

## Military Electronics: Improvements in Network Technology

Question: What types of improvements need to be made in network technology/architecture that can provide improved performance and capabilities in military applications?



By: Mukesh Kumar,  
Multicore DSP Marketing Manager, Texas  
Instruments

With the Department of Defense taking a more net-centric approach to communications, the focus is on the implementation of the Global Information Grid (GIG) project. Before the idea of GIG came along, the military used various technologies, such as fiber or copper-based terrestrial networks and Satcom, to communicate with each other depending on their needs. With the implementation of GIG, the military will have one architectural framework that will enable all networks, from NIPRNET to SIPRNET to even various tactical battlefield networks like WIN-T, to connect with each other for an effective communication system.

In order to successfully implement GIG, military networks need greater capacity, security and flexibility. For example, in a network like WIN-T,



By: John Thompson  
Motorola Solutions

The biggest future opportunity for broadband defense is the desire to deploy private 4G networks. Commercial wireless broadband technologies, such as WiMAX and LTE, have far exceeded the performance targets of government-developed technologies designed to bring broadband to the warfighter. Security concerns with these technologies have also matured, providing sufficient levels of encryption, access/authentication controls and managed platform security.

One of the top challenges faced by military defense agencies centers on the decision of whether or not to deploy a fixed or an ad-hoc network. Commercial technologies are primarily designed with the assumption of fixed infrastructure topologies, while military environments and scenarios require rapidly deployable and mobile ad-hoc network topologies. These capabilities may be implemented on commercial platforms but there is little incentive for commercial markets to deploy such capabilities.

the following needs to happen in order to successfully meet the three GIG requirements (mentioned above):

- Implementation of Software Defined Radio (SDR)/Joint Tactical Radio System (JTRS) which supports multimode waveform platforms;
- Improving spectral efficiency of the waveforms through new technologies within SDR, such as adaptive coding and modulation, MIMO processing or smart antennas in battlefield radios;
- Use of IPv6 as the common transport layer protocol and intelligent routing protocols;
- Deployment of Mobile Adhoc Networks (MANET) to create self configuring networks to create Network On The Move (NOTM);
- Development of hardware and software platforms that can be used for multiple purposes while meeting the SWaP (Size, Weight and Power) considerations.

Today, semiconductor companies are helping GIG become a reality for the military by developing multicore digital signal processors (DSPs) that power SDR, new physical layer communication algorithms, novel networking protocols and supporting hardware.

Secondly, military customers must also choose the frequency band in which to operate by choosing to operate in a dedicated license or opting for frequency agility offered by unlicensed solutions. Frequency band selection poses a challenge to defense and military agencies when deploying commercial technology, especially for broadband access networks. Commercial markets have defined spectrum developed through various industry forums, such as 3GPP, WiMAX Forum and others. The U.S. Department of Defense relies on spectrum for domestic use, but the military primarily performs their missions outside of the national borders where available spectrum is different region and by country. This requires technology that is frequency agile and resilient to interference. Again, these capabilities may be implemented on commercial platforms, but there is little incentive for commercial markets to deploy such capabilities.

Defense agencies may choose to continue to develop customized solutions to address these challenges, such as the JTRS and WIN-T programs. However, they can also look at alternatives to deploy the commercial technology alternatives that require little or no modification of these core technologies.

Technical evaluations of 4G commercial technology are underway today in different places within the defense sector. However, the organization is providing industry with direction and guidance on how they envision these technologies being deployed and if any modifications are required beyond commercial standards. Defense needs to speak to industry with one voice in order to deploy common interoperable technology broadly, at the lowest possible cost and in the shortest amount of time. Deployment of 4G networks in defense will place significant strain on backhaul requirements. Next generation TDD-based point-to-point and point-to-multipoint backhaul will be critical to providing the type of connectivity a soldier needs to be their best when it matters.

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