

Poster

Parallel Software Framework for Time-Critical many-core Systems

Project consortium

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Parallel Software Framework for Time-Critical many-core Systems

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*CISTER Research Centre Polytechnic Institute of Porto (ISEP-IPP) Rua Dr. António Bernardino de Almeida, 431 4200-072 Porto Portugal Tel.: +351.22.8340509, Fax: +351.22.8321159 E-mail: http://www.cister.isep.ipp.pt

Abstract



Parallel Software Framework for Time-Critical many-core Systems

SOLUTION FOR SCALING PERFORMANCE IN EMBEDED APPLICATIONS

- process big amounts of data from multiple data sources with guaranteed processing response times
- coping with the extra complexity of many-core hardware architectures

System Composed of OpenMP Applications with different timing characteristics

- reducing the complexity of parallel programming
- better performance with less effort

Mercurium Analysis System Timing Phase Deployment Analysis OpenMP **OpenMP Run-time** Schedulability Static ERIKA Scheduling Analysis Erika Timing Dynamic Scheduler guarantees Dispatcher **Execution feedback** Many-core processor

P-SOCRATES SDK

- Mercurium (source-to-source compiler)
 - » Analyses OpenMP applications and extracts parallel software components and data-flow and controlflow information
- Timing Analysis Tool
 - » Execution time upper bounds of each parallel component including impact of hardware interferences

Lightweight OpenMP run-time library

- » Efficiently implements OpenMP4.5 functionality to fully exploit parallel opportunities while maintaining the timing guarantees derived by the timing and schedulability analysis
- Erika Operating System
- » Implements light and efficient OS mechanisms supporting the time predictable parallel execution » Assigns OS threads to cores respecting the timing guarantees derived by the timing and schedulability analysis

Scheduling algorithm

- » Assigns parallel components of OpenMP applications to OS threads, respecting the timing properties of each application
- » Assignment can be static, for systems requiring strong timing guarantees, or dynamic, for systems with more relaxed timing guarantees

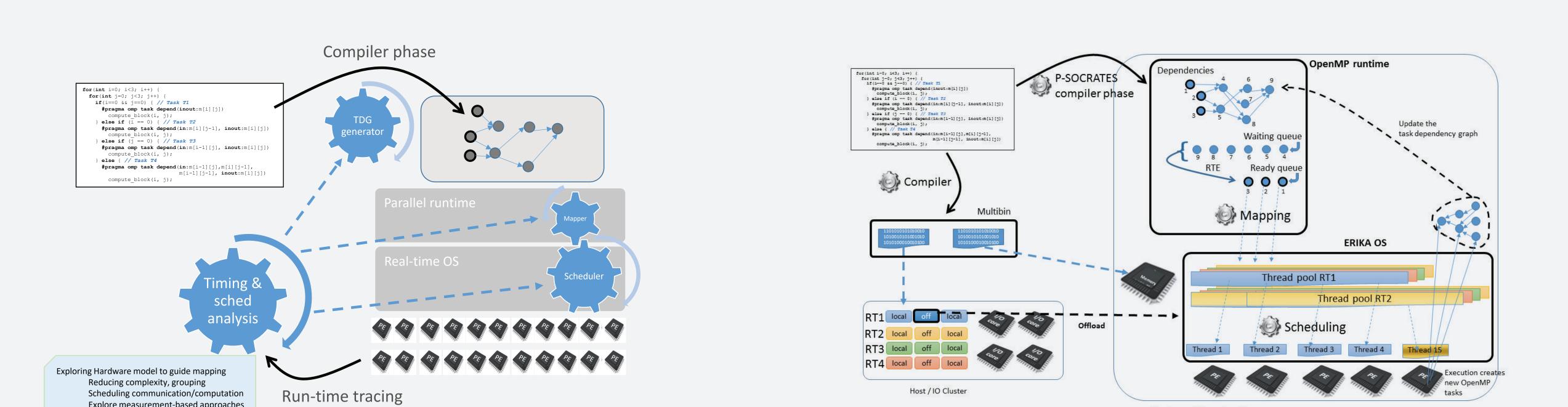
Schedulability analysis tool

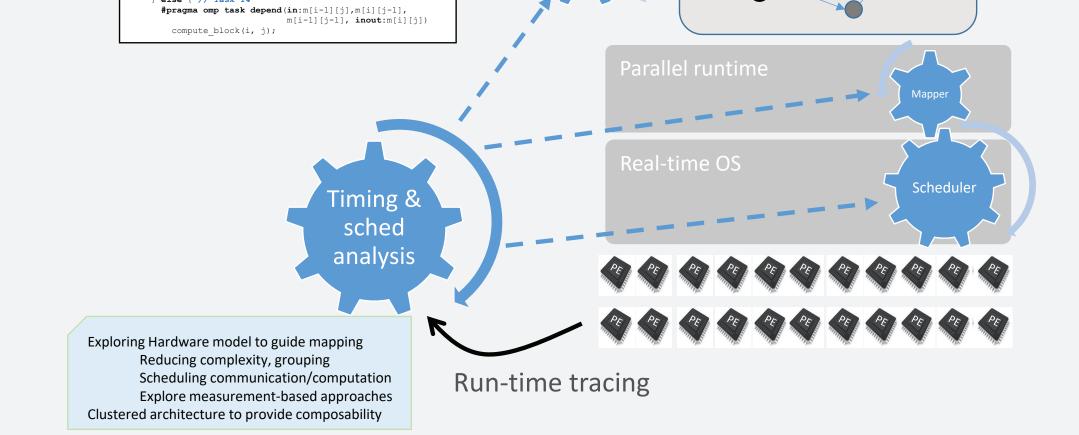
» Efficiently determines the schedulability of a complex system composed of multiple OpenMP **Applications**

Many-core architectures supported

- » Kalray MPPA
- » Texas Instrument Keystone II (partial)
- » Potential to port to other platforms

Technical Approach





Accelerator / Computing Cluster



Real-Time & Embedde **Computing Systems**







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