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Delay Analysis of Traffic Dependent MICF for Voice Traffic in WLAN

Vandana Choudhary[#1], Mrs. Neha Gautam Nagpal[*2]

[#1]*M.Tech., Student, Deptt. of CSE, Surendra Group of Institutions, Sri Ganganagar, Rajasthan, INDIA*

[*2]*Assistant Professor, Deptt. of CSE, Surendra Group of Institutions, Sri Ganganagar, Rajasthan, INDIA*

ABSTRACT

In the origin, IEEE 802.11 was composed to support just data applications and did not recognise more about the quality of service (QoS) assures for throughput-sensitive and delay-sensitive multimedia applications. A WLAN is one which makes use of a wireless transmission medium, Ad- hoc networking, and the coverage of positions hard to use wire. The MAC sublayer combines two different fundamental access methods. First one is known as Distributed Coordination Function which applies Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) approach. Another one is the Point Coordination Function which is based on the polling to decide station that can send next and give contention-free services. To enhance the quality of the DCF and PCF multiple researchers performed a lot of work. They contributed to improving in different Quality of Services factors. In this paper, the delay analysis is performed. Multi-Packet MICF technique supports the sufficient number of calls. But it has some drawbacks. New scheme Traffic Dependent MICF is proposed. The results are better than the previous Multi-Packet MICF technique.

Keywords—**Traffic dependent MICF, MICF, WLAN, PCF, DCF.**

I. INTRODUCTION

Nowadays, Wireless Local Area Network (WLAN) is a dominant choice in multiple sectors like business, education, and government, public and individual. The achievement of WLAN technology is based on utilising the free ISM band at 2.4GHz and also the 5GHz band. Wireless local area networks (WLANs) are same as the conventional LAN but they have a various wireless interface, so they are giving the location-independent network access. With the use of radio waves, it allows a local network of computers to exchange information or data. A wired LAN replaced by it. Now wireless LANs has occupied a pregnant section in the local area network market. Various organisations have found that wireless LANs have the substantive attachment to traditional wired LANs. WLAN fulfilled the various demands of users for mobility, relocation, ad hoc networking, and coverage of locations that were not provided in a wired network.

Voice over Internet Protocol (VoIP) is today's one of the quickest developing Internet applications. The use of traditional PSTN system is diminishing day by day. It has numerous advantages in comparison with voice over traditional telephone networks [1]. VoIP over WLAN becomes a new Internet application [2]. WLAN gives the

connections to IP networks and several VoIP applications are running over IP networks. So these two different technologies are merged together and become VoIP over WLANs (VoWLAN) [3]. VoIP is the technique to send voice traffic in the form of packets over IP-based networks. It is also called the Internet Telephony, IP Telephony, etc. [4].

Wireless LAN is the organisation of LAN in which wireless components are utilised. Without wire, the wireless network permit nodes to talk with each other. WLAN is of two types [3], [19] -Infrastructure less mode or Ad hoc or peer to peer (P2P) network and Infrastructure mode.

A wireless Ethernet is also called as the IEEE 802.11 WLAN network. WLAN is played an important function by it. IEEE 802.11 has two different layers – Physical Layer and Data Link Layer.

Medium Access Control (MAC) sub-layer has two several functions like Distributed Coordination Function (DCF) and Point Coordination Function (PCF) [3]. The contention-based DCF and contention-free PCF functions are supported by the IEEE 802.11 WLAN. PCF uses the centralized polling system which needs AP as access coordinator when the DCF need no such node. The DCF mode is based on the random access of channel that is suitable for non real-time traffic or busy traffic when PCF mode is based on the polling mechanism that is suitable for real-time traffic [5].

The time interval between the continuous frames is known as the interframe space (IFS) [6]. The various IFSs shall not be subordinate on the STA bit rate. The IFS timings will be determined as time gaps on the medium. The various IFSs are - Short Inter Frame Space SIFS, PCF Inter Frame Space PIFS, DCF Inter Frame Space DIFS and Extended Inter Frame Space EIFS.

Quality of service (QoS) is determined as the network ability to provide good services which satisfy the maximum number of users [3]. In other words, QoS estimates the degree of user satisfaction. High QoS shows that the users are satisfied with the services. QoS has become a significant issue when sending voice packets on WLAN because real-time and unlike non-real-time applications are too sensitive to delay. So QoS of VoIP is an importing concern to ensure that voice packets are not delayed, missed or lost during the transmission over the network [3]. There are various parameters on that basis the VoIP quality of service is measured like delay, jitter, packet loss, throughput and echo [7] [8]. VoIP QoS can be changed by controlling the contents of these parameters to be within the tolerable range.

This research paper has the five sections. Section I is Introduction, which presents the basics of WLAN. Section II is Literature Survey, which gives the previous research work given by different researchers. Section III is Proposed Work, which demonstrate new proposed algorithm. Section IV is Experimental Results and Analysis, which presents the results of the experiments and their analysis. Section V is Conclusion and Future Work, which presents the conclusion of the research work along with the future work.

II. LITERATURE SURVEY

WLAN standard IEEE 802.11 usage two different modes of operation – DCF and PCF. The DCF and PCF both coexist in such a manner that both operate together. DCF is not fit for the real-time services like voice services.

The disadvantage of the basic PCF mode is that it has a limited number of concurrent VoIP calls. There are a lot of algorithms given by different authors which improve the call capacity.

In [1], the authors proposed the Point Coordination Function (PCF) with Signalling Scheme. In [9], the authors proposed M-PCF. Real-time stations access the channel in the round-robin manner in the PCF mode. In the proposed M-PCF, stations locate channel in a hub-poll manner. In [10], the authors proposed Dynamic PCF. The Dynamic PCF (DPCF) and Modified DPCF (DPCF2) [10] were purposed to improve the PCF which resolved the problem of the PCF scheme with regards to VoIP.

In order to overcome the under-utilization problem of bandwidth, the concept of Modified PCF [11] was purposed which uses a distributed polling protocol (DPP) strategy for supporting the real-time traffic rather than the centralized polling scheme. In [12], the new contention-based channel access mechanism is proposed, known as enhanced distributed coordination function (EDCF). In [13], the authors purposed Bidirectional PCF (BD PCF). It is an upgraded version which has the bidirectional transmissions and low-complexity mechanism that permits the admitted stations to store the energy during the polling process. In [14], the authors introduced the ICF. ICF gives a dynamic time division multiple access (TDMA)-like service for sending of voice packets efficiently.

In [5], the authors introduced MICF. In the Isochronous Coordination Function, the downlink packets are transmitted using the same method as the one used for uplink packets. To come over from the drawbacks of Modified ICF, 2-Buffered Packet ICF [15] and 3 - Buffered Packet ICF [16] is introduced by the authors, which reduces the delay in WLAN. In that scheme, the TDMA like time slots are utilised for the voice packet transmission. Multi-Packet MICF [17]. It is also TDMA like service which is utilised for the voice packet transmission with a various number of packets at the uplink and downlink side. Authors suggested the new method Enhance DCF [18] for intensifying the MAC performance of DCF in IEEE 802.11 wireless LANs.

III. PROPOSED WORK

To enhance the Multi Packet MICF, a new scheme is introduced that is Traffic Dependent MICF. In this scheme the time slots are utilised for the voice packet transmission with various number of packets according to the traffic of the network.

In the Traffic Dependent MICF scheme, each station and AP has the buffer memory. Packets are stored in the buffer and in ready state. When the Packets in buffer are more than three packets or three packets then, the three packets are transmitted at a time. The station transmits the buffered packet to the AP. Three packets are transmitted to AP. When the number of packet is less than three packets, then packets are transmitted one by one. The key point is that the packets are stored in the buffer. As per the above rule, the packets are transmitted to the AP.

At the downlink stream, the packets are sent to the particular destination station by the AP in the same manner as discussed above. Advantage of this technique is that now the stations have not to wait for a long time when the packet traffic is high.

In this scheme, there is no multiplexing or demultiplexing is performed. Also no extra part is added or removed from the existing packet. The packets are buffered and transmitted according to the scheme.

IV. EXPERIMENTAL RESULTS AND ANALYSIS

For the proposed algorithm simulation environment was modelled using network parameters for the 75 nodes in network. The node could move randomly. Uplink and downlink both types of traffic included in the simulation. Each node may have uplink or downlink data.

The Traffic Dependent MICF implemented for the 16 ms, 17 ms and 18 ms CFP values. The obtained results are as following-

A. *CFP = 16ms*

For CFP = 16 ms, there are 38 time slots for the packets. The delay includes both the uplink and downlink delay. Fig. 1 shows the delay graph between the number of stations and the delay. The delay varies from the 0.1609 ms to 0.4022 ms. Nodes are moving randomly in the simulation area.

B. *CFP = 17ms*

For CFP = 17 ms, there are 41 time slots for the packets. The delay includes both the uplink and downlink delay. Fig. 2 shows the delay graph between the number of stations and the delay. The delay varies from the 0.2413 ms to 0.4022 ms. Nodes are moving randomly in the simulation area.

C. *CFP = 18ms*

For CFP = 18 ms, there are 44 time slots for the packets. The delay includes both the uplink and downlink delay. Fig. 3 shows the delay graph between the number of stations and the delay. The delay varies from the 0.2011 ms to 0.4022 ms. Nodes are moving randomly in the simulation area.

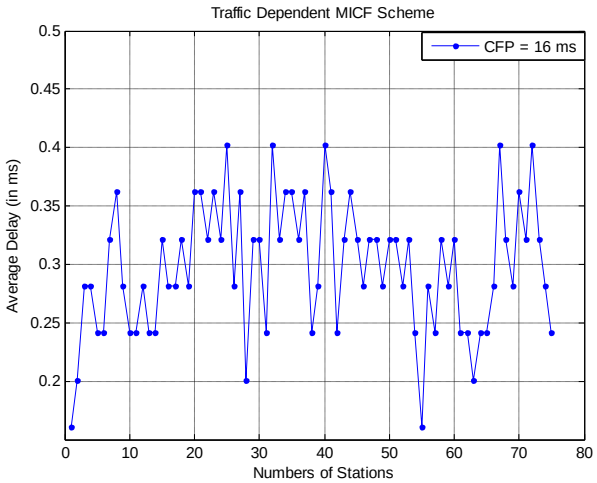

Fig. 1 Delay Graph at CFP=16 ms

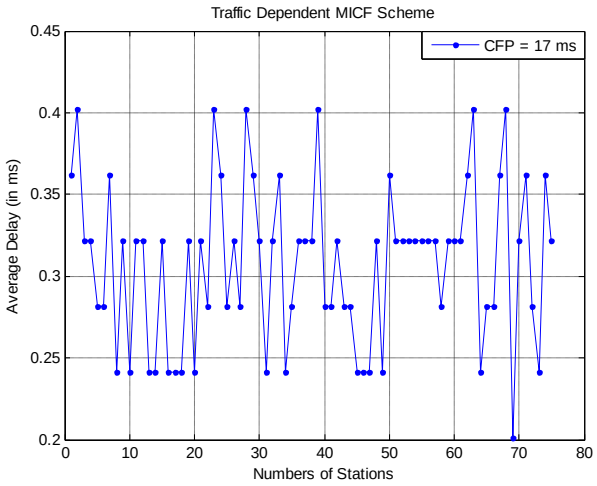

Fig. 2 Delay Graph at CFP=17 ms

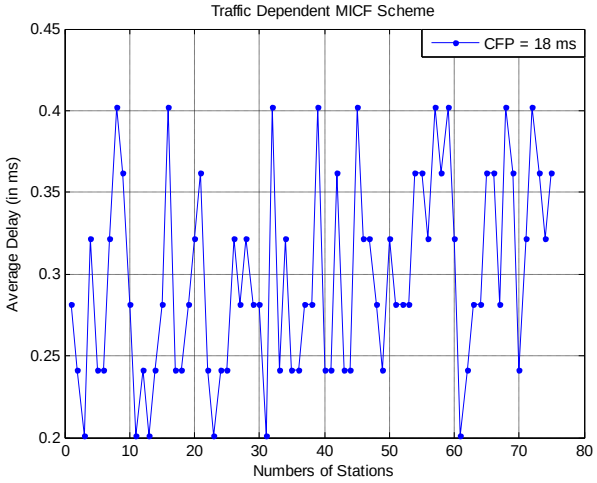

Fig. 3 Delay Graph at CFP=18 ms

The proposed scheme gives the better results than the Multi Packet MICF scheme. Multi Packet MICF support 60 stations [17] while the proposed Traffic Dependent MICF support 75 stations at CFP = 18 ms.

V. CONCLUSION AND FUTURE WORK

WLAN made a great revolution in the field of network over the past few years. It made the user stationary to mobile. In this research work Traffic Dependent MICF is proposed to improve the call capacity of WLAN. Among the various QoS factors, the delay factor is taken in this work and work performed to reduce the delay. The Traffic Dependent MICF supports more stations than the Multi packet MICF with very less delay. The Traffic Dependent MICF is better than the Multiple Packet MICF. The hidden terminal problem is not considered. In Traffic Dependent MICF the delay for the buffer is not considered. These are some of the limitations which can be improved

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