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Research paper

An Improved Load Balancing in MANET Using on-Demand Multipath Routing Protocol

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Abstract

In this fast growing application usage towards the wireless communication led to concentrate on the mobile ad-hoc networks (MANETs) in most parts of the globe. Although MANETs are widely used in many of the commercial, military and medical applications, they are inflexible with the traffic congestion route failure, delay, and throughput results in the performance degradation. As there several routing protocols that mainly relies on the shortest route to the destination, usage of less hop count, but none of them proved to complete solution to the multipath routing in case of load balancing in the network. So in this paper we try to put our efforts to apply an efficient load balancing Ad-hoc On-demand Multipath Distance Vector (LBA-AOMDV) that have the ability to maintain constant load among the nodes by balancing the traffic among the multipath routes whenever required. To show the performance of the algorithm in terms of its performance metrics such as throughput, delay and packet loss from the source to destination for the nodes, the total simulations are carried on the NS-2.32 tool.

Keywords: *load balancing; multiple routes; ad hoc networks; AOMDV; load balancing; MANET*

1. Introduction

In recent days (MANET) comprises of wireless miniature nodes which can move haphazardly inside a system premises. A framework less or ad-hoc arrange is produced with none settled base stations and does now not require unified organization. Every node can swap from a host to a switch as and when required and imparts by means of two or three remote hyperlinks [1]. The remote systems have kept transmission capacity and hubs require two or three bounces to send information to various hubs inside the system. Because of the chaotic network, nonattendance of incorporated specialist, dynamic changing topology, directing in MANET has ended up being a testing undertaking and there is a need to control the whole network without causing long hyperlink breaks [1]. Further, low capacity and screw up inclined remote connections, controlled battery intensity of miniature nodes corrupt the execution of MANET steering conventions. Various directing conventions were proposed in later past that adapt up to advert hoc systems attributes. A basic endeavor in a specially appointed steering is the plan and advancement of compelling directing conventions that give least separations and over the top five-star correspondence with least postponement. A brilliant directing convention must convey steering obligations and activity vary among the numerous nodes in MANET in the record of valuable asset requirements like transmission capacity, support line size, and battery vitality.

An uneven conveyance of activity, as a rule, prompts control consumption of firmly stacked hubs. The system network endures fundamental to time-regarded detachments because of network apportioning as the additional amount of hubs is shut down. Besides, the end to end postponement and parcel misfortune raises for the associations utilizing these intensely stacked hubs. Load adjusting can boost the lifetime of miniature nodes, bring down movement blockages, vitality utilization of versatile hubs and end to end parcel delays [2].

A portion of the prevalent directing convention with regards to multi-course steering is the AOMDV [3]. The creators present the AOMDV convention, which makes utilization of the essential AODV course improvement system, with expansions to make in excess of one circle free and hyperlink-disjoint ways. AOMDV likely registers the in excess of one way all through course revelation strategy and it contains two fundamental embellishments: a standard for course updates to discover different ways at each hub, and an apportioned convention to ascertain the hyperlink-disjoint ways.

On this convention, each course demand and course answer parcel touching base at a hub is potentially using one other course from the source to the goal [4-5]. These courses can't be allowed because of the way that they might have the capacity to result in the development of circles as delineated in Fig.1. The proposed marketed hop count metric is used in one of these scenario. The advertised hop depend for a distinct node is the highest suited hop rely for any path recorded at that node. A path with a better hop rely cost is with ease discarded and nearest those paths with a hop rely not up to the advertised cost is permitted. Values larger than this threshold way the route most likely has a loop.

The main thing to consider is that it has two disjoint routes that are properly connected. Let us treat a node *S* broadcast a packet *m* in to the suitable network at this instant. The *m* number of copies reached at node *I* through different routes or neighbors that are designated as a group of disjoint nodes that have path from I to S. To explain functionality it uses a distributed protocol employed at every intermediate node so that every packet arrives at this node check for node-disjoint path so that ovulation will be done at ease.

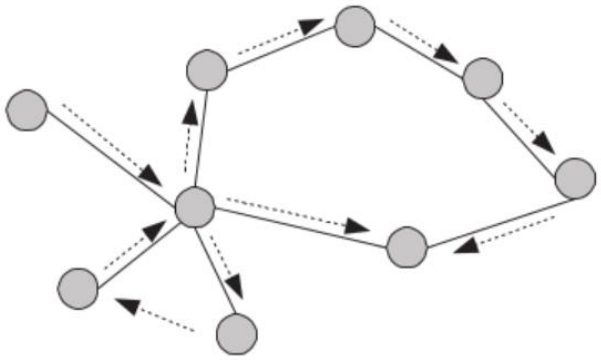

Fig.1: Example of a potential routing loop scenario with multiple path computation [3]

The main contributions and organization of this paper are summarized as follows: In section 2 we describe background details of different routing protocols. The section 3 proposed work. The section 4 results and discussion. Finally in section 5 we concluded the paper.

2. Background work

In [6], the authors uses the multi-path routing protocol that for employing unique filtering model that assemblies in cooperation per packet as well data filtering to alteration traffic between several paths in that way smoothing the data packets to not be received out of order. The mechanism of load balancing to allotting traffic during the course of several routes is a resolution taken based on the computation of data like traffic load and packet growth. The authors done some modification to DSR [7] by using authors in [8] is yet an additional protocol take a turn on the similar workouts of MALB. Moreover a multi path source routing protocol that sends packets on multiple routes without consideration to the trail calculation in intermediate hops. Similarly the usages of load balancing scheme is another approach based on probing packets periodically for calculating the RTT (round trip time) using the Karn's algorithm [9] that aids in the estimation of spread out in a one direction. Such delay calculation offers the correct estimation of congestion in the network or heavy traffic routes and helps us in sending less quantity packets on route that have the better lifetime than the predicted and higher packets on paths with accepted delay.

In [10], the authors mainly focussed on the evaluation metric that decides the end-to-end delay in the given network denoted with the η defined to be amount of paths among any two disjoint routes. When the η value is zero it means there is no link exist between the routes and the routes are isolated. As the η value grows it shows that existence of more end-to-end delay on every route. In this approach there is no much satisfied work done towards the load distribution but on the other hand it managed to reduce latency present in the network to some extent. A further yet subtly unique metric interference correlation element defined by means of authors in [11] counts now not the connecting hyperlinks between paths but most effective these connecting links that fall within the interference variety of the paths. The interference variety is believed to be twice the transmission variety.

In [13], the authors employed the intelligent packet caching approach and used the shortest multipath routes when there is route failure in one route and reduced packet loss rate to some extent. However the contribution of load balance of data cache at certain stage shows improved packet delivery ratio as compared to traditional AODV protocol in [14] and other similar work with DSR protocol by the author in [7]. The final verdict is that they managed to route overhead at the cost of mobility in the node cost. In [15], the authors examined the coupling mechanism between the neighbor nodes and its disjoint paths, after several they came to the conclusion that route couple problem cannot be solved with only disjoint path of node also one should take care of considering both zone and partial disjoint paths during the transmitting process of data with the assistance of suitable simulation tools. The important consideration of this work is that there is no chance of interference in case of zone disjoint routes due to utilization of suitable directional antennas as related to isotropic antennas.

In [16], the authors explained about the node behaviour and its computation of load on the particular route so that it can get details of load stability period of the network with the aid of LBAR protocol. The path with least degree of nodal recreation is selected for traffic transit. In [17], [18], the authors suggest an solution where overloaded nodes have the freedom to forbid extra starting of routes by way of them unless their overloaded repute get dissolved. This serves as a mechanism to hinder an unbiased load distribution on nodes.

3. Proposed framework

The proposed scheme uses basically two folds the primary one is to get the route updates for an alternate path at each and every node so that information can reroute on overload or route failure cases. The secondary is to obtain the particular link-disjoint paths. The main functionality of this protocol has been to always update the routing table with the advertised hop count, which can be defined as the maximum quantity of hop count for several alternate routes to reach destination, which cannot be altered in any of the situation for an identical sequence number of the destination node. In case of data sending from particular valid source to the intended destination, every node in the network has the complete information about hop count of the subsequent routes that can be useful for the node to give announcement regarding its route when required. As mentioned earlier the hop count for the advertised node are more as compared to that of alternate routes. One of the important use of the protocol is that the destination gets the highest sequence number, then that of advertised one, then immediately later list is reinitialized. The subsequent fig.2 and fig.3 shows the differences in the middle of routing table entries of AODV and AOMDV routing protocol:

Destination IP address
Sequence number
Hop count
Timeout
Next hop IP address

Fig.2: Structure of AODV routing table

Destination IP address
Sequence number
Advertised hop count
Timeout
Route list {(next hop1, hop count1), (next hop2, hop count2),…}

Fig.3: Structure of AOMDV routing table

3.1. Modified algorithm:

To explain the working of the proposed protocol as illustrated in fig.4, initially it computes the weights of the adjacent neighbor nodes before transmitting the data to the intended destination. The weights computation takes place based on the conversion time, delay, and the overall cost. After this, it will assign the priority-labelled as low, medium and high based on the previous computation parameters, the node which is consuming more power and which seem to below the threshold rate are treated to as the lowest priority. Similarly checks for other neighbor nodes for the same condition and distribute the load accordingly and finally choose the route which is having the less load that will be decided based on the length and capacity of queue size that it can hold the packets without any loss.

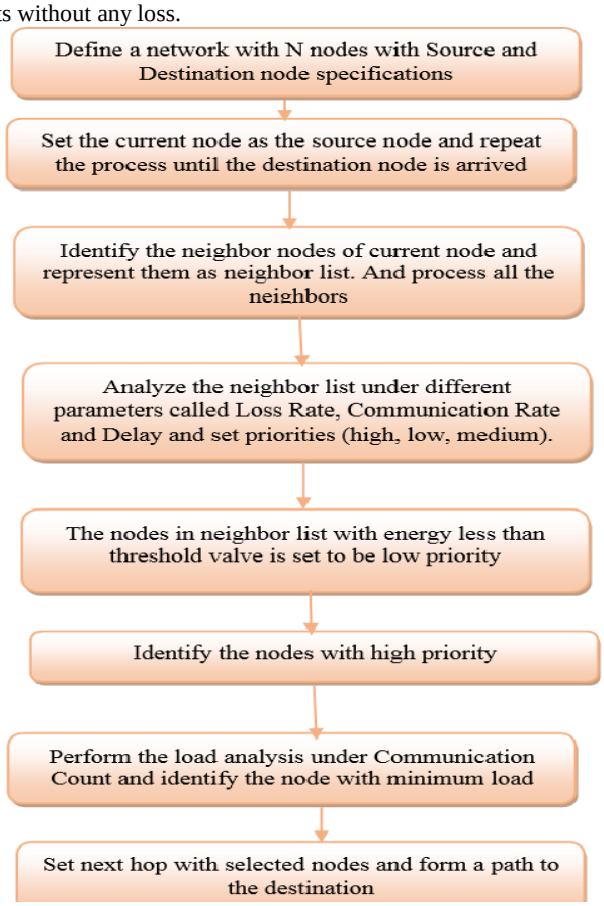

Fig.4: Proposed flow chart

4. Results and discussion

The simulations carried with the aid of NS-2.32 [7] for comparing the performance of two algorithms namely traditional AOMDV and the other one is our proposed LBA-AOMDV based on the evaluation parameters namely the achieved throughput of the routing, end-to-end delay and packet loss in the network across all the neighbor nodes.

Table.1: simulation parameters used in evaluation

Simulator	**NS-2.35**
Protocol	AOMDV, LBA-AOMDV
Simulation Time	100 seconds
Simulation area	600m X 600m
Number of nodes	40
MAC Layer Protocol	IEEE 802.11
Link Type	Duplex-link
Queue size	50
Transmission range	250
Traffic Type	FTP

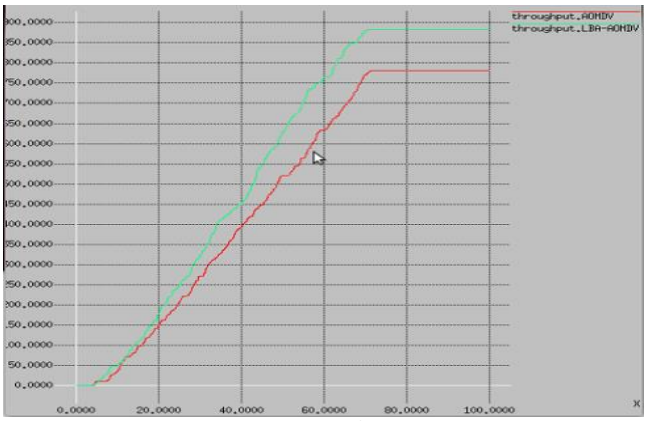

Fig.5: throughput of the rotuing

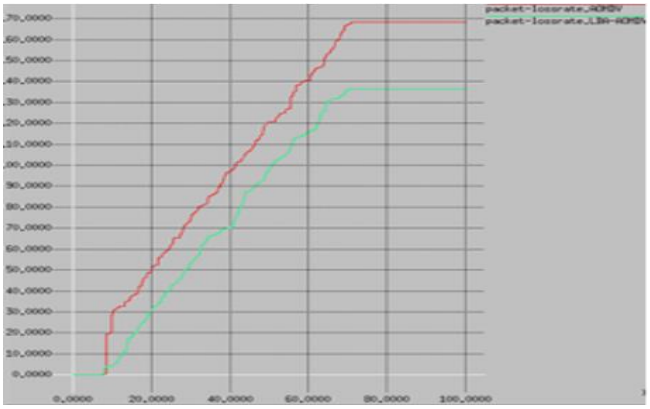

Fig.6: Packet Loss Rate

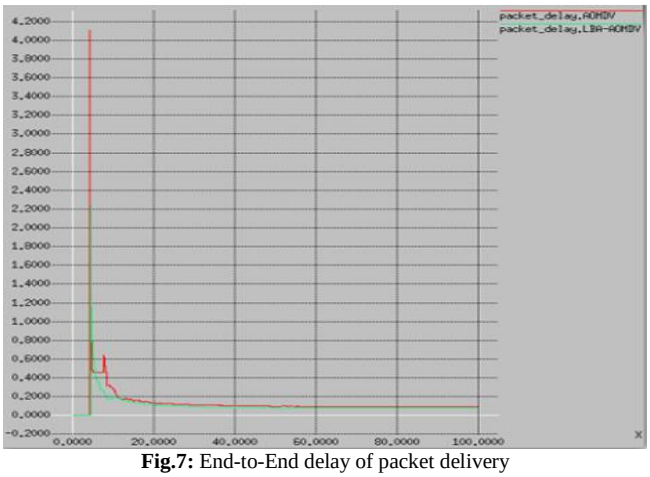

Fig.7: End-to-End delay of packet delivery

5. Conclusion

The paper examines how to solve the load among the neighbor nodes in the alternate routes and compare the performance the two different approaches for traditional AOMDV and other one is LA-AOMDV in terms of evaluation parameters namely throughput, delay and packet loss. The simulation results shows greater improvement of evaluation parameters in case of our proposed LA-AOMDV approach shows its efficient algorithmic functionality in case of route failures, traffic congestion irrespective of different traffic conditions prevailing in the routing protocols while sending data form the source to the intended destination with less number of hop counts.

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