QFNSS BASED SCHEDULING ALGORITHM IN MOBILE AD-HOC NETWORKS

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Abstract:

Mobile ad hoc networks consist of a collection of mobile nodes without having a fixed infrastructure. Due to the infrastructure less network, there exist a frequent link breakage which leads to frequent path failures and route discoveries. A mobile node blindly rebroadcasts the first received route request packets unless it has a route to the destination and thus it causes the broadcast storm problem. In this proposed work, to overcome this problem we have implemented a new algorithm called "QoS factors based node selection method and Scheduling" (QFNSS) in which is the node is selected for the routing process. In Proposed work, for each and every link the packet delivery ratio, throughput, delay, bandwidth, stability, interference is computed. Based on the node selection, then the packet priority is computed for the scheduling process. It selects an intermediate node assigns the highest priority to the packet with the closest deadline and forwards the packet with the highest priority first. An experimental result shows in the proposed system to achieve high packet delivery ratio, less delay, high bandwidth utilization when compared to the existing system.

Keywords: MANET, Ad-hoc networks, Quality of services, NFPS, QFNSS.

1.Introduction

A mobile ad hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Ad hoc is Latin and means "for this purpose". Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. It is a kind of Wireless ad hoc network that usually has a routable networking environment on top of a Link Layer ad hoc network[1].

2.Proposed method

Mobile ad hoc networks (MANETs) consist of a collection of mobile nodes which can move freely. These nodes can be dynamically self-organized into arbitrary topology networks without a fixed infrastructure. One of the fundamental challenges of MANETs is the design of dynamic routing protocols with good performance and less overhead. Many routing protocols, such as Ad hoc On-demand Distance Vector Routing (AODV) and Dynamic Source Routing (DSR), have been proposed for MANETs. The above two protocols are on-demand routing protocols, and they could improve the scalability of MANETs by limiting the routing overhead when a new route is requested. However, due to node mobility in MANETs there is a frequent link breakages may lead to frequent path failures and route discoveries which could increase the overhead of routing protocols and reduce the packet delivery ratio and increasing the end-to-end delay. Thus, reducing the routing overhead in route discovery is an essential problem [2].

The conventional on-demand routing protocols use flooding to discover a route. They broadcast a Route Request (RREQ) packet to the networks, and the broadcasting induces excessive redundant retransmissions of RREQ packet and causes the broadcast storm problem which leads to a considerable number of packet collisions, especially in dense networks. Therefore, it is indispensable to optimize this broadcasting mechanism. Some methods have been proposed to optimize the broadcast problem in MANETs in the past few years. The broadcasting protocols are categorized into four classes: “simple flooding, probability-based methods, area based methods, and neighbor knowledge methods.” For the above four classes of broadcasting protocols, they showed that an increase in the number of nodes in a static network will degrade the performance of the probability-based and area-based methods [3][4].

Since, limiting the number of rebroadcasts can effectively optimize the broadcasting, and the neighbor knowledge methods perform better than the area-based ones and the probability-based ones and then propose a neighbor coverage-based probabilistic rebroadcast (NCPR) protocol[5] and in order to effectively exploit the neighbor coverage knowledge we need a novel rebroadcast delay to determine the rebroadcast order and then can obtain a more accurate additional coverage ratio[6]. In order to keep the network connectivity and reduce the redundant retransmissions, we need a metric named as connectivity factor to determine how many neighbors should receive the RREQ packet. But the drawback of the NCPR protocol is less throughput and less packet delivery ratio. In the proposed system, “QOS factors based node selection and scheduling method” (QFNSS) is introduced and selects the node for routing based on the following metrics such as interference level, bandwidth and stability to get high packet delivery ratio and throughput.

QOS factors based node selection and Scheduling algorithm (QFNSS)

1. Initialize N number of nodes randomly in the mobile adhoc network
2. Set of nodes $V = (v_1, v_2, .. v_N)$ // N =total number of nodes, i=1,2,..N, i=identifier of the node
3. $\forall i$ compute the metrics
4. // Computation of interference
5. Signal to interference ratio (SIR) distribution between two nodes with RSSI distribution P_i and P_j is given by,
6. $SINR(v_i) = \frac{J(e_i)}{d(u_i,v_i)^{\alpha}[N_0 + \sum_{j \neq i} \frac{J(e_j)}{d(u_j,v_i)^{\alpha}}]} \geq \beta$ // where N_0=noise density, α= path loss component, $J(e_i)$= power level which node u_i transmits, β=antenna gain, $d(u_i, v_i)$ = Euclidean distance between nodes
7. // Computation of bandwidth
8. $BW(v_i) = SZ_{v_i}/TM_{v_i}$ // Where SZ_{v_i}= Size of the input data for node v_i, TM_{v_i}=data movement time
9. // Computation of stability
10. $R_{i,j}(a_{i,j}) = \frac{\sum_{a=a_{i,j}}^{A_{max}} a.d[a]}{\sum_{a=a_{i,j}}^{A_{max}} d[a]}$ - $a_{i,j}$ // where $R_{i,j}(a_{i,j})$=residual lifetime, a_{max} represents the maximum observed age of the links, d is an array of length a_{max} + 1 used to store the observed data, d[a] represents the number of links
11. **If** ($n_i =$ (More stable+ less traffic+ High packet delivery ratio+ high throughput+ less interference) **then**
12. Compute every node capacity in terms of stability, interference and bandwidth
13. RREQ packets are forwarded
14. //Scheduler
15. Compute the queuing time of the packets
16. $T_w^{(x)} = \sum_{j=1}^{x-1}(T_{I \to D}^{(j)} \cdot \frac{[T_w^{(x)}}{T_a^{(j)}]} (0 < j < x)$ // where x denotes a packet with the xth priority in the queue, and $T_{I \to D}^{(j)}$ and $T_a^{(j)}$ respectively denote the transmission delay and arrival interval of a packet, $\left\lceil T_w^{(x)}/T_a^{(j)} \right\rceil$ is the number of packets arriving during the packet’s queuing time $T_w^{(x)}$ which are sent out from the queue before this packet

17.Packets are forwarded by the intermediate nodes

3.Performance Evaluation

In the proposed work, we evaluate the performance of the QOS factors based node selection and scheduling method (QFNSS) is introduced using Ns. It is introduced in which the node capacity is computed for the routing process. This method computes the delay, bandwidth, stability, interference for each and every link in the network. Compare to existing system (NCPR) there is high packet delivery ratio and throughput in the proposed system.

4.Simulation environment

By using Ns2 2.3.4 simulator, we find out the simulation parameters such as packet send, packet receive and throughput etc.

4.1Simulation Parameters

Parameters	Values
Simulation Area	1000*1000m
Number of Nodes	30
Algorithm	QFNSS
Scheduling queue type	Priority queue
Protocol	AODV
Propagation	Radio-propagation model
Antenna	Omni-antenna model
Topology	Flat grid
Traffic type	CBR

4.2 Performance Metrics

4.2.1 End-to-End delay

This is the delay elapsed between the packet generation at the source and successful reception at the destination.

Figure 1. End-to-End delay

Table 1: End-to-End delay

S.NO	Time(ms)	End-to-end delay	
		NFCS	QFNSS
1.	50	35	26
2.	100	38	29.5
3.	150	42.5	33.4
4.	200	46	37.2
5.	250	48	40.4
6.	300	52.69	41.1

4.2.2 Packet delivery ratio

It is defined as the ratio of the number of delivered data packet to the destination. This illustrates the level of delivered data to the destination.

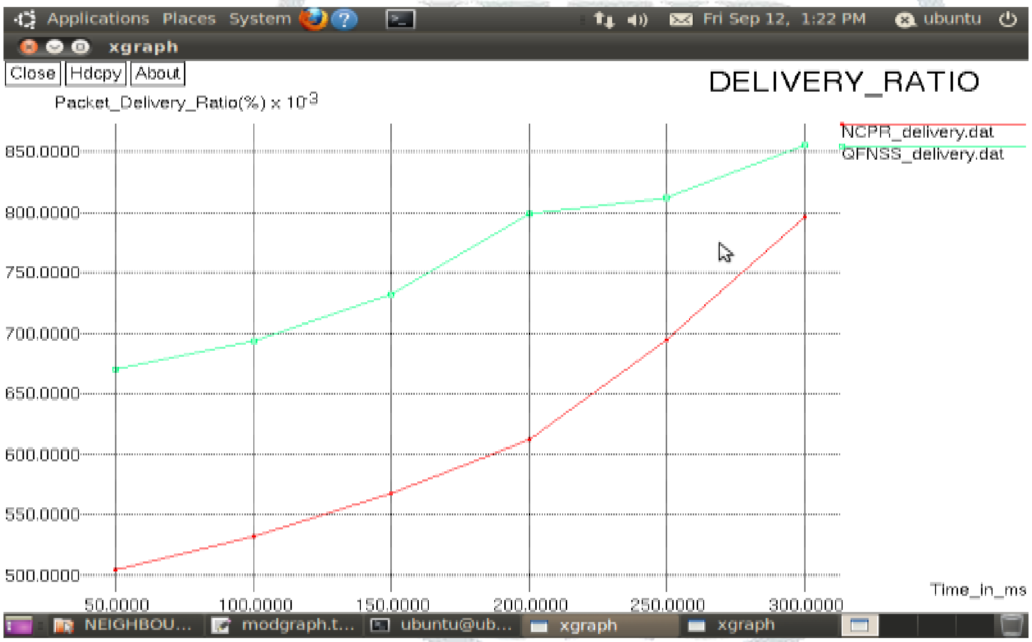

Figure 2. Packet delivery ratio

The packet delivery ratio is measured with varying from source to destination distance. The QFNSS protocol is compared with NCPR and experienced with an increases in packet delivery ratio as shown in figure 2.

In NCPR increases the packet delivery ratio about 21.8 and 6.3 when compared to QFNSS.

Table 2: Packet Delivery Ratio

S.NO	Time(ms)	Packet delivery ratio (%)	
		NCPR	QFNSS
1.	50	510	680
2.	100	535	690.25
3.	150	573.9	730.25
4.	200	620.36	800
5.	250	690.26	810.25
6.	300	799.36	860.25

4.2.3 Routing overhead

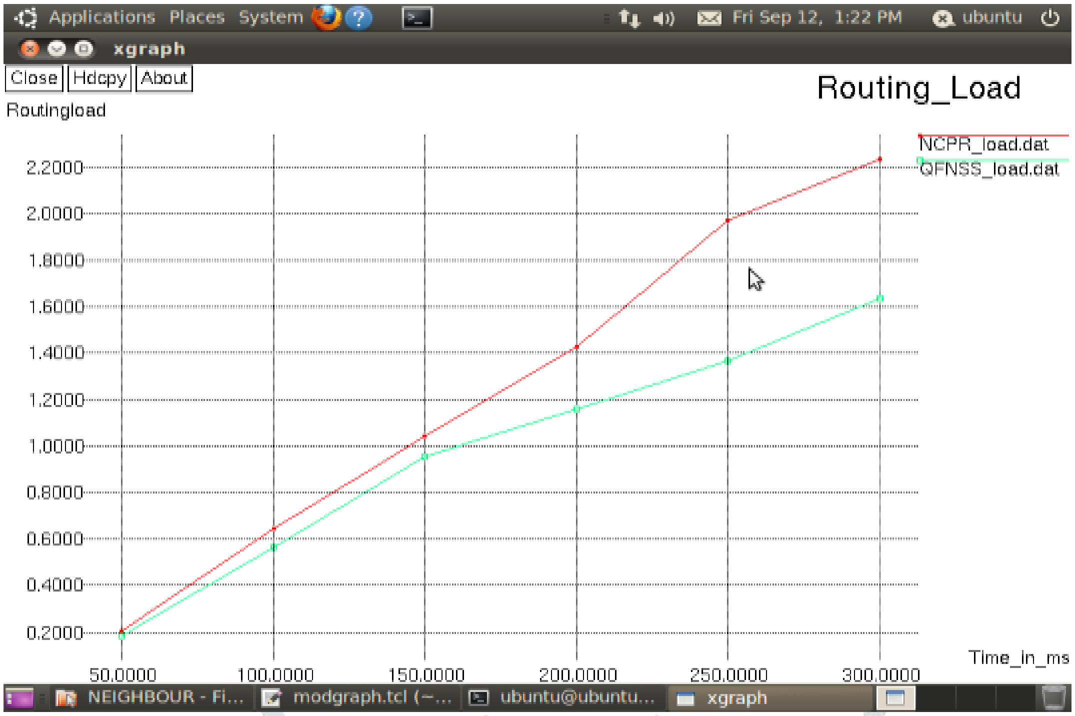

Figure 3. Routing overhead

The routing overhead that can occurred in the NCPR when the packet size increases and it decreases the packet size when compare to QFNSS.

Table 3: Routing Overhead

S.No	Time(ms)	Routing load	
		NCPR	QFNSS
1.	50	0.2	0.2
2.	100	0.65	0.58
3.	150	1.12	0.98
4.	200	1.42	1.19
5.	250	1.91	1.39
6.	300	2.23	1.64

5.Conclusion And Future Work

In this work, we have explored crucial problems such as link breakage and routing overhead etc., But in proposed work a new techniques is implemented called as “QFNSS QoS factors based node selection and scheduling algorithm” based techniques it aims to reduce the end – to- end delay, routing overhead and increase the packet delivery ratio and throughput. This algorithm assigns earlier generated packets to forwarders with higher queuing delays and scheduling feasibility, while assigns more recently generated packets to forwarders with lower queuing delays and scheduling feasibility, so that the transmission delay of an entire packet stream can be reduced.

References

[1] R. Nandakumar.(2019). A review on packet scheduling algorithm in manet. Infokara research, volume 8 issue 10 2019, issn no: 1021-9056.

[2] garg, k., & singh, r. (2012). Scheduling algorithms in mobile ad hoc networks. International journal of computer science & applications (tijcsa), 1(5).

[3]raj, a., & prince, p. B. (2013). Round robin based secure-aware packet scheduling in wireless networks. International journal of engineering science and technology, 5(3), 570.

[4] lathies bhasker, “a scope for manet routing and security threats,” *ictact journal on communication technology*, vol. 4, no. 4, p. 840, 2013.

[5] werner creixell, kaoru sezaki,” routing protocol for ad hoc mobile networks using mobility prediction,” pp. 149-156, 2007.

[6] d. Johnson, y. Hu, and d. Maltz, the dynamic source routing protocol for mobile ad hoc networks (dsr) for ipv4, ietf rfc 4728, vol. 15, pp. 153-181, 2007.