WIND RIVER

SELEX Leads the Way in Military Communications

Innovative New SDR Solution Developed Using Wind River's RTOS

In the military field, research and development in software-defined radio (SDR) technology is aimed at covering all operational needs of radio transmission with a limited number of models. This functionality was created by adopting a new common architecture, Software Communications Architecture (SCA). Employing SCA was a winning approach—a variety of SCA-based products are already available on the market for military and civilian use. In Italy, the only company operating in the military communications market is SELEX Communications (formerly Selenia Communications), which developed its SDR design and prototype using Wind River software.

A Brief History of SDR

The SDR project evolved from the need to solve communication problems caused by the environment and a lack of network infrastructure. The goal was to reduce the number of transceiver devices. Researchers investigated how to define radio devices that could be reconfigured in order to respond to any transmission requirements, without having to deploy a great number of transceivers or terminals—each with limited service capabilities and frequency or distance range—prior to each mission. In the first phase of defining the SCA architecture, the base interface framework was established. Through the components of this framework, all the radio functionalities can be realized. The resulting architecture enables the development of application software (waveform) and its integration into the framework, independent of the hardware platform adopted.

The Advantages of SDR

The SCA approach achieved the SDR project's objectives with a limited number of radio device models, one for each category—naval, avionic, and terrestrial. As a result, a military unit operating on a particular terrain can choose which models to deploy: For example, small radio units for short-range transmissions, with a single longer-range device acting as a collector. This collaboration is possible because all the models may be reconfigured to adapt to disparate

"A key factor in the choice [of Wind River for this SDR project] was support. Developers of these products have to count on the maximum level of support, not only to save time and costs, but also to be certain that they are developing a reliable product."

— *Fabrizio Vergari, Senior Engineer, SELEX Communications*

Company Profile: SELEX Communications

- Leading communications supplier to military and civilian customers
- Complete portfolio of communication, navigation, and identification (CNI) integrated equipment and systems
- 5,000 employees worldwide

Industries

- Aerospace & Defense

Solution

- Wind River's VxWorks

Results

- Software-defined radio (SDR) demo prototype
- Software Communications Architecture (SCA) knowledge base

networking requirements. The same concept applies to the civil sector and Homeland Security, thanks to the option of creating wireless networks in limited time frames, when conditions do not allow the use of existing wired or wireless infrastructures (for example, in the case of rescue activity following a natural disaster).

Another innovation involved the use of CORBA1 middleware to manage the exchange of messages between software components and the base framework. Due to the common structure of the interfaces, the middleware acts as a "logic bus" through which components are connected, regardless of the development language in which the interfaces and other components were implemented. This exchange is like a postal worker who can deliver different messages simply by knowing the recipient's identification reference, without the sender knowing the exact physical location (a condition called "location transparency"). This capability requires the presence of common, applied, specifics-defined, standard software interfaces. This approach offers a clear advantage: Moving from one version of a product to another, developers can reduce platform software development time by at least 60 percent.

SELEX Communications, Meet SDR

SELEX started looking into SDR in early 2000 by participating in forums and workshops. The company is also a member of the SDR Forum (www.sdrforum.org), which brings together many organizations in the civilian and military sectors through its technical and commercial work groups. After an initial phase of evaluation, training, and feasibility studies, SELEX concentrated on developing a first prototype for naval platforms or fixed land stations. The prototype, studied for defense requirements, may generate products for civilian use in the future. The project was managed by Fabrizio Vergari, Senior Engineer at SELEX, and it clearly demonstrated the company's ability to develop SDR products. As required by the SCA architecture, a real-time operating system (RTOS) was used for the first time in a radio device—not just for operator-device interface services, but also to manage the entire signal management flow.

Joining Forces with Wind River

The Role of the Operating System

The operating system serves as the foundation for the other software components, governing access to a device's hardware resources. Therefore, the operating system's functions must be executed quickly, given the specific processor and the defined latency times. The operating system can guarantee that the execution of a certain task does not exceed a certain time, thereby managing the priorities of the multitasking environment in which SDR computing takes place.

Based on these factors, as well as Wind River's proven record of certified worldwide support, SELEX selected Wind River's VxWorks operating system for the company's inaugural SDR project.

World-Class Partnerships and Support

In addition to the excellent performance of Wind River products, Wind River's partnership with Motorola—specifically, the combination of Motorola boards with VxWorks—played a key role in SELEX's decision to adopt the VxWorks RTOS. The company also favored the high level of quality offered by Wind River support: SELEX designers appreciated suggestions made by Wind River support specialists during the project development phase. These were not strictly limited to the use of the OS, but also covered multiprocessing in embedded systems.

Finmeccanica Industrial Group

SELEX Communications is a Finmeccanica company. Within the Finmeccanica Industrial Group (www.finmeccanica.it), SELEX distributes the user license of a common packet that allows product distribution to other sites and across the organization. This extensibility is possible because of Wind River's Device Software Optimization (DSO) strategy. Per a previous agreement, Wind River operates as a key supplier of software solutions for the entire Finmeccanica Group, which includes leading companies in the A&D and manufacturing industries in Europe.

Successful Results

SELEX has now completed development of its demo prototype and the testing phase of the platform, as well as the integration of waveforms according to SCA version 3.0 specifications. As a result of this experience, SELEX has developed a solid knowledge base in SCA, which the company is currently applying to its SDR product development roadmap.

Learn More

SELEX Communications
a Finmeccanica Company

For additional information about the products mentioned in this case study, visit:

www.selex-comms.com
www.windriver.com

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