

Amorndej Chamswarnng 2010: Gateway Association Policy for Two-Tier Wireless Sensor Networks on Bandwidth Constraints. Master of Engineering (Computer Engineering), Major Field: Computer Engineering, Department of Computer Engineering. Thesis Advisor: Assistant Professor Chaiporn Jaikaeo, Ph.D. 92 pages.

Wireless sensor networks are system to gather physical information from the environment. They consist of two kinds of components, sensor nodes and base stations. Multi-tier architecture has been proposed to avoid the issue of power consumptions and scalability. Less energy-constraint nodes, called gateways, are introduced as intermediate nodes between sensor nodes and a base station. Gateway association policy is typically based on distance, overall power consumption, or number of associated sensor nodes. However, situations where these sensors produce huge amount of data will cause some gateways to be occasionally overwhelmed, leading to higher packet drops and delay.

The objective of this research is to study and improve gateway association policy in multi-tier wireless sensor networks in order to minimize energy consumption of sensor nodes while still meeting bandwidth constraint. The proposed algorithms were divided into two approaches, algorithm for single-hop wireless sensor networks and multi-hop networks. Both algorithms have similar concept. They both attempt to relocate some sensor nodes from overloaded gateways to others, expecting these relocations will reduce packet drops and delay in the overloaded personal area networks.

The proposed protocols were tested with the Network Simulator version 2.33 (NS-2). Experiments were divided into single-hop networks and multi-hop networks for evaluating performance with other schemes in terms of base station's throughput, delays, delivery ratio, and energy consumption per useful bit. The experimental results reveal that the algorithm for single-hop networks outperforms other approaches in terms of data delivery while still keeping energy efficiency on par. Furthermore, the performance of the algorithm for multi-hop networks is similar to that of other approaches in most cases, and better when sum of sensor nodes' datarate is going up.

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