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Drop Rate Minimization Using MIB under Media Access Control(MAC) Layer in MANET

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Abstract: **Wireless local area networks (WLANs) areincreasingly popular because of their flexibility. This spreading of WLANs comes with an increasing use of multimedia applications. Such applications are bandwidth sensitive and require a quality of service(QoS) that guarantees high performance transmission of continuous data.EDCA 802.11e used to supporting Quality of service for real time transmission over WLANs. But EDCA 802.11e week in Multi-hop case because of hidden station effect. however monitoring is difficultin networkdue to every time changing topology in mobile ad-hoc network(MANET)To resolve the problem of hidden terminal in this paper we use 802.11 MAC layer protocol which use a MIB (Management information Base) technique.A Simulation experiments - using the network simulator NS-2 are carried out to compare the performance of both protocols.**

Keywords:*MANET, EDCA802.11,802.11e,MIB(ManagementInformation Base) CSMA/CA.*

I.INTRODUCTION

IEEE 802.11 is the popular standard for WLANs. It works in the first two layers of the OSI reference model, the medium access control (MAC) and the physical (PHY) layer [8]. It provides two MAC methods. Distributed Coordination Function (DCF) and Point Coordination Function (PCF). IEEE 802.11 did not achieve the required QoS performance for multimedia applications because it serves all transmitted frames with the same level of priority. From this point, the IEEE Committee has developed a new standard called IEEE802.11e to enhance the original 802.11 standard and support the required QoS. The IEEE 802.11e introduced a new access method called Hybrid Coordination Function (HCF) that enhanced the two original access methods and provided two enhanced mechanisms: Enhanced Distributed Channel Access (EDCA) and HCF Controlled Channel Access (HCCA) [9]. The main idea in both mechanisms depends on providing traffic classification to achieve priorities for real-time applications.

In This paper we evaluate the Performance of EDCA method Compared with it the 802.11 MAC Method using with aManagement Information Base (MIB) is a database containing the information pertinent to communicating network management.For performance evaluation we use network simulator.The remaining paper is organized as follows. In the section II we will present some brief description of the AODV protocol,IEEE 802.11 DCF and the IEEE 802.11e EDCA access methods. Section III presents the simulation methodology, scenarios and parameters. The conclusion is given in Section 4.

a. Ad-Hoc on Demand Distance Vector (AODV)

The Ad-hoc On-demand Distance Vector routing protocol use for mobile node in an mobile ad-hoc network[7].Which enables multi-hop routing between the participating mobile nodes wishing to establish and maintain an ad-hoc network. AODV is a reactive protocol based upon the distance vector algorithm. The algorithm uses different types of messages to discover and maintain links. Whenever a node wants to try and find a route to another node it broadcasts a Route Request (RREQ) to all its neighbors. The RREQ propagates through the network until it reaches the destination or the node with a fresh enough route to the destination. Then the route is made available by uncasing a RREP back to the source. The algorithm uses hello messages (a special RREP) that are broadcasted periodically to the immediate neighbors. These hello messages are local advertisements for the continued presence of the node, and neighbors using routes through the broadcasting node will continue to mark the routes as valid. If hello messages stop coming from a particular node, the neighbor can assume that the node has moved away and mark that link to the node as broken and notify the affected set of nodes by sending a link failure notification (a special RREP) to that set of node.

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b. Enhanced Distributed Channel Access

The EDCA is the preferred channel access of the 802.11e standard. It is used for service differentiation. The EDCA has four access categories (AC) that support priority-based service [6]. The EDCA parameters consist of as follows: the minimum and maximum contention window (CWmin, CWmax), the arbitration interframe space (AIFS), and the transmission opportunity (TXOP). TXOP is an interval of time when a particular QSTA has the right to initiate frame exchange sequences onto the wireless medium. Each AC (i = 0, 1, 2, 3) has the backoff mechanism as the DCF. If an AC has smallerAIFS, CWmin or larger TXOP, then it has a higher priority than other ACs. The backoff mechanism of the EDCA isdifferent from the DCF. The EDCA is selected from [1, CW],instead of [0, CW-1] as the DCF. Each AC acts independentlyusing the EDCA backoff mechanism. If two ACs finish theirbackoff at the same time in a station, then the station has aninternal collision called virtual collision. To avoid such virtualcollision, a node selects one AC having the higher priority.

II. IEEE 802.11 DCF

The distributed coordination function (DCF) is the basic channel access method of the IEEE 802.11 protocol. It is based on the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) mechanism. The DCF uses for this purpose three main concepts: Inter frame Space (IFS), Random Back off, and Contention Window (CW). Details of the method are available in [4]. The enhanced distributed channel access (EDCA) is the access method of the IEEE 802.11e protocol [5].Just like DCF, EDCA depends on contention windows to generate a random waiting time for each station before accessing the channel. EDCA providesdifferentiated service by providing distinct waiting times for four traffic priority levels. The standard defines four traffic types: Voice (VO), Video (VI), Best Effort (BE) and Background (BK). Voice is assigned the highest priority, whereas the background traffic is given the lowest. These priority levels are called Access Categories (AC).

In IEEE 802.11, the station (STA) uses IEEE 802.11 to communicate with AP. Several STAs may send frames toAP simultaneously. This will cause a collision and these STAs need IEEE 802.11 MAC layer to solve the problem.Carrier sense is used to decide if the air is idle or not. If it isidle, the ST A waits an interval of DIFS and sends the frame.Since the sending ST A cannot hear the signal at the receiver,it cannot detect collision during transmission as in the caseof IEEE 802.3. The price of collision is unacceptable. TheSTA should do its best to avoid the collision. Therefore, theSTA will continue to sense the media if it senses the air andfind it is busy. This will be continued until it becomes idle.Then, it will wait DIFS, find a random waiting time andstart a back off timer. During the back off process, it willstop the timer if the transmission media becomes busy. Itwill continue this timer if the media becomes idle again. Ifthe timer reaches zero and the media is idle, this STA cansend its frame. Since each STA will select different backoff time with large probability, the collision can be avoidedin most cases. This is called carrier sense multiple access/collision avoidance (CSMA/CA). If a frame needs a higherpriority than data frame, it will wait an interval of SIFS andsend the frame without back off. Since SIFS is smaller thanD1FS, this frame will be sent before the data frame andhigher priority is obtained.

a. IEEE 802.11e

In IEEE 802.11, the station (STA) uses IEEE 802.11 to[1] Communicate with AP. Several STAs may send frames to AP simultaneously. This will cause a collision and these STAs need IEEE 802.11 MAC layer to solve the problem. Carrier sense is used to decide if the air is idle or not. If it is idle, the STA waits an interval of DIFS and sends the frame. Since the sending ST A cannot hear the signal at the receiver, it cannot detect collision during transmission as in the case of IEEE 802.3. The price of collision is unacceptable. The ST A should do its best to avoid the collision [6]. Therefore, the STA will continue to sense the media if it senses the air andfind it is busy. This will be continued until it becomes idle.Then, it will wait DIFS, find a random waiting time andstart a back off timer. During the back off process, it will stop the timer if the transmission media becomes busy. It will continue this timer if the media becomes idle again. If the timer reaches zero and the media is idle, this STA can send its frame. Since each STA will select different back off time with large probability [1], the collision can be avoided in most cases. This is called carrier sense multiple access/ collision avoidance (CSMA/CA). If a frame needs a higher priority than data frame, it will wait an interval of SIFS and send the frame without back off. Since SIFS is smaller than D1FS, this frame will be sent before the data frame and higher priority is obtained.

b. The Arbitration Interframe Space (AIFS)

This new IFS parameter replaces the distributed interframe space (DIFS) interval in the DCF access method. The AIFS value for a given access category should be set according to the following equation:[1]

$$AIFS = AIFSN \times SlotTime + SIFS$$

Where,

- *SlotTime* is a time unit dictated by the underlying physical layer characteristics.
- *SIFS* is the short interframe space time period which is used for management and control Frames.
- *AIFSN* is the Arbitration Interframe SpaceNumber which determines the length of the AIFS.

c. Contention Window

The parameters CWmin and CWmax determine the upper and lower values of the contention window for each access category (AC). The adjustment of the two variables, determines the range of the random backoff values, and hence the random waiting time before accessing the medium. Distinct CW ranges are assigned for different AC of the traffic classification. Based to the IEEE 802.11e draft [3], the idea behind the CW range is to give the high priority traffic small CW values and therefore, small waiting period before accessing the medium. On the other hand, a station having low priority traffic will have a large CW value and hence a large back-off counter and a long waiting time. In this way lower priority traffic gives the opportunity to higher priority traffic to capture the transmission medium first, and start transmission.

III.SIMULATION ENVIRONMENT

The simulator we have used to simulate the ad-hoc routing protocols in is the Network Simulator 2 (ns) from Berkeley. To simulate the mobile wireless radio environment we have used a mobility extension to ns that is developed by the CMU Monarch project at Carnegie Mellon University.

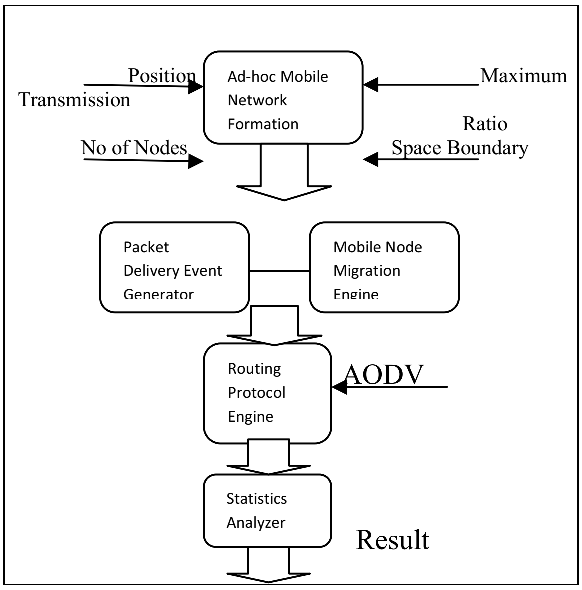

FIGURE 1: AN AD HOC MOBILE NETWORK SIMULATION MODEL.

Our simulation model has five major components: ad hoc mobile network formation, packet delivery event generator, mobile nodes migration engine, routing protocol engine and statistics analyzer, as illustrated in Figure 1.

The module of ad hoc mobile network formation takes in parameters of the space boundary, number of network nodes, their positions in space and their maximum transmission radius. This module is implemented using Tcl script. The network formation is the simulation ground for packet delivery and mobile node migration events. The number of active communicating flows can be varied and the mobile nodes' migration speed and pause interval is node dependent. These are parameters inputted at simulation setup. Both events are generated using Tcl script and are subsequently handled by the routing protocol engine.

IVSIMULATION PARAMETER

We get Simulator Parameter like Number of nodes, Dimension, Routing protocol, transport layer protocol, application layer data and maximum speed of mobile nodes etc.

According to below table 1 we simulate our mobile ad-hoc network.

1. Performance Parameter

This section presents the performance parameters used to evaluate the proposed Location Tracking technique case Traffic Analysis. The main performance parameters are Routing message overhead, average end to end delay, and throughput. Under each main performance parameters, there are secondary performance parameters which affect it or depend on it.

2. Routing Load

The total number of routing packets transmitted during the simulation. For packets sent over multiple hops, each transmission of the packet or each hop counts as one transmission.

3. Average End to End Delay

This includes all the possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times.

It is calculated as the total summation of the division of total end to end delay (DT) by the number of packets delivered (NPD) divided by the number of nodes (Nn) as in Eq.(1)

$$\sum\left(\frac{\mathrm{Dt}}{\mathrm{Npd}}\right)/\mathrm{Nn}$$

TABLE 1: SIMULATION PARAMETER

No of Nodes	**50**
Dimension of simulated area	**800x600**
Routing Protocol	**AODV**
Simulation Time (Second)	**100**
Transport Layer	**TCP,UDP**
Packet Size	**CBR,FTP**
Traffic Type	**1000**
MAC	**EDCA,MIB**
Number of Traffic Connection	**20**
Maximum Speed(M/S)	**Random**

V RESULT ANALYSIS

a. UDP packet Analysis

Here we analyze the UDP packet in this table 1.we get the information about UDP sender, receiver, total UDP packets receive and drop packets. According to our simulation result we set two mobile node as UDP packet sender that sends 2456 UDP packets and we receives 1125 packets that conclude only 45% data packets receives by the receiver node and nearby 55% data packets drop.

b. Receive Analysis

In this graph we analyze UDP receives analysis in EDCA and MIB case, and we take simulation time as 100 second. Result shows MIB time better data receives via receiver but the previous EDCA technique case receiver only 800 packet receives that is very poor as compare to MIB technique.

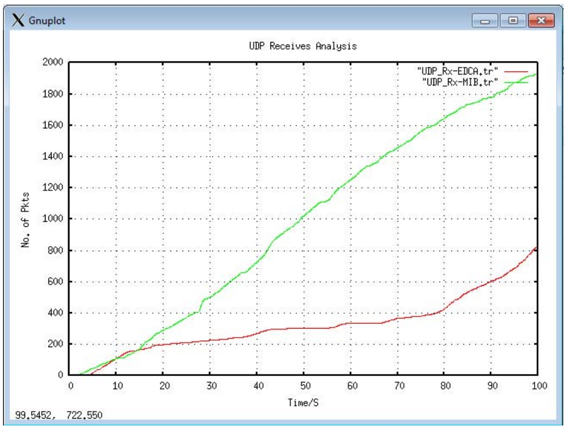

FIGURE 2:UDP RECEIVES ANALYSIS

c. Lost analysis

The routers might fail to deliver or drop some packets or data if they arrive when their buffer are already full. Some, none, or all the packets or data might be dropped, depending on the state of the network, and it is impossible to determine what will happen in advance.

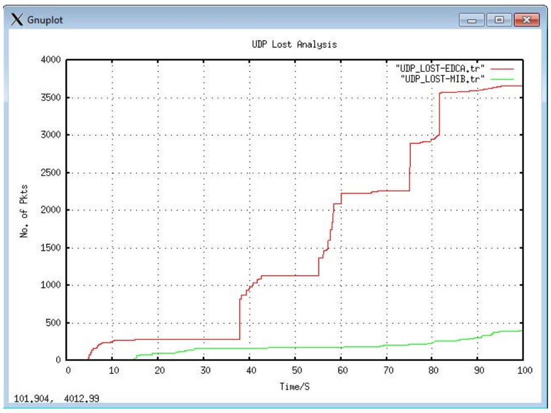

FIGURE 3: UDP LOST ANALYSIS

d. Routing Load Analysis

The total number of routing packets transmitted during the simulation. For packets sent over multiple hops, each transmission of the packet or each hop counts as one transmission.

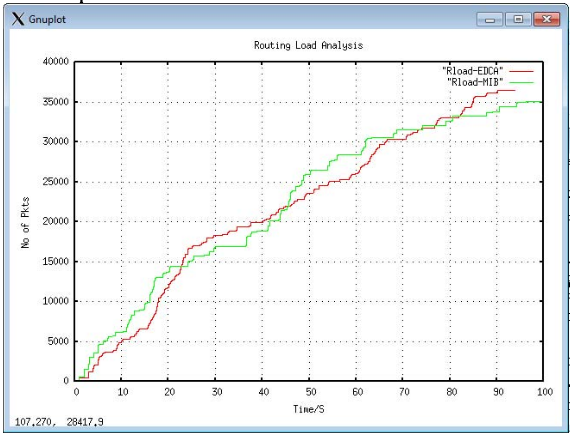

FIGURE 5: ROUTING LOAD ANALYSIS

e. Packet Delivery Ratio Analysis

Total number of packetreceived by the sink over the total no of packetsent by the source.We have transferred packet at different time interval and calculated the result, at every 05 second s the packet sent and received.

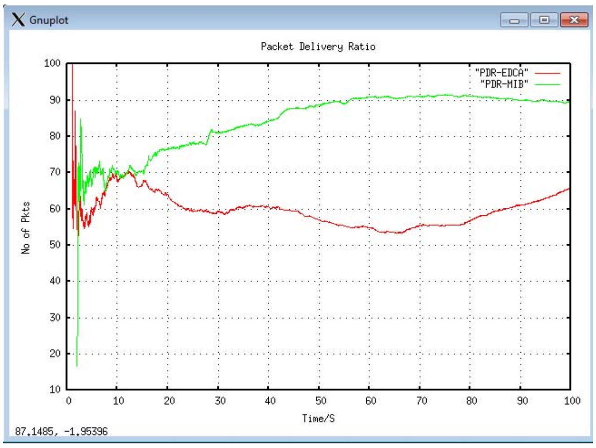

FIGURE 4: PACKET DELIVERY RATIO ANALYSIS

VI. CONCLUSION

In our simulation we create scenario and deploy fifty mobile nodes in EDCA and MIB case and through number of different mobility we compare result through different network parameter like routing overhead, UDP packet analysis and packet delivery ratio. We get MIB gives better result as compare to EDCA technique and also conclude that MIB more feasible in MANET environment.

In MIB technique packet delivery ratio 25% greater and UDP receives is 40% more as compare to EDCA or (802.11e) technique that all above point conclude that MIB technique gives low overhead and better result.

FUTURE WORK

Here we analyze MIB and EDCA media access technique and retrieve result. In our simulation we use routing protocol as AODV (ad-hoc on demand distance vector routing) protocol but in MANET uses number of different routing protocol like table driven and on demand bases name as DSDV, and DSR routing etc. in future we use all different type routing protocol and analyze them, in media access control layer we further use CSMA-CA technique that provide strength for collision resolution and minimization drop rate of data. And simulate them.

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