

Can Defense Capitalize on Commercial Software Defined Radios?

Manuel Uhm, Senior Manager, Strategic Marketing, Spectrum Signal Processing

Software defined radio has been a goal of the signal and communications intelligence community for some time now. According to the SDR Forum, software defined radios (SDRs) are defined as "radios that provide software control of a variety of modulation techniques, wide-band or narrow-band operation, communications security functions (such as hopping), and waveform requirements of current and evolving standards over a broad frequency range." There are a number of advantages of software defined radios over traditional hardware radios, but interoperability has been a primary issue in the defense industry. Initiatives such as the Joint Tactical Radio System (JTRS) in the U.S. and the Bowman project in the U.K. have been trying to solve this problem for some time now.

Due to the shrinking defense budgets and COTS mandate, the defense industry has been looking forward to the day that software defined radio will hit the mainstream and become COTS, thereby lowering the cost of SDR implementation. While that day will probably come in the next 5 years, the requirements of the commercial wireless arena are so different that there may well be little direct benefit to the defense wireless community. The much larger volumes and extreme price sensitivity in the commercial world alone result in a completely different business model than would be supported by the defense industry.

For example, while Field Programmable Gate Arrays (FPGAs) and catalog digital signal processors (DSPs) are the norm for development of next-generation commercial wireless platforms such as 3G, ASICs are still commonplace for deployed solutions. However, the use of ASICs for signal processing is contrary to the true concept of SDR. ASICs can be more commonly utilized in the commercial world because there are fewer air interface protocols to deal with and therefore, less stringent requirements for dynamic (protocol) reconfigurability. In affect, the commercial requirements for SDR tend to be a subset of the full flexibility and functionality required by the defense industry. This more



Spectrum's flexComm HCDR-1021 is a COTS software defined radio (SDR) subsystem utilizing Xilinx Field Programmable Gate Arrays (FPGAs) and Texas Instruments DSPs.

fixed-functionality, combined with the large volumes, make ASICs more cost-effective for commercial deployment but of little use for military deployment. Instead, reconfigurable FPGAs and DSPs provide the flexibility needed in defense SDR implementations.

This represents one area where commercial SDR implementations might benefit the defense industry. The new generation of FPGAs, DSPs and reconfigurable processors are finally enabling the flexibility and dynamic reconfigurability demanded by SDR. For example, the new Virtex-II family of FPGAs from Xilinx is powerful enough to handle the channelization and chip-rate processing tasks of the new wideband protocols. As well, the 'C6416 DSP from Texas Instruments includes Viterbi and turbo co-processors for superior performance of baseband and symbol-rate processing. Reconfigurable processors, such as those offered by Chameleon Systems which can be dynamically reprogrammed in one clock cycle, may also help usher in a new era of software defined radios.

Open standards are another trend that will benefit the implementation of SDR in the defense industry. This will create compatibility between vendor offerings, stimulate more competition and generate economies of scale. The SDR Forum is an organization committed to

developing open standards and interfaces for use by both the defense and commercial telecommunications industries for just this reason. The Software Communications Architecture (SCA) supported by the SDR Forum outlines the standard interfaces to ensure compatibility between vendor SDR offerings. Although the SCA is specific to JTRS, the SDR Forum has taken it and come up with the SRA in an attempt to make a standard for both mil and commercial. SCA and SRA are virtually the same thing.

Companies such as Spectrum Signal Processing and other members of the SDR Forum are leading the way for COTS implementations of SDR in the defense industry through SCA-compliant architectures and use

of COTS hardware for subsystems (see Figure). Although there are some synergies between the defense and commercial requirements at the component and subsystem level, the requirements for the complete deployed systems differ substantially. Military radios will have much more rigorous requirements for security and encryption, as well as dynamic reconfigurability.

For example, while a commercially deployed base station may have to support a static number of channels of 2 to 3 different waveforms (such as GSM and WCDMA), a military radio may have to support several channels with different waveforms all in a single session. Companies familiar with the defense industry are best positioned to fulfill the complete set of requirements for SDR subsystems that meet the requirements of both the defense and commercial industries.

Spectrum Signal Processing
Burnaby, BC, Canada.
(604) 421-5422.
[www.spectrumsignal.com].

Software Defined Radio Forum (SDRF)
Rome, NY.
(315) 736-2433.
[www.sdrforum.org].