

Chapter 7

Design, Architecture, and Security Issues in Wireless Sensor Networks

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ABSTRACT

Wireless Sensor Networks (WSNs) provide a new paradigm for sensing and disseminating information from various environments, with the potential to serve many and diverse applications. In this chapter, we report the latest trends in WSN research, focusing on middleware technology and related areas, and including application design principles. We give an overview of WSNs and design aspects of applications, including existing research prototypes and industry applications. We describe the technology supporting these sensor applications from the view of system architecture and network communication. We then highlight outstanding issues and conclude with future perspectives on middleware technology.

INTRODUCTION

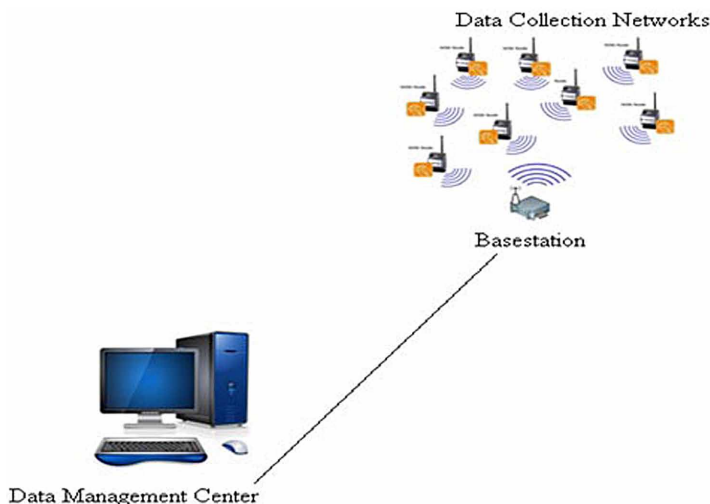
In recent years, advances in miniaturization, yet simple low power circuit design and improved low cost, small size batteries have made a new technological vision possible: wireless sensor network (WSN) (You, Lieckfeldt, Salzmann, Timmer-

DOI: 10.4018/978-1-4666-8687-8.ch007

mann, 2009). Wireless Sensor Networks (WSNs) are designed by sensor nodes that communicate each other and also processing data and sensing environment (Li & Halpern, June 2001). A conventional Wireless Sensor is illustrated with the help of Figure 1. A sensor node is basically a device that converts a sensed attribute (such as temperature, vibrations) into a form understandable by the users. A functional block diagram of a typical sensor node is given in Figure 2. WSNs, which can be considered as a special case of ad-hoc networks with reduced or no mobility, are expected to find increasing deployment in coming years, as they enable reliable monitoring and analysis of unknown and untested environments. These networks are “data centric”, i.e., unlike traditional ad-hoc networks where data is requested from a specific node, data is requested based on certain attributes such as, “which area has temperature over 35C or 95F”. Therefore A large numbers of sensors need to be deployed to accurately reflect the physical attribute in a given area. Due to lack of a better word, typical sensor consists of transducer to sense a given physical quantity with a predefined precision, an embedded processor for local processing, small memory unit for storage of data and a wireless transceiver to transmit or receive data and all these devices run on the power supplied by an attached battery.

It is interesting to note that precise specifications of various components, may depend on the type of applications in hand, but the basic characteristics are essentially present to fulfil desired application functionalities. There are few integrated sensors commercially available and can be used directly as plug and play unit to monitor and control some specific physical parameters as decided by the user.

Figure 1. Wireless sensor diagram



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