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ADAPTATION OF HCCA/EDCA RATIO IN IEEE 802.11E FOR IMPROVED SYSTEM PERFORMANCE

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Abstract. *To reduce the average delay and to improve the overall system throughput in IEEE 802.11e environment, a novel scheme for the adaptation of the ratio of HCCA and EDCA periods is developed and presented in this paper. The fundamental idea is to choose favorable transfer modes for traffics with different characteristics. The ratio of HCCA and EDCA periods can be dynamically adjusted by changing the CAPLimit value, which specifies the maximal permissible duration for HCCA. A two-phase algorithm is designed to adaptively adjust the CAPLimit value based on measured system dynamics. In Phase 1, coarse-grain adjustment was made to the CAPLimit value according to the measured ratio of CBR-prone traffics and VBR-prone traffics. In Phase 2, the CAPLimit value is subject to fine-tuning based on observed system throughput. Simulation results reveal that the proposed scheme can effectively reduce the average delay and, in the same time, is capable of maintaining or even improving the total throughput.*
Keywords: 802.11e, HCCA, EDCA, CBR, VBR

1. **Introduction.** Motivated by the desire for freedom, wireless computer networks have been studied for decades. However, Wireless Local Area Network (WLAN) was not widely deployed until recent years. The IEEE 802.11 [1] standard has been the major driving force for the maturity and pervasiveness of WLAN today. However, despite of its success, due to the unreliable nature of the wireless communication channels, IEEE 802.11 WLAN still bears some inherent limitations, such as low bandwidth and high packet loss rate.

Numerous studies had been made to improve the efficiency of WLAN [2,3]. Among other issues, Quality of Service (QoS) had received much attention for the emerging of multimedia applications. This kind of applications is more demanding in its Quality of Service (QoS) requirements, such as low delay, constant bandwidth and so forth. In response to the increasing popularity of multimedia applications, IEEE 802.11e [4] was released to support QoS management in IEEE 802.11 WLAN. With 802.11e, traffics are classified into different classes according to their QoS requirements. Access Point (AP) is supposed to offer different quality of services to traffics of different classes.

Aiming at more elaborated QoS management, under the frameworks of IEEE 802.11 and 802.11e, numerous attempts had been made. A large number of them devote to the dynamic assignment of Inter-Frame Spacing (IFS) or Contention Window (CW) for the differentiation of connections with different priorities. Representative works related to this study will be briefly reviewed in the next section.