

# SOLUTIONS FOR RAIL

FOUNDATIONAL SOFTWARE FOR  
TOMORROW'S RAIL SYSTEMS



# FOUNDATIONAL SOFTWARE SOLUTIONS

Rail transportation is growing rapidly as trends such as urbanization, green energy, digitalization and autonomous rail technology drive demand for modern and smart railway systems. Functional safety and cybersecurity are top of mind as new software-defined rail systems are developed and communities and rail companies reimagine mass transit.

Increased ridership and the demands of freight paired with aging infrastructures are driving investments to refurbish signaling systems, rail yards, wayside systems, operations control centers and rolling stock. Costly maintenance of analog and legacy hardware, often from manufacturers long out of business, is creating opportunities for new software-driven infrastructures, as is the migration to green, sustainable energy technologies.

Automated safety systems, such as Rail Control systems, Positive Train Control (PTC), Automatic Train Operation and fully autonomous rapid transit monitored by remote operation control centers are increasingly part of the solution. These systems are supported by modern sensors and software solutions retrofitted to railway tracks and signaling systems to provide additional safety mechanisms for the locomotives and rolling stock, the tracks and the public.

Intelligent, automated software-defined systems are the foundation of railway digitalization; they enable advanced efficient control, communication, monitoring, maintenance and response in rail

networks. At the same time, safety requirements loom large, as do cybersecurity challenges due to increased connectivity, automation and Internet of Things (IoT) integration. Regulatory compliance is increasing at the same time manufacturers need to control the lifetime cost of equipment that must run reliably, securely and safely for decades.

BlackBerry® QNX® works closely with its rail partners to deliver the expertise and technologies needed to help them adapt and thrive in this changing environment. BlackBerry QNX provides robust, safe and secure embedded software solutions that are trusted throughout the global rail industry and beyond. We help rail manufacturers and suppliers like you develop safe and secure systems with lower costs over long product lifecycles. A foundation of BlackBerry QNX software can maximize reliability, increase system longevity and ease maintenance.



**300+**

million  
mission-critical  
systems

**100%**

success rate  
achieving safety  
certification

**40+**

years building  
trusted embedded  
software





# WHY LEADING RAIL MANUFACTURERS CHOOSE BLACKBERRY QNX

BlackBerry QNX helps rail manufacturers and suppliers to overcome many challenges at once. The same QNX® operating system that enables rail companies to build in functional safety and cybersecurity also helps them to improve reliability, simplify safety certification and reduce costs over the lifetime of rail systems.

At the heart of BlackBerry QNX embedded solutions is the microkernel QNX® Neutrino® Real-Time Operating System (RTOS). The microkernel architecture minimizes downtime and reduces attack surfaces through isolation and separation of functions. Device drivers and system services run alongside applications, separated from one another and separated from the kernel. Running all OS services outside of kernel space enables highly available, fault-tolerant designs because the failure of a given application, a device driver or a service doesn't crash the kernel, other services, drivers or other applications. Building on the QNX Neutrino RTOS can help you to develop more resilient and reliable systems.

The QNX Neutrino RTOS also improves design flexibility. QNX-based systems are easier to develop, debug, configure, reconfigure and expand than are systems based on any monolithic kernel. With a microkernel architecture, the QNX Neutrino RTOS scales from single core to multicore to high-performance computing platforms seamlessly. If a system has a very limited capability and functionality, the microkernel design can jettison excess services to fit in a very small footprint with very little memory.

Additionally, with the QNX® Hypervisor and its safety variant, the QNX® Hypervisor for Safety, you can contain entire systems with their OSs as guests in hypervisor virtual machines. This means that you can port legacy code built on different OSs (e.g., Android™, Linux®) onto new SoCs and run them concurrently with your latest product. You can also implement new features or upgrade entire systems in virtual machines, confident that the new code won't affect other systems, including safety-critical systems, running on the SoC.





BlackBerry QNX safety services and functional safety training are available to help you successfully navigate your next certification project. We offer trusted expertise in safety and cybersecurity standards, such as IEC 61508, the basis for industry standards, and rail-specific standards, such as EN 50128 for railway control and protection, EN 50129 for signaling and EN 50657 for rolling stock.

## ACCELERATE SAFETY CERTIFICATION

Safety is a grave concern for the rail industry and regulators worldwide. Certifying a system to industry standards like IEC 61508, EN 50128 or EN 50657 is time-consuming and costly—and an almost impossible task with an open source OS, such as Linux. The use of a safety pre-certified OS or hypervisor greatly simplifies your development and testing effort and shortens overall system certification processes. BlackBerry QNX solutions help developers build safe systems that deliver real-time performance.

Using pre-certified software and hardware components reduces the scope, risk, length and cost of rail system certification to any safety standard. BlackBerry QNX solutions are built with a focus on safety, cybersecurity and the real-time determinism needed for safe rail systems. The QNX® OS for Safety and the QNX Hypervisor for Safety are pre-certified for use in applications requiring IEC 61508 SIL 3 and can be used in systems certified to EN 50128, EN 50657 and other applicable standards.

## STRENGTHEN CYBERSECURITY

Train and signaling systems are increasingly integrated and connected—and at risk of cyberattack. A cybersecurity breach can put drivers, passengers and the public at risk. With the industry's most advanced and secure embedded RTOS for mission-critical systems, the QNX Neutrino RTOS and the QNX Hypervisor provide a layered approach to security that won't hamper functionality or performance.

Building and maintaining a secure system requires a reliable and secure OS, secure over-the-air (OTA) software updates, a secure supply chain and managed public key infrastructure (PKI) authentication. The QNX Neutrino RTOS reduces the attack surface by running all services outside of the kernel space, and provides multi-layered protection with system-wide security policies, path trust, fortified functions, access controls, security tooling and separation and isolation mechanisms. BlackBerry® Jarvis®, our software composition analysis solution, can help you to uncover and remediate software vulnerabilities in components from across your supply chain without having to access source code.

## MANAGE MIXED CRITICALITY

Rail systems often need to run safety-critical software concurrently and isolated from non-safety-critical software, such as legacy code and open source applications. Such mixed-criticality systems require a mechanism to ensure the isolation and separation of these systems. This isolation and separation can be achieved either by running each system on its own hardware platform or by using a virtualization solution to consolidate them both on a single system-on-a-chip (SoC).

The QNX Hypervisor and QNX Hypervisor for Safety enable designers to run multiple OSs and their applications as guests in virtual machines on a single SoC. These products leverage the latest Armv8 and x86-64 hardware virtualization extensions to enable developers to run diverse OSs with different criticality levels and functional safety requirements on one SoC while maintaining optimal performance.

## ESTABLISH RELIABILITY

Highly available, robust software systems for rail require a fail-proof foundation over a long product lifecycle. Rail equipment needs to boot quickly, run precisely, eliminate system crashes and ensure that the highest-priority tasks run first. A deterministic microkernel RTOS provides the foundation that rail systems need to deliver the reliability expected by customers today and into the future.

The QNX Neutrino RTOS's microkernel architecture facilitates software component updates. Because drivers and services run outside the kernel space, they can be added and upgraded with minimal impact on the kernel and the system. Similarly, if drivers and services are not safety-critical and thus outside the scope of safety-certifications, changes to them will require less work to ensure the functional safety of critical components and the overall system.

In short, the QNX microkernel architecture offers both innate reliability and a clear, low-cost strategy for upgrades that make it ideal for systems that require long-term reliability and maintainability.



## EASILY PORT YOUR SOFTWARE

Reusing application and driver code across devices and product lines can enable you to deliver new product introductions faster and drive more revenue. Committing your own resources to the development and maintenance of an OS based on an open source distribution, such as Linux, drives up costs. In contrast, BlackBerry QNX manages all OS maintenance and updates for you.

What's more, with the QNX Hypervisor, you can develop new code on the QNX Neutrino RTOS and run Linux and Android on the same SoC. If your system is safety-critical, you can use the QNX Hypervisor for Safety and use the hypervisor's safety-certified virtual machines to isolate non-safety systems from your safety-certified systems.

Rail system developers can migrate and manage legacy and Linux code by porting it to BlackBerry QNX. The QNX® Software Development Platform (SDP) is POSIX-compliant, so you can easily port any software from Linux at any phase of the software development lifecycle. Rail developers ramp up quickly on QNX software because it looks and feels like Linux and uses familiar tools, such as the Eclipse-based QNX® Momentics® IDE and the GNU compiler collection (gcc).

## REDUCE COST OF OWNERSHIP

Less downtime and maintenance, coupled with the availability of long-term customer support, can significantly reduce total cost of ownership. The development resources your company devotes to internal OS or hypervisor maintenance add up year after year, making an open source foundation impractical for systems with long lifecycles.

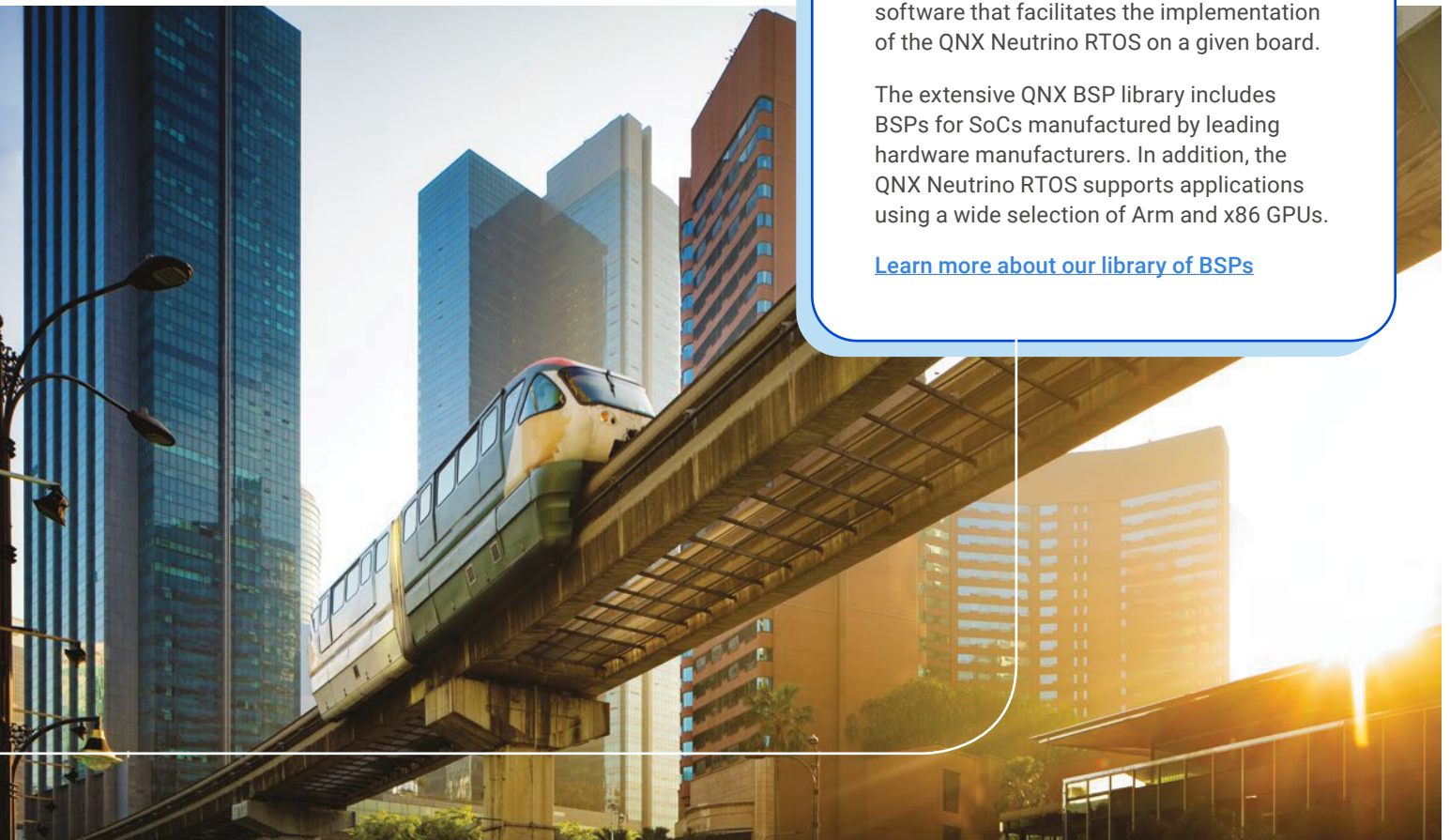
BlackBerry QNX helps rail manufacturers and equipment owners reduce costs and downtime for embedded systems that run for decades. When you use the QNX Neutrino RTOS, QNX Hypervisor solutions across product lines, you gain the flexibility of being able to build drivers and other software components once and use them across the business.

## BOARD SUPPORT

Board support packages (BSPs) and engineering services, including specialized safety and security services, streamline development timelines. BlackBerry QNX Board Support Packages (BSPs) provide an abstraction layer of hardware-specific software that facilitates the implementation of the QNX Neutrino RTOS on a given board.

The extensive QNX BSP library includes BSPs for SoCs manufactured by leading hardware manufacturers. In addition, the QNX Neutrino RTOS supports applications using a wide selection of Arm and x86 GPUs.

[Learn more about our library of BSPs](#)







Since 1980, thousands of companies have deployed QNX's real-time operating systems to ensure the ideal combination of performance, security and reliability in mission-critical systems.

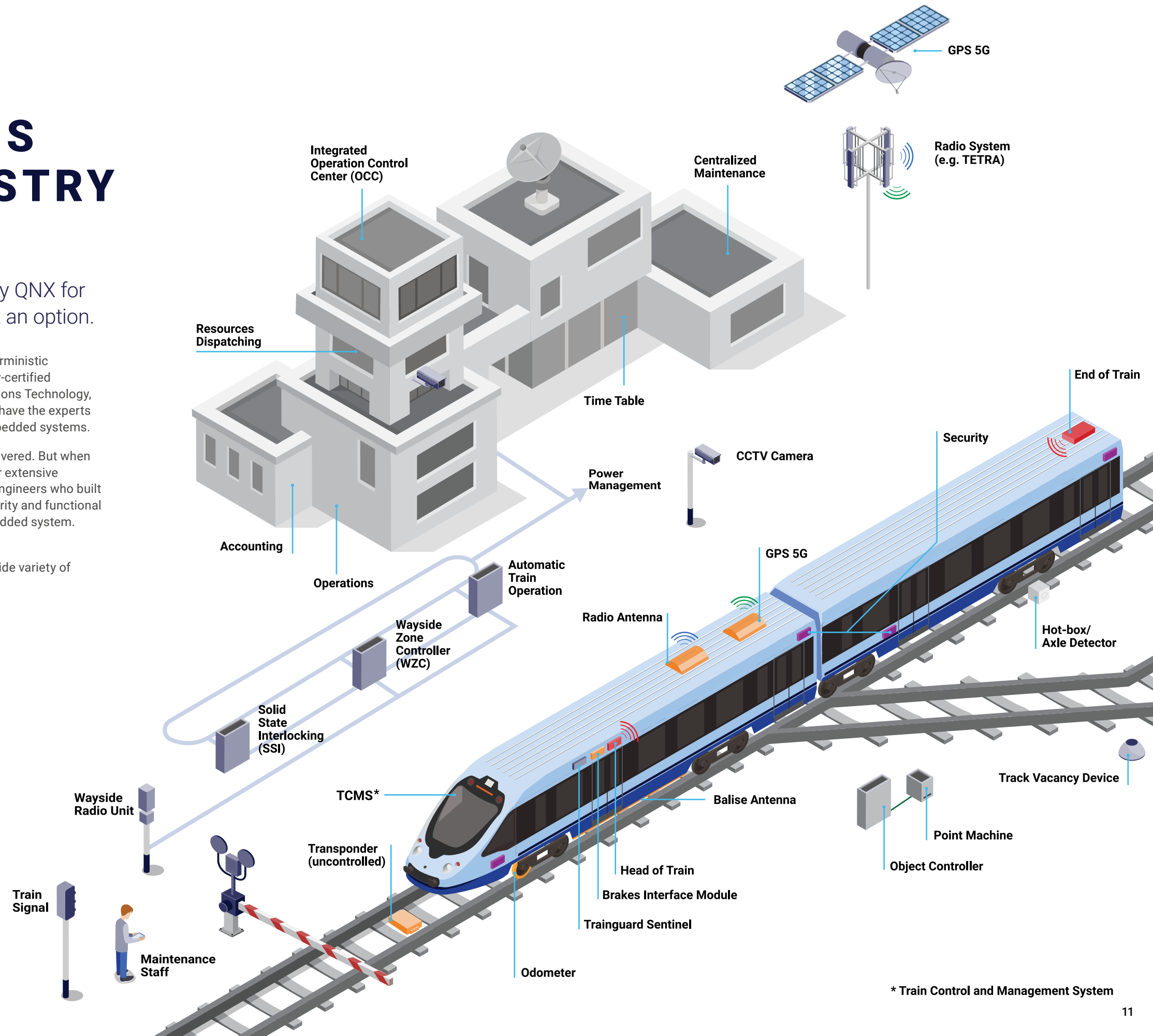
# TRUSTED SOLUTIONS FOR THE RAIL INDUSTRY

Railway technology companies globally trust BlackBerry QNX for a broad range of embedded systems where failure isn't an option.

BlackBerry QNX provides time-tested and trusted foundation software, including a deterministic microkernel real-time operating system (RTOS) and a hypervisor, along with their safety-certified variants, and other safety-certified products such as QNX® Black Channel Communications Technology, middleware, and cybersecurity solutions—all purpose-built for embedded systems. We have the experts to provide the software, support and professional services you need to build better embedded systems.

With some embedded software providers, you are on your own after the software is delivered. But when you choose BlackBerry QNX, we back up our products with top-quality support from our extensive knowledge base, best-in-class documentation and expertise from the developers and engineers who built the QNX products you use. Industry experts guide you in areas such as embedded security and functional safety. We partner with you at every step, from the inception to the launch of your embedded system. We are successful only when you are successful.

BlackBerry QNX software solutions add value to rail companies that are developing a wide variety of railway management systems, subsystems and rolling stock.



\* Train Control and Management System



# SUPPORT AND PROFESSIONAL SERVICES

BlackBerry QNX is your partner throughout your product lifecycle. We offer a range of services to help you reach your goals faster. The BlackBerry QNX professional services teams have deep knowledge of embedded systems, functional safety and cybersecurity, and a 100 percent success rate in achieving safety certifications with our customers.

Whether you need extra development resources or help kickstarting a project or certifying products, our embedded rail systems development and OS experts can provide the right knowledge and experience at the right time.



We provide professional services worldwide—driver software, board support packages (BSPs), system debugging, profiling and optimization, human-machine interface (HMI) and cloud development.



We offer flexible engagement models and deliver the highest levels of quality of service throughout your product lifecycle.



Our expertise spans the entire technology stack.



All our services are directly enabled, supported and managed by BlackBerry QNX.

### SAFETY SERVICES

The BlackBerry QNX Safety Services team has deep knowledge of functional safety. We can help customers achieve certifications such as IEC 61508, EN 50128, EN 50129 and EN 50657. We help you to reduce risk and streamline the development of your safety-certified products.

### SECURITY SERVICES

BlackBerry is synonymous with security. With specialized tools and decades of cybersecurity experience, the BlackBerry QNX Security Services team has the expertise and solutions you need to secure rail systems and supply chains. From penetration testing to a holistic appraisal of your cybersecurity posture, our team can help you address the most challenging security issues.

### CUSTOM DEVELOPMENT

BlackBerry QNX offers custom development, support packages and expert technical advice from developers, engineers and architects.

### TRAINING

BlackBerry QNX offers courses customized to the needs of your project, functional safety requirements and embedded design.

### CUSTOMER SUPPORT

BlackBerry QNX support services span the entire lifecycle of systems built with QNX solutions—including decades-long support and services.

### SOFTWARE UPDATES

BlackBerry QNX maintains its software solutions through a managed product lifecycle with regular updates and fixes.

[Learn more about our professional services and service packages.](#)





# SOFTWARE AT-A-GLANCE

## FOUNDATION PRODUCTS

<a href="#">QNX Neutrino Real-Time Operating System</a>	<p>This is a deterministic, flexible foundation for your next-generation products. The unique microkernel architecture provides features for scalability, dependability and layered security.</p>
<a href="#">QNX Hypervisor</a>	<p>This embedded virtualization solution with a microkernel architecture enables multiple OSs (QNX Neutrino RTOS, Linux, Android) to safely operate on the same system-on-a-chip (SoC).</p>
<a href="#">QNX Software Development Platform</a>	<p>This development platform for embedded systems software provides the power of the QNX Neutrino RTOS plus the QNX Momentics Tool Suite in a POSIX-compliant, Linux-like environment.</p>

## SAFETY-CERTIFIED PRODUCTS

<a href="#">QNX OS for Safety</a>	<p>The safety variant of the QNX Neutrino RTOS, the QNX OS for Safety is pre-certified to IEC 61508 SIL 3 and can be used in systems certified to EN 50128, EN 50657 and other applicable standards. Easily port Linux-based prototypes to the QNX OS for Safety and get the documentation and support you need for certification.</p>
<a href="#">QNX Hypervisor for Safety</a>	<p>Composed of the QNX OS for Safety plus safety-certified virtualization extensions, the QNX Hypervisor for Safety enables multiple OSs to run on the same system-on-a-chip (SoC), safety separated and isolated in safety-certified virtual machines. It is certifiable to EN 50128 and EN 50657 and is the first embedded hypervisor pre-certified to IEC 61508 SIL 3 and ISO 26262 ASIL D.</p>

## SECURITY SOLUTIONS

<a href="#">BlackBerry Jarvis</a>	<p>This cloud-based software composition analysis solution blends system exploration technology and expert services to help you examine a complete software product for security vulnerabilities and software craftsmanship.</p>
<a href="#">BlackBerry QNX Over the Air</a>	<p>BlackBerry QNX Over the Air (OTA) is a customized remote software update solution that addresses the complex requirements of embedded system manufacturers. OTA can be tailored to update seamlessly and securely and manage the endpoints on embedded systems.</p>
<a href="#">BlackBerry Certicom Solutions</a>	<p>BlackBerry® Certicom® provides device security, anti-counterfeiting and product authentication to deliver end-to-end security with managed public key infrastructure, code signing and other applied cryptography and key management solutions to ensure secure communications and device security.</p>

# ABOUT BLACKBERRY QNX

BlackBerry QNX is a trusted supplier of safe and secure operating systems, hypervisors, frameworks and development tools, and provides expert support and services for building the world's most critical embedded systems. The company's technology is trusted in more than 195 million vehicles and is deployed in embedded systems around the world, across a range of industries including automotive, medical devices, industrial controls, transportation, heavy machinery and robotics. Founded in 1980, BlackBerry QNX is headquartered in Ottawa, Canada, and was acquired by BlackBerry in 2010.

BlackBerry QNX software and development tools are standards-based and enable companies to adopt a scalable software platform strategy across product lines and business units. The BlackBerry QNX software portfolio, including our safety pre-certified product versions, is purpose built for embedded systems and scales to support everything from single-purpose devices to highly complex, mixed-criticality platforms. Because we believe we are not successful until you are, you can rely on our support and professional services teams to provide the expertise you need, when you need it –throughout the entire product development lifecycle.

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