Architectures Session

Application-Specific System-Level Design Space Exploration for Heterogeneous Multiprocessor Embedded Platforms

L. Pomante, L. Imbriglio, F. Graziosi
University of L'Aquila – DEWS, ITALY
luigi.pomante@univaq.it, laura.imbriglio@univaq.it, fabio.graziosi@univaq.it

Abstract

Heterogeneous multiprocessor platforms have been recently exploited for a wide range of application domains, for both the embedded and the general purpose products. Such systems can include different microprocessor cores (GPP or DSP), memories, dedicated ICs (ASICs and/or FPGAs) and a set of connections between the system components. They are so complex that the design methodology plays a major role in determining the success of the products.

This work addresses the problem of the system-level co-design of heterogeneous multiprocessor embedded platforms tailored to specific applications.

In particular, it enhances the system-level design space exploration step of an existing co-design flow by means of new metrics and tools.

Given the application specification and related requirements, the proposed enhancements allow the methodology to automatically propose in an integrated step:
- an heterogeneous (i.e. GPP, DSP, FPGA) multiprocessor architecture;
- an HW/SW partitioning and mapping of the given application components onto the suggested architecture.

The project design space is explored by means of a genetic algorithm optimizing a cost function composed of several metrics that allow to consider, with different weights assigned by the designer, both the computational issues (i.e. number and type of heterogeneous processors composing the architecture) and the communication ones (i.e. links and topology interconnecting the proposed processors) with respect to the actual features of the given application.