A Survey on Congestion Control Using Red Algorithm over MANET

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***Abstract* - Manet is infrastructure less network [1].Mobile Ad Hoc network is self organizing network of mobile devices that doesn't relay in any fixed infrastructure. Due to this, nodes in network behave as a router. Congestion is the major problem in Manet. Congestion occurs when the demands on a network are greater than the available resources and due to increasing mismatch in link speed caused by intermixing of heterogeneous network technologies. RED (Random Early detection) is congestion control algorithm [1, 2]. But RED encounters with new challenges such as high packet drop ratio, degradation of throughput and frequent link failure. One of the important considerations in any AQM is how exactly the level of congestion is measured at a particular router. In this paper, we did survey of packet routing , congestion ,congestion control and popular queue management schemes: Random Early Detection (RED), Random Exponential Marking (REM) and Drop tail.**

Key words - Random Early Detection (RED), Active Queue Management (AQM), REM, Drop tail.

I. INTRODUCTION

MANET is a collection of communication nodes that wish to communicate with each other, but has no fixed infrastructure and no predetermined topology of wireless links [1]. Mobile devices in MANET will participate in the communication if they are area unit at intervals vary of network, and can move freely at intervals transmission [2]. The dynamic nature of MANET with restricted resources, will vary with time such as battery power, measure makes quality of services provisioning, a difficult drawback [1]. In Internet, due to the rapid increment in scalability of data volume may lead to congestion, queuing delay and high packet loss rate and buffer over flow. Network congestion at intervals the network happens once the collective demands exceed accessible resources. However just increasing network resource is unable to handle the congestion problem. Various congestion management approaches have been planned to solve this issue [4, 5]. For Each node router has two types of queue algorithms, first approach is queue management algorithm, Active queue management and another is queue scheduling algorithm. During congestion, the transmission gateway changes its window size proportional to the size of bandwidth [5]. RED algorithm is designed to handles short type of bursts that might be delay sensitive, but not to allow the average queue size increase very much. RED algorithm is not biased with the busty traffic. However, as there's a considerable quantity of delay between the packet drop at the queue and the notification at the sender, massive range of packets could also be born because the sender continues causing at its current rate. Multiple flows back off results in below utilization of the queue (no congestion).

In queue management algorithms there are three different types of algorithms, active, passive and proactive like Drop Tail, RED and REM. Drop Tail is the most widely used queue management method in today's IP networks. RED is mostly the default method implemented in the routers nowadays. RED monitors the average queue size and drops packets based on statistical probabilities. REM is an active queue management scheme that aims to achieve both high utilization and negligible loss and delay in a simple and scalable manner [5, 6].

In section II, describes packet routing in Manet. Section III describes congestion in Manet. In Section V, we have given overview of Queue management techniques. Conclusion is presented in section VI

II. ROUTING IN A MANET

The absence of fixed infrastructure in a MANET contains several types of challenges. The biggest challenge among them is routing. Routing is the process of selecting paths in a network along which to send data packets. An ad hoc routing protocol is a convention, or standard, that controls how nodes decide which way to route packets between computing devices in a mobile ad-hoc network. In ad hoc networks, nodes do not start out familiar with the topology of their networks; instead, they have to discover it. The basic idea is that a new node may announce its presence and should listen for announcements broadcast by its neighbors. Each node learns about nearby nodes and how to reach them, and may announce that it can reach them too. The routing process usually directs forwarding on the basis of routing tables which maintain a record of the routes to various network destinations. Thus, constructing routing tables, which are held in the router's memory, is very important for efficient routing.

III. CONGESTION IN MANET

Congestion is a situation in communication networks in which too many packets are present in a part of the subnet. Congestion may occurs when the load on the network (number of packets send to the network) is greater than the capacity of the network (number of

packets a network can handle). Congestion leads to packet losses and bandwidth degradation and waste time and energy on congestion recovery [3]. In Internet when congestion occurs it is normally concentrated on a single router, whereas, due to the shared medium of the MANET congestion will not overload the mobile nodes but has an effect on the entire coverage area [4]. When the routing protocols in MANET are not conscious about the congestion, it results in the following issues.

1) **Long delay**: This holds up the process of detecting the congestion. When the congestion is more rigorous, it is better to select an alternate new path. The prevailing on-demand routing protocol delays the route searching process.
2) **High overhead**: More processing and communication attempts are required for a new route discovery. If the multipath routing is utilized, it needs additional effort for upholding the multi-paths regardless of the existence of alternate route.
3) **Many packet losses:** The congestion control technique attempts to minimize the excess load in the network by either reducing the sending rate at the sender side or by dropping the packets at the intermediate nodes or by executing both the process. This causes increased packet loss rate or minimum throughput.

Congestion types: Congestion can be classified into four different types [5]:

1) **Instantaneous Congestion**: It is caused by mild bursts, created naturally due to IP traffic.
2) **Baseline Congestion:** It appears to be caused by systematic under-engineering of network or hop capacity (alternatively due to simple source overflow).
3) **Flash Congestion**: It suggests frequent but momentary periods of overload in a highly utilized network, where bursts from individual sources add up to create significant packet loss hills.
4) **Spiky Delay**: It a condition where no packets are transferred for a long duration of time - the transit delay of packets shoots up from few milliseconds to tens of seconds during this period

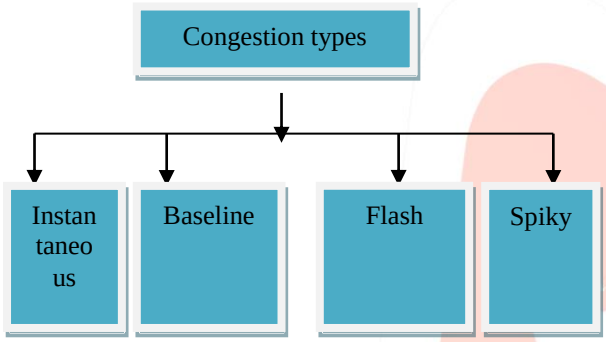

Figure1: Congestion types[16]

IV. QUEUE MANAGEMENT

Queue management is defined as the algorithm that manages the length of packet queues by dropping packets when necessary or required to be dropped. From the point of dropping packets, queue management can be classified into three categories as in the figure [7].

Active queue management is expected to eliminate global synchronization and improves quality of service. The expected advantages of active queue management increases the throughput, reduces delay. Random Early Detection (RED), an active queue management scheme, has been recommended by the Internet Engineering Task Force (IETF) as a default active queue management scheme for next generation networks.

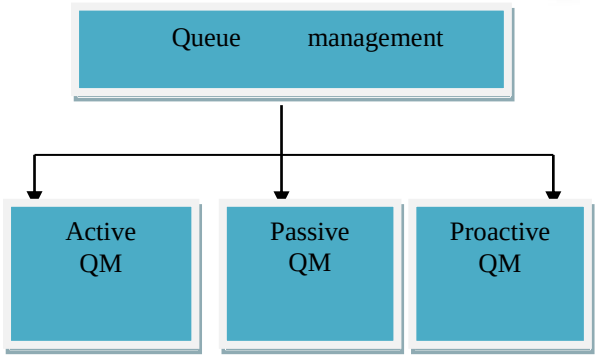

Figure 2: **Queue management technique classification [7]**

4.1 Active Queue Management

In Internet routers, active queue management (AQM) is a technique that consists in dropping or ECN-marking packets before a router's queue is full. Typically, they operate by maintaining one or more drop/mark probabilities, and probabilistically dropping or marking packets even when the queue is short [8].

RED: RED is a type of active queue management technique used for congestion avoidance. RED monitors the average queue size and drops (or marks when used in conjunction with ECN) packets based on statistical probabilities. If the buffer is almost empty, all incoming packets are accepted. As the queue grows, the probability for dropping an incoming packet grows too. When the buffer is full, the probability has reached 1 and all incoming packets are dropped. RED is more fair than tail drop, in the sense that it does not possess a bias against bur sty traffic that uses only a small portion of the bandwidth. The more a host transmits, the more likely it is that its packets are dropped. The probability of a host's packet being dropped is proportional to the amount of data it has in a queue. Early detection helps avoid TCP global synchronization.

REM: REM is an active queue management scheme that measures congestion not by performance measure such as loss or delay, but by quantity. REM can achieve high utilization, small queue length, and low buffer overflow probability. Many works have used control theory to provide the stable condition of REM without considering the feedback delay. In case of (Random Exponential Marking) REM, the key idea is to decouple congestion measure from performance measure (loss, queue length or delay). In REM, the user rates are matched by clearing buffers irrespective of number of users. The sum of link prices, summed over all the routers in the path of the user to the end-to-end marking [9].

4.2 Passive Queue Management

In Passive Queue management (PQM) technique, an Internet router typically maintains a set of queues, one per interface, that hold packets scheduled to go out on that interface. Such queues use a *drop-tail* discipline: a packet is put onto the queue if the queue is shorter than its maximum size (measured in packets or in bytes), and dropped otherwise.PQM does not employ preventive packet drop before the router buffer gets full.

Drop tail: In Drop tail, the router accepts and forwards all the packets that arrive as long as its buffer space is available for the incoming packets. If a packet arrives and the queue is full, the incoming packet will be dropped. The sender eventually detects the packet lost and shrinks its sending window.

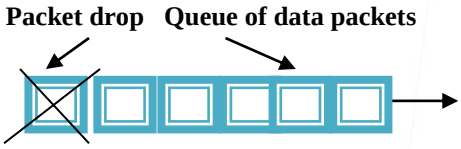

Figure 3: packet drop during Drop tail queuing [4]

4.3 Pro-active Queue Management

Pro-active queue management algorithms are novel attempts to prevent congestion from ever happening in the first place. This congestion-prevention approach is in contrast to the congestion avoidance approach of traditional active queue-management schemes where congestion is actively detected early and then reacted to. In addition to enhancing fairness, GREEN keeps packet-queue lengths relatively low and reduces bandwidth and latency jitter. These characteristics are particularly beneficial to real-time multimedia applications.

V. CONCLUSION

In MANET congestion is occurs when transmit the packets is greater than capacity of the network. Due to congestion performances of the network decreased. Congestion-control increases the packet delivery and decrease the end to end delay, packet loss. Network performance can be increased by controlling the congestion in MANET. In this paper number of congestion control techniques have discussed. Through this paper, we tried to understand the queue management techniques behavior in the traffic loaded network. As our survey show that, each algorithm has its pros and cons.

Our survey shows that REM has minimum packets dropped. While RED is an intermediate in terms of lost packets. But, simultaneously, if we consider end-to-end delay, RED achieved the best results. So we concluded that not a single queue management technique is sufficient in terms of all the parameters. So we can do further work to improve congestion control in MANET.

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