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Efficient Spectrum Allocation for the Cognitive Radio-Based Internet of Things

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Abstract

The scarcity of the spectrum is one of the key impediments to the growth of Internet of Things (IoT) applications and services. Cognitive Radio-based IoT (CR-IoT) is an advanced IoT framework in which IoT integrates cognitive radio (CR) technology for dynamic spectrum sensing to mitigate spectrum scarcity and enhance wireless communication. CR-IoT is useful in diverse applications and sectors, such as healthcare, industrial IoT, smart cities, smart agriculture, military, and defense. CR-IoT can use an IEEE 802.22-compliant Wireless Regional Area Network (WRAN) for backhaul and wide-area connectivity. In this paper, we propose an IEEE 802.22-compliant scheme called Efficient Spectrum Allocation (ESA) for CR-IoT networks. This study includes three novel algorithms for ESA to distribute channels efficiently to primary and secondary users. The system model, spectrum accessibility along with priority, and channel access mechanisms for primary and secondary users are mathematically and graphically illustrated. The complexity and performance of the algorithms are evaluated using mathematical modeling and simulations. Simulation results show that the ESA

significantly improves the overall performance parameters of CR-IoT in terms of throughput (3.5%–21%), spectrum utilization (7.5%–31%), collision reduction (up to 32%), and successful packet transmission (up to 21%) over the state-of-the-art. © 2013 IEEE.

Author keywords

cognitive radio; efficient spectrum allocation; Internet of Things; licensed and unlicensed spectrum; primary; secondary users; wireless regional area network

Indexed keywords

Engineering controlled terms

Agriculture; IEEE Standards; Internet of things; Military applications; Mobile telecommunication systems; Radio systems; Regional planning; Spectrum efficiency; Wireless local area networks (WLAN)

Engineering uncontrolled terms

Efficient spectrum allocation; IEEE 802.22; Key impediments; Licensed and unlicensed spectrum; Primary Users; Secondary user; Spectra's; Spectrum allocation; Unlicensed spectrum; Wireless regional area networks

Engineering main heading

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