24th International Conference on Software, Telecommunications and Computer Networks - SoftCOM 2016

September, 22 – 24, 2016, Split, Croatia

Proceedings of the 7th Symposium on green networking and computing

ISBN: 978-953-290-065-1

In cooperation with:

IEEE Technical Committee on Green Communications & Computing

Technicaly cosponsored by:

IEEE

IEEE COMMUNICATIONS SOCIETY

Organisers:

MESSAGE FROM THE SYMPOSIUM ORGANIZERS

Foreword

Communication technologies continue to be a central element of the transition to smart, energy-efficient and sustainable lifestyles. However, energy requirements of communication systems are a challenging problem that is already straining operating budgets and attracting the attention of policy makers around the world. For that reason, improving energy efficiency of information and communication systems become imperative goal. This proceedings solicits works on all aspects of enabling technologies for green networking and computing presented during the seventh in a row Symposium organised on this topic.

The 7th Symposium on green networking and computing (SGNC 2016) was organized in the frame of the 24th International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2016). The SoftCOM 2016 conference was held in attractive ambience of the hotel Radisson Blu Resort, Split, Croatia, September 22 to 24, 2016. 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 has been technically co-sponsored by the IEEE Communications Society (ComSoc). Organizers of the 7th Symposium on green networking and computing are 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 7th 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 (SYM2/I). Additionally, five accepted papers were presented in the technical program of the second part of the Symposium on green networking and computing (SYM2/II). In total, ten papers were accepted and presented, covering different topics from improving energy efficiency of data centres and wireless backhaul heterogeneous networks to enhancing energy performance of routing protocols and cognitive networks.

Antonio Capone

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.

Symposium Co-chairs

Josip Lorincz

PROCEEDINGS INFORMATION

Proceedings of the 7th Symposium on green networking and computing
2016 International Conference on Software, Telecommunications and Computer Networks

ISBN: 978-953-290-065-1

Additional copies requests (proceedings CD and paper) and all technical inquiries should be addressed to:

SoftCOM
FESB, University of Split
Josip Lorincz
R. Boškovića 32.
21000 Split
Croatia
Tel. +385 21 305 665
Fax: +385 21 305 667

Email: josip.lerinc@fesb.hr, softcom@fesb.hr
Web: *http://www.josip-lorincz.com/Portals/0/2016_CfP_Green%20net_lorincz_capone.pdf*
http://www.fesb.hr/SoftCOM,

INTERNATIONAL SYMPOSIUM COMMITTEE

Symposium co-chairs:
Antonio Capone (*capone@elet.polimi.it*)
DEIB, Politecnico di Milano, Italy

and

Josip Lorincz (*josip.lerinc@fesb.hr*)
FESB, University of Split, Croatia

Committee members:
Marco Ajmone Marsan, *Institute IMDEA Networks, Spain*
Ulrich Barth, *Alcatel-Lucent/ Bell Labs, Germany*
Luca Chiaraviglio, *University of Rome, La Sapienza, Italy*
Ken Christensen, *University of South Florida, USA*
Marco Conti, *Institute for Informatics and Telematics, Italy*
Lingjia Liu, *University of Kansas, USA*
Mario Pickavet, *Ghent University, Belgium*
Michela Meo, *Politecnico di Torino, Italy*
Haijun Zhang, *University of British Columbia, Canada*
Honggang Zhang, *Zheijang Uiversity, China*
Jinsong Wu, *Universidad de Chile, Chile*

SYMPOSIUM PROGRAM

SYM 2/I - Symposium on green networking and computing I

Session chair: *Josip Lorincz, Ph. D., FESB, University of Split, Croatia*

September 22, 2016, 10:00 – 11:30, Conference room Hvar, (Hotel Radisson Blue Resort, Split, Croatia)

SYM 2/II - Symposium on green networking and computing II

Session chair: *Josip Lorincz, Ph. D., FESB, University of Split, Croatia*

September 22, 2016, 12:00 – 13:30, Conference room Hvar, (Hotel Radisson Blue Resort, Split, Croatia)

Tracks

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

Symposium on Green Networking

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

- ***SYM2/I - Symposium on Green Networking and Computing I***
- ***SYM2/II - Symposium on Green Networking and Computing II***

SYM2/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)*

- **PDMDC: A Power Distribution Manager for Cloud Environment Data Centers**
  Fawaz AL-Hazemi (Korea Advanced Institute of Science and Technology, Korea)

- **Datacenters Powered by Renewable Energy: A Case Study for 60 Degrees Latitude North**
  Enida Sheme and Neki Frashëri (University of Tirana, Albania); Simon Holmbacka and Sébastien Lafond (Åbo Akademi University, Finland); Dražen Lučanin (University of Vienna, Austria)

- **SAND-Assisted Encoding Control for Energy-Aware MPEG-DASH Live Streaming**
  Mikko Uitto and Antti Heikkinen (VTT Technical Research Centre of Finland, Finland)

- **Energy-efficient Data Transfer: Bits vs. Atoms**
  Ivana Marincic and Ian Foster (University of Chicago, USA)

SYM2/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)*

- **Energy Efficient Wireless In-Band Backhaul in Heterogeneous Networking Environments**
  Georgios Kyriazis and Angelos Rouskas (University of Piraeus, Greece)

- **Impact of Power Control on Network-Layer Stability in Cognitive Radio Systems**
  Yunsung Choi and Dongwoo Kim (Hanyang University, Korea)

- **Green Operator Cooperation for Radio Frequency Transmission Minimization**
  Lamis Amamou (ENIT & Sup'Com, Tunisia); Maissa Boujelben (Sup'Com & ESPRIT, Tunisia); Hakim Ghazzai (Qatar Mobility Innovations Center (QMIC), Qatar); Ammar Bouallegue (ENIT, Tunisia); Hichem Besbes (Sup'Com, Tunisia)

- **RLA-ENAR: A Realistic Near-Optimal Energy-Aware Routing**
  Ehsan Mohammadpour and Bahador Bakhshi (Amirkabir University of Technology, Iran)

- **Coupling Unit for Narrowband Power Line Communications Channel Measurement**
  Raja Alaya and Rabah Attia (University of Carthage, Tunisia)

Authors

A B C D E F G H I

J K L M N O P Q R

S T U V W Z X Y

A

Alaya, Raja
AL-Hazemi, Fawaz
Amamou, Lamis
Attia, Rabah

B

Bakhshi, Bahador
Besbes, Hichem
Bouallegue, Ammar
Boujelben, Maissa

C

Choi, Yunsung

D

E

F

Foster, Ian
Frashëri, Neki

G

Ghazzai, Hakim

H

Heikkinen, Antti
Holmbacka, Simon

I

J

K

Kim, Dongwoo
Kyriazis, Georgios

L

Lafond, Sébastien
Lučanin, Dražen

M

Marincic, Ivana
Mohammadpour, Ehsan

N

O

P

Q

R

Rouskas, Angelos

S

Sheme, Enida

T

U

Uitto, Mikko

V

W

A

Alaya, Raja
Coupling Unit for Narrowband Power Line Communications Channel Measurement

AL-Hazemi, Fawaz
PDMDC: A Power Distribution Manager for Cloud Environment Data Centers

Amamou, Lamis
Green Operator Cooperation for Radio Frequency Transmission Minimization

Attia, Rabah
Coupling Unit for Narrowband Power Line Communications Channel Measurement

B

Bakhshi, Bahador
RLA-ENAR: A Realistic Near-Optimal Energy-Aware Routing

Besbes, Hichem
Green Operator Cooperation for Radio Frequency Transmission Minimization

Bouallegue, Ammar
Green Operator Cooperation for Radio Frequency Transmission Minimization

Boujelben, Maissa
Green Operator Cooperation for Radio Frequency Transmission Minimization

C

Choi, Yunsung
Impact of Power Control on Network-Layer Stability in Cognitive Radio Systems

D

E

F

Foster, Ian
Energy-efficient Data Transfer: Bits vs. Atoms

Frashëri, Neki
Datacenters Powered by Renewable Energy: A Case Study for 60 Degrees Latitude North

G

Ghazzai, Hakim
Green Operator Cooperation for Radio Frequency Transmission Minimization

H

Heikkinen, Antti
SAND-Assisted Encoding Control for Energy-Aware MPEG-DASH Live Streaming

Holmbacka, Simon
Datacenters Powered by Renewable Energy: A Case Study for 60 Degrees Latitude North

I

J

K

Kim, Dongwoo
Impact of Power Control on Network-Layer Stability in Cognitive Radio Systems

Kyriazis, Georgios
Energy Efficient Wireless In-Band Backhaul in Heterogeneous Networking Environments

L

Lafond, Sébastien
Datacenters Powered by Renewable Energy: A Case Study for 60 Degrees Latitude North

Lučanin, Dražen
Datacenters Powered by Renewable Energy: A Case Study for 60 Degrees Latitude North

M

Marincic, Ivana
Energy-efficient Data Transfer: Bits vs. Atoms

Mohammadpour, Ehsan
RLA-ENAR: A Realistic Near-Optimal Energy-Aware Routing

N

O

P

Q

R

Rouskas, Angelos

Energy Efficient Wireless In-Band Backhaul in Heterogeneous Networking Environments

S

Sheme, Enida

Datacenters Powered by Renewable Energy: A Case Study for 60 Degrees Latitude North

T

U

Uitto, Mikko
SAND-Assisted Encoding Control for Energy-Aware MPEG-DASH Live Streaming

V

W

X

Y

Z

The City of Split

The county of
Split and Dalmatia

HAKOM
HRVATSKA AGENCIJA ZA POŠTU
I ELEKTRONIČKE KOMUNIKACIJE

ERICSSON

KRON

Zračna luka Split-Kaštela