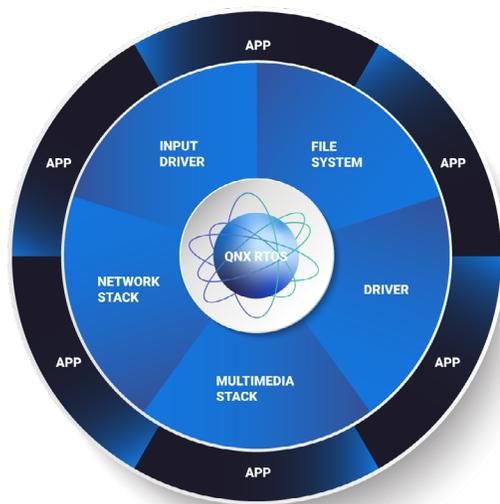# QNX Neutrino
Real-time Operating System

Guarantee CPU Cycles

The QNX Neutrino RTOS offers the determinism only a real-time OS can provide. Techniques such as adaptive partitioning guarantee critical processes get the cycles they need to complete their tasks on time, while maintaining the performance your complex embedded systems require.

Microkernel Reliability

The QNX Neutrino® RTOS's microkernel architecture isolates every application, driver, protocol stack and filesystem in its own address space, outside the kernel. This means that a failed component won't take down other components or the kernel; it can be restarted immediately with minimal impact on the rest of the system.

- Quickly add new drivers with confidence, knowing a driver failure won't mean a system failure.

- A self-monitoring high-availability manager (HAM) can perform multistage recovery when system services or processes fail or aren't responding properly.

The microkernel architecture also enabled us to safety-certify QNX OS for Safety, so you can focus on building and certifying what you build—not the OS you built it on.

Real-time Availability

The QNX Neutrino RTOS ensures system resources are available when needed, and tasks complete when they are supposed to complete.

Designed to scale on the latest generation of multicore systems on a chip (SoCs), including ARMv8 and Intel x86-64, the QNX Neutrino RTOS supports both asymmetric multiprocessing (AMP) and symmetric multiprocessing (SMP), as well as bound multiprocessing (BMP), a QNX improvement on standard SMP processor affinity.

Our innovative adaptive partitioning enables you to guarantee that critical processes always get the CPU cycles they need. You can configure time partitions according to your particular system's requirements, so that processes that need additional power can access unused cycles from other processes' budgets.

The QNX Neutrino RTOS ensures temporal isolation while providing deterministic real-time performance.

Holistic Security

With the QNX Neutrino RTOS's layered security features and access to QNX security experts, you can take a holistic approach to security and ensure your systems are protected.

Restart Failed Components

With the QNX microkernel architecture, a component failure doesn't bring down other components or the kernel. The failed component is simply shut down and restarted without adversely affecting the rest of the system.

Board Support Packages

BlackBerry QNX has an extensive library of board support packages (BSPs) for a broad selection of ARMv8, x86-64 and older platforms.

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Comprehensive, Layered Security

The QNX Neutrino RTOS provides a comprehensive, layered approach to security. You can easily configure security profiles with the granularity you need for your systems, as well as monitor and audit their integrity.

This layered approach allows you to implement exactly the security protocols you need to mitigate threats and harden your systems, including: granular control of system privilege levels, encrypted and self-verifying filesystems implementing AES 256 encryption and lockable encryption domains, secure logging of system activities, heap, stack and memory protection, and secure boot implementing TPM and TrustZone.

The QNX Neutrino RTOS at a Glance

Microkernel Architecture
- Spatial isolation of OS from drivers and applications
- Fine-grained fault isolation and recovery
- Message-passing design for modular, well-formed systems
- Comprehensive multi-core support
- Asymmetric (AMP), symmetric (SMP) and bound multiprocessing (BMP)
- Guard pages at the end of each virtual stack to protect against stack overflow

POSIX Compliance
- Validation using PSE 54 test suite
- Supports a broad range of POSIX API specifications

Deterministic Performance
- Pre-emptive scheduler with choice of scheduling methods
- Distributed priority inheritance

Adaptive Partitioning
- Redistribute unused cycles to optimize CPU loading
- Guarantee CPU cycles to critical processes without compromising system performance

High Availability
- Heartbeat for early fault detection
- High availability manager (HAM) to restart failed or unresponsive processes and services
- Intelligent restart and transparent reconnection

Protected Direct Memory Access (DMA)
- IOMMU/SMMU Manager leverages x86 VT-d or Arm® SMMU derivatives to protect against unauthorized DMA
- Configurable boundaries for access to bus devices
- Boundary violation monitoring and management

Processor Support
- 64-bit support for the latest ARMv8 and x86-64 SoCs
- Continued 32-bit support for ARMv7 SoCs

Networking and Connectivity
- WiFi 802.11 a/b/g/n
- Full IPv4 and IPv6 stack
- USB 3.x, host, device and on-the-go (OTG)
- PCIe
- Integrations with eAVB, TSN, SOME/IP, RTPS, DBUS, DDS
- Support for network applications, including NFS, SSH, DHCP and DNS

Layered Security
- Granular control of system privilege levels
- Self-verifying filesystems with AES 256 encryption
- Secure system activity logging
- Heap, stack and memory protection
- Rootless execution
- Secure boot implementing TPM and TrustZone

File Systems
- Image file system (IFS), RAM, Flash, QNX6 Power-Safe, QNX Trusted Disk, Compressed
- UDF, NVMe, HFS+, Linux, DOS, CD-ROM, CIFS, NFS and NTFS

Graphics and HMI Technologies
- Screen composition manager supporting multiple graphics technologies
- Single, unified interface from multiple UI sources
- Leverages GPU acceleration and supports multi-touch input and video capture

Instrumented Microkernel
- System-wide performance analysis and optimization
- Rapid detection of timing conflicts, hidden faults, etc.

Support and Documentation
- Architecture overviews
- Programming and configuration guides
- Complete API references
- Board Support Packages

Related Products

QNX OS for Safety
Need to safety certify your system? The QNX OS for Safety is the only embedded OS certified to IEC 61508 SIL3, IEC 62304 for Class C devices, and ISO 26262 at ASIL D.

QNX Hypervisor
Need to run diverse OSs on the same board? The QNX Hypervisor lets you run multiple OSs on the same SoC: QNX Neutrino RTOS, QNX OS for Safety, Linux and Android.

QNX Momentics Tool Suite
Work with a mix of languages (e.g., C, C++ and Python), and develop for multiple SoC architectures (ARM and x86) simultaneously in a familiar Eclipse-based environment.

BlackBerry QNX Professional Services

We've helped thousands of clients build safe, secure and reliable systems on QNX. BlackBerry QNX system architects and engineers are here to guide you through the complex process of aligning software, hardware and processes to achieve your project goals.

Porting Assessment
This engagement will help you better understand the effort and resources required to port your prototype or project from your current OS to the QNX Neutrino RTOS.

Architecture Assessment
An experienced architect will do a thorough review of your embedded system or application architecture and provide recommendations and artefacts to help you increase reliability and shorten time-to-market

Safety Services
We offer functional safety training, consulting, custom development, root cause analysis and troubleshooting, system-level optimization and onsite services across a range of industries and systems. Let us help you with your certification journey.

Security Services
We can evaluate your software assets to identify vulnerabilities and recommend specific remediation actions. From penetration testing to a holistic appraisal of your company's security posture, our teams of security experts can assess and address security issues with your processes or products at every stage of your software development life cycle (SDLC).

QNX Software Center

Take the guesswork out of managing multiple, complex software installations. With the QNX Software Center, product dependencies are automatically managed and pro-active alerts are sent when relevant product releases, patches or security updates are available.

About BlackBerry® QNX®

BlackBerry QNX is a leading supplier of safe, secure, and trusted operating systems, middleware, development tools, and engineering services for mission-critical embedded systems. BlackBerry QNX helps customers develop and deliver complex and connected next generation systems on time. Their technology is trusted in over 150 million vehicles and more than 300 million embedded systems in medical, industrial automation, energy, and defense and aerospace markets. Founded in 1980, BlackBerry QNX is headquartered in Ottawa, Canada and was acquired by BlackBerry in 2010

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