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Proceedings of the 8th Symposium on green networking and computing (SGNC 2017)

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MESSAGE FROM THE SYMPOSIUM ORGANIZERS

Foreword

Energy consumption of information and communication networks has continued to grow faster than global electricity consumption, what makes optimization of network energy consumption a new target for competitive differentiation and innovation. For that reason, improving the energy efficiency of information and communication systems and networks become the imperative goal. These proceedings solicit works on all aspects of enabling technologies for green networking and computing presented during the eight in a row Symposium organized on this topic. The 8th Symposium on green networking and computing (SGNC 2017) was organized in the frame of the 25th International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2017). The SoftCOM 2017 conference was held in the attractive ambiance of the hotel Radisson Blu Resort, Split, Croatia, September 21 to 23, 2017. The Conference is organized by the University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB) under the patronage of the Croatian Ministry of Science, Education and Sports. The Conference was technically co-sponsored by the IEEE Communications Society (ComSoc). Organizers of the 8th Symposium on green networking and computing are the University of Split, FESB and Politecnico di Milano university, Department of electronics, informatics and bioengineering (DEIB). The Symposium is organized in cooperation with the IEEE ComSoc Technical Committee on Green Communications and Computing (TCGCC).

In the frame of 8th Symposium on green networking and computing, four accepted papers have been presented in the technical program of the first part of the Symposium on green networking and computing (SYM5/I). Additionally, three accepted papers were presented in the technical program of the second part of the Symposium on green networking and computing (SYM5/II). In total, seven papers were accepted and presented, covering different topics from experimental analysis of energy-efficiency of virtual machines and containers' to energy profiling of energy-critical embedded applications. Additionally, during conference business forum, one presentation held by an expert from company Nokia, Croatia was organized, on the topic related to Nokia solutions for improving base stations energy efficiency.

We hope that readers of these proceedings will find the articles and presentations informative and that they will enjoy reading this feature topic devoted to exciting fast-evolving field of green networking and computing. We would like to thank all the authors who submitted articles to this Symposium and to all presenters who give their presentations which significantly contribute to international affirmation of this Symposium. Finally, we express our gratitude to all reviewers for their comments and valuable feedback on the submitted articles.

Antonio Capone, PhD *Symposium Co-chairs* **Josip Lorincz, PhD**

PROCEEDINGS INFORMATION

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SYMPOSIUM PROGRAM

SYM 5/I - Symposium on green networking and computing I
Session chair: *Josip Lorincz, Ph. D., FESB, University of Split, Croatia*
September 23, 2017, 08:30 – 10:00, Conference room Agava, (Hotel Elaphusa, Bol, Croatia)

SYM 5/II - Symposium on green networking and computing II
Session chair: *Josip Lorincz, Ph. D., FESB, University of Split, Croatia*
September 23, 2017, 10:30 – 12:00, Conference room Agava, (Hotel Elaphusa, Bol, Croatia)

Business forum:
Nokia solutions for improving base stations energy efficiency
Presenter: *Mr. Darko Giljević, Nokia, d.o.o., Croatia*
September 21, 2017, 14:30 – 15:00, Conference room Ruzmarin, (Hotel Elaphusa, Bol, Croatia)

Tracks

- *Symposium on Green Networking and Computing*
- *Business Forum*

Symposium on Green Networking and Computing

Symposium organizers: *Antonio Capone (Politecnico di Milano, Italy), Josip Lorincz (University of Split, Croatia)*
Symposium chair: *Josip Lorincz (University of Split, Croatia)*

- ***SYM5/I - Symposium on Green Networking and Computing I***
- ***SYM5/II - Symposium on Green Networking and Computing II***

SYM5/I - Symposium on Green Networking and Computing I

Symposium organizers: *Antonio Capone (Politecnico di Milano, Italy), Josip Lorincz (University of Split, Croatia)*
Symposium chair: *Josip Lorincz (University of Split, Croatia)*

❑ **Characterization of Low Voltage Access Network for Narrowband Powerline Communications**
Raja Alaya and Rabah Attia (University of Carthage, Tunisia)

❑ **Experimental Energy Profiling of Energy-Critical Embedded Applications**
Kameswar Rao Vaddina, Florian Brandner and Gerard Memmi (Telecom ParisTech, France), Pierre Jouvelot (MINES ParisTech, France)

❑ **Performance Analysis of Adaptive Modulation in Underwater Visible Light Communications**
Imen Sahnoun (SupCom, Tunisia), Imran Shafique Ansari (Texas A&M University at Qatar (TAMUQ), Qatar), Mohamed M. Abdallah (Hamad Bin Khalifa University (HBKU), Qatar) and Khalid A. Qaraqe (Texas A&M University at Qatar, USA)

❑ **ECG Biometric Template Protection Based on Secure Sketch Scheme**
Emna Kalai (SERCom Laboratory, Tunisia), Adel Benzina (LISI Lab, INSAT, Tunisia) and Rabah Attia (University of Carthage, Tunisia)

SYM5/II - Symposium on Green Networking and Computing II

Symposium organizers: *Antonio Capone (Politecnico di Milano, Italy), Josip Lorincz (University of Split, Croatia)*
Symposium chair: *Josip Lorincz (University of Split, Croatia)*

- **Comparative Experimental Analysis of the Quality-of-Service and Energy-Efficiency of VMs and Containers' Consolidation for Cloud Applications**
  Ismael Cuadrado-Cordero (IMT-A, INRIA, LS2N, France), Anne-Cecile Orgerie (CNRS, IRISA, France) and Jean-Marc Menaud (IMT-A, INRIA, LS2N, France)

- **Investigation of Induced CRAH Bypass for Air-Cooled Data Centers Using Computational Fluid Dynamics**
  Hamza Salih Erden (Istanbul Technical University, Turkey)

- **Measurement of temperature inside Open TEM-cell with thermal camera**
  Kresimir Malaric, Roman Malaric and Josip Herceg (University of Zagreb, Croatia)

Business forum

Darko Giljević, *Nokia d.o.o., Croatia*

Thursday, September 21, 2017, 14:30 - 15:00 (Conference room Ruzmarin)

Nokia solutions for improving base stations energy efficiency

Abstract: Reducing network greenhouse gas (GHG) emissions and energy consumption has not typically been a high priority for most operators over the years. Faced with dramatic changes in their business environment driven by increasing competition, declining average revenue per user (ARPU) and exploding demand for data services, most operator investments have focused on network capacity and performance to improve the customer experience.

The power utilities are on the front line and have stated aims to reduce the amount of carbon emitted per unit of energy generated. For example, Helen Oy as one of the largest energy companies in Finland states: ”We aim to produce energy in a carbon-neutral way in 2050. Our intermediate target is to reduce carbon dioxide emissions by 20% and to increase the share of renewable energy to 20% by 2020”.

Meanwhile, network equipment vendors are constantly introducing more energy efficient infrastructure. On average, each new base station generation reduces energy consumption by about 35 percent.

These two examples show that operators have an expanding range of options to reduce their network GHG emissions and energy consumption. Only by adopting the latest energy-saving and renewable energy technologies can ensure operators support to the emissions-reducing targets, that align with the Paris climate change agreement’s stated goal of limiting global warming to 2°C. Hence, this presentation will introduce solutions of Nokia dedicated to the improvement of the energy-efficiency of telecom operator’s network. The presentation will point out different concepts used for optimizing energy-efficiency of Nokia base stations and other network equipment.

Authors

A B C D E F G H I

J K L M N O P Q R

S T U V W X Y Z

A

Abdallah, Mohamed M.
Alaya, Raja
Attia, Rabah

B

Benzina, Adel
Brandner, Florian

C

Cuadrado-Cordero, Ismael

D

E

Erden, Hamza Salih

F

G

H

Herceg, Josip

I

J

Jouvelot, Pierre

K

Kalai, Emna

L

M

Malaric, Kresimir
Malaric, Roman
Memmi, Gerard
Menaud, Jean-Marc

N

O

Orgerie, Anne-Cecile

P

Q

Qaraqe, Khalid A.

R

S

Sahnoun, Imen
Shafique Ansari, Imran

T

U

V

Vaddina, Kameswar Rao

W

X

Y

Z

A

Abdallah, Mohamed M.
Performance Analysis of Adaptive Modulation in Underwater Visible Light Communications

Alaya, Raja
Characterization of Low Voltage Access Network for Narrowband Powerline Communications

Attia, Rabah
Characterization of Low Voltage Access Network for Narrowband Powerline Communications
ECG Biometric Template Protection Based on Secure Sketch Scheme

B

Benzina, Adel
ECG Biometric Template Protection Based on Secure Sketch Scheme

Brandner, Florian
Experimental Energy Profiling of Energy-Critical Embedded Applications

C

Cuadrado-Cordero, Ismael
Comparative Experimental Analysis of the Quality-of-Service and Energy-Efficiency of VMs and Containers' Consolidation for Cloud Applications

D

E

Erden, Hamza Salih
Investigation of Induced CRAH Bypass for Air-Cooled Data Centers Using Computational Fluid Dynamics

F

G

H

Herceg, Josip
Measurement of temperature inside Open TEM-cell with thermal camera

I

J

Jouvelot, Pierre
Experimental Energy Profiling of Energy-Critical Embedded Applications

K

Kalai, Emna
ECG Biometric Template Protection Based on Secure Sketch Scheme

L

M

Malarić, Krešimir
Measurement of temperature inside Open TEM-cell with thermal camera

Malarić, Roman
Measurement of temperature inside Open TEM-cell with thermal camera

Memmi, Gerard
Experimental Energy Profiling of Energy-Critical Embedded Applications

Menaud, Jean-Marc
Comparative Experimental Analysis of the Quality-of-Service and Energy-Efficiency of VMs and Containers' Consolidation for Cloud Applications

N

O

Orgerie, Anne-Cecile

Comparative Experimental Analysis of the Quality-of-Service and Energy-Efficiency of VMs and Containers' Consolidation for Cloud Applications

P

Q

Qaraqe, Khalid A.

Performance Analysis of Adaptive Modulation in Underwater Visible Light Communications

R

S

Sahnoun, Imen
Performance Analysis of Adaptive Modulation in Underwater Visible Light Communications

Shafique Ansari, Imran
Performance Analysis of Adaptive Modulation in Underwater Visible Light Communications

T

U

V

Vaddina, Kameswar Rao
Experimental Energy Profiling of Energy-Critical Embedded Applications

W

X

Y

Z

Patrons


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