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Review on Efficient Energy Saving AOMDV Protocol with Energy Aware Routing

Neha Lastami[1], Mrs. Hansa Acharya[2]
Department of Computer Science and Engineering, Radharaman Institute of Technology & Science[1, 2]
neha.singhlastami@gmail.com[1], hansaacharya@gmail.com[2]

Abstract: *Mobile Ad hoc Network is self-organizing, multi hop and dynamic network because of mobile nodes. Due to frequently changing network topology, this type of network requires efficient dynamic routing protocol. In Mobile Ad hoc Network, node operates on battery power of limited capacity and very often node fails due to energy limitation. To reduce nodes failure due to limited energy it is require to establishing of efficient energy saving protocol based on AOMDV named (EES_AOMDV) which works on the checking the energy level of each node while route discovery procedure to remove the abrupt route failure and also in packet transmission time to reduce packets loss. EES_AOMDV maintains multiple routes from source to destination if one route is failed, then it uses the alternate route to transmit packet rather than establishing another path discovery procedure. Selection of routes will be based on the energy remains in the nodes within route. If any node energy remains less than certain threshold, then that node cannot take part in route discovery procedure and also in packet transmission. The entire node within route is consistently checked their energy level if any node energy is lower than threshold another route is followed to transmit packet. If all nodes within route have sufficient energy then there is less possibility of route failure, this will reduce packet loss and increase efficiency.*

Keywords: *MANET, Energy efficient routing, AODV, Route selection, RREQ, AOMDV.*

1. INTRODUCTION

Nodes in Mobile Ad hoc Network (MANET) [1][2] are highly mobile and dynamic network topology and neighboring nodes of each node dynamically changing their positions which can cause the communication failure. Communication is possible if source node and destination node is in direct transmission range or connected through intermediate node. Every mobile node operates on battery power, which is source of energy to transmit and receive packets. If any nodes in route fail, communication will also fail. To re-establish the communication, it is required to route discovery procedure again which will flood Route Request (RREQ) packets within network, which consume lot of energy. To solve this problem, here we introduce a new protocol named Efficient Energy Saving Ad hoc On Demand Multi-path Distance Vector (EES_AOMDV) to remove link failure due to limited energy in nodes within route failed to transmit packet. Proposed mechanism combines the features of AOMDV which is multipath routing protocol that discover multiple routes in one route discovery procedure. The proposed EES_AOMDV protocol will check the energy level of each node while route discovery procedure and packet transmission time this will remove the route failure due to reduced energy. This protocol will initially check the energy level of node by calculating the average power of a node and the number of hops needs to travel in the actual path. Secondly, when there is a path failure or link failure it calculates the number of hops travelled and the remaining number of hops has to travel by data in that route to reach the destination.

2. AODV ROUTING PROTOCOL

AOMDV is a multi-path extension of AODV [4]. In AODV source initiates a route discovery process when it wants to communicate to a destination by flooding a Route Request (RREQ) packet for destination within the network. An intermediate node, receiving a RREQ packet if it is unique, first sets up a reverse path to the source. If a valid route from source to the destination is available, then the intermediate node generates a route reply (RREP) packet. If valid route is not available, then RREQ is rebroadcast to initiate another route discovery procedure.

AODV Route Discovery

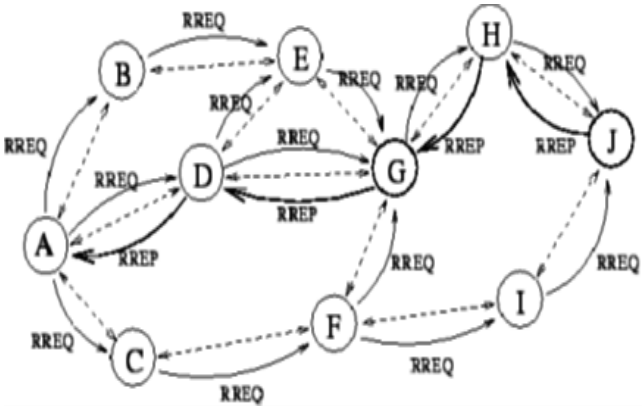


Figure 1: AODV Route Discovery procedure

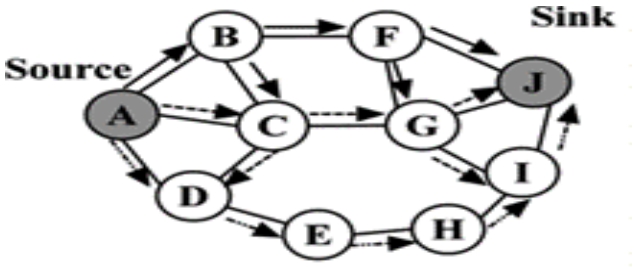
When the destination node receives RREQ which is non-duplicate, it generates RREP. The RREP is routed back to the source via the reverse path. Like AODV, AOMDV is also use distance vector routing and uses hop to hop routing approach. AOMDV also find routes on demand bases using a route discovery procedure. Unlike AODV, AOMDV finds multiple routes in an exceedingly in a single route discovery procedure. Unlike AODV in which all duplicate RREQs are discarded, AOMDV finds an alternate route with each duplicate RREQ. In AOMDV, RREQ packets propagate from the source towards the destination that establishes multiple reverse paths at intermediate nodes as well as to the destination. Multiple RREPs traverse these reverse roots back, to establish multiple forward routes to the destination from the source. The core of the AOMDV protocol lies in guaranteeing that multiple roots discovered are loop free and disjoint and also efficiently finding such paths using a flood-based route discovery.

3. AOMDV ROUTING PROTOCOL

The basic idea of AOMDV [3] is multi-path routing to find multiple paths between a source and a destination in one route discovery procedure. This protocol is classified as on-demand routing protocols for MANETs which discover routes only when a source needs to communicate with a destination These multiple paths can be used for load balancing or used as backup routes when the primary route fails.

AOMDV Route Discovery

Several changes have done on basic AODV route discovery mechanism to enable computation of multiple link disjoint routes between source and destination pairs. The core of the AOMDV protocol lies in guaranteeing that multiple routes discovered are loop-free and disjoint. AOMDV [4] route update rules, applied locally at every node, play an important role in maintaining and disjointness and loop-freedom.



AOMDV			
Node A's Routing Table			
Destination	Next-Node	Hops	Sequence No
J	C	3	11
J	B	3	11
J	D	5	11

Figure 2: AOMDV Route Discovery Procedure

AOMDV depends as much as possible on the routing information already within in the underlying AODV protocol, thereby limiting the overhead incurred in discovering multiple paths. In particular, it does not use any special control packets. In fact, additional RREPs and RERRs for multipath discovery and maintenance along with a few additional fields in routing control packets (i.e., RREQs, RREPs, and RERRs) represented the only extra overhead in AOMDV relative to AODV.

4. RELATED WORKS

Several researches have done work for energy efficient routing in wireless ad hoc network. Some related works relevant to this paper have explained below.

This paper is based on improving mobile ad hoc network performance using improved RED algorithm. This paper has proposed an enhanced algorithm by setting the RED parameter dynamically, instead of static setting of RED parameter. By using this mechanism authors expected that performance will increase. [2]There are no implementations details are given to verify the results.

This paper is based on the comparing the results of AODV and AOMDV in Ad hoc network. This paper has discussed AODV and AOMDV protocols in brief and multiple challenges in ad hoc network and results are compared using multiple parameters. In this it has been proved that AOMDV perform better than AODV network. [3]There is results are compared. AODV protocol fails in every parameter of network as compare AOMDV and no any improvement in results.

This paper is based on analyzing the AODV performance, by increasing no of nodes and observing its effect on Quality of Service (QoS) of Mobile Ad hoc Network. In this Cluster Head Gateway mechanism is used to improve the performance. [4] Failure of one Cluster Head Gateway (CHG) may affect the entire system to fails.

This paper is based on the alleviating data packets loss during transmission in Mobile Ad hoc Networks due to the node mobility problem. Authors proposed the new routing protocol called AD-AODV by introducing a novel metric M whose value depends on the number of hops and average mobility of a given route, which improve the routing mechanism of AODV and enable AD-AODV to select the most stable route. Simulation result is compared with AODV protocol indicates that proposed protocol is performing better in terms of packet delivery ratio. [6]There are load balancing is done to distribute load evenly in all available route, this can create extra delay due to long path followed by some packet in long route.

This paper, a new QoS-aware routing protocol is proposed based on AODV named QAODV (QoS- AODV). Using the premise of the delay and available bandwidth meeting the QoS demands, this protocol defines a new route metric with the hop count and load rate so as to select the best route. Simulation results are compared with AODV, shows that the performance of QAODV is better on both network throughput and end-to-end delay with small increase of control overhead. As a whole, the protocol improves the QoS guarantee capability in the WMN [7]. There is route selection process can exclude some nodes permanently who doesn't fit to the QoS requirements proposed by authors.

This paper authors presented new protocol named Enhanced Ad hoc On demand Distance Vector (EAODV) to solve link failure in the network which calculate the average power of a node and the number of hops in the actual path before transmission so that no path failure occurs due to limited power within nodes. This proposed protocol overcomes the link failure by suggesting alternate path or energy booster according to the situation that the data has encountered. This booster is triggered when necessary life of each node is enhanced to a great extent also increased the packet delivery ratio with reduced delay and life span of each node. [8] There are energy booster is calculated based on number of node need to travel to reach to destination due to if node is more to travel to reach destination.

This paper authors developed a new routing algorithm named as ECNC_AODV which is modified from AODV protocol. This algorithm is relying on the current energy of each node and the cached node. The main aim of this suggested algorithm is to reduce the number of routing packets

generated due to flooding method so that there should be reduction in energy consumption, routing overhead and increase in network lifetime could be achieved, without affecting the throughput of the network. [9] There is reducing energy consumption which affects the other performance results.

This paper, author presented the algorithm which combines the energy metrics and integrates these metrics in an efficient way to improve the life time of Ad hoc network and the energy consumption across the nodes is reduced. [10] There is proposed methodology but a result has not been verified by solution and graphs.

This paper, authors suggested an energy economical multipath routing protocol for mobile ad hoc networks, called MMRE-AOMDV, which extends AOMDV routing protocol. The fundamental plan of the protocol is to find the minimal nodal residual energy of each route in the route choice method and arrange multiple routes on descending order of nodal residual energy. Once a new route with higher residual energy in all the nodes is found, it is used to forward rest of the data packets. [11] There are energy is limited which can affect other performance parameters.

The authors proposed an optimized energy aware routing referred as OEAR that takes into consideration energy of the node as well as the number of packets can buffered within the node while selecting the route. The proposed OEAR finds the most suitable path among the existing paths to forward data packets from source to destination using on-demand routing. [12] There are finds the stable path in terms of energy remains in node which can be longer path and can increase delay and can decrease throughput in network.

This Energy Efficient Ad-hoc on demand Routing Protocol for Mobile Ad-hoc Network (EEAODR) is an improvement over Ad hoc on-demand destination vector protocol that considers power level of each node in the network while calculating the route in order to increase lifetime of the network. The optimization function is used to select the energy efficient path among the all discovered by considering different factors such as nature of packets, their size and distance between nodes. The path that has minimum of the communication cost among all the possible paths between a source and destination node pair is chosen as the best path. [13]There are every time we use different path for sending packet which is not possible in the case of AODV which uses same path every time.

This paper, authors has improved the routing mechanism of AODV and enables AD-AODV to select the most stable route. A lot of simulations are operated based on the variation of node number and node speed to evaluate the performance of AD-AODV protocol. Simulation results compared with AODV protocol indicate our protocol's superiority in terms of packet delivery ratio therefore AD-AODV's enhancement of routing reliability is proved. [14] There are added some additional metrics which can increase overhead in route establishment and packet transmission.

In this paper, authors consider delay-optimal power control for an energy harvesting wireless system with finite energy storage. The system is powered by a renewable energy source with burst data arrivals, and is characterized by data and energy queues. Which consider delay-optimal power control and formulate an infinite horizon average cost Markov Decision Process (MDP). To deal with the curse of dimensionality, introduce a virtual continuous time system and derive closed form approximate priority functions for the MDP at various operating regimes. Based on the approximation, this obtains a low complexity online power control solution which is adaptive to the channel state information as well as the data and energy queue state information. The derived power control solution has a multilevel water-filling structure, where the water level is determined jointly by the data and energy queue lengths [15].

In this paper, a new routing protocol to alleviate the problem of link failure due to random node mobility. In proposed modified AODV named MAODV which takes the stability of route into consideration to attempt to search the more stable path between source and destination. In MAODV some changes in Hello and RREQ message format to respectively record the sending time and route stability [16].

5. PROBLEMS IN AOMDV

In mobile ad-hoc networks efficient energy utilization of every node is an essential requirement to avoid node failure. Failure of node due to energy exhausted result in the network partition and causes communication failure within the network. AOMDV and other reactive protocols do not consider energy in nodes while route discovery and routing of packet. Since energy is limited in wireless ad hoc networks, coming up with energy aware routing protocols has become a main issue. The aim of these types of protocols is to reduce energy consumption of the mobile nodes within the network in order to maximize the time period of the network. So, we tend to design a new routing protocol which will be based on a reactive and multipath routing, and takes transmission power of nodes and residual energy as energy metrics so that it maximizes the network lifetime and to reduce energy consumption of mobile nodes.

6. PROPOSED SOLUTION

The proposed protocol will check the energy level while route discovery procedure and packet transmission time. Nodes which are having energy higher than the certain threshold will participate in the communication. Threshold value decision will be based on average energy in the nodes; this will remove the route failure due to reduced energy. This protocol will first calculate the average power of a node and energy consumption by each node and the number of hops in the actual path. Secondly, when there is a link failure or path failure it will calculate the number of hops travelled and the remaining number of hops the data has to travel in that route to reach the destination from source. If the nodes having sufficient energy to transmit packet, then the packet will transmit in those path otherwise alternative path will be followed to transmit recent and remaining packets.

7. EXPECTED RESULTS

Proposed protocol will reduce the packet loss and it will lower the retransmission of the packet this will conserve the energy in the ad hoc network which is critical parameter which leads to communication failure. This will increase the life span of network and increased packet delivery ratio and throughput and reduce routing load.

8. CONCLUSION

In this paper we are trying to effort in improving the life time of network by reducing the energy consumption of node. This will also reduce packet drop rate due to node failure and improve network performance than existing AOMDV protocol. To verify results, experiment will be performed in NS 2 and result will be compared with existing AOMDV and other reactive protocol.

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