From Blueprint to Production:

Qorix Adaptive – TÜV-certified and production-ready, delivering ADAS innovation on proven automotive platforms.

Overview

▶▶ **As part of the ADAS in today's modern automobiles, ACC is an essential application for enhancing driver convenience and functional safety. Qorix, Red Hat, and ZF collaborated to craft an efficient, blueprint platform solution for original equipment manufacturers (OEMs) adoption in modern SDVs.**

Accelerated speed with reduced costs

As automotive systems evolve towards high-performance computing platforms, manufacturers face challenges in managing mixed workloads, particularly with safety and non-safety applications running on shared hardware. Automakers are often still seeking to break away from hardware-centric, highly sequential platform architecture that does not scale well across product lines and model years. Additionally, proprietary operating systems (OS), tightly coupled to each new hardware design, are still the rule in automotive. These OSs generally require lengthy commercial negotiation for licensing and access before development can begin, causing costly delays early in the software development cycle.

The industry is increasingly recognizing the imperative to move faster, with greater resource efficiency and cost effectiveness, taking advantage of modern, open technologies, within the open source community and the broader ecosystem. This also means embracing open standards and open collaboration and adopting DevOps methodologies and modern, cloud-native technologies to support rapid, continuous innovation required for the software-defined vehicles (SDVs).

A pre-integrated joint solution offers tremendous value in stakeholder collaboration:

▶ Qorix delivers a leading TÜV-safety-certified AUTOSAR Adaptive stack, providing automakers with a middleware that ensures safety, long-term support, and lifecycle maintenance.

▶ Red Hat provides a Linux®-based in-vehicle OS, supporting efficient resource utilization, mixed-criticality workload handling, and integration with modern DevOps development approaches and cloud-native toolchains.

▶ ZF contributes a production-grade electric control unit (ECU) hardware, proven adaptive cruise control (ACC) application with 20 years of volume production, and extensive advanced driver assistance system (ADAS) expertise.

▶▶ **Qorix's TÜV-certified middleware expertise, ZF's proven electronic control unit ECU hardware and ADAS domain knowledge, pre-integrated on the safety-certified Red Hat In-Vehicle OS, work together to provide a reference architecture that shortens integration timelines, reduces development risks, and accelerates the deployment of SDV platforms.**

Qorix middleware solutions

Qorix offers a comprehensive portfolio of middleware solutions that support OEMs and Tier-1 suppliers to focus on delivering innovation on top of a stable and production-ready foundation.

The portfolio includes:

▸ Qorix AUTOSAR Classic and Qorix AUTOSAR Adaptive: Both TÜV-certified and series-proven, supporting safety-critical automotive domains across all ECU classes.

▸ Qorix Performance: A non-AUTOSAR middleware designed for high-performance ECUs and real-time orchestration, bridging Eclipse S-CORE open innovation with industrial-grade deployment.

▸ Qorix Developer: A configuration and tooling environment that simplifies setup, validation, and lifecycle maintenance of complex software stacks.

▸ Qorix Bootloader: Modular, secure, and OEM-tailored solution for automotive ECUs. Flexible across leading controller families, it provides faster porting and licensing options for series-ready deployments.

This initial integration solution features the Qorix AUTOSAR Adaptive running on Red Hat® In-Vehicle OS. Qorix Adaptive is designed for complex automotive applications that require flexible and dynamic architectures with high-performance ECUs, including autonomous driving (AD)-ADAS, digital cockpits, zonal architectures, high-performance compute platforms, and powertrain systems. It is TÜV-certified for International Organization for Standardization (ISO) 26262 and Automotive Safety Integrity Level B (ASIL B).

Qorix Adaptive features a service-oriented architecture (SOA), simplifying development, delivering interoperability and ease of integration, as well as dynamic updates support. The middleware includes a zero-copy interprocess communication that delivers high performance in communication. The stack includes a configurable optimized boot sequence and static discovery and supports advanced security features.

▸▸ **Complementing this with off-board solutions, such as Red Hat OpenShift® and the Qorix Developer software development kit (SDK), help OEMs build and deploy SDV applications more efficiently.**

Red Hat automotive solutions

Red Hat In-Vehicle OS and hybrid cloud platform portfolio offer automotive developers modern software solutions that ensure reliable, predictable behavior for safety-critical systems, even under high load conditions, crucial for ISO 26262 compliance. Red Hat In-Vehicle OS has achieved functional safety certification, to level ASIL B of the ISO 26262 automotive standard, as a Safety Element Out of Context (SEooC), ensuring safety and reusability throughout OEM production series and across models. Importantly, safety recertification is integrated into the OS development and validation process for maximum agility.

Red Hat has achieved this certification through an innovative container-based solution that ensures Freedom From Interference (FFI) for safety applications by isolating quality management (QM) applications and their resource requirements in a QM partition. While virtual machine (VM) isolation is also supported, this container-based approach provides efficient resource use and greater flexibility and serviceability in deployed applications.

In addition to these benefits, Red Hat In-Vehicle OS also delivers real-time responsiveness, with the PREEMPT_RT support enabled by default, long-term lifecycle support, regular security patches, and over-the-air (OTA) updates support with A/B and rollback for continuous innovation and serviceability.

ZF production-ready ECU and ACC solutions

ZF Parking ECU (PECU) is an affordable and scalable electronic control unit developed to host a variety of automated parking functions, such as automated park assist (APA), automated memorized parking (AMP), and remote park assist (RPA). Its core is a TI TDA4 system-on-chip with 22.000 Dhrystone MIPS (DMIPS) and an 8 TOPS graphics processing unit (GPU), along with several video deserializers, ultrasonic sensor ports, as well as 2 control area networks (CANs) and 1 Ethernet connector in its periphery.

ZF Adaptive Cruise Control (ACC) is an advanced driver assistance system that automatically adjusts a vehicle's speed to maintain a safe following distance and has been in volume production for more than 20 years. Using camera and optional radar sensors, it detects surrounding vehicles as well as other traffic-relevant information to slow down or accelerate without driver input.

ZF ACC is an affordable option that enhances driving comfort and safety by adjusting speed for the vehicle ahead, upcoming intersections, tight curves, traffic signs and speed limits and traffic lights in highway, rural, and urban environments. It features full-speed ACC with stop and go and advanced feature sets that achieve a Euro NCAP 5-star rating and maintain a smooth ride by supporting early cut-in, overtaking, and merge-in detection maneuvers.

A proven ECU hardware platform

The ZF ACC function runs on top of the Qorix Adaptive middleware solution and Red Hat In-Vehicle OS, combined as a foundational ADAS platform. The hardware platform for the demonstrator is the production-grade ZF Parking ECU.

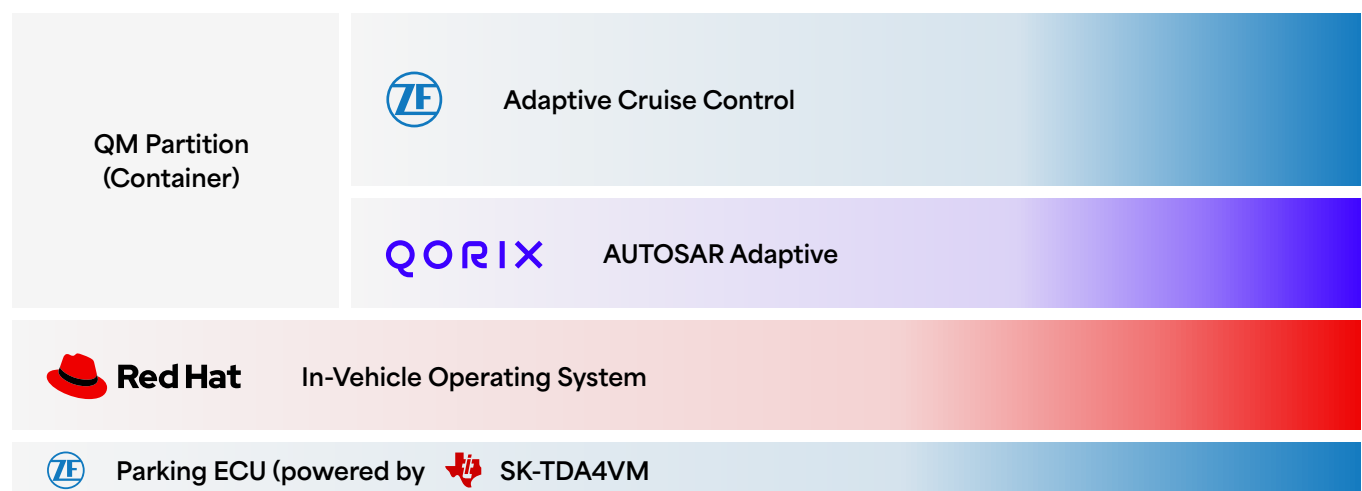| QM Partition (Container) | **ZF** Adaptive Cruise Control |
	QORIX AUTOSAR Adaptive
Red Hat In-Vehicle Operating System	
ZF Parking ECU (powered by SK-TDA4VM)	

Image: Reference solution blueprint

Demonstrator configuration

By combining Qorix's TÜV-certified middleware expertise, ZF's proven ECU hardware and ADAS domain knowledge, pre-integrated on the safety-certified Red Hat In-Vehicle OS, automotive manufacturers get a reference architecture that shortens integration timelines, reduces development risks, and accelerates the deployment of SDV platforms.

Learn more about Red Hat and ZF

🌐 **Red Hat automotive solutions**　　　🌐 **ZF automotive solutions**

About Qorix

Qorix is a technology company that develops innovative, robust middleware solutions for software-defined vehicles (SDVs). We help automotive manufacturers and suppliers manage increasing software complexity while maintaining control over their architecture. Our middleware creates a secure, scalable, and powerful software ecosystem for next-generation vehicles, providing support from platform integration to the long term.

Our portfolio includes AUTOSAR Classic and Adaptive platforms, both of which are TÜV-certified, as well as our proprietary performance stack for high-performance computers and real-time integration. With a global team of around 300 experts, Qorix delivers software products for leading original equipment manufacturer (OEM) and tier one (Tier-1) programs.

As a joint venture between KPIT Technologies, Qualcomm Ventures, and ZF, Qorix combines deep software expertise with comprehensive automotive knowledge. We are members of the VDA, AUTOSAR, and the Eclipse Foundation and actively shape tomorrow's mobility standards.

Learn more at **www.qorix.ai**