INTERNET OF THINGS: PART 2

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The Internet of Things (IoT) is seen as a set of vertical application domains that share a limited number of common basic functionalities. In this view, consumer-centric solutions, platforms, data management, and business models have to be developed and consolidated in order to deploy effective solutions in the specific fields. The availability of low-cost general-purpose processing and storage systems with sensing/actuation capabilities coupled with communication capabilities are broadening the possibilities of IoT, leading to open systems that will be highly programmable and virtualized, and will support large numbers of application programming interfaces (APIs). IoT emerges as a set of integrated technologies — new exciting solutions and services that are set to change the way people live and produce goods. IoT is viewed by many as a fruitful technological sector in order to generate revenues. IoT covers a large wealth of consumer-centric technologies, and it is applicable to an even larger set of application domains. Innovation will be nurtured and driven by the possibilities offered by the combination of increased technological capabilities, new business models, and the rise of new ecosystems.

This Feature Topic (FT) issue addresses several promising approaches to sensors, actuators, and new consumer devices. New communication capabilities (from short-range to LPWAN to 4G and 5G networks, with NB-IoT). In addition, there are new communication protocols and the exploitation of NFV/SDN for better communications; new solutions for large distributed systems (e.g., combination of cloud, grid, and edge/fog computing); new vusiness models and ecosystems; and consumer-centric aspects including IoT application development, utilization of semantics, and security, privacy, and trust.

This timely FT has gathered articles from a wide range of perspectives in different industrial and research communities of IoT. In response to the Call for Papers, 103 high-quality manuscripts were received, and after a very careful review process, four outstanding papers have been selected for Part 2 of this FT, giving an overview of recent developments in quantum-resistant cryptosystems for securing the IoT, game theoretic models for resource management for IoT, the potential of UAVs equipped with IoT devices, and new business models for IoT.

In the first article, "Securing Internet of Things in a Quantum World" by C. Cheng, R. Lu, A. Petzoldt, and T. Takagi, the authors present the concept of quantum-resistant cryptosystems for securing the IoT as well as the existing implementations on constrained devices suitable for the IoT. They also present ongoing projects that will help develop the future security solutions for the IoT.

In the second article, "Management in Massive Wireless IoT Systems" by P. Semasinghe, S. Maghsudi, and E. Hossain, some non-conventional game theoretic models that fit the inherent characteristics of large-scale IoT networks are explored. The present five type of games: evolutionary games, mean field games, minority games, mean field bandit games, and mean field auctions, and discuss the potential IoT-related resource management problems that can be solved by using these models.

In the third article, "UAV-Based IoT Platform: A Crowd Surveillance Use Case" by N. Hossein Motlagh, M.Bagaa, and T.Taleb, the potential of UAVs, equipped with IoT devices, in delivering IoT services from height is discussed. As a use case the article demonstrates, by using a developed platform, how UAVs can be used for crowd surveillance based on face recognition.

In the fourth article, "Business Development in the Internet of Things: A Matter of Vertical Cooperation" by A. Ghanbari, A. Laya, J. Alonso-Zarate and J. Markendahl, the relevance of vertical cooperation in the IoT ecosystem is discussed, and the need to develop new value networks that leverage this cooperation and enable the creation of new business models is highlighted. The authors use the examples of two major building blocks of smart cities: intelligent transport systems and health and well being services.

BIOGRAPHIES

CHRISTOS VERIKOUKIS [S'95, M'04, SM'07] (cveri@cttc.es) got his Ph.D. from Universidad Politècnica de Catalunya (UPC) in 2000. He is currently a Fellow Researcher at CTTC, head of the SMARTECH Department, and an adjunct associate professor at the University of Barcelona. He has published 100 journal papers and over 170 conference papers. He is also a co-author of three books, 14 chapters in other books, and two patents. He is currently Chair of the IEEE ComSoc CSIM Technical Committee.

ROBERTO MINERVA holds a Ph.D. in computer science and telecommunications from Telecom Sud Paris, France, and a Master's degree in computer science from Bari University, Italy. He is the Chairman of the IEEE IoT Initiative, an effort to nurture a technical community and to foster research in IoT. He is at TIMLab, involved in activities on SDN/NFV, 5G, big data, and architectures for IoT. He is the author of papers published in international conferences, books, and magazines.

MOHSEN GUIZANI [S'85, M'89, SM'99, F'09] received his B.S. (with distinction) and M.S. degrees in electrical engineering, and M.S. and Ph.D. degrees in computer engineering from Syracuse University in 1984, 1986, 1987, and 1990, respectively. He is currently a professor and the Electrical and Computer Engineering Department Chair at the University of Idaho. He currently serves on the Editorial Boards of several international technical journals. He is the author of nine books and more than 450 publications in refereed journals and conferences.

SOUMYA KANTI DATTA is a research engineer at EURECOM and a co-founder of an IoT startup, Future Tech Lab. His research focuses on innovation, standardization, and development of next-generation technologies in mobile computing, IoT,

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YEN-KUANG CHEN [F'12] received his Ph.D. degree from Princeton University. He is a principal engineer at Intel Corporation, Santa Clara, California. His research areas span from emerging applications that can utilize the true potential of IoT to computer architecture that can embrace emerging applications. He has 50+ U.S. patents, 20+ pending patent applications, and 90+ publications. He is the Editor-in-Chief of the *IEEE Journal on Emerging and Selected Topics in Circuits and*

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HAUSI A. MULLER is a professor in the Department of Computer Science and associate dean of research in the Faculty of Engineering at the University of Victoria. He is a member of the IEEE Computer Society Board of Governors and the 2016–2017 Vice-President of the IEEE CS Technical and Conference Activities Board. His research interests include software engineering, software evolution, IoT, smart cyber physical systems, and self-adaptive systems. He is a Fellow of the Canadian Academy of Engineering.

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