

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zürich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at <http://www.springer.com/series/7411>

Mari Carmen Aguayo-Torres · Gerardo Gómez
Javier Poncela (Eds.)

Wired/Wireless Internet Communications

13th International Conference, WWIC 2015
Malaga, Spain, May 25–27, 2015
Revised Selected Papers

Editors

Mari Carmen Aguayo-Torres
ETSI Telecomunicación
Malaga
Spain

Javier Poncela
ETSI Telecomunicación
Malaga
Spain

Gerardo Gómez
ETSI Telecomunicación
Malaga
Spain

ISSN 0302-9743

ISSN 1611-3349 (electronic)

Lecture Notes in Computer Science

ISBN 978-3-319-22571-5

ISBN 978-3-319-22572-2 (eBook)

DOI 10.1007/978-3-319-22572-2

Library of Congress Control Number: 2015946067

LNCS Sublibrary: SL5 – Computer Communication Networks and Telecommunications

Springer Cham Heidelberg New York Dordrecht London

© Springer International Publishing Switzerland 2015

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media
(www.springer.com)

Preface

On behalf of the WWIC committee members, we welcome you to the proceedings of the 13th International Conference on Wired & Wireless Internet Communications (WWIC 2015), which was held in Malaga, Spain, during May 25–27, 2015.

WWIC is a well-established conference in all Internet communication aspects held in the late Spring. This year's 3-day event provided a dynamic platform to exchange ideas, research findings, innovations, best practices, lessons learned, and challenges encountered on wireless network technologies and their applications related to the Internet, in order to designate future research efforts and directions.

The 13th edition focused on the efficient integration of new network approaches with the traditional wired infrastructure. WWIC 2015 addressed research topics such as the design and evaluation of protocols, the dynamics of integration, the performance trade-offs, the need for new performance metrics and cross-layer interactions. The goal of the conference is to present high-quality results in the field.

The WWIC 2015 call for papers attracted submissions from 20 countries (Europe, North Africa, North America, Asia) on the major areas of next-generation services, resource management, wireless and wired networks, and network architectures and applications. Finally, 25 papers were selected out of 42 submissions, and they were grouped by topic into six technical sessions distributed throughout the event. The area of wireless and wired networks aroused more interest, with nearly half of the papers being on this topic.

We would like to thank our keynote speakers, Preben Mogensen (Aalborg University, Denmark) and Joerg Widmer (IMDEA Networks, Spain), for accepting our invitation. Their interesting talks introduced us to the forthcoming 5G generation radio technologies and the challenges and possible solutions for networking in the millimeter wave-band. The conference also held five invited papers from relevant research groups in the field, which addressed issues for optimization of link and network mechanisms. The accepted papers were organized in six sessions.

We thank all authors for contributing to the technical excellence of WWIC 2015. We would also like to thank all the members of the Technical Program Committee as well as the additional reviewers for their effort. Thanks also to our sponsors, in particular the School of Telecommunications Engineering (ETSIT), the University of Malaga (UMA), and the International Federation for Information Processing (IFIP).

We expect all attendees enjoyed the scientific and social program, and look forward to welcoming you at WWIC 2016!

May 2015

Mari Carmen Aguayo-Torres
Gerardo Gómez
Javier Poncela

Organization

Technical Committee

Khalid Al-Begain	University of South Wales, UK
Onur Altintas	Toyota InfoTechnology Center, Japan
Vangelis Angelakis	Linköping University, Sweden
Bigomokero Bagula	University of Western Cape, South Africa
Kamel Barkaoui	Cedric Cnam-Paris, France
Paolo Bellavista	University of Bologna, Italy
Fernando Boavida	University of Coimbra, Portugal
Malika Bourenane	University of Senia, Algeria
Wojciech Burakowski	Warsaw University of Technology, Poland
Scott Burleigh	JPL, California Institute of Technology, USA
Maria Calderon	Universidad Carlos III de Madrid, Spain
Paulo Carvalho	Centro Algoritmi, Universidade do Minho, Portugal
Ana Cavalli	Telecom SudParis, France
Ken Chen	University of Paris 13, France
Marilia Curado	University of Coimbra, Portugal
Boubaker Daachi	University of Paris-East, France
Aïssani Djamil	LAMOS, University of Bejaia, Algeria
Lefteris Mamatas	University of Macedonia, Greece
Ognjen Dobrijevic	University of Zagreb, Croatia
Scott Fowler	Linköping University, Sweden
Paul Gendron	University of Massachusetts Dartmouth, USA
Yassine Hadjadj-Aoul	University of Rennes 1, France
Haffaf Hafid	University of Oran, Algeria
Petr Hanacek	Brno University of Technology, Czech Republic
Jarmo Harju	Tampere University of Technology, Finland
Sonia Heemstra de Groot	Eindhoven Technical University, The Netherlands
Said Hoccini	UPEC, University of Paris-Est Creteil Val de Marne, France
Muhammad Imran	KSU, Saudi Arabia
Malika Ioualalen	USTHB, Algeria
Bouabdellah Kechar	University of Oran, Algeria
Ibrahim Korpeoglu	Bilkent University, Turkey
Francine Krief	University of Bordeaux, France
S.A. Kumar Kumar	Delhi Technological University, India
Abderrahmane Lakas	UAE University, UAE
Sekhri Larbi	University of Oran, Algeria

Vassilis Tsaoussidis	Democritus University, Greece
Pascal Lorenz	University of Haute Alsace, France
Chung-Horng Lung	Carleton University, Canada
Christian Maihöfer	Daimler AG, Germany
Christian Makaya	IBM Research, USA
Eva Marin-Tordera	Technical University of Catalonia, UPC, Spain
Xavier Masip-Bruin	Universitat Politècnica de Catalunya, Spain
Ahmed Mehaoua	University of Paris Descartes, France
Paulo Mendes	COPELABS, University Lusofona, Portugal
Enzo Mingozzi	University of Pisa, Italy
Edmundo Monteiro	University of Coimbra, Portugal
Hassnaa Moustafa	Intel, USA
Liam Murphy	University College Dublin, Ireland
Rakesh Nagaraj	Amrita School of Engineering, India
Ioanis Nikolaidis	University of Alberta, Canada
Panagiotis Papadimitriou	Leibniz Universität Hannover, Germany
Nikolaos Pappas	Linköping University, Sweden
Ioannis Psaras	University College London, UK
Jean-Pierre Richard	Ecole Centrale de Lille, France
Dimitrios Serpanos	University of Patras, Greece
Farhan Siddiqui	Walden University, USA
Vasilios Siris	Athens University of Economics and Business, Greece
Harry Skianis	University of the Aegean, Greece
Yahya Slimani	University of Manouba, Tunisia
Dirk Staehle	HTWG Konstanz, Germany
Burkhard Stiller	University of Zurich, Switzerland
Jean Thiriet	GIPSA lab, France
Elias Tragos	Institute of Computer Science, FORTH, Greece
Alicia Triviño	University of Malaga, Spain
Ming-Fong Tsai	Feng Chia University, Taiwan
Angeliki Tsioliariidou	Foundation for Research and Technology, Greece
Hans van den Berg	TNO, The Netherlands
Rob van der Mei	Centrum voor Wiskunde en Informatica, The Netherlands
Wei Wei	Xi'an University of Technology, China
Miki Yamamoto	Kansai University, Japan

Organizers

General Chair

Mari Carmen Aguayo-Torres	Spain
---------------------------	-------

General Co-chairs

Abdelhamid Mellouk France
Gerardo Gómez Spain

TPC Chair

Javier Poncela Spain

Proceedings Chair

Gerardo Gómez Spain

Asia/Pacific Liaison Co-chairs

Nadeem Javaid Pakistan
Lei Shu China

America Liaison Chair

Eduardo Cerqueira Brazil

Europe Liaison Chair

Periklis Chatzimisios Greece

Middle East/Africa Liaison Co-chairs

Samira Moussaoui Algeria
Nidal Nasser Kingdom of Saudi Arabia

Web and Publicity Chair

Gerardo Gómez Spain

Local Organizing Co-chairs

Javier Poncela Spain
Gerardo Gómez Spain

Steering Committee

Torsten Braun Switzerland
Vassilios Tsaoussidis Greece
Peter Langendörfer Germany
Geert Heijenk The Netherlands

X Organization

Yevgeni Koucheryavy Finland
Otto Carle Germany
Ibrahim Matta USA

Sponsors

Universidad de Málaga (www.uma.es)



UNIVERSIDAD
DE MÁLAGA

Escuela Técnica superior de Ingeniería de Telecomunicación (www.etsit.uma.es)



Departamento de Ingeniería de Comunicaciones (www.ic.uma.es)



International Federation for Information Processing (www.ifip.org)



Keynote Speakers

5G for People and Things – Expanding the Human Possibilities of Technology

Preben Mogensen

Aalborg University, Denmark

The commercial launch of the forthcoming fifth-generation (5G) mobile communication system is expected to start from 2020. 5G has three key drivers: to provide perception of unlimited access to services in the cloud; to be ultrafast responsive for real-time remote and automation control; and to give reliable and secure connectivity to an enormous number of low-power and low-cost devices (Internet of Things, IoT). Some of the key radio technologies to reach these 5G targets are to move up in frequency bands so as to have access to more spectrum, to densify the network by deploying ultra-dense small cells, and to enhance the transmission efficiency by MIMO and advanced transceivers. Finally, the overall 5G network architecture will be programmable and software driven. This presentation will discuss Nokia's view on 5G.

Efficient Networking in Millimeter Wave-Bands

Joerg Widmer

Institute IMDEA Networks, Madrid, Spain

State-of-the-art wireless communication already operates close to Shannon capacity and one of the most promising options to further increase data rates is to increase the communication bandwidth. Very high bandwidth channels are only available in the extremely high frequency part of the radio spectrum, the millimeter wave-band (mm-wave). Upcoming communication technologies, such as IEEE 802.11ad, are already starting to exploit this part of the radio spectrum to achieve data rates of several gigabits per second. However, communication at such high frequencies also suffers from high attenuation and signal absorption, often restricting communication to line-of-sight (LOS) scenarios and requiring the use of highly directional antennas. This in turn requires a radical rethinking of wireless network design. On the one hand, such channels experience little interference, allowing for a high degree of spatial reuse and potentially simpler MAC and interference management mechanisms. On the other hand, such an environment is extremely dynamic and channels may appear and disappear over very short time intervals, in particular for mobile devices. This talk will highlight some of the challenges of and possible approaches for networking in the mm-wave band.

Contents

Wireless Technologies

Downlink Packet Scheduling Algorithm Using Tabu Method in LTE Systems	3
<i>Radhia Khdir, Kais Mnif, and Lotfi Kammoun</i>	
Online Charging Based on Machine Context for M2M Communication in LTE	18
<i>Ranko Maric, Tomislav Grgic, Maja Matijasevic, and Ignac Lovrek</i>	
Cloud Computing-Based Message Dissemination Protocol for Vehicular Ad Hoc Networks	32
<i>Salim Bitam and Abdelhamid Mellouk</i>	
PerformLTE: A Testbed for LTE Testing in the Future Internet	46
<i>Almudena Díaz-Zayas, Cesar A. García-Pérez, Álvaro M. Recio-Pérez, and Pedro Merino-Gómez</i>	
Analysis of CQI Traces from LTE MIMO Deployments and Impact on Classical Schedulers	60
<i>Jose Oscar Fajardo, Ianire Taboada, and Fidel Liberal</i>	

Network Mobility and Mobility Management

A Survey on Wireless Sensors Networks Security Based on a Layered Approach	77
<i>Raul A. Fuentes-Samaniego, Ana Rosa Cavalli, Juan A. Nolasco-Flores, and Javier Baliosian</i>	
A GPSR Enhancement Mechanism for Routing in VANETs.	94
<i>C. Bouras, V. Kapoulas, and E. Tsanai</i>	
AntWMNet – A Hybrid Routing Algorithm for Wireless Mesh Networks Based on Ant Colony Optimisation	108
<i>Luis J. Mariscal, Alicia Triviño, and Fernando Boavida</i>	
Adaptive Beaconless Opportunistic Routing for Multimedia Distribution	122
<i>Larissa Pimentel, Denis Rosário, Marcos Seruffo, Zhongliang Zhao, and Torsten Braun</i>	

Network Architecture and Applications

Invariant Preserving Middlebox Traversal.	139
<i>Ahmed Abujoda and Panagiotis Papadimitriou</i>	
BitWorker, a Decentralized Distributed Computing System Based on BitTorrent	151
<i>Arnaud Durand, Mikael Gasparian, Thomas Rouvinez, Imad Aad, Torsten Braun, and Tuan Anh Trinh</i>	
Virtual Network Flavors: Differentiated Traffic Forwarding for Cloud Tenants	165
<i>Aryan TaheriMonfared and Chunming Rong</i>	
Exploiting Communication Opportunities in Disrupted Network Environments	180
<i>Lefteris Mamatras, Alexandra Papadopoulou, and Vassilis Tsaoussidis</i>	

Next Generation Services

Tiny Network Caches with Large Performance Gains for Popular Downloads	197
<i>Piotr Srebrny, Dag Henning Liodden Sørbo, and Thomas Plagemann</i>	
An Openflow-Based Approach to Failure Detection and Protection for a Multicasting Tree	211
<i>Vignesh Renganathan Raja, Abhishek Pandey, and Chung-Hong Lung</i>	
A Hierarchical Classification Model of QoE Influence Factors	225
<i>Lamine Amour, Sami Souihi, Said Hoceini, and Abdelhamid Mellouk</i>	
Network Traffic Analysis and QoE Evaluation for Video Progressive Download Service: Netflix	239
<i>Francisco Lozano, Mari-Carmen Aguayo-Torres, Gerardo Gómez, Carlos Cárdenas, and Juana Baños</i>	
A Tool to Estimate Roaming Behavior in Wireless Architectures	247
<i>Rute Sofia</i>	
Distributed and Efficient One-Class Outliers Detection Classifier in Wireless Sensors Networks.	259
<i>Oussama Ghorbel, Mohamed Wassim Jmal, Mohamed Abid, and Hichem Snoussi</i>	
Brain-Computer Interface as Networking Entity in Body Area Networks	274
<i>M.A. Lopez-Gordo and F. Pelayo Valle</i>	

Resource Management

A Modification of DYMO Routing Protocol with Knowledge of Nodes’ Position: Proposal and Evaluation 289
Enrica Zola, Francisco Barcelo-Arroyo, and Israel Martin-Escalona

DTN Routing Optimised by Human Routines: The HURRy Protocol. 299
Susana Pérez-Sánchez, Jose Maria Cabero, and Iñigo Urteaga

On the Performance of Caching and Forwarding in Information-Centric Networking for the IoT 313
Mohamed Ahmed M. Hail, Marica Amadeo, Antonella Molinaro, and Stefan Fischer

Empirical Analysis of the Minkowski Distance Order in Geographical Routing Protocols for VANETs 327
Luis Urquiza-Aguilar, Carolina Tripp-Barba, José Estrada-Jiménez, and Mónica Aguilar Igartua

Lossless Multicast Handovers in Proxy Fast Mobile IPv6 Networks 341
Bernd Meijerink and Geert Heijenk

Wireless and Wired Networks

Unifying Web Services Communities Modelling Through a UML Profile. 357
Hela Limam and Jalel Akaichi

Towards Information-Centric Wireless Multi-hop Communication 367
Carlos Anastasiades and Torsten Braun

Formal Approach for Modeling, Verification and Performance Analysis of Wireless Sensors Network 381
Sajeh Zairi, Anis Mezni, and Belhassen Zouari

Optimization and Verification of the TR-MAC Protocol for Wireless Sensor Networks 396
Sarwar Morshed and Geert Heijenk

A New Hierarchical Key Management Scheme for Secure Clustering in Wireless Sensor Networks 411
Mohamed-Lamine Messai, Hamida Seba, and Makhlouf Aliouat

Author Index 425