Lecture Notes in Computer Science 2538

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

Springer
Berlin
Heidelberg
New York
Barcelona
Hong Kong
London
Milan
Paris
Tokyo

Birgitta König-Ries Kia Makki
S.A.M. Makki Niki Pissinou
Peter Scheuermann (Eds.)

Developing an Infrastructure for Mobile and Wireless Systems

NSF Workshop IMWS 2001
Scottsdale, AZ, October 15, 2001
Revised Papers

Springer

Series Editors

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

Volume Editors

Birgitta König-Ries
Karlsruhe University, Germany
E-mail: koenig@ipd.uni-karlsruhe.de

Kia Makki
Niki Pissinou
Florida International University, Miami, FL, USA
E-mail: kia/niki@eng.fiu.edu

S.A.M. Makki
Queensland University of Technology, Brisbane, QLD, Australia
E-mail: s.makki@qut.edu.au

Peter Scheuermann
Northwestern University, Evanston, IL, USA
E-mail: peters@ece.nwu.edu

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): C.2, D.2, I.2.11, H.3, H.4, H.5

ISSN 0302-9743
ISBN 3-540-00289-8 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

© Springer-Verlag Berlin Heidelberg 2002
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Boller Mediendesign
Printed on acid-free paper SPIN: 10871576 06/3142 5 4 3 2 1 0

Preface

The workshop on an Infrastructure for Mobile and Wireless Systems was held in Scottsdale, Arizona on October 15, 2001 and was funded by the National Science Foundation (NSF) and sponsored by the Telecommunications and Information Technology Institute of the College of Engineering at Florida International University (FIU), to establish a common infrastructure for the discipline of mobile and wireless networking, and to serve its rapidly emerging mobile and wireless community of researchers and practitioners. The workshop provides a single, cohesive, and high-quality forum for disseminating research and experience in this emerging field. Of significance is the integration of many diverse communities. The areas of mobile and wireless networking combine the best of both worlds, namely academia and industry. The objective of the workshop is to define and establish a common infrastructure of the discipline and to develop a consensus-based document that will provide a foundation for implementation, standardization, and further research.

Workshop Program Chairs Dr. Birgitta König-Ries (Universität Karlsruhe), and Dr. Peter Scheuermann (Northwestern University) and Vice Program Chair Dr. S.A.M. Makki (Queensland University of Technology), assembled a truly impressive program committee. Together with the program committee, they worked diligently to select papers and speakers that met the criteria of high quality and relevance to our various fields of interest. It takes time and effort to review a paper carefully, and every member of the program committee is to be commended for his/her contribution to the success of this workshop.

The papers contained in these proceedings focus on original research results in the areas of theory, design, implementation, and applications of mobile and wireless networks. They identify challenging problems facing the development of such technologies and provide novel, innovative, and fundamental advances in the areas. We sincerely believe you will find the manuscripts included in these proceedings to be of significant technical merit.

A lot of work went into organizing this workshop, forming this program, and producing the proceedings. We would like to express our deepest personal thanks to keynote speakers, invited speakers, speakers, Registration Chair Dr. E.K. Park (University of Missouri-Kansas), and the various workshop organizers for their efforts. We take this opportunity to acknowledge the excellent work done by Program Chairs Birgitta König-Ries and Peter Scheuermann, and by S.A.M. Makki (Vice Program Chair). In addition, we would like to thank Charles Perkins (Nokia), Peter Reiher (University of California at Los Angeles), Jari Veijalainen (University of Jyvaskyla, Finland), Alexander Wolf (University of Colorado), and Ouri Wolfson (University of Illinois at Chicago) for their contributions towards this effort. We are grateful to NSF who generously funded this workshop. Specifically, we would like to thank Dr. Mukesh Singhal (University of Kentucky, Lexington/NSF) and Dr. Yuan-Chien (Randy) Chow (NSF).

We would also like to thank Dr. Modesto Maidique, President of Florida International University (FIU), Dr. Mark Rosenberg, Provost and Executive Vice President of FIU, Dr. Vish Prasad, Dean of College of Engineering at FIU, and other administrators and staff at FIU for their support and encouragement.

It was our great honor and pleasure to accept the responsibilities and challenges of general chairs. We are pleased to offer an excellent program, and we hope that you all took advantage of these opportunities for professional development. We hope that the workshop was stimulating, informative, enjoyable, and a fulfilling experience for all who attended.

September 2002

Kia Makki
Niki Pissinou

Organization

The NSF Workshop on an Infrastructure for Mobile and Wireless Systems was held in conjunction with the International Conference on Computer Communications and Networks, ICCCN. It was sponsored by NSF and the Telecommunications and Information Technology Institute at Florida International University.

Executive Committee

General Chairs:	Niki Pissinou, Florida International University Kia Makki, Florida International University
Program Chairs:	Peter Scheuermann, Northwestern University Birgitta König-Ries, Florida International University/Universität Karlsruhe, Germany
Vice Program Chair:	S.A.M. Makki, Queensland University of Technology, Australia
Registration Chair:	E.K. Park, University of Missouri-Kansas City

Program Committee

B.R. Bardrinath, Rutgers University, USA
Bharat Bhargava, Purdue University, USA
Yuri Breitbart, Lucent, Bell Labs, USA
Ahmed Elmagarmid, Purdue University, USA
Ophir Frieder, Illinois Institute of Technology, USA
Forouzan Golshani, Arizona State University, USA
Mohsen Guizani, University of West Florida, USA
Abdelsalam Helal, University of Florida, USA
David Hislop, Army Research Office, USA
Anupam Joshi, University of Maryland, Baltimore County, USA
Demetrios Kazakos, University of Louisiana at Lafayette, USA
Robert Laurini, L'Institut National des Sciences Appliquées de Lyon/Université Claude Bernard, Lyon, France
Dik Lun Lee, University of Science and Technology, Hong Kong
Charles E. Perkins, Nokia, USA
Peter Reiher, UCLA, USA
Kurt Rothermel, IPVR, University of Stuttgart, Germany
Mukesh Singhal, University of Kentucky, Lexington/NSF, USA
Oezguer Ulusoy, Bilkent University, Turkey
Jari Veijalainen, GMT-FIT, Germany/University of Jyvaskyla, Finland
Julian Wu, Army Research Lab, USA

External Referees

Sasikanth Avancha
Christian Becker
Alexander Leonhardi
Brahim Medjahed
Alex Vrenio

Sponsoring Institutions

National Science Foundation (NSF)
Telecommunications and Information Technology Institute (IT^2)
at Florida International University

Table of Contents

Consensus Report

Research Direction for Developing an Infrastructure for Mobile & Wireless Systems: Consensus Report of the NSF Workshop Held on October 15, 2001 in Scottsdale, Arizona 1
Birgitta König-Ries (Universität Karlsruhe, Germany), Kia Makki (Florida International University), S.A.M. Makki (Queensland University of Technology, Australia), Charles E. Perkins (Nokia Research Center, Mountain View, CA), Niki Pissinou (Florida International University), Peter Reiher (University of California at Los Angeles), Peter Scheuermann (Northwestern University), Jari Veijalainen (University of Jyvaskyla, Finland), Alexander Wolf (University of Colorado), Ouri Wolfson (University of Illinois at Chicago)

Keynote Presentation

Recent Developments with Mobile IPv6 38
Charles E. Perkins (Nokia Research Center, Mountain View, CA)

Invited Papers

Ad Hoc Wireless Networks: Analysis, Protocols, Architecture, and Convergence 39
P.R. Kumar (University of Illinois)

Supporting E-commerce in Wireless Networks 40
Radek Vingralek (STAR Lab, InterTrust Technologies Corporation)

Modeling Moving Objects for Location Based Services 46
Ouri Wolfson (University of Illinois at Chicago), Sam Chamberlain (Army Research Lab), Kostas Kalpakis, Yelena Yesha (University of Maryland)

Accepted Papers

Content-Based Networking: A New Communication Infrastructure 59
Antonio Carzaniga, Alexander L. Wolf (University of Colorado)

Flexible Integrated Cache for Efficient Information Access in Mobile Computing Environments 69
Mohan Kumar, Sajal Das (The University of Texas at Arlington)

Design Considerations for Mobile Client-Server Database Applications 78
Wai Gen Yee, Shamkant B. Navathe (Georgia Institute of Technology)

Smart Environments: Middleware Building Blocks for Pervasive Network Computing (A Position Paper) 90
Jon Weissman, Zhi-Li Zhang (University of Minnesota)

Agents, Mobility, and M-services: Creating the Next Generation Applications and Infrastructure on Mobile Ad-Hoc Networks 106
Anupam Joshi, Timothy Finin, Yelena Yesha (University of Maryland)

ANTARCTICA: A Multiagent System for Internet Data Services in a Wireless Computing Framework 119
A. Goñi, A. Illarramendi, E. Mena, Y. Villate, J. Rodríguez (University of Zaragoza, Spain and University of the Basque Country, Spain)

A Collaborative Infrastructure for Mobile and Wireless Systems..... 136
Lutz Wegner, Morad Ahmad, Stefan Fröhlich, Christian Schmidt (Universität Gh Kassel, Germany), Wilfried Evers (SIEMENS AG, Germany)

The Rationale for Infrastructure Support for Adaptive and Context-aware Applications: A Position Paper 146
Nigel Davies, Keith Cheverst, Christos Efstratiou, Adrian Friday (Lancaster University and University of Arizona)

Mobile Wireless Interfaces: In Search for the Limits 153
Jari Veijalainen (University of Jyvaskyla, Finland), Tom Gross (GMD-FIT, Germany)

Prospects of Secure Real-Time Video Transmission over CDPD Networks . 164
Farid Hatefi, Forouzan Golshani, Gamze Seckin (Arizona State University)

Middleware for Location Based Information Services in Mobile Environment 173
Yugyung Lee, Nitin Prabhu, E.K. Park (University of Missouri)

Author Index 183