Guest Editorial
RFID Technologies & Internet of Things

The Next Generation Internet aims to interconnect and to make interoperable heterogeneous and smart objects in order to assert the so-called Internet of Things (IoT) vision. In this new scenario, the Human-to-Machine paradigm (H2M) is increasingly moving toward the new Machine-to-Machine (M2M) paradigm, so leading to an improvement of several aspects in everyday life. Certainly, Wireless Sensor Network (WSN) and Radio Frequency Identification (RFID) are playing a fundamental role as IoT enabling technologies. A very interesting research challange aims to implement smart environments able to minimize costs and to maximize the satisfation level of end-users. The opportunity to implement pervasive environments that are able to detect environmental parameters in a smart mode is becoming more attractive for both the academic and the industrial world in many scenarios such as environmental monitoring, building automation, healthcare, smart cities, smart grid, logistics, etc..

This special issue on RFID Technology and Internet of Things of the JOURNAL OF COMMUNICATIONS SOFTWARE AND SYSTEMS aims to report on the recent advancement and developments in various aspects correlated to emerging technologies enabling the IoT such as RFID, NFC, WSN, integrated solutions RFID-WSN, embedded systems, and so on.

Twenty papers were submitted and eight of them have been recommended for publication based on the standard reviewing process. Papers published in this special issue of JCOMSS cover most research topics previuosly reported.

In the work "Study of the Readability of Passive UHF RFID Tags Placed Inside a Cargo Van by a Reader Located Outside" [1], the authors Philippe Mariage, Mirabelle Handeme Nguema, and Laurent Clavier study the feasibility of getting information from a cargo van returning back on its storage area by using a low cost communication system. According to the low speed of the vehicle and to the involved short distances, a UHF RFID solution is considered. An experimental study shows that passive tags may be read successfully but not in the entire space of the van. A semi-empirical numerical method based on a modified version of the Geometrical Optics is derived in order to build a fast computer aided-positioning tool that may help to optimize the placement of the tags. The same software tool is used for carrying out a parametric study that informs on the best antenna system to use. It is find out that a solution using passive tags and two antennas limits the theoretical results to 90% successful reading percentage whereas using semi-passive tags ensures a 100% one in the whole space of the vehicle. This work shows that such a good successful reading rate may be also reached in the future by purely passive tags if their sensitivity decreases from -15dBm to -20dBm.

In the work "Unconventional UHF RFID Tags with Sensing and Computing Capabilities" [2], the authors Riccardo Colella, Danilo De Donno, and Luciano Tarricone present design, realization, and experimental validation of two fully-passive UHF RFID Tags with "augmented" capabilities. Specifically, the first device is named RAMSES (RFID Augmented Module for Smart Environmental Sensing) and is optimized for RFID-based sensor data transmissions up to 5 meters of distance from the interrogating reader. The second device, named SPARTACUS (Self-Powered Augmented RFID Tag for Autonomous Computation and Ubiquitous Sensing), renounces a long operating range in exchange for additional computing capabilities enabling and increased interaction with RFID readers.

In the work "No Communication Nodes Synchronization for a Low Power Consumption MAC Protocol in WSN based IR-UWB" [3], the authors Anouar Darif, Rachid Saadane, and Driss Aboutajdine are involved with synchronization issue in a WSN based on IR-UWB. The Impulse Radio Ultra Wide Band technology has proven an important technique for supporting high rate, short-range, low-power communication and low complexity. In addition, Energy optimization in WSN is an important requirement. Recently, WideMac protocol was presented as a new low power consumption MAC protocol designed for WSN using IR-UWB transceivers. Its low power consumption leads it to be very close to an ideal energy consumption model for the IR-UWB based transceivers. Its first version suffered from a lack of synchronization between nodes' wakeup periods. Because of this, this paper presents a solution for this problem, especially in the case of no communication between nodes. Obtained results proved again the WideMac efficiency in terms of power optimization. And the implemented synchronization mechanism brings a remarkable improvement in terms of packets delivery ratio.

In the work "Integrating Passive UHF RFID Tags with WSN Nodes: Challenges and Opportunities" [4], the authors Danilo De Donno, Maria Laura Stefanizzi, Luca Catarinucci, Luca Mainetti, Luigi Patrono, and Luciano Tarricone propose and validate an innovative RFID-WSN integration approach. Although originally designed with different objectives, they represent two complementary technologies whose integration might increase their functionalities and extend their range of applications. In this work, a new-generation, long-range, EPCglobal Class-1 Generation-2 UHF RFID tag has been connected to a commercial WSN node. To validate the proposed approach, the energy consumption of the developed tag has been thoroughly analyzed. Moreover, the tag has been successfully used as a fully passive wake-up radio for WSN nodes and the achieved wake-up ranges in an indoor scenario have been measured. The presented results demonstrate the effectiveness of the proposed approach compared to existing solutions in the literature.

In the work "Conception and Validation of smart Building

Energy Management System BEMS using the Discrete EVent system Specification DEVS" [5], the authors Abdelfettah Maatoug and Ghalem Belalem focuse their attention on modeling and simulation of a multi-layer optimization BEMS, using the characteristics of the formalism DEVS for the first time. Their choice is explained by the fact that DEVS is a tool for modeling of discrete event systems and it divides the overall system into subsystems in order to facilitate the achievement which is consistent with the characteristics of multilayer architecture of the chosen system. The goal of the paper is not only to model these control layers but also to validate their operation and the energy management mechanism by varying predicted scenarios (from the BEMS) and real data (simulation values from the simulation model of building). In general, the main objective of validation is to check if a system works as expected, in different conditions and scenarios of simulation. The validation aims to make the model useful in the sense that it responds to good problem. A simulation of a dynamic system such as the smart building energy management system BEMS will enable to test new concepts for reducing energy consumption. Authors propose a model that describes the studied system. Based on this model, they have developed an application using the tool of modeling and simulation JDEVS to simulate the behavior of the BEMS.

In the work "Mesh Network for RFID and Electric Vehicles Monitoring in Smart Charging Infrastructure" [6], the authors Ching-Yen Chung, Aleksey Shepelev, Charlie Qiu, Chi-Cheng Chu, Rajit Gadh fucuse on charging infrastructure for electric vehicles. With the increasing number of plug-in electric vehicles (PEVs), charging infrastructure will have to overcome its current shortcomings such as unresponsiveness to grid constraints, low degree of autonomy, and high cost. A charging station will have to accomplish also PEV identification, charging authorization, dynamic monitoring, and charge control. The proposed system automatically identifyies and authorize vehicles, along with monitoring and controlling all charging activities via an RFID mesh network consisting of charging stations and in-vehicle devices. The proposed system uses a ZigBee mesh network of in-vehicle monitoring devices which simultaneously serve as active RFID tags and remote sensors. The system lays the groundwork for intelligent charge-scheduling by providing access to vehicle's State of Charge (SOC) data as well as vehicle/driver IDs, allowing a custom charging schedule to be generated for a particular driver and PEV.

In the work "Discovery and Mash-up of physical resources through a Web of Things architecture" [7], the authors Luca Mainetti, Vincenzo Mighali, Luigi Patrono, and Piercosimo Rametta, define and validate a distributed Web of Things architecture to support the development of applications interacting with constrained devices and to manage private and public resources information. In the literature there are several works that try to address these issues. However, they are often suitable for tech-savvy users only and generate a big amount of data by physical devices. Here, the authors develop a distributed architecture that allows to create and control mash-up applications in an easy way, and they define a centralized public database, deployed on the Internet, to manage and share physical resource information. The effectiveness of the proposed framework has been tested through a real use case.

Finally, in the work "Optimal Configuration of Distributed Generation on Jeju Island Power Grid Using Genetic Algorithm: A Case Study" [8], the authors Rui Huang, Yubo Wang, Chi-Cheng Chu, Rajit Gadh, and Yu-jin Song focuse on the Distributed generation (DG), which is heatedly studied among researchers in the field of Smart Grid. With the rapid development of wind turbine (WT), photovoltaic (PV) and battery (BA) technologies, renewable energy resources such as wind and solar catch plenty of attentions as alternative solution and become the most common DGs that are being integrated into microgrids. However, it is still challenging to determine the sizes and placements of DGs within which the microgrid can achieve its maximum potential benefits. To solve the optimization problem, in the paper genetic algorithm (GA) is used and compared with a mathematical optimization method nonlinear programming (NLP). The proposed model is tested on a real microgrid, i.e. Jeju Island, to evaluate and validate the performances of the approach. The paper focuses on solving the problem for Jeju Island power grid by considering and combining all the important DGs together.

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