WIND RIVER

Wind River Answers
50 Questions to Ask Your ARINC 653 Vendor

Corporate

Q1. How financially stable is your company? Are your books publicly available?

A1. Founded in 1981, Wind River is a publicly held company headquartered in Alameda, California, with operations worldwide. Wind River went public on April 15, 1993. Wind River stock is traded on NASDAQ (WIND).

For the fiscal year ending January 31, 2007, Wind River reported revenue of $285.3M, GAAP net income of $573,000, and GAAP diluted earnings per share of $0.01. For fiscal year 2007, non-GAAP net income was $26.8M, and non-GAAP diluted earnings per share was $0.31.

- For FY07, Wind River's subscription license model continued to resonate with our customers, yielding 34% subscription revenue growth year-over-year.
- Wind River delivered reported revenue growth of 7%.
- Strong subscription business resulted in deferred revenue growth of 29%.

For the first six months of fiscal year 2008, Wind River reported revenue of $162.7M, an increase of 17% compared to the first six months of fiscal year 2007.

Q2. Does your company have adequate corporate revenue, profits, and cash in the bank to sustain global support during your entire development and deployment schedule?

A2. Wind River has a strong balance sheet, with operations in more than 18 countries around the globe.

- **FY07:** Cash, cash equivalents, and investments ended FY07 at $203M. Cash flow from operations was $55.7M, and total deferred revenue was $127M.
- **FY08:** For the first six months of fiscal year 2008, cash flow from operations was $23.3M.
- **Q2 FY08 geographic breakout:** 54% of revenue was from the Americas; 22% from Europe, Middle East, and Africa; and 24% from Asia Pacific, including Japan.
- **Q2 FY08 bookings profile:** 31% of end market was aerospace and defense; 26% was industrial and automotive; 25% was network infrastructure; and 18% was digital consumer.

Q3. How many engineers are available to support your development effort?

A3. Wind River has more than 1,300 employees worldwide, including 170 support engineers, 150 professional services engineers, and more than 450 development engineers. We have five times the number of engineers than any competitor in the Device Software Optimization (DSO) space.

Q4. How many active aerospace and defense (A&D) customers do you have?

A4. Wind River has more than 500 active A&D customers, including fundamental design wins with Boeing 787 Dreamliner Common Core System, Boeing SOSCOE, Boeing P8-MMA, Airbus A400M, Airbus MRTT, other EADS companies, and Northrop Grumman UCAS-D. Many of these projects deploy both federated (VxWorks) and Integrated Modular Avionics (IMA) VxWorks 653.

Wind River has more than 50 VxWorks 653 customers, encompassing hundreds of developers using VxWorks 653 in more than 100 challenging A&D programs; so we expect all aspects of our A&D business to grow in the coming years. No other company has this level of penetration of ARINC 653 usage.

Q5. What is the total A&D revenue for your last fiscal year? How can I verify these numbers?

A5. Wind River's A&D revenue exceeded $80M in our last fiscal year. We expect this revenue to grow more than 15% in the current fiscal year.

Wind River is a public company, so these revenue figures can be verified using our standard financial reports available through public dissemination. Our account representatives can also provide you with easy-to-read, two-page quarterly financial summaries upon request.

ARINC 653 Development Environment

Q6. What other operating systems does your development environment support?

A6. The Wind River Workbench development environment is based on Eclipse, the open environment supported by Eclipse Strategic Members Hewlett-Packard, IBM, Intel, and others (see www.eclipse.org). Workbench supports Wind River Linux/Real-Time Core for Linux, VxWorks 6, VxWorks 5, VxWorks 653, and VxWorks MILS. In addition, our Workbench product can support other third-party operating systems and components, along with proprietary, in-house operating systems. Workbench does not lock a user into any operating system environment, and therefore is the highest-value software development in the industry.

Q7. Is the market share for your development environment growing or shrinking?

A7. Wind River Workbench is one of the fastest growing products in the DSO industry. Its broad support of Linux and the VxWorks family of operating systems, along with the widest array of partner tools available, make Workbench a logical choice for all future device software projects. For avionics customers that must support an entire design flow with DO-178B processes, our Workbench product significantly reduces the burden for tool integration.

Q8. What other industry tools are available for your development environment?

A8. The Workbench development environment has the largest array of tools available in the embedded industry. In addition, the Wind River Partner Ecosystem offers the widest range of Workbench/Eclipse plug-in tools, from requirements and design to test, integration, and management, enabling a broad spectrum of tool interoperability.

Q9. How easily can my own tools or in-house real-time operating system (RTOS) plug into your environment?

A9. The Eclipse foundation of Workbench allows for the integration of any in-house or commercial tool, along with any operating system environment. This capacity to plug in any tool, regardless of ownership or pedigree, enables developers to use Workbench with a wide array of device software products.

Q10. Does your development environment have an open, public interface?

A10. The Wind River Eclipse environment has an open interface for plugging any device software or enterprise tool into this powerful framework. Note that most device software and enterprise tool vendors already have created Eclipse plug-ins for their products.

Q11. Do you have a host-based simulator for your ARINC 653 product?

A11. Yes. Wind River VxWorks 653 Simulator provides rapid test of development ARINC 653 software and XML load modules on host-based systems. This is a unique capability—most simulators in the industry only support flat memory model execution environments with static configurations or very slow instruction set simulators for singular software modules.

Q12. What are my language and compiler choices for C/C++/ Ada/Ada 95/Ada 2005?

A12. Wind River's VxWorks 653 product enables the use of either C or C++ compilers from Wind River or our C compiler partners. Robust Ada and Ada 95 language support is supplied by our Ada partners (AdaCore, Aonix, and DDC-I) and fully integrated with our Workbench debug and development environment. AdaCore also delivers an Ada 2005 product that is integrated with Workbench. Aonix and DDC-I also supply robust Java run-times for our VxWorks environment.

Note that VxWorks 653 now includes a C++ subset definition that can be used for DO-178B certification efforts. This subset excludes C++ features that can cause non-determinism, such as pure virtual functions, run-time type information (RTTI), C++ exceptions, the delete operator, and garbage collection.

Q13. Is a JTAG target connection supported?

A13. Yes, JTAG connections are fully supported with Wind River's VxWorks 653. This connection eliminates the need for expensive debug ports on airborne hardware platforms and therefore reduces complexity and DO-178B certification costs on airborne systems. VxWorks 653 users can now test, validate, and debug complex single partitioned environments without the need for connection target monitors, added instrumentation, or network communications.

Q14. Do you support AMIO (advanced multiplexed input and output)?

A14. AMIO is a feature of VxWorks 653 that allows the multiplexing and de-multiplexing of data channels from different partitions into a single channel, enabling different partitions in the ARINC 653 system to share a single serial port in a partition-safe manner. AMIO enables advanced communication capabilities that greatly enhance debugging ARINC 653 applications without adding additional hardware or instrumentation.

Q15. Which tools come with your product that are "qualified as development tools" under DO-178B (FAA 8110.49, Chapter 9)?

A15. To address the challenge of loading new/updated software modules without affecting the certification of the entire ARINC 653 system, Wind River supplies a DO-178B Level A qualified XML compiler that translates the platform, core OS, partition OS, and health management XML configuration data into binary run-time data (no run-time translation required). No other ARINC 653 OS provider delivers this type of comprehensive tool.

Q16. Which tools come with your product that are "qualified as verification tools" under DO-178B (FAA 8110.49 Chapter 9)?

A16. Wind River includes DO-178B Level A verification tools that monitor ARINC port utilization and traffic, CPU execution time, and memory utilization inside the user partitions. These tools include a small monitor, Agent for Certification Environment (ACE), which gets deployed with the system and incurs the same amount of execution time whether the monitor is enabled or disabled (in order to not vary timing/execution of software during test). ACE is certified as a DO-178B software component, and all DO-178B Level A certification artifacts for our qualified development and verification tools are included on our comprehensive DO-178B certification evidence DVD.

ARINC 653 Operating Environment

Q17. What percentage of the ARINC 653 API Supplement 1 is implemented and tested?

A17. VxWorks 653 is 100% conformant to ARINC 653 Supplement 1. In addition, it is fully conformant to ARINC 653 Supplement 2, Part 1, which includes ARINC 653 partition management, cold start and warm start transitions, application software error handling, Ada and C language bindings, and basic SAP port support per Part 2, Extended Services. Furthermore, Wind River has contracted with a third-party testing firm to independently test ARINC 653 compliance based on ARINC 653, Part 3.

Q18. What percentage of the ARINC 653 API has supporting certification artifacts?

A18. Wind River delivers DO-178B Level A certification evidence for 100% of the ARINC 653 API with our VxWorks 653 certification evidence product. This product also includes all required certification documentation for the DO-178B Level A qualified development and verification tools that are part of the product.

Q19. Do you have a full implementation of the ARINC 653 Health Monitor? Which functions must I complete in the board support package (BSP)? Which functions need to be created with my applications?

A19. Wind River has implemented 100% of the ARINC 653 Health Monitor (HM) capabilities. This is a complete, independent implementation of the HM, with zero capabilities left for the user to implement in the BSP. This enables a clean implementation of HM solutions, where changes in the HM configuration do not affect the rest of the system. Standard HMs are supplied in the VxWorks 653 product—however, if the user requires specific functionality for any health monitoring event, this capability may be added by reference in the HM configuration tables.

All health monitoring capabilities can be easily configured using XML.

Q20. What happens when a failure occurs? Is partition restart the only alternative?

A20. The HM enables three levels of failure management: process, partition, and module (core OS). The health management framework is hierarchical, where errors that cannot be handled at the level where they occur are propagated up to the next level. The configuration of the HM is easily configured by the system integrator using our XML table editor, which feeds our DO-178B Level A qualified XML compiler.

Q21. How many customers use your ARINC 653 product?

A21. VxWorks 653 is the ARINC 653 industry standard, with more than 50 customers encompassing hundreds of developers using it in more than 100 challenging A&D programs.

Q22. What large applications/projects does your ARINC 653 product support?

A22. We support the most challenging ARINC 653 environments in the world. The most ambitious VxWorks 653 deployment to date is the Boeing 787 Dreamliner, which uses it as the sole OS component in its Common Core System, delivered by Tier 1 supplier Smiths Aerospace. In this deployment, VxWorks 653 supports more than 70 hosted functions provided by more than 10 suppliers. VxWorks is also a key component in almost every other modern aircraft, including Airbus A400M, Airbus MRTT, Boeing 767 Tanker, Boeing C-130 AMP, and Northrop Grumman UCAS-D.

Q23. What are your safety-critical success stories?

A23. In addition to the Airbus A400M, Airbus MRTT, Boeing 767 Tanker, Boeing 787 Dreamliner, Boeing C-130 AMP, and Northrop Grumman UCAS-D successes mentioned previously, Wind River's safety-critical products have also enabled the Eurocopter EC-225, Gripen, Mars Spirit and Opportunity Rovers (and almost all other systems from JPL/NASA), and most U.S. Air Force aircraft.

Q24. Can your ARINC 653 operating system support multiple DO-178B (or other safety specification) safety levels on a single instance of silicon?

A24. Yes. VxWorks 653 supports multiple safety levels of applications executing simultaneously on a single microprocessor, from DO-178B Level A through Level D/E.

Q25. Which OS APIs are available for my ARINC 653 environment?

A25. Wind River's VxWorks 653 product supports mixed, simultaneous partition OS environments, including a pure ARINC 653 partition OS API, a VxWorks API (more than 100 system calls), and a subset of POSIX system calls, along with a strategy to support proprietary and in-house operating systems. We can also support in-house and/or proprietary operating systems inside our ARINC partitions.

Q26. What languages does your ARINC 653 environment support?

A26. We support mixed C/C++/ Ada/Ada 95/Ada 2005/ Java environments inside our ARINC 653 application partitions. For Ada support, Wind River has integrated Ada solutions from AdaCore, Aonix, and DDC-I. For Java support, we work with our partners Aonix and DDC-I.

Q27. Do you support shared libraries?

A27. Yes. VxWorks 653 supports shared libraries and other technologies to maximize memory-access performance while maintaining robust MMU-based hardware partitioning.

Q28. Which standard commercial boards do you support?

A28. Wind River and our VxWorks 653 partners offer the broadest support for hardware platforms in the industry. A sampling of this hardware support includes the following:

- Aitech S950 (PPC 750FX), SBS RL4 (PPC 750/755)
- CES RIO3 806x (PPC 750)
- Curtiss-Wright Rhino 10 (PPC 7410)
- Curtiss-Wright Rhino DX (PPC 7455)
- Curtiss-Wright SVME-181 (PPC 7410)
- Freescale HpcNet 8641D (single core only)
- Lockheed Martin SPC103C (PPC 7455/7457)
- Motorola MVME5100 (PPC 750/74xx)
- Motorola MVME5500 (PPC 7455)
- Motorola MVME2400 (PPC 750)
- Radstone IMP1A-xC1345 (PPC 7410)

- Radstone PPC7A-xC1345 (PPC 7410
- Wind River SBC7447 (PPC 7447)
- Wind River SBC7457 (PPC 7457)
- Wind River PPMC7xx (PPC 750/755)
- Wind River PPMC74xx (PPC 74xx)
- Wind River SBC750GX (PPC 750gx)
- Wind River SBCPowerQuicII (PPC 8260 or 8270)
- Wind River PPMC8245 (PPC 8245)
- Wind River SBC834x (PPC 8349e)
- Wind River SBC8560 (PPC 8560)

Q29. Do you support IBLL (independent build, independent link, independent load)? Can I rebuild my applications separately?

A29. Yes. This is a key capability of VxWorks 653 and a key requirement of any IMA environment that needs to support multiple application groups or third-party hosted function suppliers, delivering software builds asynchronously.

VxWorks 653 fully supports IBLL. Independent build means that one does not need the entire source code of the system to build one piece of the system and that there is no longer the demand to create a "system" project that builds all software modules in the system. Independent link means that one does not need the OS binaries to link an application; and independent load enables the loading, updating, or flashing of binaries to be done separately.

Why is IBLL important? IBLL is very modular and flexible capability that is easily adapted to customer environments. This build/link/load independence reduces the scope and impact of change, accelerates software updates and maintenance, and makes it easier for multiple suppliers to work together.

Q30. Can I alter the XML configuration of one application in one partition without testing the entire platform? What tools are available to enable this capability?

A30. Yes. This is a fundamental differentiator of VxWorks 653.

We supply a DO-178B Level A qualified XML compiler that enables the reconfiguration and reinsertion of new or updated applications that limit the impact of this update solely to those partitions affected by the software under change. This qualified compiler, along with VxWorks 653 IBLL capabilities, drastically reduces the costs of maintenance, support, and deployment.

ARINC 653 vendors that do not have a robust, proven, and tested strategy for changing system configurations and hosted function software loads will cause a fundamental increase in support costs for an IMA system, for they must recertify the entire platform when any change is made to any application or operating system module. Note that ARINC 653 XML configuration data on a complex platform can well exceed 300,000 lines of code.

Q31. Do you support DO-297?

A31. Wind River's VxWorks 653 has full compliance with DO-297, defining and separating the roles of system integrator, platform provider, and each application/hosted function supplier on a complex IMA project. This is essential to mini-mize the impact of XML configuration changes, protect the intellectual property (IP) of hosted function suppliers, and enable teams to work asynchronously and independently when building ARINC 653 systems.

Q32. How can I change the Health Monitor characteristics without retesting the entire platform?

A32. The VxWorks 653 three-tiered hierarchical HM system can easily be reconfigured by the system integrator who can change the XML tables using an XML table editor supplied with the product. These changes are then converted into PowerPC binaries using the DO-178B Level A qualified XML compiler. These binaries are then loaded on the ARINC 653 target environment, where only the applications impacted by this change will need to be tested.

Q33. How can I change the port configuration of a partition without retesting the entire platform?

A33. Changing the port configuration in a VxWorks 653 target is easily accomplished by changing the XML configuration data for a particular port and the XML connection table, which describes how the ports are interconnected. This change will then be input into our DO-178B Level A qualified XML compiler for generating revised PowerPC binaries for system load. At the application level, the application developer must make port change adjustments to the application code, but no system-level code needs modification.

Q34. Do I configure the system using a C include file or an XML file?

A34. All system configuration data is performed using XML and deployed using our DO-178B Level A qualified XML com-piler.

Note that if other vendors require a change in a C include file for their ARINC 653 OS, this will force a retest of the entire operating system and application environment, add-ing significant testing costs and deployment delays to every configuration update.

Q35. How do I test the configuration data in my include file or XML data?

A35. With VxWorks 653, there is no configuration data in any include file, and all XML data (due to our DO-178B Level A qualified XML compiler) does not need to be tested in its entirety by the user. This qualified tool strategy enables our commercial-grade ARINC 653 environment to save users sig-nificant testing costs, and also accelerates time-to-market and deployment.

Q36. How do I monitor the performance of my applications?

A36. Wind River includes DO-178B Level A verification tools that monitor ARINC port utilization and traffic, CPU execution time, and memory utilization inside the user partitions. These tools include a tiny monitor, which gets deployed with the system and incurs the same amount of execution time whether the monitor is enabled or disabled (in order to not affect timing/execution of software during test).

Q37. What are the implications of removing the tools used in monitoring and verifying my ARINC 653 system?

A37. There are no implications. Our VxWorks 653 performance monitoring tool requires only a small monitor, which gets deployed with the system and incurs the same amount of ex-ecution time whether the monitor is enabled or disabled (in order to not affect timing/execution of software during test). Therefore, removing the tools from the system will not affect the execution of the platform and hosted function supplier software.

Q38. What kind of communication ports do you support?

A38. For a wide choice in application designs, VxWorks 653 supports four types of communication ports:

- **Local ports:** Buffered, one-to-many, memory-based, inter-partition communication ports
- **Pseudo ports:** Buffered, one-to-many, transport-based, inter-partition communication ports, enabling the use of AFDX or other physical transport/network system
- **Direct access ports:** Fast, unbuffered, one-to-one, transport-based, inter-partition communication ports
- **Partition pseudo ports:** Fast, unbuffered, one-to-one, direct access communications ports based upon a user-mode driver

Q39. Do you have a network stack available with complete DO-178B certification evidence?

A39. Yes. VxWorks 653 has an optional UDP/IPv4-based network stack that can be used for both debugging systems and deployment environments.

Certification Artifacts and Documentation

Q40. What certification evidence is available for your ARINC 653 environment?

A40. Wind River's VxWorks 653 certification evidence leads the industry in both quality and depth. All of our DO-178B Level A evidence is prepared by Verocel, an independent certifi-cation company. Unlike most certification packages, which only supply the approximately 20 documents required by DO-178B, the VxWorks 653 certification evidence has all documents and source code, including build files of the entire VxWorks 653 product—more than 60,000 hyperlinked files on a single DVD.

Q41. Does an internal designated engineering representative (DER) or engineer prepare the certification evidence, or is it prepared externally?

A41. Wind River believes that external and independent testing of DO-178B certification products is the best strategy for ensuring the highest quality and robustness. Our VxWorks 653 product is tested by our internal test team and then released to our manufacturing and production team. The product is then given to Verocel, an independent certification testing service firm that runs an independent set of automated tests per DO-178B Level A specifications. Verocel then performs all required reviews of this data, and when all verification and review activities are successfully completed, generates our VxWorks 653 certification evidence DVD with automatic systems. This DVD contains all requirements, design, test, tool qualification, and review documents, along with complete source code and build environment. The current volume of supporting documents on this DVD now exceeds 60,000 hyperlinked documents.

Note that our requirements are some of the most complete in the industry, with an average of one requirement for every 10 lines of C code.

Q42. What is the form of this certification evidence?

A42. All VxWorks 653 certification evidence is delivered on a DVD independently created by an external certification firm, Verocel. These documents are hyperlinked for ease of certification audit review and requirements traces. The package contents include an OS certification evidence DVD and a tools qualification evidence DVD.

Q43. How many files make up this certification evidence?

A43. There are currently more than 60,000 hyperlinked support files on Wind River's VxWorks 653 certification evidence DVD.

Q44. Has anyone ever audited this evidence? If so, who?

A44. Multiple ongoing avionics systems programs have reviewed Wind River's VxWorks certification evidence. These reviews have included renowned authorities such as Mike DeWalt and Leanna Rierson. DeWalt is a DER and safety certification auditor and is Chief Scientist of Aviation Systems at Certification Services, Inc. (CSI). Rierson is also a DER and safety certification auditor and represents Digital Safety. Both DeWalt and Rierson are former National Resource Specialists for the U.S. FAA (Federal Aviation Administration).

Q45. Can this evidence be used in the United States?

A45. Yes. The VxWorks 653 certification evidence was prepared using DO-178B Level A guidelines, and it can be used in any avionics certification project in the United States under any FAA or military guidelines.

Q46. Can this evidence be used in Canada?

A46. Yes. Wind River's VxWorks 653 DO-178B Level A certification evidence is ready for presentation to any Transport Canada certification official.

Q47. Can this evidence be used in the European Union?

A47. Yes. The VxWorks 653 certification evidence was prepared under ED-12B and DO-178B guidelines, and it is ready to be used in any avionics project in the European Union or under European Aviation Safety Agency (EASA) guidelines.

Q48. Is the evidence a standard product or a custom service?

A48. Wind River's VxWorks 653 DO-178B certification evidence is available as a standard product. Our VxWorks 653 customers plan to use this product in dozens of avionics projects worldwide. Because this intensive set of work, with an investment of tens of millions of dollars, is used by multiple parties, Wind River can contain costs for this product to each customer without the burden of singular, proprietary efforts. This saves our VxWorks 653 customers millions of dollars in product and maintenance investment and enables a more rapid review of the common set of certification evidence.

Q49. Can the certification evidence be used in certification efforts in other industries with differing certification standards?

A49. Yes. The VxWorks 653 evidence can be used in certification efforts in other industries, including automotive, industrial control, medical, military, and nuclear environments. The Wind River certification team can assist with using this data for other certification standards by creating document maps between DO-178B and other certification requirements.

Q50. Can the certification evidence be used in reusable software component (RSC) environments?

A50. Yes. The design of our VxWorks 653 product and all the related VxWorks 653 certification evidence can be used immediately in projects with RSC requirements.

WIND RIVER

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: Veracode 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).** 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.

WIND RIVER

Wind River is the global leader in Device Software Optimization (DSO). We enable companies to develop, run and manage device software better, faster, at lower cost, and more reliably. www.windriver.com