New project to plug the software-stack support gap for energy-efficient computing
Imagine being able to write an application once and have it scheduled from Internet of Things (IoT) sensors to data centres and supercomputers, all while making the most energy-efficient use of the hardware available. This is the main challenge the European project LEGaTO (Low Energy Toolset for Heterogeneous Computing) will tackle over three years of research. The project, which has a budget of over €5 million and is coordinated by Barcelona Supercomputing Center (BSC), kicks off today and tomorrow in Barcelona.

Due to fundamental limitations of scaling at the atomic scale, coupled with the heat density problems associated with packing an ever-increasing number of transistors in a unit area, Moore’s Law has slowed down. Heterogeneity aims to solve the problems associated with the end of Moore’s Law by incorporating more specialized compute units in the system hardware and by utilizing the most efficient compute unit for each computation. However, while in the last years a lot of research and advances were made to support heterogeneity for performance; for power- and energy-efficient computing it is severely lacking. The overall objective of the LEGaTO project is to produce a mature software stack to optimize the energy-efficiency heterogeneous computing. The project will strive to achieve this objective through employing a task-based programming model, coupled to a dataflow runtime while simultaneously ensuring security, resilience and programmability. The LEGaTO project will apply this energy-efficient software stack for heterogeneous hardware to the use cases of healthcare, smart home/city and machine learning. Concrete targets of the LEGaTO project are:

- improve one order of magnitude in energy-efficiency for heterogeneous hardware through the use of the energy-optimized programming model and runtime;
- reduce the size of the trusted computing base by at least an order of magnitude;
- Decrease of 5-fold mean time failure rate while decreasing the energy consumption;
- Increasing 5-fold FPGA programmer productivity leverage on use of novel features of dataflow hardware design.

Osman Unsal and Adrian Cristal, coordinators of LEGaTO project and BSC’s Computer Architecture for Parallel Paradigms group managers, state: “Moore’s Law is slowing down, and as a consequence hardware is becoming more heterogeneous. In the LEGaTO project, we will leverage task-based programming models to provide a software ecosystem for Made-in-Europe heterogeneous hardware composed of CPUs, GPUs, FPGAs and dataflow engines. Our aim is one order of magnitude energy savings from the edge to the converged cloud/HPC.”

About LEGaTO

The LEGaTO (Low Energy Toolset for Heterogeneous Computing) project is funded by the European Commission with a budget of more than €5 million and will last 3 years from its beginning on 1 December 2017. The partners of the project are Barcelona Supercomputing Center (BSC, Spain), Universitaet Bielefeld (UNIBI, Germany), Universite de Neuchatel (UNINE, Switzerland), Chalmers Tekniska Hogskola AB (CHALMERS, Sweden), Data Intelligence Sweden AB (DIS, Sweden), Technische Universität Dresden (TUD, Germany), Christmann Informationstechnik + Medien GmbH & Co. KG (CHR, Germany), Helmholtz-Zentrum für Infektionsforschung GmbH (HZI, Germany), TECHNION - Israel Institute of Technology (TECHNION, Israel), Maxeler Technologies Limited (MAXELER, United Kingdom).

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