

## 12 Reasons to Deploy the Wind River VxWorks 653 Solution

1. **We are commercial grade.** We have the most powerful implementation of ARINC 653 available, including the operating system and reference board support packages (BSPs). VxWorks is the ARINC 653 industry standard, with more than 50 customers encompassing hundreds of developers using VxWorks 653 in more than 100 challenging aerospace and defense (A&D) programs, including Airbus A400M, Airbus MRTT, Boeing 787 Dreamliner, Boeing 767 Tanker, Boeing C-130 AMP, and NGC UCAS-D.
2. **We are more than just an ARINC API on top of a priority-preemptive RTOS.** We have fully implemented the complete ARINC 653 specification, including Supplement 2, Part 1 additions, with a strict two-level scheduler, scheduling MMU-protected partitions on a time basis and independently scheduling threads inside these partitions on a priority-preemptive basis. We are *not* a stubbed-out ARINC 653 API. We are *not* a simple priority-preemptive RTOS with a modified round-robin scheduling mechanism made to appear to schedule partitions on a time basis. These partial implementations are inefficient for densely scheduled systems and they introduce data and control coupling issues between applications and the operating system.
3. **Our ARINC 653 product can handle industrial loads of software from dozens of hosted-function suppliers and application providers.** Wind River's ARINC 653 architecture, incorporating robust two-level partition and thread scheduling, can handle the critical scheduling of many diverse applications, each with different safety requirements and safety levels. VxWorks 653 is designed to handle 255 simultaneous applications running in time and MMU-protected spaces, not just a few applications separated by an MMU-protected kernel. The application performance is consistent regardless of the number of partitions deployed.
4. **We understand the high cost of change for testing and maintaining software in an IMA (Integrated Modular Avionics) system.** Wind River provides a DO-178B Level A XML compiler qualified as a development tool under FAA 8110.49, Section 9. This tool enables change to a single application or the configuration of applications without retesting other independent components. In complex ARINC 653 systems, this tool can save millions of dollars in testing reconfigurations.

Without this tool, a customer modifying configuration data must either:

- Create specialized tests for each element of the large data structure that contains that ARINC 653 kernel and application configuration data, typically based upon XML. This is very difficult, expensive, and error-prone to do.
- Test the entire operating system and all applications every time a change is made anywhere in the system.
- Compare configuration data before and after a change to ensure there is no unintended impact (also time-consuming and error-prone).

Note that ARINC 653 XML configuration data can easily exceed 300,000 lines of code in a complex IMA system.

5. **We have a fully functional health monitoring system—an absolute requirement for any safety-critical ARINC 653 system.** This hierarchical health monitor implements all required capabilities in the ARINC 653 specification. In addition, we can also configure our health monitoring system with XML, leveraging our DO-178B tool-qualified XML compiler to rapidly reconfigure failure conditions/responses.
6. **We provide DO-178B-qualified verification tools to assist customers with the development of DO-178B Level A certification evidence for their overall systems, including monitors for execution-time attributes, memory usage, and ARINC port traffic, along with host commands to start and stop execution, peek and poke memory, and examine other system attributes during test for credit.** We also can provide a tool for DO-178B Level coverage at the object code level: Vera-code covers code at 20,000 source lines per day on a fast PC, and it can be multiplexed on any number of PCs to increase that rate (use five PCs for 100,000 lines per day). Coverage reports depict the number of instructions, the number covered, and uncovered instructions for each module. Wind River's certification evidence for the operating system uses this tool to provide its coverage evidence. Customers can use this tool for coverage of their own applications.

7. **We provide the industry's best and most complete certification evidence, developed and fully tested by an independent third party, Verocel ([www.verocel.com](http://www.verocel.com)).** This evidence is on a sealed DVD, ready for submission to certification authorities, and includes all DO-178B Level A documents, including complete requirements and design documents; all design and code reviews; test plans, tests, and all test results; plus the Software Vulnerability Analysis that will be required by DO-178C. This documentation is provided both for the operating system and for the DO-178B-qualified development and verification tools that are part of our solution—more than 6GB in 65,000 hyperlinked files.
8. **Our customers can leverage a common set of certification evidence that spans multiple platforms and projects.** Wind River's VxWorks 653 product is now used in more than 100 projects. Globally renowned authorities Mike DeWalt and Leanna Rierson audit our auditor. This common review reduces program risks for our customers. DO-178B and ED-12B Level A–D certification of applications and BSPs is also available.
9. **We are the only ARINC 653 vendor that has implemented a strategy per DO-297 to isolate and protect the intellectual property of various parties (platform provider, application developers, and system integrators) involved in a complex IMA implementation.** Wind River offers the world's only solution that protects intellectual property in a hostile multi-vendor environment, using a formal strategy approved by the avionics industry.
10. **For ease of integrating software from a diverse source of legacy and current suppliers, our ARINC 653 product can support POSIX threads, VxWorks tasks, ARINC processes, and applications simultaneously on a single microprocessor.** We also support the simultaneous use of C, C++, Ada, and Java in application partitions. This unique capability enables the rapid reuse of existing software from legacy federated systems on modern ARINC 653 platforms.
11. **Wind River is a global company and provides global support for our ARINC 653 product.** Our IMA solution is supported by engineers with deep technical knowledge on all aspects of our ARINC 653 product, located across North America and Asia. We are the only ARINC 653 operating system vendor with this depth of ARINC 653 support. Many of our engineers continue to be active participants in the APEX Working Group (ARINC 653 industry committee).
12. **We have the only ARINC 653 supported by an open commercial-grade development environment.** Our Wind River Workbench product, based on the open Eclipse environment, does not lock our customers into a closed proprietary development environment. It is fully compatible with Eclipse plug-ins from third-party vendors and internal tool product teams. The huge ecosystem of tools and partners can seamlessly access targets on host simulators, JTAG connections, and any serial, Ethernet, or other host target connection mechanism.

*In summary, we provide the world's leading ARINC 653 product, based upon an open, robust development environment, with commercial-grade tools, coupled with unmatched support capabilities that will save our customers millions of dollars in development, test, and maintenance costs over the life of any IMA project.*

*This product is delivered by Wind River, the global leader in Device Software Optimization.*