Software defined radio adds a new dimension to military communication

Personal role radios (PRR) have long been utilized by the military to enable highly-effective battlefield communications. With even basic communications capabilities, soldiers in the battlefield have a significantly larger chance of mission success. These capabilities have been significantly improved in recent years with the advent of software defined radios (SDRs), which enable an unprecedented level of connectivity. Stephanie Chiao, Product Marketing Manager at Per Vices, describes the evolution of battlefield radio technology, and the advantages provided by today's options.

Seamless military communication is vital to modern warfare for units to engage in combat effectively. As a result, it is required to be dependable, adaptable, fast, and interoperable. The ability to accurately receive and quickly react to a piece of information is crucial on the battlefield as it can make the difference between success and failure.

Over the years, the military industrial complex has also evolved significantly, and so have the communication devices that are available to them. Basic voice solutions are no longer sufficient as data sharing is imperative. As a result, the soldier on the battlefield will need to access a variety of frequencies and implement multiple protocols while not adding weight to the pack.

Although there are many communication devices available to the military, not all meet their requirements. Here, we will be discussing the two available options, personal role radios (PRRs) and software defined radios (SDRs).

Personal role radio (PRR)

PRR is a short-range radio that operates independently of any infrastructure. These radios currently operate on HF/UHF bands and 2.4GHz, which can provide effective short range communications solutions. Furthermore, when the bandwidth has been utilized adequately, interference issues are negligible.

Popular with the Ministry of Defense, PRR provides British infantry units with headsets attached to short range transmitters and receivers. This enables infantry sections to stay in communication, but only when they're in the line of sight.

It can also be used for urban warfare as the intensity is strong enough for effective short range communication, but it does fall short in the area of security. These devices are not securely encrypted and offer limited availability for implementing new security measures and communication protocols. Furthermore, most PRR devices only offer selective one-to-one peer-to-peer and duplex conference operating modes.

These devices rely on one radio within the group, or a network-concentrated unit that enables communication with all systems by playing the role of a synchronization unit. However, some systems are built to function without synchronization, which enables true independent communications.

Most PRR systems in the past were limited to voice-only communication, however, the systems have continued to evolve, and now some PRRs can handle both voice and data communications. However, this ability is usually limited by the bandwidth of the radios.

Personal Role Radio (PRR) is a small UHF transmitter-receiver issued to the British Armed Forces that allows for direct tactical soldier-to-soldier communication. Credit: Cpl Paul Morrison/ MOD

Software defined radio (SDR)

SDR can be defined as a communication apparatus where the transmitter and receiver functionality can be modified or changed by software, without making any physical changes to the hardware. This is a huge departure from other hardware-based radios like the PRRs that are used by the military.

These systems are possible through the development of flexible, wide-band tuners and filters in conjunction with programmable digital chipsets, such as field programmable gate arrays (FPGAs) and software.

Furthermore, the structure allows a single hardware platform to be used to tune into many frequencies utilizing only software applications instead of the traditional approach of modifying the hardware.

Various architectures can be achieved for different SDRs and this will directly impact the performance and cost of the systems. For example, higher end SDRs will have multiple independent radio chains, high bandwidth, wide operating frequency, and better RF characteristics (such as noise figure, dynamic range, etc.). Lower end SDRs also have their place for low bandwidth hobbyist applications, but it is not recommended

modern warfare where reconnaissance, signal intelligence, and electronic warfare can make the difference between life and death.

SDRs such as Per Vices' Crimson TNG can be specially customized to meet specific user needs including but not limited to size, weight, power consumption, and UI. As a result, the soldier on the ground doesn't have to be limited by hardware when it comes to their ability to communicate on a much larger scale. **GMC**

for use in the military or any critical communications infrastructures.

Military communication requires high performance, ability to communicate across various frequency bands, detect unknown wireless signals to relay to command and control, and of course, the ability to communicate using various protocols (WiFi, 4G LTE, Bluetooth, proprietary protocol, etc.). Higher end SDRs that allow easy configuration depending on the situation fulfill these requirements, which in turn reduces the amount of equipment required.

SDRs are applicable to much more than just communication, and offer the flexibility to combine signals intelligence, communication, and electronic warfare all in one platform. This provides a clear advantage over the PRRs from a performance and utility standpoint.

SDR also offers the capability of employing new technologies as they become available through software and firmware updates. SDR is upgradable through software/firmware changes, so users of SDR are able to use present day SDRs with future protocols and standards without the need for changing equipment, resulting in overall cost savings in both hardware and in training.

Providing additional functionality

Incorporating SDR into the role of PRR enables military personnel to access additional functionality that is not available in traditional PRR. This is because SDR allows users to not only communicate across a wider frequency band with the ability to employ ever-changing encryption methodologies, it also allows users to increase their situational awareness and EW capabilities from a single platform. This is vital to engage in

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