

# Chapter 5

## Literature Review of MAC, Routing and Cross Layer Design Protocols for WSN

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### ABSTRACT

*In this chapter, the authors present a literature review for MAC, routing, and cross layer design protocols proposed for WSN. This chapter consists of three sections. In the first section, the authors discuss in depth the most well-known MAC protocols for WSN. A comparison among these protocols will be presented. Moreover, the major advantages and disadvantages of each protocol are discussed. The routing protocols for WSN are discussed in the second section. The discussed protocols are classified into data centric routing protocols, Hierarchical routing protocols, location based protocols, and QoS aware routing protocols. Moreover, A Classification of Routing Protocols based on the Application is presented in this section. In the third section, some cross layer design protocols are discussed. A comparison among the discussed protocols according to layers integrated, intended applications, cross-layer objectives, and the evaluation approach, is presented.*

### INTRODUCTION

Although a WSN is a wireless multi-hop network, it has distinguished features over the traditional multi-hop wireless networks. These features are related to the deployment of sensor nodes, the

resources constraint, and the QoS requirement of the WSN. These distinguished features must be considered when designing different protocols that control the operation of WSN such as MAC protocols and routing protocols. Sensor nodes are usually deployed randomly. There is not a pre-defined infrastructure of the established network.

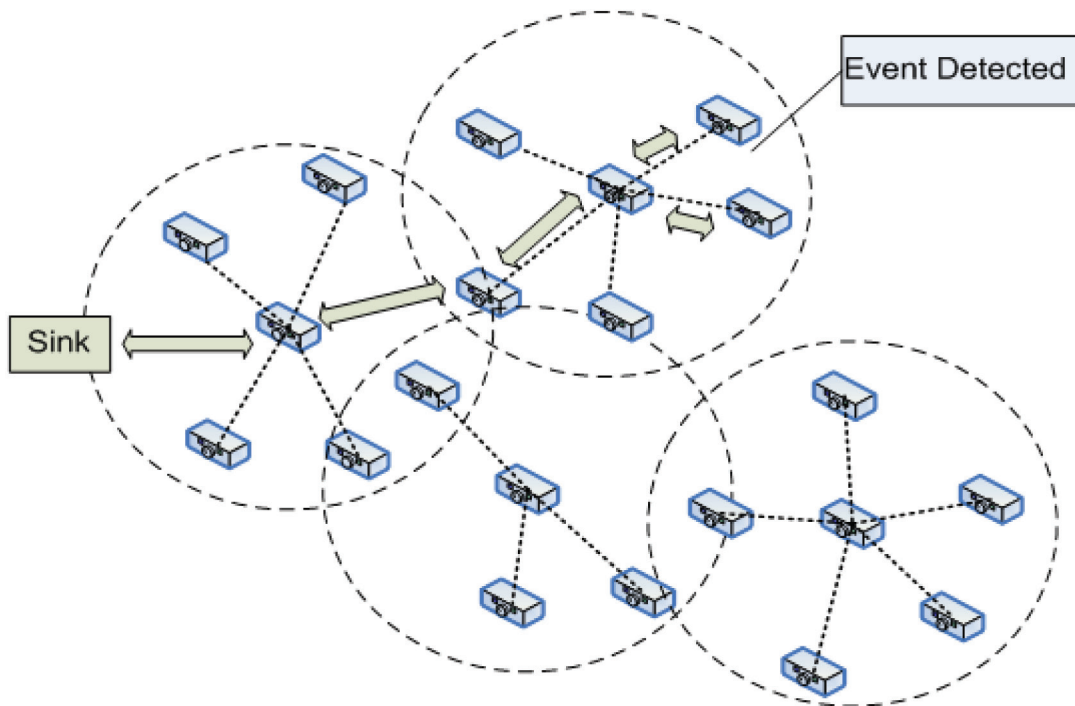
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Therefore, sensor nodes must organize themselves autonomously. Self organizing techniques must be integrated within MAC and routing protocols. On the other hand, Existing of many nodes close to each other generates redundancy in the data gathered from the environment. Therefore, it is not required to transmit all the sensed data, data aggregation can be performed at each intermediate sensor node. Data aggregation will reduce the data traffic in the network. The aggregation function depends on the application. Sensor node has limited resources, for example, all the sensor nodes have a limited power supply (batteries). In most WSN applications, all the sensor nodes are out of control, it is impossible to replace or recharge these batteries. All the control protocols of the WSN must be designed taking into account the energy constraint. These protocols must be energy efficient. Another example of limited resources in the sensor node is the radio transceiver. The

transmission range for radio transceiver of the sensor node is very limited. Therefore, not all the sensor nodes in WSN can hear all other nodes. All sensor nodes must collaborate to transfer data from the source sensor node to the sink. Different WSN applications needs different QoS requirement. For example, Data latency in WSN is very critical in some applications and not so much in other applications. Taking into account these distinguished features, a lot of MAC, routing and cross layer design protocols for WSN are proposed.

A WSN is composed of a large number of sensor nodes that are communicated using a wireless medium (air) as shown in Figure 1. The sensor nodes are deployed in the environment to be monitored in ad hoc structure. In WSN, there is sink node that collects data from all sensors, and usually not all nodes hear all other nodes. WSN is considered a multi-hop network.

*Figure 1. A wireless sensor network*



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