Performance Degradation of IEEE 802.11 MANET due to Heavy Increase and Heavy Decrease in Contention Window

Abstract

The primary Medium Access Control (MAC) technique of IEEE 802.11 is called Distributed Coordination Function (DCF). This protocol adopts a Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) with a binary exponential backoff (BEB) algorithm to access the channel. The protocol performance mainly depends on backoff procedure which reduces the
probability of collision.

With BEB, waiting time of a node gets doubled after every unsuccessful transmission. This introduces fast-growing retransmission delays for the backlog traffic. In a Mobile Ad hoc Network (MANET), it would be worthwhile to slow down the growth-rate of waiting time because the nodes communicating in a MANET might move out of collision range while waiting for retransmission. Moreover, DCF reduces the Contention Window to the initial value after each successful transmission which essentially assumes that each successful transmission is an indication that the system is under low traffic loading.

In this paper, we point out the inefficiencies in conventional DCF protocol by simulating the data transfer in a MANET with different number of nodes under different traffic conditions. It is shown that as the number of nodes in a MANET increases the performance of conventional DCF protocol in IEEE 802.11 decreases drastically. Finally we propose a layout for the new DCF protocol with modified backoff algorithm.

Reference


Index Terms

Computer Science Wireless Networks

Key words
DCF MAC CSMA/CA

BEB