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Study of Various Queue Management and Random Early Detection technique in Mobile Ad hoc Network

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***Abstract*— Mobile Ad hoc Network (MANET) is self-organizing network of mobile devices which does not relay in any fixed infrastructure. Queue management plays a vital role in the performance of MANET. There are lot of queue management approaches which are already defined among which Active queue management approaches are the most widely used approaches. The Random Early Detection (RED) is one of the most popular active queue management approaches that achieve high throughput and low average delay by detecting and avoiding the inchoate congestion. The detection of inchoate congestion is predicated on calculation of average queue length and RED parameter settings. To avoid the congestion within the network, operators ought to have a priori estimations of average delay in congested routers, that is troublesome to estimate in Mobile unintentional Network because of uncertainty in dynamic the network conditions. To realize high throughput and low delay, it wants constant standardization of parameters in keeping with this traffic condition. Our goal during this paper is analyzed many active queue management and RED algorithms are mentioned.**

***Keywords*— Throughput, AQM, Ad-hoc Network & RED.**

I. INTRODUCTION

Mobile ad hoc Network (MANET) [1] is self-organizing network of mobile devices that doesn't relay in any fixed infrastructure as shown in Figure 1. MANET nodes are personal devices like laptop computer, mobile phones and personal digital assistance (PDA's). Nodes in MANET will participate within the communication if they're within the range of network, and may move freely inside transmission range of network and nodes that are outside the transmission range of network cannot participate in communication. The dynamic nature of manet with restricted resources that may vary with time like battery power, storage space bandwidth makes QoS provisioning, a difficult problem. to prevent congestion, this internet use end-to-end congestion management [2], during this mechanism end host are responsible for detection of congestion and packet loss is treated as implicit congestion notification signal from routers. When detection of inchoate congestion, packet transmission rate is reduced to decrease the congestion level.

Fig 1: Mobile Ad hoc Network

Traditional Queue Management like Drop-tail Queue Management, that uses first in first out policy, during which packet enter in queue from one end and packet leave the queue from different end[3]. Drop tail permit packet to enter in queue until the queue is empty and drop the whole incoming packets once queue becomes full. In drop tail there's no any approach for early detection of congestion before queue become overflow i.e. in congested network packet drop is common problem and re-forwarding of all dropped packets can consume lot of resources like battery power, transmission link and process power of nodes. this method ends up in some serious drawbacks. first of all, Drop tail queues don't seem to be suited to interactive network applications as a result of the drop-tail queues are forever full or near full for long periods of your time and packets are continuously dropped once the queue reaches its most length.

A. Active Queue Management (AQM)

The solution to the total queues problem isn't waiting to drop packets till the queue becomes full, but rather to drop the packets before the queue becomes full so sources slow down owing to this congestion notification, so preventing the queue from overflowing. This approach is named Active Queue Management, AQM, and is very recommended for today's routers.

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One of the most necessary goals of AQM is to keep up a small size steady-state queue so the issues two-faced in drop tail or similar disciplines are prevented. Actually, small queue size has several advantages like a reduced range of dropped packets, low end-to-end delay, and therefore the avoidance of lock-out behavior. Since the common queue size is kept small, the quantity of packets dropped are reduced. This may decrease the unnecessary waste of obtainable bandwidth and can increase link utilization by avoiding international synchronization. moreover, an unavoidable side of packet networks, packet bursts, are simply absorbed owing to the additional queue area on the market for many of the time. Another disadvantage of drop tail queues, long end-to-end delays, are reduced dramatically with the usage of AQM owing to the little average queue size.

One final advantage AQM provides is that the prevention of lock-out behavior. Therefore the bias of a router against flows that use small bandwidth owing to monopolized flows are prevented. One fascinating purpose to be noted here is that thinking of planning algorithms and active queue managements because the replacements of every different is wrong. Rather they ought to be used complementary to every different and there ar several applications wherever each of them are used along. The planning algorithms by themselves cannot pay attention of the queue size though they need a small queue size to reduce the latency owing to quality of service (QoS) issues. So, AQM is simply applied at the side of any scheduling algorithm across every flow severally.

II. Literature Review

In this paper [1], authors proposed Analysis of Active Queue Management by examination and contrasting the ECN queue law and packet drop queue law, they mentioned characteristics of ECN traffic and key router configuration problems so as to be well-configured within the presence of ECN traffic. They conjointly confirmed that ECN marking routers ought to apply a considerably higher marking rate than packet drop routers so as to control with a fairly low queuing delay. Additionally, they mentioned that ECN traffic could facilitate routers throughout congestion by stabilizing average queue oscillations.

Authors proposed Proactive prognostic Queue Management Strategy (PAQMAN) [2] that takes advantage of the predictability within the underlying traffic to estimate the typical queue length within the future by using the RLS algorithmic rule. in line with authors it's straightforward to implement and doesn't need any previous data of the traffic model. With a negligible process overhead in computing a prediction (6 multiplications each 0.02s), it accurately captures the fluctuations within the input traffic and converges quickly in less than a second. The performance of PAQMAN has been comprehensively analyzed compared to RED with regard to completely different performance metrics for variable number of flows and a spread of traffic mixes.

Authors presented a survey on recent advances within the space of active queue management [3].The implementation of AQM is helpful in a very general network environment. Further author classified the mechanisms according to the kind of metrics they used as congestion measure. From the survey author found that the performances of rate based} AQM schemes are higher than that of queue based schemes. The queue length of rate based} scheme is a smaller amount sensitive to the quantity of protocol connections than that of queue based schemes. Inclusion of a lot of variety of congestion measures within the existing rate based mostly schemes like AVQ, EAVQ could lead to higher performance in terms of, throughput, packet loss, link utilization.

In this paper [4], author developed AP-RED to produce a ascendible and systematic mechanism for RED parameter standardisation. the benefits of AP-RED are that it provides a straightforward mechanism, from a theoretic position, for perpetually standardisation four key RED parameters rather than standardisation just one of them, like max p , underneath variable network conditions, like traffic load, round-trip time and link capability. It’s inessential to consider the interaction among these RED parameters once they are modified in response to modified network conditions. Stability analysis and nonlinear simulations showed that APRED might stabilize the queue and maintain high link utilization in dynamic network situations. Multi-service things involving networks with multiple bottlenecks and connections haven't been thought of during this study. a lot of analysis is needed so as to increase AP-RED to the multiservice.

Author took one bottleneck link in a very dumbbell topology in there simulations so as to best compare the proposed algorithmic rule with ARED. For a lot of realistic topology, additional work is needed.

Network based mostly congestion avoidance that involves managing the queues within the network devices is an integral a part of any network [5]. According to authors, particularly in MANETs, packet loss leads to inflated overhead in terms of energy wasted to forward a packet that was dropped, further energy needed to convey this packet. They have driven the necessity of AQM in Mobile Ad-hoc Network. They presented a completely unique queue management scheme known as PAQMAN that manages the queue proactively. MANET performance is improved by using PAQMAN because it reduces packet ratio (thereby reducing the quantity of retransmissions) and will increase transmission efficiency. However authors can't study the performance of PAQMAN within the presence of hybrid traffic.

In this paper [6], authors compared many queue management algorithms (RED, FRED, BLUE, SFB, CHOKe) supported simulation results. Authors have conferred their simulation setting, comparison result and algorithmic rule characteristics. It's still hard to conclude that algorithmic rule is better altogether aspects than another, particularly considering the deployment complexity. however the most important trends are: (1) of these algorithms offer high link utilization, (2) RED and BLUE don't establish and penalise non-responsive flow, whereas the opposite three algorithms maintains honest sharing among completely different traffic flows, (3) the fairness is achieved using completely different strategies, FRED record per-active-flow data, SFB statistically multiplex buffers to bins, however must be reconfigured with sizable amount of non-responsive flows, CHOKe correlates dropping rate with corresponding flow's incoming rate, and is in a position to penalise sizable amount of non responsive flows adaptively, (4) all of the algorithms has computation overhead per incoming packet, their house needs are completely different.

AQM may be improved with adoptive reference Queue Threshold, as suggested by authors [7]. Active Queue Management (AQM) could be a powerful supplement of transport layer (i.e. TCP) congestion management for IP layer to control network load while not increasing the quality of end-user protocols. However, as a standard flaw of most AQM schemes, it maintains a hard and fast reference queue (Qref) threshold.

The mounted threshold leads to unnecessarily further delay within the case of sunshine traffic load, whereas bring on excessive packet losses once traffic is serious. During this paper, an improved version known as ARTAQM with minor revision to ATPAQM is conferred. In ARTAQM, a practical relationship between traffic load and therefore the Qref is made. The distinction between the calculable traffic rate and link capability is the input of the perform to regulate the Qref. Simulation results show that ARTAQM outperforms different schemes in queue stability, packet ratio and link utilization.

In this paper [8], Authors study the result of control parameters on queue length for a given target. based on theoretical analysis, a self-tuning RED algorithmic rule is projected, which might keep queue length stable at the target worth by adjusting the most drop chance and setting a correct exponential averaging weight. According to Authors variety of simulations shows that the self-tuning RED performs higher than numerous AQM algorithms in term of deviation from the target and therefore the fluctuation of queue length. Additionally, the self-tuning RED doesn't amendment the fundamental principle of the RED algorithmic rule, and may be merely applied in follow.

During this paper [9], authors revise the look of improved active Queue internal control scheme for time delay systems. Authors consider two stages, firstly, a reduction method for time delay system using a time approach and synthesizing the linear fluid model. Then, a pole placement by feedback are be used, by duality, an observer has been engineered to estimate the typical window size. Hence, Active Queue management schemes were based on a straightforward use of fundamentals of control theory. Addressing delay, the model is performed using principles of uncertainty.

In this paper [10], authors proposed a brand new straightforward and easy technique on Congestion management using RED and protocol Window Adjustment. They present an innovative technique that mixes TCP/RED with window adjustment to enhance the performance of TCP flow control. They conjointly develop a completely unique and easy analytical model which might offer a rather perceptive understanding of the theoretical principle of the proposed algorithm. Numerical results show that this scheme achieves inflated network stability with desired latency and packet dropping rate, whereas totally utilizing the network resource. The proposed algorithmic rule is elegant and straightforward to implement.

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It is applied to any communication network that utilizes TCP for traffic flow control. It's significantly useful to networks wherever packet loss, latency, and/or giant bandwidth variation exists. Such a system is a wireless or satellite network1 that has restricted spectrum and utilizes adaptive writing and modulation to send information to a group of various finish points underneath dynamic operative conditions (e.g., changes in quantity of bandwidth and physical layer link characteristics).

A Survey in 2014 on active queue management techniques of congestion management [11], author studied numerous congestion management techniques and explore the chances of additional analysis within the space of congestion management. They mentioned RED and Drop Tail and there many aspects. According to them Major downside of RED is its parameter sensitivity though by the comparison it's shown that RED performs slightly higher than Drop Tail. They concludes that until node eight RED and Drop tail performed virtually equally. From node eight until node thirty two RED performed higher than drop tail. Where as in DT, once the queue becomes full, it starts dropping packets; RED reduces the consecutive packet drops. They suggest that, there's a requirement to safeguard the packets that are having higher priority. therefore rather than dropping the packets randomly, if we tend to choose the packets that are having less priority at the time of dropping, our algorithmic rule could get better results.

In this paper [12], authors proposing a Priority queue based mostly AQM scheme Improve RED (IRED), that uses the packet arrival rate and queue size to choose the chance of dropping and marking a packet to reduce the result of network congestion. Comparison with the previous AQM schemes (RED) indicates that their algorithmic rule IRED, not solely outperforms the opposite schemes by achieving lower packet loss rate and better sensible place, however is also a lot of resilient to dynamic workloads in maintaining a stable queue. Stability of the queue could be a desirable feature of an AQM policy since it helps in lowering the packet loss rate, and therefore the projected policy has this distinct feature.

This paper [13], concisely surveys comparative analysis of various congestion control algorithms. The AQM algorithms are classified based on congestion metrics and the flow data. Most of the AQMs solely need congestion indicators whereas a number of them need each congestion indicator and flow data. Very few need only flow data for detecting congestion. These AQMs are compared based on the assorted performance metrics. This paper tries to project the desirable quality and disadvantage that exists in every of the algorithm in terms of their performance.

TABLE I
PERFORMANCE COMPARISON OF VARIOUS AQMS [3]

AQM	Loss Rate	AVG q Packets	STD q Packets
Drop Tail	11.8%	92.7	8.7
RED	3.1%	42.1	26
REM	13.6%	40.1	28.3
AVQ	14%	10.5	11.8
SVB	13.2%	51.4	5.9

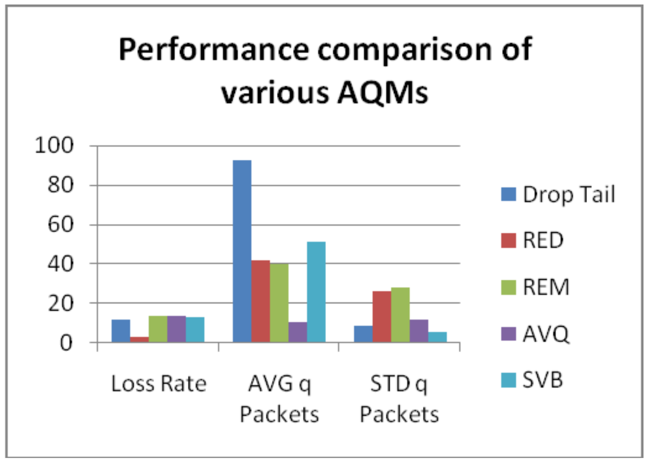

Fig 2: Performance comparison of various AQMs

III. CONCLUSION

In this paper we tend to study previously created efforts for active queue management and Random Early Detection.

The performance of RED queue management algorithm is far better than traditional queue management algorithm; however its performance is influenced by setting the value of queue parameters. Dynamic parameter setting can regulate parameter for higher performance rather than mounted parameter in RED queue management and work it required in this field to improve the parameter sensitivity for queue management in mobile ad hoc network in terms of performance. Hence, the previous algorithms performances aren't acceptable.

The previous queue management techniques performance aren't enough thus we are working on new approach for Mobile ad hoc Network to regulate network congestion; to boost the network performance.

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