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An Overview of Real-Time Traffic through IEEE 802.11ah Wireless LAN with Quality of Service Support.

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Abstract: In recent years, Wireless local area network (WLAN) growing rapidly for data communication. IEEE 802.11 has emerged as the de facto standard for WLAN. There is increasing interest for Real time traffic e.g. Voice, Video, Multimedia over wireless LANs because of its low cost. QoS support for real-time services like voice in the IEEE 802.11 WLAN is an important issue. Since IEEE 802.11 uses contention based MAC protocol – the distributed coordination function DCF, it is difficult to support the strict QoS requirements for real-time service in these networks. In this paper we propose a practical scheme to achieve this goal without changing the basic channel access mechanism of IEEE 802.11. In this end, one Fair and Dynamic channel grouping scheme is proposed to improve the Quality of Service. Agglomerative Hierarchical Clustering for station grouping is proposed where fairness and throughput are used as matrix for distance measure and level selection. Neural Network is can be used to estimate Level throughout form group clusters.

Key Words: IEEE 802.11, Wireless Local Area Networks (WLAN), Restricted Access Window (RAW) (Quality of Service (QoS),

1. INTRODUCTION

Three of the most exciting and fastest-growing Internet technologies in recent years are the World Wide Web, multimedia streaming, and wireless networks. The Web has made the Internet available to the masses, through its TCP/IP protocol stack and the principle of layering:. Multimedia streaming provides desktop access to real-time and on-demand audio and video applications for educational and entertainment purposes at home, office, and school. Wireless technologies have also revolutionized .The way people think about networks, by offering users freedom from the constraints of physical wires. In recent years the mobile Internet has gained popularity and the IEEE 802.11 [1] WLAN have become widely accepted standard because of simple deployment and low cost

The Internet of Things (IoT) is the concept of connecting devices to the internet and to other connected devices, which have the ability to transfer data without the help of any human intervention. There are many areas where IoT plays a crucial role, some of which being Human Heart Rate Monitoring, Smart Meters for Utilities such as Electricity and Water, Remote control for home appliances, Vehicular Communication's, etc,. According to a recent survey [1], it is estimated that IoT will expand to 75 billion connected devices by 2025.

Supporting IoT in cellular networks is a whopping task. Therefore, individuals tend to take advantage of a less expensive unauthorized band like WLANs (Wireless LANs), to meet the traffic requirements of IoT communications. In any case, the standard IEEE 802.11 was intended for small scale networks like WLAN in a workplace or housing with portable devices like smart phones, laptops, tablets, etc.

2. Overview

A number of different methods have been proposed to support prioritized transmission of traffic. The proposed prioritized MAC scheme modifies the current standard for WLAN, thereby allowing real time control traffic to co-exist with the multimedia and batch traffic. Some researchers have used two queues in the ad-hoc mode of the WLAN network interface card (NIC), and a complicated scheduling algorithm based on the earliest deadline first (EDF) has been implemented for RT packets.

An analytical model was built by authors to derive an average delay estimate for the traffic of different priorities in the unsaturated 802.11e WLAN, showing that the QoS requirements of the real-time traffic can be satisfied if the input traffic is properly regulated. The key idea used is when accepting a new real-time flow, the admission control algorithm considers its effect on the channel utilization and the delay experienced by existing real-time flows, ensuring that the channel is not overloaded and the delay requirements are not 106 violated. At the same time, the rate control algorithm allows the best effort traffic to fully use the residual bandwidth left by the real-time traffic, thereby achieving high channel utilization. In the above papers, many systems are developed for improving QoS. But the system can further be improved. To confirm the real world, one can use variable bit rate video traffic model. The EDCA scheme can support prioritized QoS; however, it cannot guarantee strict QoS required by real-time services such as voice and video without proper network control mechanisms. Hence there is a need to find a scheme that can easily improve the QoS of real time services using combination of conventional scheduling algorithms.

Every year, an increasing number of Internet of Things devices are released. These devices can make our lives easier, but they also make our data, and potentially us, more vulnerable to hackers. The question is no longer theoretical,

as many of these devices can have a real impact on the world around them, like a networked sprinkler system that, if hacked, could flood a target's basement. Going forward, we can look to the current law of product liability and the Federal Trade Commission to protect individuals from harm and loss when these devices might be compromised.

Minimizing the energy consumption is one of the main challenges in internet of things (IoT) networks. Recently, the IEEE 802.11ah standard has been released as a new low-power Wi-Fi solution. It has several features, such as restricted access window (RAW) and target wake time (TWT), that promise to improve energy consumption. Specifically, in this article we study how to reduce the energy consumption thanks to RAW and TWT.

In order to do this, we first present an analytical model that calculates the average energy consumption during a RAW slot. We compare these results to the IEEE 802.11ah simulator that we have extended for this scope with an energy life-cycle model for RAW and TWT. Then we study the energy consumption under different conditions using RAW. Finally, we evaluate the energy consumption using TWT. In the results, we show that the presented model has a maximum deviation from the simulations of 10% in case of capture effect (CE) and 7% without it. RAW always performs better than carrier-sense multiple access with collision avoidance (CSMA/CA) when the traffic is higher and the usage of more slots has showed to have better energy efficiency, of up to the 76%, although also significantly increasing the latency. We will show how TWT outperforms pure RAW, by over 100%, when the transmission time is over 5 min.

3. Proposed Methodology

IEEE 802.11ah doesn't specify any information about how the grouping should be done, it is left for the users to choose among static, uniform and random grouping schemes. Uniform grouping refers to the grouping in which stations are divided uniformly among all the groups and slots whereas random grouping refers to the allocation of stations to groups and slots without any particular order or restriction. There have been many works in the literature focusing on station grouping algorithms for prediction of the RAW parameters and station grouping based on current network conditions such as number of active stations, traffic demand of the stations, and station location. These algorithms mainly differed in the optimization objective (such as throughput, energy, mitigating hidden nodes.

So, proposing one Fair and Dynamic channel grouping scheme to improve the Quality of Service. Agglomerative Hierarchical Clustering for station grouping is proposed where fairness and throughput are used as matrix for distance measure and level selection. Neural Network is can be used to estimate Level throughout form group clusters.

4. Conclusion

In this paper we proposed a simple and effective fair & dynamic channel grouping scheme to support QoS for real-time traffic in the IEEE 802.11ah wireless LANs. Making the novel use of agglomerative clustering, the proposed scheme enables the wireless network be operated at the optimal point thereby, guaranteeing the strict QoS requirements of the real-time flows at the same time achieve the maximum possible channel utilization.

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