ABSTRACT

Energy consumption is a constraint in the design architecture of wireless sensor networks (WSNs) and internet of things (IoT). In order to overcome this constraint, many techniques have been proposed to enhance energy efficiency in WSNs. In existing works, several innovative techniques for the physical, the link, and the network layer of OSI model are implemented. Energy consumption in the WSNs is to find the best compromise of energy consumption between the various tasks performed by the objects, the detection, the processing, and the data communication tasks. It is this last task that consumes more energy. As a result, the main objective for the WSNs and the IoT is to minimize the energy consumed during this task. One of the most used solutions is to propose efficient routing techniques in terms of energy consumption. In this chapter, the authors present a review of related works on energy efficiency in WSNs and IoT. The network layer routing protocols are the main concerns in this chapter. The interest is focused on the issue of designing data routing techniques in WSNs and IoT.

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INTRODUCTION

In recent years, covering a wide field of application, Wireless Sensor Networks (WSNs) play an important role in collecting data from an environmental context, monitoring, monitoring or other applications. The fact that the network is wireless allows more flexibility for deployment compared to a wired deployment that requires cabling. On the other hand, the WSNs are a very important technology in the Internet of Things (IoT). These networks allow presenting the characteristics and the state of the objects (or environments) in which are implanted (or deployed) like Web services on Internet. Sensors are therefore invited to play the role of hosts of the Internet (often client/server) and communicate with each other and with hosts already connected to the Internet. In addition, the WSNs and IoT are being solicited and must respond to new constraints of WSN and IoT applications. Among these constraints, we can cite:

- **Autonomy**: Sensors and connected objects are usually able to operate autonomously in terms of energy source. The consideration of all the elements contributes to the energy consumption in the electronic circuits of the sensor or object, since the data communication consumes more energy, and again the communication power in terms of transmission to a big effect on the amount of energy used.

- **Mobility**: Sensors or moving objects in the network can move freely and independently. At any time, new equipment can join or leave the network. The change of the topology of a network during the time results from the failures of the sensors or the breaks of the links between them.

In this chapter, we first present a general overview of the WSNs, their architectures, their characteristics, their principal applications, their protocol architecture, their characterized models and their factors, their routing protocols and their constraints. Then we present the IoT, its architecture, its different application domains, its communication paradigms, its life cycle, its constraints related to the deployment and its data routing. Finally, we present the different wireless communication technologies used by the WSNs and the IoT.

WIRELESS SENSOR NETWORKS

WSNs generally consist of a large number of sensors, stationary or mobile, communicating with each other by radio, often randomly deployed in an area of interest (refer Figure 1). The latter is usually a hostile environment, isolated or difficult
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