

1. Introduction

Wireless sensor networks (WSN) is one of the faster-growing technologies [1]. To apply efficient WSNs able to fulfil the requirements of the applications, in particular in monitoring field, it is important to correctly select the suitable wireless protocols that will support the various layers, especially the physical (PHY) and medium access control (MAC) layer. There are popular and commercially available wireless protocols, designed for PHY and MAC layer provide various use-cases. Most of us are very familiar with the IEEE802.11 protocols (WiFi), which becomes an integral part of day-to-day life. In fact, in the monitoring applications requiring of extremely low power consumption as well as low data rate wireless sensing over short distances, WiFi and similar protocols like Bluetooth (defined by the IEEE 802.15) are inappropriate: they are support high-data-rate, consume more energy, and required high-complexity network [2]. For this purpose, the Institute of Electrical and Electronics Engineers (IEEE) approved IEEE 802.15.4 standard [3] as a communication standard for Low Rate Wireless Local Area Networks (LR-WPANs). Notable, although IEEE802.15.4 protocol appears to have promising medium access control (MAC) layer and physical layer (PHY) specifications for (LR-WPANs) networks, it's still facing many challenges.

In this chapter, the basic main reasons for conducting this research are explained. First, we start with a more detailed description of the concept of wireless sensor networks including their main system properties, applications, and major challenges occur in WSN. Then, we will provide the brief introduction of the different MAC layer protocols assigned to monitoring field. Next, the “problem statement and motivation” is presented to point out the important shortcomings of

IEEE802.15.4 standard protocol followed by a summary of our contributes to addressing these shortcomings. Finally, we explain the content and structure of our thesis.