Guest Editorial
Smart Environment Technologies

Smart environment represents a world full of different sensors and smart devices seamlessly working together, making everyday living easier and more comfortable. According to Mark Weiser, a smart environment is "a physical world that is richly and invisibly interwoven with sensors, actuators, displays, and computational elements, embedded seamlessly in the everyday objects of our lives, and connected through a continuous network". To build a smart environment, interdisciplinary research in areas like wireless communication, speech and image processing and recognition, localization, sensors design, Radio Frequency Identification (RFID), Machine-to-Machine (M2M) communication and adaptive control is required. All these technologies, which are utilized in a variety of sensors, actuators, displays, and computational elements, are playing a fundamental role in enabling smart environments.

This special issue on Smart Environment Technologies aims to report on recent advances in technologies, architectures, algorithms and protocols for smart environments with emphasis on real smart environment applications. Seven papers have been submitted and four of them have been recommended for publication based on standard reviewing process.

In the paper “Harnessing XMPP for Machine-to-Machine Communications & Pervasive Applications” [1], the authors Antti Iivari, Teemu Väisänen, Mahdi Ben Alaya, Tero Riipinen and Thierry Monteil examine the suitability of the Extensible Messaging and Presence Protocol (XMPP) and experiment with its potential to rise to the challenge of machine-to-machine communications and meet the needs of modern pervasive applications. M2M systems as a whole are typically characterized by the diversity in both the type of device and type of network access technology employed, and such systems are often still today task-specific and built for just one specific application. Smart lighting, remote monitoring and control of all kinds of consumer devices and industrial equipment, safety and security monitoring devices and smart health and fitness products, exemplify this revolution of intercommunicating machines. However, the differences in communication technologies and data formats among such devices and systems are leading to a huge complexity explosion problem and a strongly fragmented market, with no true interoperability. Based on the study and the experimental implementations discussed in the paper, the authors conclude that many of the requirements and challenges (also discussed in the paper) in such systems can be met by harnessing XMPP-based technology.

In the paper “Cost and Lightweight Modeling Analysis of RFID Authentication Protocols in Resource Constraint Internet of Things” [2], the authors Adarsh Kumar, Krishna Gopal and Alok Aggarwal analyze computational and communication costs for Lightweight Mutual Authentication Protocol (LMAP), RFID mutual Authentication Protocol with Permutation (RAPP) and Kazahaya authentication protocols. These authentication protocols are modeled to analyze the delays using lightweight modeling language. Delay analysis is performed using alloy model over LMAP, RAPP and Kazahaya authentication protocols where one datacenter (DC) is connected to different number of readers with connectivity to 1, 5 or 25 tags associated with reader. Among three protocols (LMAP, RAPP and Kazahaya), LMAP has shown the minimum delay for one reader and attachment of multiple tags (maximum tags = 50). De-centralized DC topologies are better compared to centralized for small scale authentication through DCs. A maximum of 651 ms delay is observed in de-centralized peer to peer connectivity as compared to 614 ms in centralized MDC connectivity using LMAP protocol. Results show that there are large delays using RAPP and Kazahaya for centralized topologies compared to de-centralized topologies for large scale networks. These tests are valid for passive devices that support the lightweight authentication protocol.

In the paper “From the Smart City to the Smart Community, model and architecture of a real project: SensorNet” [3], the authors Stefania Nanni and Gianluca Mazzini present a conceptual, architectural and organizational model for the realization of a smart city based on a holistic paradigm as its cornerstone and on the new technologies as its enabling tools. The model is based on the concept of integration of the data belonging to different systems, through the development of a middleware, which allows the retrieval of data from various sources and their storage in a standard format in a new centralized database. The article also illustrates a real project concerning the integration of different sensor networks for the environmental monitoring that exemplifies and implements the main topics discussed. The issues related to its "governance" are also highlighted, not only from a strategic point of view, but also, and above all, from the perspective of its maintenance, which is an important and crucial feature for its "survival" over time.

In the paper “Seamless Connectivity System for Intelligent Public Transportation Systems. Architecture and Mechanism Design” [4], the authors Zsuzsanna Ilona Kiss, Andrei Ciprian Hosu, Gabriel Lazar, Andrei Bogdan Rus, Virgil Dobrota and Zsolt Alfred Polgar propose the architecture of a connectivity system for public transportation communication services, the architecture design being considered on three distinct levels: system, functional and platform level. Providing ubiquitous connectivity to the passengers of public transportation vehicles is an important goal of the communication system designers in

the context of fast development of the intelligent transportation systems and of the Future Internet communication technologies. The proposed system architecture specifies a minimal set of entities required to implement the envisaged connectivity solution and based on a functional analysis the subsystems and modules are derived. By mapping the functional architecture on the hardware components intended to be used the platform architecture is developed. The paper proposes also the design of the mechanisms which implement the inter-process communications, perform the acquisition and handling of the context information and implement a distributed information system characterizing the heterogeneous networking environment. For other mechanisms, like decision and mobility management, the design principles are described. In order to validate the proposed architecture design and to check the correct functioning of the various subsystems and modules a few experimental tests are presented.

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GUEST EDITORS

Mladen Russo was born in 1977 in Split, Croatia. He graduated in 2001 from the University of Split, Croatia. He has been with the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, Croatia since 2001, where he received the M.S. and Ph.D degrees in 2006 and 2010, respectively. His research interests include speech recognition, biophysical cochlear models, wireless positioning, pattern recognition, ambient energy harvesting and mobile communications. He served as a general secretary of the International Conference on Software, Telecommunications and Computer Networks - SoftCOM from 2005 to 2007. He is a member of IEEE, ASA and CCIS.

Maja Stella was born in 1976 in Split, Croatia. She graduated in 1999 from the University of Split, Croatia. She has been with the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, Croatia since 2001, where she received the M.S. and Ph.D degrees in 2007 and 2011, respectively. Her research interests include wireless positioning, signal processing, pattern recognition and mobile communications. She is a member of IEEE and CCIS.