An implementation on node discovery of suggestion based routing protocol for mobile ad hoc network

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***Abstract**:* Mobile Ad Hoc Networks provides important control and route establishment functionality for a number of unicast and multicast protocols. To discover an effective and an efficient routing protocol for transmit information from source to destination across whole network topology. This is a main issue in networking research.The mobile nodes are connected with links and data packets are transferred from node to another node and vice versa. A simple flooding approach is used by the mobile node if the destination is not within the hop region. If the data packet is not transferred within a particular time, rebroadcast of data packet is done and which leads to overhead in Manet. In this project we propose a neighbor coverage probabilistic rebroadcast protocol for reducing routing overhead in Manet. In order to find the neighbor coverage nodes, we propose a novel rebroadcast delay to determine the common neighbors. We also define a rebroadcast probability which is the combination of additional coverage ratio and connectivity factor. the broadcasting increases the routing overhead, packet delay, which negativity affects the throughput due to the excessive use of the redundant Route REQuest message. In addition, the network is susceptible to so-called broadcast storm problem. Therefore, developing a new routing protocol, which is able to relieve the unnecessary Route REQuest messages while boosting the performance of the network, is required. In this article, a novel routing protocol for mobile ad hoc network, called scalable neighbor-based mobile routing, is proposed. The broadcasting in this protocol is governed by the inverse relation between the number of neighbors and the probability of the rebroadcasted Route REQuest messages.. The both approaches are defined to reduce the number of retransmissions so as to reduce the routing overhead, collision rate and improve the packet delivery ratio. To discover the route better than broadcasting methodology rebroadcast can done with the help of neighbour knowledge methods. 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 the more accurate additional coverage ratio by sensing neighbour coverage knowledge. We also define a connectivity factor to provide the node density adaptation. By combining the additional coverage ratio and connectivity factor, we set a reasonable rebroadcast probability. This approach can significantly decrease the number of retransmissions so as to reduce the routing overhead and also improve the routing performance.

***Index Terms* – Mobile ad hoc networks, neighbour coverage, network connectivity, probabilistic rebroadcast, routing overhead, Routing protocol, broadcasting techniques, NCPR,**

I. INTRODUCTION

The Mobile Ad hoc Networks (MANETS) is a special type of wireless mobile network in which mobile hosts can communicate without any aid of established infrastructure and can be deployed for many applications such as battlefield, disaster relief and rescue, etc. The nodes are free to move randomly and act as end points as well as routers to forward packets in a multi-hop environment where all nodes may not be within the transmission range of the source. The network topology may change rapidly and unpredictably in time. New nodes can join the network, and other nodes may leave the network[1]. THE field of wireless communication is becoming more popular than ever before due to the rapid advancement of wireless technologies and the wide spread of mobile devices. After a natural disaster, such as a fire, flood, or earthquake, distributed nodes. Furthermore, a MANET has the potential to work alongside different networks such as cellular networks and the Internet. Indeed, the set of applications for MANETs is diverse[2]. These applications are not limited to areas such as emergency and crisis management, local-level, commercial and military battlefield applications. Aside from the aforementioned advantages of MANET, the mobile nature of the nodes in such a network imposes a battery lifetime limitation. Furthermore, these nodes may be equipped with different transmission technologies even though the transmission medium is shared. As a result, nodes The Expected size of a MANET is larger than the transmission range of the nodes, because of this fact it is necessary to route the traffic through a multi-hop path for giving the nodes the ability to communicate with each other[3]. There exist neither fixed routers nor fixed locations for the routers nor centralized administration. The lack of any fixed infrastructure is compensated by the routing ability of every mobile node. They all act as mobile routers and for this they need the capability to discover and maintain routes to every node in the network and to route the packets accordingly. To optimize the broadcasting, limiting the number of rebroadcasting in the routing will help. Rebroadcasting delay helps to define the neighbor coverage knowledge in network, in order to strengthen the network connectivity, broadcasting neighbors should receive the RREQ packet these reduce the redundant and number of rebroadcasts of the RREQ packet in the data transmission[4]. Always neighbor selection has to done randomly, due to random mobility model in network. Number of collisions in re-broadcasting will occur in the physical layer. Since data packets and routing packets share the same physical channel, the collision possibility is high when there is a large number of routing packets

The main Contributions of the project are:

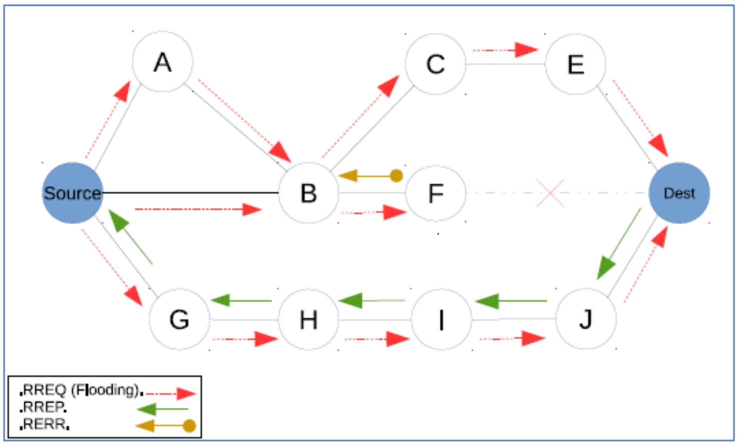
i. Calculate Rebroadcast Delay to determine the forwarding order. The node which has more common neighbors with previous node has lower delay. If a rebroadcast of same message is done, then a rebroadcast delay enables the information that nodes have transmitted the packet to spread to more neighbors.

ii. A Rebroadcast probability that covers the information about the uncovered neighbor's connectivity metric and local node density to calculate the rebroadcast probability.

a. Additional Coverage Ratio is the number of nodes that should be covered in a single broadcast message.

b. Connectivity Factor is the relationship of network connectivity and number of the neighbors for a given node.

This generates undesirable delays, and in some cases, collisions may occur, which increases routing overhead. This is known as the Broadcast Storm Problem (BSP) As a consequence, routing in MANET has become the main challenging issue because a network with a changeable topology leads to frequent path failure. Most available routing protocols have been categorized into three types: proactive, reactive and hybrid. Undoubtedly, a MANET uses reactive routing protocols, which are more practical for such a network due to the low routing overhead that they produce and the low power resources that they need. Recently, several routing protocols have been used in MANET, including the AODV protocol, Dynamic Source Routing (DSR), Location Aided Routing (LAR) and Zone Routing Protocol (ZRP). Basically, in routing protocols such as AODV and NCPR, when there are data to be sent to a particular destination, the source node must check its routing table for the destination node if there is any; otherwise, it initiates a so-called RREQ and broadcasts it to all nodes in the worst case (flooding). Most of these messages are redundant, leading to a performance degradation from imposing extra routing overhead. Many routing protocols have been proposed to reduce the extra routing packets, and the majority of such protocols are classified under four main schemes: flooding, probability, area-based and neighbor-information-based schemes[6]. This project addresses the NCPR protocol problem, which considers the preset variables of the total number of nodes, while reducing routing overhead. As a result, it reduces the end-to-end delay, MAC collisions, energy consumed by nodes, network connectivity, and packet delivery ratio..



MANETs can route packets in multiple hops

II. NEIGHBOR COVERAGE-BASED PROBABILISTIC REBROADCAST PROTOCOL

In this section, 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.

A. UNCOVERED NEIGHBOURS SET AND REBROADCAST DELAY

When node ni receives RREQ packet from its neighbor node s, it can use the neighbor list available in the RREQ packet to calculate how many its neighbors have not been covered by the RREQ packet which has been delivered from node s. If node ni has more neighbors uncovered by the RREQ packet from node s, which means that if node nirebroadcasts the RREQ packet, this RREQ packet could reach more extra neighbor nodes. We calculate the Uncovered Neighbors set U (ni) of node ni as follows:

$U(n_i) = N(n_i) - [N(n_i) \cap N(s)] - \{s\}$

We obtain the initial UCN set. Due to broadcast characteristics of RREQ packet, node ni can receive the redundant RREQ packets from its neighbors. Node ni could further adjust the U (ni) with the neighbor knowledge. Where N(s) and N (ni) are the neighbors sets of node s and ni respectively. S is the node which sends the RREQ packet to node ni.The Rebroadcast delay Td (ni) of node ni is calculated as follows: $T_p(n_i) = 1 - \frac{|N(n_i) \cap N(s)|}{|N(s)|}$ $T_d(n_i) = MaxDelay \times T_p(n_i)$ Where Tp (ni) is the delay ratio of node ni and MaxDelay is a Small constant delay.| | is the number of elements in a set.

B. CALCULATION OF NEIGHBOR KNOWLEDGE AND REBROADCAST PROBABILITY.

If node ni receives a redundant RREQ packet from its neighbornj then node ni can further adjust its UCN set according to the neighbor list in the RREQ packet from nj. Then U(ni)can be adjusted as follows: $U(n_i) = U(n_i) - [U(n_i) \cap N(n_j)]$ After adjusting the U(ni), the RREQ packet received from nj is discarded. The rebroadcast probability is composed of additional coverage ratio and connectivity factor. Additional coverage ratio Ra (ni) of node ni is defined as follows:

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

This formula indicates the ratio between the number of nodes that are additionally covered by this rebroadcast to the total number of neighbors of node ni . Fc (ni) is defined as a connectivity factor as follows:

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

Where Nc=5.1774 log n, and n is the number of nodes in the network. The rebroadcast probability Pre (ni) of node ni as follows:

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

Where, if the Pre (ni) is greater than 1, we set the Pre (ni) to 1. The calculated rebroadcast probability Pre (ni) may be greater than 1, but it does not impact the behaviour of the protocol [1]. Then, with probability Pre (ni), node ni need to rebroadcast the RREQ packet received from s.

C. ROUTE RECOVERY BY RREQ AND RREP

In this section the signal handoff is done with the knowledge of route plan (RREP).The route manager inform the channel fading.

III. PROTOCOL IMPLEMENTATION

- A base wireless network is created and data packet is forwarded from source to Destination.

- Hello packet is forwarded from one node to another node and RREQ is broadcasted in order to forward the packet from one node to another node. RERR is generally sent from destination point if a packet is dropped.

- Consider a wireless network which contains multiple nodes and a node Nx which checks for the Rebroadcast Delay and Rebroadcast probability, Node Nj which forwards the RREQ packet to node Nx when required. The following steps are to be followed:

1. First check for an uncovered node set
2. Calculate and identify Uncovered node first
3. Calculate Delay Ratio and Maximum Delay of neighbor node set to avoid collision and overhead in the Manet.
4. Calculate Rebroadcast Delay
5. Set Rebroadcast Timer according to the Rebroadcast Delay.
6. If node Nx receives a duplicate RREQ packet from another node Nj before additional coverage expires adjust Uncovered nodes at Nx and discard the RREQ packet from Node Nj.
7. If rebroadcast timer expires then compute Rebroadcast probability Pre, Additional Coverage and Connectivity factor Cf.

a. If rebroadcast probability is zero then discard the RREQ packet.

b. If rebroadcast probability is one then rebroadcast the RREQ packet again.

8. The node which receive the RREQ packet from node Nx can take their according to the num_neighbors in the received RREQ packet:

a. If the num_neighbors is positive, node substitutes its neighbor cache of node Nx according to the neighbors list in the RREQ packet

b. If the num_neighbors is negative, the node updates its neighbor cache of node Nx and deletes the deleated neighbors in the received RREQ packet

c. If the num_neighbors is Zero, the node does nothing.

IV. IMPLEMENTATION

This part of the paper focus on the main implementation work of the paper by which our goal will be fulfilled. For optimization of the routing mechanism using NCPR we will follow some steps these are discussed in next point.

A. Steps of the implementation work

Step 1: Select the Packet Size for Input UDP packets.

Step 2: Create the Protocol NCPR, and get the result for that protocol.

Step 3: Create and Implement the AODV Protocol.

Step 4: Comparing the parameters between NCPR and AODV output's.

Step 5: Computing Performance Matrix

Step 6: Calculating the PDF, Throughput, Delay and Routing Load.

Step 7: Evaluation of Graph.

Step 8: Display the Final Output.

Step 9: Stop.

B. PERFORMANCE METRICS

We evaluate the performance of the protocol we calculate following performance metrics:

Routing load: Routing Load is the sum of the routing control messages such as RREQ, RREP, RRER, HELLO etc, counted by k bit/s.

Throughput: Throughput is the ratio of the total amount of data that reaches a receiver from a sender to the time it takes for the receiver to get the last packet is referred to as throughput. It is calculated in packets per second or bits per second. Factors that affect throughput in MANETs include limited bandwidth and limited energy, frequent topology changes, unreliable communication,.

Packet Delivery Ratio: Packet Delivery Ratio (PDR) is the ratio between the number of packets transmitted lines by a source node and the number of packets received by a sink node. This measures the loss rate by transport protocols. It characterizes the efficiency and correctness of ad hoc routing protocols. Always a high packet delivery ratio is required by a network.

End to End Delay: The packet end-to-end delay is the average time that packets take to traverse the whole network. This time is the generation of the packet by the sender up to their reception at the destination's application layer and is calculated in seconds. It therefore includes all the delays in the network such as transmission time, delay and buffer queues induced by routing activities and MAC control exchanges.

V. EXPERIMENTAL RESULT

In order to optimization of routing mechanism of MANET using NCPR We compare results of ncpr with AODV protocol and shows that NCPR is better using four performance metrics these are routing load (energy utilization), throughput, packet delivery ratio, end to end delay.

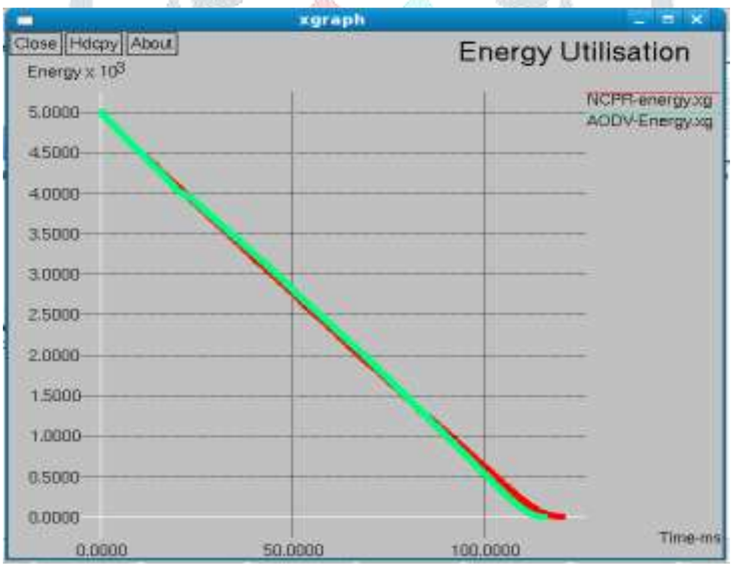


Fig.4. Graph of Energy Utilization

The simulated result shown in figure 4 from this it is cleared that the energy utilization in AODV is not linear as some interval of time the energy changes but it is not happen in NCPR. So we can say NCPR is better in energy utilization.

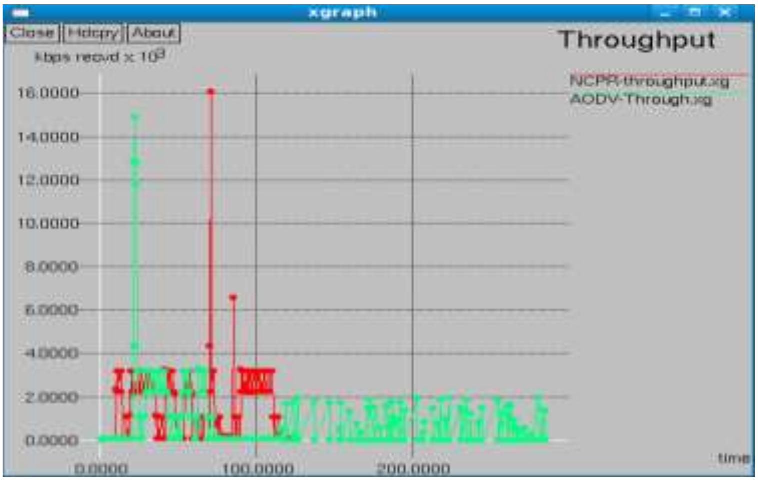


Fig.5 Graph of Throughput

The simulated result shown in figure 5 from this it is cleared that the throughput between the Time and Packet sent kbps. This graph tells that Comparison of Throughput between the AODV protocol and NCPR protocol. The AODV protocol gives the efficient throughput at the end of the packet delivery. But the NCPR protocol gives the most efficient throughput in Starting itself.

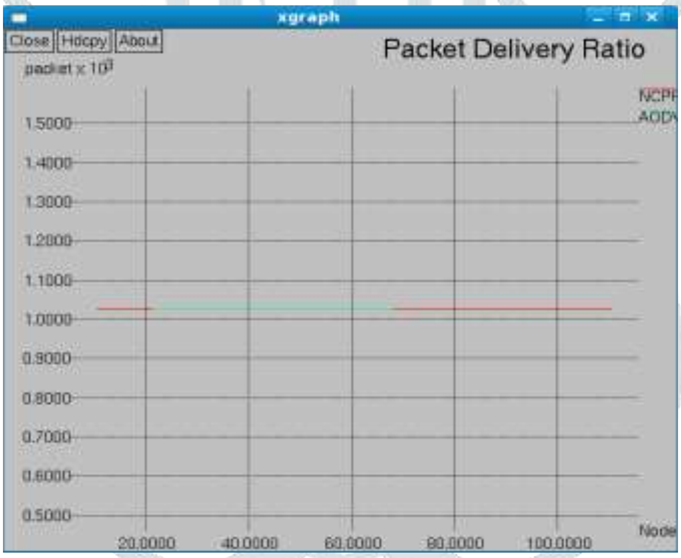


Fig.6. Graph of Packet Delivery Ratio

The simulated result shown in figure 6 from this it is cleared that the Packet Delivery Ratio Comparison between AODV Protocol and NCPR protocol. The Packet Delivery Ratio means plot the graph between Node and Average Packet delivery. It shows that PDR of AODV is efficient for only some number of nodes but for NCPR it good for all nodes.

Fig.7. Graph of End to End Delay

The simulated result shown in figure 7 from this it is cleared that the end to end delay of NCPR is high at initial time interval but when time increases the end to end delay will not increases as compared to AODV. In average packet delay of NCPR protocol is more efficient than AODV protocol packet delay.

CONCLUSION

We propose a probabilistic rebroadcast protocol based on neighbor coverage to reduce routing overhead. The proposed protocol generates less traffic compared to flooding as it decreases the rebroadcasting of RREQ packet. The proposed protocol decreases the network collision and contention, increases the packet delivery ratio and decreases the end to end delay. We also proposed a scheme to calculate rebroadcast delay weather to rebroadcast the packet or not. The proposed neighbor coverage scheme calculates additional coverage ratio and connectivity factor. The simulation results also show that the proposed protocol has decreased overhead and good results when compared with the standard protocol. The packet delivery ratio using the drop policy on a number of neighbors for each node. Not only the four mention metrics but also wasted energy by redundant packets has been enhanced as compared to both NCPR and AODV protocol. SNBR mitigated the problem of extra RREQ in the first stage route discovery, based on the inverse relation between the number of neighbors and the probability of the rebroadcasted RREQ messages This protocol has good performance when the network is in high-density or the traffic is in heavy load. Because of less redundant rebroadcast, the proposed protocol mitigates the network collision and contention, so as to increase the packet delivery ratio and decrease the average end-to-end delay.

FUTURE WORK

An Ad-hoc network is a collection of multi-hop wireless nodes that communicate with each other without centralized controlling or without fixed infrastructure, dynamically formed by an autonomous system of mobile nodes that are connected via wireless links. The battery power is very scarce resource in this network. The network lifetime and connectivity of nodes depend on battery power. Due to energy constraint the power aware routing schemes for mobile ad hoc networks has been developed for increasing network life time by isolating low power nodes from the routing process. This paper presents a study of recently proposed power aware routing schemes based on their own feature and improvement. The power aware routing schemes are classified on the basis of approaches they use to minimize the energy consumption. The purpose of this paper is to give brief review on power aware routing schemes improvements to last few recent years.

REFERENCES

[1] M. Ayyash, Y. Alsbou, and M. Anan, "Introduction to mobile ad-hoc and vehicular networks," in Wireless Sensor and Mobile Ad-Hoc Networks. Springer, 2015, pp. 33–46.

[2] H. Safa, M. Karam, and B. Moussa, "Phaodv: Power aware heterogeneous routing protocol for manets," Journal of Network and Computer Applications, vol. 46, pp. 60–71, 2014.

[3] S.-Y. Ni, Y.-C. Tseng, Y.-S. Chen, and J.-P. Sheu, "The broadcast storm problem in a mobile ad hoc network," in Mobile Computing 99. ACM, 1999, pp. 151–162.

[4] Y.-C. Tseng, S.-Y. Ni, Y.-S. Chen, and J.-P. Sheu, "The broadcast storm problem in a mobile ad hoc network," Wireless networks, vol. 8, no. 2-3, pp. 153–167, 2002.

[5] C. Perkins, E. Belding-Royer, S. Das et al., "Rfc 3561-ad hoc on-demand distance vector (aodv) routing," Internet RFCs, pp. 1–38, 2003.

[6] D. Johnson, Y. Hu, and D. Maltz, "Rfc: 4728," The dynamic source routing protocol (DSR) for mobile ad hoc networks for IPV4, 2007.

[7] Y.-B. Ko and N. H. Vaidya, "Location-aided routing (lar) in mobile ad hoc networks," Wireless Networks, vol. 6, no. 4, pp. 307–321, 2000.

[8] Z. J. Haas, M. R. Pearlman, and P. Samar, "The zone routing protocol (zrp) for ad hoc networks," draft-ietf-manet-zone-zrp-04. txt, 2002.

[9] B. Williams and T. Camp, "Comparison of broadcasting techniques for mobile ad hoc networks," in Proceedings of the 3rd ACM international symposium on Mobile ad hoc networking & computing. ACM, 2002, pp. 194–205.

[10] J.-s. Kim, Q. Zhang, and D. P. Agrawal, "Probabilistic broadcasting based on coverage area and neighbor confirmation in mobile ad hoc networks," in Global Telecommunications Conference Workshops, 2004. GlobeCom Workshops 2004. IEEE. IEEE, 2004, pp. 96–101.

[11] H. Al Amri, M. Abolhasan, and T. Wysocki, "Scalability of manet routing protocols for heterogeneous and homogenous networks," Computers & Electrical Engineering, vol. 36, no. 4, pp. 752–765, 2010