OPEN ACCESS

International
Journal
Of Modern Engineering Research (IJMER)

A Neighbor Coverage-Based Probabilistic Rebroadcast for Reducing Routing Overhead In Mobile Ad Hoc Networks

S. Divya[1], Dr. M. Rajaram[2], Dr. Selvakumar[3]

[1]*PG Scholar, Department of CSE Sri Ramakrishna Engineering College*
[2]*Professor Anna University Chennai*
[3]*Professor, Department Of SE (PG) Sri Ramakrishna Engineering College*

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 frequent link breakages which lead 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. So, rebroadcast is very costly and consumes too much network resource. In the existing System, different mechanisms are proposed for improving the routing performance. In the gossip-based routing overhead is reduced. However, when the network density is high, the gossip-based approach is limited. In the Dynamic Probabilistic Route Discovery scheme, each node determines the forwarding probability according to the number of its neighbors and the set of neighbors which are covered by the previous broadcast. So, coverage-based probabilistic rebroadcast protocol for reducing routing overhead in MANET propose a novel Ra rebroadcast delay to determine the rebroadcast order, and then it obtain the more accurate additional coverage ratio by sensing neighbor coverage knowledge. The advantages of the neighbor coverage knowledge and the probabilistic mechanism, which can significantly decrease the number of retransmissions so as to reduce the routing overhead, and can also improve the routing performance. To improve the quality of routing particularly in mobile ad hoc networks, improved routing protocol have been proposed such as Optimized Link State Routing Protocol (OLSR).*

I. INTRODUCTION

Introduction about MANET

MANET stands for "Mobile Ad Hoc Network." A MANET is a type of adhoc network that can change locations and configure itself on the fly. Because MANETS are mobile, they use wireless connections to connect to various networks. This can be a standard Wi-Fi connection, or another medium, such as a cellular or satellite transmission.

Some MANETs are restricted to a local area of wireless devices, while others may be connected to the Internet. For example, A VANET (Vehicular Ad Hoc Network), is a type of MANET that allows vehicles to communicate with roadside equipment. While the vehicles may not have a direct Internet connection, the wireless roadside equipment may be connected to the Internet, allowing data from the vehicles to be sent over the Internet. The vehicle data may be used to measure traffic conditions or keep track of trucking fleets. Because of the dynamic nature of MANETs, they are typically not very secure, so it is important to be cautious what data is sent over a MANET.

A mobile ad hoc network (MANET) is self-configuring Infrastructureless 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. MANETs are a kind of Wireless ad hoc network that usually has a routable networking environment on top of a Link Layer ad hoc network.

The growth of 802.11/Wi-Fi wireless networking have made MANETs a popular research topic since the mid-1990s. Many academic papers evaluate protocols and their abilities, assuming varying degrees of mobility within a bounded space, usually with all nodes within a few hops of each other. Different protocols are then evaluated based on measures such as the packet drop rate, the overhead introduced by the routing protocol, end-to-end packet delays, network throughput etc. OLSR reduces control packets by selecting only partial neighbor nodes for packet forwarding. OLSR is a optimization of a pure link state protocol in mobile ad hoc network, First it reduces a size of control packets. Second it minimize the flooding of the control traffic by using selecting node called multipoint relay. This technique reduces number of retransmission in flooding.

II. PROPOSED SYSTEM

In the proposed system, we introduce a innovative approach called neighbor coverage-based probabilistic rebroadcast protocol. Therefore,

- ✓ In order to effectively exploit the neighbor coverage knowledge, we need a novel rebroadcast delay to determine the rebroadcast order, and then we can obtain a more accurate additional coverage ratio.
- ✓ 2) In order to keep the network connectivity and reduce the redundant retransmissions, we need a metric named connectivity factor to determine how many neighbors should receive the RREQ packet.

After that, by combining the additional coverage ratio and the connectivity factor, we introduce a rebroadcast probability, which can be used to reduce the number of rebroadcasts of the RREQ packet, to improve the routing performance.

The main contributions of this paper

- ➢ Propose a novel scheme to calculate the rebroadcast delay. The rebroadcast delay is to determine the forwarding order. The node which has more common neighbors with the previous node has the lower delay. If this node rebroadcasts a packet, then more common neighbors will know this fact. Therefore, this rebroadcast delay enables the information that the nodes have transmitted the packet spread to more neighbors, which is the key to success for the proposed scheme.
- ➢ Propose a novel scheme to calculate the rebroadcast probability. The scheme considers the information about the uncovered neighbors (UCN), connectivity metric and local node density to calculate the rebroadcast probability.

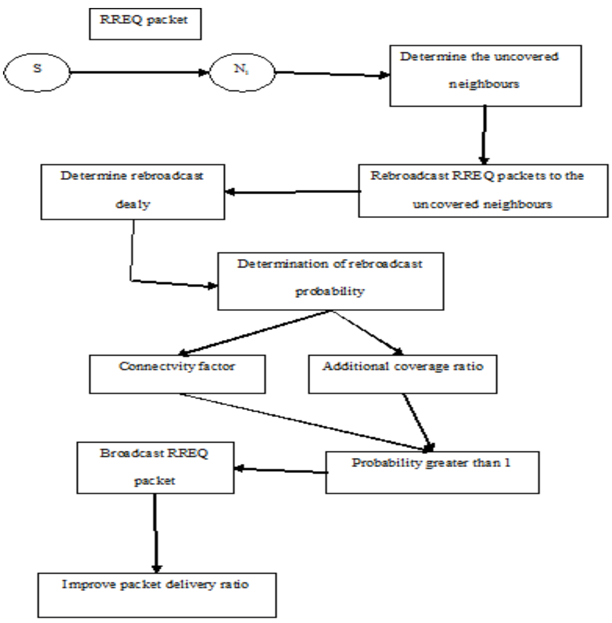
The rebroadcast probability is composed of two parts:

- ❖ additional coverage ratio, which is the ratio of the number of nodes that should be covered by a single broadcast to the total number of neighbors;
- ❖ Connectivity factor, which reflects the relationship of network connectivity and the number of neighbors of a given node.

Advantages of Proposed System

- ➢ Increase the packet delivery ratio
- ➢ Decrease the average end-to-end delay
- ➢ Decrease the number of retransmissions
- ➢ Improve the routing performance

III. ARCHITECTURE DIAGRAM



In this architecture source node sends RREQ packet to its N_i, it determine the uncovered neighbors and rebroadcast the RREQ packet to the uncovered neighbors. In order to effectively exploit the neighbor coverage knowledge, it need a novel rebroadcast delay to determine the rebroadcast order, and then it obtain a more accurate additional coverage ratio; In order to keep the network connectivity and reduce the redundant retransmissions, it need a metric named connectivity factor to determine how many neighbors should receive the RREQ packet. After that, by combining the additional coverage ratio and the connectivity factor, we introduce a rebroadcast probability, which can be used to reduce the number of rebroadcasts of the RREQ packet, to improve the routing performance.

3.1 Network module

An undirected graph G (V, E) where the set of vertices V represent the mobile nodes in the network and E represents set of edges in the graph which represents the physical or logical links between the mobile nodes. Sensor nodes are placed at a same level. Two nodes that can communicate directly with each other are connected by an edge in the graph. Let N denote a network of m mobile nodes, N1, N2...Nm and let D denote a collection of n data items d1; d2; . . . ; dn distributed in the network. For each pair of mobile nodes Ni and Nj, let tij denote the delay of transmitting a data item of unit-size between these two nodes.

3.2 Identification of Uncovered Neighbors Set

When node ni receives an RREQ packet from its previous node s, it can use the neighbor list in the RREQ packet to estimate how many its neighbors have not been covered by the RREQ packet from s. If node ni has more neighbors uncovered by the RREQ packet from s, which means that if node ni rebroadcasts the RREQ packet, the RREQ packet can reach more additional neighbor nodes. To quantify this, we define the UnCovered Neighbors set U(n_i) of node n_i as follows:

U(n_i) = N(n_i) – [N(n_i) ∩ N(s)] – {s}

where N(s) and N(n_i) are the neighbors sets of node s and ni, respectively. s is the node which sends an RREQ packet to node n_i. From this we obtain the initial UCN set.

3.3 Determination of Rebroadcast Delay

Due to broadcast characteristics of an RREQ packet, node ni can receive the duplicate RREQ packets from its neighbors. Node n_i could further adjust the U(n_i) with the neighbor knowledge. In order to sufficiently exploit the neighbor knowledge and avoid channel collisions, each node should set a rebroadcast delay. The rebroadcast delay T_d (n_i)of node n_i is defined as follows:

$$T_p(n_i) = 1 - \frac{|N(s) \cap N(n_i)|}{|N(s)|}$$

$$T_d(n_i) = \text{Max Delay X } T_p(n_i)$$

Where $T_p(n_i)$ is the delay ratio of node ni, and MaxDelay is a small constant delay. |.| is the number of elements in a set. Stann et al. [9] proposed a Robust Broadcast Propagation (RBP) protocol to provide near-perfect reliability for flooding in wireless networks, and this protocol also has a good efficiency. The above rebroadcast delay is defined with the following reasons: First, the delay time is used to determine the node transmission order. To sufficiently exploit the neighbor coverage knowledge, it should be disseminated as quickly as possible. When node s sends an RREQ packet, all its neighbors $n_i . i = 1,2, \ldots\ldots |N(s)|$ receive and process the RREQ packet. We assume that node n_k has the largest number of common neighbors with node s, according to (2), node n_k has the lowest delay.

3.4 Determination of Rebroadcast Probability

The node which has a larger rebroadcast delay may listen to RREQ packets from the nodes which have lower one. For example, if node ni receives a duplicate RREQ packet from its neighbor n_j, it knows that how many its neighbors have been covered by the RREQ packet from n_j. Thus, node ni could further adjust its UCN set according to the neighbor list in the RREQ packet from n_j. Then, the U(n_i)can be adjusted as follows:

U(n_i) = [U(n_i) ∩ N(n_j)].

After adjusting U(n_i)the, the RREQ packet received from n_j is discarded. When the timer of the rebroadcast delay of node n_i expires, the node obtains the final UCN set. The nodes belonging to the final UCN set are the nodes that need to receive and process the RREQ packet. Note that, if a node does not sense any duplicate RREQ packets from its neighborhood, its UCN set is not changed, which is the initial UCN set. Now, we study how to use the final UCN set to set the rebroadcast probability.

3.4.1 Additional Coverage ratio

We define the additional coverage ratio ($R_a(n_i)$) of node n_i as

$R_a(n_i) = \frac{|U(n_i)|}{|N(n_i)|}$

This metric indicates the ratio of the number of nodes that are additionally covered by this rebroadcast to the total number of neighbors of node ni. The nodes that are additionally covered need to receive and process the RREQ packet. As Ra becomes bigger, more nodes will be covered by this rebroadcast, and more nodes need to receive and process the RREQ packet, and, thus, the rebroadcast probability should be set to be higher.

3.4.2 Connectivity factor

We define the minimum $F_c(n_i)$ as a connectivity factor, which is

$F_c(n_i) = \frac{N_c}{|N(n_i)|}$

Where Nc = 5.1774 log n, and n is the number of nodes in the network. when | N(n_i)| is greater than Nc, $F_c(n_i)$ is less than 1. That means node is in the dense area of the network, then only part of neighbors of node n_i forwarded the RREQ packet could keep the network connectivity. And when |N(n_i)| is less than Nc, $F_c(N_i)$ is greater than 1. That means node ni is in the sparse area of the network, then node ni should forward the RREQ packet in order to approach network connectivity.

Combining the additional coverage ratio and connectivity factor, we obtain the rebroadcast probability pre (n_i) of node n_i.

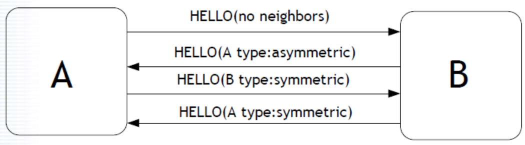
pre (n_i) = $F_c(n_i)$. $R_a(n_i)$.

Where, if the pre(n_i) ` is greater than 1, we set the pre(n_i) to 1.

Although the parameter R_a reflects how many next-hop nodes should receive and process the RREQ packet, it does not consider the relationship of the local node density and the overall network connectivity. The parameter F_c is inversely proportional to the local node density. That means if the local node density is low, the parameter F_c increases the rebroadcast probability, and then increases the reliability of the NCPR in the sparse area.

3.5Neighbor Sensing:

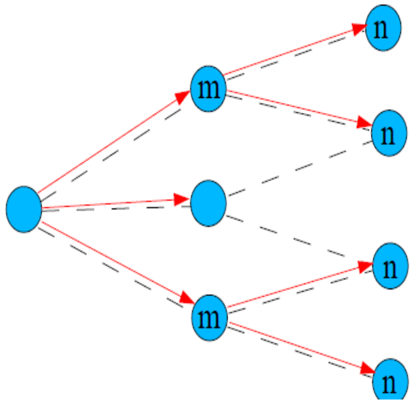
Neighbors and links are detected by HELLO messages. All nodes transmit HELLO messages on a given interval. These contain all heard-of neighbors grouped by status.

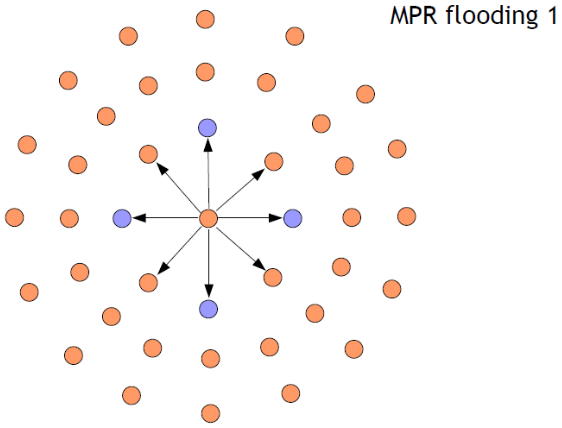


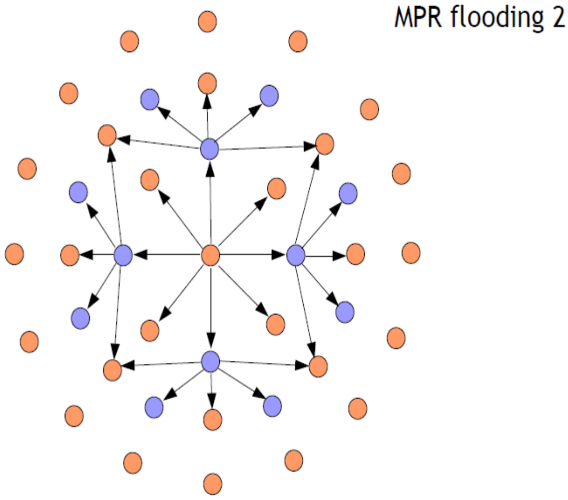
3.6 Multi point relay selection

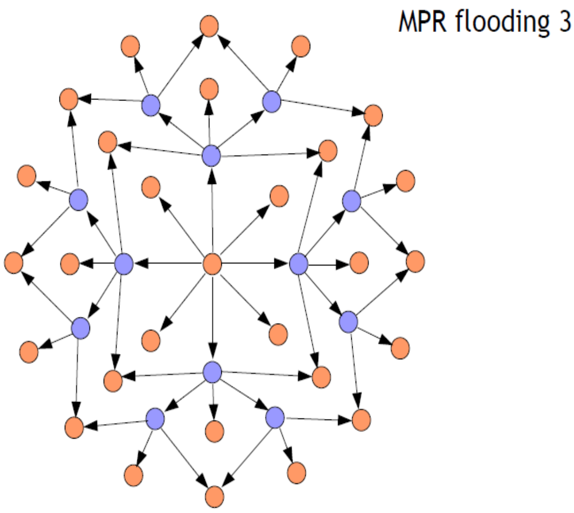
Each node select its own multi point relays. Reduce the number of duplicate retransmissions while forwarding a broadcast packet. Restricts the set of nodes retransmitting a packet from all nodes(regular flooding) to a subset of all nodes. The size of this subset depends on the topology of the network. All nodes selects and maintains their own MPRs.

Rule: "*For all 2 hop neighbors n there must exist a MPR m so that n can be contacted via m.*"





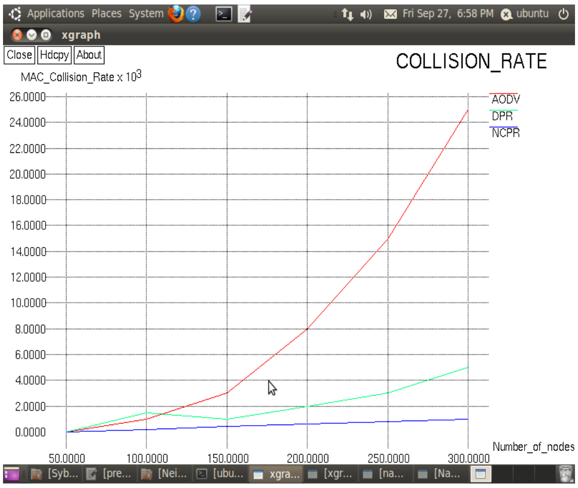




IV. PERFORMANCE EVALUATION

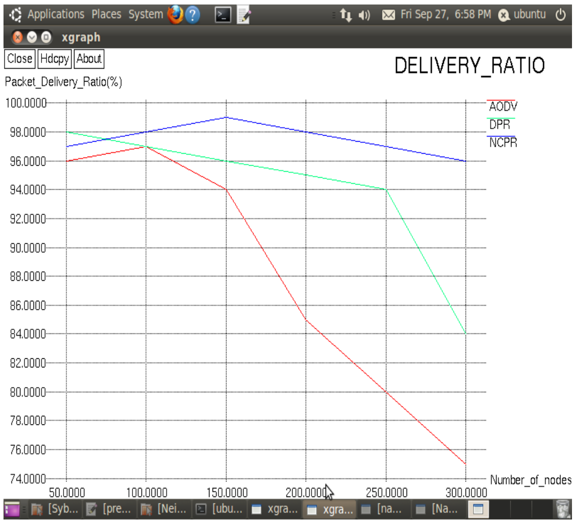
Finally in this module the performance of the existing and the proposed approaches were illustrated and evaluated. Finally, existing algorithms like Ad hoc On-demand Distance Vector Routing (AODV) and Dynamic Source Routing (DSR) and Proposed Neighbor coverage-based probabilistic rebroadcast (NCPR) protocol are compared. Based on the comparison and the result from experiment show the Neighbor coverage-based probabilistic rebroadcast (NCPR) protocol proposed approach works better than the other existing systems in terms of collision rate and packet delivery ratio.

4.1Collision rate



The Collision rate is shown in this graph. In the X-axis number of nodes are taken. Y-axis Collision rate is taken. This graph clearly shows that the number of nodes are increases the collision rate is increases in existing methods. But in the proposed coverage based probabilistic rebroadcast protocol, the collision rate is decreases.

4.2Delivery ratio



The Packet delivery ratio is shown in this graph. In the X-axis number of nodes is taken. Y-axis packet delivery ratio is taken. This graph clearly shows that the number of nodes is increases the packet delivery ratio is decreases in existing methods. But in the proposed coverage based probabilistic rebroadcast protocol, the packet delivery ratio is increases.

V. CONCLUSION AND FUTURE WORK

A neighbor coverage-based probabilistic rebroadcast protocol is used to reduce the routing overhead in the mobile ad hoc networks. Because of the random movement of the nodes in the mobile ad hoc networks, there is a frequent link breakage which leads to path failure and route discoveries. So, we use neighbor coverage knowledge, we propose a novel rebroadcast delay to determine the rebroadcast order and rebroadcast probability. To determine the rebroadcast probability we calculate additional coverage ratio and connectivity factor. So, we effectively decrease the number of retransmissions so as to reduce the routing overhead, and can also improve the routing performance.

For future work, we monitoring the links lifetime of the mobile nodes in the wireless network, in the past and in the present, to predict its behavior, in the future without considering directly parameters depending by underlying mobility model such as node speed or direction.

REFERENCES

[1] C. Perkins, E. Belding-Royer, and S. Das, Ad Hoc On-Demand Distance Vector (AODV) Routing, IETF RFC 3561, 2003.

[2] 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.

[3] X. Wu, H.R. Sadjadpour, and J.J. Garcia-Luna-Aceves, "Routing Overhead as a Function of Node Mobility: Modeling Framework and Implications on Proactive Routing," Proc. IEEE Int'l Conf. Mobile Ad Hoc and Sensor Systems (MASS '07), pp. 1- 9, 2007.

[4] S.Y. Ni, Y.C. Tseng, Y.S. Chen, and J.P. Sheu, "The Broadcast Storm Problem in a Mobile Ad Hoc Network," Proc. ACM/IEEE MobiCom, pp. 151-162, 1999.

[5] A. Mohammed, M. Ould-Khaoua, L.M. Mackenzie, C. Perkins, and J.D. Abdulai, "Probabilistic Counter-Based Route Discovery for Mobile Ad Hoc Networks," Proc. Int'l Conf. Wireless Comm. and Mobile Computing: Connecting the World Wirelessly (IWCMC '09), pp. 1335-1339, 2009.

[6] B. Williams and T. Camp, "Comparison of Broadcasting Techniques for Mobile Ad Hoc Networks," Proc. ACM MobiHoc, pp. 194- 205, 2002.

[7] J. Kim, Q. Zhang, and D.P. Agrawal, "Probabilistic Broadcasting Based on Coverage Area and Neighbor Confirmation in Mobile Ad Hoc Networks," Proc. IEEE GlobeCom, 2004.

[8] Z. Haas, J.Y. Halpern, and L. Li, "Gossip-Based Ad Hoc Routing," Proc. sIEEE INFOCOM, vol. 21, pp. 1707-1716, 2002.

[9] W. Peng and X. Lu, "On the Reduction of Broadcast Redundancy in Mobile Ad Hoc Networks," Proc. ACM MobiHoc, pp. 129-130, 2000.

[10] A. Keshavarz-Haddady, V. Ribeirox, and R. Riedi, "DRB and DCCB: Efficient and Robust Dynamic Broadcast for Ad Hoc and Sensor Networks," Proc. IEEE Comm. Soc. Conf. Sensor, Mesh, and Ad Hoc Comm. and Networks (SECON '07), pp. 253-262, 2007.