

T6. Machine-to-Machine in Smart Grids and Smart Cities: Technologies, Standards, and Applications

Abstract:

An unprecedented communication paradigm facilitating the connection between a prior unseen number of devices is currently gripping both industrial as well as academic communities. Referred to as machine-to-machine (M2M) communication, it is essentially composed of three key ingredients: 1) a wireless end-device, 2) an infrastructure-based or infrastructure-less wireless carrier network, and 3) the back-end server network. The gamut of application is vast, including emerging applications in the smart grid, smart cities and many other applications. Market prospects of M2M are thus very encouraging, which was estimated at €200bn in Q4 2010 connecting an enormous amount of communicating devices.

The aim of this tutorial is to provide a detailed technical insight into latest key aspects of M2M networks. To this end, we will discuss major developments and updates related to the heterogeneous set of available end-device technologies applicable to M2M systems. Notably, on cellular M2M level, ETSI M2M and 3GPP MTC are pacing at an incredible speed to facilitate standardization of said systems. Also, on capillary M2M level, the IEEE and IETF are extraordinary active to ensure viable system designs. All of these developments will be discussed in great details, as well as open research challenges in the area of cellular M2M. We will also dwell on the applicability of M2M in emerging Smart Grids and Smart City applications.

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Mischa Dohler is now leading the Intelligent Energy [IQe] group at CTTC in Barcelona, with focus on Smart Grids and Green Radios. He is working on wireless sensor, machine-to-machine, femto, cooperative, cognitive and docitive networks. Prior to this, from June 2005 to February 2008, he has been Senior Research Expert in the R&D division of France Telecom, France. From September 2003 to June 2005, he has been lecturer at King's College London, UK. At that time, he has also been London Technology Network Business Fellow receiving appropriate Anglo-Saxon business training, as well as Student Representative of the IEEE UKRI Section and member of the Student Activity Committee of IEEE Region 8 (Europe, Africa, Middle-East and Russia). He obtained his PhD in Telecommunications from King's College London, UK, in 2003, his Diploma in Electrical Engineering from Dresden University of Technology, Germany, in 2000, and his MSc degree in Telecommunications from King's College London, UK, in 1999. Prior to Telecommunications, he studied Physics in Moscow. He has won various competitions in Mathematics and Physics, and participated in the 3rd round of the International Physics Olympics for Germany. In the framework of the Mobile VCE, he has pioneered research on distributed cooperative space-time encoded communication systems, dating back to December 1999. He has published 138 technical journal and conference papers at a citation h-index of 24 and citation g-index of 50, holds 13 patents, authored, co-edited and contributed to 19 books, has given 25 international short-courses, and participated in standardisation activities. He has been TPC member and co-chair of various conferences, such as technical chair of IEEE PIMRC 2008 held in Cannes, France. He is EiC of ETT and is/has been holding various editorial positions for numerous IEEE and non-IEEE journals. He is Senior Member of the IEEE. He is fluent in 6 languages.

In addition to being an experienced lecturer in academia (4 years of MSc and BSc courses at King's College London) and industry (7 years at Mobile VCE and 3 years in France Telecom), he has given over 20 international short-courses on UMTS and Beyond, distributed cooperative systems, wireless sensor networks, issues pertaining to the design of the Internet of Things, and M2M systems.

Jesús Alonso-Zárte received his M. Sc. and Ph. D degrees in Telecommunication Engineering from the Universitat Politècnica de Catalunya (UPC, Spain) in March 2004 and February 2009, respectively. In 2005, he was awarded by the National Telecommunication Agency (COIT) of Spain with the Best Master Thesis Award in ICT. In 2011, he received the UPC Award for his thesis read during the course 2008/2009 (Premi Extraordinari de Doctorat 2011). From 2004 to 2005, he worked as an Information Technology consultant at Everis (former DMR Consulting). In 2005, he was granted by the Centre Tecnològic de Telecomunicacions de Catalunya (CTTC) to obtain the Ph. D. on Signal Theory and Communications at the UPC. While completing his Ph. D. degree, he was granted in 2006 by the European Space Agency (ESA) and by the Generalitat de Catalunya to attend the Space Studies Program (SSP'06) at the International Space University (ISU) in Strasbourg, France. He has also been a visiting teacher assistant at the Escola Politècnica Superior de Castelldefels (EPSC) of the UPC during the second semester of 2007. He is now with the CTTC holding a Research Associate position. He has published several scientific papers in renowned international journals (IEEE Wireless Communications Magazine, IEEE Transactions on Wireless Communications, etc.) and international conferences (IEEE ICC, IEEE GLOBECOM, IEEE PIMRC, IEEE VTC, etc.) over the last years and he has also participated in both public funded and industrial research projects. He is member of the IEEE ComSoc CSIM Technical Committee (Communication Systems Integration and Modeling) and works as reviewer and chair for numerous international conferences. He is part of the Editorial Board of the IET Wireless Sensor Systems Journal and supervises a number of graduate students and Phd Thesis. In 2011, he has been awarded with the Best Paper Award of IEEE International Conference on Communications (ICC) with a technical contribution towards the energy-efficiency of wireless communications.