Energy Efficient Congestion Control mechanism in MANET

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***Abstract* - In MANET, congestion is one of the main important problem that degrades the performance of whole network. In MANET nodes can communicate to each other directly as mesh network. In this paper we define three queues at each node for holding the forwarded packets. When the average load along the route increases beyond the network handling capacity the packets are discarded and congestion occurs. For this we fix a threshold and if packet arrives beyond the threshold then congestion control algorithm starts running to control the congestion otherwise the congestion control algorithm will be idle. In this paper we proposes the concept to minimize the congestion and maximize the lifetime of to keep them idle by using threshold in the queues with backpressure and tried to enhance the performance as well as the QoS.**

***Keywords*- MANET, Congestion, Queue, Backpressure, threshold**

I. INTRODUCTION

A. Mobile Ad hoc Network (MANET)

MANET nodes are mobile and they are based on infrastructureless environment. These nodes communicates through wireless medium. In MANET the network topology may dynamically change in an unpredictable manner as nodes are free to move in an infrastructure less environment. Mobile host that moves in and out of each others communication range results in frequent connection breaks and topology varies stochastically [1]. For establishing routes between nodes, some routing protocols are used. Table driven approach cannot perform in such environment due to dynamic changes in network topology resulting in development of on demand approach. MANET provides an effective method for constructing an inexpensive network anywhere without requiring access points [2].

B. Congestion in MANET

Congestion occurs when number of packets or load increases beyond the limit that can be handled by network resources which results in degradation of network performance [3]. Congestion is a blockage of resources due to overloading and leads to loss of packet and bandwidth degradation. Ad hoc network works on shared resources, where multiple sender compete for network resources like link bandwidth so each sender must adjust their data rates in order not to overload the network. When large number of packets arrived at node they are not forwarded and are dropped because network node being bottleneck. The dropped packets might have travelled a long way in network and consumed significant resources [4].

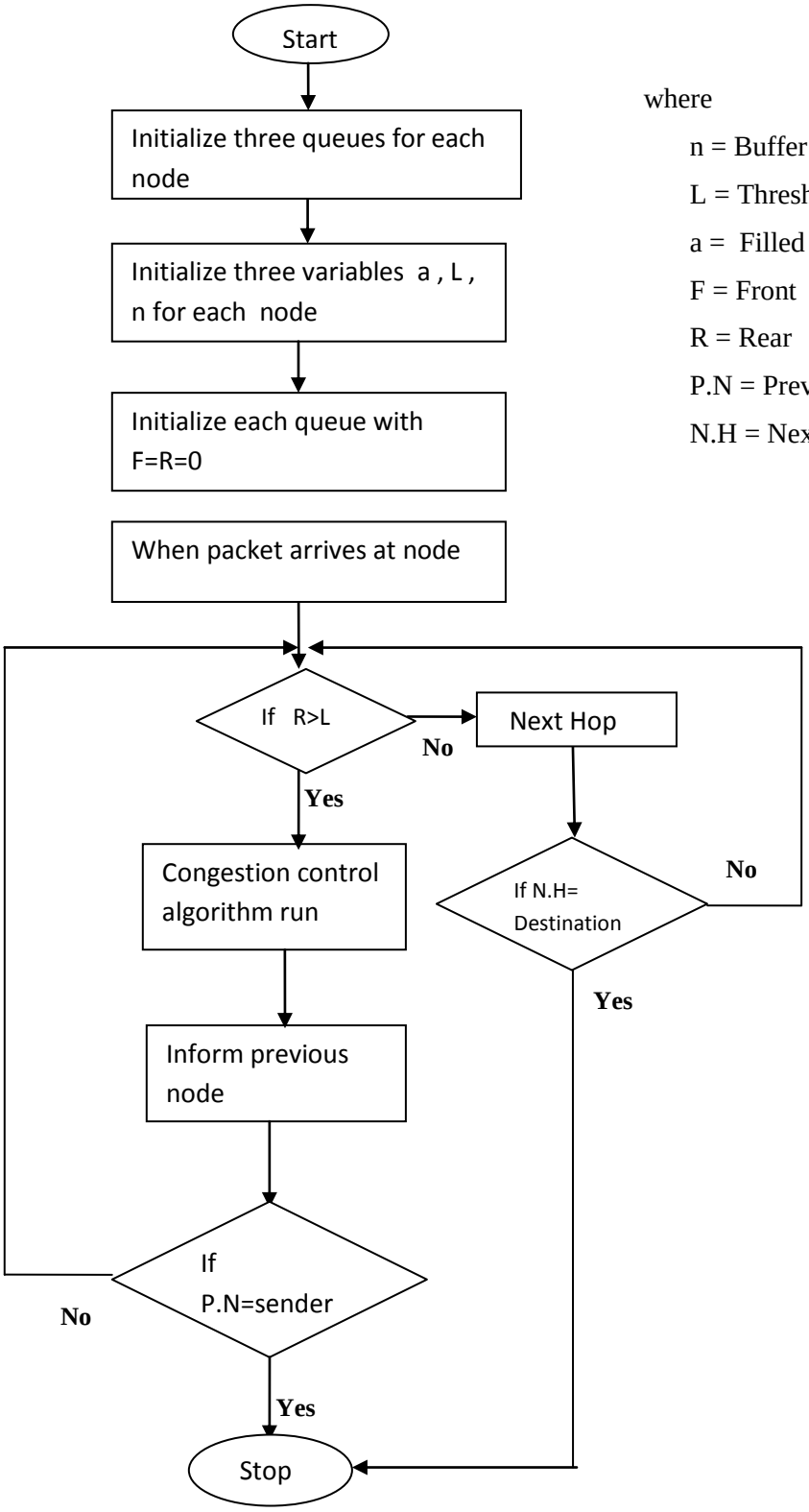
For traffic shaping we use leaky bucket. Leaky bucket refers to a bucket with a small hole at bottom that causes it to leak at constant rate as long as there is water in the bucket[5]. The output rate does not depend on the input rate and input rate can vary but output rate remains constant. This concept is used in network to control the congestion and smooth out bursty traffic. Bursty chunks are stored in bucket and sent out at an average rate. Every host in network is having a buffer with finite queue length. Packets entering the network are put in buffer with finite queue length and if the buffer is full then the arrived packet is discarded.

Token bucket is also use to shape the traffic and it allows for varying output rates. It allows the idle hosts to accumulate credit for future in the form of token[5].For larger burst of traffic token buckets are more helpful. Token bucket manages the queue regulator that controls the rate of packet flow into the network. A token is generated at a constant rate by token generator and place them into a token bucket. Fixed number of bytes are granted by each token to transmit in network. Arrived packets are placed in a queue. The token bucket is easily implemented by using counter. Initially the token is set to zero,each time a token is added the counter is incremented by one. Each time the data is sent the counter is decremented by one. When counter reaches zero the host cannot send data. If more packets are delivered by flow than the queue can store, the extra packets are dropped.

Backpressure is a technique in which the congested node does not receive data from the previous node. This may cause the previous node to get congested and in turn they stops receiving from their previous node and so on. Backpressure is a node-to-node congestion control mechanism that starts with a node and propagate in opposite direction to source node.

II. RELATED WORK

Kazuya NISHIMURA and Kazuko TAKAHASHI et al [2] proposed a routing protocol in which multi agents are used for reduction of congestion. Two types of agents are used:



where

n = Buffer size

L = Threshold

a = Filled packet

F = Front

R = Rear

P.N = Previous node

N.H = Next hop

Fig 1 Proposed Work

Routing agent- to collect congestion information and to update routing table at each node. **Message agent** to move the information collected by routing agent. In this model, agents which are used to collect information are distributed uniformly and their works are very light, and the protocol controls the packet congestion.

Soundararajan, S. and R.S. Bhuvanewaran et al [6] proposed Multipath Load Balancing and Rate Based Congestion Control (MLBRBCC). In this the channel utilization percentage and queue length are estimated at each intermediate node along the destination and transmit the feedback to sender then the sender performs rate control based on feedback packet. MLBRBCC has higher packet delivery ratio and less end-to-end data packet delay.

T Senthil Kumaran et al [7] proposed early detection of congestion and control routing protocol is a unicast routing protocol. EDAODV has lost fewer packets and shows significant improvement of end-to-end delay and packet delivery ratio.

Hongqiang Zhai, Xiang Chen and Yuguang Fand et al [8] proposed a novel rate base end-to-end congestion control scheme (RBCC). They are based on novel use of channel busyness ratio, which is an accurate sign of the network utilization and congestion status, a new rate control scheme has been proposed which efficiently and reliably support the transport services in MANET. In rate based congestion control a sublayer consisting of leaky bucket is added under TCP to control the sending rate of packets based on the feedback at the bottleneck node. Aggregate throughput of RBCC is 57% higher than that of TCP.

S.Karunakaran and P.Thangaraj et al [9] proposed a cluster based congestion control protocol which consist distributed and scalable cluster based mechanisms for supporting congestion control in ad hoc networks. The cluster monitors congestion within its localized scope. System responsiveness is improved by this approach. After estimating the traffic rate along a path, and after a congestion feedback the sending rate of source is adjusted accordingly.

III. PROPOSED WORK

In this paper we proposed an efficient approach for traffic shaping and avoid congestion in MANET. As we know that in MANET every node acts as a router to forward the packet from the source end to destination end. To avoid the congestion and also improving the QoS in MANET we are proposing three buffers at each node of fixed size say **"n".** Here we are managing three different buffers at each node to hold the packets at different priority levels. We are also proposing an alarming technique at the node to control the traffic from the previous node which are sending data to current node. Here we set an maximum value at the buffer level say **"l"** and if size of the filled packet say **"a" is greater than l** i.e a>l than the alarm informs the previous node about the traffic and then the congestion control algorithm starts. The congestion control algorithm starts only when the alarm informs the node about traffic to save the energy of node. Incomming packets are placed in any of the buffer according to their priority class. The packet in higher priority queue are processed first even if other two queues are full. If the packets arrived at queue exceed beyond the threshold, the network discard the packet. The main aim to flow down the traffic into the network by alarming the nodes from the congested node till the alarm to the sender. After getting the alarm by sender it slows down the generation of packets in the network.

A. Before the deployment

1) Taking three different queues let q1, q2, q3 at each node of length L1, L2, L3.
2) Fix the maximum length of packet that a queue can hold let m1, m2, m3 for each node.
3) Initialize queue with front = rear=0 (F=R=0) for each node.

B. After the deployment

1) At the time of routing our algorithm checks the value of rear for each queue at each node.
2) If R>L in that case the alarm detects the congestion.
3) The alarm informs the previous node about congestion than the congestion control algorithm take place.
4) Go to step 2

The flow diagram of the proposed scheme is shown in figure 1.

IV. CONCLUSION

In this paper we proposed a technique for congestion control by using leaky bucket, queues and backpressure. Congestion occurs when packets are discarded at nodes because of network overload. We are removing the packet loss at each node by fixing the threshold so it improves the QoS in the network. Congestion algorithm only runs when the queue size exceeds the threshold value so it increases the energy efficiency in our network. It increases the lifetime of sensor node.

V. REFERENCES

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