Energy Aware Contention-Addressing Algorithm in WLAN Wake-Up Based Radio Network Uplink

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Abstract. The increased relevance of WLAN in upcoming wireless technology has made the efficient design of WLAN Medium Access Control an open issue of concern especially in terms of energy. Energy efficiency primarily focuses on carrier sensing, false wakeups, collision ad number of contention rounds. Research has proposed the use of low-power wakeup radio to perform carrier sensing operation which is has the potential of making WLAN have more energy and time for data transfer. However, the reduction of false wakeup and collision are still areas that consume node energy if not properly designed especially when contending stations are much. This work, proposes a IEEE 802.11 wake-up radio algorithm for uplink that employs a Hybrid Contention-Addressing to enhance energy in WLANs. Unlike other methods, the algorithm makes use of a distributed contention strategy to determine which station can wake up for data communication. Contention rounds are used to determine and queue up a set of stations chosen to transmit data. The algorithm greatly reduces false wakeups which arises from delay between sleep and wake up, by broadcasting the ACK frame after modulating the frame with a wake-up message (WuM) Piggybacking the address of the next station to transmit. Simulation results show that the by HCA-CSAM/CA algorithm is able to reduce energy overhead by 97%, which translates to 60hrs increase in battery lifetime and 68.3% reduction in latency as compared with ESOC..

Keywords: Wake-up radio, Medium Access Control, network uplink, IEEE 802.11.

1 Introduction

Typically, the contention-based IEEE 802.11 algorithm grants channel access to the lone station that wins contention while others that failed all wait for another session of contention before they can attempt data transfer [1, 2, and 3]. The down fall of this strategy (especially in large networks) is longer waiting periods and possible loss of