



ONE PLATFORM, ONE ARMY

SOFTWARE-DEFINED RADIO ENABLES SOLDIERS ON THE GROUND TO BE MORE GEOSPATIALLY AWARE BY UNIFYING SEPARATE SYSTEMS, SAYS STEPHANIE CHIAO

In modern warfare, access to real-time reliable data over secure data links is paramount to the success of a military operation. Soldiers on the ground and command-and-control need to be geospatially aware by having an uninterrupted instant voice and data communication to successfully engage in conflicts.

On the battlefield, it all comes down to access to good data (geospatial awareness), reliable and secure communication, and coordination. It's imperative for soldiers to have knowledge about the terrain and the objects such as buildings that are located within it. This information can in turn help combatants navigate and make better predictions as to where the enemy might confront them.

The solution is a single platform to replace the current set-up of multiple radio devices. After all, the soldier on the ground has to be highly mobile, so having light and small devices will go a long way towards improving speed and flexibility.

Geospatial devices were essentially developed to build geospatial databases with information pertaining to the area as well as the shape and size of the objects within it. This data can be accessed to develop operational maps and manage vital enterprise content. By incorporating software defined radio (SDR) technology, a soldier can use the device across several platforms efficiently and reliably, ensuring uninterrupted, secure communication and geospatial intelligence.

SDR in the military

SDR entered the defence market because it eliminated the need to have hardwired mechanisms to perform functions such as encoding/decoding, as well as modulation/demodulation. SDR is growing in popularity as it provides much more flexibility: the software can be changed or reprogrammed without making any physical modifications to the hardware. Depending on the change, this might require a new application to be launched, similar to opening a new program on a computer, or could be automatically programmed into the firmware as an alert or trigger by a digital engineer.

The software that's introduced into an SDR is intended to be adaptable while enabling complete (re)configuration of the functions – both protocols and physical layer formats – of the radio. All these functions can be reprogrammed without modifying the physical hardware. This essentially makes it easier to perform tasks such as changes in frequencies, migration, and modulation schemes.

The military depends on adaptability, clarity, interoperability, precision and speed. SDRs have had a major impact as they provide not only standard two-way communication, but also secure wireless nodes that incorporate an encryption layer with very low latency, point-to-point links. They also engage with a number of different devices concurrently while acting as a communications repeater.



Using a paper map is not as effective as sharing GPS coordinates

The military is actively engaged in various surveillance operations. This surveillance of communication can be done on several different frequencies like HF, VHF, and UHF using the available toolsets. These toolsets depend on the type of SDR and can be as easy as a web interface or as complicated as developing a new software program. Now you can also operate on several different protocols, such as GSM, CDMA, LTE, WiFi and Bluetooth. This creates a flexible device and system for military personnel as they can tune into one of the preferred frequencies and support more than one protocol. They can also monitor a large portion of the spectrum while supporting multiple protocols.

Cognitive radios

SDRs are now evolving into cognitive radios, through the development of automatic actions based on sensory information, with distributed architecture that enables multi-intelligence fusion. As a result, it provides a network-centric operations solution for devices with mobile platforms, web browsers and communicators. This technology can be used to process information, share data, model and analyse information, and visualise geospatial and metadata across defence networks. In other words, with a massive amount of imagery and data

coming through, a robust network and device is essential to efficiently handle the influx of data.

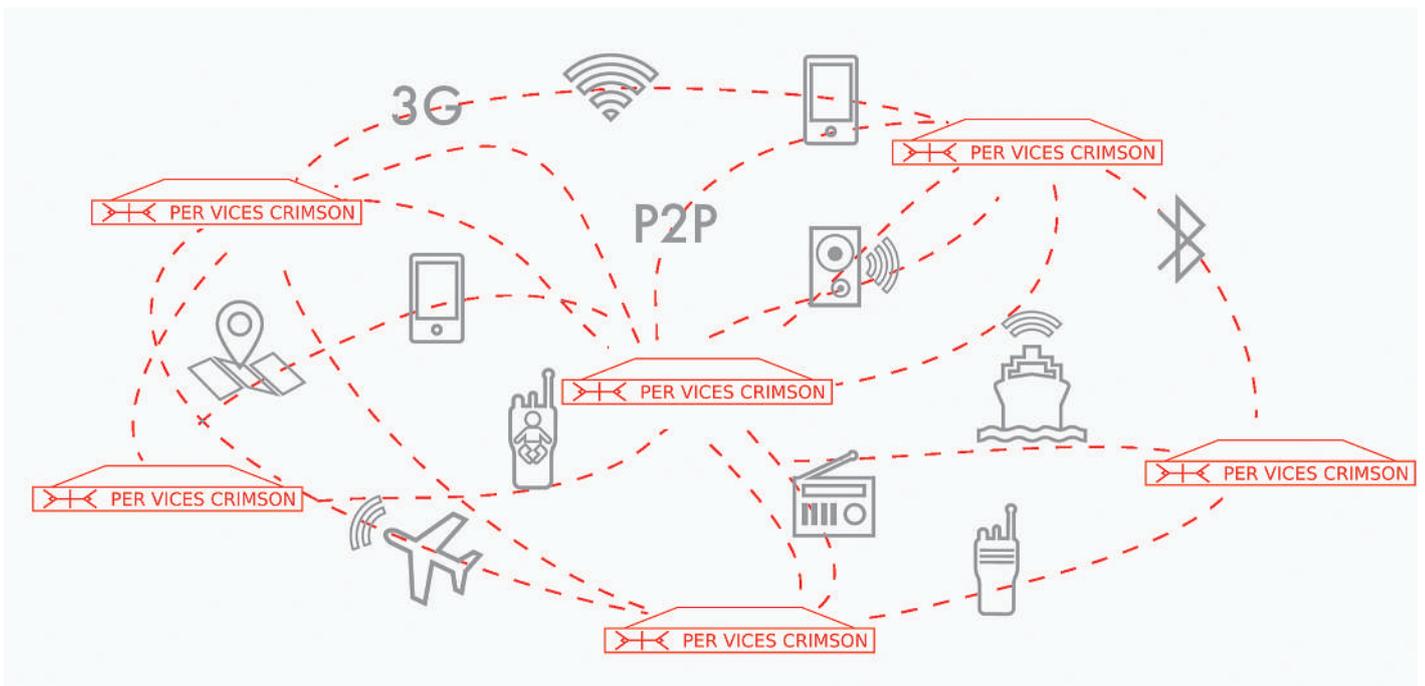
SDR from a geospatial perspective can be used to gather intelligence, perform terrain and defence-related analyses, and operational planning by accessing the geospatial database on the network. By accessing the imagery, soldiers can have an accurate idea of the terrain and enemy bases. Further, coordinated attacks can be conducted successfully with efficient communication and transfer of vital data. Devices such as Per Vices' Crimson SDR, come with SFP+ connectors and high-speed interfaces built in to achieve maximum throughput of data. Further, these radio and tactical intelligence products come with the option of customisation which in turn broadens the scope of what can be accomplished with one device.

Geospatial intelligence

With fast and adaptable access to military networks, geospatial intelligence is now possible. By accessing geospatial data, military operations can easily integrate different defence components easily. With data on which radios and nodes function, SDRs today can be used



Use SDR to easily adapt to collecting all types of data, including data from UAVs (© US Air Force/Lt Col Leslie Pratt)



SDR connects everything wireless by providing a communication platform where the receiver and transmitter functionality is changed/modified by software alone. This enables changes to the functions without making any physical changes to the hardware. By changing the software, the user can communicate on different frequencies and allow other devices to communicate on different frequencies



Per Vices' Crimson SDR

by applications to display 3D and 2D plots of the spectrum as detected by the radio in real-time, through custom application development.

By completely integrating geospatial capabilities and imagery, the soldier on the ground can depend on crucial intelligence and support. Before technology made this possible, various components of the defence apparatus were separate entities and this made it difficult to perform tasks such as mapping or collecting imagery intelligence. In modern warfare, there are usually several organisations involved, and reliable and secure communication is what enables all these different entities to work efficiently together. Battalions that effectively manage geospatial data and the fusion of geospatial and intelligence data can easily perform sophisticated visualisations and analyses in real-time with the appropriate software. As a result, soldiers can be prepared and make better decisions much faster, while engaged with the enemy.

Device installations and environment

The defence industry is made up not only of soldiers on the battle front but also hundreds of departments and thousands of military personnel. As a result, SDR and geospatial technologies can be used to make tasks, such as resource planning, utility management and logistics, much easier through a flexible platform that receives information on multiple frequencies and displays the received data.

Before the emergence of SDR, it was difficult to work across different disciplines as it required significant coordination between departments, installations and workers. Now it can also be used to manage the environment and the defence infrastructure by efficiently sharing information independently of the frequency of operation.

Precision engagement

Modern soldiers have the capability to be spatially aware, with access to reliable data. They will have a good understanding of the relationship between themselves, the enemy, and the terrain. This enables them to make vital decisions in a timely manner. They can also better understand their situation and communicate it effectively to other

HOW IT WORKS

SDR technology consists of two parts: hardware and software. The hardware is simple – users just need to ensure they purchase SDRs that meet their specification, such as the frequency space of interest. The software/firmware level is where the actual application sits and there are a number of methods available for development. Some SDRs interface with common toolsets, such as GNURadio, while others use proprietary software. Manufacturers such as Per Vices offer custom firmware and software development, creating full solutions for customers for various applications. So it's imperative to be clear about what exactly you would want to do with the device before making any purchases.

Nowadays, there is a significant amount of surveillance data gathered by UAVs that needs to be analysed. SDR enables combatants to receive this data securely and quickly through an application that configures the equipment to receive the wireless signal the UAVs transmit. This enables the military to get a better understanding of what's on the ground to focus its assets. Military personnel can also use this technology to manage weapons systems, coordinate operations, and manage high data rates to successfully command and control a military operation.

SDR plays an important role in this field as it's an interoperable and reliable communications technology. However, historically, there have been issues related to the size, weight, and power reductions (SwaP). Furthermore, a soldier would have to sort through a complicated web of radio frequencies (RF) to deliver the correct information to the right destination. In the past, the military also used several devices that were incompatible and unable to handle the functions required for new technology like UAVs. There was also a need for video imaging and the ability to engage in electronic warfare.

personnel. By using an SDR device to maintain signals with sensors, they can receive a better operational and tactical picture in real-time.

SDR technology is now small, light and highly mobile, and plays an important role in performing precision airstrikes by communicating precise information. By communicating the data to an engaged system, soldiers can have the desired effect while in battle. By effectively communicating precise information, armies can also reduce collateral damage. As a result, SDR will be at the core of all future military operations.

BY USING AN SDR DEVICE TO MAINTAIN SIGNALS WITH SENSORS, SOLDIERS CAN RECEIVE A BETTER OPERATIONAL AND TACTICAL PICTURE IN REAL-TIME

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