

Two operating systems on one device

In addition to their real-time operating system, many machines also need a general purpose operating system to perform tasks such as aggregating data and sending it to the cloud, or to run business intelligence analytics or computationally intensive HMI applications. Traditionally, this has required the use of two separate pieces of hardware. With a bare-metal hypervisor, it is now possible to implement both systems on a single industrial PC without any compromise in performance.



Modern controllers and real-time operating systems offer extremely high performance and are able to perform a multitude of functions. Nevertheless, it is often advantageous to run additional functions and software applications on a separate operating system. "Specialized programs for simulation or 3D animations are often run on a Linux or Windows system," explains Gerd Lammers, president of Real-Time Systems. Web applications also often run in Linux or Windows environments rather than on real-time systems.



The RTS hypervisor allows all of the hardware resources of an industrial PC to be allocated unambiguously.

Lower costs

Separate hardware can be used for control and additional functions without any compromise in performance. "The advantages of an integrated solution speak for themselves," explains Lammers: faster communication and reduced space requirements in the control cabinet. The available hardware resources are also utilized more efficiently. Costs are reduced.

For many years, the solution for running multiple operating systems on a single hardware device has been virtualization. "Virtualization technology has one major disadvantage," explains Manfred Mitterbuchner, automation software manager at B&R. "The operating systems interfere with one another. If one crashes, it causes problems on the other. If one of the operating systems is responsible for controlling a machine or line, that could have grave consequences – whether that means an unplanned outage, a damaged machine or even an injured operator."

No interference

What is needed is therefore a solution that prevents interference between the two systems. "You can't have a host system with the other system running on top of it," stresses Mitterbuchner, "and you need sufficient performance to guarantee real-time behavior." The only way to achieve this is if the hardware is allocated to each operating system unambiguously. This is made possible by what is known as a bare-metal hypervisor. "It's called 'bare-metal' because it runs directly on the hardware rather than being tied to an operating system."

In cooperation with hypervisor specialist Real-Time Systems, B&R has integrated a bare-metal hypervisor into its automation system. This now makes it possible to run both Automation Runtime and a general purpose operating system on the same hardware.

All resources clearly allocated

"The hypervisor makes it possible to clearly allocate all of the available resources," emphasizes Mitterbuchner. Not only the processor cores, RAM and Ethernet interfaces, but also the USB and other ports can be clearly assigned to a specific operating system. "We also support the latest Intel technology in this area," adds Lammers. "With Cache Allocation Technology, the last level cache is also clearly assigned to the specific operating systems." This maximizes the stability of both operating systems.



"The hypervisor allows multiple operating systems to run on a single device, entirely independently of one another."
Manfred Mitterbuchner, Technology Manager - Automation Software, B&R

Easy configuration

Configuring the hypervisor is extraordinarily easy. In B&R's Automation Studio engineering environment, the user simply enables the hypervisor and allocates the resources. Then the setup file is saved to a USB flash drive and installed on the target system via the boot menu. "After that, the hypervisor is ready to go," says Mitterbuchner.

The latest versions of Linux and Windows can be used as the general purpose operating system (GPOS). Whereas previous parallelization solutions were tailored to a specific Windows version, the hypervisor is completely independent of which operating systems are used. Installing updates, patches and upgrades is easy and straightforward. As more and more PCs are connected directly with the Internet, this is becoming an especially important feature.



The hypervisor can run on any of B&R's industrial PCs – from the ultra compact Automation PC 2200 with an Intel Atom processor to the powerful Automation PC 910 with a XEON processor.

Gateway for the IIoT

"The hypervisor is ideal for converting an industrial controller into an edge device or IoT gateway," adds Mitterbuchner. To do this, the real-time operating system (RTOS) uses a virtual Ethernet interface to send data to an application on the GPOS. There, the data is compressed and sent to higher-level systems via OPC UA . These systems can also be located in the cloud.

RTS Hypervisor runs on any B&R industrial PC with at least two processor cores. Users have a broad selection: from the ultra compact Automation PC 2200 with an Intel Atom processor to the powerful Automation PC 910 with a XEON processor. Mitterbuchner: "The combination of advanced hypervisor technology and our broad spectrum of industrial PCs allows our users to put together an optimal solution for any application."

About Real-Time Systems

Real-Time Systems is a globally active provider of Hypervisor technology specializing in real-time virtualization. The company is headquartered in Ravensburg, Germany, was founded in 2006 and since early 2018 has been a company of congatec AG with partners in Europe, USA and Asia. For more information, visit www.real-time-systems.com.