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ROUTING ALGORITHM FOR REDUCING OVERHEAD IN MANETS

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Abstract

Mobile ad-hoc network (MANET) consists of collection of mobile nodes. The research activities in mobile ad hoc networks (MANET) are grown over the past few years. There are various challenges in designing a wireless ad hoc network like dynamic topology, limited and shared bandwidth and limited battery power. This paper concentrated on providing the solution for routing overhead and energy consumption. Due to dynamic nature of the nodes there may occur the path failures and lead to route discoveries. Due to changing topologies the route from source to destination breaks quite frequently. Consequently, to find a new route from source to destination, network initiates a route discovery. The route discovery process involves overhead. To achieve good quality of service it is necessary to find a route that lives for a longer time, this should reduce the routing overhead. In this paper we proposed a new method to reduce the energy consumption by reducing the frequent path failures. By reducing the path rediscovery automatically routing overhead also decreases. In this thesis we proposed a new algorithm for reducing frequent path breakages. In this method we calculate the Energy and RSS of nodes. Based on the RSS of the nodes more stable route path is obtained. By calculating the energy and RSS we can reduce the routing overhead caused by link breakages and also reduces the energy consumption. This is the one of the solution to reduce frequent path failures.

Key words : MANET , RSS , Route , Path failure , Overhead .

Introduction

Computer Networks are formed for communication at different places. Now-a-days wireless communication is emerging area for research. In wireless communication all the communicating devices move freely throughout the network, so maintaining connection between devices is not necessary. This advantage leads to many problems in the wireless communication[1]. In the wireless network two types of network environment are used. Infrastructure based Ad-Hoc network and Infrastructure-less Ad-Hoc networks.

In the Infrastructure based Ad-Hoc network, all the access points in the network should connect to the fixed backbone and all the mobile nodes are free to move. Whereas in the infrastructure less network, any access point or base stations are not present. Mobile nodes are present, which are free to move in network. Mobile nodes in MANET sometimes act as end points and sometimes act as routers for forwarding the packets further. The mobile nodes are responsible for the communication in the network. The communication among any nodes in MANETS is done by following three phases. First the route from source to destination should be discovered. Later the best optimal route should be established by the mobile nodes and then forwarding the data packets from source to destination should be done[2].

Fig 1: MANET infrastructure

The main challenge in MANETS occurs in designing of the optimal routing protocol. Various routing protocols are presented in MANETS. Basically the routing protocols are divided into two categories which are proactive and reactive routing protocols. In proactive routing protocols such as DSDV and OLSR, all the routing information is maintained consistently that means the route from source to all the nodes in network should be maintained. The routing information is maintained at each and every routing table. Whereas in reactive routing protocols the routes in the network is found on-demand when it is necessary. In this type of routing mechanism routes are discovered periodically and maintain the routes to every possible destination in the network[3]

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The main problem in the MANET, occurs at the route discovery phase, in the route discover phase to find out all the routes from source to destination. In conventional on-demand routing protocol, the node which needs to discover the route should broadcast the Route Request packet (RREQ) packet to all the neighbors which are in that node's transmission range in the network. The received nodes blindly rebroadcast that Route Request packet (RREQ) until it discovers the route to the destination. This broadcasting is known as blind flooding[4]. This process continues until destination is reached. At the end the total number of rebroadcast is N-2. Where 'N' is the total number of nodes in the network. By this flooding mechanism most of the packets are going waste and bandwidth of the network is wasted by this forwarding of unnecessary packets. This can leads to excessive redundant retransmissions in the network. The collision of packets in the network is high and contention of data occurs. This serious contention, collision and redundant retransmissions lead to "Broadcast storm problem". Many solutions are proposed to overcome this broadcast storm problem [5].

Literature Survey

Abdulai J.D. Et al. [6] proposed this broadcasting is developed by using some other techniques; by appending probability to the broadcasting some of the problems with the broadcasting can be reduced. In this approach we use a dynamic probabilistic approach based on the coverage area and neighbor confirmation. In this mechanism, coverage area concept is used. If the mobile node is placed near to the sender, then the rebroadcast probability is low. Whereas the mobile node is placed far from sender then the rebroadcast probability is high. In this case the additional coverage area is high. The coverage area of one broadcast is calculated by measuring the distance between the sender and receiver. The node position can be measured by global position system (GPS). Broadcasting is done based on some probability of the RREQ packet. The main aim of this scheme is to reduce the number of rebroadcasts; by this the bandwidth of the network is not wasted. By this dynamic based probabilistic broadcasting scheme the rebroadcast probability is less and the network resources are not wasted compared to the previous method.

W.Peng and X.Lu.[7] proposed Scalable broadcast algorithm. In this algorithm the main aim is to reduce the cost of the rebroadcast. Mobile node need not to rebroadcast when all the neighbors is covered by this broadcast. In this algorithm is divided in two phases. First it needs to find out the neighbors list of the node. By periodically sending hello packets, each and every node maintains the neighbor list. Each and every node maintains the topology information of 2 hop neighbors. When broadcasting is takes place, then the receiver checks which neighbors are covered by this broadcast by checking into the neighbor information. Then those covered nodes are added into the broadcast coverage nodes list. Then any rebroadcast decision is made, it checks into that list. If all its neighbors are covered, the rebroadcast id cancelled. By this Scalable broadcast algorithm, the redundancy of rebroadcast is decreases. It saves the duplicate packets by compared to the flooding.

Huda AlAamri et al. [8] proposed the algorithm OTRP. OTRP is a new protocol for MANET. OTRP means On-demand Tree Based Routing Protocol. OTRP is combination of hop-by-hop count method and TOF. Tree based optimized flooding algorithm is used. The main aim of this protocol is to improve the scalability. It is especially designed when the previous knowledge is absent in the network. To achieve this branching node concept is used. Because they form a tree based structure to scan the network. By using the branching node concept the overhead is decreased by flooding though a some finite node sets. Source node is considered as root node with at most four nodes and parent node having at most three branches. Branch nodes are forward the rreq packets to the parent nodes. The branching nodes are referred as rebroadcasting nodes. By using the GPS the node locations are obtained, depend up on the location the branching nodes are selected. The neighbor area is the parent node transmission area. The area is divide in to RT, LT, Ld, RD regions, every region has its scanning process to rebroadcast rreq packets. The source nodes choose the four nodes for initial broadcasting of rreq packet. The address of the parent node is set as address of selecting four branch nodes in rreq packet. if the route was not found all the nodes will rebroadcast. The link is active between the nodes till the parent node neighbors are valid. Because of the node mobility there may be changes in the node position etc.. To update the information the control packets are used.

X.M. Zhang et al.[9] proposed A new protocol EDRP is proposed based on the estimated distance(EstD).this protocol can limit the range of propagation of RREQ and diminish the Overhead. The Estimated geometrical distance (EGD) use the Received signal strength to calculate the estimated later period distance when a node leaves the node transmission range and estimate the link quality when two nodes are come nearer to each other. Estimated topological distance (ETD) is use the historical information. by using the previous information it uses the sum of hop distance of the previous path. The sum is used to calculate the node pair distance. If EGD<ETD then the EGD is valid. IT is used to refine the

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inaccurate EGD. By combining the ETD and EGD the EstD is calculated. The EstD is dividing the network into source region, destination region and other region. For each region a different mechanism is used to forward the request packets. The link quality is evaluated by the EGD to eliminate the weak links. this protocol is worked efficiently absence of the positioning service and avoid to send the RREQ packet to all over the network. It reduces the overhead and improves the routing performance in dense network.

Ruay-Shiung Chang and Shing-Jiuan Leu [10] proposed this protocol. It is used to improve the link connection. Received signal strength used as a parameter in the Aodv-RSS. By using the RSS and RSS changing rate the Link available time(LAT) will be calculated. By using the LAT between the nodes a min hop count route will be selected. The selected route is satisfies the LAT constraint. This protocol sends the RREQ packets to nodes in the network, for those nodes satisfy the LAT constraint. If the reply to that packet is not get within the time then the connection request is rejected. In the case of path re-establishment because of any error in the source node receive the route error RERR from the receiver, then the node will again send the request packet to path discovery. LAT mechanism provide good quality service, LAT constraint need the long LAT because of this one of the problem arriving is high connection rejection probability. This protocol is used for multimedia communication and real time flows.

B.Ramchandran and S. Shanmugavel [11] proposed this protocol. In this protocol cross layer design used. Received signal strength (RSS) is taken as a parameter in this protocol. The RSS value taken at one layer and then the layer can be communicated to the other layer. In this the RSS value is calculated at the bottom layer and the value is passed or communicated to the above layers. The main aim of this protocol is reliable route discovery, To achieve this a threshold RSS value is calculated. The route request packets are only forwarded to nodes which are having higher than the threshold value. If the RSS value is less than the threshold value then the node is not considered in the route discovery process. For calculating the threshold value two types of methods are described. They are

1. Fixed threshold

One fixed predefined threshold value is considered. The threshold value is not depending on the speed of the mobile node. For different speeds of the mobile node the Threshold value remains constant.

2. Adaptive threshold.

In this method the threshold value changes with respect to the speed of the node. It consider the speed and mobility and moving direction of the node.

Proposed method

In MANETS broadcasting is most frequently used mechanism for route discovery and data dissemination. While broadcasting a mobile node rebroadcasts the first RREQ packet to neighbors until it has a route to the destination. Rebroadcasting of the RREQ packets causes the broadcast storm problem. One of the solution to reduce the broadcast storm problem is to limit the number of rebroadcasts. To reduce the number of rebroadcasts we proposed a new approach , in this method received signal strength and energy is taken into the consideration.

Algorithm
{
Input:
Nodes: 10, 20, 30, 40
Transmission range: 250 mts
Bandwidth: 2 mbps
Packet size: 512 bytes
Output:
Less Energy Consumption
Less routing overhead

Method
{
For i=0 to n-1 do
Calculate the initial energy for all nodes
End for
For i=0 to n-1 do
Calculate the distance form source node to remaining all nodes
Calculate the received signal strength for all nodes
End for
If rss(source)>= rss(node ni)
Allow the node in to route discovery
Else
Discard the node
End if
End for

A. Energy Calculation

Energy is one of the important factor in MANETS. One of the current challenges in MANET is create a new protocol with less energy consumption. In the first module calculate the energy of the each node in the network.

B. Distance Calculation

Second module is to calculate the distance from source node to the remaining all the nodes in the network. For calculating the distance Euclidian distance formula is used.

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C. RSS calculation:

Received signal strength is inversely proportional to the distance. If the distance between the nodes is more then the received signal strength is less.

$$P_r(d) = \frac{P_t * G_t * G_r * \lambda^2}{(4 * \Pi * d)^2} \quad (1)$$

Pt: Transmitted signal power
Gt: Transmitter gain (1.0 for all antennas)
Gr: Receiver gain (1.0 for all antennas)
d : Distance from the transmitter
λ : Wave length

After calculating the RSS and energy of the nodes set the threshold value. The source node value will be taken as threshold value. Before sending the RREQ packet the current node RSS and energy threshold values checks with the threshold value. The current node RSS value is greater than or equal to the If the neighbor node receives the packet for the first time it will allow the packet otherwise just drop the RREQ packet. In this case there may be a chance to loss the neighbor information. To overcome this we are using relay value of node. This mechanism will help to reduce the redundant rebroadcast RREQ. This mechanism reduces the energy consumption and another problem in MANETS is frequent link failures. To reduce the frequent link failures we are using the received signal strength mechanism. The route found by using RSS we can obtain more stable path or route remains active for longer time.

Simulation results

We used ns2 simulator. Network Simulator which uses the tool command language and C ++ language. The simulation area is a square field of 600m x 600m size, where nodes are placed randomly. The two ray ground model is used, The bandwidth of shared wireless channel is assumed to be 2 MHz The nodes use the 802.11 as MAC protocol and IP as network protocol with output queue size of 100. The transmission range of all the nodes in the network is set to be around 250m. The parameters considered for the simulation are listed in the table

Table 4.1 : Parameters

Parameter	Value
Simulator	NS-2(v2.27)
Topology size	600m*600m
No. of. nodes	20, 30……
Transmission Range	250 m
Packet Size	512bytes

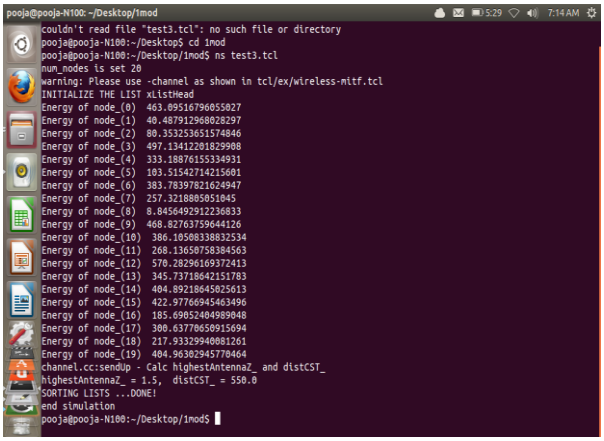

Fig 4.1:snapshot of energy

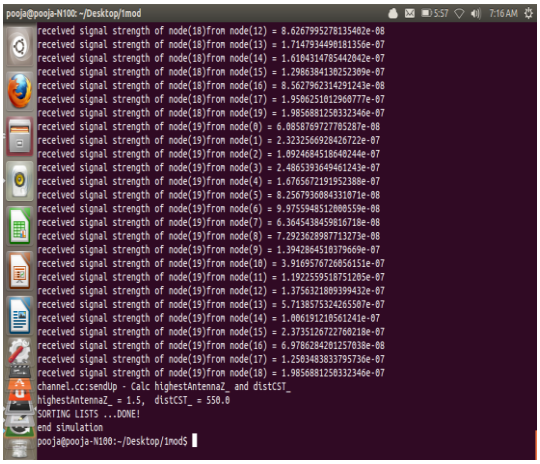

Fig 4.2 : snapshot of RSS

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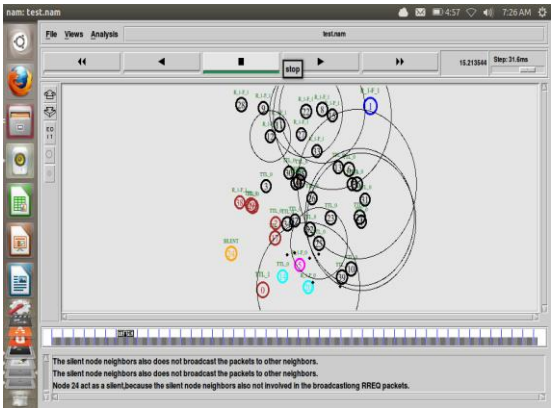

Fig 4.3: simulation in the nam

Performance metrics

Energy Consumption-Total energy consumed for transmitting and receiving packets by all the nodes in the network.

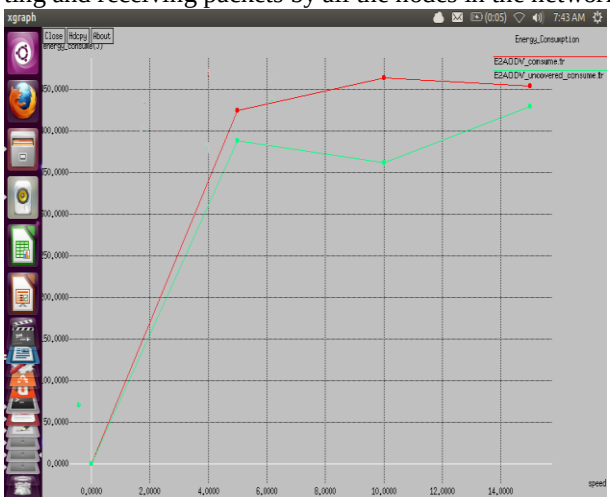

Fig 4.4 : Energy consumption.

The above graph shows that by using proposed method we can reduce the energy conservation than the existing AODV.

Conclusion

The research activities in mobile ad hoc networks (MANET) are grown over the past few years. The main problem in MANETS is energy consumption and routing overhead. In this paper we proposed a new method by using RSS and Energy. The results clearly shown by using the proposed method the energy is consumed less then the AODV.Due to this routing overhead is also decreased.

Acknowledgments

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