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Measurement, Modelling and Evaluation of Computing Systems

19th International GI/ITG Conference, MMB 2018
Erlangen, Germany, February 26–28, 2018
Proceedings

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Preface

As conference chairs, it is our pleasure to present this LNCS volume with its contributions on performance and dependability evaluation techniques for computer and communication systems and their related fields. The papers were presented at the 19th International GI/ITG Conference on Measurement, Modelling and Evaluation of Computing Systems (MMB 2018), held during February 26–28, 2018, at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) in Germany.

The biennial MMB conference started in the early 1980s and has seen a significant broadening in scope but has also kept its essence: measurements, stochastic modeling, analysis, and simulation applied to computer and communication systems. From the methodological perspective, new techniques such as a network calculus have been included and, besides performance, dependability and security have been added. From an application perspective, the traditional area of networking has been supplemented by many additional domains such as smart energy systems, smart mobility, social networks, and others.

Today we are faced with complex interconnected systems in which information and communication technology always plays the key role as nerve tissue. This is the case, for instance, regarding the Internet of Things, cyber-physical systems, future 5G mobile communication systems, software-defined networking, smart energy systems, connected mobility systems, and countless more examples. MMB provides a means for assessing important, mostly quantitative system aspects such as the performance, dependability, and also security of these systems that is ultimately needed for their proper design.

The technical program was composed by the Program Committee in a thorough review procedure involving at least three reviewers and after a careful selection process during a physical meeting. In all, 16 full papers were selected representing very well the broad spectrum of methodological and applied work. A Special Session on Software-Defined Networking, organized by Ognjen Dobrijevic, University of Zagreb, Croatia, and Thomas Zinner, Universität Würzburg, Germany, was included in the program and covered a very relevant topic in current networking. The program was framed by three distinguished invited speakers, giving insights into major application fields:

1. Performance Optimization of 5G Mobile Networks by Prof. Hans van den Berg, TNO, The Netherlands, who is also affiliated with Twente University and the Centre for Mathematics and Computer Science in Amsterdam, The Netherlands, and a recipient of ITC's Arne Jensen Lifetime Award 2017 for his contributions on performance modeling and analysis
2. Future Energy Grids – Challenges and Potential for ICT by Prof. Hartmut Schneck, Full Professor of Applied Informatics at Karlsruhe Institute of Technology, who is additionally director of the FZI Research Center for Information Technology, a shaper of the new discipline “energy informatics,” and a recipient of the Heinrich-Hertz Prize 2016 from EnBW foundation

3. Autonomous Driving – The “Uncrashable” Car? What It Takes to Make Self-Driving Vehicles Safe and Reliable Traffic Participants by Dr. Frank Keck, CEO of ZF Zukunft Mobility GmbH, a company of ZF Friedrichshafen AG, and former CEO of Automotive Safety Technologies GmbH

All three talks provided insights into the latest technological trends like 5G mobile communications with new radio, “softwarization,” and network slicing that include many relevant MMB topics. In particular, the energy transition with smart grids and smart markets to balance fluctuating supply and demand seems to be made for the MMB community. Finally, autonomous and connected cars provide a high potential for simulation as well as analytic performance and dependability evaluation during the design process.

The technical program additionally offered nine papers about software tools that were demonstrated during the conference. As a new element, industrial, practical experience and PhD track papers were included: one industrial paper, one practical experience report, and two PhD track papers.

As in previous MMB conferences, two satellite workshops were organized covering highly relevant research topics:

- 4th Workshop on Network Calculus (WoNeCa-4)
- Second International Workshop on Modeling, Analysis, and Management of Social Networks and Their Applications (SOCNET 2018)

At the beginning of the conference, three tutorials were presented:

- A Modern Perspective on Fault Tree Analysis, by Joost-Pieter Katoen and Matthias Volk, RWTH Aachen
- IoT — From Praxis to Theory by Florian Metzger and Tobias Hoßfeld, Universität Duisburg-Essen
- Data Analysis of Measurements with Immanent Dependencies and Heavy-Tailed Characteristics, by Natalia M. Markovich, Russian Academy of Sciences, and Udo Krieger, Universität Bamberg

As conference chairs, we express our gratitude to all members of the Program Committee and all external reviewers for their dedicated service, maintaining the quality objectives of the conference, and for the timely provision of their valuable reviews. We express our sincere appreciation to FAU Erlangen-Nürnberg as the conference host, as well as to all members of the local Organizing Committee of MMB 2018 for their great efforts devoted to the success of the conference. We thank all the authors for their submitted contributions, all the speakers for their lively presentations, and all the participants for their contributions to interesting discussions. Finally, it is our hope that readers will enjoy these MMB 2018 proceedings and use them for their future research.

February 2018

Reinhard German
Kai-Steffen Hielscher
Udo Krieger

Organization

MMB 2018 was jointly organized by the German Gesellschaft für Informatik (GI) and Informationstechnische Gesellschaft im VDE (ITG), Technical Committees on Measurement, Modelling and Evaluation of Computing Systems (MMB) in cooperation with the Department of Computer Science 7 (Computer Networks and Communication Systems) of Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany.

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Abstracts of Invited Talks

Performance Optimization of 5G Mobile Networks

Hans van den Berg

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Abstract. Research on 5G in Europe is boosted by the 5G PPP consortium consisting of network vendors and operators, system integrators and academia and other research institutes, working closely together with companies from important vertical industries. 5G aims at bringing new, distinctive network and service capabilities fulfilling the needs of the future Internet of Things (IoT). As such it should sustain enormous data volumes and support critical, highly demanding communication services for e.g. self-driving cars, robotics in smart industry, and mobile virtual reality applications. Network ‘softwarization’ through emerging technologies as Software Defined Networking (SDN) and Network Functions Virtualization (NFV) is introduced to provide the flexibility needed to reach the required performance and scalability targets in an efficient way. However, to actually achieve the full potential of future 5G networks huge challenges regarding network management and performance optimization are faced. Big data techniques exploiting data coming from network devices in forms of e.g. device logs and usage histories provide a promising direction to address these challenges. In the talk we will briefly sketch the 5G PPP ambitions, review the aforementioned research challenges and present (ongoing) work on some specific 5G network performance optimization problems.

Future Energy Grids – Challenges and Potential for ICT

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Abstract. The energy system is one of the most critical infrastructures of our world. The reliable supply of energy is essential for the adequate operation of almost any process in our private and professional life. Society and industry would suffer enormously, if the steady balance between demand and supply could not be guaranteed. The current transition towards energy from renewable sources is having tremendous effects on this well-established infrastructure. In particular, the restricted capabilities of controlling the supply of electricity from weather-dependent energy sources leads to the need for an essential change in one of the basic principles of the electric power system, which means that it will no longer be feasible to let the power supply follow the demand but there will be a strong need to let the demand follow the supply. This can only be achieved by discovering and exploiting the potential of flexibility of demand and supply in the best possible way. The talk will illustrate how the major challenges of the ongoing energy transition create the need for an adequately designed energy information and control network with distributed intelligence. A fundamental task in the design of this network consists of making the necessary information available to the locations where operating and control decisions have to be taken and to provide appropriate methodology for managing tomorrow's energy system in the most efficient and most reliable way. In particular, an assessment of the potential contribution of flexibility in demand and supply to guaranteeing the necessary stability and resilience needs appropriate modelling and simulation, based on effective strategies for measuring the current status and behaviour of relevant grid components.

Autonomous Driving – the “Uncrashable” Car?

What It Takes to Make Self-Driving Vehicles Safe and Reliable Traffic Participants

Frank Keck

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Abstract. Autonomous driving is in the spotlight of both scientific research and industrial development. With worldwide constantly growing traffic volumes, the challenging task in putting self-driving vehicles onto the street is to cross the chasm between high system availability and low to zero malfunction rates, even in dense traffic and complex situations on the road. Developing software functions for driver assistance and vehicle safety for autonomously driving cars requires the traditional developments processes and methods to be revised. In this talk, a novel and promising development approach is presented. The combination of use case based requirement specification, algorithm development with machine learning techniques and both simulation based and real-life testing yields an agile yet sound software development framework for autonomous driving functions. Additionally, some thought-provoking impulses are given on how to achieve a high level of system reliability by exploiting the capabilities of virtualization at early development stages.

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