Chapter 11
Self-Managed System for Distributed Wireless Sensor Networks: A Review

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ABSTRACT

With the advancements in technology, wireless sensor networks (WSNs) are used almost in all applications. These sensor network systems are sometimes used to monitor hostile environments where human intervention is not possible. When sensing is required to be done in areas that are hostile, there is need for autonomous/self-managing systems as it is very difficult for the human to intervene within such hostile environmental conditions. Therefore, in such systems, each node is required to do all functionalities and act like autonomous decision taking node that performs both data forwarding and network control. Therefore, introducing a self-management for large-scale distributed wireless system is a highly tedious task due to resource constrained nature of these nodes. It is very difficult to achieve required quality of service by large systems as a huge amount of energy is dissipated by systems in radio communication. Owing to resource constraint as well as vulnerable nature, developing a self-managing system for distributed WSN is a very challenging and demanding task.

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Figure 1. Wireless sensor network

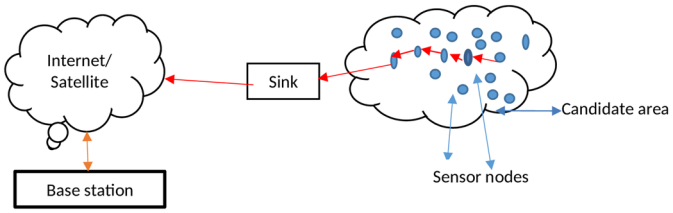
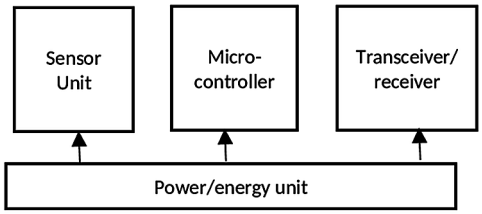


Figure 2. Architecture of sensor node



INTRODUCTION

Extensive work and research is going on in wireless sensor networks (WSNs). These are the networks that are composed of sensor nodes which are distributed in a candidate area either densely or sparsely depending upon the requirement of application, sensing range of nodes, kind of territory and other environmental factors.

In sensor networks, active entity sensor nodes (SNs) are deployed in an area whose physical parameters need to be monitored and these areas may be open or closed. Sometimes SNs need to be deployed in hostile environments, where it is not possible for a human to intervene in a system. Monitoring and management of systems in such hostile environments e.g. under water battlefields, volcano prone area, flood or land slide areas need to be self-manageable, so that, little or no intervention of human is required. In such systems, nodes communicate with one another via wireless means; do their sensing work and other tasks autonomously and smartly. These nodes are smart enough to take decisions by their own according to the changing demands of the environment. These systems are used in large number of applications now-a-days but still sometimes they fail to give throughput up to their full potential as these nodes, which are main constituent of the WSNs, are the resource constrained nodes and possess very less memory, processing capability and energy. These nodes are battery operated devices and these batteries get depleted with time and therefore, battery life decides the life of node (Song, Kim and Sung, 2005). When a node gets scarce from battery, it becomes dead and is unable to communicate with other nodes and base station (BS). The dead nodes greatly affect the working of the overall system. Energy management, energy harvesting, power management are the challenging areas of WSN in which many researches are still going on so as to provide energy externally from some mobile charging sources or by harvesting energy from natural resources or managing internal energy of nodes. All these efforts are