Guest Editorial Preface

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Research in wireless networking has undoubtedly achieved some important milestones toward making ubiquitous anytime anywhere access and pervasive communications and computing a reality. However, we are still a long way off from providing seamless efficient services to wireless end users. In 4G, heterogeneous networks are deployed with different access network technologies (e.g., WLANs, ad hoc, wireless mesh, WiMAx, LTE etc.) that vary in bandwidth, latency and cost. Seamless Connectivity in such networks entirely depends on efficient optimized handoff mechanisms in order to ensure non disruptive session continuity and traffic redirection in a seamless and secure transparent manner. The network dynamics due to node mobility, the nature of the wireless channel, interference between different users and collisions adversely impact network performance across all layers of the protocol stack.

The non proliferation of multi hop mobile ad hoc networks, despite their practical usefulness and need, is mainly due to their poor performances caused by the lack of viable low signalling and high validity routing algorithms. Routing still plays the central and vital role to yield an appropriate and efficient running of these networks, yet it stands out as one of the most crucial actors to attain adequate performances and viable deployments. The crux of routing in such networks lies in its ability to maintain and provide routes that are valid at the instant of their requests otherwise traffic may wander inside the network without ever being able to be delivered to its ultimate destinations. Worse yet, invalid routes amount to over using the wireless communication medium and hence throttling the network from being able to yield good performances.

The proliferation and advancement of wireless communication technologies have revolutionized human's lifestyles by providing the best convenience, safety and flexibility ever in deploying various types of personal communication applications and accessing the Internet services. Car manufacturers have already started equipping cars with the technology that allows drivers and passengers to communicate with each other as well as with the roadside infrastructure, in order to improve the driving experience and make driving safer. However, in such Vehicular Ad hoc NETworks (VANETs) potential security and privacy preservation threats need to be efficiently addressed. The merits of launching VANETs are patent; however, it

comes with certain challenges of security and privacy preservation aspects, in which any malicious behaviour of users, such as a modification to the disseminated messages, could be fatal to other users.

Furthermore, we have been witnessing an unprecedented evolution of the technology making the connection of all kinds of devices to IP possible. The success of all IP networking and wireless technology has changed the ways of living and monitoring the environment. Wireless Sensor Networks stand out as one of the most rapidly emerging technology. In this context there is a strong need for open protocols to enable the cohabitation of various medium technologies and interfacing facilities between devices. Power Line Communication PLC medium, the electrical network, is actually the most widely deployed network. While PLC proprietary protocols restrain its usage, collaboration with classic RF solutions is possible through the use of open standards such as IPv6. Efforts are needed to adapt the IEEE 802.15.4 standard over PLC.

The pressing need to address these technical challenges with solid and novel contributions is the motivation behind this special issue. It includes extended versions of four outstanding papers, which were presented at the ACS/IEEE International Workshop on Future Trends on Ad hoc and Sensor Networks FT-ASN'10, held in Hammamet, Tunisia, in May 2010.

The first paper "Interoperable IPv6 Sensor Networking over PLC and RF Media", by C. Chauvenet et al., investigates the interoperability between Power Line Communications (PLC) and Wireless Sensor Networks (WSN). Different applications from smart metering and environment monitoring to home control and energy efficiency are targeted. They propose an adaptation of the IEEE 802.15.4 standard to the low power, lossy channel and low data rate context of the PLC transceivers using pulse modulation. They focus on the convergence of the IPv6 protocol with the 6LoWPAN adaptation layer and proposed an implementation of RPL, the IETF protocol proposed for Routing Over Low Power and Lossy (ROLL) networks. The interoperability is then demonstrated using a real test bed integrating PLC and WSN running IEEE 802.15.4/6LoWPAN/ IPv6/RPL stacks.

The second paper "Period Size Self Tuning to Enhance Routing in MANETs", by M.A. Abid et al., proposes a novel proactive routing protocol for wireless mobile ad hoc networks. The novelty of their proposal stems from the fact that they allow different nodes to adopt different routing period sizes calculated individually, locally and dynamically. As such, stationary or slowly moving nodes adopt a large period size while fast moving nodes utilize rather a small period size. The size of the routing period depends on the level of the dynamics perceived by each node in an autonomous way where no synchronization is required. Moreover and to better track node mobility and to further mitigate its effect, every node integrates a self regulating process that keeps calibrating the currently chosen period size. A detailed performance investigation is carried out to demonstrate the betterment brought by their proposal against the de facto OLSR. They showed that their proposal provides around 97% routing validity and delivers more than 50% increase in throughput than OLSR with a far much less end to end delay at moderate to high speeds and workloads, hence allowing the smooth exchange of real time traffic.

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The third paper "A Distributed Secure Architecture for Vehicular Ad Hoc Networks", by T. Gazdar et al., proposes a novel distributed Public Key Infrastructure for VANETs based on the election of a small subset of trusted vehicles to play the role of the Certification Authorities. The novelty of their proposal stems essentially from the following facts: first an election process based on various metrics including the relative mobility, a constrained cluster size, a d-connected cluster and a security criterion, second a dynamic demilitarized zone composed of confident nodes within one hop of the elected cluster head to shield it from any malicious node behaviour, and third a trust metric to measure the level of confidence of each vehicle within the platoon. Using extensive simulations, they studied the performance of their proposal and investigated the impact of the vehicle speed, the vehicle average arrival rate and the percentage of confident vehicles on the stability and efficiency of the security infrastructure. In particular, their proposal is scalable, stable and efficient and that only a very small fraction of the nodes need to be confident to attain a very adequate high level of stability and efficiency.

The fourth paper "Predictive Dynamic Uplink/Downlink Resource Reservation for Vertical Handoff Optimization in 4G Networks", by S. Trabelsi et al., tackles one of the major issues in 4G networks that of optimizing the handoff procedure to ensure seamless session continuity with minimum latency. They propose various dynamic and predictive radio resource reservation algorithms in order to enhance the handoff performance in 4G networks. These algorithms concern both of the uplink and downlink and maximize the handoff success probability. A detailed performance study is carried out to demonstrate the efficiency of their proposals.

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Abdelfettah Belghith is currently a full Professor of Computer Science at the National School of Computer Sciences (Ecole Nationale des Sciences de l'Informatique, ENSI), University of Manouba, Tunisia and since 1992. He received in 1979 his main engineering diploma in computer sciences from the Faculty of Sciences of Tunis, university of Tunis II, his Master of Science and his Ph.D. both in computer science from the University of California at Los Angeles (UCLA) respectively in 1982 and 1987. He is currently the Director of the Doctoral School (Graduate School) STICODE of the University of Manouba, the responsible of the Network and Distributed Systems Master degree and the head of the HANA Research Group within the Laboratory CRISTAL at the National School of Computer Sciences. His research and teaching interests focus on Advanced Heterogeneous Networking and Applications. Particularly, he works on ad hoc networks, sensor networks, mesh networks, WiMax and LTE, inter vehicular communications, management and optimization of hand off mechanisms, QoS management in wired and wireless networks, performance evaluation and protocol optimization and specification. He is the author of more than 190 journal articles and conference papers. He is currently serving on several reputed international conference Technical Program Committees (IEEE Globecom, IEEE ICC, IEEE LCN, IEEE WiMob…). He organized and served as the technical Committee Chair and the organizing committee chair of many international and regional conferences. He has been involved in several national and international collaborative research projects with both academia and industry. He has built strong academic and research cooperation with several international institutions with whom several Masters and Ph.D.s have been conducted under joint supervisions. As the head of the HANA Research Group, he supervised over sixty Master and Ph.D. theses on advanced networking and networking applications.

Mario Gerla is a Professor in the Computer Science at UCLA. He holds an Engineering degree from Politecnico di Milano, Italy and the Ph.D. degree from UCLA. He became IEEE Fellow in 2002. At UCLA, he was part of the team that developed the early ARPANET protocols under the guidance of Prof. Leonard Kleinrock. He joined the UCLA Faculty in 1976. At UCLA he has designed and implemented network protocols including ad hoc wireless clustering, multicast (ODMRP and CODECast) and Internet transport (TCP Westwood). He has lead the $12M, 6 year ONR MINUTEMAN project, designing the next generation scalable airborne Internet for tactical and homeland defense scenarios. He is now leading two advanced wireless network projects under ARMY and IBM funding. His team is developing a Vehicular Testbed for safe navigation, urban sensing and intelligent transport. A parallel research activity explores personal communications for cooperative, networked medical monitoring (see www.cs.ucla.edu/ NRL for recent publications).