Adaptive Congestion Control in Cognitive Wireless Sensor Network

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***Abstract*—Cognitive wireless sensor networks (C-WSN) promise a substantial increase in communication performance, provided that an adequate congestion control is designed. In fact, congestion control, which is one of the most important mechanisms in cognitive radio with spectrum sharing, is challenging for C-WSN due to the need of simplicity and efficiency of the mechanism. In this paper, a simple and efficient distributed protocol for congestion regulation for CSMA-based C-WSN is proposed to improve the channel utilization while ensuring predetermined performance for primary devices. By the protocol, when the primary channel is nearly saturated due to high traffic demands, secondary devices leave the primary channel and join some secondary channels, based on their own estimation of the congestion level. In the case of light traffic condition in the primary channel, a rejoining procedure is conducted to insert more secondary devices to fully utilize the primary channel. The protocol runs on top of CSMA mechanism and does not require any standard protocol modification. The proposed congestion regulation protocol is implemented on STM32W108 chips that offer IEEE 802.15.4 standard communications for WSN. Extensive experimental evaluation results show that the proposed protocol can substantially improve the channel utilization, while demanding low signaling overhead even in non-stationary wireless environments.**

Keywords*—*LTE for Smart Grids, congestion control, CSMA/CA, channel utilization, Cognitive wireless sensor networks.