

Design Tools Session

Source-to-source optimizations of statically allocated data mapping on MPSoC platforms

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Abstract

This work aims at establishing a systematic approach for high level exploration and optimization of memory management for statically allocated data. The targeted domain is primarily multi-threaded applications from the communication and multimedia systems realized in embedded MPSoC platforms. The major challenge in this work is the optimization of the management of parallel execution of tasks which allocate concurrently arrays and scalar data in the memories.

We will describe the MP-MH tool that tackles the optimization of the management of parallel execution of tasks which allocate concurrently arrays and scalar data in the memories[1-3]. The methodologies will provide multiple operating points and generating metadata regarding quality level vs. processing element usage, memory usage, and bandwidth usage. The tool would automate the process of parallelizing a sequential application in multiple threads and explore the trade-off between performance and energy consumption. It will improve and automate the design-time exploration process for the system designers. The primary benefit of such a tool is the reduction of time-to-market that is an important factor for the ever-evolving embedded systems industry.

This tool is a part of the FP7 EU project MNEMEE [4] that will introduce an innovative supplementary source-to-source optimization design layer for data management between the state-of-the-art optimizations at the application functionality and the compiler design layer. The key focus of the project is the efficient data access and memory storage of both dynamically and statically allocated data and their assignment on the memory hierarchy.

[1] R Baert, E De Greef, E Brockmeyer, G Vanmeerbeeck, P Avasare, J Mignolet, M Cupak, "An automatic scratch pad memory management tool and MPEG-4 encoder case study", in the proceedings of The 45th Design Automation Conference (DAC), 2008

[2] R Baert, E Brockmeyer, T Ashby, S Wuytack, "Exploring parallelizations of applications for MPSoC platforms using MPA", in the proceedings of Design Automation & Test in Europe, April, 2009

[3] J.-Y Mignolet, R. Wuyts, "Embedded multi-processor systems-on-chip programming," To be published in Software, IEEE , vol.26, no.3, May-June 2009

[4] MNEMEE, Memory management technology for adaptive and efficient design of embedded systems, www.mneme.org