Ph: 9585554590, 9585554599
Email: support@salemsmartreach.com
URL: www.salemsmartreach.com

Optimally Adaptive Power-Saving Protocols for Ad Hoc Networks Using the Hyper Quorum System

Abstract:

Quorum-based power-saving (QPS) protocols have been proposed for ad hoc networks (e.g., IEEE 802.11 ad hoc mode) to increase energy efficiency and prolong the operational time of mobile stations. These protocols assign to each station a cycle pattern that specifies when the station should wake up (to transmit/receive data) and sleep (to save battery power). In all existing QPS protocols, the cycle length is either identical for all stations or is restricted to certain numbers (e.g., squares or primes). These restrictions on cycle length severely limit the practical use of QPS protocols as each individual station may want to select a cycle length that is best suited for its own need (in terms of remaining battery power, tolerable packet delay, and drop ratio). In this paper, we propose the notion of hyper quorum system (HQS)-a generalization of QPS that allows for arbitrary cycle lengths. We describe algorithms to generate two different classes of HQS given any set of arbitrary cycle lengths as input. We also describe how to find the optimal cycle length for a station to maximize energy efficiency, subject to certain performance constraints. We then present analytical and simulation results that show the benefits of HQS-based power-saving protocols over the existing QPS protocols. The HQS protocols yield up to 41% improvement in energy efficiency under heavy traffic loads while eliminating more than 90% delay drops under light traffic loads.