

Guest Editorial

Special Section on Wireless Technologies in Factory and Industrial Automation—Part II

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 second part, 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 by the IEEE 802.11 technology in industrial environments. 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 that 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. A case study is presented as a showcase for the described methodology.

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. A. 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 with 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.

We again want to express our gratitude to all the people involved in the process of publishing this special section: the authors, the reviewers, and the editorial team.

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Digital Object Identifier 10.1109/TII.2007.903227



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