

Guest editorial

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The design of wireless networks offers challenges not present in fixed networks: the offered traffic and the network topology depend of the mobility of the nodes; moreover, the network capacity is time-varying, and transmission interference among neighboring nodes must be considered. Besides functioning correctly, the designs are also expected to optimize the performance with respect to many criteria, such as energy efficiency, quality of service, and capacity utilization. We are happy to bring this special issue of *ACM/Springer Wireless Networks* to the wireless communication and networking community that addresses some of these challenges. The issue includes selected papers that were presented at the 5th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt), held on April 16–20, 2007, in Limassol, Cyprus. WiOpt brings together researchers and practitioners working on the optimization of wireless networks from different perspectives, such as performance analysis, protocol design, wireless communication, and optimization theory.

The invited papers have been extended by the authors and have undergone careful peer reviews. They collectively report on research that improves the state-of-the-art in design, analysis, dimensioning and operations of wireless networks.

The issue opens with a paper by Anna Pantelidou, Anthony Ephremides and André L. Tits on “A Cross-layer

Approach for Stable Throughput Maximization under Channel State Uncertainty”. In the paper, the authors characterize the stability region of a network with multiple commodities for the realistic case when the network control only has access to estimates of the channel state. They find that the stability region may be considerably reduced by errors in the channel estimation. The second paper “Multicast Scheduling with Resource Fairness Constraints” by Vladimir Vukadinović and Gunnar Karlsson studies the sharing of resources within a cell between unicast and multicast sessions. Fairness is considered in terms of the users’ utilities rather than their throughputs. The paper presents an extension of the proportional fair scheduler to the multicast scenario. The third paper by Avinash Sridharan and Bhaskar Krishnamachari is titled “Maximizing Network Utilization with Max-Min Fairness in Wireless Sensor Networks”. It deals with the problem of maximizing utilization of a wireless sensor network while guaranteeing the best possible minimum rate to sources. The problem is modeled as two coupled linear programs and the authors show that existing additive increase techniques are sub-optimal; they also present a heuristic with nearly optimal performance.

The fourth paper in the issue is “Energy-Efficient Scheduling with Individual Packet Delay Constraints over a Fading Channel” by Wanshi Chen, Urbashi Mitra and Michael J. Neely. The offline-scheduling problem is first studied in order to develop an online algorithm, which achieves energy and delay performances comparable to those of the optimal offline scheduling. Neeraj Jaggi, Koushik Kar and Ananth Krishnamurthy study event detection by means of sensor networks in their paper “Rechargeable Sensor Activation under Temporally Correlated Events”. How should a sensor be activated if events are correlated, given that the sensor node recharges

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(but slowly)? The authors provide simple deterministic activation policies that are close to the optimal for realistic scenarios. Xianren Wu, Hamid R. Sadjadpour and J. J. Garcia-Luna-Aceves present a characterization of link and path lifetimes in mobile ad-hoc networks with unrestricted mobility that can be used in the analytical modeling and optimization of MAC and routing protocols. The paper has the title “From Link Dynamics to Path Lifetime and Packet-Length Optimization in MANETs”.

Denial of service is a problem that occurs also in wireless networks. Yalin Evren Sagduyu and Anthony Ephremides, in their paper “A Game-Theoretic Analysis of Denial of Service Attacks in Wireless Random Access,” address the problem of non-cooperative random access of selfish and malicious transmitters. The non-cooperative equilibrium results are compared with those of the

cooperative strategies and they outline a linear pricing scheme to improve the non-cooperative equilibrium. The concluding paper of the issue is “Detection of Mobile Targets on the Plane and in Space Using Heterogeneous Sensor Networks” by Loukas Lazos, Radha Poovendran and James A. Ritcey. The paper addresses the problem of heterogeneous sensor network deployment on the plane and in space, with the objective of detecting mobile targets. The study is performed by mapping the problem to a line-set intersection problem and an analogy to digital modulation schemes is deduced.

The compilation of this issue relied on the efforts of dedicated experts who provided detailed and timely reviews on the papers invited for the issue. We would therefore like to thank them for their most valuable efforts.