

Multiple Path Creation in AODV Using Factors of Node Energy and Secure Load Balancing

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ABSTRACT

MANET, the designing of routing protocols had been turning into the principle essential project that meet MANET until now. Furthermore, nodes with closely site visitors load can also additionally exhaust their strength in routing others packets ensuing in volatile community and therefore overall performance deterioration. In this essay we gift a new edition of one of the nicely distinguished reactive routing protocols named Ad Hoc On Demand distance Vector (AODV). he counseled scheme is called, Energy efficient, Load balanced and Stabilized Multi routes- AODV (ELSM-AODV), in which the trails choice is primarily based totally on a composite criterion, named Node Efficiency Factor (NEF) which incorporate all elements which have direct effect at the overall performance stage and existence time of MANET (e.g. strength, speed, distance and site visitors load of nodes). Simulation consequences evidenced that overall performance of the counseled protocol outperform general AODV from factor of view accurate packets shipping ratio, stop to stop put off time, normalized routing load and nodes strength consumption.

To reduce the number of route discovering process, multipath routing protocols makes use of alternate paths to continue packets transmission. Ad Hoc On-demand, multipath distance vector routing protocol or AOMDV, is one of the well-known multipath protocols that relays on the hop count metric to route packets. Nodes that excessively consume energy in time are considered overloaded and are excluded from route discovering, hence nodes with reduced energy variation are selected to route packets.

Keywords: MANET, AOMDV Routing Protocol, ELSM-AODV, Energy, Speed, Traffic load

1. INTRODUCTION

A mobile ad hoc network or MANET is a wireless communication network formed by cooperating mobile nodes to deliver packets. It presents several challenges such as high dynamic topology, frequent nodes movement change, low power capacity and limited throughput and bandwidth.

The MANET shape isn't like the others wired/wi-fi networks because of its awesome traits such as, freelance cell gadgets with restrained energy, finite bandwidth and dynamic community topology. Furthermore because of the absence of centralized management, all cell gadgets performing as routers and hosts at equal time. Due to the restrained transmission variety of cell gadgets, regularly they created routes take the shape of multi hops style. MANETs are infrastructure much less networks due to the fact the nodes are cell. All the nodes can circulate in any path at the same time as speaking and those nodes can act as each router and host. So, those networks are dynamic in nature method can extrade their topology. Routing is challenge of moving information from supply to vacation spot at the same time as maximizing community performance. So it turns into a undertaking in MANETs.

Split Multipath Routing with Maximally Disjoint Paths in ADHOC Networks this describes in current years, routing has been the maximum centered vicinity in advert hoc networks research. On-call for routing in particular, is broadly advanced in bandwidth restrained cell wi-fi advert hoc networks due to its effectiveness and efficiency. Providing a couple of routes allows minimizing direction restoration method and manage message overhead. To distribute information packets into a couple of paths of energetic sessions. The visitors distribution effectively makes use of to be had community assets and stops nodes of the direction from being congested in closely loaded visitors situations.

1.1 Extensive Simulation ZD-AOMDV

A New Routing Algorithm for Mobile Ad-Hoc Networks, this describes the MANET is a group of cellular nodes which could speak with every different the use of multihop wi-fi hyperlinks without making use of any constant primarily based totally station infrastructure and centralized management. It could be very important for MANETs to have an green routing and QoS mechanism to help various applications. Multipath routing permits the status quo of a couple of paths among a unmarried supply and unmarried vacation spot node. A new method to on-call for loop-loose multipath routing, on this on-call for multipath supply routing scheme in cellular advert hoc networks called "break up multipath - dynamic supply routing" (SMP-DSR) is proposed. The proposed protocol establishes and makes use of multipath maximally disjoint routes which will enhance fault tolerance and to offer load balancing through multipath routing.

1.2 Routing of MANETs

In routing user data is send from sender to destination through network. The routing functions are: Path Generation

- Path Selection
- Data transmission
- Path Maintenance
- Path Generation- In this, path is generated from scattered environment of network. There are multiple path generated from sender to destination.
- Path Selection- In the previous phase, there were multiple path and from them suitable path is chosen for data transmission so that time, memory and overhead will be less and performance is better.
- Data transmission- In this data is transmitted from sender to destination on the selected path
- Path Maintenance- The suitable path must have to maintain using control messages like Hello. If the link is broken and not active then using hello messages, maintenance of the route is done.

The Multipath on-call for protocols have remarkable cap potential to lessen the direction discovery frequency as compared to the unmarried course protocols. These protocols hold the change paths which have been already discovered, and use them to get better each time the principle course crashes. First, the course with the optimized hop be counted number is used as a number one course. When this course fails, in preference to launching every other direction discovery process, the change paths are used to keep packets transmission. This might also additionally lessen the wide variety of routes discovery packets transmitted throughout the community to go looking opportunity paths.

In our approach, we've used the historic values of nodes electricity to compute electricity variant rate. This fact can monitor if there's an immoderate intake of electricity. Multiples moves can also additionally boom the electricity intake along with an extended packet passing throw the node, extended direction mistakes packet transmission, etc. The simple concept is simple with the usage of parameters: the electricity threshold and the coefficient alpha. These parameters are used to make certain the upkeep of the node electricity. The protocol overall performance indicates an extended community lifestyles time and decreased electricity intake. The residual electricity of nodes and distance is taken under consideration at the same time as making a couple of paths from supply to the destination, to keep the electricity intake in cell advert hoc networks. NS2 simulation effects confirmed that MC-AOMDV is higher in phrases of overhead and throughput.

2. ELSM-AODV ROUTE DISCOVERY PROCESS

To meet our needs, mild change has been made within side the formatting of each direction request packet (RREQ) and direction respond packet (RREP). Where one subject introduced to RREQ packet known as linkage performance factor (LERq), whilst any other one has been introduced to RREP packet known as direction performance factor (RREP). When supply node has inclination to speak with vacation spot node and it does now no longer has a righteous direction in its routing table, it inaugurates direction origination process, via disseminate RREQ packet with hyperlink performance factor (LERq):= 3, to neighbor nodes

1- Calculate its efficiency factor (NEF).

2- If $NEF < LER_q$, then LER_q field is updated with NEF ($LER_q := NEF$). Otherwise, no change will be made in LER_q field of RREQ packet and performs one of the following states: *

- * If there is no valid route in its routing table: It sets the reverse path and re-broadcast RREQ packet.
- * If there is a valid route with an efficiency factor (REF) $\geq LER_q$, it sends RREP packet to source node. Otherwise, it sets the reverse path and re-broadcast RREQ packet.

2.1 ELSM-AODV Route Maintenance Process

In the direction of sending of facts packets, in state of affairs of any fractured hyperlink, predecessor node from misplaced hyperlink transmits Route Error (RERR) packet, with the aid of using approach of hops style, to supply node. During the voyage of RERR packet in path of supply node, every previous intermediate node of the misplaced hyperlink, erases path to any inaccessible vacation spot node of its routing table. In nation of receiving message of wonderful reaction from vacation spot node through the reserve path whilst it is ready time, supply node begins off evolved sending the residual facts programs over the reserve path. Otherwise, it commences novel path discovery process.

3. AOMDV ROUTING PROTOCOL OVERVIEW

The key idea of the AOMDV protocol is to compute a couple of loop-loose paths, to exchange to an trade route if the primary route the vacation spot node crashes. When a course respond RREP is received, the node replies the supply thru the opposite disjoint route in its routing table. Note that route with the node disjointness is stricter then paths with the hyperlink disjointness. The hyperlink disjointness technique lets in computing a couple of paths passing via way of means of the equal node, hence not unusual place nodes can be based in paths from supply to vacation spot, whilst an intermediate node gets a RREP from the vacation spot, and it replies the supply thru the hyperlink disjoint paths in its routing table. AOMDV makes use of marketed hop-matter to make sure now no longer getting any routing loops.

3.1 Send Route request

When a supply desires to supply packets to a vacation spot it first exams whether or not it has a legitimate pre-present route to it in its routing table. If it's miles the case, it provides the content material directly .If not, it shops the cutting-edge packets in a buffer (the packets are buffered in a FIFO "first in, first out" queue) and transmit them to the vacation spot each time a course is set. The supply is permitted to rebroadcast the RREQ packets for a most number, after that the supply will forestall sending course requests to save you the growing of the community overhead with an infinite broadcast.

3.2 Receive, Forward and Reply a Route Request

A new route entry is created if the route entry of the source doesn't exist. In the case where, the source sequence number of the received packet is greater than the source sequence number in the routing table that already exists then the node will update the source sequence number in the routing table, delete all old paths that already exist, create a reverse path to the new fresh path and set the hop count filed as the maximum hop count.

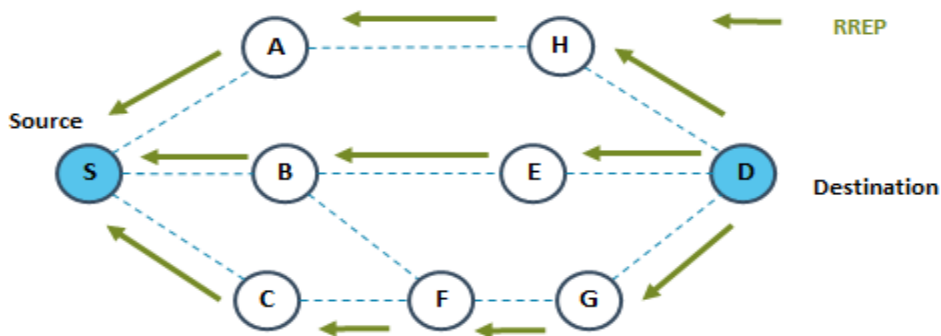


Figure 1 Route Reply flood in network and path establishment

3.3 Load Balancing Algorithm Using Round Robin

- When it reaches the end of the list, the load balancer loops back and goes down the list again.
- Going down the list of servers in group, round robin load balance forwards a client request to each server in turn.

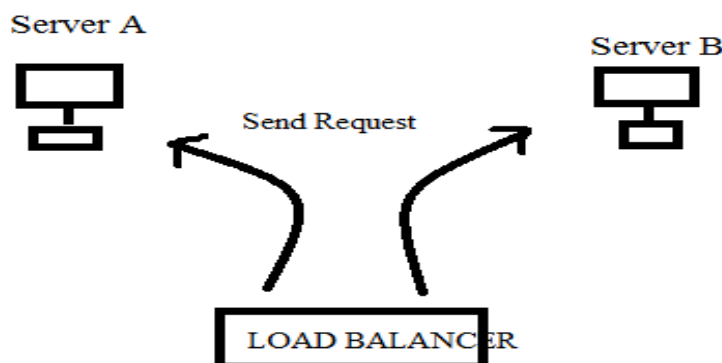


Figure 2 Load balancer

Split Multipath Routing with Maximally Disjoint Paths in ADHOC Networks this describes in latest years, routing has been the maximum targeted location in advert hoc networks research. On-call for routing in particular, is broadly evolved in bandwidth restrained cellular wi-fi advert hoc networks due to its effectiveness and efficiency. Providing more than one routes facilitates minimizing path healing method and manage message overhead. To distribute information packets into more than one paths of energetic sessions. The site visitors distribution successfully makes use of to be had community sources and stops nodes of the path from being congested in closely loaded site visitors situations.

The main design criteria for the routing protocols in MANETs are as follows:

- Scalability and reliability
- Simplicity and ease of implementation
- Fault tolerance.
- Dynamic topology maintenance
- Distributed and lightweight

In most cases, the ability of creating multiple routes from a source to a destination is used to provide a backup route. When the primary route fails to deliver the packets in some way, the backup is used.

Greedy forwarding uses the positions of neighbor nodes and a packet's destination to make packet forwarding decisions. Specifically, if a node knows its neighbors' positions, the locally optimal choice of the next hop is the neighbor that is geographically closest to the packet's destination.

3.4 Route Request Flooding

Even aleven though routing overhead is much less in comparison to proactive protocols, path discovery overhead results in wastage of the restrained assets within side the network. When S is ready to ship statistics to D and no path for D is available, then path discovery is started. S selects the node nearest to D (right here node is selected) from its neighbor desk as the following hop and sends RREQ (through RREQS, we denote the RREQ packet despatched through S) to it. When a gets RREQS, it data RREQS in its RREQ desk and updates the corresponding fields of RREQ (RREQS) with its ID, position, velocity, and LET(S, a). Then, node a selects b as its subsequent hop and sends RREQ a to b (RREQ)a denotes the RREQ that has been updated.

Multiple Source Routing protocol (MSR) proposes a weighted round-robin heuristic-primarily based totally scheduling approach amongst more than one paths so that it will distribute load, however gives no analytical modeling of its overall

performance and feature similarly in comparison on-call for routing protocols with one of the green desk pushed routing protocol DSDV to illustrate that how and why on-call for protocols paintings higher than desk pushed protocols below the equal situations of visitors load and mobility pattern. The protocols had been additionally studied below random mobility patterns. The gift studies paintings includes enforcing of 4 routing protocols specifically DSDV (Table pushed), DSR, AODV and AOMDV (On-call for), and the complete evaluation of unipath on call for routing protocols like DSR, AODV and multipath on-call for routing protocol like AOMDV the use of NS-2 (model NS-2.31) simulator.

The nodes in MANETS are highly mobile and it maintains dynamic interconnection between those mobile nodes. MANTes have been considered as isolated stand-alone network. In AODV the network is silent until a communication is needed. At that point the network node that needs a communication broadcasts a RRER.

When a link fails, a routing error is passed back to a transmitting node and the process repeats. Flooding of route request message by all nodes imposes major concern in energy consumption. Link failure during transmission.

- No acknowledgement send by the receiver.
- Sometimes back up cannot be predicted.

4. PROPOSED ELSM-AODV SCHEME

As the path production among any communicated nodes includes a series of wi-fi related middleman nodes. So, hyperlink breakdown among any consecutive nodes alongside the path cause absolutely route failure. Where, hyperlink smash off comes both from loss of life of someone of the 2 successive nodes; because of its strength exhaustion, or nodes motion in order that successive nodes are getting out in their participated transmission range. Where, this criterion is a characteristic of coefficients of strength, site visitors load and balance of node. Furthermore, to reduce wide variety of new release of path discovery operation, the cautioned new edition creates multiple route (-route) in the course of walking of every path discovery operation.

4.1 Energy Paradigm

Because of nodes of MANET running on batteries of limited energy

Where, node energy factor (E_f) could be computed according to the following equations:

$$E_f = E_s/E_i \quad (1)$$

$$E_s = E_p - (E_{tx} + E_{rx}) \quad (2)$$

Where,

E_s : surviving energy of node

E_i : incipient energy of node

E_p : present energy of node

E_{tx} , E_{rx} : the wasted energy from node for each transmitted and receipted data/control packet respectively.

N.B: For node of high energy level, E_f should be high.

4.2 Traffic Load Paradigm

Traffic load of each node along the selected route is very important factor. This is because in case of high traffic load, packet waiting time in the buffer of transmission (latency time) is increased, resulting in increased delay time to deliver data from source node to destination node.

$$TL_f = PB/B_{max} \quad (3)$$

Where,

PB : Present packets' count in the transmission Buffer and

B_{max} : Maximum number of packets in transmission buffer.

N.B: For node with light traffic load, TL_f should be small

4.3 Stability Paradigm

Leading to often routing direction failure, therefore a extra direction re-discovery manner is required, which bring about overall performance degradation of MANET. Therefore, to reduce the effect of nodes' mobility on direction balance, the supplied balance version has been considered that permitting every node for buying records approximately its balance relative to each one in every of its neighbouring nodes. To enforce the steadiness paradigm, we assumed that each one nodes in MANET are homogeneous and supplied with GPS machine for acquiring their place coordinates (X, Y).

To fulfill our requirements, a brand new discipline has been brought in HELLO message layout for placing function coordinates of node. According to the facts worried in consecutive HELLO messages from a neighbor, the use of the Euclidian distance equation, the receiving node can calculate its personal relative pace and its distance relative to the supply of HELLO message.

Subsequently, node A can computes its relative speed with respect to node B using the following equation:

$$Sr = \Delta dB / \Delta t \quad (4)$$

Where,

$$\Delta dB = |d2 - d1|,$$

$$\Delta t = t2 - t1 = \text{HELLO_INTERVAL}$$

Where,

$$Srf = Sr / Smax$$

$$Dn = d2 / Rmax$$

Where,

Smax: Node's maximum speed

Rmax: Maximum transmission range of node B.

5. SIMULATION ENVIRONMENT AND PARAMETERS

For strolling and assessing the overall performance of the advised ELSM-AODV protocol towards the unique AODV, the community simulator NS2 has been used. Where the AWK command has been used to carry out mathematical evaluation of the statistics of simulation effects created in hint file. As the advised scheme targets to achieve solid routes and extend the life of community, mainly in surroundings of excessive dynamic topology, so the overall performance appraisal and contrast is executed primarily based totally on trying out the effect of nodes velocity on overall performance of the proposed scheme ELSM-AODV and traditional AODV. This because of excessive velocity of nodes result in boom the chance of routes failure, ensuing in similarly statistics packets forfeiture. Also it's far apparent that, the suggest PDR of ELSM-AODV (40.06%) is better than its peer of AODV (28.25%), with ratio of refinement 42%.

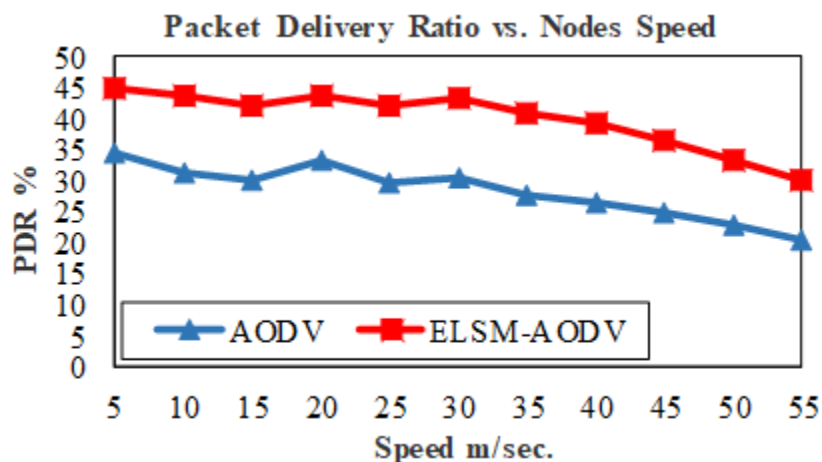


Figure 3: Packet Delivery Ratio vs. Nodes Speed

This because of at excessive nodes pace results in boom the chance of routes breakage, ensuing in extra routes re-initialization process. Thence boom of E2E postpone time. From the discern we word that, the imply E2E of ELSM- AODV (1.87ms) is much less than its peer of AODV (2.74ms), with amelioration ratio 32%.. All of those cause decrease E2E postpone time.

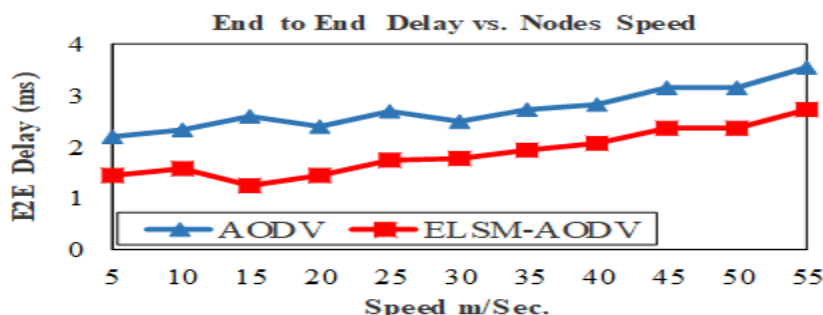


Figure 4 End-to-End Delay vs. Nodes Speed

It is plain that as the velocity of nodes boom, the NRL will increase for each schemes. This due to, excessive pace of nodes cause boom the eventuality of routes failure, main to greater repetition of direction discovery operation, therefore boom the technology of RREQ and RREP packets. This due to ELSM-AODV creates greater solid routes, similarly to making use of the idea of multi routes advent in keeping with every direction discovery operation, main to lessening the repetition of direction advent process, therefore minimization of RREQ and RREP packets. A proper routing protocol wishes to offer reliability and strength performance with low manage overhead. To make certain reliability, load balancing and QoS, multipath routing protocols had been proposed for MANET. It additionally consists of look at of various protocols and simulation environments that is straightforward to investigate the system. The inspiration additionally has minimum computational complexity and conversation overhead. In order to similarly enhance accuracy withinside the adhoc network, we will cross for the a few extra capabilities withinside the simulations parameters of the adhoc network.

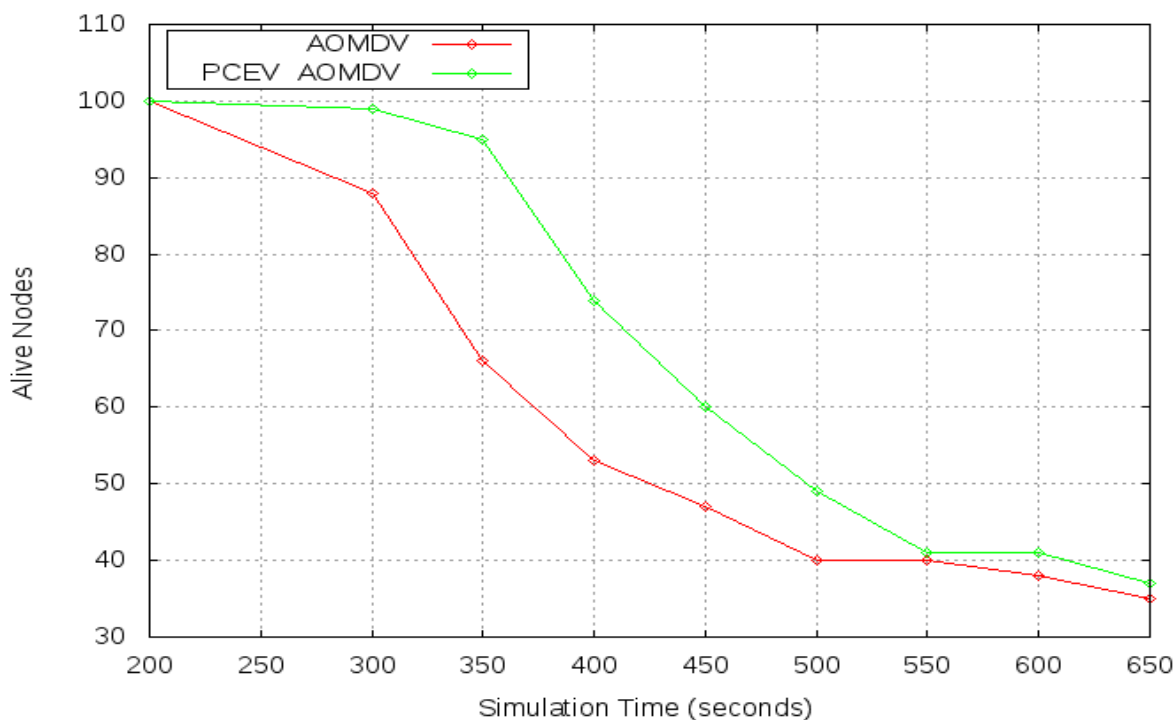


Figure 5 Number of alive nodes

6. CONCLUSIONS

In this paper, a pre-emptive technique primarily based totally at the strength fee variant of nodes is used to lessen the range of useless nodes. The proposed protocol PCEV_AOMDV hit upon overload nodes through the use of ancient data of strength intake and keep away from sending packet throw them. Our technique were tested throw an in depth simulation examine the use of the famous NS2 simulator. To make sure reliability, load balancing and QoS, multipath routing protocols were proposed for MANET. It additionally consists of examine of various protocols and simulation environments that is straightforward to research the system. The technique consists of simulating MANET with AODV protocol and studying the community performances with recognize to extraordinary parameters.

The multipath routing protocols are to offer dependable conversation and to make certain load balancing in addition to to enhance exceptional of carrier of MANETs. In addition they used the method of multi paths introduction in step with every path discovery operation with intention to decrease the path re-discovery operation and eschewing the technology of greater manipulate packets specifically at MANET of excessive dynamic topology. It additionally diminishes E2E postpone time, routing manipulate packets and strength intake of nodes. Also for lessening fee of exchanged hey packets, we are able to take a look at the relation among the periodic time of sending hey packet and the nodes speed.

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