

# Improvement of the mechanism of congestion avoidance in mobile networks

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**Abstract** - Mobile ad hoc network congestion control is a significant problem. Standard mechanism for congestion control (TCP), the ability to run certain features of a wireless network, several mutations are not common. In particular, the enormous changes in the network topology and the joint nature of the wireless network. It also creates significant challenges in mobile ad hoc networks (MANET), density is one of the most important limitations that disrupts the function of the entire network, after multi-path routing can load balance in relation to the single-path routing in ad hoc networks better, so the traffic division multiple routes congestion is reduced. This study is a multi-path load balancing and congestion control based on the speed of rate control mechanism to avoid congestion in the network provides communication flows. Given such a speed control method that is consistent is that the destination node copy speed is estimated at intermediate nodes and its reflection in the In the forward direction confirmation to the sender sends a packet, therefore the rate quickly estimate The results of the simulation has been set to demonstrate that a given method better package delivery speed and expanded capacity and density to be effective checks congestion control method is better than The result traditional.

**Keywords** - Mobile Ad hoc Networks, Congestion control, TCP, Rate Control

## I. INTRODUCTION

### 1.1. Mobile Ad hoc Networks

Mobile network nodes without infrastructure as mobile ad hoc networks (MANET) is known. Organization of mobile nodes in a network is beyond the radio link. To establish paths between nodes, some special routing protocols are used. The nature of mobile ad hoc networks represent a difference between the concept of wireless features and nature of the network topology and the exclusive nature of Mobile ad hoc networks can be used at any place and any location.

Mobile ad hoc network use, including military conflict, disaster relief and rescue during an emergency, discovery and is also groups related to the use of mobile ad hoc networks, including conference calls, data dissemination is services [1].

MANETs are a kind of Wireless ad hoc network that usually has a rout able networking environment on top of a Link Layer ad hoc network. MANETs consist of a peer-to-peer, self-forming, self-healing network. MANETs circa 2000-2015 typically communicate at radio frequencies (30 MHz - 5 GHz).

### 1.2. Congestion Control

When several transmitters set to compete for bandwidth with data speeds used by each transmitter to avoid network overload is necessary. When the router will drop packets arrive and cannot move forward. Also a lot of packages when they drop a lot of packets in a network to reach a stumbling block. Packets that are dropped can move longitudinally alongside the missing packet transmissions used in most cases as a

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driver again. If an appropriate congestion control is implemented more packages are sent to the network and network capacity while creating network congestion becomes worse, resulting in successful where more data is not delivered the density to be created. [2]

In reality On the Internet, congestion control is in the responsibility of the transport layer, more precisely of TCP. TCP combines congestion control and reliability mechanisms. This combination allows performing congestion control without the need for explicit feedback about the congestion state of the network, and without direct participation of the intermediate nodes. To detect network congestion, TCP simply observes occurring packet losses. Since on the Internet, missing packets are almost always caused by congestion, a missing packet is interpreted as a sign for network congestion.

### 1.3. Rate Control

Such as the nature of the network and is considered self-locking design, while ACK packets arrive and can be avoided by transferring the speed.

In order to estimate the delay and bandwidth requirements of real-time traffic, speed control locally at each node in a mobile and in a completely decentralized and dispersed done. Speed control for best effort traffic restriction is designed to create the necessary bandwidth. Speed control is also best effort traffic and bandwidth used in an effective way that only real-time traffic not used during any special occasion. The overall speed of the traffic and best effort traffic distribution in real time during each conductive network with a common time, to maximize long overdue, following a real threshold is maintained.

Method of determining the data rate adopted by the obvious method is to facilitate and speed control mechanism so as to scale the bandwidth and re-routing events respond. Transfer speed available source can help to facilitate the flow control that avoids congestion, adjusted. [3]

In order to meet the bandwidth and latency requirements of real-time traffic, local control rate in the manner in each mobile node in a fully distributed and decentralized done. Control traffic rate limiting efforts to establish the necessary bandwidth is designed. Rate control also allows best effort traffic for bandwidth utilization in an efficient way by the real-time traffic cannot be used during any particular situation. The total

rate of all best effort traffic and real-time traffic distribution over time shared media channel is stable below a certain threshold, to minimize the excessive delay. [6]

Explicit approval by the method of identification data rates and thus facilitate the flow rate control mechanism to quickly respond to the modulation bandwidth and re-routing events. [7] The transfer rate for the device resources can help to avoid congestion adjustable flow control. [8]

### 1.4. Problem Identification and Solution

A major challenge in congestion control method in MANET is how it learns sender information network congestion and speed adjustment.

In previous research, a controlled compression and is compatible with multi-path routing protocols to achieve load balancing and congestion avoidance in MANET was proposed. Multiple Choice safe routes to failure of nodes with minimal time and energy better battery power remaining. When the average time a node along the way beyond a threshold is increased, the traffic over multiple paths unknown to reduce the traffic load on the link detached densely distributed.

## II. RELATED WORK

MS. Kata Subramanian and colleagues QoS architecture for managing bandwidth and speed control proposed in the MANET. QoS architecture is proposed to include a bandwidth management method is compatible with the bandwidth available to each node is calculated in real time and then it is released on demand with QoS routing protocol. When the specified network congestion, QoS mechanisms to regulate traffic speed control is in the best Level. [4]

The first class alternative protocol, the protocol is the EXACT by Chen et al. EXACT based on your speed network by, for example, by intermediate nodes, are supported. These nodes state variables into account all processes from which they pass. All the nodes in your neighborhood to determine their current bandwidth and can share the broadband local fair for the entire course of their calculation.

Kazi Chandrima Rahman et al [9] proposed explicit rate based congestion control (XRCC) for multimedia streaming over mobile ad hoc

networks. XRCC addresses the problems that TCP faces when deployed over ad-hoc networks, and thus shows considerable performance improvement over TCP. Although XRCC minimizes packet drops caused by network congestion as compared to TCP congestion control mechanism, it still suffers from packet drops.

Hongqiang Zhai et al [10] proposed a novel rate based end-to-end Congestion Control scheme (RBCC). Based on the 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 to efficiently and reliably support the transport service in MANET. In RBCC, a sub layer consisting of a leaky bucket is added under TCP to control the sending rate based on the network layer feedback at the bottleneck node.

For mobile multimedia communication Fu et al. also propose an adaption of TFRC called ADTFRC [4]. TFRC is a rate-based transport protocol originally developed as a TCP-friendly transport protocol for wired networks with smooth rate adaption properties [5]. ADTFRC applies the same ideas to TFRC that ADTCP applies to TCP. An identical combination of metrics and general mechanism are used to distinguish loss types and to provide receiver-based feedback.

### III. Congestion control method based on rate

#### 3.1. General overview

Based on our case, the transmitter data packets to the destination node via intermediate nodes leads, in this regard, the intermediate node, the network traffic and data to estimate the length of the queue and sends it to the recipient. This step is repeated at each intermediate node, and the packet reaches the destination node. After receiving the data packet, the destination node information contained in the packet header, and then control the rate is estimated to get them in one package, copy and paste as a reflection of it is sent to the sender. Finally transmitter control in accordance with the estimated rate, which reached the receiver to be updated.

#### 3.2. Estimating the scale

##### 3.2.1 Rate (Speed) Estimation

The source node, data packets to the destination through intermediate nodes sends

Korea. According to the buffer position intermediate nodes, depending on the input or output of intermediate node to the intermediate node, deleted or central nodes are updated with the new position.

The rate of the incoming packet ( $\tau_i$ ) is estimated as the reciprocal of the arrival time interval of the incoming packet.

$$\text{i.e. } \tau_i = 1/\tau_i \quad (1)$$

The rate of the outgoing packet ( $\tau_o$ ) is estimated as the reciprocal of the service time of the packet.

$$\text{i.e. } \tau_o = 1/\tau_o \quad (2)$$

#### 3.2.2 The frequency of use of the network

In the wireless networks, when the transmission channel is being completely utilized, it is concluded that the network Congestion has occurred. The channel utilization for time interval  $t$  is estimated using channel busy-time ( $T_c$ ) metric on a Percentage scale. The channel busy-time can be computed based on the category of control frame and the rate and data Frame size. [11]

$T_c$  can be computed as the sum of the time utilized by the transmission of all data and control frames in the network and The total number of delay components at time  $t$  (explained in Eq (3)). The delay is taken into account while estimating  $T_c$  as the medium remains unshared among the stations in the network at time  $t$ .

The percentage channel utilization at time  $t$ ,  $CU(t)$  [11] is Given using Eq (4)

$$T_c(t) = (\alpha(t) * T_{cr}) + (\beta(t) * T_{cc}) + (\gamma(t) * T_{ca}) + (\delta(t) * T_{cb}) + \left( \sum_0^{d(t)} T_{cd}(Z_i) (\tau_i) \right) \quad (3)$$

$$\%CU(t) = \frac{T_c(t)}{10^6} * 100 \quad (4)$$

#### -Algorithm for Detecting Congestion

1. The source sends the data packets to the destination through The intermediate nodes.

The intermediate nodes.

2. Let % CU<sub>th</sub> be the predefined threshold percentage channel Utilization

Upon reception of the data packets,

intermediate node verifies channel utilization and further assigns value to  $C_b$  as per following cases.

If  $\%CU > \%CU_{th}$ , Then Set  $C_b = 1$

End if

If  $\%CU = \%CU_{th}$ , Then Set  $C_b = 0$  End if

Upon detection of density, intermediate node estimates the new rate information. The recipient information in a packet and a confirmation copy it to the sender, the sender after receiving the package rate with the rate achieved to date are estimated.

### 3.2.3. Algorithm for rate based congestion control

The following measures were taken to control our rate:

$C_b$  = congestion bit set in the packets IP header

$\tau_e$  = rate estimated in the intermediate node

$\tau_p$  = estimated rate of the previous node

ACK = acknowledgement packet

The algorithm for rate based congestion control is described below:

The current rate of the node [9] is taken as inverse of its

Thus the rate estimated at the intermediate node ( $\tau_e$ ) [9]

Is as follows “ $\tau_p$  is the estimated rate of the previous node”

If  $\tau_e > \tau_p$  Then Set the packet with  $\tau_e$ , The intermediate nodes insert the information of congestion bit ( $C_b$ ) and the estimated rate ( $\tau_e$ ) into the options field of standard IP header.

The process of rate estimation is repeated in every intermediate node and packets are updated with estimated rate Value, after the reception of the data packet, the destination node checks for the value of  $C_b$  and rate information in the packets IP header fields. Along with  $C_b$ ,  $\tau_e$  is also copied to an acknowledgement (ACK) packet and feedback to the sender by the destination node. The ACK packet contains the source address, destination address, and time stamp fields. [Shown in Figure1] After receiving an ACK packet, sender controls the amount of  $C_b$ . If  $C_b = 1$ , then it updates the current sending rate to the estimated rate  $\tau_e$ .

Since the rate is based on the estimated rate of intermediate nodes is set, this method is better than the traditional congestion control.

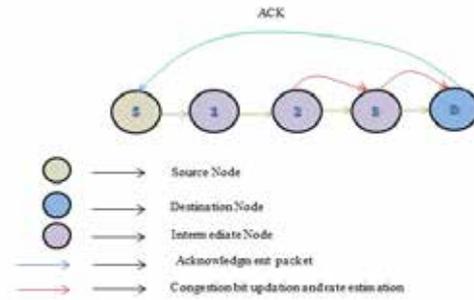


Figure 1. Congestion Control

## IV. SIMULATION RESULTS

### A. Simulation Parameters

The proposed algorithm was tested in a simulated environment with NS2. In this simulation, the host mobile network capacity, the value is set to 2Mbps. We distributed organization structure (DCF) of the IEEE802.11 MAC layer protocol for wireless networks as we use. The structural network has information about the failed link.

In our simulation, the number of nodes is 110. Mobile nodes in a square area 1250 x 1250 mm for the simulation run 50 seconds. We assume that each node to independently make the same move with an average speed. All nodes on the same transmission range of 250 meters. In our simulation, the speed in 10m/s is fixed. Mobile mode, random point is mobile version. Traffic simulation speed constant (CBR) is. Our speed of 250 kb and 1000 kb different traffic and traffic flows are from 2 to 8.

### B. Performance Parameters

The proposed method by RCC [9] based on the following parameters were compared.

The average delay from end to end: end-to-end latency while maintaining all data packets from source to destination, on average, has been set.

The average ratio of shipping: The number of received packets to be successful than the total number of packets is transmitted.

Drop: the average number of packets during transmission loss (discarded) is found.

Using the values for all 3 parameters presented above, the numbers compare, and finally using the formula  $((\text{Max Value} - \text{Min Value}) / \text{Max Value}) * 100$  percent of the improvement of the proposed method compared to XRCC Is expressed.

*A. According to Flow*

First, we have a different number of streams such as 2, 4, 6, and 8 have to maintain speed at 250 kb.

Figure 2 presents the results average end to end delay to increase the flow. From these results, it can be seen that Proposition 5/58% lower latency than is XRCC plan.

Figure 3 Results of packet delivery ratio to change the layout of the show. In particular, we plan to 4/13% packet delivery ratio achieves more than XRCC.

Figure 4 shows the results of packet loss. From these results, it can be seen that the supposed 58/24% packet loss is less than XRCC.

*B. According to Rate*

In the second experiment, we rate (rate) packets as 250, 500, 750 and 1000 Kb to keep the number of streamers at 8 we set.

Figure 5 average end to end delay to speed up the show. It can be seen from the results that we plan 39/17% lower latency of the project XRCC.

Figure 6 shows the averaged results of the shipping for different speeds. In particular, we plan to 6/69 percent more package delivery against plan achieves XRCC.

Figure 7 shows the results of packet drops in the rate. From these results it can be seen that the supposed 19/15% packet drop is less than XRCC.

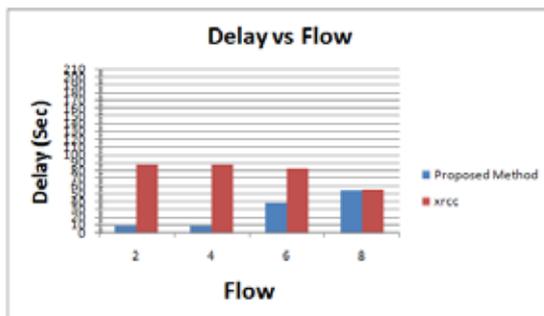


Figure 2. Flow Vs Delay

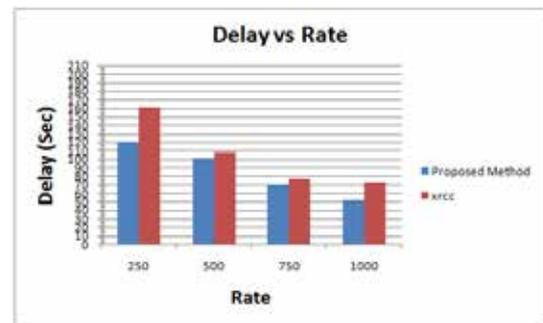


Figure 5. Rate Vs Delay



Figure 3. Flow Vs Delivery Ratio



Figure 6. Rate Vs Delivery Ratio

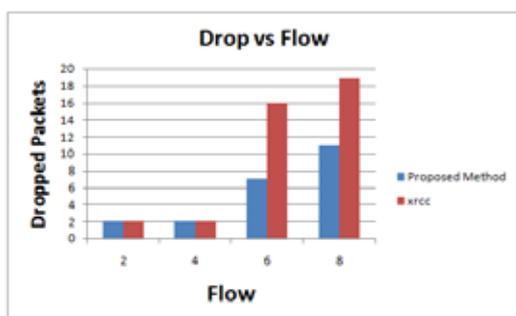


Figure 4. Flow Vs Drop

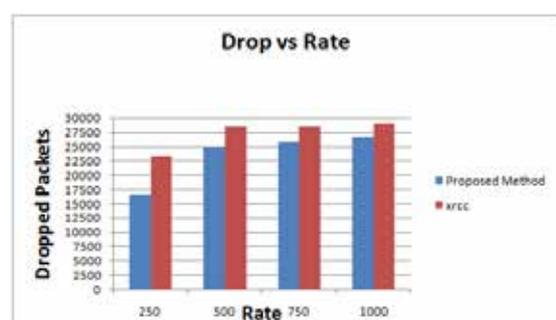


Figure 7. Rate Vs Drop

Finally, in this study, a method of multi-path load balancing and congestion control based on the rate offered. In our approach, the source node (transmitter) data packets through intermediate nodes to the destination node send. Upon receipt of the data packet at each intermediate node, the percentage of estimated network, then based on this value, estimated position and the rate is calculated and transmitted to destination. The update. Simulation results show that this method is higher than package delivery and the proposed Method is more reliable than the XRCC.

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