Chapter 4

Conclusion

IEEE 802.11 is the most prevalent standard for the wireless technology. It contains two schemes for medium contention: *Point Coordination Function (PCF)* and *Distributed Coordination Function (DCF)*. PCF is a centralized scheme and the central controller is called the *Point Coodinator (PC)*. A user is only allowed to transmit when being polled by PC. Contrary to PCF, DCF is a distributed method in which all users independently compete for the channel. The synonym for the DCF algorithm is *Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)*. Despite the success of IEEE 802.11, it does not guarantee any *quality of service (QoS)*. All stations have equal opportunity in gaining the channel.

In order to complement the deficiency of IEEE 802.11, IEEE 802.11e was established. Similar to 802.11, two modes of operations are provided in 802.11e: the centralized one is called *HCF Controlled Channel Access (HCCA)*, while the distributed one is *Enhanced Distributed Channel Access (EDCA)*. The basic operations are the same as 802.11. The difference is that 802.11e classifies various traffic into four different *Access Categories (ACs)*. In $EDCA$, each AC has its own *EDCA parameter set* including $AIFS$, $CWmin$, $CWmax$, and $TXOPlimit$, which decides the transmission priority between the four ACs.

Two algorithms are devised in the thesis. The first one aims to improve the PCF scheduling algorithm in IEEE 802.11. A station could only proceed transmission while

being polled by PC. So the polling sequence is definitely a critical factor on the system performance and the perceived QoS of each user. However, no explicit scheduling method is defined in the 802.11 standard. Only the *Round Robin (RR)* is suggested in the document. RR will cause the unfairness since the length of every packet is different. Besides, it does not consider the various QoS requirement of diverse applications. To conquer these problems, the *Modified Weighted Fair Queueing (MWFQ)* is proposed. Based on the famous wired scheduling algorithm, *Weighted Fair Queueing (WFQ)*, $MWFQ$ considers some traffic parameters including the data rate and packet size. It could allocate the bandwidth according to the pre-determined weight of each traffic flow. Inaddition, all mobile users supporting $MWFQ$ should monitor its radio condition. Once the condition is too poor, the station will give up its transmission opportunity even when being polled. The scheme would improve the medium utilization. According to the simulation results, the proposed $MWFQ$ could have outstanding performance than RR.

The other algorithm emphasizes on the IEEE 802.11e EDCA. Since most of the wireless gadgets lack long-term electricity supply, energy is definitely a precious resource. EDCA would confront serious performance deterioration when the traffic load is getting high. The reason is because EDCA is distributed, and a lot of collisions will happen when the load is heavy. Collision will in turn produce longer packet delay and more retransmission, which also wastes the energy consumption. *Enhanced Distributed Channel Access with Contention Adaption (EDCA/CA)* is proposed in the work. The basic idea of the method is to suspend some transmission attempts when the load is intense. So the load could be lessened and the successful transmission rate could be higher. The energy could be reduced as well since the collision opportunity is getting lower in the scheme. According to the experiments, the delay and energy consumption could significantly be reduced if the $EDCA/CA$ were adopted.