Internet of Things


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The Internet of Things (IoT) refers to the connectivity of tens of billions of network-enabled devices having diverse requirements. Beyond the current hype, IoT will undoubtedly affect all sectors of the economy such as automotive, construction, energy or manufacturing, wherein communication is a prerequisite to reach the "fourth industrial revolution."

What seems to be clear is that Long Term Evolution (LTE) technology operative in deployed networks is not capable of enabling this massive communication between machines, so it cannot be considered as IoT's enabling technology. In fact, LTE until Release 12 has not been designed for communication between machines (in terms of scalability, battery life and control signaling).

The reaction from standardization bodies has been immediate, producing a number of new standards in the last few years (eMTC, NB-IoT, LTE-V, EC-GSM, LoRa, etc.). In addition to the network communications related standards, various IoT protocol and platform (3GPP, IEEE, IETF, oneM2M, etc.) standards have been developed to address requirements for device management and secure data exchange between devices and applications.

As the pace of IoT deployments accelerate, IoT standards are undergoing major evolutions, sometimes revolutions. For instance, cellular networks standards under specification are now adding techniques to improve network performance to address traffic patterns generated by an increasing number of IoT devices. Ongoing discussions around 5G requirements may become game changing for machine-to-machine communications because the standard is being designed, from the ground-up, for massive scale IoT deployments. In parallel, semantic interoperability is now emerging as a major trend that allows data exchange between applications, an increased level of interoperability, analytics and reasoning. With ontologies engineering, researchers will soon overcome the limitations of static data models and bridge the gap between the currently deployed vertical silos. Other areas that will see intense standardization activity are IoT security and low power wide area connectivity.

Two articles have been selected for this series topic. The first article by Ji Lianghai *et al.*, "Applying Device-to-Device Communication to Enhance IoT Services," proposes a context-aware algorithm to exploit network controlled device-to-device (D2D) communications to improve LTE support for massive IoT services. In fact, in 3GPP, D2D communication has been standardized to enable discovery and communication between two devices. In LTE Release 13, UE-to-network relaying is introduced to extend network coverage in public safety scenarios only. But that leads to high time resource usage on the system level and battery drain on the device level, two important features for the success of massive IoT service. The D2D context aware scheme improves both the service availability and battery life of sensors relative to LTE Release 13.

The second article by Di Marco *et al.*, "Performance Evaluation of the Data Transfer Modes in Bluetooth 5," highlights the evaluation results of advantages and disadvantages of the alternative data transfer modes (i.e., advertising mode and advertising extension mode) available in Bluetooth 5 by referring to a home IoT automation use case with a realistic deployment. Overall advertising extension provides good performance although is suffers from higher losses and longer delays. As the BLE standards are being developed toward supporting complicated IoT scenarios, this article provides a good guidance to IoT application designers to select the proper BLE data transfer mode.

We hope the readers will enjoy this issue and find the articles useful. We also like to express our thanks to the Communications Society staff for their continuous support.

Biographies

Afif Osseiran [SM] (afif.osseiran@ericsson.com) is director at the Ericsson CTO office. His main responsibility is to develop strategy for 5G and IoT. He holds a doctorate degree from the Royal Institute of Technology (KTH), Sweden, and a master's degree from École Polytechnique de Montreal. Since 1999 he has held several positions at Ericsson in various units (such as product, research and strategy units). He co-authored the first comprehensive book on 5G with Cambridge and two books on IMT-Advanced with Wiley.

Omar Elloumi [M] (omar.elloumi@alcatel-lucent.com) leads the oneM2M Technical Plenary, a partnership project chartered to advance interoperability standards for consumer, enterprise and industrial IoT. He joined Nokia in 1999 and held several positions, including research, strategy and system architecture. He is currently with Nokia Bell-Labs and the CTO group, where he is responsible for standards and system architectures for IoT. He is the coeditor of books on M2M communications and Internet of Things published by Wiley and ETSI. He is also involved in the program committees of several international conferences and magazines on M2M and IoT. He is a recognized IoT industry thought leader and is regularly invited as a panelist or keynote speaker at IoT industry events.

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