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Modified Load Balancing Technique to Improve Performance of MANETs

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Abstract: Mobile Ad-Hoc Networks are autonomous and decentralized wireless frameworks. MANETs include mobile nodes that are allowed to move in the network. The load balancing is one of the fields in mobile ad hoc networks that need to be focused upon to improve the performance of the network. If the same path is over utilized for a period, its bandwidth can get used or the energy of the nodes might be drained. This would result in the loss of the data if data transmission is continued over the same path. This paper takes load balancing of the network into consideration. The load has been monitored by taking into consideration the available bandwidth and packet delivery ratio of the current path, which is being used for data transmission. If the load exceeds then a new path is used for packets transmission. The performance of the network was analyzed based on four parameters namely packet delivery ratio, throughput, routing overhead and remaining energy in the network.

Keywords: MANETs, ACO, Packet Delivery Ratio, Load Balancing.

I. INTRODUCTION

Mobile Ad-Hoc Networks are autonomous and decentralized wireless frameworks. MANETs include mobile nodes that are allowed to move in the network. Nodes are the gadgets that are mobile and that take an interest in the networks, for example, mobile telephone, portable PC, individual computerized help, MP3 player, and PC. These nodes can go about as host/switch or both all the while. They can structure self-emphatic topologies depending upon their availability with each other in the framework. These nodes are able to arrange themselves and because of this interesting capacity, they can be conveyed earnestly without the need of any foundation. Web Engineering Task Force (IETF) has MANET working gathering (WG) that is given for creating IP routing conventions. Routing conventions are one of the testing and entrancing examination zones. Various routing traditions have been made for MANETs i.e. AODV, OLSR, DSR and so on.

The load balancing is one of the fields in mobile ad hoc networks that need to be focused upon to improve the performance of the network. If the same path is over utilized for a period of time, its bandwidth can get used or the energy of the nodes might get drained. This would result in the loss of the data if data transmission is continued over the same path. This paper takes load balancing of the network into consideration and Section IV of the paper represents the proposed scheme.

II.ACO ALGORITHM

The ant routing basic principle can be defined as:

1. Each network node sends a number of discovery packets -forward ants (F-ANT) towards the selected destination nodes of the network.
2. The stochastic tables replace the routing at each node in order to choose next hops as per the weighted probabilities available.
3. The routing tables are changed for selection of the next node in the network.
4. When forward Ant (F-ANT) reaches the destination node, it generates a backward ant (B-ANT) and then dies. Similarly, in MANETs routing, the new packet created and sent back to the source will propagate through the same path selected by the forward Ant (F-ANT).
5. Now backward ant (B-ANT) deposits pheromone on the crossed links. It means that it updates the routing table of the nodes along the path followed by forwarding Ant (F-ANT).
6. After arrival to the source node, the backward ant (B-ANT) dies [9].

III. LITERATURE SURVEY

Tripti et. al., [2014] proposed the vitality utilization effectively with "Range Switching". They utilize connected range changing strategy at to the Gradient based routing Protocol for enhancing the execution and it demonstrates the potential pick up in its throughput. This network speaks to a creative prototype for separating data from the earth for different applications. It comprises of different sensors that are utilized to send their detected data to sink. Therefore, vitality protection is a key issue for sensor nodes as they have limited power. This improves the network lifetime [1].

Abhilasha et. al., [2014] tries to limit the quantity of route requests (RREQs), that is an important source of overhead for the DSR. They adjusted DSR calculation to upgrade its execution. In the altered DSR i.e. Portable internetwork communicate, framework procedure (MIKBIT) multicasting strategy is utilized to diminish packet overheads. The execution parameters like throughput, normal end-to-end delay, normal jitter and packet delivery proportion are computed for the proposed calculation and contrasted and that of existing DSR routing protocol [2].

Shivashankar et. al., [2013] proposed effective power aware routing (EPAR), a routing protocol that upgrades lifetime of MANET. Rather than past calculations, EPAR checks the limit of a node by its leftover battery control, as well as by vitality spent in sending data packets over a specific connection. EPAR pick the way that has the best packet limit at the packet transmission limit. This protocol must have the capacity to deal with high versatility of the nodes that frequently cause changes in the network topology [3].

Nilam et. al., [2016] proposes an Energy Aware Routing Protocol (AODVEA) in light of AODV that incorporates nearby sending choice with node vitality edge for transitional nodes and routing in light of max min vitality calculation to expand the lifetime of the network. Likewise, extend proposes Modified AODV (AODVM) which joins same nearby sending choice for middle nodes, however, routing depends on the blend of max min vitality calculation and most limited separation [4].

Andrews et. al., [2016] proposed Mobility and Direction Aware Ad-hoc On Demand Distance Vector routing protocol (MDA-AODV) intend to deal with the versatility and course factors in ad hoc networks. MDA-AODV guides the route revelation and route answer upon the speed of the taking part nodes and their headings. Simulator utilizing two offered options (packet-rate and CBR associations), was utilized to examine the impact and the upsides of MDA-AODV over AODV protocol. The changes come about demonstrate that the proposed plot diminishes control overhead [5].

Arvind et. al., [2016] they give a novel approach for exchange servers' load starting with one server then onto the next server. Energy efficiency is a basic factor for operation of specially appointed networks. Proposed calculation will occupy the heap from low energy node to high-energy node. The entire proposed arrangement will work to find multipath routing for load adjusting for MANET [6].

B. Shalini [2015] enhances the multi path usefulness in typical AODV protocol that will enhance the execution of routing protocol for selecting best route and ID of getting rowdy routes. Their goal is to diminish the expanded vitality and overhead in MANET. However quick evolving topology, restricted transmission capacity and battery control in MANET environment give enormous difficulties to the reliability and power of its routing protocol without depending on the previous foundation. The proposed AOMDV and AODV calculation are successfully implemented. The execution of the proposed framework has assessed on various network sizes. The outcomes demonstrate that better change in execution and diminishment in overheads [7].

Nisheeth et. al., [2016] proposed approach goes for expanding the network lifetime of such a MANET, by dispersing the routing load among every one of the nodes inside the network. This is accomplished by computing the leftover energy of the considerable number of nodes in a whole way between the source and the destination, for different ways accessible, and after that contrasting and selecting the way, which is ideal as far as energy effectiveness [8].

Subhrapratim Nath et. al., [2016] in [9] proposed a hybridization of the Ant Colony Optimization (ACO) and the Firefly, swarming algorithm (FA) for Ad-Hoc On Demand Distance Vectoring (AODV) routing protocol. It has been proposed to increase the efficiency in the transmission of the signals in a MANET system and thereby intending to substantially reduce the losses, so incurred using solely the AODV Routing Protocol and overcome drawbacks of ACO based AODV. Initially, the time stamps are calculated for every neighbor pair and then ant colony optimization is applied to retrieve multiple paths. For the multiple paths achieved, the path having best attractiveness is chosen to send the data to the destination. The authors made comparative studies on the proposed hybrid algorithm with the existing routing algorithms (AODV and ACO based AODV) thereby ensuring reduction of network load by avoiding re-discovery attempts between the nodes.

IV. PROPOSED WORK

In the proposed scheme, when the source node would broadcast the forward ants in its neighborhood, the next hop availability will be modified which furthermore will depend on the probability of a node and link sustainability instead of link availability. The probability of the node will depend on the residual energy of the node. Nevertheless, the link sustainability will be proportionate to the relative mobility of the connecting nodes.

Thus, once the nodes are selected using the modified next hop availability the process of broadcasting will resume and continue until the path to the destination is found. Once the forward ants reach the destination, the destination node will send the backward ants towards the source node. The source node would store the paths in its cache and would choose the path having highest pheromone value for data transmission. The source node, over the chosen path, would start sending the data to the destination.

Now that after sending the data for a period of time, the load over the nodes need to be checked. If over the existing path, the available bandwidth is more than half of its initial value and packet delivery rate is more than 80 percent the source node would continue sending data over the path. Else, if the condition were not satisfied, the source node would choose a new path from its cache memory to send data to the destination.

V. RESULTS

The performance of the network was analyzed on the basis of four parameters namely packet delivery ratio, throughput, routing overhead and remaining energy in the network.

Fig: Comparison of PDR

This figure shows the comparison of the packet delivery ratio for both the schemes. The data transmission for both the schemes began at 15 seconds. At that point, the proposed scheme has found to give better values for this parameter.

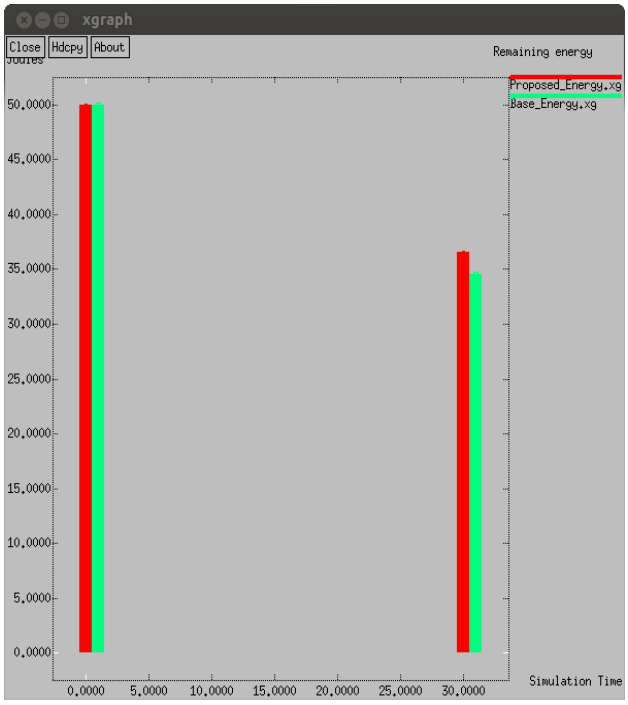

Fig: Remaining Energy comparison

This graph shows the comparison of the average energy remaining in the network at the end of the simulation time. Initially, the average energy was 50 Joules at the starting of the simulation time. At the end of the simulation, the remaining energy for the proposed scheme was 37 Joules approximately and 35 Joules for the existing scheme. Thus, it clearly indicates better network lifetime.

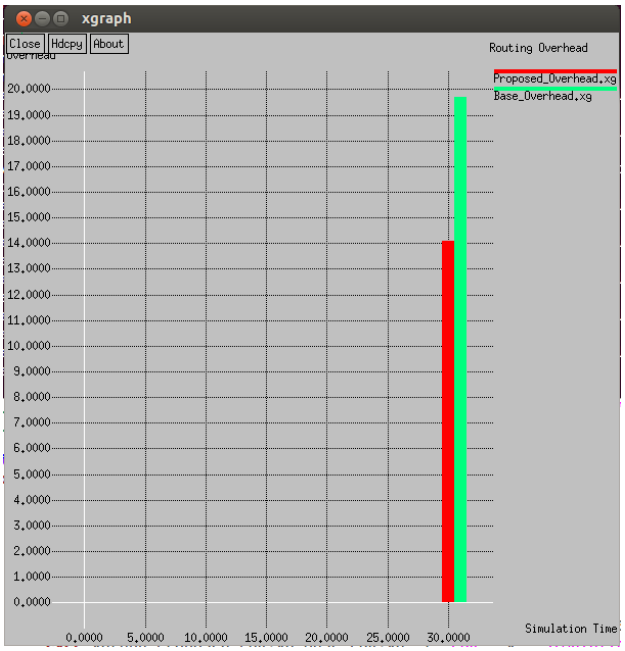

Fig: Routing Overhead

The above figure shows the comparison of the routing overhead values for both the schemes. The value of this parameter for the proposed scheme was approx. 14, and for the existing scheme was 19.8.

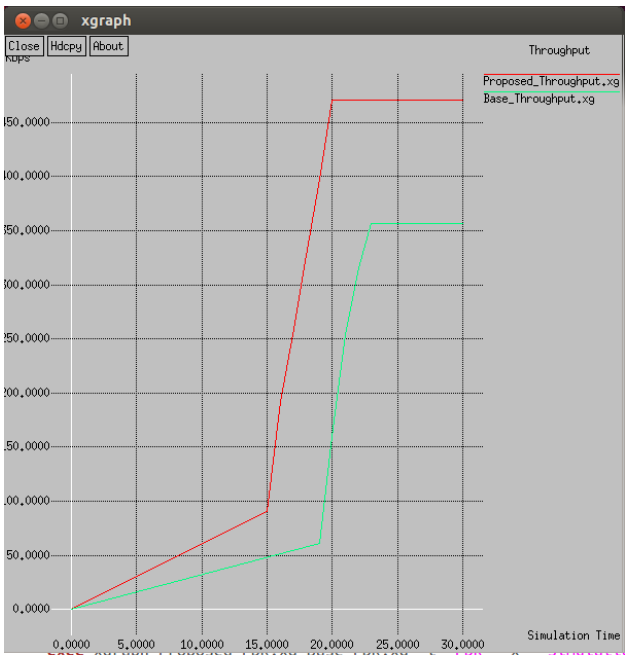

Fig: Throughput Comparison

The throughput values for the proposed scheme are higher than the existing scheme. This shows that destination receives more data and indicates better performance of the network. For proposed scheme, the throughput obtained was approx. 470 Kbps and for existing scheme, it was 355 Kbps.

CONCLUSION

The proposed scheme aimed at reducing the energy consumption of the nodes by achieving better load balancing and reducing the overhead. The parameters showed an improvement over the existing scheme. The existing scheme defines the index for checking the load over the path. The index is calculated by taking times of forwarding ants and backward ants into consideration. The congestion would normally be, relevant if checked during the data transmission phase. The proposed scheme, on the other hand, checks on the load by calculating the available bandwidth and packet delivery ratio of the links at the time of data transmission. This work can be modified in future to use other schemes such as cuckoo search algorithm, firefly algorithm to optimize the performance of the network.

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