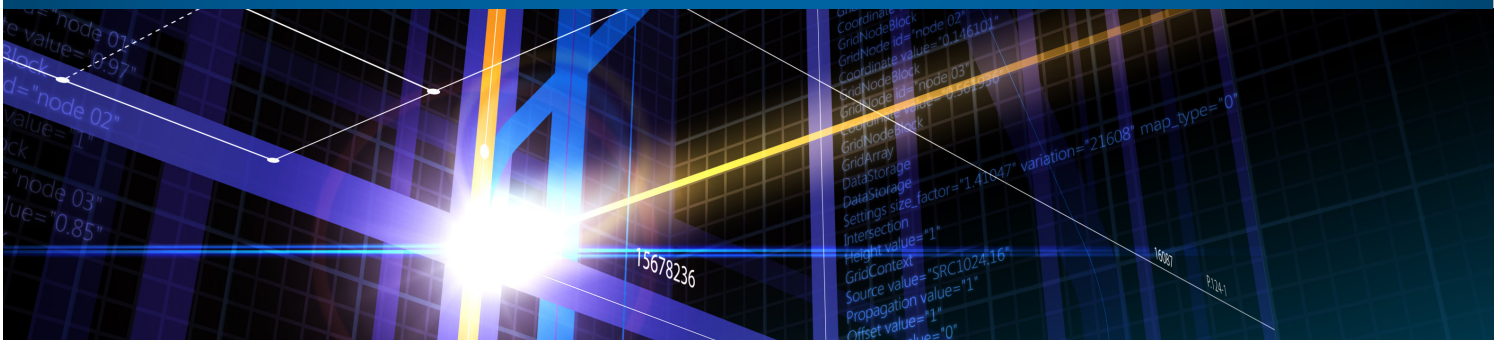
QNX Hypervisor

Virtualization, safety-critical isolation, and mission-critical reliability for embedded systems



By supporting the clean separation and isolation of critical and non-critical applications on a single platform, virtualization – employed through the use of a hypervisor – allows embedded systems developers to reduce the cost, size, weight, and power consumption of their systems designs. The QNX® Hypervisor enables developers to assign critical functions to a real-time operating system (the QNX Neutrino® OS), while using a separate operating system for GUI or device management operations.

Best-in-class technology

The QNX Hypervisor is a realtime, Type 1 hypervisor that is ideal for use in industrial automation systems and medical devices, as well as for car infotainment systems, advanced driver assistance systems (ADAS), and digital instrument clusters. The QNX Hypervisor has been architected to support operating system "guests" that are well suited to safety-critical applications while also supporting those designed to deliver compelling graphics capabilities. Preliminary hypervisor benchmark tests yield performance impacts in the very low single-digit percentage range, consistent with the design criteria that QNX Hypervisor be suitable to support requirements in automotive systems such as fast boot, early splash screen, and backup camera support.

Share devices and graphics

In embedded systems that use a hypervisor, it is still desirable to share some components for cost savings, reduced development time, and operational efficiency. The QNX Hypervisor employs patented and patent-pending technologies that simplify the sharing of common elements across the entire system. For example, multiple operating systems can use a single display controller to render graphics content onto multiple displays, such as a digital instrument cluster and an infotainment touchscreen. The QNX Hypervisor can also simplify the sharing of other resources, network connections, file systems, and other I/O devices such as the I^2C serial bus.

Developers can avoid writing custom, shared-device drivers, which reduces testing and certification costs, and allows them to take advantage of the higher performance that is typical with vendor-supplied device drivers. Other forms of inter-guest communication are handled by shared memory or TCP/IP over virtual Ethernet.

Preserve safety certifications

The QNX Hypervisor makes it easier to obtain and maintain safety certifications by separating safety-critical components from non-critical ones in two separate guest OSs. Safety certifications can be achieved only on the components that need it, and de-scoped for those that do not. Different parts of the system can then be updated independently without impacting certifications. The QNX Hypervisor complies with IEC 61508 for industrial safety, IEC 62304 for medical device software, and IOS 26262 for automotive safety.

More options for isolation and separation of mission-critical apps

There is a trend in the embedded market towards adding general purposes OSs with industry-standard interfaces and compelling graphics to hard real-time systems. To do this properly requires the separation and isolation of critical functions from these non-critical ones. QNX offers all of the key components for developing consolidated, safety-certified, real-time solutions with separation and isolation, including microkernel OS architecture, adaptive partitioning technology, ISO-certified OS products, and now, a virtualization solution.

Hardware and OS support

The QNX Hypervisor supports ARMv7 hardware and makes full use of the hardware support for virtualization extensions on that platform. Release 1.0 supports the following guest systems: QNX Neutrino OS 6.6 and 6.5 SP1, QNX CAR Platform for Infotainment, Linux, and Android. Please contact your local QNX Sales representative for an up-to-date list of hardware and guests as this list is constantly being expanded.

Shared devices

Sharing devices on a single hardware platform or system-on-a-chip (SoC) typically involves detailed development work specific to the device and the hypervisor. The resulting shared device drivers are custom and therefore do not have the same in-field testing that vendor-supplied drivers do. The QNX Neutrino OS supports distributed device sharing within its architecture which has been in-market for many generations of the operating system. QNX-patented Transparent Distributed Processing allows for device sharing in a much simpler manner, greatly reducing test, development, and certification efforts.

Shared GPU and graphics

QNX Software Systems has developed patent-pending technology that greatly improves the simplicity of sharing graphics processing unit (GPU) devices among virtual operating systems. This technology is used for rendering OpenGL ES and EGL content on remotely located GPU hardware regardless of where in the world, or where on the SoC, the GPU is located. With frame rates that surpass MiraCast and MirrorLink performance, this technology enables each individual virtual machine to render graphical output to individual and dedicated external displays, a core requirement for supporting the consolidation of automotive instrument clusters and infotainment systems on a single SoC, for example.

Integration with QNX Momentics® debugger

The QNX Hypervisor is integrated with the QNX Momentics Tool Suite, enabling developers to see and capture system-wide events such as interrupts, context switches, and messages between virtual machines. This greatly improves integration and debugging capabilities for virtualized platforms and cannot be done using typical debuggers, which are only aware of a single operating system.

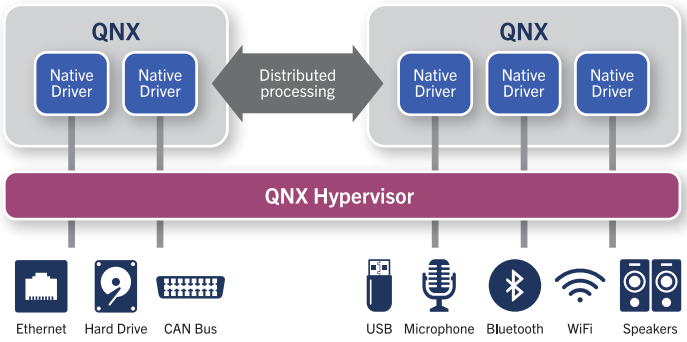


Figure 1: When both guest OSs are QNX, patented technology is used to share devices without the need to write custom drivers.

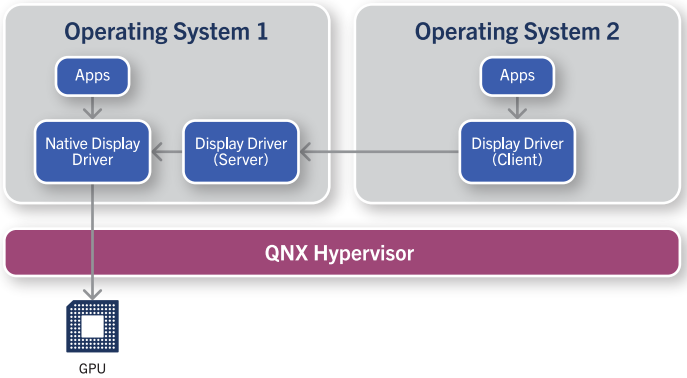


Figure 2: QNX technology allows GPU devices to be shared by guest OSs so each can render graphical output to external displays.

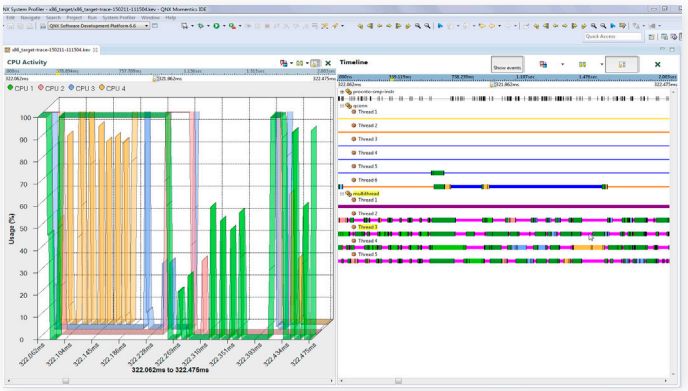


Figure 3: Integration with the QNX Momentics Tool Suite gives developers a system-wide view.

About QNX Software Systems

QNX Software Systems Limited, a subsidiary of BlackBerry, is a leading vendor of operating systems, development tools, and professional services for connected embedded systems. Global leaders such as Audi, Cisco, General Electric, Lockheed Martin, and Siemens depend on QNX technology for vehicle infotainment units, network routers, medical devices, industrial automation systems, security and defense systems, and other mission- or life-critical applications. Founded in 1980, QNX Software Systems Limited is headquartered in Ottawa, Canada; its products are distributed in more than 100 countries worldwide. **Visit www.qnx.com**