UNIVERSITI TEKNOLOGI MARA

A QoS GUARANTEED LINK ADAPTATION PACKET TRANSMISSION IN IEEE 802.11ac WLAN

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Presently, the internet, as well as the multitude of popular social media platforms, various mobile apps, and other digital communication technologies have become an essential routine for billions of people around the world. The rising demand for digital communication technologies has contributed to the increase in traffic intensity which in turn, has led to a congested network. As a result, the QoS performances of the wireless network has degraded. Consequently, the demand for techniques to improve the QoS performance is increasing. Many techniques have been proposed by researchers to overcome these problems and one of the approaches is the link adaptation technique. Most of the recent studies that proposed the link adaptation technique focus on cellular networks such as LTE, 4G, and 5G, and not many works of link adaptation approaches give much attention to WLAN. In this research, the link adaptation technique for the IEEE 802.11ac WLAN is developed to improve the throughput while controlling the performance of the delay. The proposed algorithm is executed at the Physical layer, specifically at the network interface configuration. This study, therefore, is implemented in IEEE 802.11ac WLAN standard to be parallel with the present high throughput trend as compared with the previous WLAN standards. The proposed technique will adaptively change the transmission data rate by increasing or decreasing the MCS level according to the traffic conditions. The main objective of the proposed method is to improve the QoS performance which are throughput and delay. In addition, the traffic conditions are represented by the queue length and delay which act as Channel State Information (CSI). For low traffic load, the transmission data rate is decreased to one step lower than the existing MCS level. For as long as the delay value is less than the threshold, the transmission data rate is kept on decrease. However, whenever the delay value exceeds the threshold level, which is set as 2ms, the transmission data rate will remain at that level. In contrast, for a high traffic load, the transmission data rate is increased to one step higher than the existing MCS. By adapting to a higher MCS level, the throughput is increased while maintaining the delay below the threshold level. The proposed algorithm is simulated and analysed in the OMNeT++ simulator. To verify the effectiveness of the proposed algorithm in terms of QoS, simulation results were compared with the existing WLAN standard which is the IEEE 802.11g WLAN and the default condition. Simulation results showed that the throughput of IEEE 802.11ac WLAN with link adaptation approach achieved 7.82% and 36.48% of improvement compared to the IEEE 802.11g WLAN and the default condition. By adapting the transmission data rate based on the traffic channel conditions, the throughput and delay performances can be improved. For an ideal channel condition, no fading occurred, thus, lowering the transmission data rate to combat the varying channel condition is not an issue. This indicates that transmission at a higher data rate will give an advantage in terms of the throughput. It can be concluded that the link adaptation technique will be able to successfully improve the QoS performance in WLAN especially in terms of throughput and delay even during high traffic load.

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