Wind River Certifiable
Intellectual Property (IP) Blocks

Streamlining the Safety Requirements of Avionics Software

In building and testing aviation electronics systems (avionics), it can take years for a single software component — even one as seemingly small as a universal serial bus (USB) port — to complete DO-178C certification. Each year, aerospace and defense companies spend hundreds of millions of dollars in the implementation, verification, detailed documentation, and approval of avionics software components.

The complexity of DO-178C compliance can be traced, in part, to the proprietary nature of avionics software. In the last few years, DO-178C compliance has become even more challenging for avionics manufacturers facing global supply chain issues, a shortage of skilled engineers, and an industry-wide migration from single-core processors to more powerful (and more complex) multi-core processors.

Despite these challenges, aircraft manufacturers can simplify the DO-178C compliance process and dramatically reduce its associated costs. This is possible by leveraging existing intellectual property (IP) from Wind River®, a global leader in avionics software solutions. Wind River has developed a substantial body of software and IP supporting DO-178C compliance that can be repurposed to help reduce costs and accelerate the various stages of development. This full software stack solution is designed to satisfy the first three stage of involvement (SOI) reviews in the typical certification authority process: planning (SOI-1), implementation (SOI-2), and verification (SOI-3).

Wind River certifiable IP blocks and DO-178C–compliant artifacts have been developed for critical avionics software components, including:

- **Wind River Helix™ Virtualization Platform with VxWorks®:** Add hypervisor capabilities to VxWorks®, a real-time operating system for virtualized workloads on multi-core processors.
- **Arm® Cortex-A72/NXP LX2160A board support package (BSP):** Provide essential device drivers for A72 multi-core processors up to Design Assurance Level (DAL) A.
- **Arm Cortex A53 Xilinx Zynq UltraScale+ MPSoC ZCU102 BSP:** Provide key device drivers for A53 multi-core processors up to DAL B specifications.
- **Simics models for the NXP LX2160A and the Xilinx Zynq UltraScale+ MPSoC ZCU102:** Utilize to simulate and test software without physical hardware.
- **RTnet real-time network stack:** Support vital network communications protocols including IP, ARP, ICMP, UDP, and TCP.
- **Information assurance foundation (IAF):** Enabling hardware security features, including confidentiality and integrity cryptographic mechanisms.

- **High-reliability file system (HRFS):** Provides a power fail-safe system designed to meet DAL A objectives.
- **Secure boot loader:** Creates a secure boot environment for both standard and complex boot sequences.

In addition to its current suite of IP blocks, Wind River also offers a software-based simulation and testing platform, Wind River Simics®, designed to replicate traditional hardware-based testing in a virtualized, software-based environment. Simics models replicate the performance of the LX2160A and the Xilinx Zynq UltraScale+ MPSoC ZCU102 multi-core processor at scale, allowing aircraft systems manufacturers to test thousands of virtual devices in software simulation prior to verification with hardware, significantly reducing code and speeding the debug and integration process.

SAVE TIME, SAVE MONEY, AND REDUCE RISK

Wind River certifiable IP blocks significantly shorten the journey to DO-178C approval. Wind River Professional Services can help aircraft manufacturers complete the last mile of the journey with software customization and SOI-4 delta completion. The result is the shortest, safest, and least expensive path to DO-178C compliance and approval.

Each IP block represents years of work and millions of dollars invested in human resources. As an example, a single device driver with tens of thousands of executable lines of code (ELOCs) could easily take two or more years between the creation, documentation, and verification stages of DO-178C. By starting with a pre-built module that has SOI-1 through SOI-3 artifacts already completed and documented, aircraft manufacturers can get projects off the ground much faster. In addition, each module costs only a fraction of what aircraft manufacturers would expect to pay to create, implement, and document their own software.

Avionics software systems will almost always require some level of customization. With Wind River, aircraft manufacturers can benefit from the best of both worlds: standardizing what they can through certifiable software components and customizing what they cannot through an industry-leading professional services team.
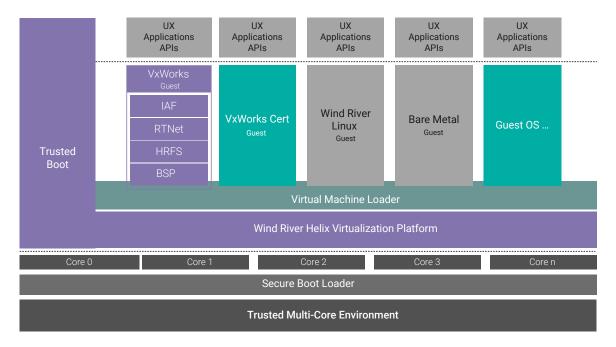

Figure 1. Certifiable software stack for multiple operating systems and mixed levels of criticality

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