



Eric Schultz

**Jeff Edney, director of engineering, Jim Cocke, senior vice president, defense and aerospace systems, Donald Marinello, senior program manager, defense and aerospace systems, and Jim Satterfield, vice president, product development and engineering, stand in a lab at Sanmina-SCI.**

# Combat clarity

## TOCNET delivers seamless communication

By Kimberly Ballard

Lying in the shadows of the front line on any battlefield where U.S. troops are in harm's way is a unit of men and women responsible for communicating accurately and efficiently with soldiers at the forefront of combat. From the sweltering deserts of Iraq or Afghanistan to the frigid winters of Bosnia, fearless teams of communications specialists are operating cutting-edge communications equipment known as the Tactical Operations Center Network (TOCNET) that has been conceived, designed, built, tested, delivered and maintained in Huntsville.

"The battlefield is an ever-changing environment," says Jim Satterfield, vice president of Product Development and Engineering for the Defense and Aerospace Systems (DAS) division of Sanmina-SCI, an electronics and technology contract manufacturer located in Huntsville. "These young soldiers have grown

up with digital communications. From cell phones to iPods, they represent a group of hands-on experts in the field who share with us what they need and how we can improve existing technologies." This unconventional and ever-changing test-market provides Sanmina-SCI with the challenge of continually improving military intercommunications systems (ICS), while constantly developing not-yet-conceived applications and components that will keep U.S. troops safer and more effective in battle.

Sanmina-SCI has developed and marketed four ICS technologies that have changed the way the U.S. military handles communications in time of war. These technologies all have potential for commercial use as well. TOCNET Classic, TOCNET V (VIS-NET) for moving vehicles, FireComm ICS, and Integrated Secure Wireless Inter Communications System (ISWICS), all use enhanced digital technology to seamlessly mix different sources

of audio (called muxing) like telephone, radio, satellite communications (SAT-COM), cell phones, Internet, and the family of Voice over Internet Protocol (VoIP) transmissions such as Internet faxing and voice messaging.

### SEAMLESS COMMUNICATION

The Tactical Operations Center functions as a multitasking entity. The ability to communicate seamlessly across multiple communications platforms and to trans-

verse ground, sea, and air support in the theatre of war is imperative to military strategy. During the Persian Gulf War, and again after 9/11, technology companies were urged by both the military and stateside first responder networks to ramp up efforts to improve ICS capabilities. "TOCNET was a three-year process from concept to market," Satterfield says.

Following a six-month evaluation by the U.S. Army in which TOCNET was one of six digital ICS systems tested, TOCNET scored the highest in both ground and air-

borne Key Performance Parameters (KPP) and in 2003, was selected as the US Army's Standard Command Post Communication System. In 2005-2006, the U.S. Marines used it successfully, and by 2007, the Army had contracted for over 40,000 box units. Today, TOCNET is standard fare with the Army and all divisions of the U.S. military.

According to Don Marinello, director of tactical products (DAS division) for Sanmina-SCI, the company takes a proactive stance in maintaining the software component of their robust hardware. "TOCNET's 'Ugly Green Boxes' undergo strenuous testing and certifications to prove their war-readiness. Because communication technology is an evolving science, we do not charge to maintain and upgrade the software over the lifetime of the box."

TOCNET consists of a switch/multiplexer unit (available with either 8 or 16 radio interfaces) called an Enhanced Micro-Switching Control Unit (eMCSU). This eMCSU acts like a brain hub for operator station options like the standard or enhanced programmable Crew Access Unit (eCAU); a TRIM CAU containing preset programming; and either a Soft CAU (laptop software); or desktop eCAU. "TOCNET is 'network-centric' and radio agnostic," Marinello explains. "It supports seamless integration with many radio technologies, in addition to the many digital and VoIP inputs." In Iraq, the U.S. Army was able to mux 700 stations on one channel. The military can network up to 64 MCSUs with 1,064 simultaneous communication channels.

A Tactical Operations Center using an eMCSU can employ for instance, a Soft CAU to mux a Rear Command Center with a Mobile Command Center using a TRIM CAU, while the Forward Command Center uses a desktop CAU to mux the Airborne Command Center. From one central command post, communication specialists coordinate multifaceted exchanges across a complex infrastructure, using everything from a cell phone or radio to an Internet connection.

"The TOCNET V product known as VIS-NET, provides a modular expandable approach to voice and data communications for vehicular command and control personnel," says Marinello. "It uses the MCSU-V (for vehicle) with vehicular versions of the TOCNET CAUs, as well as a waterproof Radio Interface Unit (RIU) and MCSU-VX-TRIM-Remote (MVTR) man-portable TOCNET-in-a-transit-case that enables the user to remotely control



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tactical radios over a great distance.”

“We call TOCNET V, the son of TOCNET Classic. We are the new kids on the block with the next generation of communications for mobile/vehicular applications,” Satterfield explains. “With VIS-NET, the equipment is mounted in wheeled or tracked vehicles like tanks, armored fighting vehicles (AFVs) and tactical trucks, as well as airplanes and helicopters.”

Just as TOCNET went through rigorous testing and certifications, VIS-NET went through Mine Resistant Ambush Protection (MRAP) testing. Vehicles mounted with TOCNET V equipment showed higher survivability. “In these tests, there was no internal injury to the VIS-NET equipment,” Marinello says. “The vehicle itself was in bad shape and the ugly green box was a little banged up, but it was in perfect working order. That is the kind of durability these guys need in the combat zone.” VIS-NET is certified to withstand temperature extremes of -40 degrees F to 185 degrees F; 100 percent relative humidity; sand and dust storms; wind and rain; immersion in water for up to two hours; lightning strikes; and a number of extreme ground vibration, ballistic, pyrotechnic and transit shocks.

## FIRECOMM

Designed for military aircraft, Sanmina-SCI's FireComm ICS product line is an enhanced digital intercommunications system designed to improve interactions onboard airplanes and helicopters. Made up of six components, the ICS comes with a Communications Control Panel (CCP) or Control Panel Plus (CCPP); a Communications Control Display Panel (CCDP); two configurations of a Communications Interface Unit Lite (CIU) or a full version CIU; a Secure Wireless Transceiver (SWT), and Secure Wireless Base Station (SWBS). It also has a Public Address Amplifier (PAA). FireComm will compete to replace current outdated wired systems onboard most military aircraft. “Right now, if a plane is carrying a crew of paratroopers, there is limited communication between the pilot, the copilot, and the crew,” Satterfield explains. “The crew is often hindered by the cords from headsets that get entangled in cargo and limit maneuverability. What's worse, an airplane is loud and many aircraft still use a loudspeaker system to communicate with the crew in the back of the plane.”

The FireComm ICS products are nearing completion and have already been

well tested and certified for flight. This complex and integrated intercom system will enhance connectivity by utilizing Sanmina-SCI's proprietary enhanced secure wireless technology.

Finally, Sanmina-SCI's Integrated Secure Wireless Intercommunications System (ISWICS) uses a unique waveform developed by 250 design engineers working in Huntsville to broaden the limitations of existing wireless technology. “As far as I know, absolutely no one else has this extended wireless capability,” Marinello says. “ISWICS extends the wireless communications link up to 3,200 feet and provides superior audio quality.” In addition, it provides multiple layers of encrypted security, robust functionality that allows for access to all tactical radios and multipath resistance. The entire unit is tamper-proof, has text/picture graphics display, video, 3-D audio, wireless headsets, voice recognition, text messaging, Soft MCSU, a USB interface and keyboard interface for eCAU.

ISWICS' Secure Wireless Transceiver and Base Station play a large role in the FireComm ICS product line due to its enhanced wireless capabilities. Both use

AES-256 encryption and a low-power transmitter, with a minimum of 300 feet of wireless communication within a range by using omni-directional antennas. Capable of functioning at temperatures ranging from -40 degrees F to 140 degrees F, the technology is due to hit the market in 2010.

Nearing completion is a fifth Sanmina-SCI product called the Human Portable Radiological Detection System. Used less in the combat zone, but actively employed for port security and cargo control, it utilizes higher than previously marketed levels of radioactive sensitivity to detect atomic or radioactive matter brought into or exported out of American-controlled ports. Detection is accomplished by waving it in a wand-like manner over any container. It has attracted the interest of the Dept. of Homeland Security as it studies the next generation in port security.

“We are in continuous development and improvement mode,” Marinello says. “While TOCNET and TOCNET V are well-established with our military forces as effective tools in the war arena, our ISWICS and FireComm ICS is the future of Sanmina-SCI's TOCNET family.” ■

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