

Lecture Notes in Computer Science

Edited by G. Goos, J. Hartmanis, and J. van Leeuwen

2644

Springer

Berlin

Heidelberg

New York

Barcelona

Hong Kong

London

Milan

Paris

Tokyo

Dieter Hogrefe Anthony Wiles (Eds.)

Testing of Communicating Systems

15th IFIP International Conference, TestCom 2003
Sophia Antipolis, France, May 26-28, 2003
Proceedings



Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany
Juris Hartmanis, Cornell University, NY, USA
Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Dieter Hogrefe
Universität Göttingen Lehrstuhl für Telematik
Lotzestr. 16-18, 37083 Göttingen, Germany
E-mail: hogrefe@informatik.uni-goettingen.de

Anthony Wiles
ETSI
PEX and Testing Competence Centre (PTCC)
Route des Lucioles, 06921 Sophia Antipolis, France
E-mail: Anthony.Wiles@etsi.fr

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.2.5, D.2, C.2

ISSN 0302-9743

ISBN 3-540-40123-7 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag Berlin Heidelberg New York
a member of BertelsmannSpringer Science+Business Media GmbH

<http://www.springer.de>

©2003 IFIP International Federation for Information Processing, Hofstrasse 3, A-2361 Laxenburg, Austria
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Olgun Computergrafik
Printed on acid-free paper SPIN: 10930533 06/3142 5 4 3 2 1 0

Preface

This volume contains the proceedings of TestCom 2003, the IFIP TC6/WG 6.1 International Conference on Testing of Communicating Systems, held in Sophia Antipolis, France, during May 26–28, 2003. TestCom denotes a series of international working conferences on testing communicating systems in the data and telecommunication domain. The conference provides a forum for researchers, vendors and users to review, discuss and learn about new approaches, concepts and experiences in the field of testing of communicating systems. This conference in particular focuses on new ways of testing for new-generation networks.

TestCom 2003 is the fifteenth in a series of annual meetings sponsored by IFIP TC6/WG 6.1. The 14 previous meetings were held in Vancouver, Canada (1988), Berlin, Germany (1989), McLean, USA (1990), Leidschendam, The Netherlands (1991), Montreal, Canada (1992), Pau, France (1993), Tokyo, Japan (1994), Evry, France (1995), Darmstadt, Germany (1996), Cheju Island, Korea (1997), Tomsk, Russia (1998), Budapest, Hungary (1999), Ottawa, Canada (2000), and Berlin, Germany (2002).

The scope of the papers presented at TestCom 2003 covers interoperability testing, TTCN-3, automata-based testing, testing of next-generation networks, IP and UMTS, test systems and tools, test specification design and methodology, and industrial experience in testing communication systems.

The TestCom 2003 program consisted of 6 technical sessions, 3 position statement sessions, and a special session on interoperability testing. Three invited speeches gave an overview on actual trends in the testing and telecommunication area and formulated requirements to the testing process.

The proceedings contain the 19 regular papers accepted and presented at the conference. They were selected from 53 submitted papers in a careful selection procedure based on the assessment of three referees for each paper. The proceedings also include the text of the invited talk by Elaine Weyuker, Philippe Cousin, and Ana Cavalli.

The Best Paper Award was given to the authors of “Realizing Distributed TTCN-3 Test Systems with TCI”, Ina Schieferdecker and Theofanis Vassiliou-Gioles, affiliated with FhG FOKUS, Germany.

For the first time the PQM Industrial Relevance Award was given to the paper with the most interest to the communications testing industry, selected during the conference by a panel of delegates from within the industry itself.

TestCom 2002 was organized under the auspices of IFIP TC6 by the European Telecommunications Standards Institute, ETSI, and by the University of Göttingen. It was supported by a number of partners including Danet, Davinci Communications, Ericsson, France Telecom, Motorola, Nokia, Testing Tech and Telelogic.

We would like to express our gratitude to the numerous people who contributed to the success of TestCom 2003. The reviewing process was one of the

major efforts during the preparation of the conference. It was completed by experts from around the world. The reviewers are listed in these proceedings. We also thank Mr. Hofmann of Springer-Verlag for his constructive support when editing these proceedings. Finally, we would like to thank Mr. Karl Heinz Rosenbrock for making the ETSI facilities available to us and thank the local organizers for the excellent running of the conference, especially Emmanuelle Jouan and Laetitia Taisne.

Our special thanks goes to Tabea Georgi, Kathrin Högg and André Meyer from the University of Lübeck who did the majority of the work in organizing and preparing these proceedings.

May 2003

Dieter Hogrefe
Anthony Wiles

Conference Committees

Conference Chairmen

Dieter Hogrefe, *University of Göttingen, Germany*

Anthony Wiles, *ETSI, France*

Steering Committee

Sam Chanson, *Hong Kong Univ. of Sci. & Tech., China*

Roland Groz, *France Telecom, France*

Guy Leduc, *University of Liege, Belgium*

Alexandre Petrenko, *CRIM, Canada*

Technical Program Committee

B. Baumgarten, *Fraunhofer SIT, Germany*

G. v. Bochmann, *University of Ottawa, Canada*

A.R. Cavalli, *INT, France*

G. Csopaki, *Budapest University of Technology and Economics, Hungary*

S. Dibuz, *Ericsson, Hungary*

A. Gehring, *Deutsche Telekom, Germany*

J. Grabowski, *University of Lübeck, Germany*

R. Hierons, *Brunel University, UK*

T. Higashino, *Osaka University, Japan*

M. Kim, *ICU University, Korea*

H. Koenig, *BTU Cottbus, Germany*

D. Lee, *Bell Labs Research, USA*

G. Maggiore, *TIM, Italy*

O. Monkewich, *OMC International, Canada*

R.L. Probert, *University of Ottawa, Canada*

O. Rafiq, *University of Pau, France*

S. Randall, *PQM Consultants, UK*

I. Schieferdecker, *Fraunhofer FOKUS, Germany*

K. Stöttinger, *Deutsche Telekom, Germany*

K. Suzuki, *Advanced Communication, Japan*

J. Tretmans, *University of Nijmegen, The Netherlands*

A. Ulrich, *Siemens, Germany*

H. Ural, *University of Ottawa, Canada*

M.U. Uyar, *City University of New York, USA*

C. Viho, *IRISA/University of Rennes, France*

C. Willcock, *Nokia, Germany*
J. Wu, *Tsinghua University, China*
N. Yevtushenko, *Tomsk State University, Russia*

Additional Reviewers

B. Bao, *Bell Labs Research, China*
S. Barbin, *IRISA/University of Rennes I, France*
J. Barta, *Ericsson, Hungary*
G. Batori, *BUTE, Hungary*
E. Bayse, *Institut National des Télécommunications (INT), France*
S. Boroday, *CRIM, Canada*
A. Carolina Minaburo, *RSM/ENST-Bretagne, France*
A.W.H. Chang, *BUTE, Hungary*
S.C. Cheung, *Hong Kong Univ. of Sci. & Tech., China*
C. Chi, *Bell Labs Research, China*
J. Corral, *RSM/ENST-Bretagne, France*
Z.R. Dai, *University of Lübeck, Germany*
A. Duale, *IBM, USA*
M. Fecko, *Telcordia Technologies, Inc., USA*
H. Hallal, *CRIM, Canada*
R. Hao, *Bell Labs Research, China*
T. Hasegawa, *KDDI R&D Labs., Japan*
O. Henniger, *Fraunhofer SIT, Germany*
L. Hevizi, *Ericsson, Hungary*
M. Higuchi, *Kinki University, Japan*
J. Hosszu, *Ericsson, Hungary*
D. Huang, *Bell Labs Research, China*
A. Idoe, *KDDI R&D Labs, Japan*
S. Kang, *Information and Communications University, Republic of Korea*
P. Koopman, *University of Nijmegen, The Netherlands*
I. Koufareva, *Tomsk State University, Russia*
G. Kovacs, *BUTE, Hungary*
P. Krémer, *Ericsson, Hungary*
J. Le Huo, *McGill University, Canada*
D. Le Viet, *BUTE, Hungary*
J. Ma, *Bell Labs Research, China*
A. Mederreg, *Institut National des Télécommunications (INT), France*
M. Meier, *BTU Cottbus, Germany*
T. Mori, *Osaka University, Japan*
H. Neukirchen, *University of Lübeck, Germany*
M. Núñez, *Universidad Complutense de Madrid, Spain*
T. Ogishi, *KDDI R&D Labs, Japan*
Z. Pap, *BUTE, Hungary*
A. Pietschker, *Siemens AG, Germany*

S. Prokopenko, *Tomsk State University, Russia*
Z. Rethati, *BUTE, Hungary*
D. Ross, *RSM/ENST-Bretagne, France*
S. Seol, *Information and Communications University, Republic of Korea*
T. Szabo, *BUTE, Hungary*
V. Trennkaev, *Tomsk State University, Russia*
D. Vieira, *Institut National des Télécommunications (INT), France*
E. Vieira, *Institut National des Télécommunications (INT), France*
M. Zuehlke, *BTU Cottbus, Germany*

Organization Committee

Emmanuelle Jouan, *ETSI, France*
Marie-Noëlle Girard, *ETSI, France*
Laetitia Taisne, *ETSI, France*
Tabea Georgi, *University of Lübeck, Germany*
Kathrin Högg, *University of Lübeck, Germany*
André Meyer, *University of Lübeck, Germany*

Table of Contents

Keynote Speech I

Prediction = Power	1
<i>Elaine J. Weyuker (AT&T Labs - Research)</i>	

Session I Next Generation Networks, IP and UMTS

UMTS Terminal Testing: A Practical Perspective	10
<i>Olaf Bergengruen</i>	
Testing of 3G 1xEV-DV Stack – A Case Study	20
<i>Ira Acharya and Hemendra Kumar Singh</i>	
Testing SIP Call Flows Using XML Protocol Templates	33
<i>M. Ranganathan, Olivier Deruelle, and Doug Montgomery</i>	
Towards Modeling and Testing of IP Routing Protocols	49
<i>Jianping Wu, Zhongjie Li, and Xia Yin</i>	

Session II TTCN-3

An Intuitive TTCN-3 Data Presentation Format	63
<i>Roland Gecse and Sarolta Dibuz</i>	
The UML 2.0 Testing Profile and Its Relation to TTCN-3	79
<i>Ina Schieferdecker, Zhen Ru Dai, Jens Grabowski, and Axel Rennoch</i>	
Realizing Distributed TTCN-3 Test Systems with TCI	95
<i>Ina Schieferdecker and Theofanis Vassiliou-Gioles</i>	
TIMEDTTCN-3 Based Graphical Real-Time Test Specification	110
<i>Zhen Ru Dai, Jens Grabowski, and Helmut Neukirchen</i>	

Keynote Speech II

Interoperability Events Complementing Conformance Testing Activities ..	128
<i>Philippe Cousin (ETSI PlugtestsTM Service)</i>	

Session III Automata-Based Methodology

Testing Transition Systems with Input and Output Testers	129
<i>Alexandre Petrenko, Nina Yevtushenko, and Jia Le Huo</i>	
Generating Checking Sequences for a Distributed Test Architecture	146
<i>Hasan Ural and Craig Williams</i>	

Conformance of Distributed Systems	163
<i>Maximilian Frey and Bernd-Holger Schlingloff</i>	
An Automata-Based Approach to Property Testing in Event Traces	180
<i>Hesham Hallal, Sergiy Boroday, Andreas Ulrich, and Alexandre Petrenko</i>	
Fault Diagnosis in Extended Finite State Machines	197
<i>Khaled El-Fakih, Svetlana Prokopenko, Nina Yevtushenko, and Gregor v. Bochmann</i>	
A Guided Method for Testing Timed Input Output Automata	211
<i>Abdeslam En-Nouaary and Rachida Dssouli</i>	
Session IV Interoperability Testing	
Interoperability Testing Based on a Fault Model for a System of Communicating FSMs	226
<i>Vadim Trenkaev, Myungchul Kim, and Soonuk Seol</i>	
Framework and Model for Automated Interoperability Test and Its Application to ROHC	243
<i>Sarolta Dibuz and Péter Krémer</i>	
Keynote Speech III	
TestNet: Let's Test Together!	258
<i>Ana Cavalli (INT/Testnet), Edgardo Montes de Oca, and Manuel Núñez</i>	
Session V Test Design, Tools and Methodology	
An Open Framework for Managed Regression Testing	265
<i>Naina Mittal and Ira Acharya</i>	
TUB-TCI – An Architecture for Dynamic Deployment of Test Components	279
<i>Markus Lepper, Baltasar Trancón y Widemann, and Jacob Wieland</i>	
Fast Testing of Critical Properties through Passive Testing	295
<i>José Antonio Arnedo, Ana Cavalli, and Manuel Núñez</i>	
Author Index	311