Personal Instroction:

I am Yu Yang from China. I graduated from the University of Electronic Science and Technology of China in July 2020 with my bachelor's degree. I am a 1st year PhD student in the School of Electrical and Electronic Engineering of Technological University Dublin under the supervision of Prof. Mark Davis.

Research Topic:

A Machine Learning based Methodology for Dynamic QoS Management

The Challenge of the Research:

IEEE 802.11ax introduces a new mechanism into the Physical Layer which is called Orthogonal Frequency Division Multiple Access (OFDMA). OFDMA allows users to transmit data in parallel. Under the OFDMA mechanism, the channel resources are divided into Resource Units (RUs).

To improve the QoS(Quality of Service) in IEEE 802.11ax, the most important thing is to avoid packet loss through Buffer Overflow. There are many factors that can increase the occupancy of buffer and hence lead to buffer overflow, such as packet size, the rate of the packet arrives at buffer, the number of users in the network and traffic type. To avoid buffer overflow, it's necessary to increase buffer's size or increase the channel access rate (the rate of the packet leaves the buffer) so that the buffer occupancy can be decreased. Unfortunately, it's difficult to measure the buffer occupancy, which doesn't give the administrator of the network enough information to define the buffer size . However, in IEEE 802.11ax, the network system can control the channel access rate by allocate Resource Units, and if the average channel access rate is greater than the average rate of packet arrives at buffer, the probability of buffer overflow will be decreased a lot. Besides, in IEEE 802.11ax, the most relevant factor towards the channel access rate is the number of Resource Units for a user. The more Resource Units for a user, the higher channel access rate for the user. Thus, to manage the buffer occupancy to avoid buffer overflow, it's necessary to develop an algorithm to manage the allocation of Resource Units.
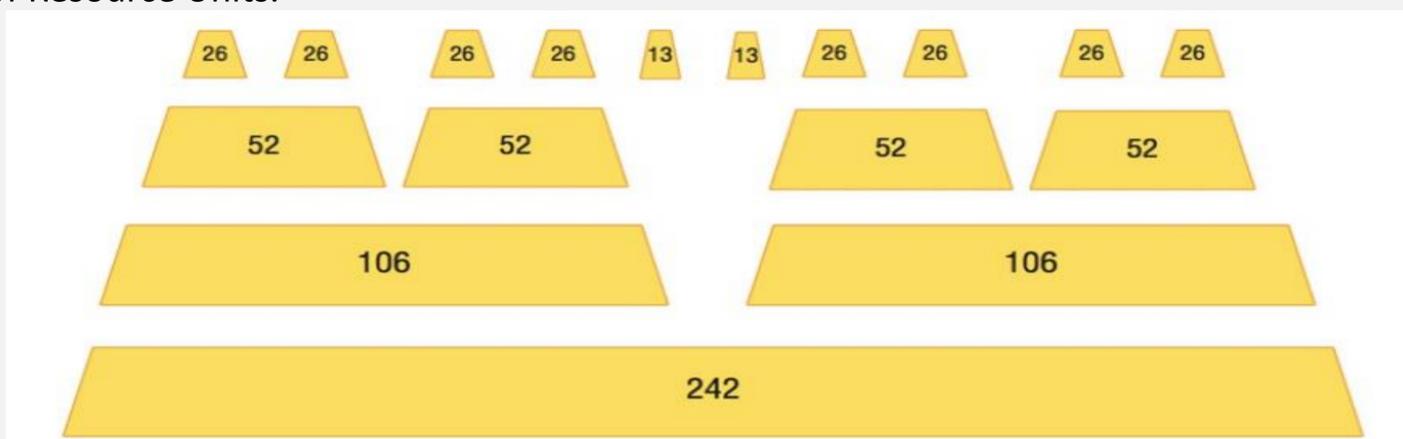
The way to allocate resource units

In IEEE 802.11ax standard, there are several ways to allocate the Resource Units to the users in the wireless network, such as allocating almost all the Resource Units to one user, or allocating Resource Units equally to multiple users. However, there is no algorithm to give the network a way to allocate Resource Units to users efficiently and fairly according to their requirements and resource availability. According the existing technology, perhaps Machine Learning algorithm is a good solution for this problem, because it can make decisions based on real-time input data.

Thus, my research topic is A Machine Learning based Methodology for Dynamic QoS Management.