Open and cost-effective virtualization techniques and supporting separation kernel for the embedded systems industry

Results in Brief

Secure embedded virtualisation systems

Virtualisation technologies are extending their reach, entering lately a new, high-volume space: embedded systems. EU-funded scientists are designing an open-source virtualisation framework that will offer flexibility and higher-level capabilities, morphing the embedded device into a new class of system.

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Embedded devices find extensive application in consumer markets and thousands of mission-critical or safety-related systems, including automotive, railway, automation control and aerospace systems. There is growing interest in enabling safe and secure hardware resource-sharing among applications of different safety criticality and security levels.

Partitioned software architectures seem to be the future of secure embedded systems to fulfil security and highly critical real-time system requirements. The VOS4ES project sought to design an open-source virtualisation layer for the concurrent execution of real-time critical and non-critical

applications of different security levels over the same hardware. Its architecture implements a partitioning kernel that securely isolates a number of execution environments for upper-level guests.

The virtualisation layer includes adaptations' libraries to make VOS4ES compatible with several hardware platforms and operating systems. It also has configuration management and an executable image generation tool to permit partitioning according to case-specific requirements.

Along with the virtualisation layer, VOS4ES provides a set of run-time supporting tools. The monitoring tool enables real-time monitoring of predefined system characteristics to allow continuous system execution overview and to add reporting capabilities. Furthermore, the validation tool provides a framework to allow the generation and execution of automated system tests for validation purposes and performance analysis of the VOS4ES virtualisation layer and the guest applications.

Project members also developed a set of embedded applications for validating the VOS4ES framework in different application domains. These include areas such as video surveillance and the automotive and telecommunications sectors.

Unlike existing proprietary solutions, the VOS4ES framework allows small- and medium-sized enterprises to have access to customisable virtualisation technologies. Low-cost secure embedded systems incorporating customisable virtualisation technologies can now be realised even by small- and medium-sized enterprises.

Keywords

Virtualisation framework, embedded system, hardware sharing, partitioning kernel, virtualisation layer

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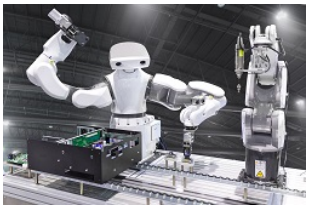

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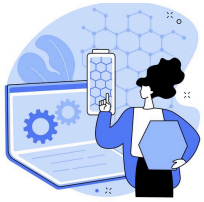

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VOS4ES

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