A Robust Method for Reducing Routing Overhead Using High Signal Strength in Manets

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Abstract : A mobile ad hoc network (MANET) is a continuously self configuring , infrastructureless network of mobile devices connected without wires, forming a temporaray network. This feature leads to frequent path failures and route reconstructions that causes increase in the routing control overhead. Broadcasting is an effective data dessimination mechanism for route discovery but also causes broadcast storm problem, which is characterised by redundant retransmission, collision and contention. In this paper, we described a robust method for reducing routing overhead using high signal strength with suitable scenarios. And also we suggest a method to reduce the routing overhead such that to improve the Quality of service (QOS) routing in MANETs.

Index terms: MANETs, Broadcast storm problem, Network connectivity, Probabilistic rebroadcast.

I.INTRODUCTION

MANETS stands for mobile Adhoc network, which is a set of wireless mobile nodes that forms a dynamic and temporary network without any centralised infrastructure, such networks are highly prone to security threats. Due to these features routing overhead is a major issue in Adhoc networks. On-demand routing protocols have been proposed for MANETS such as AODV , DSR and they could improve the scalability of MANETs by limiting the routing overhead. Due to mobility of nodes, there exist frequent link breakages that leads to frequent path failures and discovery of routes.

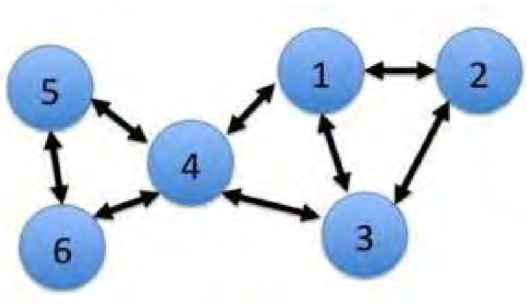

Fig 1: Redundant retransmission of RREQ packet

The conventional on-demand routing protocols use flooding to discover a route and induces excessive redundant retransmission of RREQ packet as shown in the above diagram and causes the broadcast storm problem which leads to a number of packet collisions, in dense networks. To overcome this problem, we propose a robust method for reducing routing overhead using high signal strength in manets which uses NCPR protocol. Therefore , 1) a novel rebroadcast delay is used to determine the rebroadcast order and effectively exploits the neighbor coverage knowledge, then a more accurate additional coverage ratio is also obtained. Rebroadcast delay enables the information that the nodes have transmitted the packet spread to more neighbors. 2) to reduce the redundant retransmissions and to keep the network connectivity, connectivity factor is used to determine how many neighbors should receive the RREQ packet. A rebroadcast probability is obtained by combining the additional coverage ratio and the connectivity factor, which can be used to reduce the number of rebroadcast of the RREQ packet to improve the routing performance. The scheme considers the information about the uncovered neighbors and also by using signal strength concept the uncovered neighbors are covered, thus the routing overhead can be reduced based on rebroadcast probability and also performance can be improved.

II.RELATED WORK

The conventional on-demand routing protocols use flooding to discover a route. They broadcast a Route Request (RREQ) packet to the networks for route discovery , but the routing overhead associated with the broadcasting can be quite large, especially in dense networks. Thus, optimizing the broadcasting in route discovery is an effective solution to improve the routing performance. Xim et al. [1] proposed a probabilistic rebroadcast approach based on coverage area. This scheme uses the coverage area to calculate the rebroadcast delay and rebroadcast probabilitybut it doesn't guarantee reachability of all neighbors. Stann et al. [2] proposed a Robust Broadcast Propagation(RBP) protocol that provides near-perfect rliability for flooding in networks. Keshavarz-Haddad et al.[3] proposed two deterministic timer-based broadcast schemes: Dynamic reflector Broadcast(DRB) and Dynamic Connector-Connector Broadcast(DCCB). They showed that their schemes can achieve full reachability over an idealistic lossless MAC layer, and for mobility and node failure , their schemes are robustness. Hass et al.[4] proposed a gossip based approach, where every node broadcast a packet with some predefined probability. They showed that their approach can save up to 35% overhead compared to the flooding. In our approach, we calculate a rebroadcast delay and rebroadcast probability using high signal strength, but the goal is to make the dessimination of neighbor knowledge much quicker.

III. NEIGHBOR COVERAGE BASED PROBABILISTIC REBROADCAST PROTOCOL .

In this section the rebroadcast delay and rebroadcast probability is calculated. Each node needs its 1-hop neighborhood information and the upstream coverage ratio of an RREQ packet is used to calculate rebroadcast delay, uses the additional coverage ratio of the RREQ packet and the connectivity factor to calculate the rebroadcast using high signal strength concept. When node ni receives a RREQ packet from its previous node s, it finds the neighbor node and it can use the neighbor list in the RREQ packet to estimate how many its neighbors have not been covered by RREQ packet from s. If node ni has more neighbors which are not covered by the RREQ packet from s, which means that if node ni rebroadcasts the RREQ packet, the RREQ can reach more additional nodes. So, we define the uncovered neighbors set U(ni) of node ni as follows :

$$U(ni)=N(ni) - [N(ni) \cap N(s)] - \{s\}, \quad (1)$$

Where N(s) and N(ni) are the neighbor stes of node s and ni. S is the node which sends an RREQ packet to node ni.

To exploit the neighbor knowledge, each node should set a rebroadcast delay and is defined as

$$Tp(ni) = 1- |N(s) \cap N(ni)| / |N(s)|$$

$$Td(ni) = MaxDelay \times Tp(ni), \quad (2)$$

Where Tp(ni) is the delay ratio of node ni, and MaxDelay is a constant Delay. **|.|** is the number of elements in a set.

IV. ALGORITHM

The description of the Neighbor coverage based probabilistic rebroadcast (NCPR) protocol for reducing routing overhead is shown below:

<u>Algorithm : NCPR</u>

RREQx: RREQ packet received from node x.

Rx.id: the unique identifier (id) of RREQx.

N(u): Neighbor set of node u.

U(u,v): Uncovered neighbors set of node u for RREQ whose id is v.

Timer(u,v): Timer of node u for RREQ packet whose id is v.

a) Rebroadcast Delay

1: if node ni receives a new RREQs from previous node s

2: Use neighbor list table to see uncovered neighbors set and compute U(ni, Rs.id)

3: $U(ni, Rs.id) = N(ni) - [N(ni) \cap N(s)] - \{s\}$

4: compute the rebroadcast delay Td(ni)

5: $Tp(ni) = 1 - |N(s) \cap N(ni)| / |N(s)|$

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Td(ni) = MaxDelay × Tp(ni)
set a Timer(ni, Rs.id) according to Td(ni)
end if
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b) Rebroadcast Probability

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if node ni receives a duplicate RREQj from neighbor node nj
adjust U(ni, Rs.id)
U(ni, Rs.id) = U(ni, Rs.id) – [U(ni, Rs.id) ∩ N(ni)]
discard(RREQj)
end while

if Timer(ni,Rs.id) expires then
compute rebroadcast probability Prc(ni)
Ra(ni) = | U(ni, Rs.id) | / | N(ni) |
Fc(ni) = Nc / | N(ni) |
Prc(ni) = Fc(ni) . Ra(ni)
if Random(0,1) <= Prc(ni) then
broadcast(RREQs)
else
Discard(RREQs)
end if
end if
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V. RESULTS

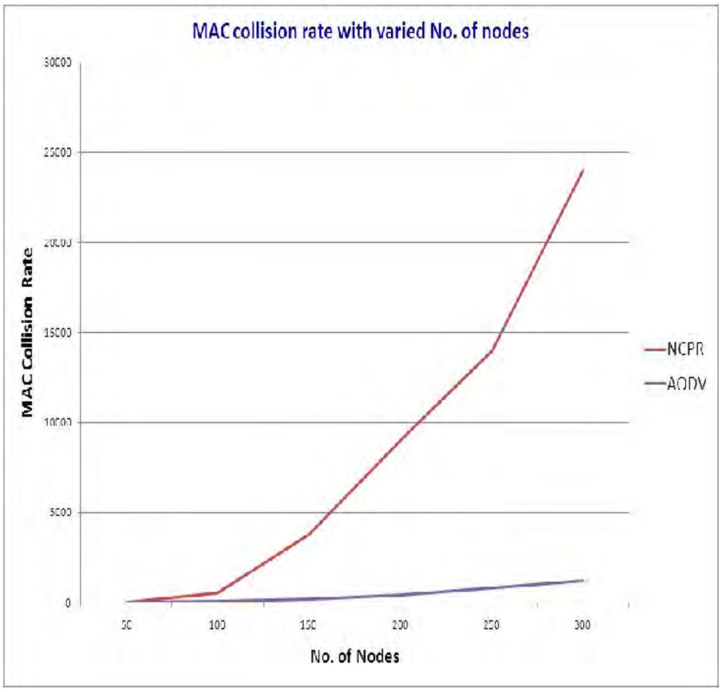

Fig 2: collision rate with varied number of nodes

Fig 2 shows the reduction of redundant rebroadcast and packet drops caused by collision to improve the routing performance. The NCPR protocol reduces the collision rate by about 92.8% on an average. So NCPR protocol could improve the routing performance.

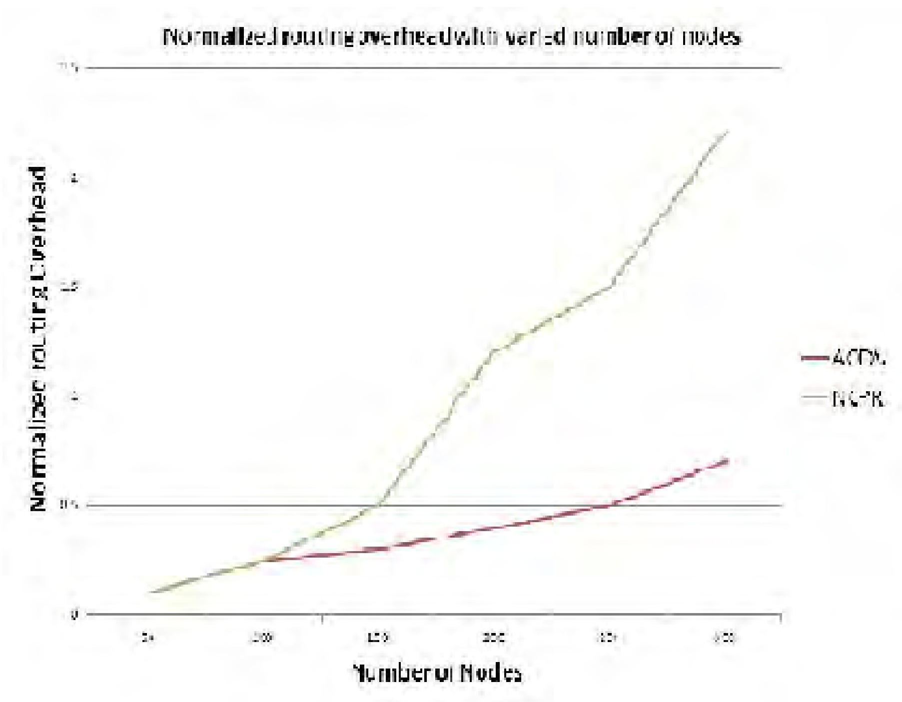

Fig 3 : Normalized routing overhead with varied number of nodes

Fig 3 shows the normalized routing overhead with varied network density. The NCPR protocol can reduce the routing overhead incurred during route discovery in dense network, then the RREQ traffic is reduced. The NCPR protocol yields the best performance, so that the improvement of normalized routing overhead is considerable.

VI. CONCLUSION AND FUTURE SCOPE

Because of node mobility in MANETs, always there is a greater chance of frequent link breakages between nodes. These frequent link breakages will cause a number of rebroadcasts between nodes and routing overhead. In this paper a robust method for reducing routing overhead in MANETs is discussed which uses additional coverage ratio, connectivity factor and high signal strength. Because of less redundant rebroadcast the proposed protocol mitigates the network connection , so as to increase the packet delivery ratio and decrease the average end-to-end delay, thus Quality of service (QOS) routing is maintained. In future this method can be used to check the suitability in VANETS and the same has to be implemented.

VII. REFERENCES

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