Applications of Specification and Design Languages for SoCs

Edited by
A. Vachoux

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APPLICATIONS OF SPECIFICATION AND DESIGN LANGUAGES FOR SOCS

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Selected papers from FDL 2005

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Contents

List of Figures

List of Tables

List of Listings

Preface

The Forum on specification and Design Languages (FDL) is the premier European forum to exchange experiences and learn about new trends in the application of languages and models for the specification and modeling of electronic systems. FDL'05 was organized around four thematic areas that cover essential aspects of system-level design methods and tools: "C/C++-Based System Design" (chaired by Frank Oppenheimer, OFFIS, Germany), "Analog, Mixed-Signal, and Heterogeneous System Design" (chaired by Christoph Grimm, University of Hannover, Germany), "UML-Based System Specification and Design" (chaired by Piet van der Putten, TU Eindhoven, The Netherlands), and "Specification, Design, and Verification Methods" (chaired by Alain Vachoux, EPFL, Switzerland). This book includes a collection of outstanding contributions to FDL'05 that have been carefully selected by the thematic area Chairs and thoroughly revised by the authors. The book has 17 chapters grouped in four parts. Each part groups chapters related to one thematic area and is introduced by its respective FDL'05 Chair:

- Part I, "Specification, Design, and Verification Methods," includes two chapters covering system design issues of growing importance, namely assertion-based design and network-on-chip (NoC) design flow.
- Part II, "C/C++-Based System Design," includes five chapters mostly addressing issues related to the development and the use of SystemC for hardware/software system-level design.
- Part III, "Analog, Mixed-Signal, and Heterogeneous System Design," includes five chapters discussing how the design of mixed-signal/mixed-technology systems may be handled at system level.
- Part IV, "UML-Based System Specification and Design," concludes the book with five chapters exploring modeling methodologies that can map abstract models of complex systems onto efficient implementations.

The book is providing an excellent coverage of recent achievements in the use of languages and models for the specification and the design of systems-on-chip (SoCs). It also highlights the diversity of the issues that have to be tackled

with in today's system designs and the creativity of researchers to develop efficient solutions. Last, but not least, the book shows the importance of the FDL event as the place to discuss issues related to electronic system design.

On a final note, I would like to warmly thank Torsten Mähne for his excellent work in helping me editing the book. Torsten efficiently managed all the subtle LaTeX issues that arose and highly contributed to make all chapters in the book consistent.

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March 2006

Chapter 1

PSL-Based Online Monitoring of Digital Systems

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Abstract We present an original method for generating monitors that capture the occurrence of events, specified by logical and temporal properties under the form of assertions in declarative form, written in the PSL standard. The method includes a library of primitive digital components and a technique to interconnect them, resulting in a synthesizable digital module that can be properly connected to a digital system under verification, or to a set of input signals under scrutiny. The complexity of the generation is proportional to the size of the PSL expression. A prototype emulation system has been implemented.

Keywords: property; monitor; PSL.

1. Introduction

Today's increasing design complexity requires innovative methods for verification and debug. With verification consuming up to 70% of the design cycle, assertion-based design (Foster et al., 2003) is viewed as one key method for improving productivity. An assertion is a design property that is declared to be true and should be evaluated by one or more techniques among simulation, emulation, or formal verification. The introduction of new standard languages such as Property Specification Language (PSL) or SystemVerilog has made assertions more easy to write and very powerful. An assertion can also be seen as a high-level functional specification for a circuit intended for monitoring of events over time.

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