Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 4, Issue. 2, February 2015, pg.88 – 91

REVIEW ARTICLE

Minimization of Routing Overhead in MANET: A Review

Neha S. Brahmankar[1], Hitendra D.Patil[2]

[1]Master Student, Computer Engineering, SSVPS'S B.S.Deore College of Engineering, India

[2]Professor and Head, Computer Engineering, SSVPS'S B.S.Deore College of Engineering, India

[1] nehab111@gmail.com; [2] hitendradpatil@gmail.com

Abstract: Movements of nodes in a MANET cause the nodes to move in and out of range from one another. As a result, there is a continuous making and breaking of links in the network, making the network connectivity (topology) to vary dynamically with time. Routing overhead in route discovery can't pass over. Broadcasting is important data dissemination mechanism for various network services such as route discovery, address resolution in Mobile Ad-hoc Networks (MANET). It also causes problems such as the broadcast storm problem. This paper presents review of various broadcasting techniques and how they are used for routing overhead minimization.

Keywords— Mobile Ad-hoc Network, Broadcasting

I. INTRODUCTION

Wireless Ad Hoc Networks are formed by a set of hosts that communicate with each other over a wireless channel. Each node can communicate directly with another node in its physical neighborhood. Automatic self-configuring and self-maintenance, inexpensive deployment, and the lack of the need for fixed network infrastructures or centralized administration are the features of wireless ad-hoc networks. These features cannot be performed by traditional wired networks. A MANET is a collection of mobile nodes that can dynamically change locations to form a network to exchange information .They do not require any pre-existing infrastructure. In MANET, each node acts as a router. Basic challenge of MANET is the designing of dynamic routing protocol. There are many routing protocols which are used in MANET. Routing protocols like Ad-hoc On-demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR) and Destination Sequence Distance Vector (DSDV).

Basically routing protocols are divided into two categories Proactive and Reactive routing protocols

Proactive Routing: This protocol maintains routes between every pair of host all times. They maintain up to date routing information for all nodes in the network before it is needed. This protocol incurs more overhead. Examples of this type include OLSR and DSDV routing protocol.

Reactive Routing: Reactive routing protocols do not maintain routing information at the nodes if there is no activity between them. 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.

Examples of Reactive Routing Protocol:

Ad hoc On Demand Distance Vector Routing (AODV):
AODV is basically an improvement of DSDV. It is not proactive routing protocol like DSDV. Ad hoc On Demand Distance Vector Routing (AODV) is a reactive routing protocol. It minimizes the number of broadcasts by making routes available based on demand, which is not done in DSDV. When any source node wants to send a packet to a destination, it broadcasts a RREQ packet. The neighboring nodes in turn broadcast the packet to their neighbors and the process continues until the packet reaches the destination. During the route request forwarding, intermediate nodes record the address of the neighbor from which the first copy of the broadcast packet is received. And that record is stored in route table, reverse path is established with the help of that record. If duplicate copies of the RREQ are received then these packets are discarded. The reply is sent back through the reverse path. As per MANET's node mobility nature, when source node moves a route discovery process is reinitiated for route maintenance.

Dynamic Source Routing (DSR):
Dynamic Source Routing (DSR) is a reactive protocol based on the source route approach. Dynamic Source Routing (DSR) protocol is based on the link state algorithm in which source initiates route discovery on demand basis. The RREQ sender determines the route from source to destination and it includes the address of intermediate nodes to the route record in the packet. Dynamic Source Routing (DSR) was designed for multi hop networks. In Dynamic Source Routing (DSR), no HELLO messages are exchanged between nodes to notify them of their neighbors in the network.

Broadcasting is effective mechanism for route discovery. Broadcasting means sending of a message from one node to other node in the network.

II. ANALYSIS OF PROBLEM

Broadcasting is an effective mechanism for route discovery. In dynamic networks routing overhead associated with the broadcasting is large. Rebroadcast is very costly and consumes too much network resource. The broadcasting obtains large routing overhead and causes many problems like redundant retransmissions, contentions, and collisions. So, broadcasting optimization in route discovery is an effective solution to improve the routing performance. Frequent node movement in MANETs causes link breakages which may lead to frequent path failures and route discoveries. These could increase the overhead of routing protocols and reduce the packet delivery ratio and increasing the end-to-end delay. Thus, minimizing the routing overhead in route discovery is an essential problem.

III. ROUTING OVERHEAD MINIMIZATION TECHNIQUES

There are number of techniques developed to minimize routing overhead associated in route discovery.

A. *Gossip-based Ad-hoc Routing*

Z. Haas, J.Y. Halpern, and L. Li proposed Gossip-based Ad-hoc Routing Method. Researchers found that many routing messages are propagated unnecessarily in routing protocols. Instead of flooding those messages gossiping can be done. In general gossiping means tosses a coin to decide whether or not to forward a message, which can be used to reduce the number of routing messages sent significantly. Actually gossiping can be applied to any routing algorithms that use flooding to update routing information. However, gossiping focuses attention on the on-demand routing algorithms AODV, since it is the one much suited for ad hoc network. Gossiping uses percolation theory. By that theory, gossiping exhibits a certain type of bimodal behavior.

The basic gossiping protocol is simple. A source node sends the route request with probability 1. After receiving a route request first time, it broadcasts the route request to its neighbors with probability p and it discards the request with probability 1-p. Duplicate route request is discarded. A route request can be broadcasted at most once. This protocol is called GOSSIP (p). Gossiping can save 35% message overhead other than flooding and also it can be used in almost any routing algorithm. Based on GOSSIP (p), researchers proposed several heuristics to improve the performance of gossiping.
In high density network, there is limitation in gossip-based approach. And here reliability is dependent on probability.

B. *Dynamic Probabilistic Route Discovery (DPR)*

J.D. Abdulai, M. Ould-Khaoua, L.M. Mackenzie, and A. Mohammed proposed Dynamic Probabilistic Route Discovery Protocol. Here each node calculates forwarding probability according to the characteristic of its local density and the set of neighbors which are covered by the broadcast. When a node forwards an RREQ packet, it appends its most recent neighbor list. Each node that receives the RREQ packet searches through the list to

determine its set of neighbors that have been covered by the broadcast. The forwarding probability at a node is set low when relatively large percentage of its 1-hop neighbors are covered by the broadcast. Also, the probability is set high when small percentage of its neighbors is covered.
DPR gives high performance, less delay. But in most cases, it gives problem in route discovery.

C. *Robust Broadcast Propagation (RBP)*

Stann et al. proposed a Robust Broadcast Propagation (RBP) protocol to provide near-perfect reliability for flooding in wireless networks. Robust Broadcast Propagation (RBP) protocol has a good efficiency. Reliable broadcasting is purpose of this algorithm. This algorithm provides more reliable broadcast by reducing the frequency of upper layer invoking flooding to improve the overall performance of flooding. This algorithm works in four steps: tracking neighbors and floods, basic retransmission to reach target reliability, adapting that target to network density, and identifying important links that require successful transmission. Robust Broadcast Propagation (RBP) is simple protocol. While balancing energy efficiency it improves reliability.

D. *Dynamic Reflector Broadcast (DRB) and Dynamic Connector- Connector Broadcast (DCCB)*

Alireza Keshavarz-Haddad, Vinay Ribeiro, Rudolf Riedi proposed a hybrid backbone, consists of a static Dominating Set (DS) and the dynamically computed set of connecting nodes and two deterministic timer based schemes such as DRB and DCCB. Backbone is broadcast forwarding over subset of nodes. There are two different broadcast schemes: static backbone and dynamic backbone. Static backbone is one which use the same backbone and dynamic backbone is one in which the backbone is recomputed for each broadcast in order to adapt to broadcast state and network topology changes.

Deterministic, timer-based broadcast schemes not only guarantee full reachability over an idealistic lossless MAC layer. These schemes stand out for their robustness against node failure as well as more general changes in the network topology. It proposes the first broadcast schemes in this class which provably perform within a factor of the optimal efficiency (in terms of number of rebroadcasts). Broadcast algorithms aim at avoiding the broadcast storm by forwarding a broadcast only over a subset of nodes called backbone. Broadcast algorithms performance is based on three parameters: efficiency measured in number of rebroadcasts, reachability gives the fraction of nodes that actually receive the broadcast packet, and latency reports the time between first transmission and the first time the last node in the network received the broadcast.
Dynamic Reflector Broadcast (DRB) and Dynamic Connector- Connector Broadcast (DCCB) uses small number no of nodes. This algorithm guarantees full reachability.

E. *Neighbor Coverage-based Probabilistic Rebroadcast Protocol(NCPR)*

Xin Ming Zhang, En Bo Wang, Jing Jing Xia, and Dan Keun Sung proposed Neighbor coverage-based probabilistic routing protocol. In order to effectively exploit the neighbor coverage knowledge, there arise need of a rebroadcast delay to determine the rebroadcast order, and using this more precise coverage ratio can be obtained. The rebroadcast delay is used to determine the forwarding order. If the node has more common neighbors with the previous node then that node has lower delay. If packet is rebroadcasted, then more common neighbors will know this fact. And in order to keep the network connectivity and reduce the redundant retransmissions, there arise the need of a connectivity factor metric to determine how many neighbors should receive the Route Request packet. By combining the additional coverage ratio and the connectivity factor, there is a rebroadcast probability, which can be used to control the number of rebroadcasts of the Route Request (RREQ) packet. It improves routing performance. The rebroadcast probability calculated using two factors:
1) Additional coverage ratio 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 gives relationship of network connectivity and the number of neighbors of a given node.
This method creates less rebroadcast traffic than flooding and other schemes. Because of less redundant broadcast it mitigates network collision and contention and so increases packet delivery ratio and decreases average packet end-end delay. In high density network or in heavy load traffic, it gives high performance.

IV. COMPARISON

Comparison of routing overhead minimization techniques is given below:

	Gossip-Based Approach	DPR	DRB and DCCB	NCPR
Routing Overhead	Reduce overhead by 35%	Less	Less	Very less
Delay	Average	Less	High MAC delay	Less
Packet Loss	High	Less	Very less at MAC layer	Very less
Cost	---	No cost consideration	---	Less

V. CONCLUSION

Broadcasting is an important topic in MANETs. The problem is how to minimize the number of rebroadcast packets while good retransmission latency and packets reachability are maintained. In this paper, a detailed review is taken to minimize the routing overhead in MANETs. The techniques given here can be used in order to improve the routing performance. They have their own advantages or disadvantages. Because of less redundant rebroadcast, the NCPR protocol moderates the network collision and contention, which increases the packet delivery ratio and decreases the average end-to-end delay.

REFERENCES

[1] En Bo Wang, Jing Jing Xia, and Dan Keun Sung Xin Ming Zhang, "A Neighbor Coverage-Based Probabilistic Rebroadcast for Reducing Routing Overhead in Mobile Ad Hoc Networks," *IEEE TRANSACTIONS ON MOBILE COMPUTING*, vol. 12, MARCH 2013.

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

[3] M. Ould-Khaoua, L.M. Mackenzie, and A. Mohammed J.D. Abdulai, "Neighbour Coverage: A Dynamic Probabilistic Route Discovery for Mobile Ad Hoc Networks," in *Proc. Int'l Symp.Performance Evaluation of Computer and Telecomm. Systems (SPECTS'08)*, 2008, pp. 165-172.

[4] V. Ribeirox, and R. Riedi A. Keshavarz-Haddady, "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.

[5] J. Heidemann, R. Shroff, and M.Z. Murtaza F. Stann, "RBP:Robust Broadcast Propagation in Wireless Networks," in *Proc. Int'l Conf. Embedded Networked Sensor Systems (SenSys '06)*, 2006, pp. 85-98.

