Demonstrator: Sketch-based Design and Simulation-based Evaluation for ESL Virtual Prototyping

Rafael Rosales, Michael Glaß,
and Jürgen Teich
Hardware/Software Co-Design, Department of Computer Science
University of Erlangen-Nuremberg, Germany
{rafael.rosales, glass, teich}@cs.fau.de

Bo Wang, Yang Xu and Ralph Hasholzner
Intel Mobile Communications, Munich, Germany
{bo1.wang, yang.a.xu,
ralph.hasholzner}@intel.com

Abstract

Virtual prototyping and Electronic System Level (ESL) modeling have become valuable approaches to cope with the ever-increasing complexity of embedded systems. Their effectiveness, however, is highly dependent on their quick development time and accuracy both conflicting goals.

In this demonstration, we present (a) an ESL methodology [1] [2] for the simulation-based evaluation of power and performance of embedded systems by the use of virtual prototypes. Our methodology permits us to develop ESL models for design space exploration of dynamic power and performance management strategies and hardware/software co-design choices. (b) We present a novel sketch-based tool termed Mahler [3], for the very early design phase of ESL modeling. Mahler provides a playground to quickly model functionality and evaluate its performance on different architecture implementations. In Mahler, ESL models are created by literally *sketching* with a pen or touch interface, e.g. a tablet stylus, or a touchless interface, such as a Leap Motion controller. The application and architecture models are transformed to an executable virtual prototype through sketch recognition. This approach provides a very intuitive and fast way to explore actor-oriented functional modeling and hardware/software partitioning. The output of Mahler is a simulation-ready SystemC-based source-code stub that can be refined for subsequent design iterations.

We will show a model of a Voice over LTE (VoLTE) use case, consisting of a heterogeneous cellular SoC platform, together with a wireless channel fading model and a base station network model. State-based [1] and polynomial-equation-based [4] power models are built and co-simulated for the SoC digital module and the RF transceiver module, respectively to abstract their different power consumption characterization accurately. The entire end-to-end modeling enables efficient SoC performance and power simulation with proper network configuration in seconds, which is highly desired in cellular system early design exploration phase and co-optimization with network vendors.

References

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