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Fundamentals of Wireless LAN Design by Using Improved Dynamic Load Balancing Algorithm

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Abstract: The advent of the portable computing devices have raised the importance of mobiles and wireless networking in the recent years, which creates congestion and data loss of packets in the WLAN. Hence we would research to improve the overall performance of the network. In this thesis, we propose a new technique in DLBA by varying certain parameters like Acknowledgement time of the network. Also, routing protocols like LEACH, SEP, TEEN and EAMMH are implemented. Performance metrics Throughput, PDR, Energy and Delay are also calculated. Simulation results prove a significant improvement in performance metrics.

Keywords: WLAN, DLBA, PDR, LEACH, TEEN, Throughput, Average Energy Consumption.

I. INTRODUCTION

The arrival of ubiquitous computing and the proliferation of portable computing gadgets have raised the significance of mobile and wi-fi networking. A mobile WLAN community is a self-sustaining series of cell nodes forming a dynamic community and speaking over wi-fi links.[1] WLAN verbal exchange concept lets in users to communicate with every different in a multi-hop fashion without any constant infrastructure and centralized administration. Because of their capability of coping with node failures and rapid topology changes, such networks are wished in conditions where transient network connectivity is required, such as in congestion disaster regions, and big assembly locations.[2][3][4] Such networks provide mobile users with ubiquitous conversation capability and statistics get entry to irrespective of area. TCP has received its vicinity because the most famous transmission protocol because of its extensive compatibility to nearly all now a days applications. however, TCP as it exists in recent times may not properly match in cell WLAN networks since it become designed for cord-line networks where the channel Bit blunders rate (BER) is very low and network congestion is the number one cause of packet loss. at the opposite of stressed out hyperlinks, wi-fi radio channels are tormented by many factors which can result in specific levels of BER.[6][7] wireless channel conduct can't be predictable, but in many cases, such channels are having a excessive BER that cannot be neglected whilst analyzing WLAN networks. furthermore, node’s mobility can also have an effect on TCP classes in WLAN networks, which is obviously now not the case of wired networks. indeed, while nodes flow, link can be damaged and TCP sessions using that hyperlinks can lose packets. subsequently, TCP does now not have the capability to understand whether or not the packet loss is because of network congestion or channel mistakes.[9]

II. DLBA IN WLAN

Within the previous couple of years, many researchers have studied TCP overall performance in terms of energy intake and common suitable positioned inside wi-fi mobile networks [2][3][4]. because of the particular issues related to wireless WLAN networks, it is anticipated that the performance of TCP might be affected notably in these environments. In wi-fi WLAN networks, reasons for packet losses are more sophisticated than traditional wi-fi (cell) networks.[5] the ones motives consist of the unpredictable wireless channel characteristics because of fading and interference (implying a excessive BER), the susceptible shared media get right of entry to because of random get admission to collision, the hidden and exposed terminal issues, direction asymmetry, multi-path routing, and so on. undoubtedly, all of those pose first rate demanding situations on TCP to offer dependable cease-to-give up communications in such surroundings.[8] TCP is known as a full duplex convention meaning every TCP association gives a couple of byte streams in the two headings. TCP actualizes the blockage control instrument with each of these byte streams so the beneficiary can restrain the sender from transmitting more information in the system [5].

Despite the fact that TCP guarantees solid end-to-end message transmission over wired systems, various existing looks into have demonstrated that TCP execution can be significantly debased in versatile specially appointed system [10][11]. Alongside the customary troubles of remote condition, the portable impromptu system incorporates additionally difficulties to TCP. Specifically, challenges like course disappointments and system parceling are to be mulled over. Moreover, DLBA encounters a few sorts of postponements and misfortunes which may not be identified with blockages, however TCP considers these misfortunes as a clog flag.

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These non-clog misfortunes or postponements for the most part happen because of the failure of TCP's adjustment to such versatile system. Fitting considerations must be taken for evaluating such misfortunes and furthermore to recognize them from clog misfortunes with the goal that TCP can be touchy while summoning the blockage control instrument.

The next subsections will present an analysis of the different types of constraints influencing the WLAN performance in DLBA environment.

DLBA is a broadly utilized responsive (on-request) directing convention which is outlined especially for the versatile impromptu systems. DSR grants the system to keep running with no current system foundation and in this manner the system moves toward becoming as a self-composed and self-designed system. This convention keeps up an on-request approach and subsequently stifles the intermittent table-refresh messages required in the table-driven approach [12]. Subsequently, it can keep the control bundles from devouring much transfer speed. Like other on-request steering conventions, DSR does not give the transmission of any occasional hi parcel (guide), which is fundamental for advising its quality to different hubs. Rather, amid the course development stage, it sets up the course by flooding a Route Request bundle in the system. Each Route Request parcel holds a succession number which is produced by every one of the hubs through which the bundle is overwhelmed. By utilizing this arrangement number, circle development and numerous transmission of a similar Route Request is conceivable to be dodged. At the point when a Route Request bundle is come to its last goal, the goal hub sends a Route Reply parcel to the source hub through the inverse way the Route Request is voyage. Since, it can't be an effective system for the hubs to give consistent flooding; DSR uses the course reserves to store the directing data [12].

III. PROPOSED TECHNIQUE & RESULTS

The fundamental thought of TCP-Hybrid comes up from TCP sack and TCP Westwood. This calculation acts in the moderate begin stage as TCP sack precisely and in the clog shirking stage carries on as both with including another part called. In any case, amid the Congestion stage, we consequently alter the parameters. The congestion window size (CWND) increases by one since the difference of the expected rate and the actual rate is less than Alpha (a minimal threshold) until it reaches the middle threshold Gama. The reason of that adjustment is the expected throughput is still low as well as we save the bandwidth. Since the difference is less than Gama (a middle threshold) then CWND behaves as TCP with checking the bandwidth each time to know if the CWND increases or decreases with resetting both the slow start threshold (SSThresh) and the CWND. That continues until it reaches the highest threshold Beta which is (a maximum threshold) then CWND decreases or keeps constant since the expected throughput gets high.The scope of this section is to show the strength of our algorithm and the ability of efficient usage of Bandwidth. The extent of this segment is to demonstrate the quality of our calculation and the capacity of effective utilization of throughput.

This algorithm works as given below:

1. DLBA Transmitter Side is implemented using TCP model in MAC layer.
2. Enhancement is proposed by varying the ACK time in the model of MAC Layer.
3. Let Base RTT is the minimum of all RTTs; // RTT: Round Trip Time.
4. Expected Rate= CWND /Base RTT; //Base RTT: the minimum RTT .
5. Actual Rate= CWND/RTT; // to estimate the flow throughput
6. Diff = (Expected Rate – Actual Rate) BaseRTT; // Diff: the difference between the expected and actual rate
7. If (Diff <) then // : Alpha (Minimum threshold)
8. CWND+1
9. else
10. If (Diff=) then // is a new variable to estimate the congestion possibility (Gama)
11. {
12. Let ssthresh = (BWE*Base RTT)/ seg_size; /* BWE: the Bandwidth Estimation; Seg_size: the size of the segment*/
13. If (CWND >sthresh) then
14. CWND=ssthresh
15. else
16. If (the time out is expired) then
17. {
18. Let CWND=1;
19. ssthresh = (BWE*BaseRTT)/seg_size;
20. If (ssthresh<2) then
21. Ssthresh=2;
22. }

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23. }
24. else
25. If (Diff >β) then // β: Beta (Maximum threshold)
26. CWND-1;
27. Otherwise -> CWND;
28. }
29. Communication Protocols – LEACH, SEP, TEEN and EAMMH Implemented in these MAC Layered Rules
30. Data Packets Sent
31. Calculations of Throughput, PDR, Delay and Residual Energy
32. Receiver side is implemented for the WLAN MAC
33. End

Layered TCP Model

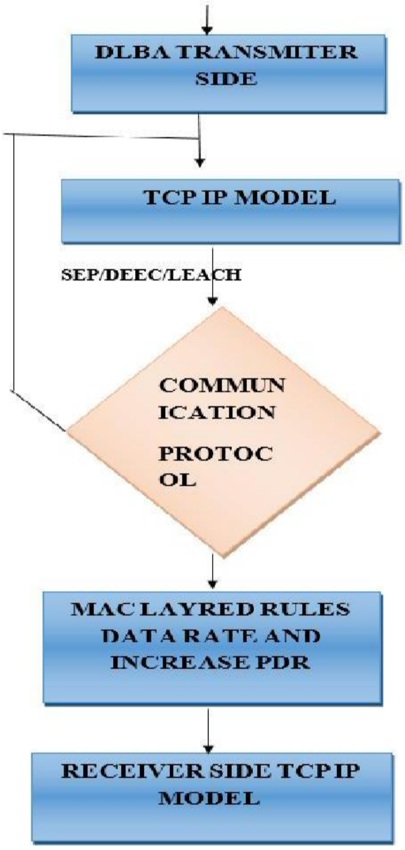

FIG 1 FLOW CHART

IV .SIMULATION RESULTS

For our work to be done successfully we have used DLBA scenario and enhanced DLBA with varying different routing protocols such as LEACH, SEP, TEEN, EAMMH. We have reached to the results with the help of various performance matrices for now we have used following performance matrices.

1. Packet Delivery Ratio
2. End to End Delay
3. Average Energy Consumption
4. Throughput

A detailed analysis of above mentioned matrices are as follows.

A. PACKET DELIVERY RATIO

This is the fraction of the data packets generated by the TCP sources to those delivered to the destination. This evaluates the ability of the protocol to discover routes.

Packet Delivery Ratio for various connections:-Figure 2 shows the PDR under various WLAN DLBA and EDLBA.

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Figure 2 Packet Delivery Ratio

Table 1: Packet Delivery Ratio Comparison

Base paper PDR	Implemented PDR
1.27	2.5

B. END to END DELAY

The end-to-end delay is the time needed to traverse from the source node to the destination node in a network. The end-to-end delay is measured in ms.The delay assesses the ability of the routing protocols in terms of use- efficiency of the network resources.

End to End Delay for various connections:-Figure 3 shows the end to end delay

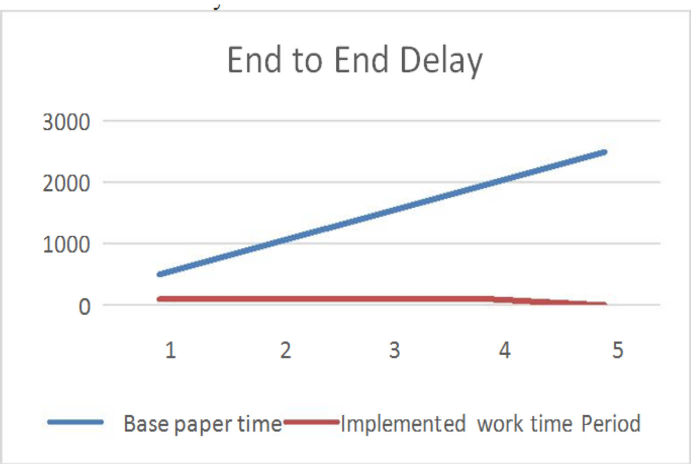

Figure 3 End to End Delay for various transmission connections

Table 2 End to End Delay Comparison

Base paper time	Implemented Work time Period
500	100
1000	98
1500	96
2000	94
2500	9

C. THROUGHPUT

The average rate at which the data packet is delivered successfully from one node to another over a communication network is known as throughput. The throughput is usually measured in bits per second (bits/sec). A throughput with a higher value is more often an absolute choice in every network.

Throughput for various connections:-Figure 4 shows the Throughput under various WLAN variants

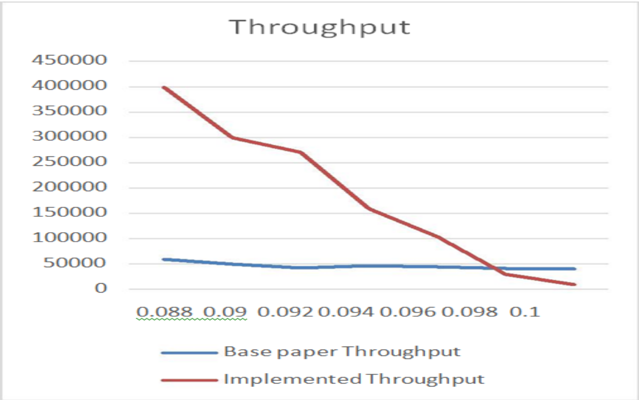

Figure 4 Throughput for various transmission connections

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Time	Base paper Throughput	Implemented Throughput
0.088	60000	400000
0.09	50000	300000
0.092	43000	271739.1
0.094	47000	159574.2
0.096	45000	104166.8
0.098	42000	30618.65
0.1	41000	10000

Table 3: Throughput Comparison

D. AVERAGE ENERGY CONSUMPTION

Total amount of energy used by the Nodes during the Communication or simulation for example node having 100 percent energy and after complete simulation 40 percent energy remaining so we can say that the Average Energy Consumption of the node is 60 percent.

Average Energy consumption for various connections:-

Figure 5 shows the Average Energy Consumption

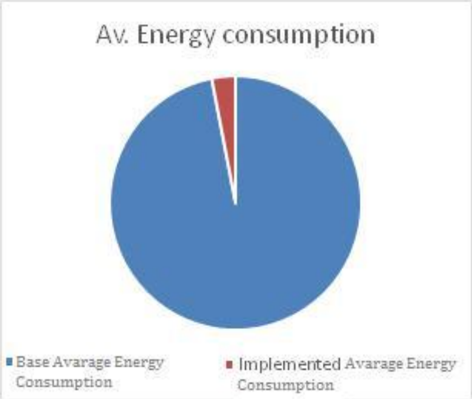

Figure 5 Average Energy consumption for various transmission connection

Table 4Average Energy Consumption Comparison

Base Average Energy consumption	**Implemented av. Energy consumption**
0.0032	0.0001

Comparative Analysis using routing protocols: Figure 6 , 7 and 8 represents routing protocols in EDLBA and DLBA.

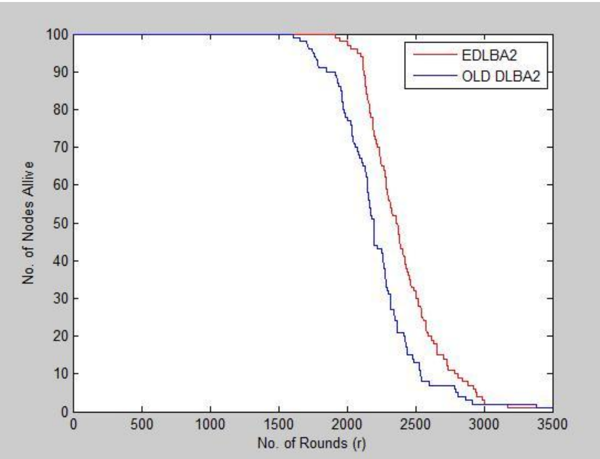

Figure 6 Comparatively graph for SEP and DLBA.

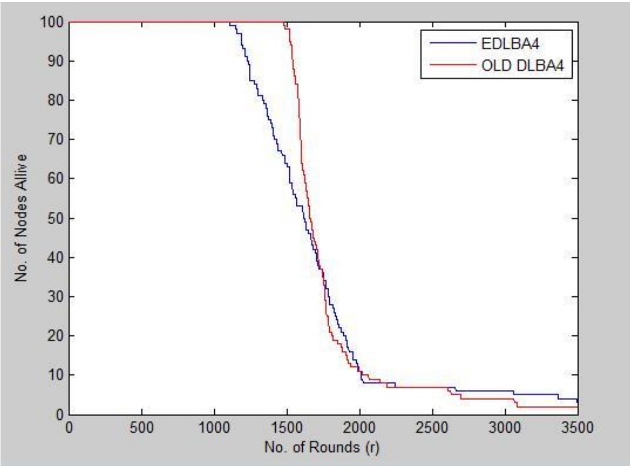

Figure 7 Comparatively graph for TEEN and DLBA.

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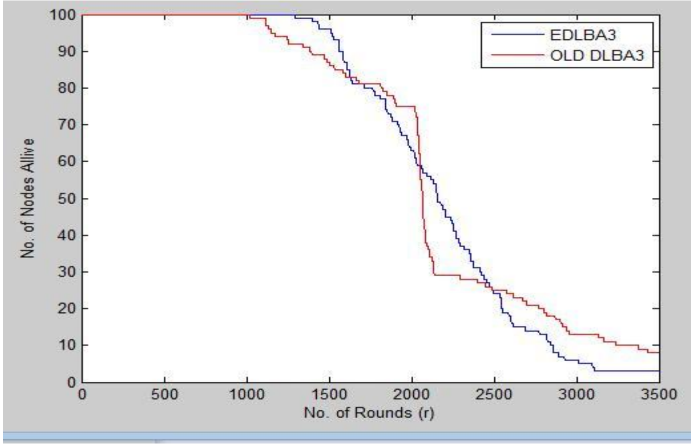

Figure 8 Comparatively graph for EAMMH and DLBA.

V. CONCLUSION

This work carried out the detailed analysis WLAN, DLBA in WLAN and Enhanced DLBA in wireless using routing protocols theoretically and through simulation by MATLAB for DLBA on the basis of different performance metrics viz. packet delivery ratio, end to end to end delay, residual energy, and average throughput. These performance metrics are analyzed for the four variants of routing protocols, LEACH, SEP, TEEN and EAMMH. Simulation of variants provides the facility to select a good environment for routing and gives the knowledge how to use variant algorithm schemes in static network. Simulation results show that, as the node density increases in the network, the performance of the variants decreases. Nodes density affects the performance of variants most as frequent path break increases with the low node density. According to simulation results as the density of nodes increases, the packet drop and overheads of routing protocol increases whereas throughput and packet delivery ratio decreases. The best results were achieved in implementing in TEEN Protocol.

From our Result it is clear that the EDLBA WLAN3 TEEN is best as compare to the others in terms of Packet Delivery Ratio, END to END delay, Throughput and Residual Energy. When we analyse various connections we cannot analyse clearly that which one is better because with different scenario all connections gives better performance, but when we analyse for Packet Delivery Ratio, END to END delay and Throughput DSR better for high number of node connections.

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BIOGRAPHY

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