# Military/Communications

*Welcome to Brainstorm!*

***How do you assess and manage these constraints while at the same time improving the overall design process and productivity?***

Jon Friedman, Aerospace & Defense Industry Marketing Manager, The MathWorks

As a manufacturer of military electronics, engineers are faced with unique technical and cost/risks design constraints.

Military and aerospace electronics engineers balance shrinking product lifecycles with growing computer power leading to more complex designs. The resulting hybrid systems encompass multiple technologies. The challenge is sifting through the various technology options to decide what portion of the design should be in analog vs. digital – software or hardware. Engineers often guesstimate the partitioning, validating it towards the end of the design process. This can mean multiple design iterations which can lead to cost overruns. Model-Based Design helps electronics and systems engineers reduce program risks and keep pace with technology cycles.

With Model-Based Design engineers create an executable model, independent of the implementation, which serves as an "executable specification." Developing, testing and partitioning the design prior to implementation is done within this model, identifying design errors more easily earlier in the process which in turn makes them less expensive to fix.

Once the algorithm model is tested and verified against the design objectives, the model is elaborated by introducing implementation details. Here, fixed point and non-ideal component performance can be brought into the system model and its impact assessed.

The implementation languages are tested on the host computer once algorithm elaboration is complete and the system level performance is verified. Automatic code generation can speed up the initial testing by eliminating errors that typically get introduced when the implementation is done manually.

The last phase is testing the production intent code on the target (microprocessor,

DSP or FPGA). This final version of the generated code can be used for production, ensuring the implementation is consistent with the design, improving the design process productivity. However, if the production application requires highly optimized or specialized code, then hand code can be authored using the model as the software specification and then functionally verified using the model as a test bench.

Model-Based Design helps electronics systems engineers capture the algorithm design as well as the system level effects of non-idealized hardware. It creates a common collaboration environment and helps explore various tradeoffs in the design space to optimize the overall design in terms of system performance. The result - design errors identified and addressed prior to implementation which improves the overall design process and productivity.

The inability of different types of radios to work together causes problems not only among coalition and allied forces in the military theater, but also among civilian radios in emergency situations.

***Have we solved the interoperability problems with the Joint Tachtical Radio System (JTRS) or "Jitters"?***

Steve Nichols, Director, Homeland Security and Public Safety, Thales Communications

Communications interoperability is a national priority, yet issues still exist between government agencies and first responders working together to secure the homeland, where network-dependent communications solutions fail to provide the flexibility required for multi-agency interoperability.

Public safety and military radio communications spectrum requirements have increased dramatically over the last two decades as the need for more communication talk paths, more data channels, and more connectivity is required by a growing universe of government agencies and first responders.

With 2.2 million first responders in the U.S. today, it is the expectation that each one will be able to connect with other personnel on scene, as well as with their dispatch center, with clear reliable voice and data communications. In many cases, lives are at stake and the radio is an essential tool to accomplish the mission.

To keep up with this voracious appetite for additional channels, talk groups, and network capacity, the U.S. Federal Communication Commission and the National Telecommunications and Information Agency have allocated spectrum in a variety

of different frequency bands from 30-870 MHz.  Up until now, each band required a separate, specific, single-band radio. The traditional components and radio design approaches limited an economically-viable design to a single band for each portable radio.

The tragic events of Oklahoma City, 9-11, and Hurricane Katrina brought communications interoperability into the focus of government agencies across the nation. Although rudimentary patching and switching equipment was available, and there was a common over-the-air standard under the APCO Project 25 effort, there were still no single transceivers available that could operate in all of the bands. It remained common for incident commanders and personnel to be carrying two, three, or even four radios.

This interoperability issue has now been solved with the Thales Liberty™ multiband, multimode, software-designed Land Mobile Radio. This new Project 25 digital radio offers conventional and trunked operation in all of the primary public safety and federal frequency bands. In addition, it offers the ability to operate on older analog legacy systems. For the first time, Federal, State, Local, and Military Government personnel can communicate with a single portable radio that can access systems in all of the frequency bands.

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