IEEE 802.11 SATURATION THROUGHPUT ANALYSIS WITH FREEZING OF BACKOFF COUNTERS

Yutae Lee

Department of Information and Communication Engineering, Dongeui University, Busan 614-714, KOREA

ylee@deu.ac.kr

ABSTRACT

This paper presents an accurate model for the performance analysis of IEEE 802.11 saturation throughput with freezing of the backoff counter. The model corrects the exiting model presented by Foh and Tantra.

INTRODUCTION

The bi-dimensional Markov chain modeling introduced by Bianch [1] for the analysis of the IEEE 802.11 saturation throughput has become a common method to study the performance of the IEEE 802.11 Medium Access Control (MAC) protocol [2] and its enhancements. The model was later refined to capture further details of the IEEE 802.11 protocol operations. Among the refinements, one is due to Ziouva and Antonakopoulos [3] aiming to capture the freezing of backoff counters when the broadcast channel is sensed busy by a station. Precisely, when a channel turns idle from busy due to, for example, a Distributed InterFrame Space (DIFS), Bianchi's model assumes that each station immediately reactivates and decrements its counter, whereas the IEEE 802.11 standard specifies that a backoff counter is decremented only after the channel continues to remain idle for a predefined slot time. The refinement reported in [3] was, however, introduced without realizing that the two key probabilities governing the performance, namely the channel access probability τ and the station collision probability p, depend on the channel status. Foh and Tantra [4] presented a model correcting that of [3] by evaluating the channel access probabilities and the station collision probabilities conditioned upon the channel status. The model presented in [4] was, however, introduced with realizing that the two key probabilities depend only on the channel status at the previous period. In this paper, we present a new model correcting that of [4]

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