

Springer

Berlin

Heidelberg

New York

Barcelona

Budapest

Hong Kong

London

Milan

Paris

Singapore

Tokyo

Ramon Puigjaner Nunzio N. Savino
Bartomeu Serra (Eds.)

Computer Performance Evaluation

Modelling Techniques and Tools

10th International Conference, Tools'98
Palma de Mallorca, Spain
September 14-18, 1998
Proceedings



Springer

Series Editors

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

Volume Editors

Ramon Puigjaner
Nunzio N. Savino
Bartomeu Serra
Universitat de les Illes Balears
Departament de Ciències Matemàtiques i Informàtica
Carettera de Valldemossa km 7.6, E-07071 Palma (Balears), Spain
E-mail: {putxi, scidir}@ps.uib.es
savino@ipc4.uib.es

Cataloging-in-Publication data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Computer performance evaluation : modelling techniques and tools
; 10th international conference ; Tools'98, Palma de Mallorca, Spain,
September 14 - 18, 1998 ; proceedings / Ramon Puigjaner ... (ed.). -
Berlin ; Heidelberg ; New York ; Barcelona ; Budapest ; Hong Kong ;
London ; Milan ; Paris ; Singapore ; Tokyo : Springer, 1998
(Lecture notes in computer science ; Vol. 1469)
ISBN 3-540-64949-2

CR Subject Classification (1991): C.4, D.2.8, D.2.2

ISSN 0302-9743

ISBN 3-540-64949-2 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 1998
Printed in Germany

Typesetting: Camera-ready by author
SPIN 106838619 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

Preface

The need to evaluate computer and communication systems performance and dependability is continuously growing as a consequence of both the increasing complexity of systems and the user requirements in terms of timing behaviour. The 10th International Conference on Modelling Techniques and Tools for Computer Performance Evaluation, held in Palma in September 1998, was organised with the aim of creating a forum in which both theoreticians and practitioners could interchange recent techniques, tools, and experiences in these areas. This meeting follows the predecessor conferences of this series:

1984 Paris	1988 Palma	1994 Wien
1985 Sophia Antipolis	1991 Torino	1995 Heidelberg
1987 Paris	1992 Edinburgh	1997 Saint Malo

The tradition of this conference series continued this year where many high quality papers were submitted. The Programme Committee had a difficult task in selecting the best papers. Many fine papers could not be included in the program due to space constraints. All accepted papers are included in this volume. Also, a set of submissions describing performance modelling tools was transformed into tool presentations and demonstrations. A brief description of these tools is included in this volume. The following table gives the overall statistics for the submissions.

Country	Submitted	Accepted	Invited	Tool
Argentina	$\frac{4}{5}$			
Brazil	1			
Canada	$4\frac{2}{3}$	$2\frac{2}{3}$		
France	$9\frac{1}{5}$	$2\frac{2}{3}$		$1\frac{1}{3}$
Germany	$8\frac{2}{3}$	4	1	2
India	1			
Ireland	3			
Israel	1			
Italy	$6\frac{1}{6}$	$1\frac{2}{3}$		
Jordan	$\frac{1}{3}$			
Poland	$\frac{2}{3}$			$\frac{2}{3}$
Singapore	1			
Spain	$12\frac{3}{4}$	$3\frac{3}{4}$		1
South Africa	$\frac{1}{2}$	$\frac{1}{2}$		
Sweden	1			
The Netherlands	1	1		
United Kingdom	$3\frac{1}{2}$	$1\frac{1}{2}$		
USA	$12\frac{1}{2}$	7	1	4
Venezuela	$\frac{1}{4}$	$\frac{1}{4}$		
Total	69	25	9	

The papers address important problems from the application and theoretical viewpoints. The sessions Software Performance Tools, Network Performance, Measurement and Modelling Tools, Case Studies, and Software Performance Evaluation Methods contain papers addressing application problems. The sessions Algorithmic Techniques, Petri Net Techniques and MVA Techniques contain papers addressing theoretical aspects of performance evaluation.

It is impossible to close this text without acknowledging the efforts made by several people to help ensure the success of the conference. I express my thanks to

- The Programme Committee members for the task of reviewing papers and selecting the best of them.
- The external reviewers, without whose help the task of the Programme Committee would become impossible.
- The Organising Committee members, all from Universitat de les Illes Balears, without whose dedicated work the conference could not be set up.
- The scientific societies who have co-organised this conference.
- All public and private organisations that have supported the conference in some way (funding, offering services, or lending material).

Palma, September 1998

Ramon Puigjaner

Programme Committee

Chairman

Ramon Puigjaner

Members

Gianfranco Balbo, Italy
Heinz Beilner, Germany
Maria Calzarossa, Italy
Adrian Conway, USA
Larry Dowdy, USA
Günter Haring, Austria
Peter Harrison, UK
Boudewijn Haverkort, Germany
Peter Hughes, UK
Raj Jain, USA
Pieter Kritzinger, South Africa
Jacques Labetoulle, France
Allen Malony, USA
Raymond Marie, France
Luisa Massari, Italy
Richard Muntz, USA
Ahmed Patel, Ireland
Brigitte Plateau, France
Rob Pooley, UK

Guy Pujolle, France
Daniel Reed, USA
Martin Reiser, Switzerland
Gerardo Rubino, France
William Sanders, USA
Herb Schwetman, USA
Giuseppe Serazzi, Italy
Bartomeu Serra, Spain
Juan-José Serrano, Spain
Kenneth C. Sevcik, Canada
Connie Smith, USA
Arne Solvberg, Norway
Edmundo de Souza e Silva, Brazil
Otto Spaniol, Germany
William Stewart, USA
Hideaki Takagi, Japan
Yutaka Takahashi, Japan
Satish Tripathi, USA
Kishor Trivedi, USA

Secretary

Nunzio Savino

Organising Committee

Chairman

Bartomeu Serra

Members

Bartomeu Adrover	Roser Lluch
Maribel Barcel	Josep Mañas
Josep Frau	

Referees

Andreas van Almsick
Juan-Luis Anciano
Gianfranco Balbo
Falko Bause
Heinz Beilner
Guillem Bernat
Madhu Bhabuta
Henrik Bohnenkamp
Peter Buchholz
Maria Carla Calzarossa
Adrian Conway
Paolo Cremonesi
Larry Dowdy
Pedro Gil
Sonia Fahmy
Tony Field
Claudio Gennaro
Mukul Goyal
Rohit Goyal
Gnter Haring
Peter Harrison
Boudewijn Haverkort
Peter Hughes
Raj Jain
Kamyar Kanani
Peter Kemper
Joao-Paulo Kitajima
William Knottenbelt
Pieter Kritzinger
Jacques Labetoulle
Christoph Lindemann
Chunlei Liu
Glenn R. Luecke

Allen Malony
Raymond Marie
Luisa Massari
Richard Muntz
Rafael Ors
Alexander Ost
Ahmed Patel
Brigitte Plateau
Rob Pooley
Ramon Puigjaner
Guy Pujolle
Daniel Reed
Martin Reiser
Gerardo Rubino
William H. Sanders
Vicente Santonja
Nunzio Savino
Herb Schwetman
Giuseppe Serazzi
Bartomeu Serra
Juan-Jos Serrano
Kenneth C. Sevcik
Connie U. Smith
Arne Solvberg
Edmundo A. de Souza e Silva
Otto Spaniol
William Stewart
Hideaki Takagi
Yutaka Takahashi
Satish Tripathi
Kishor Trivedi
Lloyd G. Williams

This conference was organised by

Universitat de les Illes Balears

in co-operation with:

ACM Sigmetrics

IFIP Working Group 6.3 (Performance of Computer Networks)

IFIP Working Group 7.3 (Computer System Modelling)

With the sponsorship of:

Ajuntament de Palma

Conselleria d'Educació, Cultura i Esports del Govern Balear

Direcció General de Tecnologies de la Informació i Comunicacions del Govern Balear

We gratefully acknowledge the support, of various types, of:

Banca March, S.A.

BMC

Caixa d'Estalvis de Balears, Sa Nostra

Digital Equipment Corporation Espaa

Silicon Graphics

Sun Microsystems Ibérica

Telefónica de España, S.A.

TransTOOLS, S.A.

Table of Contents

Invited Paper

A Modular and Scalable Simulation Tool for Large Wireless Networks	1
<i>R. Bagrodia, M. Gerla</i>	

Software Performance Tools

Designing Process Replication and Threading Policies: A Quantitative Approach	15
<i>M. Litoiu, J. Rolia, G. Serazzi</i>	
SREPT: Software Reliability Estimation and Prediction Tool	27
<i>S. Ramani, S.S. Gokhale, K.S. Trivedi</i>	
Reusable Software Components for Performability Tools and Their Utilization for Web-Based Configurable Tools	37
<i>A.P.A. van Moorsel, Y. Huang</i>	
Compositional Performance Modelling with TIPPTool	51
<i>H. Hermanns, U. Herzog, U. Klehmet, V. Mertsiotakis, M. Siegle</i>	

Network Performance

QNA-MC: A Performance Evaluation Tool for Communication Networks with Multicast Data Streams	63
<i>G. Schneider, M. Schuba, B.R. Haverkort</i>	
Response Times in Client-Server Systems	75
<i>A.J. Field, P.G. Harrison, J. Parry</i>	
A Queueing Model with Varying Service Rate for ABR	93
<i>R. Núñez-Queija</i>	
Simulative Performance Evaluation of the Temporary Pseudonym Method for Protecting Location Information in GSM Networks	105
<i>P. Reichl, D. Kesdogan, K. Junghärtchen, M. Schuba</i>	

Measurement and Modelling Tools

A Model Driven Monitoring Approach to Support the Multi-view Performance Analysis of Parallel Responsive Applications	117
<i>J. García, J. Entrialgo, F. Suárez, D.F. García</i>	

Instrumentation of Synchronous Reactive Systems for Performance Analysis: A Case Study	129
<i>A. Valderruten, J. Mosquera, V.M. Guñas</i>	

Algorithmic Techniques

A Perturbation and Reduction Based Algorithm	142
<i>J.-M. Fourneau, L. Mokdad</i>	
A Comparison of Numerical Splitting-Based Methods for Markovian Dependability and Performability Models	154
<i>V. Suñé, J.A. Carrasco</i>	
Probability, Parallelism and the State Space Exploration Problem	165
<i>W. Knottenbelt, M. Mestern, P.G. Harrison, P. Kritzinger</i>	
An Improved Multiple Variable Inversion Algorithm for Reliability Calculation	180
<i>T. Luo, K.S. Trivedi</i>	

Case Studies

Performance Evaluation of Web Proxy Cache Replacement Policies	193
<i>M. Arlitt, R. Friedrich, T. Jin</i>	
Performance Analysis of a WDM Bus Network Based on GSPN Models ...	207
<i>G. Franceschinis, A. Fumagalli, R. Grasso</i>	
Scheduling Write Backs for Weakly-Connected Mobile Clients	219
<i>K.W. Froese, R.B. Bunt</i>	
On Choosing a Task Assignment Policy for a Distributed Server System ..	231
<i>M. Harchol-Balter, M.E. Crovella, C.D. Murta</i>	

Petri Net Techniques

Structured Characterization of the Markov Chain of Phase-Type SPN	243
<i>S. Donatelli, S. Haddad, P. Moreaux</i>	
Markov Regenerative Stochastic Petri Nets with General Execution Policies: Supplementary Variable Analysis and a Prototype Tool	255
<i>R. German</i>	

MVA Techniques

A Queue-Shift Approximation Technique for Product-Form Queueing Networks	267
<i>P.J. Schweitzer, G. Serazzi, M. Broglia</i>	

Experiments with Improved Approximate Mean Value Analysis Algorithms	280
<i>H. Wang, K.C. Sevcik</i>	

Software Performance Evaluation Methods

Extending SMART2 to Predict the Behaviour of PL/SQL Applications . . .	292
<i>J.L. Anciano Martin, N.N. Savino Vázquez, J.A. Corbacho, R. Puigjaner</i>	
Performance Evaluation of Distributed Object Architectures	306
<i>S. Dumas, D. Boudigue, G. Gardarin</i>	
Performance Engineering Evaluation of CORBA-based Distributed Systems with SPE•ED	321
<i>C.U. Smith, L.G. Williams</i>	

Tool Presentations

Edinet: An Execution Driven Interconnection Network Simulator for DSM Systems	336
<i>J. Flich, P. López, M.P. Malumbres, J. Duato</i>	
Snuffle: Integrated Measurement and Analysis Tool for Internet and its Use in Wireless In-House Environment	340
<i>B. Rathke, Th. Assimakopoulos, R. Morich, G. Schulte, A. Wolisz</i>	
A Tool to Model Network Transient States with the Use of Diffusion Approximation	344
<i>T. Czachorski, M. Pastuszka, F. Pekergin</i>	
HIMAP: Architecture, Features, and Hierarchical Model Specification Techniques	348
<i>M. Sridharan, S. Ramasubramanian, A.K. Somani</i>	
SvPablo: A Multi-language Performance Analysis System	352
<i>L. De Rose, Y. Zhang, D.A. Reed</i>	
A Toolbox for Functional and Quantitative Analysis of DEDS	356
<i>F. Bause, P. Buchholz, P. Kemper</i>	
A Reconfigurable Hardware Tool for High Speed Network Simulation	360
<i>C. Labbé, F. Reblewski, S. Martin, J.-M. Vincent</i>	
JAGATH: A Methodology and Its Application for Distributed Systems Performance Evaluation and Control	365
<i>S. Santha, U. Pooch</i>	
Hierarchical Stochastic Reward Net Solver Package	369
<i>T. Sakaguchi, A.K. Somani</i>	
Authors Index	375