

Innovative multicore real-time operating systems (RTOS) for critical embedded systems with high performance, security and reliability

Category: Computer Hardware & Software

Reference: TDO0182

Broker Company Name: Verhaert

Broker Name: Sam Waes

Telephone: +32 (0)3 560 14 63

Email: sam.waes@verhaert.com



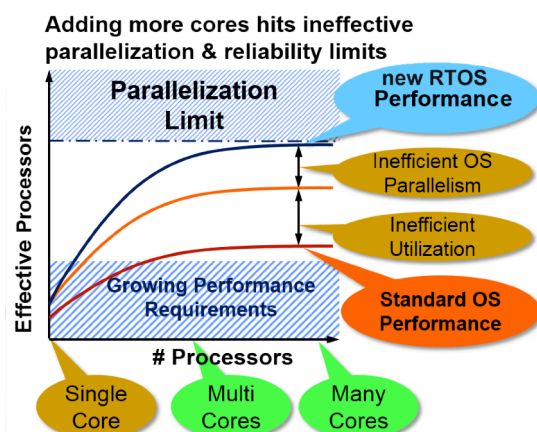
RTOS applications

Abstract

A Belgian company offers superior multicore embedded real-time operating systems (RTOS) for critical embedded systems. 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. This new RTOS is modular and configurable. It supports multicore architectures in a predictable, efficient and reliable way, and is able to take into account constraints such as small footprint, low power and very short latencies. This RTOS's higher processor utilization rate is substantiated by mathematical proofs and benchmarks. The company providing the technology is currently engaged in several industrial pilots. Partnerships are welcome to apply this new RTOS to the design of future embedded systems.

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.



Processor performance of the new RTOS

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 and advantages of the offer

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 and
- 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.

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.

Description of Space Heritage

The whole embedded systems domain originated in the space sector, with projects such as the Mars Pathfinder, where reliable, independent and fast operating systems

are a stringent requirement. The development standards of this high performance parallel-embedded real-time operating system thus derive from the concepts, the principles, the methodologies and the requirements of the space industry.

- ✓ **Reliability** leads to **Certification**
- ✓ **Performance by Efficient Multicore OS Parallelism**
 - ✓ **Efficient 100% Reliable Utilization** Limit
 - ✓ **Fault Tolerance**
 - ✓ **Power & Thermal Optimization**
- ✓ **Compliance** to Industrial Norms & Legacy
 - ✓ **Configurable**

Features of the new RTOS

Several proof of concept projects have been set up, and customer projects have begun. One is with the company Thales Alenia Space ETCA in Charleroi, Belgium. This project is currently underway where the superior RTOS

prototype runs on a multicore microcontroller system developed by Thales for satellite platforms, and will be validated for space use. Another collaboration is with the company FN Herstal, also from Belgium. A computer vision use-case has been made with Synopsis in the Netherlands.

Comments on the technology by the broker

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.

This Technology Description was downloaded from www.esa-tec.eu