Chapter 14
Post-Deployment Energy-Efficient Schemes in Wireless Sensor Networks:
A Study on Three Well-Known Energy-Efficient Approaches

Rohit Pachlor
Visvesvaraya National Institute of Technology, India

Deepti Shrimankar
Visvesvaraya National Institute of Technology, India

ABSTRACT

Once wireless sensor networks are deployed, they are expected to work autonomously for a long time. However, the limited energy of sensor nodes is the main constraint in achieving it. Therefore, to increase the overall lifetime of sensor networks, the sensors must use their limited energy source in an energy-efficient manner. In wireless sensor networks, logical topologies play a significant role in ensuring various constraints such as effective use of limited resources, bandwidth utilization, latency, and quality of communication. In this chapter, the authors discuss three famous energy-efficient topologies of sensor networks that minimize the overall energy consumption during the communication process. These topologies are cluster, chain, and tree-based. The authors highlight the design issues of each topology and discuss the benefits of each topology over other topology. The focus of the chapter will be more on cluster-based rather than chain and tree as it is widely used compared to the chain and tree-based topologies for energy-efficient communication.

DOI: 10.4018/978-1-5225-7335-7.ch014

Copyright © 2019, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

INTRODUCTION

The expeditious advancement in computer networks, wireless communication, Micro-Electro-Mechanical Systems (MEMS) technology and digital electronics has empowered the development of low-cost smart sensors (Mahapatro et al., 2013). Sensors have limited processing and storing capability. They are inch-scale devices equipped with integrated sensing, wireless communication capability, and finite energy supply. The sensors are networked together to form a wireless sensor network (WSN). WSN consists of hundreds to thousands of sensors (nodes) deployed in some geographic region to monitor, accumulate and report information. Applications of sensor networks include area monitoring, healthcare monitoring, air pollution monitoring, forest fire detection, landslide detection, water quality monitoring, natural disaster prevention, machine-health monitoring, scientific-data collection and structural health monitoring as shown in Figure 1 (Akyildiz et al., 2002).

The sensors within the WSN accumulate information autonomously from their surrounding and neighboring nodes and communicate it to a base-station throughout the network lifetime as shown in Figure 2. The BS processes the received information for any decision to be taken. There are various safety-critical

Figure 1. Applications of wireless sensor networks

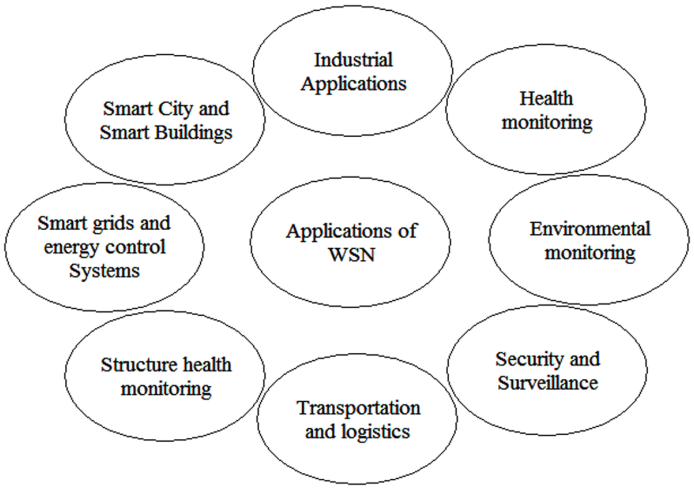
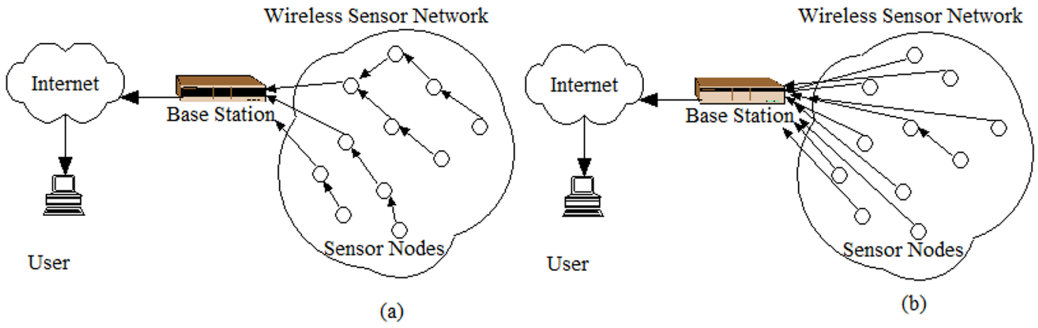


Figure 2. A wireless sensor network (a) multi-hop communication (b) single-hop communication



20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/post-deployment-energy-efficient-schemes-in-wireless-sensor-networks/225724

Related Content

The Role of Cloud Computing in Modern Business Strategy
Punith Cariappa (2025). *Embracing the Cloud as a Business Essential (pp. 435-456).*
www.irma-international.org/chapter/the-role-of-cloud-computing-in-modern-business-strategy/374722

Integrating Fog Computing With AI for Real-Time Disaster Management in Smart Cities
Sarvesh Chand (2025). *International Journal of Fog Computing (pp. 1-19).*
www.irma-international.org/article/integrating-fog-computing-with-ai-for-real-time-disaster-management-in-smart-cities/376243

Fog Computing Quality of Experience: Review and Open Challenges
William Tichaona Vambe (2023). *International Journal of Fog Computing (pp. 1-16).*
www.irma-international.org/article/fog-computing-quality-of-experience/317110

Hive: Formal Semantics of an Edge Computing Model Based on JavaScript
Matias Teragniand Claudia Pons (2022). *International Journal of Cloud Applications and Computing (pp. 1-22).*
www.irma-international.org/article/hive/312564

Verification and Identification Approach to Maintain MVCC in Cloud Computing
Niharika Singh, Upasana Lakhina, Ajay Jangraand Priyanka Jangra (2017). *International Journal of Cloud Applications and Computing (pp. 41-59).*
www.irma-international.org/article/verification-and-identification-approach-to-maintain-mvcc-in-cloud-computing/188662