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Editorial

It is our great pleasure to introduce this special section of the Journal, presenting advanced solutions for some of the key research challenges in wireless networks. The special section collects extended papers from the 13th IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks, WoWMoM 2012. Future wireless networks will be highly heterogeneous, and will aim to provide users with pervasive communications facilities, requiring for this purpose that many different types of networking paradigms co-exist in harmony. Papers in this special section cover many of the most significant paradigms in this context, including vehicular networks, wireless infrastructure networks, mesh networks and self-organizing networks (supported by opportunistic networking technologies). In particular, the papers presented in this section address a selection of extremely important open issues, including the dissemination of safety messages in vehicular networks, the understanding and modeling of human mobility, the mitigation of collisions in WLAN, the issue of privacy in Wi-Fi as well as routing in multihop wireless networks.

In the paper *Dissemination of Safety Messages in IEEE 802.11p/WAVE Vehicular Network: Analytical Study and Protocol Enhancements* (by A.J. Ghandoura, M. Di Felice, H. Artail and L. Bononi) the authors study the performance of safety applications over multi-channel single-radio VANETs. By analyzing the IEEE 1609.4 protocol, they show the harmful impact of synchronous channel switching on the message delay and delivery ratio. Furthermore, they also show the problem of dissemination of safety broadcast messages over multi-channel VANETs where the network is intermittently disconnected. To tackle this problem, they propose the WAVE enhanced Safety message Delivery (WSD) scheme to enable fast dissemination of safety messages over multi-channel VANETs, while guaranteeing compatibility with existing WAVE stack. Their simulation results show the ability of the WSD scheme to enhance the performance of IEEE 1609.4 in terms of the message delay and delivery ratio in a wide variety of scenarios.

The paper *SPoT: Representing the Social, Spatial, and Temporal Dimensions of Human Mobility with a Unifying Framework* (by D. Karamshuk, C. Boldrini, M. Conti and A. Passarella) addresses the issue of modeling human mobility, which is crucial in the analysis and simulation of opportunistic networks. As opposed to existing models, for which it is difficult to modify the features of mobility or control the exact shape of mobility metrics, the authors propose a novel mobility framework with the explicit goal of providing a flexible and controllable tool for modeling mathematically and generating simulatively different possible features of human mobility. The proposed framework, named SPoT, maps the different social communities of the network into different locations, whose members visit with a configurable temporal pattern, and thus is able to incorporate the three dimensions of human mobility: spatial, social, and temporal. Through mathematical analysis, the authors show the controllability of the framework and derive the conditions under which heavy-tailed and exponentially-tailed aggregate inter-contact times emerge.

The paper *Mitigating Collisions through Power-Hopping to Improve 802.11 Performance* (by P. Patras, H. Qi and D. Malone) introduces a power-hopping technique (PH-MAC) that, by alternating between different transmission power levels, aims to deliberately cause packet capture and thereby reduce the impact of collisions in 802.11 WLANs. By designing the PH-MAC technique based on the findings obtained from a theoretical analysis, the authors demonstrate that important performance improvements can be achieved by exploiting the interactions between the MAC and PHY layers to mitigate collisions. Furthermore, to understand the feasibility of the technique in practical deployments, the authors present a prototype implementation of PH-MAC which relies on commodity hardware and open-source drivers, and they evaluate the performance of this implementation in an indoor testbed. Results show that the scheme can provide significant gains in terms of throughput, fairness and delay.

The paper *Linking Wireless Devices Using Information Contained in Wi-Fi Probe Requests* (by M. Cunche, M.-A. Kaafar and R. Boreli) deals with privacy issues arising from active service discovery in Wi-Fi networks. Indeed, as active service discovery involves wireless stations broadcasting their Wi-Fi fingerprint, i.e. the SSIDs of their preferred wireless networks, the content of those Wi-Fi fingerprints can reveal different types of information about the owner. The authors start from the hypothesis that social links between devices owners can be identified by exploiting the information contained in the fingerprint.

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Following this hypothesis, the authors consider the similarity between fingerprints as a metric, with the underlying idea that similar fingerprints are likely to be linked. They verify this hypothesis with a dataset composed of fingerprints belonging to more than 8000 devices, and discuss potential countermeasures for this problem.

Finally, the paper *Curve-based Planar Graph Routing with Guaranteed Delivery in Multihop Wireless Networks* (by A. Loch, H. Frey and Matthias Hollick) focuses on localized geographic routing operating on planar graphs. While such techniques promise scalability for use within large multihop wireless networks, none of the existing schemes is flexible enough to adapt the sequence of faces visited by the constructed path and, as a result, real-world constraints may severely impact their network performance. To address this problem, the authors extend planar graph routing to allow the algorithm to forward packets along a sequence of faces intersected by any arbitrary curve. The authors analytically prove that this extended scheme is loop free and allows for guaranteed delivery.

As a whole, this special section collects a very interesting set of solutions for wireless networks, thus contributing to make pervasive networks a reality. We would like to thank all the authors for their high quality contributions, and the reviewers who provided timely and constructive feedback to the authors to improve the quality of this special section.

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