated	• Theory X • Organization-centric • Management control

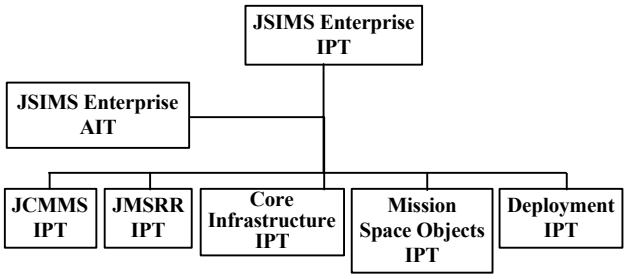
Figure 5. Enterprise Needs Framework

Application of the appropriate management technology (Theories E and Z) is a major challenge for military partners who are Theory X and Y practitioners.

But the bottom line is this: *participants in the Enterprise are the ones who must create the JSIMS.* Every member's contribution is essential to balancing the best of today's technology with the new demands of Joint training and rehearsal. Improved readiness through continual learning and realistic experience is the goal

Enterprise Organization

The internal management of the Enterprise development effort occurs within the constructs of Integrated Product Teams (IPTs) (Figure 6) are



Joint Conceptual Model of the Mission Space
Joint Modeling and Simulation Resource Repository

Figure 6. High Level Organization Chart

(detailed chart will be provided with presentation)

aligned with a high level representation of the JSIMS architecture. Therefore the very nature of the organization is software-centric. It reflects Conceptual Modeling of the Mission Space, Joint Repository for Enterprise artifacts, and common software for Core Infrastructure and Mission Space Objects. Deployment IPT coordinates activities, but partners retain responsibility for support to Service sites within their domain. The Enterprise Analysis and Integration Team (AIT) defines and integrates the products.

The IPTs are composed of representatives from the JPO, the JSIMS I&D contractor, the JSIMS Development Agents, Executive Agents (EA) and users. This provides the Enterprise with a shared vision of the JSIMS end item. The typical IPT includes software engineer developers, and support specialists for configuration management, security, and other areas as applicable.

Actual work product developments are allocated to Enterprise partners who deliver them to the IPTs. Much of the front-end AIT activity has required broad participation and integration of under JPO and I&D leadership.

The user's role is to ensure user requirements are properly defined and to clarify interpretation from the user perspective. Users will provide critical feedback on how well the design and final product meets the user's needs.

IPTs are authorized to create Working Groups (WGs). They are empowered to make decisions within the scope of their charter. Unresolved issues at the IPT level are forwarded to the Enterprise AIT for resolution.

Working Groups – These have a specific mission, products, metrics, schedule and membership. Working groups must be established by a sponsoring IPT/AIT. Working groups are limited in duration, required to have exit criteria, and are disbanded when these are met.

Numerous WGs were chartered during the past year by the AIT and IPTs – to address issues and products that span the Enterprise life cycle. They functioned as focused vehicles for conducting the detailed business of the Enterprise – with broad participation. They were frequently contentious, reflecting the diversity of partner interests. Examples are system specification, design specification, system build plans, conceptual modeling tools, requirements consolidation, Enterprise process and test planning – to mention a few.

The burden on partners to support these activities was onerous; but it assured participation by experts from all applicable domains and Joint and Service interests. It was also difficult at times for the partners' leadership to connect with all of the simultaneous efforts. However, Working Group activity was focused by several key mechanisms: (1) Sponsorship by the IPTs or AIT, (2) Explicit links to major Enterprise milestones, and (3) Published products rapidly available for review across the entire Enterprise.

The payoff of this top-down, holistic approach was (1) Balanced progress in program definition and

development, (2) Broad based understanding of the interdependency of efforts, and (3) Product accountability balanced by resource constraints.

JSIMS Enterprise IPT - The JSIMS Program Office established and chairs the Enterprise Integrated Product Team (IPT) with the I&D contractor comprised of representatives from the EAs, DAs, DA contractors, JWFC, and component IPT Leaders. It has primary responsibility for coordinating program development, test and implementation in accordance with program standards, acquisition program baseline, and master schedule.

The Enterprise IPT is responsible for coordinating program development, testing and implementation management. It contains a Risk Management Board, Cost and Schedule Board, Configuration Control Board, User Advocacy Group, JSIMS Enterprise Process Group (JEPG).

It is responsible for active management of the Enterprise risk program, technical performance measurement program, and cost against the acquisition program baseline. Responsible for resolution of issues that cannot be resolved at lower-level IPTs. It is co-chaired by the JSIMS Program Manager and the I&D Program Manager

JSIMS Enterprise AIT - The Enterprise AIT is chartered to "Engineer the JSIMS Vision." It has engineering and associated activities in these areas: Domain Engineering, Systems Engineering, Security Engineering, Validation, Verification, and Accreditation (VV&A), System Architecture and Design, System Integration, Build Management, Joint Integration Facility (JIF) Management, JSIMS Intranet, COTS Software, Hardware, and Communications.

The Enterprise AIT is responsible for the allocation of requirements to the IPTs. It develops and executes system test plans.

Core Infrastructure IPT - This IPT produces core infrastructure which consists of the following components: JSIMS Object Services, Life Cycle Applications, Infrastructure Support Services, Common Building Blocks, Translation Services, Modeling Framework.

JCMMS IPT - The JCMMS IPT provides authoritative descriptions of the Joint mission space for subsequent development, representation, verification, validation, and accreditation (VV&A) of JSIMS.

JMSRR IPT - JMSRR IPT is to ensure the efficient and effective development, deployment, and management of the Joint repository to support distributed development; storage and retrieval of lifecycle applications, mission space objects, and exercise support data; and configuration management of all Enterprise-owned system information artifacts related to planning, design, execution, and after-action-review of a JSIMS exercise.

MSO IPT - This IPT provides technical leadership and management for the Mission Space Objects development. It establishes interface standards and negotiates allocation of development responsibilities for creation of domain object models, and synthetic environment.

The MSO IPT provides for the integration of the following models from their respective Development Agents; Joint/Combined Models; Air and Space Models; Land Models; Maritime Models; Intelligence, Surveillance, and Reconnaissance (ISR) Models; Logistics Models; Strategic Models (TMD and BMD); Environment Models.

Deployment IPT - Deployment IPT provides fielding oversight, site support to Demonstration-based Reviews and Operational Testing, JSIMS Training planning, and Life Cycle Support planning.

Enterprise Processes

Financial Management - The Enterprise Development agents and the JSIMS Joint Program Office (JPO) are respectively responsible for planning and programming of associated funds to support the individual and integrated development efforts. Each Development Agent (DA) determines the allotment and prioritization of funds application, makes recommendations for cost trade-offs, and identifies the mechanism for addressing shortfalls within their respective program areas. Discussions may occur within the Enterprise to resolve responsibility for funding of new and unfunded requirements as they relate to the development efforts.

Cost and Schedule Management - A Cost and Schedule Board (CSB) is chartered by the Enterprise IPT to capture and assess appropriate cost, schedule and technical performance metrics

collected from each of the DAs and the I&D contractor. The scheduling methodology predicated on tiered milestones, critical dependencies, pre-defined criteria, and identified accountability within the Enterprise. Standard earned value methodologies along with other fundamental cost, schedule and technical performance management techniques are defined and employed.

A Cost-As-an Independent Variable (CAIV) Team within the CSB establishes the methodologies, processes and procedures to conduct these trades and makes appropriate recommendations to the Enterprise IPT throughout the life cycle of the program.

Infrastructure - Primary management of JSIMS products is located in Orlando, Florida. The key to Enterprise communications is the use of information technology such as video conferencing, web technology, telephone conferencing and electronic mail to reduce administrative and travel costs. Infrastructure processes address facilities, sites, tools, and security requirements to support development, fielding and operations of JSIMS Enterprise. JSIMS development is conducted at a variety of sites throughout the continental USA with eventual deployment to facilities and platforms worldwide.

Lessons Learned

Applicable lessons learned or confirmed include the upfront need to harmonize requirements – especially when there are multiple service stakeholders. This includes managing conflicting expectations, as well as timely commitments to facilities and other assets required for development and test.

Major achievements include integration of numerous service requirements into a common specification, leveraging the results of government and contractor sponsored technology programs and concurrent engineering of distributed, Joint and Service-focused engineering and development.

Incremental delivery and demonstration involve the multiple Service DAs. Defined standards and handoffs assure that successes and shortfalls are both visible.

The challenge to JSIMS is the cohesiveness of the collaborative development. Communication between the JPO, I&D Contractor, the Development Agents and the JSIMS partners is critical to the success of JSIMS.