RFID Model for Simulating Framed Slotted ALOHA Based Anti-Collision Protocol for Muti-Tag Identification

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1. Introduction

Radio Frequency Identification (RFID) networks use radio signal broadcast to automatically identify items with attached RFID tags. A tag consists of a microchip that stores a unique identifier and an antenna. The tag's antenna is attached to the chip and can transmit a unique tag identifier to a reader (also called interrogator). The reader is capable of learning the set of tags within its interrogation range. The process of learning in-range tags is called a census. After an initial census is completed, the reader can answer queries about the presence of specific tag(s) within its range sent to it from other type of devices.

RFID systems have abundant benefits as compared to the barcode and smart card systems. RFID networks use radio frequency as a method of data transmission. Thus, unlike barcode labels, a tag does not need to be placed in a line of sight position from the reader, or even get in contact with a reader as smart cards, in order to be identified successfully. Depending on whether they use low, high, or ultrahigh transmission frequencies, RFID tags are identifiable within 3 meters span in case of a typical far-field reader [Want06] or at even further distances. Therefore, RFID tags are used more flexibly and conveniently than existing barcode and smart card implementations.

Moreover, some commercial implementations of RFID tags can store data in the amount of 16 bytes - 64Kbytes [Finkenzeller03]. RFID tags can hold the same amount of data compared to smart cards, and much larger volume than barcodes. In addition, RFID tags are getting less expensive. The cost of RFID chips at the time of this study is less than 10 cents, while back in 1999, for example, was around 2 US dollars. Since tag readers have limits on their operations range imposed by the frequency of the wireless signal used, when RFID networks need to cover large spaces, multiple readers need to be used. The cost of current reader implementations is hundreds of US dollars. As a result, RFID networks may not be yet suitable to track large inventories of inexpensive items, but they are certainly becoming more affordable and can be used to track different types of items, e.g. live stock, pets, and valuable goods. Due to these advantages RFID systems are emerging as one of the alternative technologies of our time.