

**RTS Hypervisor**

Hardware partitioning

# Partition where you can, virtualize where you have to

Virtualization enables intelligent and complete utilization of the computing power of modern microprocessors. Additional microcontroller-based hardware is gratuitous. Virtualization is also perfectly suited when different operating systems are to be used in parallel. Real-time performance requirements often hindered the use of this technology for real-time and embedded applications, though. The RTS Hypervisor enables a combination of Real-Time and General-Purpose Operating Systems (RTOS/GPOS), as well as multiple instances of the same or different OSs on one single multi-core hardware platform – highly secure and without any added latencies.

## Hard real-time with direct hardware access

When it comes to virtualization, hardware is often at least partially emulated or managed exclusively by a single host operating system. Also, processing time is rotated among the individual OSs. Both time-slicing and hardware emulation hinder the real-time performance just as much as trapping and redirecting the instructions of the processor. An RTOS requires direct hardware access. Interrupts have to be processed without delays.

The RTS Hypervisor assures hard, uncompromised, real-time performance. Unlike conventional virtualization solutions, it allows multiple OSs to run at full speed in parallel and does not interfere with time-sensitive functions. An intervening software layer for service provision to the Hypervisor or installed OSs, which prohibits native real-time processing, is not necessary.

Interrupts are routed directly to the specific OS, ›hard-wired‹ and without adding latencies to their processing. Thanks to individual interrupt assignment, special or modified device drivers can be avoided as well.

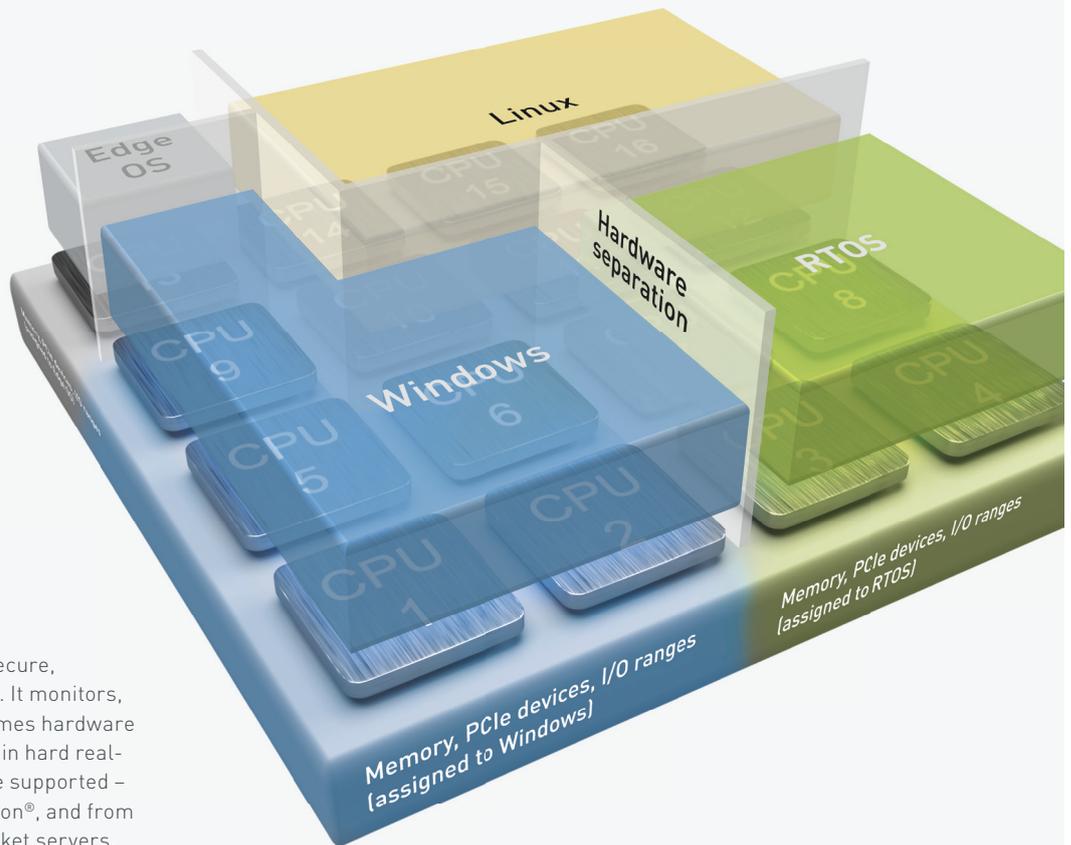
## Maximum reliability with complete separation

Thanks to exclusive resource allocation, the RTS Hypervisor guarantees safe operation. It partitions a multi-core x86 system including memory and devices into individual and independent hardware platforms. Each operating system executes tasks exclusively on the assigned processing cores.

Thanks to complete, hardware-assisted separation among the OS environments, neither the OS nor its applications can interfere with other OSs running in parallel. During operation, individual processor cores or operating systems can even reboot while the remaining systems continue to be fully operational.

Real-time applications in RTOS (e.g. Blackberry QNX) running in ›Privileged Mode‹ execute with full performance and are reliably protected from GPOS and their applications (e.g. Microsoft Windows) running in ›Virtualized Mode‹.

Temporal isolation of workloads ensures correct function of real-time applications and securely protects them from concurrent workloads.



The RTS Hypervisor provides secure, hardware-assisted partitioning. It monitors, allows, blocks, modifies, and times hardware access by GPOS. RTOS operate in hard real-time. Latest x86 processors are supported – from Intel Atom® up to Intel® Xeon®, and from mobile processors to multi-socket servers.

## Clear communication without limitations

For processors supporting Intel Hyper-Threading technology, logical cores can be regarded as separate logical CPUs. The logical CPUs can also be distributed among multiple processors.

Thanks to a virtual network, each processor core is assigned with its own IP and MAC address. Regular protocols, like TCP/IP, OPC, or CORBA enable dedicated communication between the cores. OS applications may also exchange data via user-defined shared memory partitions. In addition, an event system allows applications from different operating systems to send and receive signals via named events.

*»With resource partitioning we nearly halved the runtime jitter of our real-time applications. Now we can use the control system for our larger machines as well.«*

Manfred Wolber, HOMAG GmbH, Germany

## Your benefits

- **Deterministic and fast:** hard real-time processing with minimum jitter and no added latencies for RTOS
- **Highly secure:** independent and hardware-protected OS and BIOS operation, measured and secure boot, rights management, no backdoors
- **Flexible:** usage of multiple GPOS and RTOS on a single platform, support of several x86 processors, scalable from mobile to multi-socket server
- **Easy to use:** no customization or hardware-specific adaptation needed, works with off-the-shelf OS and standard device drivers, porting of existing applications with little effort, easy communication
- **Cost saving:** lower number of components reduces overall system costs, power consumption, and physical size of computing units, increases meantime between failure



Real-Time Systems GmbH is a leading provider of real-time virtualization, hypervisor and operating system technology for embedded and real-time systems. With an extensive knowledge of quality software design, Real-Time Systems GmbH provides a competitive advantage to their customers. The Intel® co-development partner was founded in 2006 and is headquartered in Ravensburg, Germany. Since 2018, Real-Time Systems GmbH is a company of congatec GmbH with partners in Europe, USA, and Asia.

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