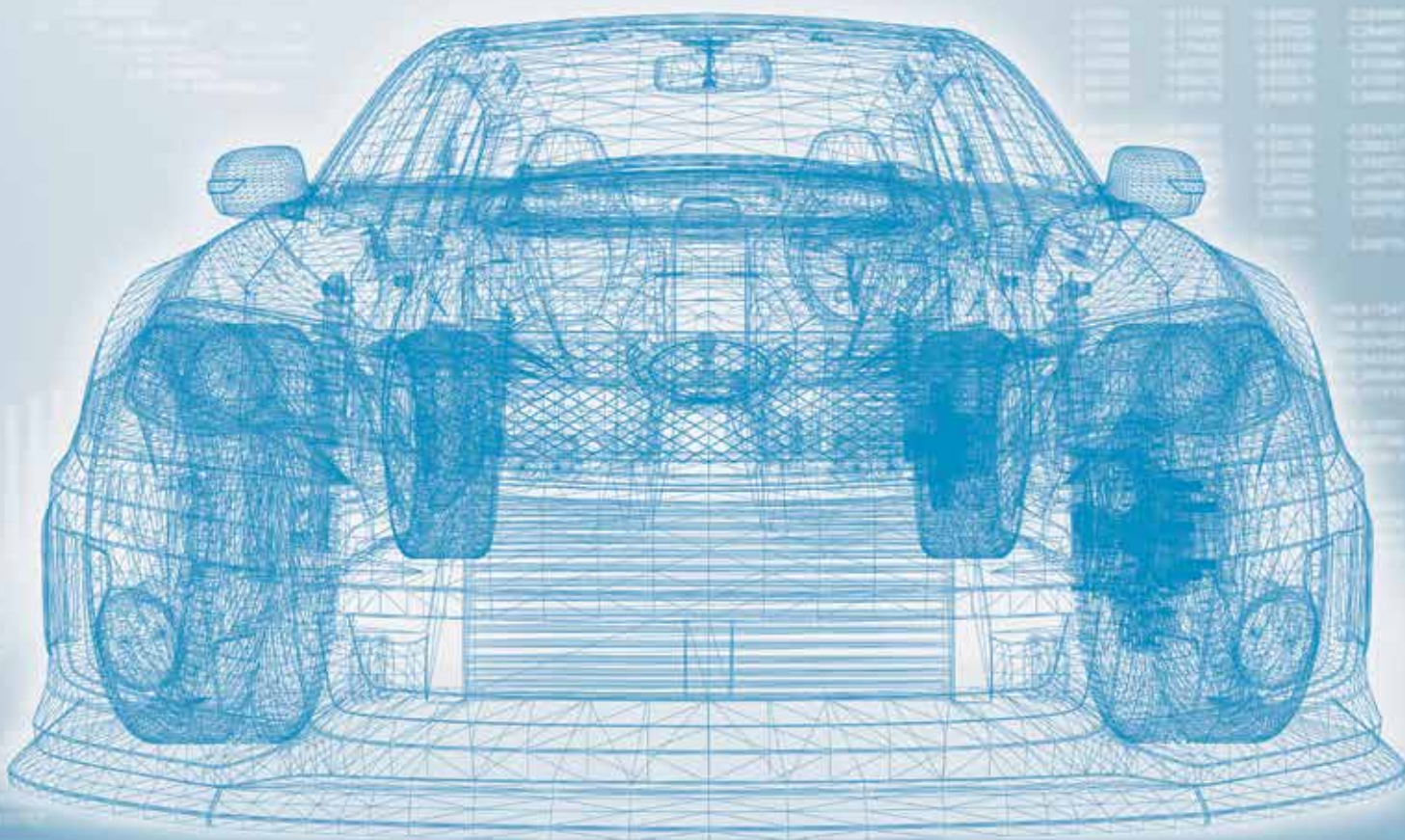




WIND RIVER AUTOMOTIVE SOLUTIONS





SIMPLIFYING THE CONNECTED AND AUTONOMOUS CAR

Connected, intelligent vehicles hold great promise, but the increasing complexities of developing, integrating, and managing a growing number of software systems are proving a major limitation to innovation and profitability for car manufacturers.

Wind River®, the leader in embedded software for the intelligent edge, applies its decades of safe and secure expertise to the software challenges of simplifying the connected and autonomous car. With technology in more than 100 million automobiles, Wind River brings together software, technologies, tools, and services to help carmakers intelligently unify, simplify, and maintain software systems in order to succeed in a rapidly evolving market.

We believe that automotive software architecture and strategy should preserve the core automotive business while enabling new experiences that support the vehicle from ideation to end of life.

DELIVERING THE PROMISE OF THE SOFTWARE-DEFINED CAR



Carmakers are racing to keep up with demands for technology in which they traditionally have limited expertise. How will they effectively manage software and ensure it lasts throughout the lifecycle of the vehicle? To deliver superior in-vehicle experiences, they must take ownership of the software and begin seeing the car as a deployment platform for new software innovations. This change requires a new model for thinking about the implementation of software—one that lets the original equipment manufacturer (OEM) fully control the inputs and the outputs.

A STRATEGY FOR OWNERSHIP: THE ACRUE MODEL



ABSTRACT

Minimize hardware and software dependencies; maintain supply chain integrity.



UPDATE

Respond quickly to software threats; develop more efficiently.



CONSOLIDATE

Lower the overall system cost; use less weight and more security.



EXTRAPOLATE

Learn from other domains.



REUSE

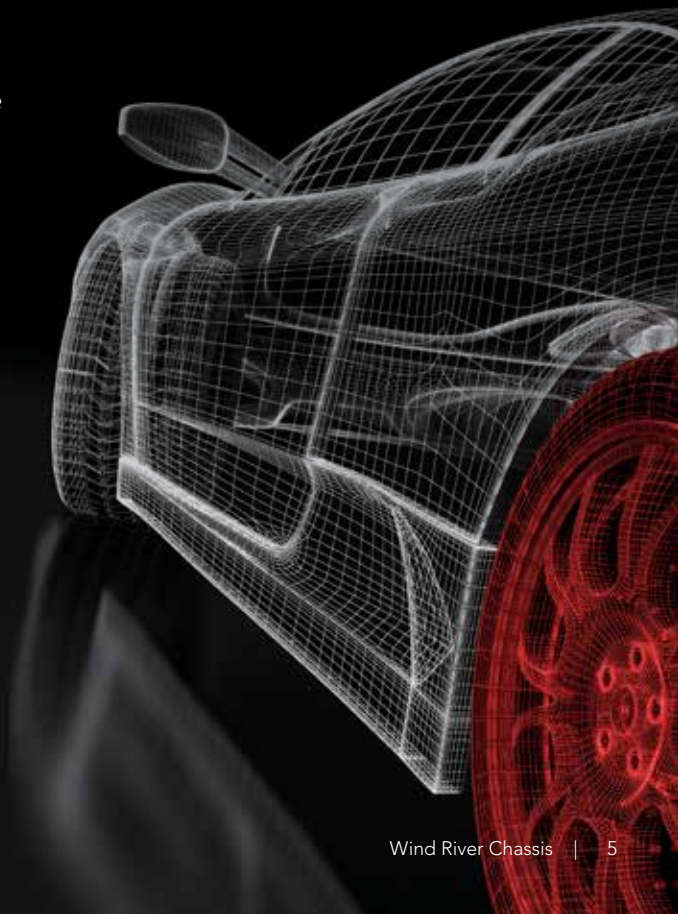
Reduce costs of deployment; speed time-to-market.

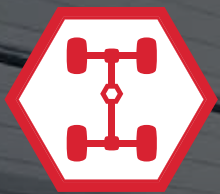




ENABLING OWNERSHIP: WIND RIVER OFFERS

- The market's most tested certified virtualization solution. It allows workloads to be **CONSOLIDATED** without worry of cross-system contamination.
- A flexible, secure, automotive **OVER-THE-AIR UPDATE** solution ensures system longevity through software lifecycle management.
- The certifiable Wind River AUTOSAR Adaptive solution allows designers to **ABSTRACT** applications from the frame-work and hardware.
- A safe and secure software framework provides a basis for decoupling high-value-add content from more operational elements of the stack that can be **REUSED** to speed development and lower cost.
- Wind River can make tomorrow's cars better by drawing from a heritage in mission-critical industries demanding rigorous levels of **SAFETY AND SECURITY**.





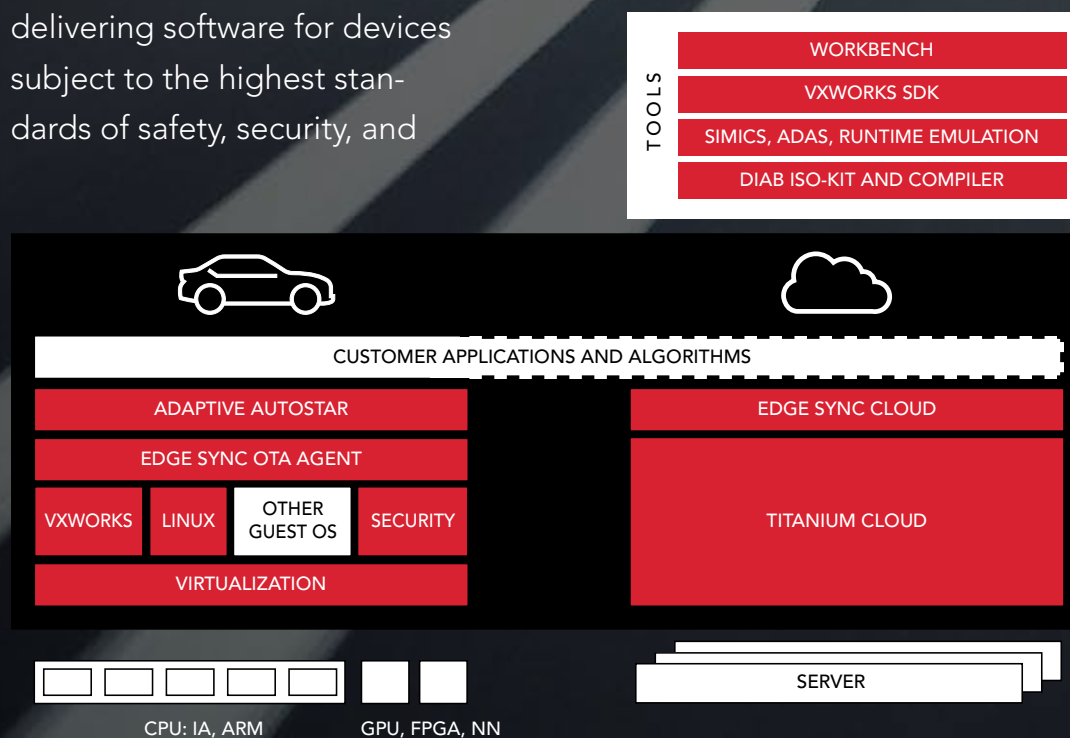
WIND RIVER AUTOMOTIVE SOLUTIONS

SAFE AND SECURE BACKBONE FOR THE SOFTWARE-DEFINED CAR

Wind River brings together software, technologies, tools, and services to help automotive manufacturers unify, simplify, and maintain software systems within vehicles and help manage their connectivity to the Internet of Things (IoT). It delivers all the components needed to define and integrate systems for controlling entertainment, navigation, drivetrain, safety, and connectivity throughout intelligent, connected, and autonomous vehicles.

Based on its proven history of delivering software for devices subject to the highest standards of safety, security, and

performance, Wind River offers VxWorks® (ISO 26262-certified by TÜV SÜD), certifiable Wind River AUTOSAR Adaptive, Wind River Linux, Wind River Cloud Platform, Wind River Edge Sync, and Wind River Diab Compiler, along with complementary tools and services. All specific components are combined with the market's most tested and certified virtualization solution that allows applications to be consolidated without worry of cross-system contamination.



OPERATING SYSTEMS

VXWORKS

VxWorks is the market-leading real-time operating system (RTOS) for deployed safety systems, delivering all the scalability, safety, security, and virtualization capabilities needed. Proven in hundreds of safety-critical projects across multiple industries and certification standards, VxWorks is also ISO 26262 certified to ASIL-D by TÜV SÜD.



- **MORE THAN 36,000** Level 3–capable automated vehicles shipped running the VxWorks RTOS
- **23% MARKET SHARE** among commercial RTOS vendors
- **ISO 26262** certified to ASIL-D by TÜV SÜD
- **BROAD SPECTRUM** of 32-bit, 64-bit, and multi-core processor support—Arm®, Intel®, and Power Architecture
- **MORE THAN 550** safety certification programs carried out for more than 550 satisfied customers



WIND RIVER LINUX

Wind River Linux is the leader in building outstanding open source embedded products, ensuring that customers work with the latest code from the most important open source efforts and most recent technologies. By taking full advantage of the open source community and adding Wind River IP as well as third-party software components, Wind River delivers a comprehensive tool portfolio. Building products using this Wind River commercial-grade platform reduces overall development costs, minimizes project risks, and shortens project timelines.



- Development and maintenance processes certified to the **ISO 9001:2015** quality management system standard
- **57% MARKET SHARE** in embedded Linux
- Access to one of the **BROADEST PARTNER ECOSYSTEMS AND BOARD SUPPORT PACKAGE LISTS** with optimized solutions for the latest NXP, Intel, LSI, Texas Instruments, and Xilinx platforms—Arm, x86, MIPS, Power

WIND RIVER HELIX VIRTUALIZATION PLATFORM



Wind River Helix™ Virtualization Platform is an edge compute software foundation that runs multiple operating systems and consolidates mixed-criticality automotive applications in a single platform, addressing the challenges you face modernizing legacy systems and innovating for the future. It delivers a proven, trusted environment that enables adoption of new software practices with a solid yet flexible foundation of known and reliable technologies on which the latest innovations can be built. Helix Platform gives you flexibility of choice for your requirements today, and adaptability for your requirements in the future.

- ✓ **OPEN, STANDARDS-BASED DEVICE VIRTUALIZATION FRAMEWORK** that efficiently enables third-party operating systems without the overhead of emulation, enabling high portability across product lines and lowering upgrade costs
- ✓ **SIMPLIFIED CERTIFICATION** of safety-critical applications according to the stringent requirements of the ISO 26262 automotive safety standards
- ✓ Modular, open architecture with robust partitioning that eliminates retesting and recertification of an entire platform when a change is made to one of the partitions, resulting in a **LOWER TOTAL COST OF OWNERSHIP**
- ✓ **HIGH-PERFORMANCE AND DETERMINISTIC** platform for the most demanding embedded, real-time applications, with a Type 1 hypervisor that provides full control over how the hardware is configured
- ✓ Support for **ANY OPERATING SYSTEM—UNMODIFIED**—inside a virtual machine, easing portability for legacy applications mixed with modern, standards-based applications and operating systems
- ✓ Support for 64-bit **ARM AND INTEL** architectures that enable both 32- and 64-bit guest operating systems

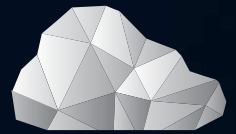
WIND RIVER AUTOSAR ADAPTIVE

The certifiable Wind River AUTOSAR Adaptive software platform is designed to help customers develop and deploy their ISO 26262 ASIL D–certifiable automotive safety-critical applications. By pre-integrating and optimizing it to run on the Wind River safety-certified operating system VxWorks, commercial grade Wind River Linux, and Helix Platform, Wind River AUTOSAR Adaptive enables automakers to build and deploy flexible and portable mixed-criticality automotive solutions.



- ✓ Offers OEMs and Tier 1s a certifiable AUTOSAR stack for developing next-generation vehicle experiences, pre-integrated with an **ISO 26262 ASIL D–CERTIFIED** operating system and virtualization platforms
- ✓ Tailor-made to address the most critical needs of advanced driver assist systems (ADAS) and **AUTONOMOUS DRIVING** technologies
- ✓ **LOWERS TOTAL COST OF OPERATIONS** through avoided software development costs and reusable software modules
- ✓ Achieves **FASTER TIME-TO-MARKET** by pre-integrating the AUTOSAR Adaptive stack with VxWorks, Helix Platform, and Wind River Linux
- ✓ Follows **OPEN STANDARDS** with no lock-in to allow control and flexibility in choosing IP, as well as the ability to focus on applications independently of the underlying hardware or operating system
- ✓ **FUTURE PROOF**, enabling software updates and upgrades to adaptive applications and services

WIND RIVER CLOUD PLATFORM



Cloud Platform is the production-grade Kubernetes solution providing the industry's smallest footprint for network virtualization and distributed cloud solutions. It eliminates the need for additional controller hardware and combines workload applications, storage, and controller functions on two servers to deliver full carrier grade reliability and performance. It also offers the telco-grade security, high-performance efficiency, and ultra-low latency needed for applications such as multi-access edge computing (MEC).

- **MERGED REALITY** for improved navigation and an enhanced driver (passenger) experience
- Compatibility and **FUTURE PROOFING** with APIs based on open source and de facto open standards
- **MEC TECHNOLOGY** that enables applications running in cloud data centers at the edge of the network to respond in real time to high-speed data from connected cars
- End-to-end **SECURITY**



WIND RIVER TOOLS

WIND RIVER EDGE SYNC

Edge Sync is a robust over-the-air (OTA) update and software lifecycle management solution for remotely maintaining the integrity of embedded systems while collecting critical data across the entire lifecycle of the vehicle, both pre- and post-production.

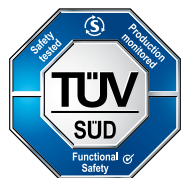
- Enables **NEW REVENUE STREAMS** through analysis and monetization of vehicle data, feature updates, and vehicle performance
- Generates the **SMALLEST DELTA FILE UPDATES**, reducing cost, distribution and update time, and memory consumed on the ECUs
- **REMOTELY** distributes maintenance updates, security patches, and performance and feature enhancements throughout the lifetime of the vehicle
- **ELIMINATES SOFTWARE RECALLS** and associated warranty and service visit costs



WIND RIVER DIAB COMPILER

Diab Compiler is a critical tool certified by TÜV SÜD to be suitable for developing safety-related software and to support automotive customers with the creation of safety artifacts that meet their end product's safety certification requirements.

- Developed using an **AUTOMOTIVE SPICE** (Software Process Improvement and Capability Determination) Level 2 process
- Unique **OPTIMIZATION** technology that generates extremely fast, high-quality object code in the smallest possible footprint
- TCL1–TCL3 tool suitable for developing safety-related software for both **ISO 26262 (ASIL)** and **IEC 61508 (SIL)** up to the highest defined levels of safety





WIND RIVER SIMICS

With Wind River Simics® you can simulate anything, chip to system, and get the access, automation, and collaboration tools required for Agile development practices. Simics opens up new possibilities for Agile development and allows teams to accelerate their timelines as well as successfully address design and test scenarios virtually impossible to replicate via traditional methods. By using Simics to develop, test, and overcome problems much sooner in the development cycle, customers can create higher-quality code, stay in control of costs, and ultimately get to market faster.

- **OPTIMIZE DEBUG TIME** by over 30%, while simultaneously increasing quality by finding bugs sooner
- Reduce costs with virtual labs, which are up to **93% LESS EXPENSIVE** than physical labs and require less than 5% of the space
- **VALIDATE** diagnostic software for safety-critical systems
- **SIMULATE, TEST, AND DEBUG** sensors individually and collectively; simulate the effects of thousands of nodes on connected units; debug the entire distributed system as one unit

WIND RIVER PROFESSIONAL SERVICES

Wind River Professional Services provides access to comprehensive knowledge and expertise to help our customers unlock the full potential of Wind River products, dramatically reducing the risks and time associated with creating and integrating new technologies. The CMMI® Institute has appraised our Connective Vehicle Solutions and Professional Services at a Capability Maturity Model Integration (CMMI) Level 3, underscoring our dedication to continuous improvement and producing quality solutions and services that make a difference.

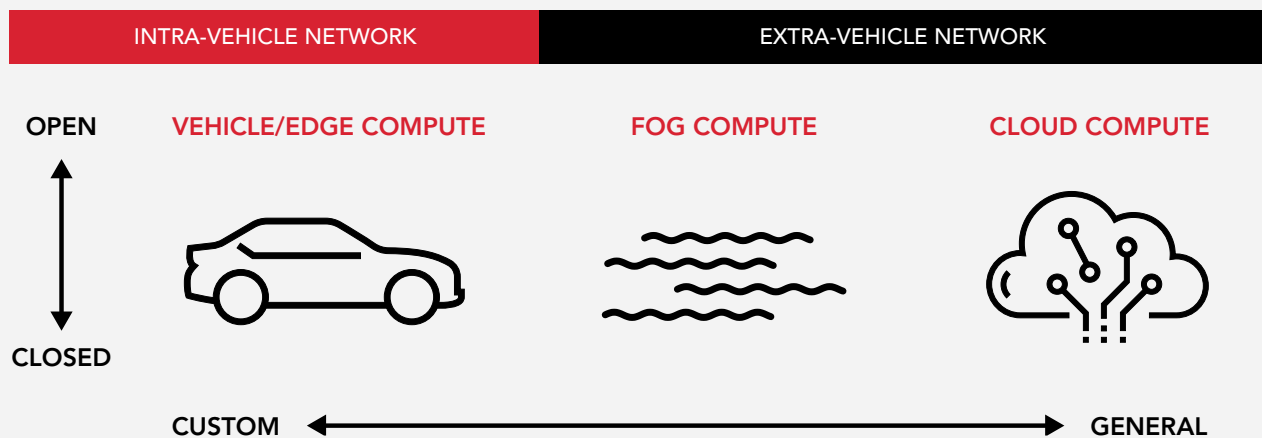
Our expertise has helped our OEM and Tier 1 customers achieve driver safety and optimize human-machine interface (HMI) usage, software and infrastructure security and connectivity, location-based services, mobile device synchronization, and data analytics.



- **20 YEARS'** experience in safety certification software products
- **CMMI LEVEL 3** and A-Spice development
- **MORE THAN 400** dedicated automotive engineers in worldwide design centers that offer local support and distributed development teams
- Average developer has **5+ YEARS** automotive experience
- Concept, prototype, and **MASS PRODUCTION** development experience
- **OVER 200** automotive projects delivered annually



IMPROVES PERFORMANCE INSIDE THE CAR AND BOOSTS CONNECTIVITY TO IOT



INTRA-VEHICLE NETWORK

- Wired and wireless components
- Adaptable and extensible software
- Abstraction between software and hardware
- Extension of safety and security to all networked components, both native and tethered
- More centralized computing/processing
- Active and passive lifecycle management
- Interoperability
- Security

EXTRA-VEHICLE NETWORK

- Virtual computing environments
- Virtual development, test, and build environments
- Data aggregation
- Evolving protocols
- Continually emerging threats
- Dynamic value propositions
- Continuous updates
- Data and analytics
- Security

A GLOBAL LEADER IN SOFTWARE FOR SAFETY-CRITICAL SYSTEMS

Wind River software runs more than 2 billion devices in environments subject to the highest standards of safety, security, and performance across the automotive, aerospace, defense, medical, industrial, and networking industries.

After nearly 40 years of experience in safety and 20 years of working with the highest levels of certification, we are confident that our solutions can also bring the highest levels of safety, security, and reliability on the roads.

AUTOMOTIVE EXPERTISE

- Advanced embedded software for automotive innovation
- 40+ years of leadership in secure, safety-critical software development and integration
- 36,000+ Level-3 capable automated vehicles shipped running the VxWorks RTOS
- Complete portfolio of automotive services, software, and tools
- Safest and most secure network stack in the industry, designed specifically for real-time deterministic use cases
- 70+ automotive clients across six continents





Speak with one of our automotive experts to discuss how
Wind River can help you build the next generation
of intelligent, connected vehicles.

CONTACT US

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Visit www.auto.windriver.com