Dynamic Queue Management For Optimized Qos In Manets

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Abstract : This paper explores a Queue based management approach for optimized QoS in MANETs. This presents a dynamic Active Queue administration scheme for traffic control in the presence of static and mobile infrastructure network environments. This strategy was proposed to manage efficiently both priority-based and non-priority-based communications. This guarantees a minimum operational resource for communication over MANET. The non-priority-based communication is anticipated to absorb the drawbacks of reduced connectivity during ultimate period of congestion. This appears as desirable QoS progress towards optimized MANETs in inadequate, unstable network situation.

Index Terms: QoS, Manets, Optimized QoS, Delay and Queue Management.

1. INTRODUCTION

Mobile Ad hoc Network is a recurrently self-configuring network possessed of a standard set of mobile devices which can converse between them without infrastructure attached wirelessly. Each device organized in a MANET remains unrestricted to be in motion alone in any route, and so change its associations to other devices often. The most important task in constructing a MANET is furnishing each device to endlessly maintain the information requisite to accurately route traffic. Queue Management stands the clever droplet of network containers inside a buffer allied by a NIC, once that buffer become full or gets nearby to becoming filled, often with the objective of reducing network bottleneck. This job is accomplished thru the network scheduler that can use a number of algorithms such as Random Early Detection (RED), Explicit Congestion Notification (ECN) and/or Controlled Delay (CoDel)

2 RELATED WORK

Since ECN comprises better result in Queue Management policy, the benefits of ECN rest on the defined AQM being used. A few notes, however, appear to hold across different AQMs. As anticipated, ECN cuts the magnitude of packets dropped by a connection, which avoids retransmission there by diminishes latency and especially jitters. This result is most drastic while the TCP connection has a single exceptional segment, when it is able to evade an RTO timeout; this is habitually the case for interactive network communications, for example remote logins and such as HTTP requests, or SQL requests. The outcome of ECN on bulk throughput remain less clear since modern TCP applications are fairly worthy at retransmission of dropped segments in an apt manner once the sender's window is outsized. Practice of ECN has been recognized to be disadvantageous to performance on extremely congested networks. Modern AQM applications elude this drawback by dropping instead of marking packets at excessive load.

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AQOR (Adhoc QOS On-Demand Routing) discovers the best available route that has the smallest end-to-end delay with a bandwidth guarantee. A route request packet that carries the requested bandwidth and the end-to-end delay constraint is sent out via flooding communication to its next hop. When an intermediate node receives the route request packet, it rebroadcasts the route request to its next hop only if the bandwidth requested can be fulfilled and the delay constraint is not violated. Since the flooding approach is used, there might be multiple request packets arrive at a destination node.
DA-AODV (Delay Aware AODV) is another extension of AODV that takes the delay requirement from applications. During the route discovery process, the accumulated delay along the path from a source to a destination is recorded in the routing table of each node. When an application requests a route to a destination; the delay requirement of the application is compared to the delay recorded in the routing table to check if such a route exists. The route will be selected if the delay requirement is fulfilled. DA-AODV has been extended to include multi-path support and the extension is named DAAM (Delay Aware AODV-Multi-path).

Stochastic fair Blue (SFB) hashes traffic flows and preserves a different mark/drop possibility for each hash value. Suppose if no hash collisions, SFB is capable to deliver a fair part of buffer space for every traffic flow arrived. In the incidence of hash collisions, SFB is simply incidentally fair. Unlike other similar disciplines, such as SFQ (Stochastic Fairness Queuing) SFB can be applied with a bloom filters instead of a hash table, which radically decreases its storage necessities while the quantities of flows are bulky. When a flow's drop/mark probability ranges 1, the flow has been displayed to not respond to congestion symptoms commencing from the network. Such an inflexible flow is placed in a "penalty box". A Resilient Stochastic Fair Blue (RSFB) procedure was offered in contrast to spoofing DDoS attacks, which accounts the responsive usual TCP flows and rescue their dropped packets. RSFB process is competent in stabilizing the TCP throughput in the existence of spoofing DDoS occurrences.Differentiated Services implements per hop behaviors, it should mark messages with the appropriate DSCP bits. However in a MANET, this infrastructure nodes might be take part in the network, making non reliable, the needed types in the IP header. The non-infrastructure nodes could simply alter them in order to prioritizing packets without being part of the prioritized nodes. AHRED (Ad hoc Hazard RED)[5] is another RED variant that has been proposed for wireless ad hoc networks. AHRED uses mechanism similar to RED to mark or drop packets except the dropping probability function are based on Weibull model of hazard rate function. The parameter of hazard function changes according to the queue length. The author claims that AHRED performs better than Drop Tail, RED, SRED and REM in terms of packet loss, throughput and delay. However, it has no constraint on the maximum queuing delay. PSRED (Priority Self-adaptive RED)[3] is proposed by Kong et al. to avoid starving to death phenomenon of lower priority queues. It is a RED-based queue management scheme that drops packets probabilistically but adds in the support of priority adaptation for packets in lower priority queues. The priorities of packets from lower priority queues are upgraded to higher priorities after the highest priority queue has been served for a specific amount of time. Instead of starving to death, those packets get transmitted after being upgraded to higher priority queues and thus their end-to-end delay is reduced. MADR (Media Access Delay Regulator) [2] is a control theoretic AQM scheme to control congestion at a WLAN AP. It is an extension of PI-controller AQM scheme proposed for wired networks with the difference that media access delay is used as a control target instead of queue length. It aims to maintain the average media access delay of TCP traffic entering WLAN. The target queue length is calculated based on the target average media access delay and the average service time of TCP packets in the sliding window from measurement. The dropping probability is then calculated based on the current and the target queue length. Packets are dropped based on the dropping probability calculated. PAQMAN(Prediction bAsed Queue MANagement) [4] is a predictive queue management that uses recursive least squares (RLS) to predict average queue length from the past samples and then regulates the packet dropping probability based on the predicted average queue length. A target queue length needs to be carefully selected for the dropping probability regulation and for packets dropping or marking. Packets are dropped or marked probabilistically between the target queue length and the maximum queue size. It mainly aims to alleviate congestion. CB-AQM [6] allows prioritizing the given infrastructure while allowing other clients utilizing the advantage of the network offered, without the need of special protocol modification or message stack. CB-AQM makes no assumption on whether the non-infrastructure nodes would implement QOS scheme or not. It works with OLSR protocol, deprived of requiring any alteration, show that they can collaborate, so making it an appropriate method. CB-AQM can prioritize the traffic originating in a selected group of nodes, while allowing the use of the infrastructure to non-prioritized clients as far as this extra traffic do not hamper with the prioritized clients moreover. CB-AQM can dynamically adapt to situations according the data rate of prioritized traffic.

3 PROBLEM DESCRIPTION

This effort has an intention to resolve communication issue when communication infrastructure could become limited or unstable or that may reach to peak point. The infrastrure in the network could be static or mobile. In this the scenario is considered between entities, which are interconnected using static infrastructure and is represented by Static Infrastructure Network (SIN), and entities, which are interconnected using mobile infrastructure and is represented by Mobile Infrastructure Network (MIN).The SIN could be equipped with communications Towers or devices planted in the earth. The MIN comprises mobiles, walkie-talkies or other wireless media capable of MANET routing. We define the connections between these in Figure-1 as dotted lines for communication between MIN entities and solid line for SIN entities.

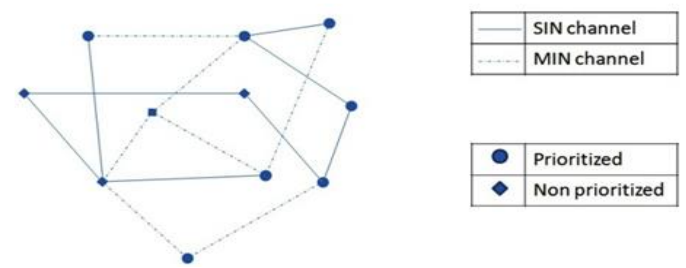

Figure 1:A *Manet with Mobile and Fixed Infrastructure with Prioritized and Non-Prioritized Characteristic*

4 IMPLEMENTATION OF QOS SCHEME

This introduces a class base scheme in which each node knows the existence of each other, but no modifications to the routing table is needed. It considers the packet header value that describes prioritized routing policy. The value of this header field consists of 4 bit structure, is described in Table.1.

The nodes established in the network are classified as either by application they use or by their location as prioritized or non-prioritized. This includes a threshold value which controls node's inbound Queue and has reached a critical occupancy. Threshold value is auto calculated by the QoS agent depending on inflow status. Initially it is assumed to set to ¼th of Queue Size. When more inflow detected then it is adjusted. When the queue length reaches to Threshold limit the QoS agent communicates the event to its neighbors. So they are aware that such route has some possible delay and try to find out alternate routes for next packets. If no such routes exist then some delay is followed by them. The inbound Queue is defined as a set of two queues Dispatch Queue and Wait Queue. The Dispatch Queue is used to hold the packets that are finalized by OPAODV process to dispatch. Once a packet enters into this queue no more changes allowed to that packet and must be dispatched. The packets are finalized by the OPAODV algorithm based on the available scenario. The Wait Queue is a prioritized queue which holds the packets based on the OPAODV bit values. When packet arrived then such packet is inserted into this queue based on the OPAODV bit value. The structure of this inbound queue is described in Figure.2.

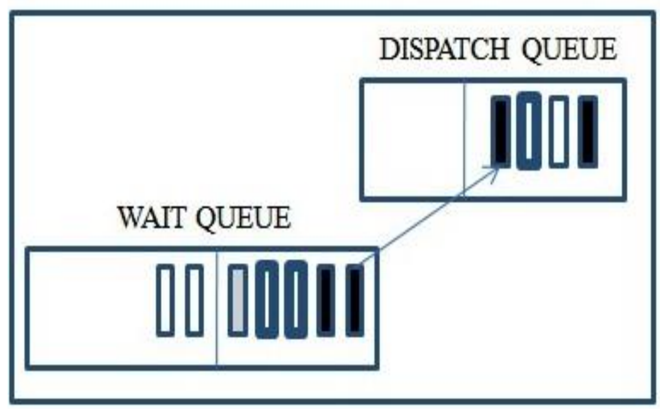

Figure.2: *OPAODV inbound Queue*

The significant objective expected from OPAODV is to manage the packets by efficiently even in the scenario of arrival of huge no of packets that are not capable to hold by the inbound queue of the node. The conventional drop tail queue of network causes the sender to enter into slow start, which reduces the throughput. When multiple packets are dropped which are arrived from multiple senders may cause Global Synchronization. In case of dropping a packet arrived from a sender the sender waits for some amount of time for acknowledgement and if not received such acknowledgement then he will try to resend the packet. So the arrival of packets may be slow but actual problem persists. Instead of dropping the packets this process applies an event communication. So the receiver node upon receive of the message recognizes that the network is in threshold limit, so it will delayed its packet transmission.

Procedure: PACKET INSERTION

- When Packet arrived to a node, then such packet is inserted into Wait Queue using Priority Queue insertion Procedure.
- After insertion if threshold limit is reached , then
  - Check at dispatch queue and fill with packets from wait queue.
  - If no space is available at dispatch queue then initiates delay event communication.

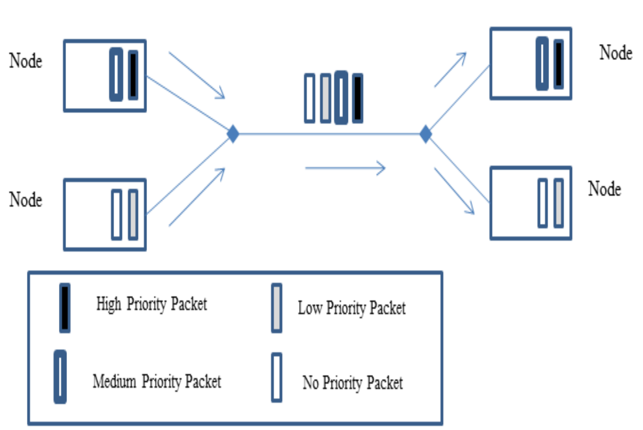

***Figure.3**: Communication between the Nodes*

Procedure: QUEUE CONTROL

- Start timer for quantum of time
- Sense the inbound flow
- When the timer expires, then
  - Assess the inflow packets
  - If frequency of threshold limit reach is high then adjust threshold limit to 2/3rd of Queue Size.
  - If frequency of threshold limit reach is low or not at all then adjust the limit to 1/4th of Queue

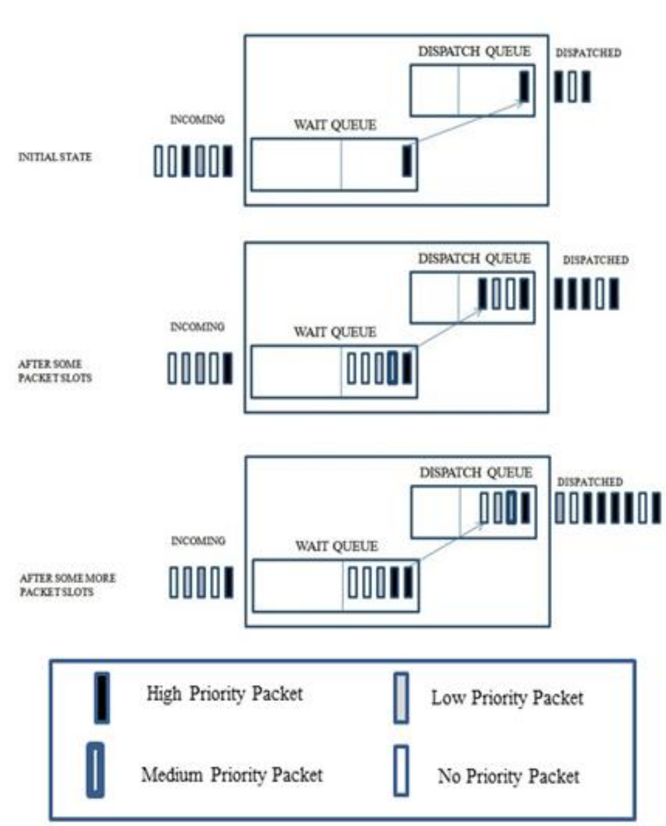

Figure.4: packet processing

Size.

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The algorithm processes incoming packets at particular node using the inbound queue and OPAODV bit with optimized controllable threshold limit. When packets exceed the inbound queue capacity then only they are marked and communicate rejected message. The working of the packet processing of the algorithm is described in Figure.4.

5 PERFORMANCE ANALYSIS

The simulation has been carried out with different traffic loads with a fixed queue size (QS) and a variable packet size of 0.1KB to 1024KB. CBR data rate (R) is 10Mbps to simulate scenarios with light to heavy traffic load in the network. elayed its packet transmission.

Table 2: Simulation Environment

Parameter (units)	Value
Simulation area (m x m)	1000 x 1000
Simulation time (s)	200
Number of nodes	15X15
Node speed (m/s)	5
Node pause time (s)	10, 20
Propagation model	Two-ray ground
Transmission range (m)	250
Data packet size (B)	Variable
Simulation tool	NS-2
Mobility Model	Random Way Point
Interface Queue	Priority Queue
Virtual Carrier Sensing	Off

Simulation has been implemented and the results are analyzed using Network Simulator 2 (NS2). This part exhibits the point by point explanation of the simulation situation and the outcomes are displayed graphically.

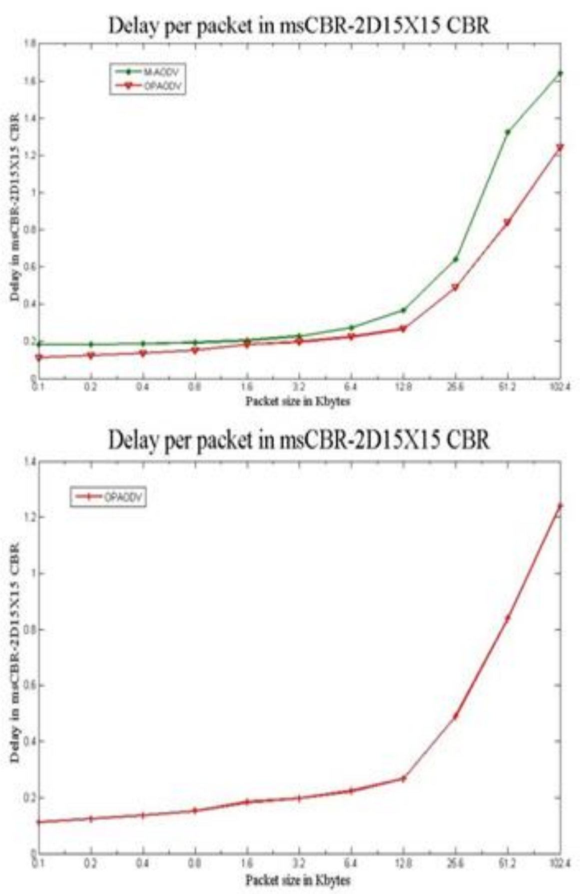

Figure 5 (a) & (b): delay per packet CBR

6 CONCLUSIONS AND FUTURE WORK

QoS-aware routing protocols have received a lot of attention due to the nature of self-configuration in wireless ad hoc networks. Dynamic routing is needed to establish paths for traffic flows. Delay-based QoS routing protocols, which rely on delay estimation and RTT, are proposed to discover routes that can satisfy the delay requirements for delay-sensitive traffic. Even with QoS routing in place, a deterministic end-to-end delay is needed to increase the efficiency of routes discovery and to minimize overhead of route maintenance. If network delay is not constrained corresponding to network dynamics the delay requirements of the routes established may be violated and cause frequent re-routing.

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