

Evaluation of some MAC layer protocols in wireless sensor networks

Mong Duc Hung

Abstract: This thesis evaluates the performance of several Medium Access Control (MAC) layer protocols in Wireless Sensor Networks (WSNs). Given the critical constraints of energy efficiency, latency, and scalability in WSNs, the choice of MAC protocol significantly impacts network lifetime and throughput. This study provides a comparative analysis of representative protocols, including contention-based, schedule-based, and hybrid approaches. Through extensive simulations under varying network conditions—such as node density, traffic load, and duty cycle configurations—key performance metrics including energy consumption, packet delivery ratio, and average end-to-end delay are assessed. The results highlight the trade-offs inherent in each protocol class: contention-based protocols offer flexibility but suffer from collisions and idle listening, while schedule-based protocols provide deterministic access at the cost of synchronization overhead. The findings offer practical insights for selecting appropriate MAC protocols tailored to specific application requirements, contributing to the optimization of WSN design for resource-constrained environments.

Keywords: Evaluation of MAC protocol, wireless sensor network, MAC layer, channel access protocol