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Energy Based Enhanced AODV Routing Protocol For MANET

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***Abstract*—MANET is defined as a collection of mobile nodes with no central management, running on batteries and changing topology. The aim of this paper is to make the existing AODV routing protocol efficient by with an enhanced route discovery mechanism which reduces transmission delay that is caused due to path instability. When a source node want to communicate with another node it broadcast RREQ.In EAODV RREQ message afield is reserved for obtaining the node remaining energy and that route will be selected which has greater average remaining energy. This will reduce transmission delay and increase throughput. We implement proposed solution in NS2.**

Keywords—MANET; AODV; QOS; TCL;PDR.

I. INTRODUCTION

MANET is a combination ofmobile nodes that are connected through wireless links having no centralized infrastructure. In MANET routers move randomly free and thus the topology changes rapidly and unpredictably. These networks are suitable for emergency situations like natural or human-induced disasters, military conflicts, emergency medical situations, etc. are three categories of routing protocols for MANET.

1. Proactive Protocols

2. Reactive Protocols

3. Hybrid Protocols

Proactive protocols are table driven and store and maintain routing information about every node. And reactive protocol are on demand it discover route only when desired and in it table s are not maintained. Whereas hybrid protocols are combination of both reactive and proactive protocols.

In this paper we modified the AODV routing protocol .AODV is an ondemand routing protocol which discover route only when it is required. For route establishment in AODV four types of messages are used which are RREQ, RREP, RERR, and HELLO.A RREQ message is broadcasted when a node needs to discover a route to a destination. When a RREQ reaches a destination node, the destination route is made available by unicasting a RREP back to the source route. RERR message is broadcast for broken links. HELLO message is used for broadcasting connectivity information. Whenever a node want to communicate with another node it initiate the route discovery process by bb broadcasting the route request message to its neighbor nodes. When RREQ message reach to the destination ode the destination node send the reply message back to the node this message is send on the basis of less number of hops. When source node receive RREP message from destination node route is established between source and destination If due to any reason topology change or node die, then link failure occurs and RERR message send to source. After receiving the RERR, if the source node still desires the route, it can reinitiate route discovery.

The rest of this paper is organized as follows. Related work and problem definition is presented in Section II. The Proposed work is covered in Section III, followed by implementation results and performance evaluation in Section IV. This paper is concluded in Section V while the references are given towards the end of this paper.

II. RELATED WORK

[1] Proposed an enhancement in AODV protocol to provide QOS support for real time traffic by using time slot bandwidth reservation in two cases: firstly when both the nodes are in the MANET and secondly, when one node is in MANET or other is in fixed network.

[2]Enhanced load balanced AODV routing protocol, is proposed which selects route on the basis of traffic load on node and reset path as topology changes.

EEMLAR protocol [3] discussed, the optimization functions to determine the bestpath to select and send RREP. It also store some inferior paths as backup.

[4] Real Time On-demand distance vector in Mobile Ad hoc Networks, a protocol which includes load parameter in the RREQ message that helps in the selection of route with low congestion during discovery process. This decreases the end to end delay for real time traffic

[5] AODVLM, provide a scheme for load distribution among nodes in MANET. AODVLM improve throughput, reduce average end to end delay and overall network performance.

[6] Energy efficient route discover method was proposed which reduce the broadcast cost and overall energy of

network. Modify the ring search method and present a new approach which uses disk instead of rings. In this approach node discovery process use region similar to to disk which have variable dimensions and as a result time and energy reduces.

[7]Energy Level and Link State Aware AODV Route Request Forwarding Mechanism, presented an AODV protocol with enhancements. In route discovery the route selection is made on the basis of node power which is power required for processing of packets.

[8]This paper proposes link quality aware routing and link quality is measured by predicting node position through past history of nodes mobility

[9]This paper presented two enhancement protocols to reduce the overhead of AODV. These protocols use location information obtained by GPS to reduce routing overhead of AODV .First protocol AODV-LAR uses TTL estimation equation to reduce time delay and control overhead. Second protocol AODV-line uses node location information to restrict route search area to be only near the line connecting source and destination nodes.

[10]Energy efficient reliable routing protocol is based on the backbone node and in routing table information about the backbone nodes that are attached to the route is placed these nodes are nearer to the routing path and have sufficient battery power and signal strength and when the route break then the route is reconstructed using these backbone nodes

[11] Energy efficient data transmission in MANET using Modified AODV is proposed. In this paper route selection is based on destination sequence number. The source node selects the route which has greater destination sequence number.

[12] This paper propose a novel MANETs routing protocol by using link lifetime based multipath mechanism to improve route stability, which is called link life time based backup routing protocol (LBR) it obtain the shortest path between source and destination through limited flooding as primary path and then sets up a local backup path for each link in the primary path concerning link lifetime. This scheme avoid backup path being out of date pre maturely and increase the availability of backup paths.

[13] EEMLAR (energy efficient maximum lifetime ad-hoc routing) algorithm is proposed to improve the network lifetime in MANET. It use energy cost function on the basis of which route will be selected.

[14] In this paper a modified route request broadcast approach is presented, based on node caching. Node caching is that we cache nodes which are recently involved in data packet forwarding route request. Suggested node caching techniques can be viewed as a dynamic implementation of a connected dominating set (CDS).They overcome the drawback of CDS overuse of dominating nodes by anew load balancing scheme in which they measure the protocol fairness using as parameter distribution among nodes of the forwarding load. Work load balance technique is based on the idea by dropping RREQ packets according to load status of each node and load status is set by the value of threshold.

[15] In this paper, energy efficient route discovery method was proposed which reduce the cost and overall energy of network. Modify the ring search method and present a new approach which uses disk instead of rings. In this approach node discovery process uses regions similar to disk which have variable dimensions and as a result time and energy reduces

[16] This paper proposes stable route AODV (SRAODV) protocol which is suitable for high mobility environment. This protocol apply stability estimation method for route selection during route discovery intermediate node when receive route request calculate stability factor and a route is selected which has maximum average value.

[17] This paper proposes a link lifetime based backup routing protocol to improve the route stability .LBR is based on link lifetime. It obtain shortest path between source and destination through limited flooding as a primary path, and then setup a local backup path for each link in a primary path concerning link lifetime. When the primary path fail then data transmission is continued through the corresponding local backup path.

[18]In this paper a new routing algorithm is proposed which can estimate delay and calculate link stability factor in the route discovery process it find path meeting delay requirements with greater stable link. In the route maintenance phase it keeps monitoring network topology changes through delay prediction and perform rerouting in time.

[19]In this paper they consider the power level of the each node while calculating the path to increase the network life time. They consider the battery power in considering the path or route, if there is a path that has low energy optimization function don't select that path. They also consider no. of hops as the larger no. of hops help in reducing the range of the power transmission, saving the energy.

[20]They modify an algorithm namely "Stable Route AODV (SR-AODV) protocol". This protocol can give good performance. They also discuss the stability estimation method for route selection and increase the performance.

[21] They discuss the three phases: Route discovery, Data forwarding, and Route maintenance. They use the Exponentially Weighted Moving Average Method to estimate the energy drain rate to calculate the node life time that is based on residual energy and past activity. They also discuss Connection Lifetime Prediction Algorithm by using GPS.

[22] In this paper they focus on the developing power-aware routing algorithms which find the route that maximize the life time of node and minimize transmission energy consumption that increase the life of a network.

[23] They proposed a probability based node selection method considers the parameter used by them is known as the energy distance factor. This factor help to select the hop factor helps to select node for optimizing the energy efficiency of the network. Also consider residual energy of the nodes as a fraction in order to improve the performance of path life time.

In the previous techniques different methods are proposed to provide the stable route. In our work we proposed a way to stable the route on the basis of energy factor.

III. PROPOSED SOLUTION

In MANET as node are mobile and they rely on batteries and if battery of node let down it also cause link breakage or link instability. This leads to the problem of delay in transmission resulting in more packet loss and lesser overall throughput.

In our proposed work we modify the existing AODV route discovery mechanism in such a way that it will show give greater performance than existing AODV protocol It will not only reduce the end to end delay but also gives the link more life. We take into account the energy of the nodes during route discovery and route establishment.

3.1 Route Selection mechanism

When a source node initiates a route discovery procedure by flooding RREQ messages, each node that receives theRREQ looks in its routing table to see if it has a fresh route to the destination. If it doesn't have the route it calculates its remaining energy and adds calculated value in RREQ and broadcasts it further. The process is repeated till either the destination is reached or no destination is found.

IV. IMPLEMENTATION AND ANALYSIS

We implemented basic and our Enhanced AODVProtocol in NS2 [24]. NS2 is discrete event simulator for the simulation of wireless ad hoc networks. It Simulate both wired and wireless network. We use the following matrices to evaluate the performance of our enhanced protocol against basic AODV.

A. Parameters Setting

The following table shows the complete detail of the parameters used in our simulation settings.

Table 1: NS-2 Parameter setting

Channel type	Channel/wireless Channel
Radio propagation model	Propagation/Two ray ground
Mobility Model	Random way point
Network interface	Phy/ WirelessPhy
MAC type	Mac/802_11
Interface queue	Queue/Droptail /priQueue
Link layer type	LL
Antenna model	Antenna/Omni Antenna
Max packet in ifq	20
Number of mobile nodes	8
Simulation time	100 seconds

B. Performance Metrics

- Average throughput

Throughput is the total number of packets received successfully in given time.

- Packet delivery Ratio

It is the ratio of the number of packets received successfully to the total number of packets transmitted.

- Packet loss

It is the packet loss ratio of the transmission.

C. Simulation Results

The results are compared and presented in graphical form after implementing Enhanced AODV protocol. We simulate the result in NS2 by taking parameters (pause time) on X axis and performance metrics (delivery ratio, packet loss, throughput) on Y-axis. The pause time is the time interval during which different parameters are calculated.

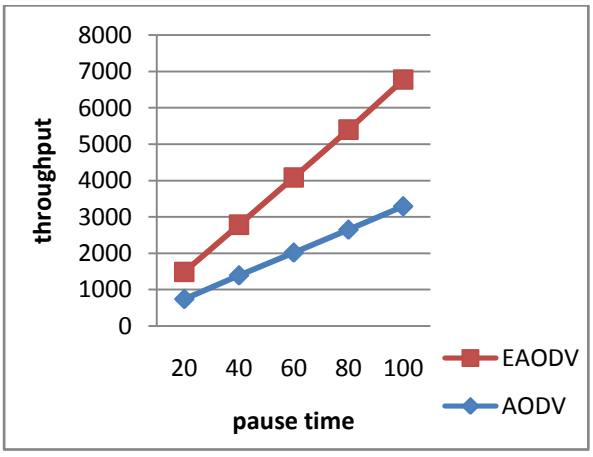

Figure 1: Throughput vs. pause time of AODV & EAODV

In figure the throughput comparison between AODV and EAODV is given and it is clear that the throughput of EAODV is greater than basic AODV as indicated by blue line in Graph.

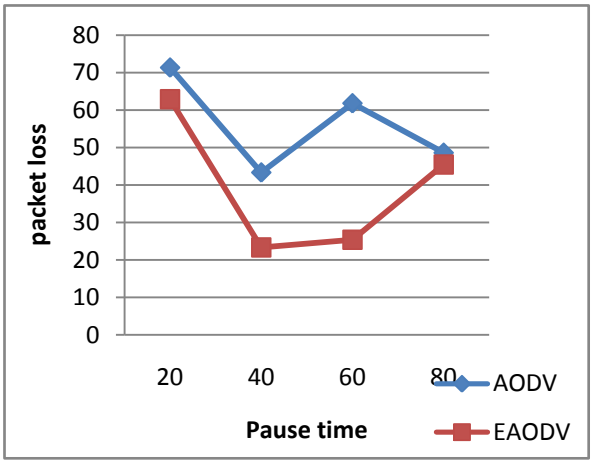

Figure 2: packet loss vs. pause time of AODV & EAODV

The packet loss ratio of Basic AODV and EAODV is compared in the above graph. The packet loss rate of both protocols is calculated at fixed interval of time. Packet loss rate for the EAODV is smaller than AODV.

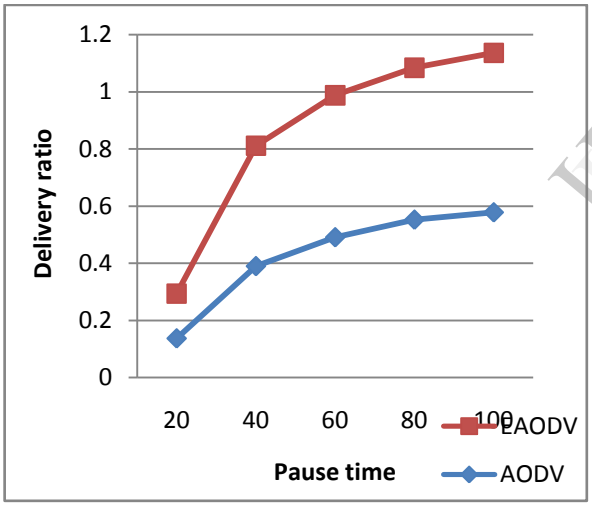

Figure 3: Delivery ratio vs. pause time of AODV & EAODV

Figure 3 shows delivery ratio of both the protocols. Red line is indicating the delivery ratio of AODV and Blue line indicate the delivery ratio of basic AODV and the delivery ratio of EAODV is Greater than AODV.

V. CONCLUSION

We proposed a protocol with an enhanced route discovery mechanism that reduce the transmission delay In EAODV we modified the RREQ message and in the RREQ message a field is reserved for remaining energy. At each node the remaining energy is calculated and value is added in the reserved field and at the destination the reserved field is divided with number of hops .this will give average remaining energy and route will be selected which has greater average remaining energy we implement this protocol in NS2 and the results show that the throughput and delivery ratio of EAODV increase as compared to AODV and EAODV show less packet loss then AODV. Hence through results it is proved that the EAODV routing protocol is better than basic AODV protocol for mobile ad-hoc networks

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