IEEE Communications Magazine
ENABLING MOBILE AND WIRELESS TECHNOLOGIES FOR SMART CITIES: PART 2

Due to advancements in communication and computing technologies, smart cities have become main innovation agenda of research organizations, technology vendors, and governments. To make a city smart, a strong communications infrastructure is required for connecting smart objects, people, and sensors together. Smart cities rely on wireless and mobile technologies for providing services such as healthcare assistance, security and safety, real-time traffic monitoring, and managing the environment, to name a few. Such applications have been a main driving force in the development of smart cities. Without the appropriate communication networks, it is really difficult for a city to facilitate its citizens in sustainable, efficient, and safer manner/environment. Considering the significance of mobile and wireless technologies for realizing the vision of smart cities, there is a need for conducting research to further investigate the standardization efforts and explore different issues/challenges in the wireless technologies, mobile computing and smart environments.

In this IEEE Communications Magazine Feature Topic (FT), we invited researchers from academia, industry, and government to discuss challenging ideas, novel research contributions, demonstration results, and standardization efforts on enabling mobile and wireless technologies for smart cities. After a rigorous review process, seventeen papers have been selected to be published in this FT of IEEE Communications Magazine. Seven out of seventeen will be published in part-1 of the FT.

LTE/LTE-A is one of the promising communication technologies for smart cities. M. S. Ali et al. in "LTE/LTE-A Random Access for Massive Machine-Type Communications in Smart Cities" presented a review on recent advances in random access (RA) mechanism of LTE/LTE-A. Based on the study, they highlighted the key limitations of the RA mechanisms. Further, they proposed a collision resolution-based RA (CRB-RA) model for massive Machine-type communication over LTE/LTEA. The model focuses on managing the bursty and massive access attempts.

Internet of Things is one of the enabling technologies for smart cities where the devices and applications running on them require energy management solutions. W. Ejaz et al. in "Efficient Energy Management for Internet of Things in Smart Cities" briefly presented an overview of energy management solutions and discussed the challenges in designing the energy management solutions for smart cities. They proposed a framework of energy-efficient scheduling for IoTs in smart cities. Finally, two case studies on energy efficient scheduling and wireless power transfer in IoT are also discussed.

Geo-conquesting is an emerging computational advertising technology for the smart cities. B-W. Chen et al. in "Geo-Conquesting Based on Crowdsourced Metatrails from Mobile Sensing" leveraged the crowd sourced meta-trails for geo-conquesting. A graph clustering approach is used to extract the sequential visiting patterns and affinity sub-networks of city. The sequential

patterns and affinity subnetworks are used to investigate the activities of crowd sequential. Lastly, an interesting discussion on the challenges in smart marketing is also provided for the readers.

The key services in the smart cities are based on media streaming that imposes high bandwidth requirements on the mobile networks. J. M. Batalla et al. in “Efficient media streaming with collaborative terminals for smart city environment” proposed a collaborative framework for adaptive media streaming received by multi-path transmission. The solution combines the network assisted device cooperation with adaptive streaming operations to guarantee the optimized resource allocation on both ways: device-to-device and base-station-to-device.

The Name Data Networking (NDN) is another promising technology for the smart cities that can be integrated with Intelligent Transportation System (ITS) to meet the demands of data-intensive applications. S. H. Bouk et al. in “Named Data Networking based ITS for Smart Cities” proposed an architecture for NDN-based ITS in smart cities. The proposed architecture comprises of naming, caching and cache replacement policies, face management, content segmentation and reassembly, communication reliability, application services, forwarding strategy, management and security components. The research challenges for enabling the NDN-based ITS in the smart cities are also highlighted in the paper.

Interference, user mobility, and high energy consumption are certain open issues hindering the flawless connectivity in smart cities. I. Yaqoob et al. in “Enabling Communication Technologies for Smart Cities” conducted a study to explore the enabling communication technologies and highlighting the issues that remain to be addressed. The recent research efforts are investigated by analyzing the strengths and weaknesses. Moreover, the literature is classified by devising a taxonomy. Capabilities of the modern communication technologies are also analyzed by performing the comparisons based on important parameters. A few notable use cases are also discussed.

Security and privacy of data are among the most important concerns in the smart city applications. Kuan Zhang et al. in “Security and Privacy in Smart City Applications — Challenges and Solutions” investigated the security and privacy concerns in applications designed for smart cities. Further, the recent advances in addressing these challenges are also presented. Finally, the authors highlighted several research directions with respect to security and privacy of applications in smart cities.

In last, we sincerely would like to thank all the people, including the contributing authors, the anonymous reviewers, and the IEEE Communications Magazine publications staff who significantly contributed to this FT. We believe that the research findings presented in this FT will stimulate further research and development ideas for mobile and wireless technologies of smart cities.

Biographies

Ejaz Ahmed is currently working at NIST, Gaithersburg, MD USA. Previously, he has worked at C4MCCR, University of Malaya, Malaysia, CogNet Lab, NUST, and CoReNet, MAJU, Pakistan. Dr. Ejaz is associate technical editor in IEEE Communication Magazine, IEEE Access, and Springer MJCS. He is also serving as a Lead Guest Editor in Elsevier FGCS Journal, IEEE Access, Elsevier Computers & Electrical Engineering, IEEE Communication Magazine, Elsevier Information Systems and Transactions on Emerging Telecommunications Technologies (ETT).

Muhammad Imran is currently working at King Saud University and visiting scientist with Iowa State University. His research interest includes MANET, WSNs, WBANs, M2M/IoT, SDN, Security and privacy. He has published number of research papers in refereed international conferences and journals. He serves as a Co-Editor in Chief for EAI Transactions and Associate/Guest editor for IEEE (Access, Communications Magazine), Computer Networks, Sensors, IJDSN, JIT, WCMC, AHSWN, IET WSS, IJAACS and IJITEE.

Mohsen Guizani (S'85–M'89–SM'99–F'09) received the B.S, M.S. and Ph.D. from Syracuse University. He is currently a Professor and the ECE Department Chair at the University of Idaho. His research interests include wireless communications/mobile cloud computing, computer networks, security and smart grid. He is the author of nine books and 400+ publications He was the Chair of the IEEE Communications Society Wireless Technical Committee. He served as the IEEE Computer Society Distinguished Speaker.

Dr. Ammar Rayes [S'85-M'91-SM'15] is a Distinguished Engineer focusing on the technology strategy for Cisco Services. His research interests include IoT, network management NMS/OSS, machine learning, analytics and security.

He authored three books, over 100 publications in refereed journals and conferences on advances in software & networking related technologies and over 25 patents. He received B.S. and M.S. degrees from the University of Illinois at Urbana and D.Sc. degree from Washington University all in EE.

Jaime Lloret [M'07-SM'10] received his M.Sc. in Physics in 1997, his M.Sc. in electronic Engineering in 2003 and his Ph.D. in telecommunication engineering in 2006. He is the head of the research group "Communications and Networks" of the Research Institute IGIC. He is EiC of "Ad Hoc and Sensor Wireless Networks" and "Networks Protocols and Algorithms". He has been general chair of 36 International workshops and conferences. He is IEEE Senior and IARIA Fellow.

Guangjie Han [S'01-M'05] is currently a Professor with the Department of Information and Communication System, Hohai University, China. His current research interests include sensor networks, computer communications, mobile cloud computing, and multimedia communication and security. He has served on the Editorial Boards of up to 14 international journals, including the IEEE Access, Telecommunication Systems. He guest edited a number of special issues in IEEE Journals and Magazines. He is a member of IEEE and ACM.

Dr. Wael Guibene is Research Scientist at Intel Labs since June 2015. He was awarded his PhD from Telecom ParisTech in July 2013. He also holds an MEng and a Master degree in Telecommunications obtained respectively in 2009 and 2010. Dr. Wael worked at Eurecom as Research Engineer from 2010 to November 2013 then joined Semtech to work on LoRa systems from 2013 to June 2015. His research activities include IoT, 5G and wireless communications.