Accelerating Safety Certification with Certifiable IP Blocks

Shortening the Runway to DO-178C / DO-278A Certification

DO-178C/DO-278A certification is one of the most time-consuming and expensive barriers to delivering modern avionics systems. As platforms shift to multicore processors and software complexity increases, aerospace and defense manufacturers face longer schedules, higher costs, and growing risk — often for software components that have already been certified elsewhere.

One of the ways Wind River addresses this challenge is by providing prebuilt, pre-documented, and pre-verified software components known as certifiable intellectual property (IP) blocks, which dramatically accelerate approval while reducing program risk.

CHALLENGE: DO-178C/DO-278A SLOWS INNOVATION

Historically, airborne software certification has required the completion of four stages of involvement (SOIs):

- **SOI 1:** Planning
- **SOI 2:** Implementation
- **SOI 3:** Verification and Validation
- **SOI 4:** Final Certification

For a single software component, this process can take 18–36 months, require thousands of engineering hours, and cost millions of dollars. When multiplied across operating systems, board support packages (BSPs), network stacks, security frameworks, and file systems, certification timelines can last five years or more. At the same time, manufacturers are faced with industry challenges, including:

- Migration to multicore processors
- Supply chain delays in hardware availability
- Expedited acquisition timelines
- A shrinking pool of experienced certification engineers

These challenges often result in delayed programs, higher risk, and slower time-to-market.

SOLUTION: REUSABLE CERTIFIABLE IP BLOCKS

With decades of experience in stringent certification requirements, Wind River packages its software portfolio and complete artifacts into reusable, certifiable IP blocks that can be applied across programs — greatly reducing time-to-certification.

Each IP block includes:

- Proven software components
- DO 178C artifacts completed from SOI 1 through SOI 3
- Documentation aligned to applicable Design Assurance Levels (DALs)

Wind River works with customers to integrate these blocks into their systems and complete a focused delta certification (SOI 4) rather than starting from scratch — resulting in the shortest, safest, and least expensive path to DO-178C compliance and approval. Additionally, the Wind River® Helix™ Virtualization Platform planning artifacts include A(M)C 20-148 reusable software component considerations for customers seeking formal RSC approval from their respective authorities.

CERTIFIABLE IP BLOCK PORTFOLIO

Wind River offers a comprehensive set of certifiable software components, including:

- **VxWorks®** real time operating system (RTOS)
- **Helix Platform** hypervisor
- **BSPs** for **Arm® Cortex A72** and **Cortex A53** processors
- **RTnet** real time network protocol stack (TCP, UDP, IP, ARP, and ICMP)
- **Information Assurance Foundation (IAF)** security framework
- **High-reliability file system (HRFS)** for DAL A requirements
- **Secure boot loader**
- **Intel® Simics®** software-based hardware simulation models

Together, these components form a certifiable software stack supporting mixed-criticality workloads on multicore platforms:

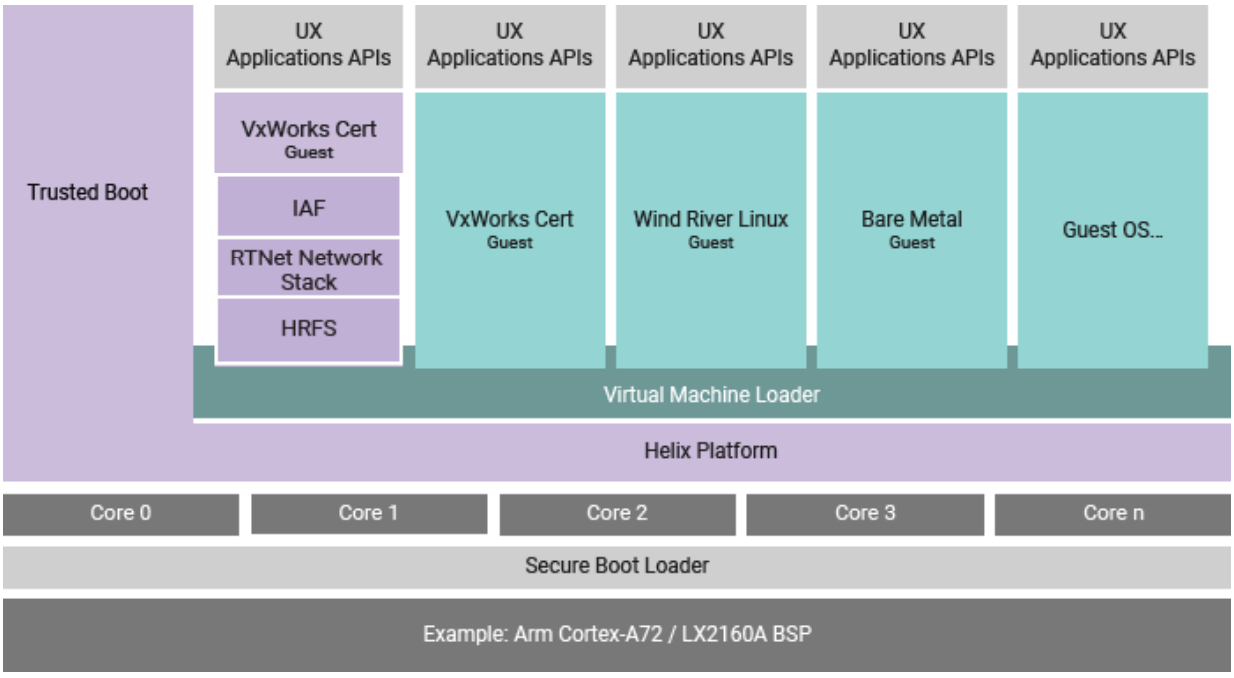

Figure 1. Certifiable software stack for multiple operating systems and mixed levels of criticality

PROVEN RESULTS: LEADING AEROSPACE MANUFACTURER UAV PROJECT

One of the world's top aerospace engine and systems manufacturers engaged Wind River to accelerate DO-178C certification for an unmanned aerial vehicle (UAV). Its goal was to reduce costs, accelerate time-to-market, and address both supply chain and skill set shortages. The system featured a 16-core Arm Cortex-A72 processor, the Helix Platform with VxWorks RTOS, real-time networking, security, and a custom BSP.

The customer was able to leverage the following certifiable IP blocks of software components, which have been tested and documented from SOI-1 through SOI-3:

- **VxWorks RTOS**
- **Helix Platform** hypervisor
- **Custom BSP with cert-ready drivers** and APIs for I2C, GPIO, serial I/O, PCI, clock, and interrupt handler, designed to support its choice of Arm Cortex-A72 processors
- **Wind River RTnet real-time network protocol stack** with support for a wide variety of network protocols, including TCP, UDP, IPv4, ARP, and ICMP
- **Wind River IAF security framework** featuring full encryption and specialized software code
- **High-reliability, power-fail-safe file system (HRFS)** designed for DO-178C DAL A environments

Wind River worked with the customer to make modifications tailored to its unique use case requirements before completing the final delta certification (SOI-4).

In parallel, the customer was able to capitalize on Wind River's system simulation capabilities through Intel Simics to create a digital twin of the NXP LX2160A processor. This enabled thousands of virtual CPUs for application testing and development before physical hardware was available, eliminating hardware procurement delays and saving millions in hardware costs.

TRADITIONAL APPROACH

- Single component: 18–36 months, several million dollars
- Full system: 5+ years, >$25 million
- Unpredictable timelines for certification
- Reliance on limited hardware availability

USING WIND RIVER CERTIFIABLE IP BLOCKS

- Full DAL C certification in just over one year
- Multi-million-dollar project cost savings
- Millions more saved in hardware (via Intel Simics digital twin)
- Critical months cut from schedule
- Significantly lower risk with proven, pre-validated artifacts

WHY WIND RIVER: A SECURE PATH TO FASTER INNOVATION

Wind River's decades of avionics certification expertise, combined with the broadest available portfolio of certifiable, reusable software IP with support for both Arm Cortex A72 and Cortex A53 processors, makes it the clear choice for customers seeking to streamline certification work.

By starting with validated, documented IP blocks and leveraging deeply integrated professional services to complete the "last mile" of certification, Wind River enables customers to standardize where possible and customize where necessary. The result is the shortest, safest, and least expensive path to DO-178C compliance and approval.

EXTENDING TO MULTICORE CERTIFICATION

For programs targeting multicore avionics platforms, Wind River offers a joint solution with Rapita Systems: the industry's first fully integrated, off-the-shelf platform designed to guide DO-178C multicore certification end to end. Together, Wind River and Rapita combine certifiable OS, hypervisor, BSPs, and simulation with timing and interference analysis, qualified tools, MACH178 evidence, and expert services — providing a single process and accountable partner from SOI-1 through SOI-4.

WIND RIVER PROFESSIONAL SERVICES

The CMMI Level 3–rated Wind River Professional Services organization provides expert support across avionics software development, DO 178C certification, simulation, and multicore system integration. Working alongside customer teams, Wind River delivers custom configurations, BSP and workload optimization, certification artifact completion, and SOI 4 delta certification support. Our services help reduce integration risk, compress schedules, and ensure certification readiness across complex avionics platforms.

Contact your account manager or visit *www.windriver.com/contact* to learn more.

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WNDRVR

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