Results from PROARTIS FP7 Project

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Critical Real-Time Embedded (CRTE) systems industry, active in safety, mission and business critical environments, faces the ever-increasing demand for new functionality and lesser development and production costs. The demand for new functionality calls for the use of more feature-rich software and aggressive hardware acceleration features, like deep memory hierarchies and multicore processors. Both elements however greatly increase system complexity and make it much more difficult to analyse applications for their temporal behaviour, which CRTE systems must do, together with proving the functional correctness of system operation. The current generation of CRTE platforms, albeit based on comparatively simple and old processor technologies, is already extremely difficult to analyse for temporal behaviour, and the errors in operation resulting from insuffient verification, cost European industries millions of Euros annually in warranty and post-production costs.

The ultimate goal of the PROARTIS FP7 project is to allow new advanced hardware features to be used and analysed effectively in CRTE systems by having their design move towards randomized timing behaviour so as to probabilistically reduce the risk of pathological cases – when some software operation may incur an extremely large response time – to quantifiably negligible levels. The PROARTIS project will thus develop a probabilistic approach to timing analysis proving that pathological timing cases can only arise with bounded probability, instead of struggling to eradicate them, which is arguably not possible and could severely degrade performance. This will be a major turn from previous approaches that seek analyzability by trying to predict with cycle accuracy the state of hardware and software through abstract analysis.

PROARTIS will develop probabilistic timing analysis techniques that can be used effectively in the verification of CRTE systems. PROARTIS will use a selected subset of a commercial safety-critical hard real-time avionics application from the industrial partner Airbus to evaluate practicality, usability, performance and quality of the PROARTIS toolset infrastructure and method against known results from state-of-the-art practice.

In this talk, I will discuss some of the results we have obtained during the first year and a half of the PROARTIS project.

Project webpage: http://proartis-project.eu