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Lieutenant General William B. Caldwell IV

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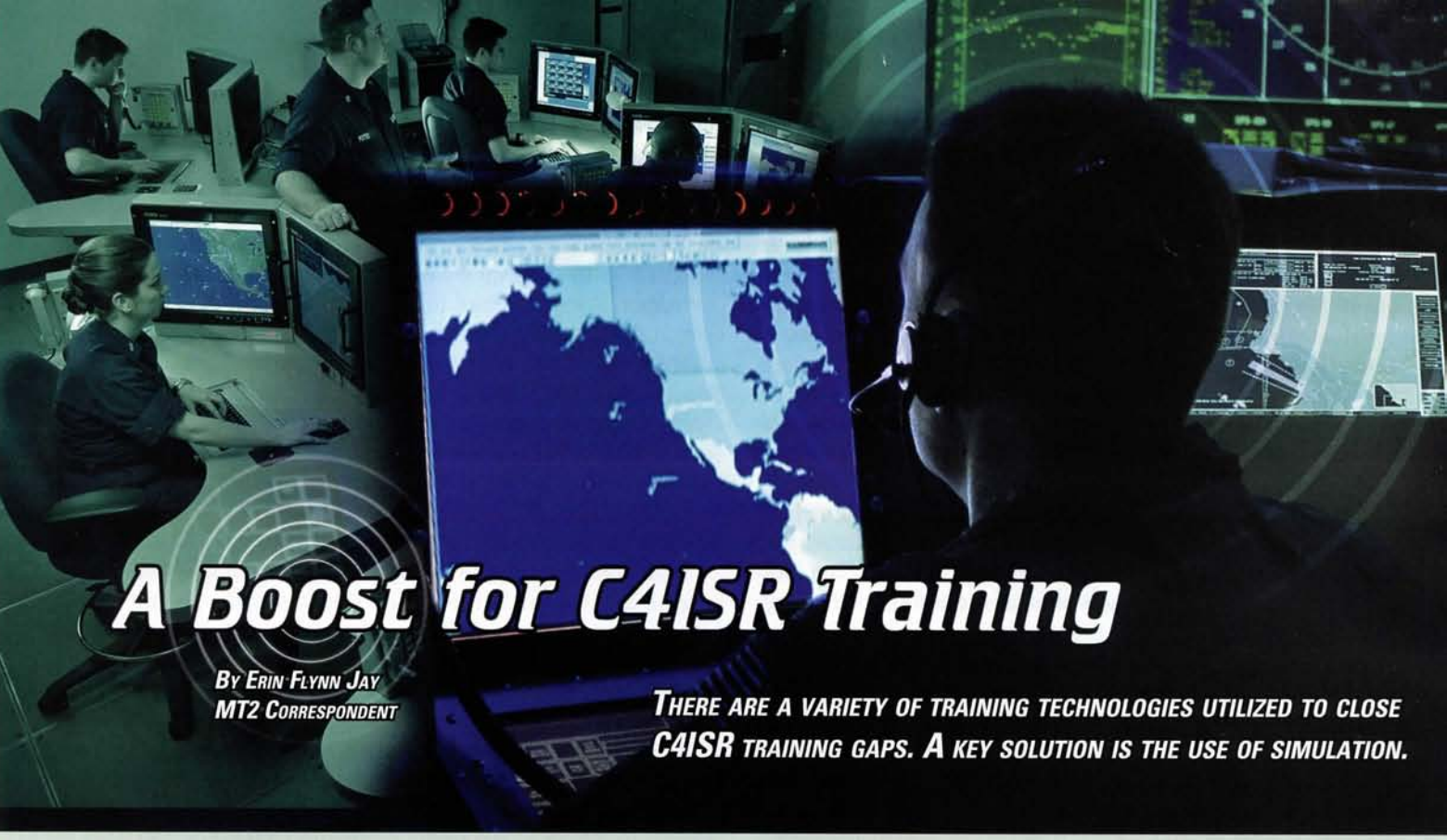

A Boost for C4ISR Training

By Erin Flynn Jay
MT2 Correspondent

There are a variety of training technologies utilized to close C4ISR training gaps. A key solution is the use of simulation.

The biggest gap in C4ISR training is an inability to fill all personnel billets in time for them to be fully trained before being deployed. This is particularly so in military occupational specialties (MOSs) that are of critical need.

Today's soldier, in order to fulfill his mission to fight the global war on terrorism, has to fully understand the C4ISR Equipment that is an essential part of his digital portfolio. "This need will continue to increase through time as the equipment that is issued becomes even more sophisticated," said Jay Herod, PEO C3T deputy operations officer for fielding and sustainment, and David E. Mock, support contractor for project manager command posts and PEO C3T.

C4ISR systems are a blend of hardware and software. Due to the spiral nature of software development, systems tend to become increasingly more sophisticated through time. This in turn creates a need for continuous incremental training for users, since more sophisticated software means more complexity and more nuances to address.

C4ISR training requirements are aligned to meet the needs of the fighting force. Each brigade size element is equipped, trained and sustained through the Army Force Generation Model, which calls for active component units to be equipped and trained, then enter into a "ready" pool, and then once deployed, to be reset. This has resulted in a burgeoning training requirement to not only ready the unit's soldiers to fight, but then to retrain them when the unit returns to CONUS to be reset.

In order to support this immense training effort, all the CONUS Planned and Structure Training techniques have to be at full readiness, said Herod and Mock. This ranges from a program manager's role to conduct new equipment training (NET), to ensuring that all the TRADOC resident schools and supporting organizations are all fully capable of conducting their mission. These two training approaches are only a small part of the entire fully integrated Army-wide training strategy that spans all training domains.

Largest Training Gap

The single biggest gap is one that technology cannot resolve. "Due to the heightened battle rhythm of having over 170,000 soldiers deployed to hostile areas of responsibility at any given time, there exists an inability to fully fill all personnel billets in time for them to be fully trained before being deployed," said Herod and Mock. "This is particularly noted in MOSs that are of critical need."

This results in the second gap area, wherein the Army is only funded to provide NET to units once. However, once the unit returns to CONUS and is assigned new soldiers, often a predominance of those new soldiers do not understand the equipment and truly deserve to receive NET. The textbook answer to fill that void is that units are to provide soldiers in NET that are capable of being trainers (train the trainers). They are then provided TRADOC-approved training packages, to be utilized by these unit SMEs to train incoming new recruits who have not had NET.

Other gaps that are worthy of discussion include the time necessary to train a new soldier on all of the C4ISR equipment that he can be expected to operate, said Herod and Mock. This is even more evident in the "battle captain" area, where first lieutenants and captains are expected to understand the information being fed to them through battle command applications, and then be able to make decisions based upon that information.

Technology Issues

Aside from institutional issues, the government/industry team is also eyeing technology capabilities to strengthen department C4ISR training.

Next-generation C4ISR systems are likely to be designed around net-centric systems and net-centric systems of systems. "These will coordinate the operation of potentially thousands of interconnected, heterogeneous and mobile platforms and devices, and rely on diverse types of traffic ranging from

sensor updates, sitreps [situation reports], voice, video and tactical communications," said Rajive Bagrodia, CEO and founder of Scalable Network Technologies. "Because wireless communications will be inherent in some—if not most—portions of the underlying network, these systems will be bandwidth constrained."

Existing training systems typically assume perfect communications (100 percent reliability of message connection and instantaneous communications) or—at best—they represent communications using simple, abstract models that represent the effects of communications using some random, stochastic distributions that are not dependably realistic.

However, the reality of these bandwidth-constrained communication systems (that are expected to scale up to thousands of heterogeneous communication devices) is anything but simple—especially in the presence of mobility, said Bagrodia. The C4ISR systems will rely on ad hoc communication networks to provide smart, tactical communications, yet are vulnerable to attack or overload from too many simultaneous transmitters.

Rajive Bagrodia

rbagrodia@scalable-networks.com

George Stone

gstone@alionscience.com

Wireless Network Vulnerabilities

Because current training systems were not designed to incorporate the unpredictable vulnerabilities of wireless networks, warfighters and commanders are not adequately exposed to the breakdowns that occur in real-world scenarios.

According to Bagrodia, some of these issues are:

- Fast deployment often doesn't allow all communications assets to be utilized in time.
- Batteries that power devices discharge/die; variable weather, mobility and terrain conditions hinder communications; critical relay sites can be destroyed/unavailable.
- Cell phones often drop calls and experience noise and/or no coverage, even in noncombat situations; these are relatively simple "1-hop wireless" transmissions as compared with the multi-hop, "on the move" communication systems typically used by the military.

Whereas training exercises using prototypes of next generation radios are an alternative, this approach becomes cost prohibitive on a large scale, and smaller scale in-the-field training events do not sufficiently stress the communication network to provide a realistic experience. "As a consequence, users of C4ISR—from commanders to warfighters—may not have a sufficiently detailed exposure on what to expect from net-centric C4ISR systems."

C4ISR users need to be trained on what will work and when—before the battle begins. "We need to develop the equivalent of flight simulators for our net-centric C4ISR systems," said Bagrodia.

Industry and DoD are using modeling and simulation (M&S) to validate C4 and network-related concepts, technologies and architectures. The technology industry trend of low-cost, powerful dual-core, quad-core and cluster computers are enabling emulation of large wireless networks in software.

New network emulation products like EXata go beyond traditional M&S to connect warfighters and commanders with a software virtual network (SVN), said Bagrodia. EXata SVNs behave like a real network, in real time, using actual applications enabling battalions and brigades of users to interact exactly as if they were connected through a real network. Communications in the SVN are realistically impacted by battery life, radio technology, terrain, speed and the applications' dynamic, scenario- and environment-dependent bandwidth utilization.

Immersive Training

George Stone, vice president and senior scientist at Alion Science and Technology, a technology solutions provider, said that frequently you have situations where those who are operating the different C4ISR systems want to be able to train and operate all of the systems as if they were in a real environment.

eC2 is designed to provide wireless, networked training using Apple iPhone and iPod Touch devices, and can interact with PC networks for classrooms and remote training, after action reviews and exercises. [Image courtesy of Alion Science and Technology]

Stone recently observed some of the training Alion sets up and operates for the Navy. "The synthetic training exercise drives the real-time command and control systems using Joint Semi Automated Forces (JSAF) simulation," Stone told *MT2*. "Working with Navy's training center and directors, Alion personnel have created an environment that makes believers out of admirals. One of the admirals wasn't a big believer in the system until he saw the immersiveness that the training audience experienced on the ship. The training audience from the commander on down were at their battle stations performing drills and exercises, being stimulated by the simulation."

The JSAF events Stone observed increased the intensity about four or five times more than what they would normally experience, other than a wartime situation, when they just go out to sea and train.

What frequently occurs on the C4ISR side is something that ignores the simulation interface and interoperability mechanisms. "The problem that you see is that people building the C4ISR systems don't always give the trainers enough time to understand the C4ISR systems and see how they can interface with them in order to add a new gadget or capability," Stone said. An example is integrating video with a C4ISR system so the commander can pull up a streaming video of the ground where units are interacting. "The video is not always linked with the simulation environment so you have a disconnect between the two until the simulation engineer can figure out how to make those link up together."

Web-Based Training

In December, Alion unveiled the electronic Collaboration Capabilities (eC^2) Web-based system at I/ITSEC. eC^2 will work in conjunction with the Apple iPhone and iPod touch—and other mobile hardware devices—to improve the capability and readiness of deployed troops.

Warfighters and managers will be able to download and customize information on the mobile devices and perform actions ranging from training and education to testing and experimentation.

eC^2 enhances tactical training and integrates with simulations and C4I systems at military and homeland security locations. The solution is designed to integrate with existing networked systems.

The system interactively disseminates training data before, during and after a training exercise and includes access to real-world terrain, simulations and C4I system controls. Before training starts, the system works to prepare warfighters for missions, tasks, conditions and standards—information gleaned from the training repository. During the exercise, eC^2 links to real-time remote visual displays of computer workstations and coordinates interactive command and control capabilities. When the exercise concludes, the tool helps the training commander analyze and report results, key events and performance data to the unit.

Additionally, eC^2 can be used as a teaching tool. Alion's new modeling and simulation framework courses deliver critical M&S instruction, enabling warfighters to continue education and training at work, home or during deployments.

The U.S. Army announced its contract award for the "Game After Ambush!" (GAA) contract in December. The Army selected VBS2 and related Calytrix software LVC Game and Calytrix' Combat Net Radio Simulator (CNR-Sim) as the replacement for DARWARS Ambush!, which has been widely used throughout the U.S. Army for game-technology training.

Game-Technology Training

The GAA contract provides enterprise licenses of VBS2, LVC Game, CNR-Sim and CNR-Log (Combat Net Radio Logger) throughout the U.S. Army including the Army Guard and Army Reserve. The GAA contract is primed by Laser Shot with subcontractors Bohemia Interactive (maker of VBS2) and Calytrix Technologies (maker of LVC Game and CNR-Sim).

Calytrix Technologies developed CNR-Sim based on demand and feedback from some of their existing customers, going back about two years. Damon Curry, international sales manager for Calytrix said that customers told his company four things:

1. They didn't always need all the features of existing and complex hardware-based radio simulator products.
2. Hardware-based radio simulators are expensive.
3. In almost all of their training and simulation exercises and lab environments, computers were generally in abundant supply, so they asked for a software-only radio simulator to run on their existing computers.
4. Since Linux is required for some often-used simulation programs like Semi-Automated Forces (SAF) programs (e.g. JSAF), customers often had plenty of spare capacity in Linux computers, and thus they wanted a software-only radio simulator that could run on both Linux and Windows.

Damon Curry

damon.curry@calytrix.com

Calytrix took customers' feedback and developed CNR-Sim, a pure software product for Windows or Linux that requires no specialized hardware—a simple PC headset will work. Because all radio simulation is done in software, CNR-Sim simulates an unlimited number of radio channels, Curry told *MT2*.

CNR-Sim uses the Distributed Interactive Simulation (DIS) networking protocol, a standard in military simulators and trainers. DIS-based CNR-Sim can also run simultaneously on High Level Architecture (HLA) networks.

Because there's no special hardware to buy, CNR-Sim is very easy to proliferate. "Calytrix also produces CNR-Log for recording and playback of radio communications," Curry said. "A typical installation has many CNR-Sim users talking on many different radio channels and one CNR-Log program recording all those communications for follow-on after action review and analysis."

C4ISR users need to be trained on what will work and when–before the battle begins. [Image courtesy of U.S. Army, C. Todd Lopez]

CNR-Sim was first used by the Australian Defence Forces and New Zealand Defence Forces on training exercises there and later used by others around the world. CNR-Sim and CNR-Log are components of the Virtual Battlespace 2 (VBS2) systems for the U.S. Marine Corps and the U.S. Army and similar VBS2 installations all over the world.

DiSTI Corp., a human-machine interface software developer and creator of GL Studio, announced in December a graphical radio interface for Calytrix' CNR-Sim. Free CNR-Sim is a two-channel version of CNR-Sim that Calytrix provides to users for free. DiSTI's new interactive graphical radio is a free add-on for use with Free CNR-Sim and an example of what can be done with GL Studio.

DiSTI created the new radio panel with GL Studio, their suite of interface design tools, to serve as the interactive controls for CNR-Sim's new application programmer's interface. The result demonstrates how customers could combine GL Studio content and CNR-Sim to simulate other specific radios. "Users will enjoy graphical control of their simulated radio communications," said Curry. ★

For more information, contact *MT2* Editor Marty Kauchak at martyk@kmimediagroup.com or search our online archives for related stories at www.mt2-kmi.com.