

Enhancing Squad Communications

Converged voice and radio communications with Radio over IP (RoIP)

Shaun Fischer and Charlie Kawasaki

Today, multiple echelons - platoon, company, battalion, brigade, and division – are all trying to communicate with each other using different mechanisms, whether via line of sight (LOS) radios or beyond line of sight (BLOS) satellite communications (SATCOM).

All these echelons need to maintain communications within their own units and within their command structure, to support intel, operations, call for fire, logistics and other communications requirements. The challenge is how to most effectively connect the warfighter at the tip of the spear at the squad level, up through the echelons, and even to the enterprise network.

Imagine a dismounted squad with an injured soldier. The squadron is carrying their tactical radios, which may be using the soldier radio waveform, and they need to communicate with a Medivac en route to retrieve the injured soldier. Because the airborne platforms primarily use SINCGARS and the squad may be communicating over SRW, they cannot directly talk with each other. There is a clear need for a standardising method or protocol to connect networks of different types and different types of radios and waveforms. The solution is to use Radio over IP (RoIP) to convert the radio's audio signal from analogue to digital, into a format that is similar or compatible with VoIP. Using RoIP, a cross band can be created through the company commander's vehicle, between the SRW and SINCGARS networks, enabling the squadron to relay information about the injured soldier directly to the Medivac before it lands. There is an ever growing need to connect every soldier, every platform, and autonomous and robotic systems to the network, to pass situational awareness information, to maintain commu-



Photos: PacStar

The PacStar Modular Radio Center (MRC) integrates SCI's TOCNET-G4 UVMS to bridge modern and legacy radio networks with industry-standard IP networks.



PacStar 463 integrates the TOCNET engine to provide a scalable solution that brings different types of communications networks into a single user interface and allows all these different platforms to communicate.

nications. In today's multi-domain operations and battle environment, the problem of network interoperability and voice convergence is growing exponentially. The Army needs to be able to communicate not just with the Navy, Air Force and Marines, but with coalition partners as well. What's more, the battlefield lacks the familiar infrastructure of cellular networks and dedicated

Ethernet and IP networks. Instead, the warfighter must take those networks with them into the battlefield.

Tactical communications today is still primarily based on radios. There are a great variety of radios out in the field, both legacy and modern, and these radios have varying levels of capabilities. Some are analogue and some are digital. They use a growing number of disparate waveforms, and they all have different types of interfaces and connectors. But the challenge isn't just how to communicate from LOS device to LOS device. To achieve the goal of unified communications, LOS networks must be able to communicate with BLOS networks. Communications have to reach over the hill, or across great geographical distances.

RoIP enables the remote access of radio networks, from various devices such as laptops and smart phones, or even VoIP phones, and helps to enhance interoperability by bridging or cross banding different radio waveforms and networks. It also enables connectivity via conferences or talk groups to extend reach and participation across the different networks.

Authors

Shaun Fischer is Director of Portfolio Management at SCI Technology and **Charlie Kawasaki** is CTO at PacStar, a Curtiss-Wright Defense Solutions subsidiary.

Relaying and Cross Banding

With RoIP, after the radio audio is digitised, multiple digital signals can be connected together, with other radio signals, or with other types of communications assets. Relaying can be used to connect multiple radios of a similar type or waveform into a single communication channel. Cross banding, which is similar to relaying, instead links multiple radios of different types or waveforms together that would not otherwise normally be able to communicate with each other. RoIP supports relaying and cross banding, making it possible to extend the range of tactical radio communications, either by relaying the same signal using a repeater, or by extending network interoperability, so an LOS radio, for example, can be bridged onto a SATCOM network for greater reach.

RoIP is not necessarily required for bridging radio communications. Two local radios could be connected and digitally bridged through an intercom system, for example. But RoIP enables radio communications to be relayed and cross banded across an IP network, making it the best solution for extending the range of communications over a satellite link or over a



TOCNET Soft CAU provides "single pane of glass" user interface for voice convergence.

multiple satellite hops. RoIP and unified communications enable voice convergence, integrating different types of networks, both similar and disparate, including radio, VoIP, SATCOM, and even telephony, into a single network that simplifies connectivity and supports multiple types of user interfaces, making all accessible through a single user interface.

That means that a soldier in the middle of combat can focus on the mission rather than having to figure out how to communicate across different types of communications channels. Even better, RoIP enables voice conferences to be established so that participants at all different locations can gain the same situational awareness at the same time.



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The PacStar 463 RoIP engine. TOCNET-G4 is standard UVMS for USSOCOM GMV 1.1

Example of a Deployable RoIP Solution

Solutions exist today that provide full unified communications capability at the tactical level, while eliminating the integration, setup and management complexity, and licensing costs associated with Enterprise type RoIP hardware components. An example of a more capable unified communications solution for voice and data networks is provided by the Curtiss-Wright PacStar 463 RoIP/Voice Convergence Engine, deployed in a PacStar Modular Radio Center, that integrate SCI's TOCNET-Generation Four (G4) Unified Voice Management System (UVMS) to bridge modern and legacy radio networks with industry standard IP networks.

Typical radio gateways provide analogue to digital conversion of radio audio to a basic IP audio format accessible, through an Ethernet interface, by external voice clients such as Motorola's WAVE 5000. These gateways are often limited to this purpose by design. PacStar 463 goes beyond the capabilities of a typical radio gateway. It integrates the TOCNET engine to provide a scalable solution that brings different types of communications networks into a single user interface

PacStar 414 Radio Sleds adapt a wide variety of tactical ILMR radios.



appropriate for use by expeditionary command posts, tactical or combat vehicles, and dismounted soldiers, and then allows all these different platforms to communicate. TOCNET UVMS enables the module to operate independently from external voice clients and external VoIP call managers like Cisco Unified Communications Manager (CallManager). It supports remote radio control, and enables relaying, cross banding, and VoIP capabilities, while providing complete interoperability with 3rd party solutions, including Cisco UCM and WAVE 5000. It can also provide redundancy when needed for operation without such systems.

What's more, any PacStar 463 RoIP Module can be linked with any other PacStar 463 RoIP Module or any other TOCNET enabled platform, to form a broad, feature rich network communications experience. At the tactical level, PacStar 463 provides all the same capability available from enterprise class solutions, such as Cisco Call-Manager and Motorola WAVE 5000, while eliminating the additional integration complexity, computing resources, and configu-

ration/setup, etc., otherwise required. The result is significantly reduced size, weight and power (SWaP), simplified logistics, and lower costs since there is no need to license Enterprise capabilities.

Providing built-in remote radio control, true VoIP calling, and conferencing from a single software application, the module reduces system complexity and increases usability with a single pane of glass approach. It provides four radio channel interfaces for audio and remote control, 2 GbE interfaces for VoIP, network interoperability, and connectivity, and a serial maintenance port. Its mission recorder can simultaneously record up to 48 audio streams from multiple RoIP modules for post action reports and training.

When combined, RoIP, radio relaying, and cross-banding deliver flexibility to military PACE (Primary, Alternate, Contingency, and Emergency) planning, helping to mitigate the challenges associated with DIL (Distributed, Intermittent, and Limited) networks. That means, in any given situation there will be multiple ways to communicate. If a radio is jammed or fails, the squad can still communicate with their intended destination or command structure. Moving into urban combat, with lots of obstructions and interference, the warfighter must rely on multiple different paths to communicate with their team. RoIP delivers the critical flexibility and utility needed by the next generation, integrated tactical network. These additional capabilities will provide significant value to the warfighter, and when extended to coalition partners, increased compatibility and the ability to interoperate will multiply mission effectiveness. ■

Photo: PacStar



PacStar's tactical comms solution enables warfighters to securely transmit sensitive data using Wi-Fi and LTE-enabled devices.