Enhanced multi route routing protocol in MANET

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ABSTRACT

Mobile Ad hoc network is also called as a mesh networks because of it consist of a large number of mobile nodes that communication with each other without any fix infrastructure or central coordinator. These mobile nodes operate with battery which is limited. Thus energy consumption becomes a crucial point in the design of routing protocol in ad hoc network. So for that traffic should follows a stable route with have higher energy in order to maximize the network lifetime. In this paper, we propose new protocol for Ad Hoc Network which Enhanced Multi route Routing protocol (EMR). These propose protocol based on dynamic source routing. This protocol achieve batter route stability according to it select route which have higher RSSI value. In the propose work during the process of route discovery we consider RSSI and remaining energy of nodes to decide whether to add that node in route or not. This parameters are compared with pre-defined threshold value, if calculated value satisfy the threshold then it process the route request packet otherwise it discard this packet. To evaluate our proposed protocol, Simulation work analysis has been performed using ns2.34 simulator. Our simulation analysis shows that there are significant improvements in average end-to-end delay and lower energy consumption For our proposed protocol compared with exiting DSR routing protocol.

Keywords: *MANET, AODV, DSR, energy efficiency, RSSI,*

I. Introduction

A mobile ad hoc network does not have any fix infrastructure such as access point in WLAN and router in wired networks etc. therefore nodes which can communicate to other nodes via wireless link. Nodes are mobile so it can free to move any direction and it can leave network at any time. Node in the network acts as a router so it find optimal path for forward data packets.

One of the important research areas in MANET is establishing and maintaining the ad hoc network through the use of routing protocols.
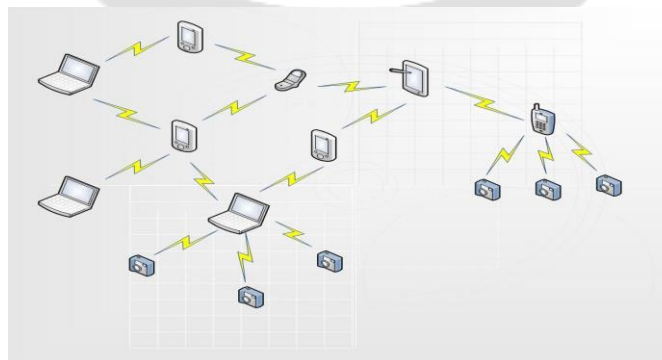

Fig 1. Mobile Ad hoc Network

MANET has been presented many of the routing protocols to communicate among nodes. These protocols are classified in to three major categories: proactive, reactive and hybrid. In these proactive routing protocols, it maintains routing information in the form of table which contains information about every node residing in the network. Example of Proactive Routing Protocols is: Destination Sequence Distance Vector (DSDV), Wireless Routing Protocol (WRP)

In this reactive approach, it only selects the route when requires and stores only that node's information which is active at that time when packets are being sent from source to destination. Hence these protocols do not required to exchange the routing information periodically. Examples of Reactive Routing Protocols are: Ad hoc on-demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR)

It is a mixture of Reactive and Proactive routing protocol. It is also called unicast routing protocol. Zone based routing protocol are come under this Hybrid routing protocol because zone based combines both the feature of Proactive as well as Reactive routing protocol. Example of Hybrid Routing Protocol is Zone Routing Protocol (ZRP)

II. Dynamic Source Routing Protocol

DSR is the reactive routing protocol which uses source routing means that the source of a packet inserts into the packet header and the entire route to be followed by the packet to its destination.

Route Discovery:

Each and every node learns about the source routes and stores them in to their route cache. When the source node has a data to transmit at the destination node then source needs a route to a destination. If it doesn't find any route for destination in its route cache, then it broadcast a route request (RREQ). This RREQ contains source address, destination address, request id and route record. The request id is a sequence number associated with the node and used to prevent the loop formation and also used to avoid the multiple transmission of the same RREQ by the intermediate nodes which is received by multiple paths. If the node is not a destination then it adds its address to the route record and again broadcast this request. At the destination side, when the destination node receive RREQ then it send back RREP to the source node through the reverse path.

Route maintenance:

When the intermediate node moves away then there may be chance for link break. Data link layer acknowledgements can be used to detect link failure when a packet has been lost and attempt retransmission. If the packet cannot be successfully transmitted, a route Error (RRER) message is sent to the original source of the packet. This RRER message contains the addresses of the nodes at both ends of the failed link. When the node send a RRER back to the source then it must have a route to the source. The node can look for a route to the source in its route cache or can use the reversed route record from the packet which encountered the error.

When the source node receives the RRER, it checks its route cache for routes containing the failed link. When a *Route Error* packet is received then the cached entries at the intermediate nodes and the source node are removed. If a link breaks due to the mobility of edge nodes the source node again starts the route discovery process.

III. Review of literature

Some multipath routing protocols for MANETs are found in the literature and they select route that will minimize the total transmission power between source and destination. Also some routing protocol based on stable energy efficient which overcome the problem of energy consumption.

In [1], Mandeep Kaur Gulati presented Stable Energy efficient QoS based Congestion and Delay aware Routing (SEQCDR) Protocol for effective QoS support. This protocol used multiple metrics of signal strength, queue length, drain rate and the delay in order to enhance the system performance.

In [2], Gagandeep Kaur et al. Proposed energy based multipath routing (EAOMDV) protocol. EAOMDV is based on energy efficient dynamic queue that uses AOMDV with load balancing.

In [3] Sneha R.Deshmukh proposed Energy Aware Load Balancing Multipath routing protocol (EALBM). This protocol has a *disjointed multipath strategy*. In EALBM, the source discovers multiple disjoint paths to reach the destination by flooding RREQ packet and stores the discovered paths in its routing table. These paths are assigned

weights based on energy level of nodes along the path. EALBM uniformly distributes traffic on these disjoint paths. This protocol will reduce delay and load in the network. Also, it would increase performance and lifespan of the network.

In [4], Baisakh proposed protocol energy saving and survival DSR (ESSDSR) which is based on some modification of DSR protocol. The ESSDSR is to forward packet through those node which having higher level of energy at a given time.Also he proposed method that , When the node is having remaining residual energy that is less than or equal to the threshold then sending node will broadcast packet where header contain a flag "low energy" set to 1.so the node which is not capable to sending packet it informs its neighbor nodes not to send packet to this node and remove this path from its route cache. So it improve the lifetime of nodes.

In [5], Salwa Othmen et al. presented new protocol called Power and Delay-aware routing protocol for Ad Hoc networks (PDRP) that is founded on the "Stable Path Routing Protocol based on Power Awareness" (SPR). These protocols consider battery power as well as satisfy the QoS requirement in terms of delay and bandwidth.

In [6], Fatiha Djemili et al. proposed approach which is based on load balancing and energy efficiency of network. This approach enhances the AODV by considering the node capacity for relaying the data packets to the destination. In this paper node capacity considers both the workload and remaining energy of node.

In this paper [7], Prasanta Kumar Manohari introduced Energy Efficient Multipath Routing Protocol (EAOMDV). This EAOMDV is a multi path routing protocol which selects paths based on route cost function between any source and destination pair. The cost function is calculated by residual battery power and its present traffic. This route cost function is helps to select energy efficient path. Also there are used node disjoint approach to select multiple paths between source and destination.

In this paper [8] Uma Rathore Bhatt et al. proposed energy efficient routing protocol (EERP) which is based on AODV. This protocol reduces the transmission power of node if neighbor node is closer to this node in active route. The distance between two consecutive nodes is calculated based on RSS (received signal strength). If the RSS is high, it means that the nodes are closer to each other. So as the result lesser transmission power required to send data. Thus this is reducing the battery power.

In this paper [9], Salwa Othmen et al. proposed routing protocol called power and delay aware multi-path routing protocol (PDMRP).first to compute the cost of each route by using the equation: $C = ML(minimum\ life) / NH(number\ of\ hops)$.then it selects primary route with greater C value and other routes are considered as secondary routes. For the data transmission it selects only primary path but any kind of fault of this path then it selects shortest and more stable secondary route.

In this paper [10], Akanksha Meshramt et al. introduced EEDSR protocol which is an extension of DSR that reduces routing overhead by limiting the number of route discovery and maintenance packets in the MANET by set the threshold energy level of every node. It checks the energy threshold value of all the intermediate nodes to the destination. Then it discards the paths which have lover energy then threshold value. it compare the average energy of various paths and select path which have greater average energy for data transmission.

In this paper [11], Shiva Shankar et al. proposed efficient power routing DSR (EPRDSR) to improve the Existing on-demand routing protocols by introducing a power efficient scheme in the network. In this EPRDSR, the path is chosen based on the power. First of all it calculates the node battery power for each path, that is, the lowest hop power of the path. The path is then selected by choosing the path with the maximum lowest hop power.

In this paper [12], Uma Rathore Bhatt et al. introduced routing protocol enhance the performance of ad-hoc network in terms of residual battery, average end to end delay and throughput. To fulfill this aim, proposed enhanced DSR (DSR1) for this work. These algorithms reduce the flooding of RREQ because when node flooding RREQ to all this neighbor it consume lots of energy. In this protocol when nodes receive a RREQ packet it checks its residual battery, received signal strength and speed. If the defined thresholds for the node for these mentioned parameters satisfy the RREQ packet will be discarded.

IV. Proposed method

The goal of our proposed protocol is to select multi-paths based on RSSI and remaining energy of each node to achieve the longest lifetime of networks. The basic steps of our proposed algorithm are as follows:

Step 1: Before start a route discovery process, source node initializes min_rssi, Qthresh, Bthresh value for each node in the network.

Step 2: Source node initiate the RREQ and send to all its neighbor nodes. When a intermediate node receive a RREQ packet , it checks if a RSSI value of each node is greater or equal threshold value and Queue length is less than or equal to Qthresh and battery of node is greater than the Bthresh then this node is take a part in routing process otherwise discard RREQ packet.

Step 3: Then the energy of this node is added in RREQ packet and forwards this RREQ. this process continues until it reach to the destination.

Step 4 : At the destination side it receive multiple RREQ packets in its buffer, for all receiving RREQ packets calculates the average of Blevel(Avg_Blevel) and then it select route which have maximum Blevel.

V. Simulation Results

We have evaluated our proposed routing protocol with different number of nodes using ns2.34. We run our tests for numbers of nodes in an area of 600 meters by 600 meters. Each simulation runs for 100 seconds. Here we have taken initial energy 100 joules and tx power 5.0 w and rx power 1.0w. We have to consider two ray as ground propagation model of my work. Also we use TCP as a traffic exchanged between the nodes. The main parameters of my simulation work are given in the table.

Table 5.1.1: Parameters

Parameters	Value
Simulation Time	100 sec.
Simulation area	600*600m
No. of mobile nodes	20/30/50
Routing protocols used	DSR
Traffic type	TCP
Initial energy	100 joules
Tx Power	5.0 w
Rx Power	1.0w
Propagation Model	Two Ray Propagation Model

In this paper we choose average end-to-end delay and remaining energy as performance metrics for the routing protocols.

Average End-to-End delay: It is represent the average of the difference between the time of the packet delivery to the final destination and the generation time of this packet. Fig.2 represent the average end-to-end delay as a function of the number of nodes. As the number of nodes increase, the complexity of the network increase and hence the Average end-to-end increase.
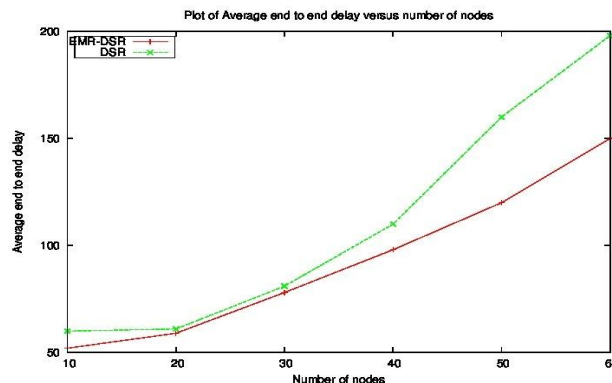

Figure 2 Average end-to-end delay

Residual energy:

It is value of residual (remaining) energy of a node at the end of the simulation. fig.3 shows the simulation results of available residual energy of EMR-DSR and DSR at in the different number of nodes.
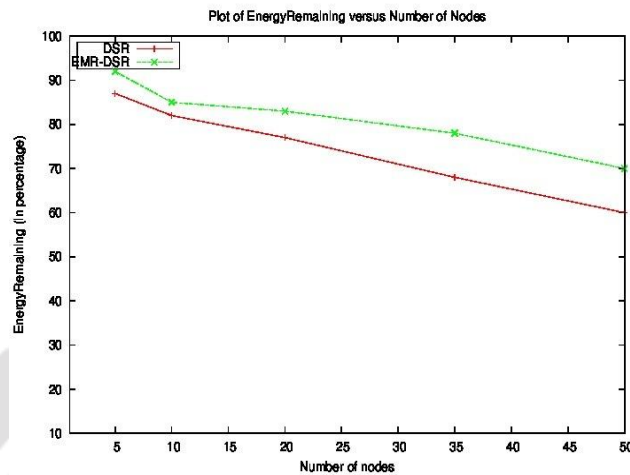

Figure 3 Residual energy

The simulation result Clearly show that, the EMR-DSR has a higher amount of energy at the end of the simulation.

VI. Conclusion

The aim of this paper is to overcome the problem of energy constraint because of limited battery power. So in this paper we proposed new routing protocol which does not consider only battery power but also find stable path between source and destination. Moreover our proposed protocol give significantly outperform then the existing DSR in terms of average end-to-end delay and residual energy of each nodes in the network.

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