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Intelligent Buffer Management Algorithm to Prevent Packet Loss in Mobile Adhoc Network

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Abstract— In a mobile ad hoc network, which is self-organized and operates without any fundamental infrastructure, packet transmission from the source node to the destination node is completed after sending the route request and route reply. A reliable path is then selected depending on the protocol choice. Data that the sender intends to deliver is broken up into packets and given sequence numbers before being transmitted over the channel. With the aid of an internal buffer that helps to receive packets and forward them to the next destination, each and every packet travels along the allotted path until it reaches its destination. If there is more traffic on the MANET, the buffer may overflow, which will result in packet loss during transmission.. The source node must retransmit to the destination if any packets were lost during the initial transfer. This article proposes the Intelligent Buffer Management (IBM) active buffer management algorithm to prevent such a scenario by enhancing the MANET nodes' buffers to prevent packet loss. The Network Simulator is used to help build this suggested approach, and the results are compared to those of the current buffer management method to show that IBM is superior.

Keywords- MANET, Missing Packet, Buffer management, packet loss.

I. INTRODUCTION

Mobile Adhoc Network (MANET) is a kind of wireless data communication devices which rely on communication among the node without infrastructure and any access point. The protocol stack of MANET follows the OSI protocol stack ,every layer is assigned responsibility of processing data for transmission. For instance the physical layer is responsible for transmitting the packet over the medium , Data link layer is for diving packet in to frame, Network layer is for finding the best route for packet transmission transport layer is for reliable packet transmission over TCP or UDP protocol.

All the packets to be transferred is placed in the queue in the source node. Queue will be work on first come and first service which means that which packets comes first in the node queue will forwarded to the next hope. Queue management in MANET is the one of the biggest challenges in the network to improve the Quality of service (QoS) which also support for congestion control and avoidance. Three different queue management are named Passive management , Active management and proactive queue management [1] as shown in the Figure 1.1 .

The easiest management buffer implementation technique is passive management technique in which the buffer queue is relay on losing the packet whenever the buffer is full and also no preventive technique for packet loss. The best example for this type is drop tail , the buffer drops the packets when gets full. In Proactive queue Management technique applies the knowledge on TCP congestion control and selectively drop the buffer packets. The third category active management technique is a preventive technique, sender node will get notifies about the neighbouring nodes buffer level reaches to full , sender will automatically stop sending the packet to the next node. The best example of this type techniques are RED (Random Early Detection),REM (Random Exponential Marking),SFQ (Stochastic Fair Queuing),FRED

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(Flow Random Early Drop) ,RED-PD: Random Early Detection with Preferential Dropping, SRED: Stabilized Random Early Detection ,BLUE, AVQ: Adaptive Virtual Queue.

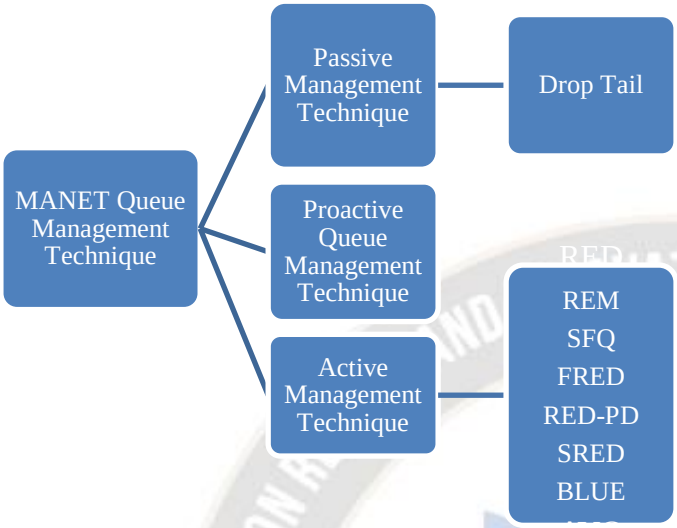

Figure 1.1Classifications of Queue Management

RED works based on the buffer capacity when a buffer is empty it accept all the receiving packet otherwise reject the receiving packets. REM is a active queue management which measures the congestion rather than the queue metric . Stochastic Fair Queuing allows the multiple packet queue rather than the single queue which support FIFO strategy. The modified version of RED is called Flow Random Early Drop and Random Early Detection With Preferential Dropping which uses different bandwidth active flow accounting for buffer maintenance and drop .

Stabilized Random Early Detection is contrast from RED is focus on active packet flow instead of available queue size. The congestion notification alert incorporated in BLUE active management technique. Stability of queue length is maintained in Adaptive Virtual Queue which causes the less delay and packet loss in Queue management . This research article proposed the new method of queue management and support for collecting the missing packets from the intermediate node using the divide and conquer strategy.

This article is structured so that the related survey-based buffer management is covered in section 2, followed by the intelligent queue management proposal, algorithm proposal in section 3, and simulation in session 4, and conclusion regarding the proposed work implementation in section 5.

II. RELATED SURVEY ON QUEUE MANAGEMENT SCHEME

In order to avoid the packet dropping in the MANET, the better implementation of queue management scheme is required. In this section elaborate the different queue management schemes

The new queue management scheme proposed by Kulkarni et [2] al against the traditional RED queue management named PAQMAN. In this method the queue size is varies based on the traffic in MANET .This technique improves the Quality of service comparing with RED . Hop based queuing method proposed by Friderikos and Aghvami [3] , the packet drop is based on the number of hops the packet traversal which recedes the excess delay in TCP flow control mechanism. Lutz et al [4] proposed the focusing on the packet flow is the same order of packet created this causes the increased the throughput and reduce the packet loss. Drop tail queue management system proposed by Chen and Bensaou [5] with multiple congestion link forms in high speed network in MANET which shown that proposed methods faces the unfairness in dropping packets as well as round trip time unfairness and round trip time unfairness.

Effective RED algorithm proposed by Abbasov and Korukoglu [6] variation incorporated in RED packet dropping function which produced the better throughput and packet loss .Size oriented Queue management proposed by Dimitriou and Tsaoussidis [7] forms the size based on the traffic , scheduling packet flow this parameter supports improvement in queue management strategies . Dynamic buffer space introduced by Muhammad Aamir et al [8] which support for avoiding the packet drop in MANET. choke packet mechanism proposed by Mr. A. Chandra[9] finds out the additional overhead traffic and maintains the virtual queue . Queue management technique analysis is done by P.T.Mahinda [10] with the support of allocating the packets in TCP flow and compared the result with RED and REM shows the better improvement . In the dell bell technology different queue maintenance technique comparison is done by Shubhangi Rastogi [11] , the result shown that Non Linear Random Early Detection technique is the better queue management technique .

From the Literature survey different queue management were proposed by different authors but all the method could not prevent the packet loss in buffer management . This article proposed a method for buffer management to prevent the packet loss.

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III. PROPOSED ACTIVE BUFFER MANAGEMENT ALGORITHM

From the Literature survey all the three category of the buffer management techniques will be done in passive , active and proactive buffer management still the research is needed for proposing the new method to overcome the packet drop in MANET .Passive buffer management technique applies when the buffer is full , active buffer management applied before buffer is full and proactive is relay on the TCP congestion control .All the categories does not provide the reliable solution for managing the buffer effectively .

Novel algorithm is proposed in this article which monitoring the buffer capacity and applies the strategy on the buffer when the buffer is in half of the capacity. This proposed algorithm always keeps the buffer capacity in between fifty percent to ninety percent. The reason for maintain the range in the buffer size to control the congestion control in the MANET .

The proposed MANET active buffer management algorithm names as Intelligent Buffer Management (IBM) . Receiving buffer information could be in the category of actual packets , router request, router reply, synchronization, Ack etc. This algorithm keeps tracking the buffer size information when the buffer size becoming half of the buffer size automatically this algorithm will invoke the controlling the packet. This algorithm start checking of the buffering information , except reliable data packet and remaining all the category of the packet are dropped from the buffer . The details work flow is explained in the pictorial representation from the Figure 3.1 and details of the IBM algorithm steps shown in the table 3.1 . This is achieved by for every second the Sample Interval queue size (SIQS) is estimated and also the estimated Queue threshold level(EQTL) is estimated by using the calculation of total queue size/ 2 . For each packet arrival to the buffer queue , current queue length (cql) is compared with estimated Queue threshold level (eqtll),if (cql) < (eqtll) then allow all the incoming packet in to the queue for forwarding otherwise the IBM algorithm is invoked to drop the non data packets in the Queue. The targeted queue delay Qd in each node is estimated by using the equation

$$Qd = targetDelay * ptc,$$

where ptc = linkBandwidth(bits)/(8 ∗ meanPktSize).

Algorithm 3.1 Intelligent Buffer Management Algorithm for each buffer

Algorithm 3.1 IBM for each node
1. Calculate total buffer space occupied by the each node
2. Check whether it reached to the threshold let say Half of the buffer size
3. If reached threshold limit call IBM
4. IBM
a) Accept all the Data Packets
b) Reject Other packets
5. Update the buffer space to IBM

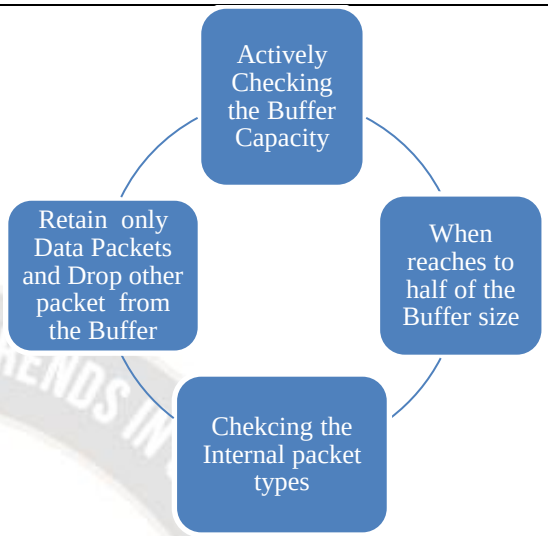

Figure 3.1 Work Flow of IBM algorithm

IV. SIMULATION SETUP

The proposed Intelligent Buffer Management algorithm is tested with the Network simulator (NS2) with the flow arrival rate of the packet is 20Mbps , 25 Mbps,30Mbps up to 40 Mbps with total number of 100 nodes .The IBM is compared with active , passive and proactive buffer management technique Drop Tail, RED and TCP congestion . When flow arrival rate initially set 20Mbps and gradually increases which causes the more packet flow and transmission of packet makes congestion in the MANET . Two different scenario of Simulation testing is defined. Packet arrival rate with our congestion and with congestion . The Table 4.1 and Table 4.2 summaries the Packet Loss Ratio IBM algorithm with Drop Tail ,RED and TCP congestion both scenario. The Pictorial Comparison shown in the Figure 4.1 ,and Figure 4.2 , the result shown that IBM algorithm packet loss is less and RED follows the preventive techniques which shown the packet loss in less compared with active buffering techniques Drop Tal and TCP Congestion in both scenarios .

Packet Flow arrival rate (Mbps)		Packet Loss		
	IBM	RED	TCP Congestion	Drop Tail
20	0.02	0.04	0.07	0.06
25	0.04	0.09	0.10	0.11
30	0.05	0.1	0.11	0.13
35	0.06	0.12	0.10	0.15
40	0.07	0.14	0.13	0.16

Table 4.1 Packet Loss Ratio without congestion

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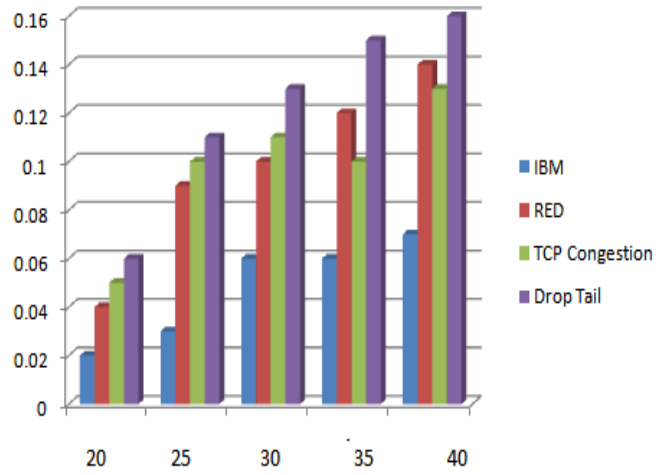

Figure 4.1 Packet Loss Ratio without congestion

Packet Flow Arrival Rate (Mbps)	IBM	RED	TCP Congestion	Drop Tail
20	0.04	0.06	0.04	0.09
25	0.06	0.09	0.11	0.11
30	0.06	0.1	0.13	0.13
35	0.07	0.12	0.1	0.16
40	0.09	0.14	0.15	0.18

Table 4.2 Packet Loss Ratio with congestion

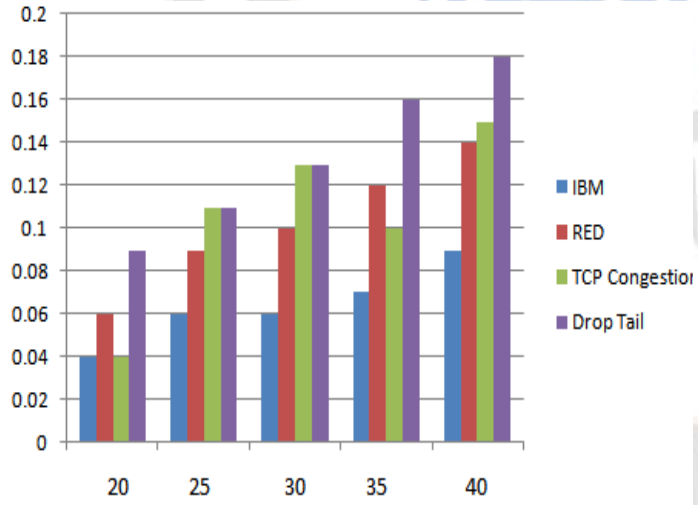

Figure 4.2 Packet Loss Ratio with congestion

V. CONCLUSION

This research article proposed the novel Intelligent Buffer management algorithm for overcoming the packet dropping due to overflow in the buffer. This is implemented with the support of any Network simulator and finding out the simulation result by comparing with the active buffer management , proactive buffer management and passive buffer management. The Result shown that the proposed algorithm overcomes the buffer over flow attack in MANET.

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