Scientific Journal of Impact Factor (SJIF): 4.72
e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 12, December -2017

PROBABILISTIC REBROADCASTING BASED ON NEIGHBOR COVERAGE TOWARDS DESTINATION FOR REDUCING ROUTING OVERHEAD

Madhuri S. Hiwale[1], Supriya A Kinariwala[2], Sushma D Ghode[3]

[1] *M.E. CSE Student, MIT Aurangabad, Maharashtra,India*
[2] *Assistant Professor, MIT Aurangabad, Maharashtra,India.*
[3] *Assistant Professor, MIT Aurangabad, Maharashtra,India.*

Abstract — *Mobile Adhoc Networks (MANETs) is collection of wireless mobile hosts which form a temporary network without the aid of any centralized administration or standard support services." Ad-hoc network topology is dynamic—nodes enter and leave the network continuously. In MANET, each node has high mobility and due to which many times there happened to be link breakdown among the nodes which may cause path failure route discoveries overheads. So ih this paper reducing of these overheads with a approach called Neighbour Coverage Probabilistic Broadcasting is implemented. In this scheme the rebroadcast delay is calculated. The rebroadcast delay is to determine the forwarding order. The node which has more common neighbours 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 neighbours, which is the key to success for the proposed scheme.*

KEYWORDS: Mobile ad hoc networks (MANETs), neighbor coverage, network connectivity, probabilistic rebroadcast, routing overhead

I. INTRODUCTION

Mobile Adhoc Network (MANET)

Mobile ad hoc networks (MANETs) consist of a collection of mobile nodes which can move freely. An Ad hoc network is a collection of mobile nodes, which forms a temporary network without the aid of centralized administration or standard support devices regularly available as conventional networks. These nodes generally have a limited transmission range and, so, each node seeks the assistance of its neighbouring nodes in forwarding packets and hence the nodes in an Ad hoc network can act as both routers and hosts. Thus a node may forward packets between other nodes as well as run user applications. By nature these types of networks are suitable for situations where either no fixed infrastructure exists or deploying network is not possible. Ad hoc mobile networks have found many applications in various fields like military, emergency, conferencing and sensor networks. Each of these application areas has their specific requirements for routing protocols. Since the network nodes are mobile, an Ad hoc network will typically have a dynamic topology, which will have profound effects on network characteristics. Network nodes will often be battery powered, which limits the capacity of CPU, memory, and bandwidth. For example, in Fig 3.1, to establish communication between nodes A and C the network must enlist the aid of node B to relay packets between them. The circles indicate the nominal range of each node's radio transceiver. Nodes A and C are not in direct transmission range of each other, since A's circle does not cover C. [1,2]

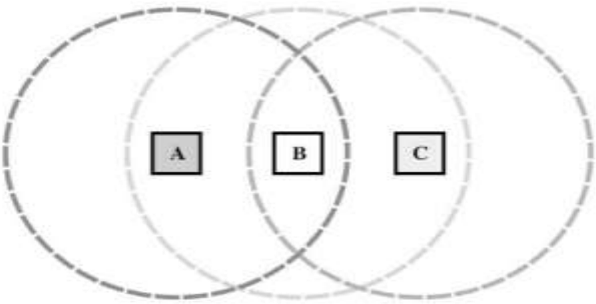

Figure 1 A Mobil Ad hoc network of three nodes, where nodes A and C must discover the route through B in order to communicate.

Figure 1.1: A Mobile Ad hoc network of three nodes, where nodes A and C must discover the route through B in order to communicate. In general, an Ad hoc network is a network in which every node is potentially a router and every node is potentially mobile. The presence of wireless communication and mobility make an Ad hoc network unlike a traditional

wired network and requires that the routing protocols used in an Ad hoc network be based on new and different principles. Routing protocols for traditional wired networks are designed to support tremendous numbers of nodes, but they assume that the relative position of the nodes will generally remain unchanged. [1,2]

II. RELATED WORK

One of the earliest broadcast mechanisms is flooding, where every node in the network retransmits a message to its neighbours upon receiving it for the first time. Although flooding is extremely simple and easy to implement, it can be very costly and can lead to serious problem, named as broadcast storm problem, which is characterized by redundant packet retransmissions, network bandwidth contention and collision. The flooding protocol is analytically and experimentally studies and showed that a rebroadcast can provide only 61% additional coverage at most and only 41% additional coverage in average over that already covered by the previous transmission. So, rebroadcasts are very costly and should be used with caution. It classifies the broadcasting schemes into five classes to reduce redundancy, contention, and collision: probabilistic, counter-based, distance-based, location-based and cluster-based. In probabilistic scheme, a mobile host rebroadcasts packets according to a certain probability. In counter-based scheme, a node determines whether it rebroadcast a packet or not by counting how many identical packets it receives during a random delay. It is assumed in counter-based scheme that the expected additional coverage is so small that rebroadcast would be in vain when the number of recipient broadcasting packets exceeds a threshold value. In distance-based scheme, they used the relative distance between a mobile node and previous sender to make the decision whether it rebroadcast a packet or not.[3] It classifies the broadcasting techniques into four groups and compared their performances: simple flooding, probability-based, area-based and neighbour knowledge scheme. In flooding scheme, every node in the network retransmits the message to its neighbours after receiving it. Probability-based scheme is a very simple way of reducing rebroadcasts. Each node rebroadcasts with a predefined probability p, where p =1 activates blind flooding. In area based scheme, a node determines whether it rebroadcast a packet or not by calculating its additional coverage area. Although area-based scheme works quite well, it doesn't know whether there is any node in the calculated coverage area. So, some nodes may not receive broadcasting packets. Neighbour knowledge scheme maintains neighbour node information to decide whether it or the neighbouring nodes have to rebroadcast or not. To use neighbour knowledge method, each node has to explicitly exchange neighbourhood information among mobile hosts using periodic Hello packets. The length of the period affects the performance of this scheme: If it is set too short then it could cause collision or contention while setting it too long would degrade its ability to cope with mobility. [4]

DRAWBACKS:

1. Excessive contention and collision
2. Redundant rebroadcasts and routing overhead
3.

III. MOTIVATION

In the Existed System it is studied that in Mobile Adhoc Network (MANETs) , nodes which form communication are mobile so there are high probability to get failure and disconnect . If we analyse this failure it definitely came out as overhead in terms of the energy and time. Whenever there is link retransmission of the same is done and at the same time it does not guarantee that in which attempt it is delivered to destination. So the motivation to proposed new system is that lot of energy which involve in transiting packets until delivery and low probability of delivery are not at affordable and something desirable should be implemented to avoid these drawbacks existed system.

IV. PROPOSED SYSTEM

It proposes 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. Moreover, proposes 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: 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 neighbors; and connectivity factor, which reflects the relationship of network connectivity and the number of neighbors of a given node. It proposes a new perspective for broadcasting: not to make a single broadcast more efficient but to make a single broadcast more reliable, which means by reducing the frequency of upper layer invoking flooding to improve the overall performance of flooding. In our protocol, we also set a deterministic rebroadcast delay, but the goal is to make the dissemination of neighbour knowledge much quicker.

ADVANTAGES:
1. Reducing routing overhead due it generates less rebroadcast traffic
2. Less redundant rebroadcast mitigates the network collision and contention
3. Better packet delivery ratio

V. SIMULATION MODEL

An extensive simulation model having scenario of n (user defined) mobile nodes and n UDP/TCP connections is used to study inter-layer interactions and their performance implications. The other parameters used in this model are as under:

Software for simulation	Network simulator 2.
Channel	Wireless
Simulation runs time	50 seconds
Area in which nodes move	600X600
Bv5Packet size	1024bytes
Speed	1m/s to 10 m/s
Routing Protocol	AODV
Propagation model	TwoRayGround
Network Interface Type	Wireless Physical
Queue Type	Drop Tail
IFQ-Length	50 Packets
MAC Type	Mac/802.11
Antenna Type	Omni Antenna

The performance differentials are analysed using MAC collision rate, Normalized routing overhead, Packet delivery ratio, and Average end to end delay.[4]

VI. SYSTEM IMPLEMENTATION

Module1: Determination of Common neighbors
Initially, each node in the network sends the beacon packets to each node in the communication range. A node which receives the beacon packet replies to the sender including its information. Thus, each node maintains the neighbour list frequently. A source node sends the RREQ packet to its neighbors, when it initiates the route discovery process. A node which receives the RREQ packet, it compares the neighbour list with its sender neighbour list. And, it determines the common neighbors.

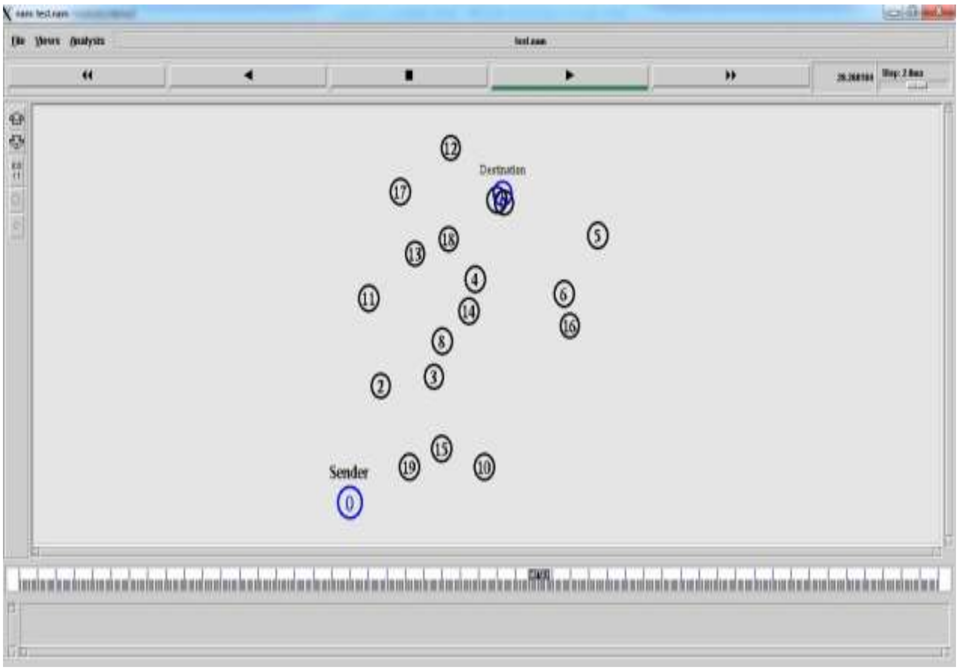

Figure 2 the simulation shows the network of nodes with source and destination

Module 2: Rebroadcast Delay

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 neighbour nodes. In the proposed work, define the UnCovered neighbours' set U(ni) of node ni as follows:

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 ni; i = 1; 2; . . . ; |N(s)| receive and process the RREQ packet. We assume that node ni has the largest number of common neighbours' with node s, node nk has the lowest delay. Once node nk rebroadcasts the RREQ packet, there are more nodes to receive it, because a node ni has the largest delay. Based on the rebroadcast delay, a node set the timer. When a node receives the duplicate RREQ packet before expires the timer, it adjusts the UCN list.

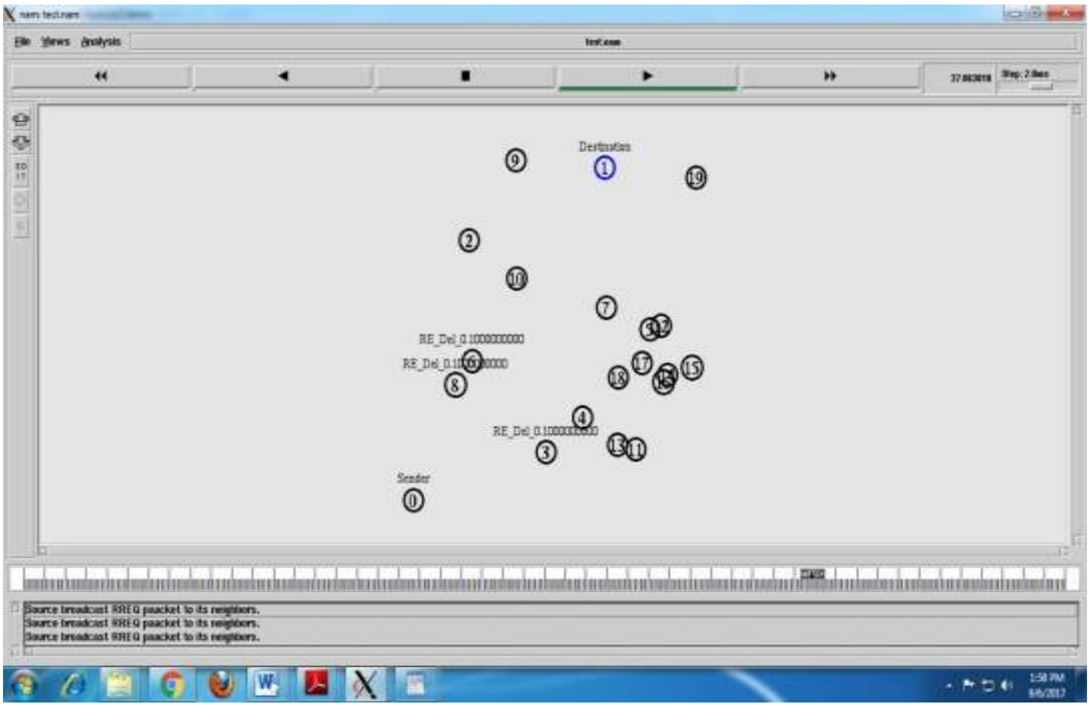

Figure 3 Rebroadcast Delay

The rebroadcast delay is calculated based on the uncovered neighbours'.
1) Uncovered neighbours' are increased with increases of rebroadcast delay.
2) Common neighbours are increased with decreases of rebroadcast delay.
Rebroadcast Delay means that the time interval (rebroadcast delay time) at which the nodes wait for rebroadcast the RREQ packets. Because rebroadcast delay time node will check the duplicate packet is received. The node will receive the duplicate packet; it's readjusted the uncovered neighbour list and then calculates the Rebroadcast Probability.

Module 3: Rebroadcast Probability

Additional coverage ratio

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

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.

Connectivity factor:

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

Where Nc = 5:1774 log n, and n is the number of nodes in the network, It observes that when |N(ni)| is greater than Nc, Fc(ni) is less than 1. That means node ni is in the dense area of the network, then only part of neighbors of node ni forwarded the RREQ packet could keep the network connectivity. And when |N(ni)| is less than Nc, Fc(ni) 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(ni) of node ni:

$$P_{re}(n_i) = F_c(n_i) \cdot R_a(n_i),$$

The parameter Fc is inversely proportional to the local node density. That means if the local node density is low, the parameter Fc increases the rebroadcast probability, and then increases the reliability of the NCPR in the sparse area. If the local node density is high, the parameter Fc could further decrease the rebroadcast probability, and then further increases the efficiency of NCPR in the dense area.

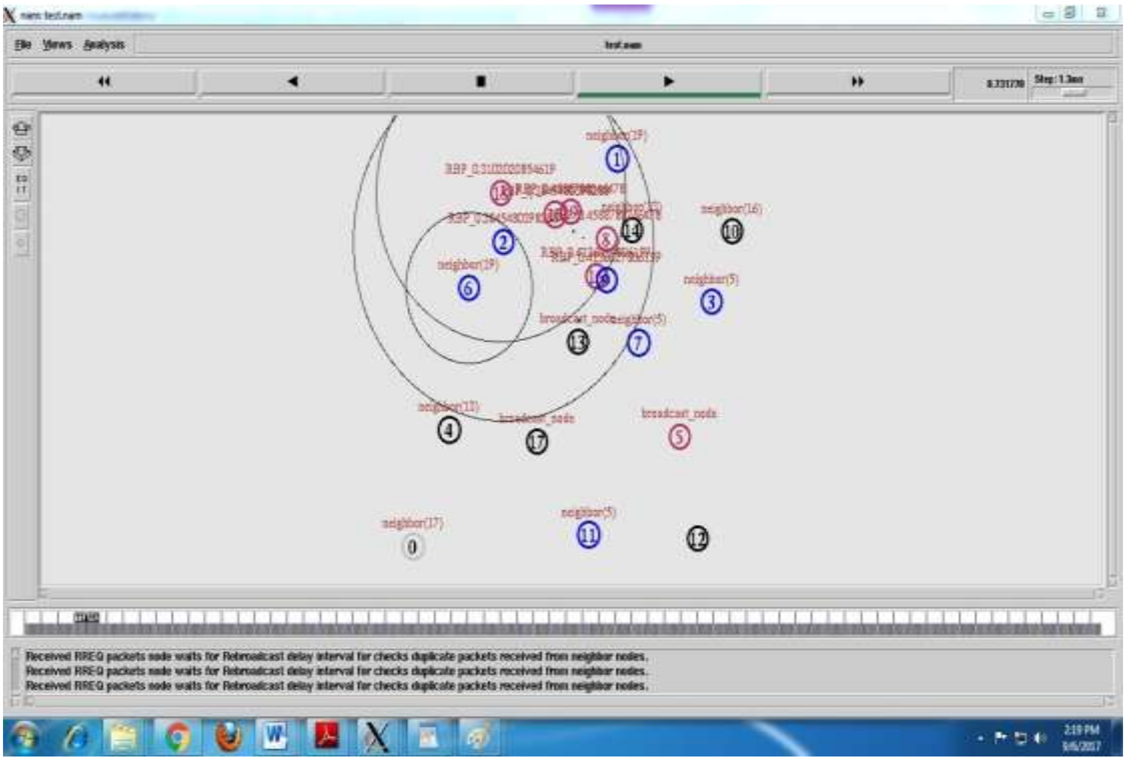

Figure 4 Rebroadcast Probability

Module 4: NCPR Algorithm

1. The node which has a larger rebroadcast delay may listen to RREQ packets from the nodes which have lower one.
2. If node ni receives a new RREQs from s
3. Compute the initial uncovered neighbors of node and set U
4. Compute the rebroadcast delay Td from U
5. Set a Timer according to rebroadcast delay Td
6. While ni receives a duplicate RREQj from nj before Timer expires
7. Adjust the uncovered neighbors
8. When the ni did not receives the duplicate RREQj from nj
9. Discard (RREQj)
10. If the Timer Expires
11. Compute the rebroadcast probability
12. If the Rebroadcast Probability ≥ Random(0,1)
13. Then Broadcast (RREQs)
14. If the Rebroadcast Probability ≤ Random(0,1)
15. Discard (RREQs)

In NCPR protocol the RREQ flooding is based on the rebroadcast delay and rebroadcast probability. The rebroadcast probability is less than the threshold value, the node will not broadcast the RREQ packets, because the node is identified the dense area. Suppose due to the mobility of nodes are moving into another location, in that situation the packets are not reached in the destination. Therefore to solve this issue, this project contributes a nodes having highest energy will broadcast the RREQ packets to its neighbors. This condition is only applied in the dense area. Therefore the rebroadcast probability of node is less than the threshold value; the nodes having highest energy will broadcast the RREQ packets to its neighbors.[5]

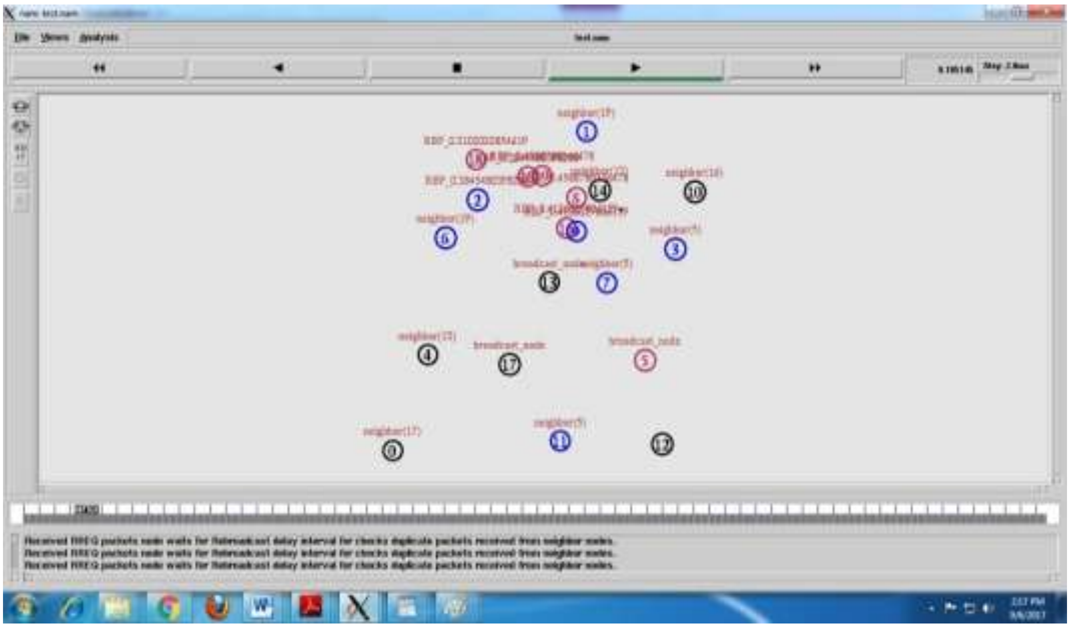

Figure 5 NCPR

Module 5: Performance Evaluation
Performance Metrics are listed below

1. **MAC collision rate:**

   The average number of packets (including RREQ, route reply (RREP), RERR, and CBR data packets) dropped resulting from the collisions at the MAC layer per second.

2. **Normalized routing overhead:**

   The ratio of the total packet size of control packets (include RREQ, RREP, RERR, and Hello) to the total packet size of data packets delivered to the destinations.

3. **Packet delivery ratio:**

   It defined as the ratio of the number of data packets successfully received by the CBR destinations to the number of data packets generated by the CBR sources.

4. **Average end-to-end delay:**

   The average delay is defined as the successfully delivered CBR packets from source to destination node. It includes all possible delays from the CBR sources to destinations.

Comparative analysis Graph of Proposed System with Existed System considering above metrics are as below.

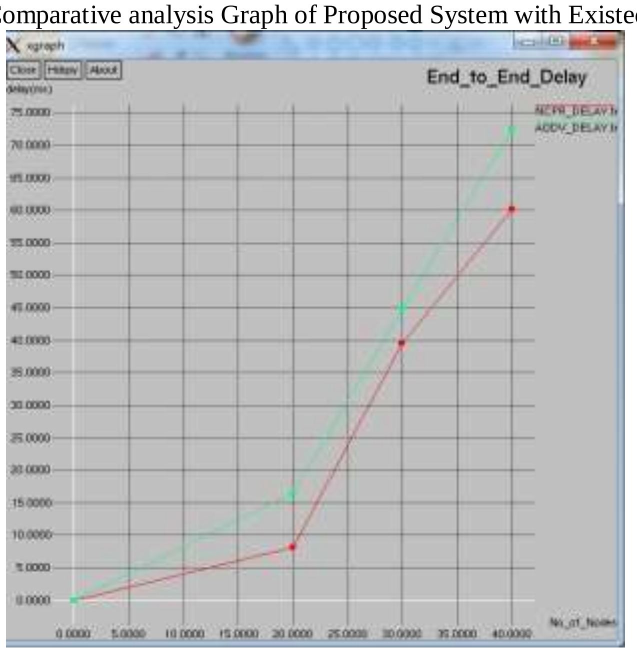

Figure 6 End to End Delay

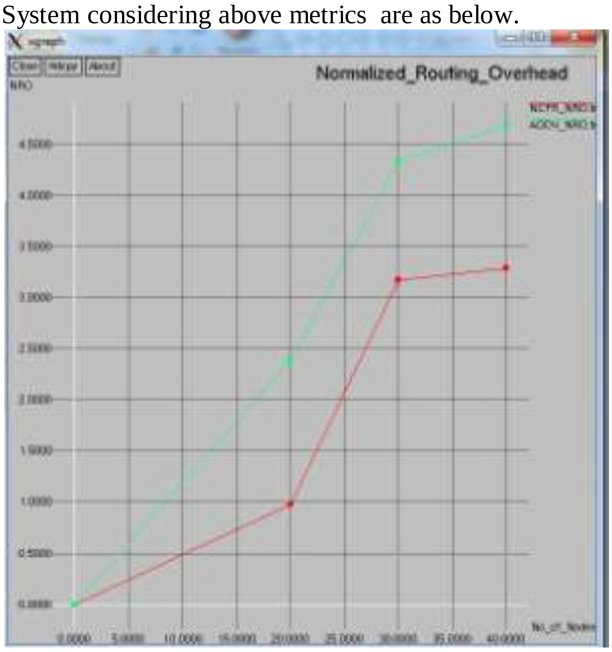

Figure 6 NRO

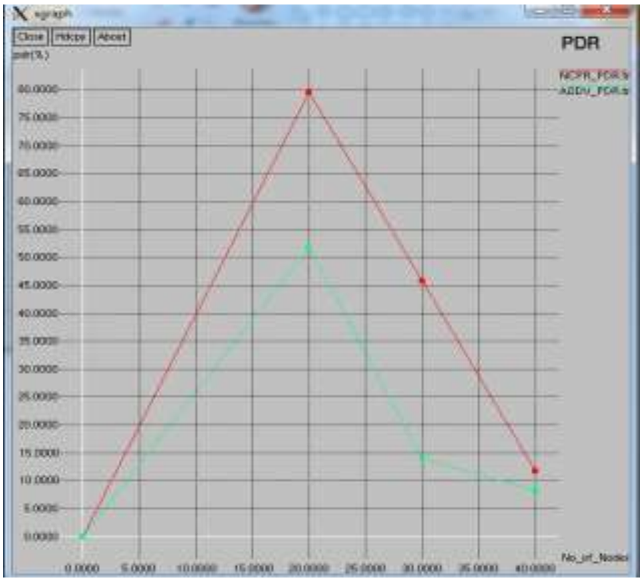

Figure 8 PDR

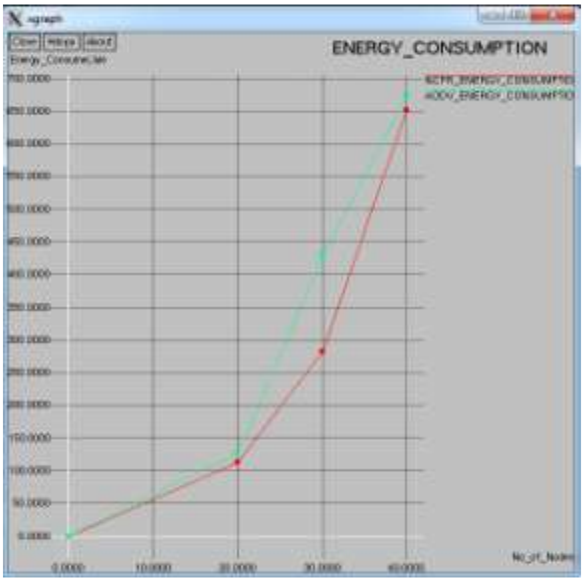

Figure 9 Energy Consumption

5. CONCLUSION

Broadcasting is an active research topic in MANETs. An important problem is how to minimize the number of rebroadcast packets while good retransmission latency and packets reachability are maintained. Even though the large number of rebroadcasts guarantees high reachability, it causes high network bandwidth wastage and so many packets collisions. On the other hand, the small number of rebroadcasts results in low reachability, because it cause rebroadcast chain broken so that some hosts may not receive the broadcast packets. In this paper, we proposed a probabilistic rebroadcast protocol based on destination towards neighbor coverage to reduce the routing overhead in MANETs. This neighbor coverage knowledge includes additional coverage ratio and connectivity factor. The rebroadcast delay determines the forwarding order and 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. It enables the information that the nodes have transmitted the packet spread to more neighbors, which is the key to success for the proposed scheme. This scheme calculates the rebroadcast probability and considers the information about the uncovered neighbors towards destination (UCN_{td}), connectivity metric and local node density to calculate the rebroadcast probability. By combining the additional coverage ratio and connectivity factor, we set a reasonable rebroadcast probability. Simulation results show that our approach can improve the average performance of broadcasting in various network scenarios. Our approach is simple and can be easily implemented in MANET.

REFERENCES

[1] On-Demand Routing In Multi-Hop Wireless Mobile Ad hoc Networks
[2] Xin Ming Zhang, En Bo Wang, Jing Jing Xia, and Dan Keun Sung "A Neighbor Coverage-Based Probabilistic Rebroadcast for Reducing Routing Overhead in Mobile Ad Hoc Networks". IEEE TRANSACTIONS ON MOBILE COMPUTING, VOL. 12, NO. 3, MARCH 2013."
[3] Panthini V Patel, Bintu kadhiwala "Broadcasting Techniques for Route Discovery in Mobile Adhoc Network - A Survey" *2016 International Conference on Computing for Sustainable Global Development (INDIACom)*
[4] Arathy O1 , Binu Mathew "Probabilistic Broadcasting based on Neighbor Coverage for CBR and VBR Traffic in MANET" International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 3 Issue 8 August, 2014 Page No. 7921-7925
[5] Neha S. Brahmankar1 , Hitendra D. Patil "Neighbor Coverage Approach for Minimization of Routing Overhead in MANET".
[6] Geethu Mohandas Dr Salaja Silas Shini Sam Survey on Routing Protocols on Mobile Adhoc Networks
[7] Sushma D. Ghode, K. K. Bhoyar, "A Survey on Energy Efficient Routing Algorithms for Ad-Hoc Network".
[8] USHMA D. GHODE, SHILPA D. GHODE "A Novel Approach For Energy Efficient Routing Algorithm For Adhoc Network".

