THE LOGISTICS FEDERATION MODEL

MAJ A. Mark Morano
PEO STRI
Orlando, FL
Anthony.morano@peostri.army.mil

Mr. Brent Nase
Tapestry Solutions, Inc.
San Diego, CA
bnase@access.tapestrysolutions.com

ABSTRACT

Current worldwide operations have again proven that serious training is required for logisticians supporting forward deployed units and the modular brigades. We must provide their sustainment brigades, higher echelon staffs, and other logisticians with the simulation tools necessary to conduct this training. In order to train as one team with one fight, we must integrate a superior logistics model into our combat simulations.

PEO-STRI is leading the way to integrate the Joint Deployment Logistics Model (JDLM) into the ACTF. This program is called the Logistics Federate (LOGFED). Current development, within the JDLM model, will provide LOGFED a stand alone capability and allow it to be used with aggregate and entity level simulations. LOGFED will operate as a functional member of the federation of models under ACTF.

JDLM's current simulation functionality includes the ability to simulate TPFDD flow and the management of all classes of supply, maintenance, medical, personnel and transportation. It is in the second year of integration with JCATS through the DIS protocol. Plans to integrate using HLA protocols are currently underway for multi-resolution federations. The stimulation of the Army's logistics C4I system, BCS3, is also under current development. JDLM has already been proven as an operational tool and is the primary technology involved in BCS3.

As the material developer, PEO-STRI is refining requirements and providing configuration management with input from its customers. The functional lead for this project is the Army's logistics simulations experts at the Logistics Exercise and Simulation Directorate, Fort Lee, VA. The current development effort will provide a usable logistics simulation to the Army in FY06. Concurrently, PEO-STRI is working with the Joint Community to provide a deployment and sustainment model that will provide a logistics training solution for joint force training events.

As the Army's logistics C4I tool, BCS3 has the ability to display supply point status, maintenance data, and ITV. By gathering and displaying sensor data, the system can provide the logistician updated information on transportation and cargo assets. LOGFED is able to stimulate BCS3 to include providing transponder position reports and ITV.

ABOUT THE AUTHORS

MAJ Mark Morano is an Acquisition Officer presently serving as a Project Director for the Logistics Federate (LOGFED) software development. He has worked as a Combat Developer, Senior Engineer on the Joint Modeling and Simulation System Program, and most recently, resides in the Constructive Simulation Program Management shop at PEO STRI. His latest education includes a Masters Degree in Information Systems Management from the Florida Institute of Technology and he is a graduate of the Command and General Staff College.

Mr. Brent Nase is currently employed by Tapestry Solutions in Yorktown, VA. He served over 22 years in the U.S. Army as a Quartermaster Officer most recently as the Director, Logistics Training Department, U.S. Army Quartermaster Center and School. He holds a Master of Science and Bachelor of Science degree from The Pennsylvania State University.

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TRAINING LOGISTICIANS USING SIMULATIONS – REALISTIC TRAINING FOR COMBAT LOGISTICIANS

What are our Capabilities and Requirements Today?

Current and ongoing real word military operations have again illustrated that significant training is required for logisticians and logistical staffs supporting forward deployed units and modular brigades in combat theater's of operation. While live training will always be the most reliable predictor of unit success, simulation training events have become an essential pillar of all training, and in particular, that of the logistician. Logisticians are consistently required to orchestrate supply, maintenance, distribution, and medical operations in an increasingly more technical and digital battlefield. In support of these requirements, training and simulation centers must provide deploying sustainment brigades, Joint and Combined staffs, and other logisticians with the simulation tools necessary to conduct realistic training prior to and during deployment. This training must incorporate In Transit Visibility (ITV) and simulate logistics that the logistician warfighter would expect to experience with respect to current logistic Command, Control, Communications, Computer, and Intelligence (C4I) systems. Today logisticians and commanders are often faced with the complexities of planning for deployment and sustainment operations while simultaneously deploying redeploying forces.

The Joint Deployment Logistics Model (JDLM) is the one logistics simulation that has the capability to support the military decision making process (MDMP) and mission rehearsal in both deployment operations, as well as in the areas of sustainment and distribution operations. This capability, combined with the fact that the Battle Command Sustainment Support System (BCS3), the Army's logistic tactical C4I system, is built around the same JDLM software, makes for a simulation suite that uniquely supports today's logistic training requirements, while interfacing and stimulating the battle field logistician's C4I tool kit.

JDLM can model the entire logistic operational environment. When used in conjunction with other strategic C4I systems and simulations, it can be used to provide strategic supply and transportation data to emulate the strategic sustainment flow into a theater of operations. During the simulation, unit personnel and equipment can be deployed and integrated into the operation, and outgoing forces and equipment can be modeled as they redeployed to home station, and are removed from the operational "play box". This picture of operational and strategic movements, combined with a simulated view of the distribution of sustainment stocks, provides the training audience a virtual picture of global logistical events outside of the tactical area. When this simulated representation is displayed, on a BCS3 C4I system, it is virtually impossible to distinguish the simulated representation from a real world view of live logistic events.

Current and emerging ITV technology and policy allows logistical forces to be better informed and have more control of the supply distribution process than ever before. It also places logisticians in the precarious situation of working with systems which are not well understood or for which they have not fully developed tactics and procedures. Without advanced simulations which can model and emulate these technologies and doctrine, logisticians go into combat without the proper training to effectively control strategic and tactical logistics.

During the deployment process, logisticians have the ability to visualize the transportation pipeline, make assessments of future force closure, and redirect transportation assets to meet the theater commander priorities. To perform these tasks, staffs rely on strategic systems which they may never have had the opportunity to train on in daily operations. The current logistic simulation architecture linked to BCS3 allows the complex network of inventory in motion and deployment operations to be integrated on one platform replicating live data on real world C4I systems to a degree never before possible.

In the tactical environment, logistics battle staffs have been given the command and control systems to visualize supply stockages on the map, see what supplies are on dedicated convoys, and control tactical convoys remotely over long distances. Just as important as logistic command and control, battle staffs can now react to convoy attack and immediately direct reaction forces to save lives and defeat enemy force using current C4I capabilities. It is in the simulation of these essential battle tasks that the JDLM - BCS3 association provides tremendous capabilities by simulating logistic operations while integrating both distribution management and force protection problems that replicate those faced in live combat situations.

EMBRACING CURRENT CAPABILITIES WHILE SPIRAL DEVELOPING FOR THE FUTURE LOGFED

The advent of enhanced computing capabilities, availability of existing, stable, net-centric networks, and ongoing real world military operational requirements now makes it possible and necessary to train logisticians under a new paradigm as never before. The capability now exists to meet the logisticians training requirements, including but not limited to, the ability to train in orchestrating logistics activities external to the theater, the ability to train logisticians on supply tracking and distribution using real world C4I systems, and the ability to depict strategic, operational, and tactical sustainment flow into the theater.

As simulation capabilities evolve to meet the training challenges described above the Program Executive Office for Simulation, Training, and Instrumentation (PEO-STRI) is chartered to manage and facilitate the material development process and provide enhanced system capabilities to meet the challenges of simulation evolution. PEO-STRI has been instrumental in embracing the logistic simulation capabilities of JDLM, recognizing the benefits of an integrated simulation engine that can simulate and subsequently stimulate, and serve as the basis for the logistics C4I system (BCS3) driver. Integration efforts have centered on integration of JDLM into the Army Constructive Training Federation (ACTF). This program and model federation is called the Logistics Federate (LOGFED). Current development, within the JDLM model, will allow LOGFED/JDLM to be used with aggregate (multi-resolution models) and entity level simulations. LOGFED/JDLM will operate as a functional member of the federation of models under ACTF.

In conjunction with this effort, the Combat Developer, Logistics Exercises and Simulation Directorate (LESD), is also looking for ways to better stimulate BCS3. LOGFED/JDLM has a proven stimulation interface to BCS3. However, currently the LOGFED/JDLM stimulation is limited to the boundaries of the simulation exercise play box. Future development will provide all available "worldwide wraparound information" that BCS3 typically collects. For instance, BCS3 can display all strategic shipments around the globe.

LOGFED/JDLM can also be used as a stand alone trainer directly stimulating BCS3 without the overhead associated with federated exercises. LOGFED/JDLM is investigating ways to quickly and efficiently simulate that data and provide it to BCS3 in both standalone and federated modes.

Logistics C4I Drives Requirements

The coming together of the Material Developer (PEO-STRI) and the Combat Developer (LESD), who is an element of the National Simulation Center (NSC), has proven to yield big dividends in establishing LOGFED/JDLM. LESD has been the key driver in establishing realistic BCS3 stimulation requirements which has resulted in a good stimulation of BCS3 via JDLM, and providing an adequate picture of sustainment and tactical and operational ITV within the boundaries of the exercise play box. We know however, that the play box of today's logistician is not limited to the theater of operations. The logisticians at LESD recognize this and have established the next spiral of the stimulation effort to include a wraparound of key logistic data outside the limited exercise play box. For instance, the next generation of BCS3 stimulation, by LOGFED/JDLM, will be capable of displaying strategic shipments around the globe and will include a more robust sustainment and material readiness view that transcends the current simulation exercise boundaries.

For the first time the simulation community is delivering a high fidelity simulation that includes capabilities to conduct the MDMP, mission rehearsal, and simulation training for logistic staffs. All of this comes with the additional capability to drive the logistics C4I platform (BCS3), and is built on the same technology and with compatible interfaces allowing ease of interface in stimulation.

HIGH FIDELITY LOGISTICS MODELING – A LOGFED SOLUTION

Logistics has been simulated in combat modeling for many years. Most combat models track fuel, ammunition, and maintenance status of combat systems. In these types of models, logistics processes above the tactical level are usually done at a macro level without taking into account the intricacies of current logistic processes, and without an ability to simulate support operations and other logistic staff training.

Until recently, the Combat Service Support Training Simulation System (CSSTSS), developed and maintained by LESD, was the Army's sole high fidelity logistics training simulation. CSSTSS is capable of supporting stand alone logistic staff only training events and is able to link, to the Corps Battle Simulation (CBS) to provide logistics play in large tactical (division and above) exercises. CSSTSS allows the logistician to operate in the same scenario (exercise play box) and as part of the same tactical team supporting combat operations.

While effective at driving logistics play, CSSTSS uses a Standard Army Management Information System (STAMIS) emulation approach to drive logistics operations, is written in legacy COBOL code, requires the support of an IBM mainframe computer located at Ft Lee, Virginia, and has no map display or conceptual ITV representation. The latest technology added to CSSTSS, allowed for a map representation of the play box to be added to the simulation. However, the exercises still must be run from the mainframe at a central location and still does not allow the simulation centers to operate an exercise without major LESD involvement. The result of these characteristics is high personnel "puckster" requirements, a long support tail of hard to find programmers / main frame operators, limited availability to support worldwide logistics training requirements, and the absence of a true distribution management training capability.

These disadvantages associated with CSSTSS, led LESD, as the combat developer for logistics simulations, to team with PEO STRI in the identification of a lower overhead simulation solution. The resulting LOGFED, with reduced database build requirements, solves the issues identified above and is capable of being run on a standard personal computer. JDLM was identified as the logistics model to fill the requirement and thus began the work to integrate the positive capabilities of JDLM into

LOGFED while developing the fidelity and material management capabilities that JDLM did not possess.

JDLM had been in use in US Army Europe (USAREUR) since the early 1990s. The model was developed to support USAREUR's emerging role as a force projection platform supporting world wide operations. This focus necessitated a model that emphasized strategic deployment. As the model matured, additional consumption modeling for supply, maintenance, transportation, personnel and medical operations were established. JDLM is built on authoritative data sources which allow in depth modeling of unit level personnel, equipment, items and activities associated with military logistics. JDLM also has a raster map based display. This is the same map based display which was incorporated into the Logistics Common Operating Picture (LCOP) - used by ground forces during Operation Iraqi Freedom (OIF) and later incorporated into the Army's logistics C4I system – BCS3. The basic software baseline used in JDLM is essentially the same as that used in BCS3.

Integration Approach and Performance

Realizing that CSSTSS could not satisfy emerging simulation technologies capable of providing adequate training to the logistic warfighter, PEO STRI and LESD embarked on a phased effort to replace CSSTSS with new logistics federate technology. A development plan was adopted and a way-ahead identified.

The initial efforts at integration of JDLM into the LOGFED focused on a stepped approach of replacing CSSTSS functionality with JDLM capabilities one module at a time. The first step was to develop the capability to link JDLM with CSSTSS and allow JDLM to perform transportation modeling for CSSTSS. In May 2005 this capability was accepted into the LOGFED and yielded the first version of LOGFED/JDLM to have a map based transportation display. It also capitalized on important transportation functionality such as simulation of radio frequency (RF) tags, RF interrogators, and satellite transponders that JDLM had modeled previously.

This version of LOGFED/JDLM will make its appearance in the summer of 2005 supporting the Unified Endeavor / Urgent Victory V Corps, and Ulchi Focus Lens 8th Army exercises. The entity level version of LOGFED/JDLM has already been used successfully in recent 101st Airborne (Air

Assault) simulation training events and is planned for use this fall at the 10th Mountain Division as well.

While the approach to replacing CSSTSS and development of ACTF capabilities will shift during the development spirals scheduled over the next two years, it is clear that simulation performance is a key for successful use of LOGFED/JDLM. Much has been done to ensure "scalability" of the LOGFED/JDLM simulation required to support Corps and Theater level training events. Communication and client reconnection enhancements have been made within the LOGFED/JDLM model to allow it to operate in a distributed, large exercise environment. For next year's release, LOGFED/JDLM has also developed a web order interface which will allow training audience input using standard web browsers. This development will reduce the number of client connections required to the LOGFED/JDLM server. A reflecting gateway has also been developed to limit the number of clients making direct connections to the LOGFED/JDLM server.

Another key to successful logistics training is a large amount of correlated data, along with a transaction history to back up that data. LOGFED/JDLM uses a web server operating off of a client connection to allow the training audience to query logistics data. This system was developed to simulate standard logistics reports which are normally provided as written Logistics Statistics (LOGSTAT) and Logistics Status Reports (LOGSTAR). It has the added benefit of allowing the training audience access to tailored logistics reports identical to those dictated by their Field Standard Operating Procedures (FSOPs) used in the field.

LOGFED Versions and Capabilities

For primarily Army training audiences, LOGFED/JDLM is a federate of the ACTF. In the entity-resolution federation (ACTF-ERF), LOGFED/JDLM is linked primarily to the Joint Conflict and Tactical Simulation (JCATS) as the primary combat model. LOGFED/JDLM has developed the ability to provide high resolution logistics for fuel, ammo, maintenance, battle damage, medical and personnel information. Additionally in the ACTF-ERF configuration, LOGFED/JDLM provides logistics support through transfer points identified in JCATS. In this configuration, LOGFED/JDLM can also operate as a consumption model, providing logistics modeling for units which are solely in JDLM, predominately noncombatant units. This exercise design gives the logistician a

more realistic idea of the logistical requirement for the entire force. LOGFED/JDLM's participation in the multi-resolution federation (ACTF-MRF) is more complex. In LOGFED v 2, the LOGFED/JDLM transportation module is linked to CSSTSS to provide logistics. CSSTSS has been used extensively to provide high fidelity logistics to the largest division and higher level exercises. By adding the LOGFED/JDLM Transportation Module, LOGFED/JDLM is able to provide a more modern map based view along with simulation of ITV transponders and RF tags. By 2006, LOGFED/JDLM will take the place of the remaining CSSTSS modules in LOGFED/JDLM.

LOGFED/JDLM has already been used in a number of Joint Forces Command (JFCOM) sponsored exercises. LOGFED/JDLM standalone exercises have been successful in driving deployment exercises and publishing exercise data to the theater level logistics systems. As a federated model, it has been part of the Joint Live Virtual Constructive (JLVC) entity resolution federation, Joint Multi-Resolution Model (JMRM) multi resolution federation, and has been federated with a number of strategic transportation and supply systems as part of the Distribution Environment Support System (DESS). LOGFED/JDLM has also been used for individual training, providing culminating exercises support throughout the Army's logistics schools.

WHERE DO WE GO FROM HERE

As the demand for realistic, low overhead logistic training escalates, LOGFED/JDLM, both at the multi–resolution and entity level will help fill the training needs of the logistics warfighter. As technology and tactics, techniques, and procedures evolve, so must the Army's' Digital Training Strategy. As force multipliers are added to the battlefield it becomes the challenge of the combat and material developers to determine how best to fold these capabilities

LOGFED/JDLM is revolutionizing how the Army and Joint Staffs manage logistics both in theater and external to the theater. Logistician warfighters are much better prepared to meet their mission requirements prior to deployment than ever before. Additionally, training does not have to stop once deployed. LOGFED/JDLM's stand alone training capability allows BCS3 operators sustainment training opportunities, before and during, training and real word deployments. Capitalizing on these capabilities is imperative as the Army fulfills a major training requirement for the logistic warfighter. The

PEO STRI – LESD effort is delivering to our logistic warfighters relevant, state of the art, simulation training to meet today's global logistic challenges.

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