

Priority-based Random Access and Resource Allocation Scheme in HiperLAN Type2

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Abstract

We propose schemes that provide effective access control and resource allocation based on service priority for HiperLAN type2 systems. The proposed Distributed Priority-controlled Access (DPA) and Centralized Priority-controlled Access (CPA) schemes provide priority services by control of distributed MTs and the centralized AP, respectively. The analysis and simulation results show that the two schemes support priority services with respect to delay and throughput. The proposed schemes are easily applicable to the conventional HiperLAN/2 standard or other systems requiring priority services together with access control and resource management.

1. INTRODUCTION

As the use of Wireless Local Area Network (WLAN) is increasing and its users want the wide range of data applications, there is a need for supporting multiple priority levels and Quality of Service (QoS) in the WLANs [1]-[3]. The major technologies for WLAN are, currently, IEEE 802.11 and ETSI HiperLAN type2. Regarding the IEEE 802.11 system, many proposals for priority services have been suggested by modifying two kinds of access method: Distributed Coordination Function (DCF) and Point Coordination Function (PCF) [2], [3]. However, there is no specific proposal to support priority services in the HiperLAN/2 system [4], [5]. Therefore, in this paper, we focus on a method that supports priority services in HiperLAN/2.

The medium access control (MAC) protocol of HiperLAN/2 is based on a dynamic TDMA/TDD and controls the random access of a Mobile Terminal (MT). The basic MAC frame structure is shown in Fig. 1. When an access request is needed to send uplink data, the MT uses a random channel (RCH). The RCH range that the MT can access is determined by a contention window maintained by each MT. The size of the contention window increases exponentially whenever random access fails, and so the MT can select an RCH within a larger range every retransmission [4]. In this way, the MAC of HiperLAN/2 performs the access control for MTs. However, it does not provide resources management (i.e., the control of the number of RCHs assigned in a frame) in addition to priority services. Thus, an adaptive random access and resource allocation scheme [5] was proposed in the HiperLAN/2 system. This scheme presents an effective algorithm

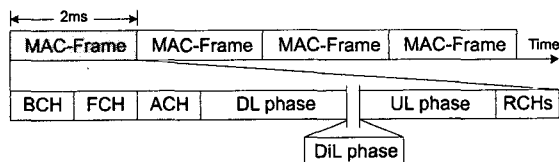


Fig. 1. MAC frame structure of HiperLAN/2.

that controls MT access by broadcasting the access probability instead of employing the HiperLAN/2 standard's contention window method and dynamically adjusts the number of RCHs every frame, according to the current traffic load. However, it still does not support various priority levels for multimedia services.

In TDMA-based wireless systems, various proposals for priority services have been presented [6]-[9], which offer the priority services by differentiating either the access control or the resource management. However, if both differential access control and resource management are applied, more effective priority services can be achieved while guaranteeing quality-of-service (QoS) in various network environments. Therefore, we propose random access and resource allocation schemes that support priority services and QoS in the HiperLAN/2 system.

This paper is organized as follows. In Section II, the proposed priority-based random access and resource allocation schemes are explained in detail. In Section III, the system performances of the proposed schemes are analyzed, and numerical results as well as simulation results are provided