

Open internship position

Title:

Runtime System for efficient executions on heterogeneous architectures

Keywords:

OpenMP programming models, OpenMP 4.0, Compilation techniques, LLVM, Runtime, Multicore Architectures

Description:

State-of-the-art energy-efficient multicore embedded systems adopt in major part heterogeneous architectures combining CPUs with compute accelerators such as GPUs. The ARM big.LITTLE¹ technology (e.g., adopted in the Samsung Exynos 5422 chip) rather promotes a single-ISA heterogeneous and adaptive architecture paradigm according to which a runtime can dynamically migrate application workloads between two different clusters of ARM cores: a low-power cluster (referred to as “LITTLE”) and a high performance cluster (referred to as “big”). All these cores communicate via a cache coherent interconnect, which consists of a bus.

This internship addresses the definition of adequate mapping and migration policies that provide the best energy-efficiency for such single-ISA heterogeneous architectures. Here, the considered application workloads to be executed are assumed to be programmed in OpenMP 4.0². One possible approach is to adapting the corresponding runtime of OpenMP and the LLVM compiler so as to take into account both the task/thread execution monitoring and the best allocation to available cores so as to obtain a good compromise in terms of performance and energy consumption. The expected solution will be validated on a real board providing an ARM single-ISA heterogeneous platform, the Odroid XU4³.

The duration of the internship is between 3 and 6 months in the LIRMM lab, which is a cross-faculty research entity of the University of Montpellier and the French National Center for Scientific Research (CNRS). Located in Montpellier (France), LIRMM is one of the largest multi-disciplinary research laboratory in Europe. Its Microelectronics department carries out cutting-edge research in the fields of design and testing integrated systems and micro-systems, with a focus on architectural aspects, modeling and methodology.

Contact:

Applications (including a CV, academic records, motivation letter and appreciation letters if available) are to be sent to the following person:

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¹ <https://www.arm.com/products/processors/technologies/biglittleprocessing.php>

² <http://www.openmp.org/mp-documents/OpenMP4.0.0.pdf>

³ http://www.hardkernel.com/main/products/prdt_info.php?g_code=G143452239825