Editorial for QShine 2014 Special Issue

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Editorial:

This special issue features six high quality papers, most of which have been substantially improved and extended from the best papers presented at the 10th International Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (QShine 2014), which was held on August 18–20, 2014 in Rhodes, Greece.

The first paper “Optimal Downlink Scheduling for Heterogeneous Traffic Types in LTE-A Based on MDP and Chance-Constrained Approaches” was written by Samira Niafar, Xiaoqi Tan, and Danny H. K. Tsang. In the fast growing mobile broadband market nowadays, the high traffic demands come from a wide range of heterogeneous applications with different quality of service (QoS) requirements. This paper considers two packet scheduling problems, taking both the long-term and short-term approaches, to support QoS in LTE-A system. The paper

formulates optimization problems considering both the long-term and short-term revenues for heterogeneous traffic demands, proposes packet-scheduling schemes to solve the problems, and validates the solutions via numerical simulations.

The second paper is “Understanding and Predicting Data Hotspots in Cellular Networks” from Ana Nika, Asad Ismail, Ben Y. Zhao, Sabrina Gaito, Gian Paolo Rossi, and Haitao Zheng. The authors in this paper take an empirical approach to study the unprecedented growth of mobile data usage by analyzing a large-scale dataset from a European cellular provider. The dataset contains 3 months of records of user voice and Internet data usage, involving 734 K+ subscribers and 5327 cell sites. They analyze the data usage at both cell and individual user levels, and seek to understand key characteristics, predictability and causes of data hotspots in today’s cellular networks. The study can lead to more efficient and responsive resource management and thus better QoS provision in cellular networks.

The next article “Achieving Collision-Free Communication by Time of Charge in WRSN” was written by Yuelong Tian, Peng Cheng, Liang He, Yu Gu, and Jiming Chen, which considers wireless rechargeable sensor networks. These kinds of networks support energy harvesting from wireless signals, but the simultaneous transmission may cause collisions at the MAC layer. In this paper, the authors avoid such communication collisions through proper reader movement by exploiting the differences in the time of charge among rechargeable sensor nodes. They formulate the optimization problem and prove that the complexity of the optimal solution is NP-

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hard. They propose a simple yet effective algorithm to optimize both the reader stop location and stop time for minimizing the total communication delay. Extensive simulations show that their design can largely reduce the communication delay and outperform the baseline design by at least 20 %.

The fourth article is “A Network Coding Scheme to Improve Throughput for IEEE 802.11 WLAN”, written by Kaikai Chi, Yi-hua Zhu, Yongchao Wu, and Victor C.M. Leung. In an infrastructure WLAN, the communication between any two nodes is relayed by an access point (AP), which may become the bottleneck and severely restrict the overall throughput. Existing coding schemes consider at most one packet per data flow. To remedy the problem, this paper proposes a network coding scheme that combines multiple buffered packets in one flow into a larger packet for coding, so that the packets participating in coding have similar sizes. The paper formulates an integer programming problem and proposes an optimal packet coding scheme, which is solved by a heuristic algorithm with low time complexity.

The next article is “Efficient Multicast Association to Improve the Throughput in IEEE 802.11 WLAN” written by Dhrubajyoti Bhaumick and Sasthi C. Ghosh. This paper deals with the problem of optimal association of stations (STAs) to APs for multicast services in IEEE 802.11 WLAN. It develops a combined greedy algorithm that selects a subset of APs with minimum cardinality for a conflict-free frequency assignment. It also finds an association between the STAs and the selected APs that maximizes the data rate. Simulation results show that the proposed algorithm selects significantly less number of APs for different data rates in comparison to the well-known metrics for multicast association.

The last article is “Throughput Optimization via Association Control in Wireless LANs” from Heyi Tang, Liu Yang, Jiang Dong, Zhonghong Ou, Yong Cui, and Jianping Wu. The authors point out that the existing RSSI-based association strategy often leads to load imbalance among APs and decreases the aggregated throughput. The different bandwidth demand of users is usually not considered in the current AP association schemes. To address this problem, the authors introduce the bandwidth demand of users as a new constraint to formulate the Joint AP Association and bandwidth Allocation (JAA) problem. They comprehensively analyze the solution space and prove the problem NP-hard. Trace-driven evaluations show that the throughput is improved about 23.1 % compared to conventional schemes.

The guest editors are thankful to the authors for their great contributions and the reviewers for their efforts in reviewing

the manuscripts. We also thank the Edit-in-Chief, Dr. Imrich Chlamtac for his supportive guidance during the entire process.

Dr. Victor C. M. Leung is a Professor and the holder of the TELUS Mobility Research Chair in Advanced Telecommunications Engineering in the Department of Electrical and Computer Engineering, the University of British Columbia. His research interests are in the areas of wireless networks and mobile systems. He has co-authored about 900 technical papers in international journals and conference proceedings, in addition to a number of edited books

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