Ingredients for Successful System Level Design Methodology

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Springer

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To those affected by April 16, 2007,

the Blacksburg and Virginia Tech. community,
the friends and families, and
all our fellow Hokies.

Hiren D. Patel
and
Sandeep K. Shukla
February 3, 2008

Preface

ESL or "Electronic System Level" is a buzz word these days, in the electronic design automation (EDA) industry, in design houses, and in the academia. Even though numerous trade magazine articles have been written, quite a few books have been published that have attempted to define ESL, it is still not clear what exactly it entails. However, what seems clear to every one is that the "Register Transfer Level" (RTL) languages are not adequate any more to be the design entry point for today's and tomorrow's complex electronic system design. There are multiple reasons for such thoughts. First, the continued progression of the miniaturization of the silicon technology has led to the ability of putting almost a billion transistors on a single chip. Second, applications are becoming more and more complex, and integrated with communication, control, ubiquitous and pervasive computing, and hence the need for ever faster, ever more reliable, and more robust electronic systems is pushing designers towards a productivity demand that is not sustainable without a fundamental change in the design methodologies. Also, the hardware and software functionalities are getting interchangeable and ability to model and design both in the same manner is gaining importance.

Given this context, we assume that any methodology that allows us to model an entire electronic system from a system perspective, rather than just hardware with discrete-event or cycle based semantics is an ESL methodology of some kind. One could argue about the applicability, effectiveness and designer friendliness of one ESL methodology over another. One could also argue about the right abstraction level at which systems should be modeled, whether direct algorithmic synthesis from system models to hardware/software should be available, and whether the ESL model should be used only as a reference model without any hope of direct mapping into implementation.

All these are valid arguments which need to be sorted out through continued interaction, discussion, innovation and standardization efforts from industry and academia. These arguments also lie at the very core of the work presented in this book. In fact, as the title implies, we have here a set of prescriptions and solutions that we think is one direction that ESL methodology

should take, if it has to succeed with designers. Of course, we have strong reasons to believe that the current directions in the market place in the ESL domain are not necessarily the correct ones, and hence we have spent several years researching alternative visions, methodologies, language extensions, and implemented prototype of tools that demonstrate the effectiveness of our methods and views.

A word of caution for the readers is probably justified at this point. The work reported in this monograph is the work of one PhD student over about four years, and hence one should not expect that this book provides a panacea for the ESL problems, nor should one expect that the tools described here are industry strength tools that can be downloaded and directly used for the next design project. It is meant to present our academic perspective which is a fruit of our interaction with various design companies as well as EDA companies, and which is enriched at various points in time by discussions with many of our academic colleagues. So it is but an attempt to bring out what we have envisioned and worked out as a few strands in the whole ESL DNA that would eventually spawn the ESL based electronic design industry.

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