P-SOCRATES: Parallel SOftware framework for time-CRitical mAny-core sysTEmS (P-SOCRATES)

Description

The recent technological advancements and market trends are causing an interesting phenomenon towards the convergence of High-Performance Computing (HPC) and Embedded Computing (EC) domains. On one side, new kinds of HPC applications are being required by markets needing huge amounts of information to be processed within a bounded amount of time. On the other side, EC systems are increasingly concerned with providing higher performance in real-time, challenging the performance capabilities of current architectures. The advent of next-generation many-core embedded platforms has the chance of intercepting this converging need for predictable high-performance, allowing HPC and EC applications to be executed on efficient and powerful heterogeneous architectures integrating general-purpose processors with many-core computing fabrics. To this end, it is of paramount importance to develop new techniques for exploiting the massively parallel computation capabilities of such platforms in a predictable way.

P-SOCRATES will tackle this important challenge by merging leading research groups from the HPC and EC communities. The time-criticality and parallelisation challenges common to both areas will be addressed by proposing an integrated framework for executing workload-intensive applications with real-time requirements on top of next-generation commercial-off-the-shelf (COTS) platforms based on many-core accelerated architectures. The project will investigate new HPC techniques that fulfil real-time requirements. The main sources of indeterminism will be identified, proposing efficient mapping and scheduling algorithms, along with the associated timing and schedulability analysis, to guarantee the real-time and performance requirements of the applications. The technology developed in the project will be implemented on a real-time use-case based on a real-world intelligent transportation system.

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