

Sandia National Laboratories Relies on Wind River

National Defense Company Won't Compromise on RTOS Reliability

Since 1949, Sandia National Laboratories has developed science-based technologies that support our national security. Sandia's mission is to meet domestic needs in the areas of nuclear weapons, energy and infrastructure, defense systems and assessments, and homeland security. The company is one of three defense programs laboratories in the U.S. Department of Energy's National Nuclear Security Administration (NNSA).

In 2006, Sandia embarked on a new project to build a rugged, portable unit called the TacNet Tracker. TacNet Tracker is a handheld device that individuals can wear or hold while communicating securely. The device has similar communication and data-sharing capabilities as a laptop computer, but in a much more compact, lightweight format—approximately the size of a Blackberry. TacNet Tracker provides additional functionalities—including Bluetooth communications, USB ports, and tracking with GPS or mesh positioning. The TacNet Tracker offers better performance than a ruggedized laptop system, at less than one-half the cost.

"Blue Force [a term Sandia uses to describe military and civilian good guys] members use the TacNet Tracker to remain aware of situations during tactical maneuvers, so they can effectively react and respond," explains Loren Riblett, Principal Member of Technical Staff in the Communications Systems Department, which researches and develops communication systems. "The devices must be highly secure and uncompromisingly reliable."

Turning to a Trusted Partner

Sandia immediately turned to Wind River for its real-time operating system (RTOS) needs, since the companies had successfully partnered since 1989. Sandia used Wind River's VxWorks platform for several versions of its Vehicle



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—Loren Riblett, Principal Member of Technical Staff, Communications Systems Department, Sandia National Laboratories

Company Profile: Sandia National Laboratories

- Science and engineering lab for national security and technology innovation
- Managed and operated by Lockheed Martin Corporation for the U.S. Department of Energy's National Nuclear Security Administration.
- Headquarters in Albuquerque, New Mexico

Industry

- Defense/Industrial/Security

Solutions

- Wind River Platform for Network Equipment, VxWorks Edition
- Wind River Professional Services

Results

- Decreased time-to-market by two and a half years
- Saved \$600,000 in development costs
- Gained ability to focus engineering resources on competitive differentiation

Network Systems (VNS). This in-vehicle communications system allows secure communications between vehicles and control centers. Featuring a GUI display, VNS supports text messaging, voice, and data communications; and navigation and map capabilities.

In the past Sandia used Wind River's VxWorks platform and pieced together board support packages (BSPs) from various sources. This time the company wanted a more cohesive, comprehensive solution. Riblett and the engineering team decided upon Wind River Platform for Network Equipment, VxWorks Edition for its high reliability and built-in features, including encryption, enhanced network protocols, and USB capabilities. The company also decided to engage Wind River Professional Services.

"We don't have a big group, so we needed support—and we knew we could trust Wind River to extend our team," Riblett says. "We wanted to get to market quickly and we couldn't spend time on OS problems. We had enough challenges on our hands with application code and developing a differentiated product to meet customer needs."

To further accelerate time-to-market, Sandia decided upon a semi-custom design for the TacNet Tracker hardware, working with long-time hardware partner Arcom Control. They based the design on one of Sandia's former XScale portable communications devices. Another key player in the project was GUI expert Tilcon, a Wind River partner.

Up-and-Running in Record Time

Within one year of engaging Wind River for the TacNet Tracker project, Sandia had the device up, running, and field-tested. Throughout the process, Riblett worked closely with Wind River Professional Services, consulting on everything from hardware schematics to building the BSP.

"In some cases it's more cost-effective to use external resources since there are so many rules and regulation costs associated with government staffing," he says. "More importantly, I have as much confidence in Wind River Professional Services as I have in my immediate developers at Sandia. I know Wind River won't quit until I have a good product. If we hadn't worked with Wind River, I think we would still be working on the project two and a half years later."

For example, Sandia was able to get Advanced Encryption Standard (AES) up in one day. Without the Wind River platform it would have taken weeks to find an open source AES encryption package and get it to work. Even then it would likely have bugs, and open source isn't supported.

Reliable, Robust, Repeatable, Scalable, Efficient

Riblett says the key benefits of using the Wind River solution are reliability, robustness, repeatability, and scalability. First and foremost, he stresses, is reliability.

"These are some of the tightest budgetary times I've seen, but we can't compromise reliability," Riblett says. "We have hundreds of devices running on VxWorks 24x7—some have been out in the field for 18 years. The number of operational hours is staggering, but the devices are out there and they work—and so we don't need to support them. We're not fighting the OS and we're not about to start. That's why we can't do without Wind River."

Robustness is a key benefit of using Wind River, according to Riblett. This means his team doesn't have to spend time addressing OS problems because "it just works." Repeatability is critical since Sandia does a lot of testing before sending devices to the field. Riblett needs to know the OS is deterministic and guaranteed.

"In terms of scalability, we've been able to pack some powerful processes into these little portable devices," Riblett says. "It was scary to move off the big Versa Module Europa (VME) racks, but in the end I think our applications run just as well in our little XScale handheld."

Wind River Workbench, the Eclipse-based developer toolset, has also enabled Sandia to work more efficiently. Riblett appreciates Workbench's standard interface, which provides a uniform development environment to his team. He says it's easy to upgrade to new versions, since he can easily clone the interface to all his developers' machines so his entire team is working with the same parameters and settings.

"I also like the ability to address several tasks at once," Riblett says. "I can open multiple instances of Workbench to modify and debug sets of code between two boxes running on Pentium and XScale processors, for example. Workbench allows our team to code faster and solve problems more efficiently."

Looking Ahead

While the TacNet Tracker is currently tested for military purposes, Sandia plans to tailor the device for various commercial and civilian uses. For example, it may be used in private security, open-pit mining, and other hazardous occupations.

Sandia's ideas for future models of the device include a secure screen display and "dead-reckoning" tracking that goes beyond GPS. As Riblett and the team design these added features, they plan to have Wind River at their side every step of the way.

Learn More



Sandia National Laboratories

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

www.windriver.com

www.sandia.gov

WIND RIVER

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