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A Review on Neighbor Coverage-Based Probabilistic Rebroadcast for Increasing Efficiency of Routing in MANETs

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Abstract— For increasing efficiency in mobile ad-hoc networks (MANETs) containing high mobility of node, it is necessary to avoid frequent link breakages which lead to frequent path failures and route discoveries. In a route discovery, broadcasting is a fundamental and effective data dissemination mechanism, where 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 paper, we propose a neighbor coverage-based probabilistic rebroadcast protocol for reducing routing overhead in MANETs. In order to effectively exploit the neighbor coverage knowledge, we propose a novel rebroadcast delay to determine the rebroadcast order, and then we can obtain the more accurate additional coverage ratio by sensing neighbor coverage knowledge. We also define a connectivity factor to provide the node density adaptation.

Keywords— Mobile ad hoc networks, neighbor coverage, broadcast storm, probabilistic rebroadcast, routing overhead

I. INTRODUCTION

A mobile ad hoc network (MANET) is a continuously self-configuring, infrastructure-less network of mobile devices connected without wires. 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 ondemand 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, 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.

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.

Performance of neighbor knowledge methods is better than that of area-based ones, and the performance of area-based methods is better than that of probability-based ones. We now obtain the initial motivation of our protocol: 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, then we propose a neighbor coverage-based probabilistic rebroadcast (NCPR) protocol. Therefore, 1) 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 and thus increase efficiency.

II. BRIEF LITERATURE SURVEY

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

On-demand routing protocols construct a path to a given destination only when it is required. They do not maintain topological information about the whole network, and thus there is no periodic exchange of routing information. 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.

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.

DSR stands for Dynamic Source Routing; it is a reactive link state protocol. It can accumulate source route during discovery of route. DSR routing appends the full route to all data packets. The hop-by-hop forwarding state in nodes is not applicable for DSR which is available in our paper. It is disorderly composition of cache routing information and automatic route shorting. Some packet salvaging can be happen in DSR.

H. AlAamri, M. Abolhasan, and T. Wysocki, "On Optimising Route Discovery in Absence of Previous Route Information in MANETs," Proc. IEEE Vehicular Technology Conf. (VTC), pp. 1-5, 2009.

This paper presents a new routing protocol for Ad hoc networks, called On-demand Tree-based Routing Protocol (OTRP). This protocol combines the idea of hop-by-hop routing such as AODV with an efficient route discovery algorithm called Tree-based Optimized Flooding (TOF.).Route discovery overheads are minimized by selectively flooding the network through a limited set of nodes, referred to as branching-nodes. However flooding gives out broadcasting storm problem when mobility of nodes and heterogeneity of networks is high which is overcome by our research paper.

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

The paper presents a mathematical framework for quantifying the overhead of proactive routing protocols in mobile ad hoc networks (MANETs). It focus on situations where the nodes are randomly moving around but the wireless transmissions can be decoded reliablely, when nodes are within communication range of each other. It explicitly presents a framework to model the overhead as a function of stability of topology and analytically characterize the statistical distribution of topology evolutions. However topology evaluation might be an overhead our paper focuses on neighbour knowledge for this.

J.D. Abdulai, M. Ould-Khaoua, and L.M. Mackenzie, "Improving Probabilistic Route Discovery in Mobile Ad Hoc Networks," Proc. IEEE Conf. Local Computer Networks, pp. 739-746, 2007.

Conventional on-demand route discovery methods in mobile ad hoc networks (MANET) employ blind flooding, where a mobile node blindly rebroadcasts received Route Request (RREQ) packets until a route to a particular destination is established. This can potentially lead to high channel contention, causing redundant retransmissions and thus excessive packet collisions in the network. Such a phenomenon induces what is known as broadcast storm problem, which has been shown to greatly increase the network communication overhead and end-to-end delay. This paper shows that the deleterious impact of such a problem can be reduced if measures are taken during the dissemination of RREQ packets. The Protocol used in our paper determines ReBroadcast order using ReBroadcast delay by using neighbour coverage knowledge. Approach is to overcome collisions and channel contentions by reducing the number of retransmission and improve the Quality of Service (QoS) routing in MANETS.

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

Many ad hoc routing protocols are based on some variant of flooding. Despite various optimizations of flooding, many routing messages are propagated unnecessarily. A gossiping-based approach is proposed, where each node forwards a message with some probability, to reduce the overhead of the routing protocols. Haas et al proposed a gossip based approach, where each node forwards a packet with a probability. They showed that gossip-based approach can save up to 35 percent overhead compared to the flooding. However, when the network density is high or the traffic load is heavy, the improvement of the gossip-based approach is limited.In our probabilistic broadcasting scheme based on coverage area and neighbor confirmation, this scheme uses the coverage area to set the rebroadcast probability, and uses the neighbor confirmation to guarantee reachability.

III. PROBLEM FORMULATION

Broadcasting is a common problem in networks. In ad-hoc networks, broadcast plays an important role, relaying message generated by one node to all other nodes. Broadcasting is an integral part of a variety of protocols that provide basic functionality and efficiency to higher-layer services. MANETs consists of collection of nodes which can move freely. No base stations are supported in MANETs. These nodes can be dynamically self-organized into arbitrary topology networks without a fixed infrastructure. One of the fundamental challenges in the MANETs is the design of dynamic routing protocols with good performance and less overhead. Routing protocols in ad-hoc networks are classified into proactive (table-driven) protocol and reactive (on demand) protocol

A. Proactive protocols maintain routes between every host pair at all times. In proactive protocol, when a packet needs to be forwarded the route is already known. This protocol is based on periodic updates. They maintain up-to-date routing information for all nodes in the network even before it is needed. Because of this situation, proactive protocols will require low latency. This protocol incurs more overhead. Examples of this type include OLSR and DSDV routing protocol.

B. Reactive routing protocols do not maintain routing information at the nodes if there is no activity between them. (i.e.) it determines the route if and when needed. This protocol incurs less overhead. Examples of this type include AODV, DSR routing protocol. Nodes in the reactive routing protocols are trying to minimize the overhead by only sending routing information as soon as the communication is initiated between them.

Some methods have been proposed to optimize the broadcast problem in MANETs in the past few years. Williams and Camp categorized broadcasting protocols into four classes:

1) Simple flooding
2) Probability based methods
3) Area based methods
4) Neighbour 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. Our approach combines the advantages of the neighbour coverage knowledge and the probabilistic mechanism, which can decrease the number of retransmissions so as to reduce the routing overhead and enhance the routing performance.

IV. OBJECTIVE

Following are the objectives to overcome the problem formulation:

A. To have transmitted the packet spread to more neighbors by nodes.
B. To do Delay calculation in forwarding order.
C. To also make available Re broadcast probability.
D. Broadcasting incurs large routing overhead; this paper avoids many problems such as redundant contentions, retransmissions and collisions.

V. PROPOSED METHODOLOGY

The main contributions of this paper are as follows:

A. We 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.

B. We also 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:

1) 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; and
2) Connectivity factor, which reflects the relationship of network connectivity and the number of neighbors of a given node.

VI. CONCLUSIONS

Thus we have studied various previous routing methods and protocols and have also proposed the protocol used to improve efficiency of broadcasting in routing in MANETS.

Therefore our approach combines 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.

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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] H. AlAamri, M. Abolhasan, and T. Wysocki, “On Optimising Route Discovery in Absence of Previous Route Information in MANETs,” Proc. IEEE Vehicular Technology Conf. (VTC), pp. 1-5, 2009.

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

[5] J.D. Abdulai, M. Ould-Khaoua, and L.M. Mackenzie, “Improving Probabilistic Route Discovery in Mobile Ad Hoc Networks,” Proc. IEEE Conf. Local Computer Networks, pp. 739-746, 2007.

[6] Z. Haas, J.Y. Halpern, and L. Li, “Gossip-Based Ad Hoc Routing,” Proc. IEEE INFOCOM, vol. 21, pp. 1707-1716, 2002.

[7] 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.

[8] 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.

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

[10] 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.

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

