Preface

This volume presents the set of papers accompanying the lectures of the 9th International School on Formal Methods for the Design of Computer, Communication and Software Systems (SFM).

This series of schools addresses the use of formal methods in computer science as a prominent approach to the rigorous design of computer, communication, and software systems. The main aim of the SFM series is to offer a good spectrum of current research in foundations as well as applications of formal methods, which can be of help for graduate students and young researchers who intend to approach the field.

SFM 2009 was devoted to formal methods for web services and covered several aspects including choreography, orchestration, description techniques, interaction, synthesis, composition, session types, contracts, verification, security, and performance.

This volume comprises eight articles. Bruni's paper overviews some of the most recently proposed abstractions in the setting of process calculi tailored to the well-disciplined handling of issues such as long-running interactions, orchestration, and unexpected events. Van der Aalst, Mooij, Stahl, and Wolf provide some foundational notions related to service interaction and address in a Petri net setting challenges like how to expose a service, how to replace and refine services, and how to generate service adapters. The paper by Marconi and Pistore presents a survey of existing approaches to the synthesis of web service compositions, a difficult and error-prone task that requires automated solutions. Vasconcelos's paper illustrates a reconstruction of session types in a linear π-calculus where types are qualified as linear or unrestricted, together with an algorithmic type-checking system. Carbone, Yoshida, and Honda explore two extensions of session types to interactional exceptions and multiparty sessions in the presence of asynchronous communications. Padovani's paper discusses a set-theoretic semantics of contracts, which is employed for defining a family of equivalence relations that can be effectively used for discovering and adapting web services implementing specific contracts. The paper by Bravetti and Zavattaro also focusses on contracts by following the idea of designing a service system through the description of the behavior of each of its participants and then instantiating such participants by retrieving services exposing contracts that conform to the given behaviors. Clark, Gilmore, and Tribastone introduce quantitative methods for analyzing web services with the goal of understanding how they will perform under increased demand or when asked to serve a larger pool of service subscribers.

We believe that this book offers a comprehensive view of what has been done and what is going on worldwide in the field of formal methods for web services. We wish to thank all the speakers and all the participants for a lively and fruitful school. We also wish to thank the entire staff of the University Residential Center

of Bertinoro for the organizational and administrative support. Finally, we are very grateful to the University of Bologna, which kindly provided sponsorship for this event under the International Summer School Program.

June 2009

Marco Bernardo
Luca Padovani
Gianluigi Zavattaro

Table of Contents

Calculi for Service-Oriented Computing

Roberto Bruni

Service Interaction: Patterns, Formalization, and Analysis

Wil M.P. van der Aalst, Arjan J. Mooij, Christian Stahl, Karsten Wolf

Synthesis and Composition of Web Services

Annapaola Marconi and Marco Pistore

Fundamentals of Session Types

Vasco T. Vasconcelos

Asynchronous Session Types: Exceptions and Multiparty Interactions

Marco Carbone, Nobuko Yoshida, and Kohei Honda

Contract-Based Discovery and Adaptation of Web Services

Luca Padovani

Contract-Based Discovery and Composition of Web Services

Mario Bravetti and Gianluigi Zavattaro

Quantitative Analysis of Web Services Using SRMC

Allan Clark, Stephen Gilmore, and Mirco Tribastone

Author Index