Guest Editorial
Special Section on Wireless Technologies in Factory and Industrial Automation – Part II

Daniele Miorandi, Elisabeth Uhlemann, Stefano Vitturi and Andreas Willig

THIS second part of the special section on wireless technologies in factory and industrial automation (the first part has been published in the May 2007 issue of the IEEE Transactions on Industrial Informatics) completes the section. Three papers can be found in this issue, ranging from protocol design and evaluation to the design and assessment of system-level solutions for wireless sensor networks in industrial automation.

The paper "Evaluation of Response Times in Industrial WLANs" by G. Cena, I. C. Bertolotti, A. Valenzano and C. Zunino deals with the performance offered, in industrial environments, by the IEEE 802.11 technology. In the paper, the authors report the outcomes of extensive experimental tests carried out using commercially available WiFi devices. Particular attention is devoted to the response time, identified as a critical performance metric for factory automation and other industrial applications. The paper includes also a simple computational model, which can be used in the dimensioning phase for estimating and predicting system's performance. The enhancements obtainable with the use of the traffic prioritization mechanisms encompassed by the IEEE 802.11e standard are also evaluated and discussed.

The paper "System Level Design for Clustered Wireless Sensor Networks" by A. Bonivento, C. Fischione, L. Necchi, F. Pianegiani and A. Sangiovanni-Vincentelli deals with the design and configuration of cluster-based wireless sensor-networks for industrial applications. The basic protocol design takes a number of recent ideas into account, including the adoption of spatial diversity to improve the transmission reliability. The authors develop a methodology which allows to set the protocol parameters so as to achieve prescribed delay targets, and to assess the consequences of these parameter settings in terms of energy consumption, which in itself is a very important concern in wireless sensor networks. As a showcase for the described methodology, a case study is presented.

In the paper "VTP-CSMA: A Virtual Token Passing Approach for Real-Time Communication in IEEE 802.11 Wireless Networks" by R. Moraes, F. Vasques, P. Portugal and J. Fonseca, a token passing procedure is proposed to enable the support of real-time communications in wireless IEEE 802.11 environments, where real-time traffic must share the same communication medium as non-real-time traffic. The VTP-CSMA protocol enhances the real-time properties of IEEE 802.11 networks by circulating a virtual token among real-time devices. This virtual token is complemented by an underlying traffic separation mechanism that prioritizes real-time traffic over non-real-time traffic. Thus, the protocol supports real-time traffic more efficiently as compared to the case where the highest priority of 802.11e is employed, while allowing standard non-real-time DCF/EDCA devices to coexist with VTP-CSMA enhanced devices. Further, this enhancement is made with the goal of keeping modifications at a minimum to facilitate the use of commercial components.

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BIOGRAPHIES OF GUEST EDITORS

Daniele Miorandi is the head of the Pervasive Area at CREATE-NET, Italy. He received a PhD in Communications Engineering from Univ. of Padova, Italy, in 2005, and a Laurea degree (summa cum lauda) in Communications Engineering from Univ. of Padova, Italy, in 2001. He joined CREATE-NET in Jan. 2005, where he is leading a group working on Pervasive Computing and Communication Environments. His research interests include bio-inspired approaches to networking and service provisioning in large-scale computing systems, modelling and performance evaluation of wireless networks, wireless extensions of fieldbus systems, prototyping of wireless mesh solutions.

Elisabeth Uhlemann (S'98 M'05) currently holds a position as Assistant Professor in Wireless Real-Time Communications at the Centre for Research on Embedded Systems (CERES), Halmstad University, Halmstad, Sweden. The position is co-funded by Volvo Technology Corporation with focus on Telematics applications. She obtained her Ph.D. degree in Communications Theory from Chalmers University of Technology, Gothenburg, Sweden, in 2004 and her M.Sc. degree in Computer Systems Engineering from Halmstad University, Halmstad, Sweden, in 1998. She has held visiting positions at the Institute for Telecommunications Research (ITR), University of South Australia, Adelaide, Australia in 2002, 2003 and 2005. Her research interests include ARQ, channel coding, digital communications and real-time communications.

Stefano Vitturi Stefano Vitturi is a senior researcher with the Institute of Electronics, Information Engineering and Telecommunications of the Italian National Research Council (IEIIT-CNR) since January 2002. From 1985 to 2001 he has worked at the control and data acquisition system of RFX, a nuclear fusion experiment included in the Fusion Program of the European Community, located in Padova, Italy. He received the Laurea degree (summa cum lauda) in Electronics Engineering from University of Padova, in 1984. His research interests include industrial communication systems, real time communication networks (wired and wireless), implementation and performance analysis of devices conforming to the most popular industrial communication protocols.

Andreas Willig is a senior researcher with the Telecommunication networks group (TKN) at the Technical University of Berlin, Germany since April 2005. From 2002 to 2005 he was an assistant professor with the Hasso-Plattner-Institue at University of Potsdam (Germany). He obtained the Dr.-Ing. degree in electrical engineering from Technical University Berlin (Germany) in 2002, and the diploma degree in computer science from University of Bremen (Germany) in 1994. His research interests include wireless networks, fieldbus and real-time systems, ad-hoc and sensor networks, all with specific focus on protocol design and performance aspects.