Experiences on the Development and Pilot Testing of Autonomous Wireless Sensor Networks

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Abstract

Wireless Sensor Networks (WSN) are most commonly understood as autonomous networked smart devices, possessing high potential for numerous applications. WSNs are envisioned to be an enabling technology for ubiquitous networks, where computing power is invisibly embedded around us and accessed through intelligent interfaces. In these visions, WSN consists of numerous nodes, which operate fully autonomously, and execute sensing, computing, actuating, and communication tasks.

TUTWSN is a wireless sensor network technology developed at Tampere University of Technology. The technology base was created in 1999-2005, small scale field testing started in 2006 and larger scale piloting with project partners in 2009. The research work and PhD projects have been focusing on low-energy platforms, medium access control (MAC) and routing protocols, efficient embedded implementations, and back-office integration to Internet-based systems. Physical prototypes have been used in the research from the beginning of the TUTWSN development.

TUTWSN technology has been targeted at low data-rate monitoring applications, where a large number of wireless nodes self-configure, perform sensing and data processing tasks, and communicate measurements to applications through gateway points. TUTWSN application fields tested in various pilots have been environmental monitoring, building automation measurements, energy consumption and machinery monitoring, and asset and human tracking.

This presentation introduces the key features of TUTWSN, real-life performance and selected piloting experiences. All TUTWSN nodes are battery powered with lifetime up to two years for multi-hop routing nodes operating on 2.4 GHz and 433 MHz ISM bands. Along the energy efficiency, reliability is maintained also for large and dynamic networks. According to our experiences, successful development of WSN technology requires a holistic view across applications, protocols and platforms.