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Editorial

Editorial for the special issue on Energy-efficient Networking

Fueled by the increasing popularity of the Internet and evermore bandwidth-hungry services, networking technologies constitute one of the most fast growing areas in the field of the IT industry. This fast growth has led to a point where the energy expenditure of networking infrastructure constitutes a significant portion of the total energy expenditure and moreover, the trend is towards an additional increase. Thus, the development of energy efficient networking technologies for the backbone and access parts of today's Internet has recently emerged as a significant research area. The primary focus of such green technologies, is towards reduction of the energy footprint of the networking infrastructure, thus enabling sustainable development, low operational costs and environmental safety.

The objective of this special issue is to report state-of-the art results in energy-efficient networking protocols and architectures. In the context of this effort, we are happy having received 19 papers from all over the world. Each paper was reviewed by at least three qualified reviewers. The review process completed with 8 papers accepted. The acceptance rate for this issue is thus about 47 percent.

The articles in this special issue are organized as follows. The first article, entitled "Energy-minimized design of IP over flexible optical networks" and authored by Vasileios Gkamas, Konstantinos Christodoulopoulos, Dimitrios J. Vergados and Emmanouel Varvarigos, addresses the energy-minimized design problem for IP over flexible optical networks. The authors propose an energy-aware multilayer network-planning algorithm, which takes as input the network topology, the IP end-to-end traffic matrix, the modular model of the IP/MPLS routers, and the feasible configurations of the flexible optical transponders and whose objective is to minimize the network's energy consumption, jointly accounting for the energy consumption of the routers' modules installed, the transponders used, and their configurations.

The second article, entitled "An Energy-efficient History based Routing Scheme for Opportunistic Networks" and authored by Sanjay K. Dhurandher, Deepak Kumar Sharma, Isaac Woungang and Aakanksha Saini, addresses routing and forwarding in opportunistic networks. The paper proposes proposes improvements in the existing history-based prediction routing protocols for such networks so as to make them energy efficient. The proposed protocol addresses the energy constraints and reduces the number of packets transferred in the network, which in turn results to a reduction in the nodes' energy consumption.

The third article is entitled "Energy Efficient Error Coding and Transmission for Cognitive Wireless Body Area Network" and is authored by Najam ul Hasan, Waleed Ejaz, Mahin K. Atiq and Hyung Seok Kim. It proposes a cognitive forward error control mechanism for Wireless Body Area Networks with energy efficiency. The proposed approach works via adaptively selecting the number of hops to the sink and adjusts the redundancy to minimize the expected latency and energy consumption.

The fourth article is entitled "Enhanced MIH (Media Independent Handover) for Collaborative Green Wireless Communications" and is authored by Hocine Ameur, Moez Esseghir, Lyes Khoukhi and Leïla Merghem-Boulahia. The authors address the issue of energy saving in heterogeneous networks to make protocols for vertical handover collaborative, in such a way to reduce the overall network energy consumption. This is done via modifications to the Media Independent Handover (MIH) protocol, to allow gathering detailed information about network state

and using them as statistics and indicators to manage network density according to traffic load and users location.

The fifth article is entitled "Channel-Aware Repetitive Data Collection in Wireless Sensor Networks" and is authored by Ryangsoo Kim, Jinho Choi and Hyuk Lim. It proposes an energy efficient transmission scheme for transmission of data sensed via sensor nodes operating in a wireless sensor network. For efficient energy conservation, each sensor node can wait for a higher channel gain before it begins the transmission of sensing data and transmits them with a power that is inversely proportional to the channel gain. However, if the node waits for higher channel gain, switching to the sleeping mode takes a longer time. The authors address channel-aware data transmission problem using an optimization problem with linear constraints.

The sixth article, entitled "Evaluating trade-offs in energy efficient error detection" and authored by Markus Rokicki and Martin Drozda, addresses the trade-off between energy efficiency and error detection performance. In order to obtain a trade-off that is suitable in a given situation, it is necessary that a methodology for comparing trade-offs across qualitatively different types of error detection approaches is available. Therefore, the authors propose and evaluate an approach for comparing trade-offs that is based on iso-performance lines.

The seventh article, entitled "Towards Power Consumption in Optical Networks: A Cognitive Prediction-Based Technique" and authored by Panagiotis G. Sarigiannidis, Georgios Papadimitriou, Petros Nicopolitidis and Emmanouel Varvarigos, proposes effective, cognitive power management technique utilizing traffic prediction mechanisms for energy-efficient operation in optical backbone networks. The technique introduced succeeds high accuracy levels, while it offers energy savings up to 30% lower than other energy-aware schemes.

The eighth article is entitled "An any-sink energy-efficient routing protocol in multi-hop Wireless Sensor Networks for planetary exploration" and is authored by Guido Oddi, Antonio Pietrabissa, Francesco Liberati, Alessandro Di Giorgio, Raffaele Gambuti, Andrea Lanna, Vincenzo Suraci and Francesco Delli Priscoli. It addresses energy-efficiency in ad-hoc network applications for planetary exploration. To this end, it proposes an ad hoc routing protocol that can be tuned for energy-efficient operation.

The guest editors would like to thank all authors and reviewers for their valuable contributions to this special issue. We would also like to thank the International Journal of Communication Systems for hosting this issue. Thanks are also due to all editorial assistants of the magazine. We hope that this issue will become a useful reference and fuel for more research efforts in this important research area of energy-efficient networking.

Guest Editors

Panagiotis Sarigiannidis
Dept. of Informatics and Telecommunications Engineering, University of Western Macedonia, Kozani, Greece

Petros Nicopolitidis
Dept. of Informatics, Aristotle University of Thessaloniki, Greece

Xiaolin Zhou
Dept. of Communication Science and Engineering, Fudan University, China

Habib M. Ammari
Dept. of Computer and Information Science, University of Michigan-Dearborn

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