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# Survey of Routing Protocol in MANET

**Abstract**

This survey investigates routing protocols for mobile ad hoc networks (MANETs). MANET is a collection of movable nodes which can move anywhere in Network. As nodes are mobile it can dynamically change their topology at any time. Broadcasting is a fundamental operation in Mobile Ad Hoc Network MANETs whereby a source node sends the identical or same packet to all the nodes in the network. Simple flooding technique used for route discovery where a mobile node blindly rebroadcast received route request packet until a route established for particular destination. While broadcasting has many advantages, it also have some disadvantage such as the broadcast storm problem, it cause redundant retransmission, collision, and contention in network. This paper discusses the various routing protocol to overcome this problem, also reduce the routing overhead to improve performance.

**Keywords:** *MANET, Rebroadcast Probability, Neighbor Coverage Knowledge, Broadcasting technique , AODV, Probabilistic Broadcasting.*

## 1. INTRODUCTION

MANET (Mobile Ad-hoc Network) is a collection of movable nodes which can move anywhere in Network. As nodes are mobile it can dynamically change their topology at any time. In MANET nodes can communicate with each other without any access point. Due to considerations such as radio power limitation, channel utilization, and power-saving concerns, a mobile host may not be able to communicate directly with other hosts in a single-hop fashion. Instead of using single –hop communication multi hop communication used, where the source node send the packets to the destination node through the several intermediate nodes. Suppose node A want to send the data packet to node D. Node D and node A are outside the transmission range of each other. By therefore node A and D are cannot directly communicate with each others. For these nodes B and C act as router and forward the packet through an intermediate node that are within the transmission range of node A and node D.

Broadcasting is the fundamental and effective mechanism to discover the route, some broadcasting techniques helps to solve the problem of redundant retransmission, contention and collision in network.

Broadcasting Techniques classified into 5 groups. Simple Flooding is used to blindly rebroadcast the received route

request packet until the particular destination is established. In Probability Based method when node received the RREQ packet first time it will assign certain probability in RREQ packet and send it to another node. If P=1 then it act as the simple Flooding. If network is sparse Probability set to high else set to low. In Counter Based method firstly by counting how many identical packets that have received during random delay and according to that node decides whether to rebroadcast the packet or not. In Area Based Method used additional Coverage Area concept to decide whether to rebroadcast the packet or not. Additional Coverage area is directly proportional to the distances between the two nodes. Neighbour Coverage Based Method is based on the information of neighbour node which decides whether to rebroadcast the packet or not. In conventional AODV (Ad-Hoc On demand Distance Vector Routing Protocol) used Simple Flooding method to discover the route. But it cause broadcast storm problem i.e. redundant retransmission, contention and collision in the network. This paper discusses the various routing protocol to overcome this problem also reduce the routing overhead to improve performance.

The rest of this paper is organized as follows: Section 2 introduces previous work. Section 3 various routing protocols with neighbor knowledge method. In Section 4 we have concluded with our observations.

## 2. PREVIOUS WORK

### *2.1 Routing Protocol is MANET*

Routing protocol is divided into 2 types:

#### *2.1.1 Proactive Routing Protocol*

Attempt to maintain consistent and up-to-date routing information (routes) from each node to every other node in the network. Topology updates are propagated throughout the network in order to maintain a consistent view of the network. Keeping routes for all destinations has the advantage that communication with arbitrary destinations experiences minimal initial delay. Furthermore, a route could be immediately selected from the route table. However, these protocols have the disadvantage of generating additional control traffic that is needed to continually update stale route entries especially in highly mobile environments, communication overhead incurred to implement a proactive algorithm can be prohibitively costly Typical and well-known examples of proactive routing protocols are destination-sequence distance vector (DSDV) [13] and optimized link state routing (OLSR) [14].

#### *2.1.2 Reactive Routing Protocol*

Establish routes only when they are needed. When a source node requires a route to a destination, it initiates a route discovery process by flooding the entire network with a route request (RREQ) packet. Once a route has been established by receiving a route reply (RREP) packet at the source node, some form of route maintenance procedure is used to maintain it, until either the destination becomes inaccessible or the route is no longer desired. These protocols use less bandwidth for maintaining the routing tables at every node compared to proactive routing protocols by avoiding unnecessary periodic updates of routing information. However, route discovery latency can be greatly increased, leading to long packet delays before a communication can start. Ad hoc on-demand distance vector (AODV) [1] and dynamic source routing (DSR) [2] are on demand routing protocol and they could improve the scalability of MANET by limiting the routing overhead when a new route is requested.

### *2.2 AODV (Ad hoc On demand Distance vector Routing Protocol)*

In AODV simple flooding mechanism is used which blindly rebroadcast the receive route request packet until the particular destination is established. It is reactive routing protocol i.e discover the route only when they are needed. No need to maintain whole network information. When the source node send the RREQ packet to intermediate node it check for valid entry in routing table if node has no route to destination it create the reverse route entry for source node and it rebroadcast RREQ packet else node generate RREP (route reply packet) and send it to source node. While sending the RREP packet node creates the forward route entry which pointing toward the destination. The state created in each intermediate node along the path from source to destination is a hop by hop state in which each node remembers only the next hop to destination node not the entire route. Due to simple flooding method it causes broadcast storm problem. To overcome this various routing protocols describe below.

## 3. VARIOUS ROUTING PROTOCOLS WITH NEIGHBOUR KNOWLEDGE METHOD

### *3.1 NCPR (Neighbor Coverage Based Probabilistic Routing Protocol) [3]*

The main aim of probabilistic rebroadcast protocol based on neighbor coverage is to reduce the routing overhead and improve the routing performance in MANETs. This approach combines the advantage of probabilistic method and neighbor knowledge method which can solve the broadcast storm problem.

Algorithm of NCPR

Assumptions: Ai is intermediate node, s is Source node, E(s) is the neighbour set of node s, RREQs is the route request packet received from node s, Rs.id is unique identifier of route request, U(s , i) is Uncovered Neighbour Set of node s for RREQ whose id is i and Timer(s , i) is timer of node s whose id is i.

In NCPR Protocol, when source node sends different RREQ need uncovered neighbour set and Timer.

Step 1: If Ai received new RREQs from s then
Step 2: Calculate initial uncovered neighbour set U(Ai, Rs.ID) for RREQs
Step 3: Compute the Rebroadcast Delay i.e. Td(Ai)
Step 4: Set a Timer (Ai, Rs.ID) according to T(Ai)
Step 5: end if
Step 6: if Ni received new RREQs from S then repeat from step 2 to step 4
Step 7: While Ai receives a duplicate RREQm from node Am before Timer (Ai, Rs.ID) expires do…
Step 8: Adjust U (Ai, Rs.ID)
Step 9: Discard (RREQm)
Step 10: Repeat step 7 to 9 until Timer expired
Step 11: end while other node received a duplicate RREQ message repeat step 7 to 9
Step 12: If Timer (Ai, Rs.ID) expires then
Step 13: calculate Rebroadcast Probability P(Ai)
Step 14: Check random probability <=P(Ai)
Step 15: If Yes Broadcast (RREQs)
Step 16: Else Discard (RREQs)
Step 17: Repeat until it reach to Destination.

When source node send RREQ packet to intermediate node it check whether it receive RREQ packet first time then calculate initial UCN set i.e Uncovered neighbor set by comparing neighbor list of itself with previous node neighbor list. After that calculate rebroadcast delay to determine forwarding order, set timer according to rebroadcast delay. Due to characteristics of broadcasting RREQ packet node can receive the duplicate RREQ packet from its neighbor node could adjust the uncovered neighbor set until timer expired. As time expired with the help of finial UCN set it calculates rebroadcast probability by multiplying the additional coverage ratio and connectivity factor. This rebroadcast probability decide whether to rebroadcast the packet or not. As compare to flooding NCPR protocol generate less redundant rebroadcast and because of this protocol mitigates the network collision and contention, so as to decrease the average end to end delay and increase packet delivery ratio. Although the protocol increases the RREQ packet size, it reduces the number of RREQ packet more significantly. The routing overhead is reduced about 45.9% in NCPR protocol compare with AODV protocol that indicate the NCPR protocol is most efficient as compare with AODV.

### *3.2 Probabilistic Broadcasting Based on Coverage Area and Neighbor Confirmation [4]*

This approach combines the advantage of probabilistic and area based method. In probabilistic method depend on pre-defined fixed probability to determined whether to rebroadcast the packet or not but the problem is that how to set rebroadcast probability. As the values of all nodes are same so it is critical to identify and categorise the node in the various regions and appropriately adjust their rebroadcasting probability. So we can dynamically determine the rebroadcasting probability. By using dynamic probabilistic broadcasting based on coverage area and neighbour confirmation in that coverage area is used to adjust the rebroadcasting probability and by using neighbour confirmation confirm that all neighbour received the broadcast packet if some are not received forward packet to that node and determine the suitable probability. For this author used three steps to determine or adjust the rebroadcasting probability.

Shadowing effect help to reduce number of rebroadcast packet. Each node is choosing different probability according to

its distance from the sender. As mobile node are closer to the sender or distance from the sender are less than the retransmission probability are set low and if mobile node are far from the sender than retransmission probability of that node is set high. It is better for the node that is far away from the sender because it may potentially act as relay node on behalf of node closer to the sender.

Based on shadowing effect we determine rebroadcast probability by calculating it coverage ratio and connectivity parameter. As distance between sender and node increase coverage area is also increase. As coverage area is directly proportional to distance from sender to node rebroadcast probability should be consider according to their coverage area. After determining the coverage ratio and adjust rebroadcasting probability we should confirmed that all neighbour should received the RREQ packet. If some of them not received RREQ packet its rebroadcast the packet. For example if n1 has the probability that do not broadcast the packet and n2 is the neighbour node of n1 and n2 not received RREQ packet. So n1 wait for the given amount of time and after the time expire it check if all neighbour received the broadcast packet and found that n2 not received the packet then n1 rebroadcast the packet to n2. Author evaluate the performance of this approach with simple flooding and analysis that the number of node transmit broadcast packet with no mobility and mobility of 20m/s this approach can substantially reduce the number of rebroadcast, reduce the collision packet more than 50% compare with flooding but this approach as more delay time compare with flooding.

***3.3 Neighbour knowledge scheme name SBA (scalable Broadcast Algorithm) [5]***

The main aim of this broadcast algorithm is to reduce unnecessary rebroadcasting by comparing the neighbour list (which is attach with RREQ packet) of current node with previous node. If all neighbour nodes have been received RREQ packet by previous transmission, node need not rebroadcast a message. In this approach local neighbour discovery and data broadcasting are utilised to avoid unnecessary rebroadcast and reduce overhead in network.

In local neighbour hello message are used to collect the neighbour information within 2 hops. When node received broadcast RREQ packet from previous node by checking the neighbour list of that node find which node have been covered by transmission and that node are added in BCS i.e Broadcast coverage set. If all node nodes are covered then rebroadcasting is not necessary and can be cancelled.

In data broadcasting when sender transmit a packet to all neighbour node and when receiver receives the packet first time receiver knows all its neighbour common to sender. It schedule RAD (random Access Delay) for delaying rebroadcast operation and start RAD, until RAD expired it accept the packet. After expired check all node covered or not if not send the packet to that node. This approach reduces the broadcast redundancy efficiently. As compare with flooding SBA reduce routing overhead about 60%, decrease packet delivery ratio of flooding with increase of network size and reduce end to end delay.

***3.4 DRP (Dynamic Probabilistic Route Discovery) [6]***

In fixed Probabilistic based scheme is used in which source node broadcast the packet by using flooding mechanism and every mobile node rebroadcast the packet based on predetermined fixed probability P. The main reason for appropriate adjustment of forwarding probability is varying degree of MANET node density. Every node in MANET has assigned fixed probability of route discovery which lead to unfair distribution in fixed probabilistic approach. Dynamic probability route discovery approach determines the forward probability of RREQ considering set of covered neighbour and local node density of forwarding node which overcome the problem.

By using Hello protocol the neighbour information is collected. The local neighbour information is used to estimate number of node in a particular region. Mobile node send the hello packet to neighbour node it check the entry in neighbour table if it does not have entry it create the entry in table or if neighbour node have the entry in table it update that entry. At certain amount of time if neighbour node is not receive hello packet delete the entry in table because all node in table are active node and thus link between them.

When node sending RREQ packet attach with recent neighbour list to intermediate node it search through the list to determine its set of node that have been covered by the broadcast. When large number of neighbour are covered then in that case forwarding probability at a node is set low otherwise set high.

## 4. CONCLUSION

The MANET (mobile ad hoc network) has been a subject of quite number of investigation in recent year. A good Routing Protocol need to provide low routing overhead, end to end delay and high packet delivery ratio. This paper presented a survey of most recent routing protocol in MANET based on neighbor knowledge method. Broadcasting is the fundamental and effective mechanism to discover the route. Neighbor knowledge method is a type of broadcasting techniques used to overcome problem of simple flooding which reduce number of retransmission, collision and contention in network. These survey protocol show that routing can improve the performance in term of normalized routing overhead, end to end delay and packet delivery ratio. By analyzing these protocols it indicates that these protocols are most efficient among the existing protocols.

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