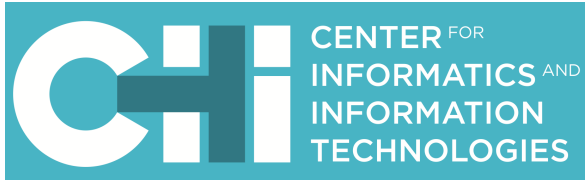


Supporting Heterogeneous Computing

COMPUTER SYSTEMS / SerCo Team



Hervé Paulino

Assistant Professor at DI-FCT-UNL

Member of the CITI research center - PI of the SerCo Project Team

Research interests: concurrent, parallel and distributed computing

Objectives

Efficient, high-level, programming of heterogeneous computing nodes comprising

- one or more Multicore CPUs and Graphic Processing Units (GPUs)
- each CPU core and GPU residing at the bottom of a complex, multilevel, memory hierarchy

Shift the concerns of heterogeneity and hierarchy aware parallel problem decomposition from the programmer to the compiler and runtime system

Methodology

Provide platform independent high-level abstractions suitable for the programming of a large spectre of architectures:

- *Single Operation Multiple Data* - declarative expressing of both task and data parallelism at subroutine (method) level
- *Algorithm skeletons* - recurrent structures and behaviours to aid the development of compound parallel applications

Empower the compiler and the runtime system:

- the compiler generates CPU and GPU Parametric Parallel Code (PPC)
- the runtime system distributes and balances the work among and across the available processing units, executing concrete instances of PPCs

Expected Results

A parallel computing framework for the programming of heterogeneous computing nodes able to:

- execute isolated tasks on both CPU cores and GPUs
- execute compound behaviours, comprising multiple interdependent tasks, across the available CPU cores and GPUs
- distribute and schedule the work according to heterogeneous nature of the underlying architecture and the layout of the memory hierarchy
- dynamically adjust this scheduling as the overall execution evolves

