Evolution of Paradigm Shifts in the Automated Design Process of Digital Circuits

Wolfgang Ecker, Lothar Schrader

Infineon Technologies AG
Wolfgang.Ecker@infineon.com

To cope with the continuous requirement on design productivity increase, two widely accepted paradigm-shifts in the automated design process of digital circuits have been made: Semi-Custom-Design and RTL Synthesis. As goal of the next paradigm shift, the synthesis of architectures from behavioural models/code is targeted. Many R&D projects work in that direction.

In this paper, we postulate “re-use” and not “synthesis” as driving force for productivity increase, confirm that postulate by analysis of semi-custom-design and RTL Synthesis, and derive from that postulate the next paradigm shift in the automated design process: *Automated TLM Design: Manual architecture design on transaction level based on transaction level IP models and automated generation of RTL code by mapping the TLMs and their communication to their RTL counterparts, also available in the IP libraries.*

The coming SPIRIT2.0 standards support this new design paradigm seamlessly: Taken from OSCI, a standard TLM representation for TLM Models of IP is defined. From IEEE, a standard for RTL coding is taken. SPIRIT provides semantic information like register addresses as add on and defines, how the different views of an IP relate to each other.

Making forecasts according to that scheme even more in the future, the next but one automated design step maps a formal description to a sub-system model composed of MPUs, DSPs, Accelerator’s, Periferals, and Software. Starting point for that paradigm might be a functional description in C or a sequential object model developed in C++ with or without aid of UML/SysML.

As final step, design requirements that are fulfilled by sub-system or functional models are treated as high-level representation. User requirements instantiate these design requirements in order to efficiently build a requirement specification. An automated process starts building models from requirements by mapping these requirements to their associated models.