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Efficient Rebroadcast for Reducing Routing Overhead in MANETs using Continuous Neighbour Discovery

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Abstract:

In mobile ad hoc networks (MANETs), the network topology changes frequently and unpredictably due to the arbitrary mobility of nodes. This feature leads to frequent path failures and route reconstructions, which causes an increase in the routing control overhead. In order to limiting the number of rebroadcasts can effectively optimize the broadcasting, a neighbour coverage-based probabilistic rebroadcast (NCPR) protocol, in order to effectively exploit the neighbour coverage knowledge. We propose a novel dynamic rebroadcast delay to determine the rebroadcast order, and then obtain a more accurate additional coverage ratio and by keeping the network connectivity and reduce the redundant retransmissions, a metric named connectivity factor to determine how many neighbours should receive the route request (RREQ) packet. By combining the additional coverage ratio and the connectivity factor, introduce a rebroadcast probability, which can be used to reduce the number of rebroadcasts of the RREQ packet to improve the routing performance.

Keywords - *Multicast capacity and delay tradeoffs, Mobile Ad Hoc Networks (MANETs), hybrid random walk mobility models, delay tolerant networks,*

I.INTRODUCTION

In Mobile Ad hoc Network (MANET) the nodes can get the service using random mobility model to communicate each other in the network. There is no centralized service to network i.e. No base station service to mobile node, due to high mobility in network link failure and the routing path cannot be define constantly for data transmission , so data loss and path failure is the major issues in MANET. Dynamic routing leads to improper neighbour selection to reach destination.

Broadcasting is a fundamental and effective data dissemination mechanism for route discovery, address resolution and many other network services in ad hoc networks. While data broadcasting has many advantages, it also causes some problems such as the broadcast storm problem, which is characterized by redundant retransmission, collision, and contention.

Why Re-Broadcasting Needed?

In MANET, A node forward the rebroadcasting packet based on the current node which didn't receive the broadcast message, there rebroadcasting packet exists, which provide the service to activate the sleeping node in the routing [1]. It mainly helps to cover the neighbour activeness for routing, which gives the results to reduce the redundancy over re- broadcasting.

To optimize the broadcasting, we can limit the number of rebroadcasting in the routing. Rebroadcasting delay helps to define the neighbour coverage knowledge in network, in order to strengthen the network connectivity, broadcasting neighbours should receive the RREQ packet these reduce the redundant and number of rebroadcasts of the RREQ packet in the data transmission.

To discover the route better than broadcasting methodology, rebroadcasting is done with the help of neighbour knowledge methods. In order to effectively exploit the neighbour coverage knowledge, a novel rebroadcast delay and a connectivity factor to provide the node density adaptation is calculated. This NCPR protocol does not focus on spectrum utility efficiently which helps in improving the performance of the protocol.

II. EXISTING SYSTEM

We have studied the multicast capacity delay tradeoffs in both homogeneous and heterogeneous mobile networks. Specifically, in homogeneous networks, we established the upper bound on the optimal multicast capacity-delay tradeoffs under two-dimensional / one-dimensional i.i.d./ hybrid random walk fast/slow mobility models and proposed capacity achieving schemes to achieve capacity close to the upper bound. In addition, we find that though the one-dimensional mobility model constrains the direction of nodes' mobility, it achieves larger capacity then the two dimensional model since it is more predictable. Also slow mobility brings better performance then fast mobility because there are more possible routing schemes.

A. Homogenous Networks

Mobile ad hoc network model: Consider an ad hoc network where *n* wireless mobile nodes are randomly distributed in a unit square. The units square is assumed to be a torus to avoid the border effect. We will study the following mobility models, similar to, in this paper.

1. **Two-dimensional i.i.d. mobility model:**
    a. At the beginning of each time slot, nodes will be uniformly and randomly distributed in the unit square.
    b. The node positions are independent of each other, and independent from time slot to time slot.
2. **Two-dimensional hybrid random walk model:** Consider a unit square which is further divided into 1/*B*2 squares of

equal size. Each of the smaller square is called a RW-cell (random walk cell), and indexed by (*Ux, Uy*) where $Ux, Uy \in \{1, ..., 1/B\}$.

3. **One-dimensional i.i.d. mobility model:**

    a. Reasonably, we assume the number of mobile nodes *n* and source nodes *ns* are both even numbers. Among the mobile nodes, *n/*2 nodes (including *ns/*2 source nodes), named Hnodes, move horizontally; and the other *n/*2 nodes (including the other *ns/*2 source nodes), named V-nodes, move vertically.

    b. Let (*xi, yi*) denote the position of node *i*. If node *i* is a H-node, *yi* is fixed and *xi* is randomly and uniformly chosen from [0*,* 1]. We also assume that H-nodes are evenly distributed vertically, so *yi* takes values 2*/n,* 4*/n, . . . ,* 1. V-nodes have similar properties.

    c. Assume that source and destinations in the same multicast session are the same type of nodes. Also assume that node *i* is a H-node if *i* is odd, and a V-node if *i* is even.

    d. The orbit distance of two H(V)-nodes is defined to be the vertical (horizontal) distance of the two nodes.

4. **One-dimensional hybrid random walk model:** Each orbit is divided into 1*/B* RW-intervals (random walk interval). At each time slot, a node moves into one of two adjacent RW-intervals or stays at the current RW-interval. The node position in the RW-interval is randomly, uniformly selected.

We further assume that at each time slot, at most *W* bits can be transmitted in a successful transmission.

Mobility time scales: Two time scales of mobility are considered in this paper:

Fast mobility: The mobility of nodes is at the same time scale as the transmission of packets, i.e., in each time-slot, only one transmission is allowed.

Slow mobility: The mobility of nodes is much slower than the transmission of packets, i.e., multiple transmissions may happen within one time-slot.

From the existing system we conclude that the broadcasting incurs large routing overhead and causes many problems such as redundant retransmissions, contentions, and collisions. Thus, optimizing the broadcasting in route discovery is an effective solution to improve the routing performance. Existing approaches only considers the coverage ratio by the previous node, and it does not consider the neighbours receiving the duplicate RREQ packet, which will degrades routing performance as well increased routing overhead will alleviate network traffic. we further propose the study to overcome these drawbacks:

- No of broadcasting process is very high.
- Redundant retransmissions problem, contentions, and collisions.
- Not consider the Duplicate RREQ packets
- Routing problem is very high. Node energy loss is high.

III. PROPOSED SYSTEM

Since limiting the number of rebroadcasts can effectively optimize the broadcasting, We propose a neighbour coverage-based probabilistic rebroadcast (NCPR) protocol, in order to effectively exploit the neighbour coverage knowledge, we propose a novel rebroadcast delay to determine the rebroadcast order, and then we can obtain a more accurate additional coverage ratio; in order to keep the network connectivity and reduce the redundant retransmissions, we need a metric named connectivity factor to determine how many neighbours 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. As well as security is also a challenging factoring in ad hoc networks. Resisting flooding attacks in ad hoc networks incur two flooding attacks: Route Request (RREQ) and Data flooding attack and secure intrusion detection system and our study proposes the following advantages over the existing system:

- No of broadcasting is low.
- Path failure is very low
- Remove redundant retransmissions problem, contentions, and collisions.
- Remove duplicates packets
- Increase node energy level
- Improve the data transmission routing performance.

IV. ALGORITHM DESCRIPTION

NEIGHBOUR COVERAGE BASED PROBABILISTIC REBROADCAST USING COGNITIVE RADIO PARADIGM

This paper focuses on improving the neighbour coverage based probabilistic rebroadcast protocol [2] which combines both neighbour coverage and probabilistic methods. The improving mechanism focuses on identifying selected set of neighbour s based on spectrum availability for faster transmission of packets and thereby improving the efficiency and performance of the protocol.

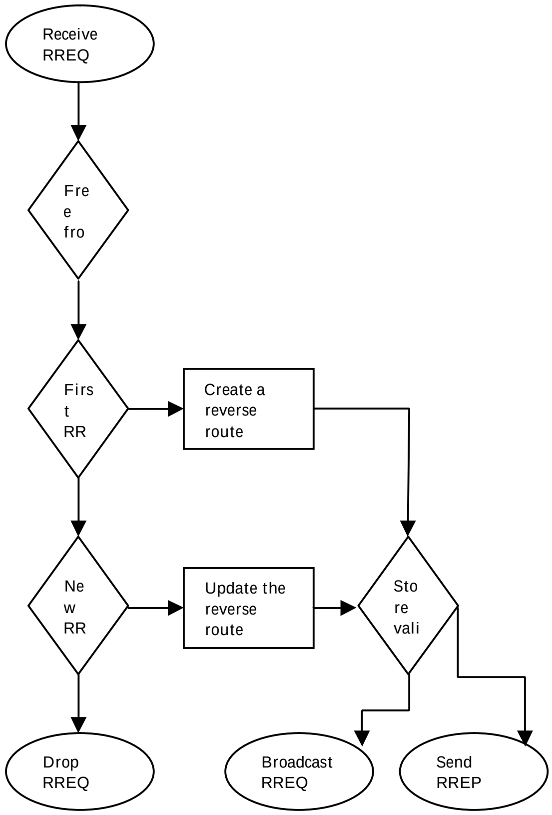
In order to effectively exploit the neighbour coverage knowledge, we need a novel rebroadcast delay to determine the rebroadcast order, and then we can obtain a more accurate additional coverage ratio. In order to keep the network connectivity and to reduce the redundant retransmissions, we need a metric named connectivity factor to determine how many neighbour s should receive the RREQ packet. After that, by combining the additional coverage ratio and the connectivity factor, we introduce rebroadcast probability, which can be used to reduce the number of rebroadcasts of the RREQ packet and to improve the routing performance.

NEIGHBOUR IDENTIFICATION:

Rebroadcasting of packets is necessary whenever there is a link breakage on existing transmission of data between source and destination .It requires a route discovery process starting with a route request (RREQ) broadcasted by the source to neighbours on each channel not affected by a PU activity and ends with a route set up after the reception of a route. Here an intermediate CU is supposed to receive and handle RREQs and RREPs among a subset of the l channels reply (RREP) from the destination, as shown by the flow charts depicted in Fig. 1.

REBROADCAST DELAY:

In order to effectively exploit the neighbour coverage knowledge, we need a novel rebroadcast delay to determine the rebroadcast order, and then we can obtain a more accurate additional coverage ratio. In order to keep the network connectivity and to reduce the redundant retransmissions, we need a metric named connectivity factor to determine how many neighbour s should receive the RREQ packet. After that, by combining the additional coverage ratio and the connectivity factor, we introduce rebroadcast probability, which can be used to reduce the number of rebroadcasts of the RREQ packet and to improve the routing performance.



The rebroadcast delay is to determine the forwarding order. The node which has more common neighbour s identified using Cognitive Radio concept with the previous node has the lower delay. If this node rebroadcasts a packet, then more common neighbour s will know this fact. Therefore, this rebroadcast delay enables the information about the nodes which have transmitted the packet to more neighbour s, which is the key success for the proposed scheme. When a node ni receives an RREQ packet from its previous node s, node s can use the neighbour list in the RREQ packet to estimate how many its neighbour s have not been covered by the RREQ packet . If node ni has more neighbour s uncovered by the RREQ packet from s, which means that if node ni rebroadcasts the RREQ packet, the RREQ packet can reach more additional neighbour nodes. When node s sends an RREQ packet, all its neighbour s ni, i = 1, 2 ...receive and process the RREQ packet. We assume that node nk has the largest number of common neighbour s with node s, node nk has the lowest delay. Once node nk rebroadcasts the RREQ packet, there are more nodes to receive the RREQ, because node nk has the largest number of common neighbour s. Node nk rebroadcasts the RREQ packet depends on its rebroadcast probability calculated in the next subsection. The objective of this rebroadcast delay is not to rebroadcast the RREQ packet to more nodes, but to disseminate the neighbour coverage knowledge more quickly. After determining the rebroadcast delay, the node can set its own timer.

REBROADCAST PROBABILITY:

This scheme considers the information about the uncovered neighbour s, connectivity metric and local node density to calculate the rebroadcast probability. The rebroadcast probability is composed of two parts:

a) 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 neighbour s, and

b) connectivity factor, which reflects the relationship of network connectivity and the number of neighbour s of a given node.

The node which has a larger rebroadcast delay may listen to RREQ packets from the nodes which have lowered one. We do not need to adjust the rebroadcast delay because the rebroadcast delay is used to determine the order of disseminating neighbour coverage knowledge. When the timer of the rebroadcast delay of node in expires, the node obtains the final uncovered neighbour set. The nodes belonging to the final uncovered neighbour 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 neighbourhood, its uncovered neighbour set is not changed, which is the initial uncovered neighbour set. Now we study how to use the final uncovered neighbour set to set the rebroadcast probability. The metric Ra indicates the ratio of the number of nodes that are additionally covered by this rebroadcast to the total number of neighbour s 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.

we calculate the rebroadcast delay and rebroadcast probability of the proposed protocol. We use the upstream coverage ratio of an RREQ packet received from the previous node to calculate the rebroadcast delay, and use the additional coverage ratio of the RREQ packet and the connectivity factor to calculate the rebroadcast probability in our protocol, which requires that each node needs its 1-hop neighbourhood information.

Algorithm 1

The algorithm describes the rebroadcast delay description for the node ni neighbour knowledge obtained using dynamic coverage;

Rebroadcast Delay ()

{

IF node ni receives RREQ from previous node s

Use neighbour list table to see the uncovered neighbours from s

THEN

IF RREQ comes for the first time

Find neighbour node knowledge

ELSE

Discard RREQ message

END IF

FOR every RREQ node s sends RREQ to neighbours of ni, i=1, 2…

DO

Assume nk has lowest delay

nk will rebroadcast based on Rebroadcast Probability which is find from Algorithm 2

END FOR

END IF

}

Algorithm 2

The algorithm describes to set the Rebroadcast Probability

Rebroadcast Probability ()

{

IF node ni receive duplicate RREQ from neighbor node nj

THEN

ni knows how many neighbors have been covered by RREQ from nj

ni adjusts its uncovered neighbor set according to neighbor list

SET a reschedule timer for node ni

IF timer expires

Node ni obtains final uncovered neighbor set

THEN Uncovered neighbor set nodes need to receive and process RREQ

FOR each uncovered neighbor set

DO

Calculate

Number of nodes that are additional covered by rebroadcast

-= Fc (ni)

Total number of neighbors of node ni

= Node density

IF Fc (ni) is low

THEN SET Rebroadcast Probability as high

ELSE

SET Rebroadcast Probability as low

END IF

END FOR

END IF

}

IV.CONCLUSION

MOBILE ad hoc networks (MANETs) consist of a collection of mobile nodes that can be dynamically self-organized into arbitrary topology networks without a fixed infrastructure. Broadcasting is a fundamental and effective data dissemination mechanism in route discovery. But it causes the broadcast storm problem. To reduce the deleterious impact of flooding RREQ packets, a number of route discovery algorithms have been suggested over the past few years. One of the fundamental challenges of MANETs is the design of dynamic routing protocols with good performance and less overhead.

This paper proposes a dynamic coverage based neighbour identification for faster re transmission of Re Broadcasting packets. This identified neighbour set is used as Uncovered neighbour list in probabilistic Rebroadcast protocol and thus routing overhead is reduced and performance of the protocol is further improved.

REFERENCES

- C. Perkins, E. Belding-Royer, and S. Das, “Ad hoc On-Demand Distance Vector (AODV) Routing,” RFC 3561, 2003.
- Xin Ming Zhang,En Bo Wang, Jing Jing Xia, and Dan Keun Sung,“A Neighbour Coverage based Probabilistic Rebroadcast for Reducing Routing Overhead in Mobile Ad hoc Networks” Mobile Computing, IEEE Transactions on VOL. 11, NO. Jan, 2012.
- J. Kim, Q, Zhang, and D. P. Agrawal, “Probabilistic Broadcasting Based on Coverage Area and Neighbour Confirmation in Mobile Ad hoc Networks,” Proc. of IEEE GLOBE COM’ 04, 2004.
- F.C. Commission, Spectrum policy task force, Technical report, November 2002.
- E. Buracchini, The software radio concept, IEEE Communication Magazine 38 (9) (2000) 138–143.
- J. Mitola, Cognitive radio, An Integrated Agent Architecture for Software Defined Radio, PhD Dissertation Thesis, KTH, Sweden.
- I.F. Akyildiz, W.Y. Lee, M. Vuran, S. Mohanty, A survey on spectrum management in cognitive radio networks, IEEE Communication Magazine 46 (4) (2008) 40–48.

- I.F. Akyildiz, W.-Y. Lee, M.C. Vuran, S. Mohanty, Next generation/ dynamic spectrum access/cognitive radio wireless networks: a survey, Computer Networks
- P. Li, C. Zhang and Y. Fang, “Capacity and Delay of Hybrid Wireless Broadband Access Networks.” in *IEEE Journal on elected Areas in Communications (JSAC)* - Special Issue on Broadband Access Networks, 27(2):117-125, February 2009.
- B. Liu, Z. Liu and D. Towsley, “On the Capacity of Hybrid Wireless Networks.” in *Proc. IEEE INFOCOM*, San Francisco, California, USA, March 2003.

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