Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 175

Editorial Board

Ozgur Akan
Middle East Technical University, Ankara, Turkey
Paolo Bellavista
University of Bologna, Bologna, Italy
Jiannong Cao
Hong Kong Polytechnic University, Hong Kong, Hong Kong
Geoffrey Coulson
Lancaster University, Lancaster, UK
Falko Dressler
University of Erlangen, Erlangen, Germany
Domenico Ferrari
Università Cattolica Piacenza, Piacenza, Italy
Mario Gerla
UCLA, Los Angeles, USA
Hisashi Kobayashi
Princeton University, Princeton, USA
Sergio Palazzo
University of Catania, Catania, Italy
Sartaj Sahni
University of Florida, Florida, USA
Xuemin Sherman Shen
University of Waterloo, Waterloo, Canada
Mircea Stan
University of Virginia, Charlottesville, USA
Jia Xiaohua
City University of Hong Kong, Kowloon, Hong Kong
Albert Y. Zomaya
University of Sydney, Sydney, Australia

More information about this series at http://www.springer.com/series/8197

Jia Hu · Victor C.M. Leung
Kun Yang · Yan Zhang
Jianliang Gao · Shusen Yang (Eds.)

Smart Grid Inspired Future Technologies

First International Conference, SmartGIFT 2016
Liverpool, UK, May 19–20, 2016
Revised Selected Papers

Springer

Editors
Jia Hu
Department of Computer Science
University of Exeter
Exeter
UK

Victor C.M. Leung
Department of Electrical and Computer Engineering
The University of British Columbia
Vancouver, BC
Canada

Kun Yang
University of Essex
Essex
UK

Yan Zhang
Simula Research Laboratory
Fornebu
Norway

Jianliang Gao
Imperial College
London
UK

Shusen Yang
The Institute of Information and System Science
Xi'an Jiaotong University
Xi'an
China

ISSN 1867-8211 ISSN 1867-822X (electronic)
Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering
ISBN 978-3-319-47728-2 ISBN 978-3-319-47729-9 (eBook)
DOI 10.1007/978-3-319-47729-9

Library of Congress Control Number: 2016957484

© ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2017
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

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

We are very pleased to introduce the proceedings of the First EAI International Conference on Smart Grid Inspired Future Technologies (SmartGIFT 2016). This was the first SmartGIFT conference, aiming to create a forum for researches, developers, and practitioners from both academia and industry to publish their key results and to disseminate state-of-the-art concepts and techniques in all aspects of smart grids. The 37 scientific participants had many fruitful discussions and exchanges that contributed to the success of the conference. Participants from 12 countries made the conference truly international in scope.

SmartGIFT covers many technical topics including high-level ideology/methodology, concrete smart grid inspired data sensing/processing/networking technologies, smart grid system architecture, quality-of-service (QoS), energy efficiency, security in smart grid systems, management of smart grid systems, service engineering and algorithm design, and real-world deployment experiences, etc. The peer-reviewed technical program of SmartGIFT 2016 consisted of 25 full papers in oral presentation sessions from the main conference track, the Workshop on Security, Flexibility and Demand Management in Smart Low-Voltage Grids, the Workshop on Systems and Technology for Energy Management in Communication Networks, and the special track on Communications and Management of Smart Grid Enabled Cities. Aside from high-quality paper presentations, the technical program also featured a keynote speech from world-renowned scientist, Prof. Vincent Wong from the University of British Columbia, Canada, and a panel discussion on "ICT-Driven Innovation for the Energy Field" organized by EIT Digital.

Coordination with the steering chairs, Imrich Chlamtac and Victor C.M. Leung, and the general chairs, Victor C.M. Leung and Kun Yang, was essential for the success of the conference. We sincerely appreciate their constant support and guidance. It was a great pleasure to work with such an excellent team. We are also indebted to the workshop chairs, Shusen Yang and Ming Xia, for their excellent work in organizing the attractive workshops, and to the publication chair, Jianliang Gao, for his hard work in preparing these proceedings. We would like to express our appreciation to all the members of the Organizing Committee and Program Committee for their efforts and support. We are grateful to all the authors who submitted their papers to the SmartGIFT 2016 conference and workshops.

Given the rapidity with which science and technology is advancing in all the fields covered by SmartGIFT, we expect that future SmartGIFT conferences will be as stimulating as this very first one was, as indicated by the contributions presented in this volume.

October 2016

Jia Hu
Yan Zhang

Organization

Steering Committee

Imrich Chlamtac	Create-Net and University of Trento, Italy
Victor C.M. Leung	The University of British Columbia, Canada

Organizing Committee

General Chairs

Victor C.M. Leung	The University of British Columbia, Canada
Kun Yang	University of Essex, UK

Technical Program Committee Chairs

Jia Hu	University of Exeter, UK
Yan Zhang	Simula Research Laboratory, Norway

Publicity and Social Media Chair

Lei Liu	Shandong University, China

Publication Chair

Jianliang Gao	Imperial College, UK

Workshops Chairs

Shusen Yang	Xi'an Jiaotong University, China
Ming Xia	Ericsson Research USA

Sponsorship and Exhibits Chair

Mark Barrett-Baxendale	Liverpool Hope University, UK

Local Chair

Jia Hu	University of Exeter, UK

Web Chair

Stewart Blakeway	Liverpool Hope University, UK

Conference Manager

Barbara Fertalova	EAI

Technical Program Committee

Farrokh Aminifar	University of Tehran, Iran
Islam S. Bayram Hamad bin	Khalifa University, Qatar
Subhonmesh Bose	Cornell University, USA
Shengrong Bu	University of Glasgow, UK
Luisa Caeiro	EST/IPS, Portugal
Hong-An Cao	ETH Zurich, Switzerland
Alvaro Cardenas	University of Texas, Dallas, USA
Stephan Cejka	Siemens AG Österreich, Austria
Chen Chen	Argonne National Laboratory, USA
Lijun Chen	University of Colorado at Boulder, USA
C.G. Deepak	Lancaster University, UK
Yingfei Dong	University of Hawaii, USA
Felicita Di Giandomenico	Italian National Research Council, ISTI, Italy
Lorenza Giupponi	CTTC, Barcelona, Spain
Ali Haghighi	INRS-EMT, Canada
Syed Faraz Hasan	Massey University, New Zealand
Miao He	Texas Tech University, USA
Hossein Akhavan Hejazi	University of California at Riverside, USA
Melike Erol Kantarci	Clarkson University, USA
Amin Khodaei	University of Denver, USA
Younghun Kim	IBM T.J. Watson Research Center, USA
David Koilpillai	IIT Madras, India
Peng-Yong Kong	Khalifa University of Science, Technology and Research, UAE
Albert YS Lam	The University of Hong Kong, Hong Kong, SAR China
Long Le	INRS, University of Quebec, Canada
Tuan Le	Middlesex University, UK
Shunbo Lei	The University of Hong Kong, Hong Kong, SAR China
Qinghua Li	University of Arkansas, USA
Hui Lin	Fujian Normal University, China
Rongxing Lu	Nanyang Technological University, Singapore
Chunbo Luo	University of Exeter, UK
Lotfi Mhamdi	Leeds University, UK
Hamed Mohsenian-Rad	University of California at Riverside, USA

Keivan Navaie	Lancaster University, UK
Duy Ng	University of Newcastle, Australia
Hieu Trung Nguyen	INRS, University of Quebec, Canada
Qian Ni	Lancaster University, UK
Dusit Niyato	Nanyang Technological University, Singapore
Moslem Noori	University of Alberta, Canada
Jorge Ortiz	IBM T.J. Watson Research Center, USA
Zhibo Pang	BB AB Corporate Research, Sweden
Sadigheh Parsaifard	ITRC, Iran
Prashant Pillai	University of Bradford, UK
Tony Q.S. Quek	Singapore University of Technology and Design, Singapore
Haile-Selassie Rajamani	University of Bradford, UK
Harold Rene Chamorro Vera	KTH, Sweden
Emanuele Lindo Secco	Liverpool Hope University, UK
Boon-Chong Seet	Auckland University of Technology, New Zealand
Babak Seyfe	Shahed University, Iran
Vahid Shah-Mansouri	University of Tehran, Iran
Zhengguo Sheng	University of Sussex, UK
Hongjian Sun	Durham University, UK
Hissam Tawfik	Leeds Beckett University, UK
Ye Tian	Beijing University of Posts and Telecommunications, China
Nghi Tran	The University of Akron, USA
Khan-Ferdous Wahid	Airbus, Germany
Xianbin Wang	Western University, Canada
Yulei Wu	University of Exeter, UK
Yong Xiao	University of Houston, USA
Junfeng Xu	China Information Technology Security Evaluation Center, China
Yunjian Xu	Singapore University of Technology and Design, Singapore
Po Yang	Liverpool John Moores University, UK
Qiang Yang	Zhejiang University, China
F. Richard Yu	Carleton University, Canada
Li Zhang	University of Leeds, UK
Haijun Zhang	The University of British Columbia, Canada
Lu Zhuo	University of Memphis, USA

MASTERING Workshop

Organization (Workshop Co-chairs)

Monjur Mourshed	Cardiff University, UK
Maryse Anbar	Engie, France
Thomas Messervey	R2M Solution, Italy
Meritxell Vinyals	French Alternative Energies and Atomic Energy Commission (CEA), France

Program Committee

Zia Lennard	Juan Espeche, R2M Solution, Italy
Sylvain Robert	Hassan Sleiman, French Alternative Energies and Atomic Energy Commission (CEA), France
Mario Sisinni	Robert-Erskine Murray, SMS plc., UK
Yann Pankow	Laborelec, France
Ivan Grimaldi	Telecom Italia, Italy
Laura Rodriguez Martin	Airbus DS Cybersecurity, France
Hisain Elshaafi	Telecommunications Software and Systems Group (TSSG)/Waterford Institute of Technology (WIT), Ireland
Michael Dibley	Cardiff University, UK

Special Session on Communications and Management of Smart Grid-Enabled Cities

Session Organizers

Michael Chai	Queen Mary University of London, UK
Yue Chen	Queen Mary University of London, UK

STEMCOM Workshop

General Chair

Muhammad Ali Imran	University of Surrey, UK

General Co-chair

Mounir Ghogho	University of Leeds, UK

Technical Program Chairs

Syed Ali Raza Zaidi	University of Leeds, UK
Muhammad Zeeshan Shakir	Texas A&M University at Qatar, Doha
Mischa Dohler	King's College London, UK
Ranga Rao Venkatesha Prasad	Delft University of Technology, The Netherlands

Contents

Main Track

Mobility Incorporated Vehicle-to-Grid (V2G) Optimization for Uniform Utilization in Smart Grid Based Power Distribution Network 3
Muhammad A. Hussain and Myung J. Lee

A Cost Function Based Prioritization Method for Smart Grid Communication Network 16
Vahid Kouhdaragh, Daniele Tarchi, Alessandro Vanelli-Coralli, and Giovanni E. Corazza

Clustering Power Consumption Data in Smart Grid 25
Kálmán Tornai and András Oláh

Using a Cost Function to Choose the Best Communication Technology for Fulfilling the Smart Meters Communication Requirements 33
Vahid Kouhdaragh, Alessandro Vanelli-Coralli, and Daniele Tarchi

Assessing Loss Event Frequencies of Smart Grid Cyber Threats: Encoding Flexibility into FAIR Using Bayesian Network Approach 43
Anhtuan Le, Yue Chen, Kok Keong Chai, Alexandr Vasenev, and Lorena Montoya

Replay Attack Impact on Advanced Metering Infrastructure (AMI) 52
Bashar Alohali, Kashif Kifayat, Qi Shi, and William Hurst

D^2Sketch: Supporting Efficient Identification of Heavy Hitters Over Sliding Windows 60
Haina Tang, Yulei Wu, Tong Li, Hongbin Shi, and Jingguo Ge

Short Term Load Forecasting for Residential Buildings: An Evaluation Based on Publicly Available Datasets 69
Carola Gerwig

Short-Term Electrical Load Forecasting Based on Fuzzy Logic Control and Improved Back Propagation Algorithm 79
Lei Wan, Junxiu Liu, Senhui Qiu, Mingcan Cen, and Yuling Luo

On the Study of Secrecy Capacity with Outdated CSI 87
Tong Chen, Peng Xu, Zhiguo Ding, and Xuchu Dai

The Role of Analog Beamwidth in Spectral Efficiency of Millimeter Wave Ad Hoc Networks 98
Pan Cao and John S. Thompson

MASTERING Workshop

An ANN-Based Energy Forecasting Framework for the District Level Smart Grids 107
Baris Yuce, Monjur Mourshed, and Yacine Rezgui

Future Demand Response Services for Blocks of Buildings 118
Tracey Crosbie, Vladimir Vukovic, Michael Short, Nashwan Dawood, Richard Charlesworth, and Paul Brodrick

Use Cases and Business Models of Multi-Agent System (MAS) ICT Solutions for LV Flexibility Management. 136
Juan Manuel Espeche, Thomas Messervey, Zia Lennard, Riccardo Puglisi, Mario Sissini, and Meritxell Vinyals

Combination of Standards to Support Flexibility Management in the Smart Grid, Challenges and Opportunities. 143
Hisain Elshaafi, Meritxell Vinyals, Michael Dibley, Ivan Grimaldi, and Mario Sisinni

Special Session Track

A Load Balanced Charging Strategy for Electric Vehicle in Smart Grid. 155
Qiang Tang, Ming-zhong Xie, Li Wang, Yuan-sheng Luo, and Kun Yang

Optimized Energy-Aware Window Control for IEEE 802.11ah Based Networks in Smart Grid Enabled Cities 165
Yanru Wang, Chao Liu, Kok Keong Chai, Yue Chen, and Jonathan Loo

Smart Home System Network Architecture. 174
Chenqi Yang, Emilio Mistretta, Sara Chaychian, and Johann Siau

Threat Navigator: Grouping and Ranking Malicious External Threats to Current and Future Urban Smart Grids 184
Alexandr Vasenev, Lorena Montoya, Andrea Ceccarelli, Anhtuan Le, and Dan Ionita

Invited Papers Track

A New Dynamic Weight-Based Energy Efficient Algorithm for Sensor Networks 195
Alsnousi Essa, Ahmed Y. Al-Dubai, Imed Romdhani, and Mohamed A. Eshaftri

LTE Delay Assessment for Real-Time Management of Future Smart Grids 204
Ljupco Jorguseski, Haibin Zhang, Manolis Chrysalos, Michal Golinski, and Yohan Toh

Big Data Processing to Detect Abnormal Behavior in Smart Grids 214
Béla Genge, Piroska Haller, and István Kiss

[Invited Paper] Native IP Connectivity for Sensors and Actuators in Home Area Network 222
Pang Zhibo, Gargi Bag, Edith Ngai, and Victor Leung

Author Index 233