# Chapter 5
# Wireless Sensor Network Protocols, Performance Metrics, Biosensors, and WSN in Healthcare: A Deep Insight

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## ABSTRACT

*Wireless network led to the development of Wireless Sensor Networks (WSNs). A Wireless sensor network is a set of connected devices, sensors, and electronic components that can transmit the information collected from an observed field to the relevant node through wireless links. WSN has advanced many application fields. It can change any kind of technology that can modify the future lifestyle. WSNs are composed of tiny wireless computers that can sense the situation of atmosphere, process the sensor data, make a decision, and spread data to the environmental stimuli. Sensor-based technology has created several opportunities in the healthcare system, revolutionizing it in many aspects. This chapter explains in detail wireless sensor networks, their protocol, and performance metrics. The impact and role of the Biosensor in a wireless sensor network and healthcare systems are depicted. The integration of the computer engineering program into the WSNs is addressed.*

## INTRODUCTION

In recent years, WSNs have earned worldwide consideration in its technological development particularly with the proliferated development of Micro Electro Mechanical Systems (MEMS) based technology. MEMS have enabled the expansion of smart and miniaturized sensors. These sensors have only limited processing and computing resources. They are inexpensive compared to conventional sensors. The sensor network is comprised of sensors, which can sense (sense the atmospheric conditions namely light,

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temperature, humidity, pressure, etc.), measure and collect the information from the environment. The sensed data is further processed for making the decision. Later the decision is transmitted on to the user. Smart sensors are low power consumption devices that are all furnished with one or more than one sensor, actuators, a power supply unit, a radio transceiver and a processor. These smart sensors can sense a variety of signals namely thermal, mechanical, biological, optical and chemical.

Since the sensor nodes in the network have limited memory capacity and are generally deployed in locations where it is difficult to access, a radio is employed for wireless transmission of the data from the sensor node to a base-station (e.g., handheld device, a laptop). The primary power supply for the sensor node is achieved by a battery which is having limited power. The secondary power supply is established by the harvesting technology from the environment that is the solar panels will be attached to the sensor nodes. From that energy will be generated and stored for processing and performing certain operations. A WSN normally has little or no infrastructure. WSNs are self-configure and self-organized in nature. Sensors in the sensor network system consist of three subsystems such as the sensor subsystem, processing subsystem, and communication subsystem. These systems are responsible for sensing the atmospheric condition, decision making based on the sensed data and responsible for the exchange of information with the neighboring sensors. WSN has significant applications likely remote environmental observation and tracking of the target. The architecture of WSNs depends considerably on the application or device and it has to consider the features namely the environment, objective application or device, cost, hardware, and system constraints. This technology can provide reliability in addition to enhanced mobility (Yick et al., 2008).

## WIRELESS SENSOR NETWORK

Rapid development in the field of sensor-based devices, computer technology, and wireless communication has lined up for the proliferation of WSN (Dargie et al., 2008). A common objective is achieved by a group of wireless sensors collaboration. The WSN consists of one or more than one sink that is a base station that collects the data from all the sensor devices. Through these sinks, WSN establishes the interaction to the outside world (Stroulia et al., 2009). With the use of unsophisticated sensors, WSNs develops a sensor device to perform sensing which is inexpensive and conventional when compared to the traditional approaches(Li et al., 2008). The main advantage of the conventional approach is greater coverage, accuracy, and reliability at a possibly lower cost. WSN is categorized into two groups such as Structured and Unstructured WSN(Raghavendra et al., 2006).

- Structured WSN: A limited number of the sensor nodes or all of them in the WSN will be deployed in the preplanned network structure. In this, only fewer amount of sensor nodes will be deployed. The main advantage of this network is less in network maintenance and in expensive. Since the nodes are retained at a definite location,only a lesser amount of nodes can be deployed in the network to establish coverage area while ad hoc network's deployment can be established even to uncovered regions.
- Unstructured WSN: In the unstructured WSN poses a dense compilation of sensor nodes. These sensor nodes follow the Ad-hoc principle for deploying the sensor nodes in the network. This sensor network has no architecture and remains unattended to perform observe and report over the functions of the sensor node. Because of the vast nodes in the unstructured WSN, maintenance of