Lecture Notes in Computer Science 2472
Edited by G. Goos, J. Hartmanis, and J. van Leeuwen

Springer
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Petri Net Technology for Communication-Based Systems

Advances in Petri Nets

Springer

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Cataloging-in-Publication Data applied for

A catalog record for this book is available from the Library of Congress.

Bibliographic information published by Die Deutsche Bibliothek
Die Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the Internet at <http://dnb.ddb.de>.

CR Subject Classification (1998): D.1-3, F.1, F.3, C.2, G.2, J.1

ISSN 0302-9743
ISBN 3-540-20538-1 Springer-Verlag Berlin Heidelberg New York

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springeronline.com

© Springer-Verlag Berlin Heidelberg 2003
Printed in Germany

Typesetting: Camera-ready by author, data conversion by DA-TeX Gerd Blumenstein
Printed on acid-free paper SPIN: 10871330 06/3142 5 4 3 2 1 0

Preface

This volume, "Petri Net Technology for Communication-Based Systems," is a state-of-the-art report in the series Advances in Petri Nets. It shows how various well-established and new Petri net notions and techniques can be used for modeling communication-based systems, with special focus on workflow management and business processes.

In the last 6 years this topic has been studied by the DFG Forschergruppe Petri Net Technology in Berlin in close cooperation with the international community. The main results of this cooperation were presented at the 1st and 2nd International Colloquia on Petri Net Technologies for Modeling Communication-Based Systems, held in Berlin in 1999 and 2001, respectively. A careful selection of contributions by members of the DFG Forschergruppe and by international experts in this field are presented in this volume. Taking into account the fruitful discussions during the two colloquia and the cross-refereeing process for the accepted papers, a high degree of common understanding was achieved, leading to a highly comprehensive presentation in this volume.

The topics of the papers in this volume can be roughly classified into the following two areas:

- Petri net technology and
- application to communication-based systems.

Since most papers comprise aspects of both areas, we chose an alphabetic order. However, in the following we give a rough overview of the contributions in both areas according to the main focus of the corresponding papers.

Petri Net Technology

The main objective of the DFG Forschergruppe has been to develop an application-oriented Petri net technology. The main idea has been to develop a "Petri Net Baukasten" comprising three different views: the application developer view, expert view, and tool view. An overview of this "Petri Net Baukasten" is given in the paper by H. Weber, H. Ehrig, W. Reisig and the other main members of the DFG Forschergruppe. The application development assistance related to the application developer view is discussed in more detail in the paper by H. Weber. The concept of Petri net transformations and refinements is essential for the expert view. Transformations are studied in the papers by B. Braatz, H. Ehrig, M. Urbasek and F. Parisi-Presicce, with focuses on the conceptual and the formal framework. Rule-based refinement is studied by J. Padberg and M. Urbasek, and transition refinement for the verification of distributed algorithms by S. Peuker.

The tool view is supported by the two papers by M. Weber and E. Kindler on the Petri net kernel and the Petri net mark-up language, respectively. The generation of animation views in the paper by C. Ermel, R. Bardohl and H. Ehrig

is based on the tool GENGED. A more general view of the integration of tools is given by V. Braun, T. Margaria and B. Steffen using the Electronic Tool Integration (ETI) platform.

A comparison of Petri nets with activity diagrams is discussed by R. Eshuis and R. Wieringa, while Petri nets are proposed as a semantic model for message sequence charts by O. Kluge.

Applications to Communication-Based Systems

New concepts for business processing based on Petri nets are presented in the papers by W.M.P. van der Aalst and J. Dehnert, with focuses on inheritance and soundness respectively. Quantitative engineering, interorganizational management, and dynamic service outsourcing for business processes are considered by J. Desel, K. Lenz and A. Oberweis, and P. Grefen and S. Angelov. Interesting new theoretical frameworks are open Petri nets as semantic models for workflow integration and team automata for CSCW in the papers by R. Heckel and J. Kleijn, respectively. Moreover the new concept of algebraic higher-order nets is used by K. Hoffmann in order to achieve flexible modeling of business processes. Last, but not least, an integrated approach for automated control system development based on Petri nets is presented by E. Schnieder et al.

We are most grateful to the German Research Council (DFG) for support of the DFG Forschergruppe and the International Colloquia on Petri net technology in 1999 and 2001, to all authors and referees of this volume for their careful work, to Kathrin Hoffmann for her assistance in the editorial process, and, last, but not least, Springer-Verlag for a fruitful and smooth cooperation in publishing this volume in the well-established series Advances in Petri Nets.

August 2002

Hartmut Ehrig
Wolfgang Reisig
Grzegorz Rozenberg
Herbert Weber

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