

FlexTools: Design Space Exploration Tool Chain from C to Physical Implementation

The complexity of the hardware-software co-design continues to grow despite the relentless efforts of the EDA community. This makes the task of producing an optimal, yet functionally correct design even more challenging. To make the situation worse, the applications that a particular design is optimized for plays a vital role in determining the competitiveness of the design. It is therefore imperative that a generic design is tailored prior to manufacturing. Encouragingly, as the design complexity increases, the innovative methods of alleviating these problems evolve. In this paper, we address the issues related to hardware adaptation for a specific suite of applications.

We present FlexTools: an integrated platform to take an application-dependent design from concept to implementation. Built to compile, simulate and implement the FlexCore processor, FlexTools takes a FlexCore processor design from specification to physical implementation. The unique aspect of FlexTools is that it provides an integrated specification platform to direct an application-dependent design from concept to realization, while being consistent with all aspects of traditional development. Furthermore, the environment allows profiling of the FlexCore processor using accelerators that can enhance computation capabilities. This improves the versatility, because the compiler reschedules the applications for the modified FlexCore to harvest maximum benefits. FlexTools enables a user to evaluate different performance criteria at different development phases to meet the design goals. In the early phases of the chain, estimates are coarse and runtime is low, while accuracy and runtime increase in later phases. The Cadence tools operate on the RTL code produced by FlexTools and make a complete flow from specification to tape out. Our proposed toolset facilitates design and evaluation of numerous prototypes of FlexCore processors. We currently focus on the design of a first test chip to evaluate a model of the FlexCore processor, optimized for a number of applications from the embedded benchmark suites. We plan to tape out this first test chip in spring 2010. In the future, we expect to explore more design alternatives and also demonstrate more advanced aspects of the FlexTools chain.