IV

UML-Based System Specification and Design
Introduction

This part of the book contains a selection of the most interesting work presented in the FDL’05 on the thematic area “UML-based system specification and design.” This thematic area addresses specification and design methodologies such as the model-driven architecture (MDA) approach, which use unified modeling language (UML) to map abstract models of complex embedded systems to highly programmable hardware platforms and heterogeneous systems on chip (SoCs).

The first three chapters in this part have been presented in the session “Model-driven engineering chapter.” The first chapter, “Compiled and synthesized UML: a practical approach for codesign” (Chapter 13) by C. Berthouzoz, F. Corthay, T. Sterren, R. Steiner, and M. Rieder, explores a practical approach for bridging the gap between UML models and VHDL. The mapping of UML on VHDL is described as a set of rules that forms the basis for a code generator. The second chapter, by O. Florescu, J. Voeten, and H. Corporaal is on “Property-preservation synthesis for unified control- and data-oriented models” (Chapter 14), focuses on the preservation of real-time system properties when developing models on the path from analysis to synthesis. The third chapter, “Traceability and interoperability at different levels of abstraction in model-driven engineering” (Chapter 15) by L. Bonde, P. Boulet, J. L. Dekeyser, describes a model-driven engineering approach of software design, in which the whole process of design and implementation is worked out around models. The focus is on the interoperability between evolving models from platform-independent to platform-dependent, using an additional traceability model.

The last two chapters selected for this part of the book have been presented in the session “Verification and validation”. “Power simulation of communication protocols with StateC” (Chapter 16) by L. Negri and A. Chiarini describes a modeling and simulation flow that can evaluate policies for optimizing power consumption in communication protocol implementations. The fifth and last chapter in this part is by P. Green and K. Tasie-Amadi. “Integrating model-checking with UML-based SoC development” (Chapter 17) addresses the complexities of SoC design where rigorous development methods
and automated tools are required. This chapter presents an approach to formal verification using model-checking, designed for use in the context of a UML-based SoC design flow. By translating UML models to communicating sequential process (CSP), a failures divergences refinement (FDR) model checker can be used to verify specified properties.

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