Markovian Model for Computation of Tag Loss Ratio in Dynamic RFID Systems
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Abstract

In Radio Frequency Identification (RFID) systems a reader device detects and identifies nearby electronic tags. Traditionally, the performance of RFID systems and their identification protocols has been analyzed for static configurations, that is, without considering incoming or outgoing tags, but just a fixed number of initially unidentified tags ,and also it has been measure in terms of throughput, average number of cycles or slots and average identification delay. However, many real scenarios cannot be consistently modeled in that way and also the metrics focused on “averages” do not answer key questions which we have to solve when we make a real RFID system planning. For instance, one of the most important issues to solve is to ensure the total, or at least a high percentage of identificactions in a RFID system. In this work we introduce a Markov model which allows us to study a dynamic RFID tag scenario, where a flow of tags (traffic) is considered. This model can be used to compute the Tag Loss Ratio, that is, the ratio of the outgoing unidentified tags to the incoming tags in the system, which is a critical metric in dynamic configurations. Besides, the analysis is carried out for two families of protocols used as medium access control in RFID: framed slotted Aloha and non-persistent CSMA.