Abstract

One source of performance degradation in wireless networks is the frame error that occurs because of non-ideal channel conditions. Most previous works assume an ideal transmission channel (i.e., no error in transmission), whereas other works assume that the error is constant and exists only in data packets. These previous works do not consider transmission errors in control frames (i.e., RTS, CTS, and ACK). Therefore, this paper proposes an analytical approximation model to computes the saturation throughput, conditional collision probability, and packet transmission probability, of IEEE 802.11 distributed coordination function (DCF) in the presence of a determinate number of nodes (n) and a wireless noise channel condition. The transmission error that occurs in the data packets and control frames are considered for the computation of the saturation throughput. Furthermore, the effect of network size (n), maximum backoff stage (m), packet length, and minimum backoff window size (W) on the saturation throughput is investigated. The results indicate that the performance of IEEE 802.11 DCF strongly depends on number of nodes, packet length, and BER.
1. Wireless LAN medium access control (MAC) and physical layer (PHY) specification: High-speed physical layer extension in the 2.4 GHz band, IEEE Standard 802.11, 2012.


Index Terms

Computer Science Wireless

Keywords

IEEE 802.11, DCF, BER, Throughput, Wireless Noisy Channel, Performance Analysis, Hidden Nodes