

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

Battery-Aware Energy-Efficient Algorithms for Wireless Networks

By

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(Abstract of 350 words or less, or recital program)

Wireless networks, such as wireless mobile ad hoc networks, wireless sensor networks and wireless mesh networks, have played an increasingly important role in a wide range of applications. Battery has emerged as a key component for energy management in these wireless networks, especially for packet routing and wireless device activity scheduling. Wireless devices in these networks are powered by batteries. Although the energy capacity of batteries has been increased by 10% to 15% per year, it still cannot keep up with the increasing energy demand of wireless devices. It is critical to improve energy efficiency of these wireless networks in a battery-awareness point of view.

This thesis provides a suite of battery-aware energy-efficient algorithms and schemes for routing and scheduling in MANETs, WSNs and WMNs. (1) The on-line computable, discrete time mathematical battery model provides an approach to accurately calculate battery discharging loss and battery residual capacity in an energy efficient way. (2) A battery-aware power metric is introduced for battery-aware routing in MANETs. Based on the metric battery-aware routing schemes and prioritized battery-aware routing schemes are proposed to improve energy efficiency of packet routing in MANETs. (3) A virtual backbone scheduling scheme for data propagation and distribution among sensors is proposed based on the mathematical battery model. The scheme constructs a battery-aware connected dominating set to let fatigue sensors recover batteries and prolong the lifetime of WSNs. (4) A router-level battery lifetime optimization scheduling algorithm is proposed to maximize the lifetime of battery-powered mesh routers. A network-wide spanning tree scheduling algorithm is designed to improve lifetime of WMNs with battery-awareness. (5) A battery-aware MIMO mesh network energy scheduling scheme is proposed to dynamically schedule mesh routers' radii based on battery behaviors.

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