



EVOLVE IMA SYSTEMS TO SUPPORT FURTHER DEVELOPMENT, CERTIFICATION, RETROFITS, AND UPGRADES

Cutting-Edge Virtualization Technology from Wind River Supports Development of ARINC 653-Compliant Multi-core Systems at Lower Cost and Risk

AVIONICS CHALLENGES

- **Affordability:** High cost of aircraft design, development, certification, retrofit, and upgrade
- **Performance and standards:** Meeting of strict regulatory constraints when implementing new capabilities

WIND RIVER SOLUTIONS

- **Wind River Helix Virtualization Platform:** A real-time, embedded, Type 1 hypervisor that can manage unmodified guest operating systems running in virtual machines, consolidating heterogeneous applications for IMA systems
- **VxWorks:** The world's leading RTOS, enabling deterministic applications scaling from very small compute packages
- **Wind River Linux:** Industry-leading open source operating system for connecting, securing, and running embedded systems and applications
- **Wind River Simics:** Software that allows developers to simulate anything, chip to system, and get the access, automation, and collaboration tools required for agile development practices
- **Wind River development tools:** Powerful tools to save developers time and increase quality

THE CHALLENGE

The global aviation industry is on the cusp of transformation. Aircraft manufacturers are facing a constant increase in demand for connectivity and capabilities that reduce pilot workload and increase situational awareness. To meet these new requirements, they adopt increasingly sophisticated innovations in products and services. The result of the increased capability of these systems is a corresponding increase in the amount of software deployed.

How can manufacturers manage the costs of aircraft design and upgrade? How can they adhere to size, weight, and power (SWaP) and performance requirements when implementing new capabilities under existing regulations?

THE APPROACH

Reducing SWaP has been a primary driver for the adoption of integrated modular avionics (IMA) architectures. The IMA approach advocates the use of common computing platforms that host multiple applications concurrently, reducing the number of platforms required in the aircraft compared to a federated architecture.

IMA is based on two fundamental principles: spatial partitioning and temporal partitioning. This partitioning ensures that the individual applications do not interfere with or affect each other. The enforcement of these principles is achieved through the specific implementation of the IMA software architecture (time slot scheduling in the case of ARINC 653) and memory management unit (MMU)-enforced separation of partitions.

Wind River® Helix™ Virtualization Platform can take multiple federated systems on an aircraft and consolidate them onto a single compute platform. This virtualization solution will allow a manufacturer to consolidate safety-critical and general-purpose applications onto a single safe, secure, and reliable platform.

Wind River Helix Virtualization Platform

Helix Platform is an adaptive software environment for aerospace and defense systems that enables support for multiple applications, from head-up displays to map display systems, weather radar displays, and speech recognition. It provides a real-time, embedded, Type 1 hypervisor that runs on Arm® or x86 multi-core processors. Applications can be legacy or can implement new capability, based on industry standards such as ARINC 653, POSIX®, or FACE™ or based on operating systems such as Linux, VxWorks®, and others. The robust partitioning allows for the integration of legacy and future applications without system redesign.

Additionally, the hypervisor can securely partition the systems to ensure that a safety-critical application has no interference or conflict from any other application or function running in another partition. Helix Platform includes VxWorks, Wind River Linux, and Wind River Simics®.

VxWorks

VxWorks is a real-time operating system proven in more than 2 billion devices worldwide. It supports C11 and C++14 programming languages as well as standards-based virtualization of common devices, including serial, networking, and storage. When used within a partition managed by Helix Platform, it can run safety-critical applications, essential applications that require real-time or deterministic functions to operate an important system.

Wind River Linux

Wind River Linux is the embedded Linux distribution that provides the perfect balance between open source flexibility, commercial grade security, reliability, and support to help minimize development complexities and total cost of ownership. As a guest operating system within a Helix Platform solution, a Wind River Linux partition can be established to run Linux applications, such as communications, graphics, and more.

Wind River Simics

Simics enables software to run on virtual platforms just as it does on physical hardware. Along with its capabilities for scripting, debugging, inspection, and fault injection, Simics enables manufacturers to define, develop, and integrate systems

without the constraints of physical target hardware. This software simulation environment enables unmodified target binaries to run on a virtual platform, supporting very early prototyping before physical hardware is designed and built.

Wind River Development Tools

To enhance developer productivity, Helix Platform provides an integrated development environment with the Eclipse-based Wind River Workbench development suite. This state-of-the-art environment includes project configuration, code browsing and build, target debugging, and the Wind River System Viewer analyzer. Wind River Diab Compiler helps boost application performance; reduce memory footprint; and produce high-quality, standards-compliant object code for embedded systems.

THE RESULT

Using Helix Platform together with VxWorks, Wind River Linux, and other general-purpose systems, manufacturers can successfully develop safety-critical IMA applications. The heterogeneous support for ARINC 653, Ada, POSIX, FACE, and VxWorks applications in an IMA environment facilitates maximum software reuse and porting of existing federated applications to Helix Platform. This feature extends to legacy platforms and OS environments by employing multi-core processors and hardware virtualization to serve as an asset bridge for migration of both federated and IMA legacy platforms. A typical configuration is shown below:

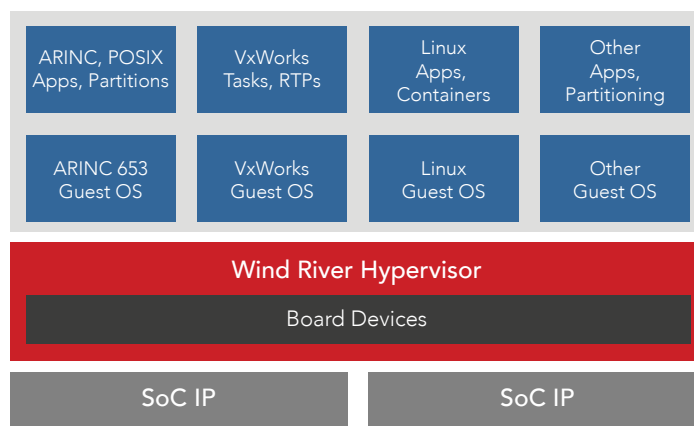


Figure 1. Helix Platform architecture

To learn more about VxWorks, virtualization, or Helix Platform, visit www.windriver.com, or contact salesinquiry@windriver.com.

