Innovative multicore real-time operating systems

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Technology abstract

A Belgian company offers superior multicore embedded real-time operating systems (RTOS) for critical embedded systems, with high performance, security and reliability. It is extremely suited for very demanding and critical applications requiring hard real-time behavior, performance, reliability and security. These are the future applications found in many domains.

ESA Broker Belgium

In the world of embedded software, a technology shift is happening towards low power multi-processor systems on chip. This RTOS is a new validated real-time parallel operating system, which combines extreme predictability and reliability with efficient multicore utilization.

- Sam Waes -

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Technology Description

Within the world of embedded systems, a technology shift is happening towards smart and connected low power multi-processor electronics systems on chip. Most of the critical electronic systems with embedded software in the fields of avionics, aerospace, defense, transportation, industrial control or medical devices have requirements for higher reliability, security and predictability than current real-time operating systems can offer. New and safer applications will furthermore need extreme reliability, more performance, security and true real-time behavior. Existing RTOS were developed for single core platforms, and do not scale well for multicores. Overall utilization is very low and limited to well below 50% of available computing power. The new RTOS described here can reach up to 100% utilization while remaining predictable and safe. This is due to a kernel designed for multi-cores as well as innovative scheduling, IPC and resource sharing mechanisms. The R&D team has extensive expertise in embedded and real-time systems.

Innovations & Advantages

The uniqueness of this RTOS technology lies mainly in its predictable hard (=rigorous)

real-time behavior, with small and bound overheads, while supporting multicore architectures in an efficient, scalable and more reliable way. It is also secured for integrity and able to optimize system resources, such as power. This allows users to create very demanding yet reliable applications, in shorter time and at lower costs, e.g. by avoiding unnecessary redundant hardware and by allowing more reactive and more predictable behavior. The higher safe processor utilization rate, while remaining predictable, is due to the kernel scheduler. The safety and efficiency of the algorithms implemented has been mathematically proven, and experimental benchmarks based on realistic use cases confirm those results. The software technology thus combines impressive features:

- certifiability
- efficient multicore parallelism
- efficient reliable utilization
- fault tolerance
- power & thermal optimization
- security
- industrial compliance
- configurability

In contrast, existing competitor RTOS are mostly monocore, use obsolete schedulers and cannot be reliable and performant at the same time.

Further Information

This new RTOS has an innovative kernel design, multicore scheduler, scalable IPC, efficient resource sharing, and is also secured, which makes it the next generation real-time and independent operating system. It does not rely on any third party code and is not subject to any restrictions or limitations (e.g. it is ITAR free). It can handle mixed criticality periodic, sporadic or aperiodic tasks.

Current and Potential Domains of Application

Most critical electronic systems with embedded software such as in the fields of avionics, aerospace, defense, transportation, robotics, industrial control or medical devices have requirements for higher reliability, security and predictability than current real-time operating systems can offer.

Possible applications: auto pilots, collision avoidance, guardian angels & smart monitoring systems, secured high-performance communication, real-time optimal control, quality monitoring of critical production lines, etc.
