



High Performance Computing and Embedded Systems (HiPCES) Research Lab

Main Thematic Areas:

Parallel and Distributed Systems, High Performance Microarchitectures, Reconfigurable Computing, Systems-on-Chip (SoC), Networks-on-Chip (NoC), Pervasive and Embedded Systems, EDA Tools, and Exploitation of the state-of-the-art computing technology and smart systems.

Contact/Lead Person(s):

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Team/Unit/Lab Website:

<http://hipces.frederick.ac.cy/>

Main Research Interests and Activities of the team/lab:

HiPCES is engaged in basic and applied research, in the areas of high performance computer architectures, pervasive and embedded computing systems. It is also engaged in the development of new applications and products that exploit the current state-of-the-art computing technology. The main research activities of the Lab are:

- **Parallel Architectures:** Members of the Lab have a significant contribution in the development of the Data-Driven Multithreading (DDM) execution and programming model. This is a threaded dataflow model, where non-blocking threads are scheduled for execution based on data availability. DDM has various implementations ranging from purely software, to multicore microarchitectures and network based.
- **Cache Optimizations:** Thread-level cache prefetching mechanisms and eviction policies for multi-core and clustered systems. Exploitation of 3D chip technologies by caches. Temperature-aware cache replacement policies.
- **NoC:** Architectures, EDA tools and IP for 2D and 3D Network-on-Chip MPSoC communication. 2D and 3D router IP blocks, NoC simulators for 2D and 3D architecture exploration and evaluation. Dynamic routing algorithms for Networks-on-Chip including fuzzy-based routing.
- **Reconfigurable techniques and FPGA exploration:** Fine- and coarse-grain reconfigurable architectures and EDA tools for SoC. A complete EDA tool chain from mapping logic to custom FPGA architectures including bitstream generation.
- **Embedded Systems:** Development of applications and products that exploit the current state-of-the-art computing technology such as embedded systems, mobile and smart devices, sensor networks, etc. Investigation of issues related to hardware/software co-design, real-time constraints, fault tolerance and power efficiency.

Main Equipment/Facilities Available:

Various Xilinx prototyping and evaluation boards from low-cost Spartan-3 and Spartan-6 to high-end Virtex-II pro, Virtex-5 as well as state-of-the-art ZYNQ-7000 SoC. EDA tools including Xilinx ISE and Vivado Design suites.

Research Projects Experience:

The members of the HiPECS Lab have participated in numerous research projects, which obtained funding from competitive calls primarily from the Research Promotion Foundation of Cyprus, the European Commission (ICT projects AMDREL and EASY) and the Greek Secretariat for Research and Technology.