ENHANCED MAC CHANNEL SELECTION TO IMPROVE PERFORMANCE OF IEEE 802.15.4

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ABSTRACT. *There has been increasing interest in wireless network system in recent years, yet there are many issues to be resolved, mainly on topics related to its application design, such as the field of intelligent robot, artificial intelligence, and healthcare system, etc. Slotted CSMA/CA is used as a Medium Access Protocol (MAC) in beacon-enabled mode of IEEE 802.15.4 protocol. Although it provides the GTS allocation mechanism for real-time flows, the slotted CSMA/CA does not provide any QoS support for such time-sensitive events. Eventually, it results in unfairness and degradation of the network performance, particularly in high load conditions. The purpose of the research is a development of mechanisms for MAC channel selection to improve the performance of IEEE 802.15.4 beacon-enabled network. First, an improved mechanism called Scan First 3 Channels (SF3C) is developed to reduce the communicating frequency among devices and PAN Coordinator. It is used to assign the sequence for the first three channels of CAP which all devices should communicate with PAN Coordinator in the original network. Then, the other mechanism called Random Prime Double Hash (RPDH) is used to avoid the problem of channels collision. The performance of the proposed mechanisms is evaluated in the simple star topology based on the NS2 simulator. The simulation results demonstrate that the proposed mechanisms can improve the performance of throughput, average delay, utilization, and drop in all respects of IEEE 802.15.4.*
Keywords: Wireless network, IEEE 802.15.4, Zigbee, MAC, Beacon-enabled network, Random prime double hash

1. **Introduction.** A standard IEEE 802.15.4 is developed to concern significant energy cost in order to provide high data rate and it defines Physical layer (PHY) and Medium Access Control layer (MAC) standard specifications with ultra low complexity, cost and power in the personal operating space of 10 m among cheap fixed devices [20,21]. This concept may lead to that the Wireless Personal Area Network (WPAN) PAN Coordinator channels are not enough for data centralizing to cause the problem of data collisions [14,19]. Since the MAC protocol plays an important role in determining the efficiency of channel bandwidth and energy consumed during communication, some research focus on the evaluation of MAC protocol in IEEE 802.15.4 about beacon-enabled network. The devices need a random value in the next back-off periods to avoid collision happened during high traffic periods. But the repeated probability of random value increased when the number of nodes is more than 40. Therefore, other nodes have to wait for next back-off period and channel searching time of MAC.