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Quality of Service Model for Load Balancing In Mobile Adhoc Networks

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Abstract: **Mobile Ad hoc Networks is a collection of wireless mobile nodes, which form temporary networks without relying on any existing infrastructure or centralized administration or standard support services regularly available in wide area networks to which the host may normally be connected. In this Paper we proposed a model i.e. Normalized Weighted Queue Model that was compared with other models and results are shown using NS2 Simulator**

Keywords: **QOS, MANETs.**

I. Introduction

Mobile Ad hoc Networks is a collection of wireless mobile nodes, which form temporary networks without relying on any existing infrastructure or centralized administration or standard support services regularly available in wide area networks to which the host may normally be connected [4]. MANET is one of the most important technologies that have gained interest due to recent advantages in both hardware and software techniques. MANET technology allows a set of mobile uses equipped with radio interfaces (Mobile nodes) to discover each other and dynamically form a communication network. MANET incorporates routing functionality into mobile nodes so that they become capable of forwarding packets on behalf of other nodes and thus effectively become the infrastructure. Providing multiple routing paths between any source-destination pair of nodes has proved to be very useful in the context of wired networks [5].

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They are opening up to various applications of Quality of service, Such as delay, throughput, packet loss and network lifetime. The mobility of nodes and the error prone nature of the wireless medium pose many challenges, including frequent route changes and packet losses, in the way of meeting the requirements of QoS. Such Challenges increases packet delay, decreases throughput and reduce network failure. The network performance degradation gets worse as traffic load increases. Despite there are large amount of effort invested in routing protocols, improving TCP performance and medium access control (MAC) for MANET [9].

The MANET can be applied in various applications such as:

- Patient Monitoring
- Detection of Earthquakes
- Ecological Danger Monitoring
- Tracking Enemy Movement
- Cyclone Evolution Analysis

Load balancing is an important key factor of MANET. Load Balancing is a very important prerequisite for an efficient use of parallel computers. Many parallel applications produce work load dynamically and its amount per processor often changes dramatically during run time. Therefore to reduce the overall computation time, the total work load of the network has to be distributed evenly among all the nodes while the computation proceeds [2]. It distributes work among resources in such a way that no one resource should be overloaded and each resource can have improved performance, depending on the load balancing algorithm. Items such as network traffic, SSL requests, database queries, or even hardware resources such as memory can be load balanced. It is the process by which inbound internet protocol (IP) traffic can be distributed across multiple servers. Load balancing enhances the performance of the servers, leads to their optimal utilization and ensures that no single server is overwhelmed [7]. Load balancing is iterative in nature. Local iterative load balancing algorithms were first proposed by Cybenko. These algorithms iteratively balance the load of a node with

its neighbors until the whole network is globally balanced. There are mainly two iterative load balancing algorithms: the diffusion algorithms and the dimension exchange algorithms. Diffusion algorithms assume that a processor simultaneously exchanges load among all neighbor processors, whereas DE algorithms assume that a processor exchanges load with only one neighbor at each time step [3]. Load balancing is particularly important for busy networks, where it is difficult to predict the number of requests that will be issued to a server. Typically, two or more web servers are employed in a load balancing scheme. A load balancer can use many different algorithms. The most basic method is round-robin, which sends a request to each server in the cluster successively. More sophisticated techniques make decisions based on CPU usage, number of requests queued, average response time or even number of lost packets [8]. Load Balancing can be applied in various applications such as:

- Single Internet service from multiple servers, sometimes known as a server farm
- Load-balanced systems include popular web sites
- Large Internet Relay Chat (IRC) networks
- High-bandwidth File Transfer Protocol (FTP) sites
- Network News Transfer Protocol (NNTP) servers.
- Domain Name System (DNS) servers.

II. Literature Review

Deficit Round Robin [10] is extension to round robin model for resource allocation. It is better than the round robin in terms of bandwidth reservation, though it pre reserves it. It uses deficit counter for managing resources among various routing units in network. As it is counter based approach, it uses more memory thus, can be used for network with small size and lesser number of nodes. It preserves the resources and takes more bandwidth. This produces longer delays and thus, cannot be deployed for large and highly dynamic networks.

Relative Bandwidth based flow model [11] is service profile model that maintains traffic profile for usage of bandwidth for maintain routing link between the nodes in ad hoc networks. This model requires dynamic adjustment of bandwidth as link capacity is not certain and may vary depending upon the mobility of the node and change in distance between relaying node. It maintains path on basis of common bandwidth requirement. This model maintains short term relationship between the arrived load and allocated service to particular class.

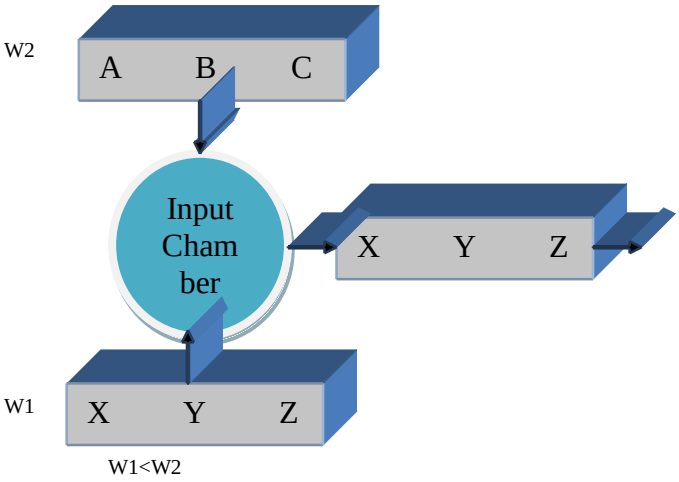
Weighted Fair Queue *[12]* is used for avoiding congestions in network to provide better QoS to end users. It works as conservative model for providing QoS to end user. It uses priority based queuing method for providing QoS to end user.

III. Proposed Work

A. *Explanation of Proposed technique*

The technique is based upon the consumption of bandwidth which is to be allocated to particular input chamber that decides the forwarding policy based upon the weight as shown in figure. The major functioning part of our technique is explained below.

- Bandwidth is allocated on priority basis lowest weight
- No pre-reservation of bandwidth
- Hence, division of bandwidth is carried out properly
- Therefore no bandwidth wastage



B. *Proposed Algorithm:*

Packet ()

1. ***Decide packet for transmission (From Application Layer)***
2. ***Queue (Packet, Count)***
3. ***Set priority_queue (queue (Packet, Count))***
4. ***Weight (Queue)***
5. ***Lesser (Weight (Queue))***
6. ***Transmit (Lesser)***
7. ***Exit***

Weight (Queue)

1. ***Weight_queue(Packet)***
2. ***Lesser (weight)***
3. ***Exit***

c. *Formula Used*

The following formulas are used to calculate bandwidth & End to End Delays.

Bandwidth*=Rmin/Reff*No of users*
*Reff=Weight*No of PU/Simulation Time*
Weight=PU/Queue Size
Rmin: Minimum Achievable Rate
PU: Presentation Unit
End to End Delay: *Number of Packet Lost*Number of Nodes/Link Speed*

IV. Simulation Results And Graphs

This Model considers an area of 800 m X 800 m with a set of the mobile nodes placed randomly. The parameters are shown in table 1.

Topology Size	800 m X 800 m
Simulation time	1000s
Communication Media	802.11b
Channel capacity	6 Mbps
No of Users	50
Packet Type	CBR
Packet Size	1024B
Node Mobility	0-2m
Transmission Range	250 m
Mobility Model	Random waypoint
Simulation Time	20
Pause Time	1 s
Rmin	500 bits/sec
Queue Size	10 B
Simulator	NS-2-34

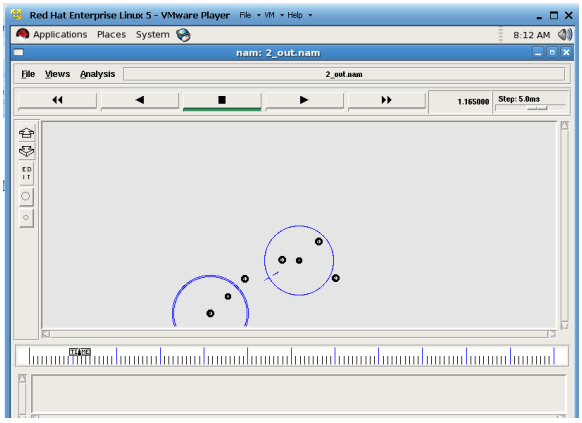


Fig 1: Initial Manets Structure

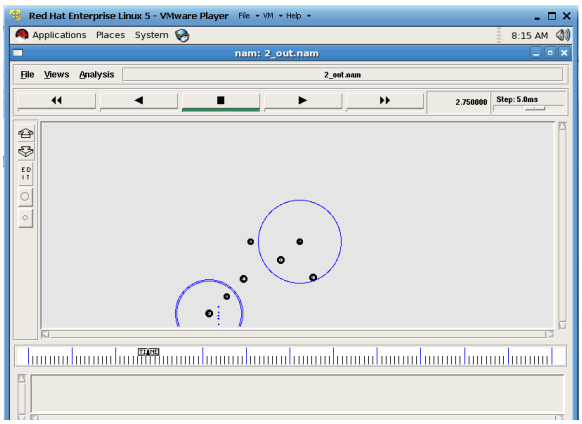


FIG 2

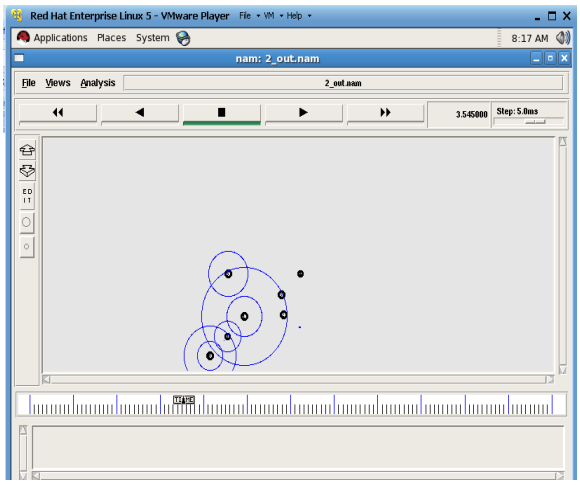


FIG 3

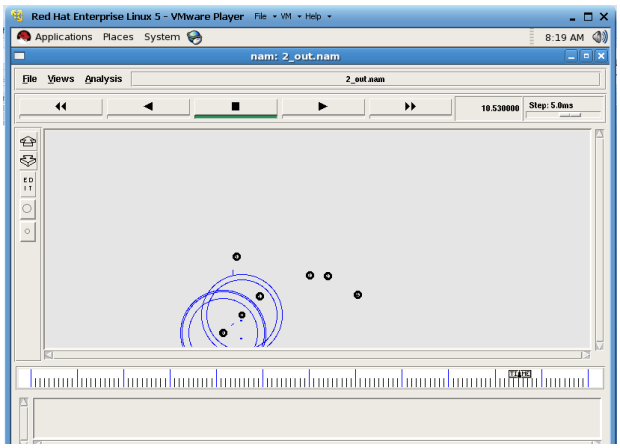
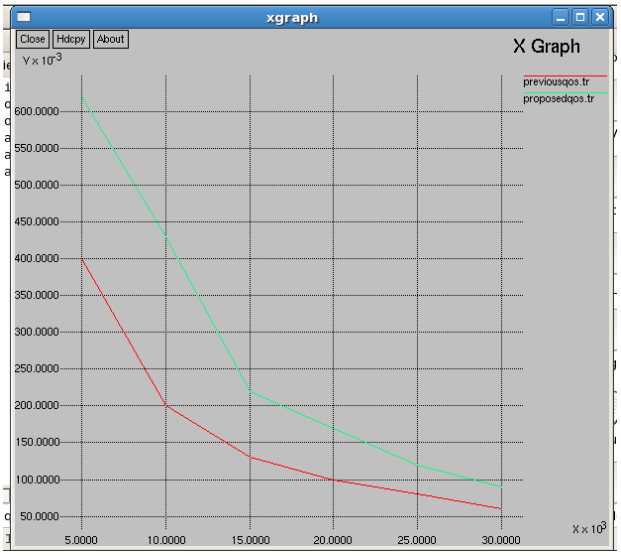


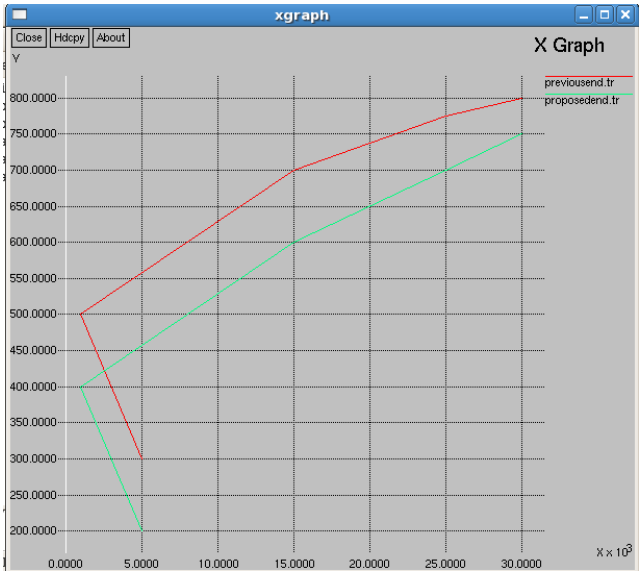
FIG 4

Figure 2, 3 and 4 are according to our algorithm



Graph 1: (Bandwidth: Previous Vs Proposed)

Graph 2 shows the comparison between previous and proposed bandwidth. Proposed bandwidth is 25% better than previous delays.



Graph 2: (End to End Delays: Previous Vs Proposed)

Graph 2 shows the comparison between previous and proposed end to end delays. Proposed delays are 5% better than previous delays.

v. Conclusion & Future Work

We have analyzed QoS for end users for load balancing and proposed an improved model for handling queue data and thus, evaluated that our model performed better than the previous proposed models. In future work can be carried out in optimizing cost, and throughput regarding QoS for end users.

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