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# Routing Quality of Service for Multipath Manets

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**Abstract:** The purpose of adhoc network architecture is to enable internet access at any time, despite the absence Mobility and variability of infrastructure and base stations need a dynamic efficient routing system. To Choose a route depending on the rate a reactive congestion aware multipath routing protocol called RCRP was presented by us as a means of lowering energy consumption and speeding up the delivery of packets. It focuses on two crucial aspects of mantes: increasing network lifetime and preventing congestion. Based on current energy and traffic conditions, is a calculation that, Using the node's ERR and the packet's Pdt, we attempt to calculate the delay energy drain rate (d.e.d.r).Results from the simulations show that the work presented here improves upon previous versions of MM-AOMDV and AOMDV in terms of both network lifetime and end-to-end latency.

***Keywords***: *AOMDV, QOS, MANETS, routing bandwidth energy, RCRP, and delays are all terms associated with this protocol.*

## 1. Introduction

Any Mobile Ad Hoc Network, abbreviated as MANET, is a type of network that is made up entirely of mobile nodes and lacks any kind of stationary infrastructure in any kind.. Through the use of a radio connection, the devices are able to share information with one another. Because of the lightning-fast development of computing hardware, ad hoc networks have become increasingly common.

MANET is an excellent platform for networking at any time and from any location. MANET nodes communicate via wireless multi-hop connections. Because of frequent node migration, the wired network routing method is unsuitable for MANET. Because of the dynamic nature of the internet, designing an efficient routing system is difficult. Because of the restricted radio transmission, the The majority of these networks have many hops. Network nodes in MANETs operate as routers by relaying packets from one another, and Every node creates they have their very own infrastructure for working together. Because of their restricted range, these devices must communicate over multihop pathways.

Because each node in these networks must execute the tasks of sending, receiving, and These networks require effective routing protocols in order to function properly. reliable offer a variety of Quality of Service (QoS) criteria. Routing are exceedingly difficult with MANETs since nodes' positions vary often, making even the most efficient nodes useless and inefficient.

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**Challenges:**

Because the characteristics of the wireless medium broadcast nature, Packet losses and a hidden problem with the terminal as a result of transmission mistakes, Route alterations caused by mobility, Packet losses caused by mobility, Battery limitations, Network partitions may occur on a regular basis. Ease with which wireless communications might be spied upon (a potential security issue), as well as the QOS.

**Quality of service (QoS):**

This idea is linked to others such as "support for finite information rate," "constrained response time," and "restricted information loss.". are all terms associated with this concept is required in order to facilitate the delivery of network-centric multi-services, which may include audio, video, and data transmission in a homogeneous or mixed manner. These services may be provided either in a homogenous or mixed mode.

**Routing of QOS:**

Quality of Service refers to the standard of care provided by a network to its users. to the individuals who make use of it. In the topic of service quality routing, it is necessary for it to offer a path that is loop-free from beginning to end while also guaranteeing that the most important quality of service requirements, including bandwidth [4,5,6], latency, battery power, jitter, availability, and resources, are met.The quality of service (QoS) criterion shifts depending on the application. Multiple QoS routing strategies have been developed, each of which is determined by a unique Quality of Service metric [4,5,6]. When the network provider optimizes the multi-hop route and makes certain that there is a high likelihood of packets' source and destination addresses, this is referred to as path continuity. combination, it may be able to improve its capacity to deliver end-to-end QoS provisioning to an even greater extent.

The delay-sensitive routing that also maximizes energy efficiency in manets is an additional powerful feature of this technology. Not only is it important for a routing protocol to take into account During end-to-end packet transmission, delay and energy consumption transit, but it also needs to take into account dependable connections and the leftover node energy. In addition to enhancing service quality, these measures also help the network last for a longer period of time. lessened the congestion. To construct a route with the least amount of delay and the least amount of energy usage, we will make use of the mathematical formulation of each node in order to compute the delay from beginning to conclusion as well as the rate of energy decrease at each node.

The paper's remaining parts are organized as follows.: described below. The AOMDV is broken down into its component parts in Section [3]. The research that are pertinent to this discussion are summarized in Section III. The proposed algorithm can be found in Section [4]. Performance evaluation will be covered in section six of Section V. Conclusion

## 1 AOMDY ALGORITHM

The Ahead-of-Distance-First (AODV) routing algorithm is the one that is used the majority of the time. The original AODV algorithm has been modified to create AOMDV, which is a newer version. Route maintenance is the primary focus of this tactic, which involves constructing a number of different pathways between the origin and the destination by employing a technique called queue and load balancing.

The Ad hoc On-Demand Multipath Distance Vector (AODV) protocol is an enhanced version of the original AODV. The discovery of numerous paths from the origin to the goal. It selects the best route with the fewest hops as the primary way, with the other routes serving as backup. The fundamental principle underlying the AOMDV protocol is guaranteeing that numerous pathways identified are devoid of loops and discontinuous, and identifying such paths fast utilizing a method of route discovery based on flooding. When it comes to maintaining loop-freedom and disjoint Ness characteristics, locally implemented AOMDV [1] route update rules play a significant role.

This are working in [2] stages.

**a)** **Route Discovery**
**b)** **Route Maintenance**

### I.Route Discovery

Source builds a route to destination during the route discovery phase. At the start of the process, the source sends a route request message (RREQ message) to its neighboring nodes. The nearby nodes get RREQs and transmit them to their neighbors. They function as relay nodes. Receive a route request (RREQ) message at the final destination node. They respond with a route reply (RREP) message to that path through a separate path from whence the RREQ was received. Multiple route request (RREP) messages are received by the source node from various pathways. They choose the optimal way based on the lowest hop count and make that road the main path. The other pathways are utilized as the backups if there is a failed path. The protocol of AOMDV determines the disjoint link and node route from source to destination.

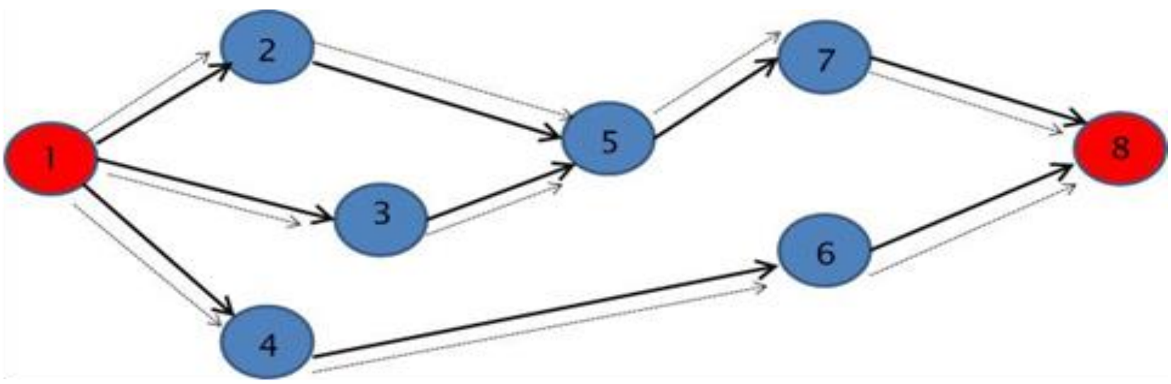



**Fig 1:** Propagation of Route Request (RREQ) Packet

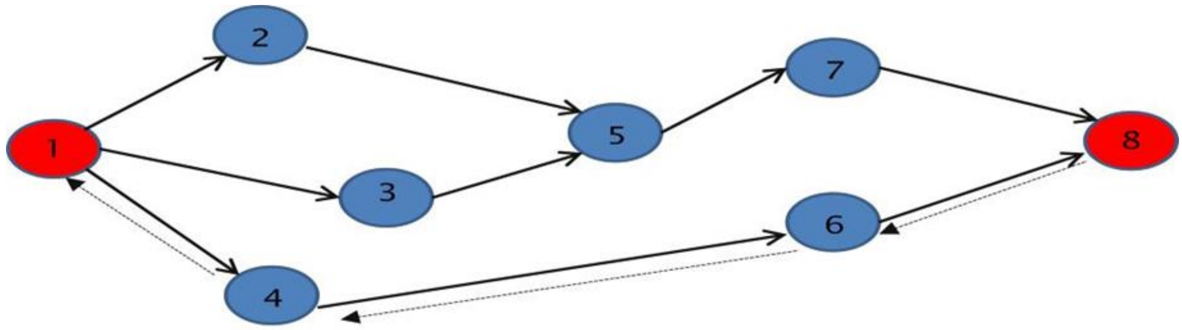



**Fig 2:** Propagation of Route Reply (RREP) Packet

## 2. Route Maintenance

When a route is disrupted as a result of heavy traffic or a lack of power during the route maintenance phase, an RERR message is issued from the node to the source node. For packet transfer, the source node chooses another secondary link. They choose the optimal path among all routes, and then beginning transmission to that route; this will be the path that is ultimately chosen as the primary path. In order to determine whether or not alternate pathways are viable, HELLO messages are transmitted. The process of route discovery is redone if there is no available path between the source and the destination.

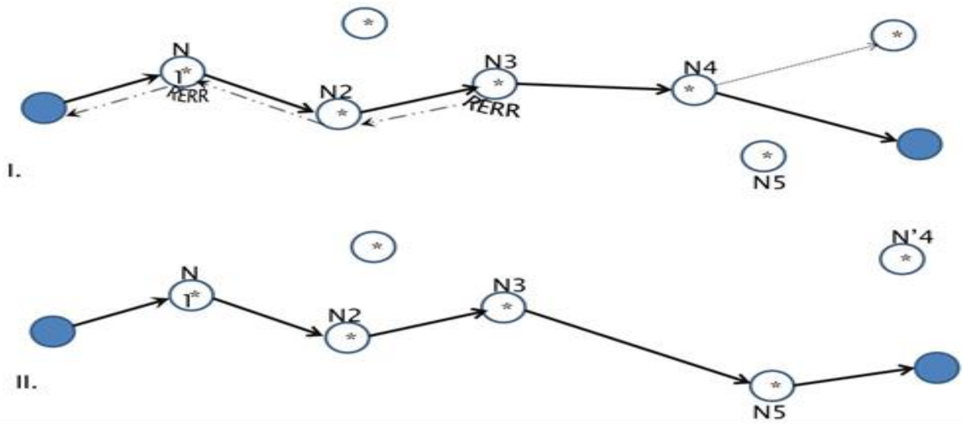



**Fig 3:** I. Route Error, II. Route maintenance

## 3. Associated Work

At the 303rd Annual Meeting of the International Conferences on Informatics, Electronics, and Vision in 2014, Thomas Chowdhury and Rahma Bintey Mufiz Mukta gave a presentation on the article they had written. The objective of the investigation that is being carried out under the working title "A Novel Approach to Finding the Complete Node-Disjoint Multipath in AODV"[2] is to locate a variety of distinct node-disjoint pathways.

During the phase of route discovery that they are in, they use the begins route request. In the event that the secondary source is unique, the neighboring nodes of the destination will accept two copies of the same message The ROUTE REPLY (RREP) is created by the destination node. for each secondary source. The first response from the secondary sources that have more than one possible route will be used, and the second response will be stored. An RERR message is delivered to the source node once the initial link becomes broken. The source node has the option of selecting the next route item from the database it maintains. The suggested method suggests that an intermediate node may warn the source node by including the hop count and the next hop in the event that it holds an additional path that can successfully lead to the destination. In instead of merely sending a route error message to the source node, this will instead be done. The fact that this technique requires the recording of an alternate path results in an increase in the amount of space required in the memory for the data.

Predictions for Future Directions in Innovative Computing: Intelligent System Design Maximum Throughput at Minimum Delay: A Routing Protocol for Large-Scale Data Centers, by Khaja Anwar Ali Siddiqui and Yousuf Khan Afroz Heterogeneous MANETs [3],They make an effort to evaluate the various packet transmission delays by utilizing mathematical formulations and analyzing the situations in accordance with specific assumptions.

They maintained that the delay equation translates network parameters and that this formulation would be efficient for the transmission of multimedia via parallel lines with changing data rates. This was in contrast to the two other methods, which did not have this property. When determining which path had the maximum throughput, they took into account the total latency experienced throughout the journey. Which is the sum of all of the delays that occur at each node, including the delays that occur during processing, queuing, transmission, and propagation. Because there is space for improvement in queue latency and node energy, the model is inefficient.

Manish Manoria, Abhinav Vidwans, Ajit Kumar Shrivastava A successful outcome was achieved during the annual Meeting of the ACM Special Interest Group on Communication Systems and Networks, which took place in 2014.AOMDV Routing Protocol Quality of Service Improvement Through the Use of Queue Length Improvement[4] It is called Enhanced Extended AOMDV (EAOMDV) uses queue length as a metric to choose which routes to take. of improving the quality of service (QoS) performance of the AOMDV protocol. The job in question that was suggested was based on the length of the queue, and it resulted in the creation of a new model called the EAOMDVA PROTOCOL. This model employs strategies to effectively manage the data, as well as giving simplicity and simple implementation of actual manet with very little overhead along with the route. Not done in an effective manner; however, in the near future, we will be able to provide in addition to communication between the nodes, synchronization of the node itself.

Communications and Networks, Volume 5, Numbers 1-8, Published in 2013 by Surjeet, Arun Parkash, and Rajeev Tripathi. In MANETs, an Estimation of the Quality-of-Service Bandwidth Necessary for Delay-Sensitive Applications [5] In order to obtain information regarding total route bandwidth for applications that are delay sensitive, it has been suggested that the existing protocols for MANET should be modified. It utilizes a differentiated strategy for both the estimation of bandwidth and the management of routes.

They only examined bandwidth limited real-time application routing and quality-of-service aware routing approaches both make in order to implement modifications during the route discovery phase using cross-layer design. During this phase, the node that was delivering the RREQ would advance only if residual capacity was required. When a host gets a new RREQ, the host evaluates the available bandwidth in comparison to the necessary bandwidth, as outlined in the RREQ header's specifications. The RREP comes in from the destination and is received by the host. host that has a modified header (a lower minimum bandwidth cumulative delay and an AODV RREP header).

They haven't investigated the foresight approach to route-break prediction. is known to result in a decrease in performance in mobile topologies. This is a known drawback of mobile topologies. It's possible that they'll offer a more effective method for the reservation of resources. Improving the Improvement of MANET Service Quality Through More Efficient Routing Algorithm, Specifically, [6] by Meena Rao and Neeta Singh was discussed by Meena Rao and Neeta Singh in their presentation that they gave at the 2014 IEEE International Advance Computing Conference (IACC). This work is intended to produce an AODV routing system that has an additional backup path, which will be referred to as the "nth backup route." The full name of this system will be abbreviated as AODV nthBR. In the event that the connection cannot be maintained, this protocol will supply the source node with several alternative paths to take.

They a concept called the energy dissipation model was presented for optimal node selection for routing. This model takes into account the energy that is dissipated by a node when it fails. of the node happens, which could be due to an attack or resource exhaustion. This model was developed to pick the best nodes for routing. They have estimated delays of nodes by utilizing a distance vector to calculate the the standard deviation of the Initially, the data transmission distance is the physical distance between the sending device and the receiving node.. The destination was initially positioned in the center of the network model.

## 4. Methamatical Model

The current AOMDV protocol has been enhanced to include elements including things like energy and delay. The proposed protocol makes use To choose the optimistic route, it is necessary to take into account the end-to-end delay and the energy drain rate of intermediate nodes. which is to reduce the likelihood of congestion and to extend the network's lifespan. MANETs operate In a P2P network, each node on the path from origin to destination represents a potential source of energy, and each packet must overcome queue delays [3, processing delays [3, and propagation delays on its way to its final destination. [3], as well as other potential delays. which add up to nodal delays [3]. Using equation, no (1), the destination node in a routing route is able to determine how long it will take for a packet to be delivered.

There will be (n-1) linkages if the route has 'n' nodes.

The time it takes to deliver a packet is equal to the delay caused by (n-1) links plus the time it takes to process a packet in (n-2) links.

$$Pd_t = \sum_{i=1}^{(n-1)} l_i\,(t) + \sum_{i=2}^{(n-1)} p_i\,(t)$$

The complexity of the routing method, which involves the generation of routing tables, is another factor that can affect the amount of time it takes for a packet to be delivered. Node attributes factors such as the routing route's intermediate nodes' energy, processing time, processing capacity, and buffer space can have an effect on this. Where,

Pdt=packet delivery time

Li=link,i=(1,2,3…n)

t=time

pi=process time at,i(1,2,3..n-2).

**Energy reduction**

$$\textbf{Rate} = \frac{\boldsymbol{Current\ Energy\ of\ node\ x}}{\textbf{Energy } \boldsymbol{Consumption\ at\ time\ t(\Delta(x))}}$$

$$\textbf{ERR} = \frac{C.E(X)}{E.C(\ X(\Delta(t))s} \quad \textbf{................(2)}$$

Were,

Current Energy of Node = C.E

Energy Consumption of Node = E.C

**METHOD SUGGESTED:**

**ROUTING PROTOCOL THAT TAKES CONGESTION INTO ACCOUNT ON MULTIPLE PATHS**

We constructed a channel with less latency while avoiding congestion by altering the AOMDV RREQ packet's delay and energy characteristics.

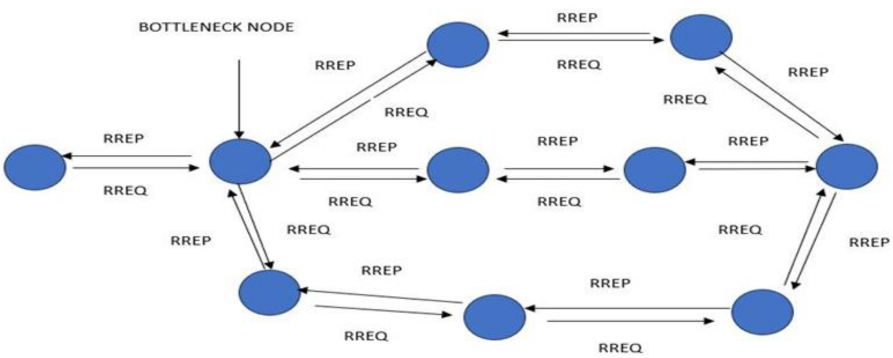
Each network node must proactively maintain a database including data on the ERR (Energy Reduction Rate). We looked at the TERR value, which is reached when the ERR of a node is more than TERR, we prevent that node from participating in the route discovery phase.When compared to AOMDV RREQ packets, every RREQ packet contains an additional field known as dedr (delay energy drain rate). This dedr field contains two subfields known as Pdt. and ERR.

Prior to Upon transmission of Starting at a value of '0' in the RREQ packet sent from the source, the d.e.d.r. value climbs as the packets hop from node to node on their way to the final destination.

In the AOMDV protocol, the destination chooses a path by sending an RREQ packet with a value less than d.e.d.r and an RREP packet with a value just larger than d.e.d.r.

**REDUCE CONGESTION**

When several nodes try to send data through a single node, the data transfer rate is reduced. becomes a bottleneck.




**Constraint properties of Manets, including the**

- **Computation capacity,**
- **Buffer,**
- **Energy**

We prevent congestion in our protocol by employing Reduced energy consumption rate (ERR). If a node's value exceeds the TERR value, the node is not allowed to participate in the routing process.When a node becomes a bottleneck, it automatically rises over the TERR value.

**EXTENDING THE NETWORK'S EACH DAY TIME:**

The network life time is defined as the amount of time until the first network device fails because the batteries had run out. It is an essential attribute since the failure of the first node has an effect on the properties of the remaining nodes. AOMDV route decision calculated not by energy but by hop count result in a shorter network lifespan. We are increasing life duration by avoiding nodes that attain lowest current energy (C.E).

We contributed most effectively by

1. calculating (energy reduction rate) ERR

2. Determining (packet delivery time(pdt)),

3. Determination of (Reduce the pace of energy drainage. (dedr)) based on ERR and Pdt

4. Route based-criteria selection lower d.e.dr

| .NOTATION | DESCRIPTION |
|---|---|
| E | Energy of node |
| $L_i$ | Link at time i(1,2,3…n) |
| $E_{RR}$ | Energy Reduction Rate |
| $P_{dt}$ | Packet delivery time |
| $P_i(t)$ | Process time at time i(1,2, 3,…n) |
| RCRP | Reactive congestion aware multipath routing protocol |
| C.E(x) | Current energy of node(x) |
| $\Delta E_d$ | Delay energy drain rate |
| Δ(X) | Delay of node X |

## 5. Performance Assessment:

Using NS-2 simulator with the necessary enhancements, We analyze how well the RCRP procedure works and contrast it with that of Under the identical conditions for the lifetime of the network MM-AOMDV, and AOMDV with a queue For the purposes of our calculations, we have assumed that the transmission range is a constant 300 meters.. Most modern and real-time network interface cards operate within this range. The "random waypoint" method was used. throughout our travels. node speeds equally dispersed between 0 and 20 m/s and a stop duration of 60 seconds. All mobile nodes must have an A data transfer rate of 2.5 Mbps and an IEEE 802.11 network interface card. All the nodes have the same initial energy of 10J. Power levels are set at 600mW for transmission and 300mW for reception. In the end, source nodes generate CBR traffic. Assuming a 512-byte packet size, traffic sessions are produced at random on chosen distinct source-destinations. When a node in a network becomes an intermediate node, it must perform our method to transmit information from source nodes. Each simulation was ran for 200 seconds, and the data we received from it was sampled four times on average. Our primary goal is to increase network longevity and reduce congestion. We next evaluate the delay and examine it next to the state-of-the-art AOMDV with queue [1, 2] and MM-AOMDV [3] are the two types of AOMDV. The amount of time remaining before the first node in a network succumbs to low battery power and dies. is what we call the network's "life time" in this analysis. If the first node fails, the rest of the nodes will be behind schedule.

As seen in Figure 1, There is a correlation between the packet delivery ratio in addition to the functionality of RCRP, AOMDV with queue[1, 2], and MM-AOMDV throughout the course of a network's lifetime.

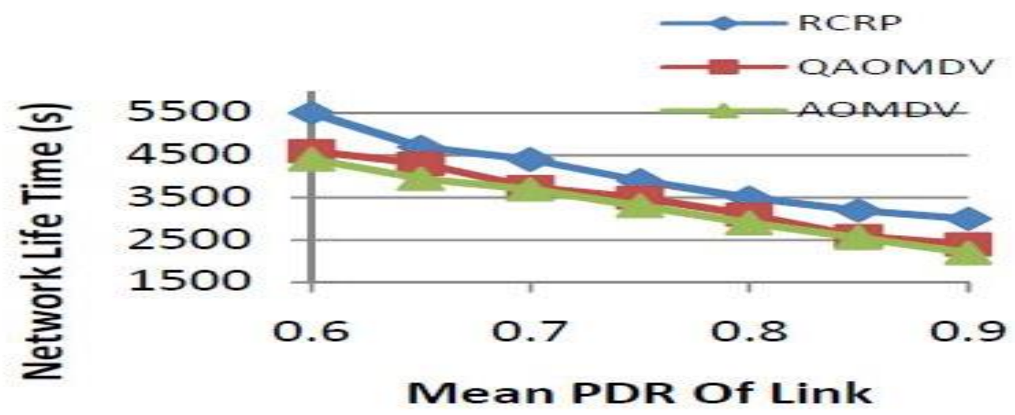



**Fig 1** network life time (s)

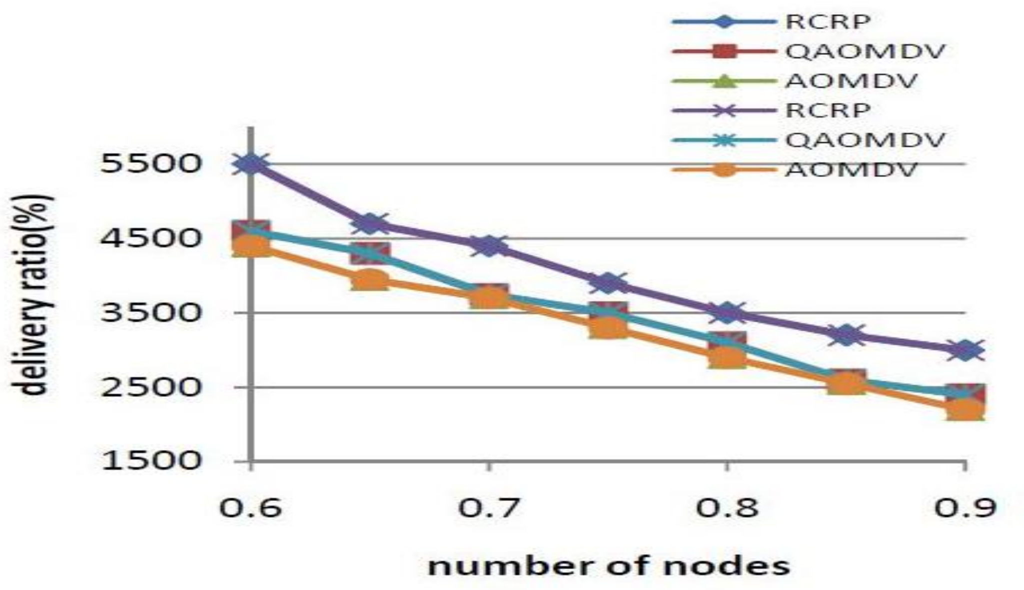



**Fig 2:** The comparison between the Quantity of nodes and percentage of packets delivered.

## 6. Conclusion

This study developed "Reactive Congestion aware multipath routing," a revolutionary technology that protects network life time and reduces congestion.

Two factors determine a node's route membership in this protocol: energy reduction, package delivery rate. This measure provides a decent approach to determine a node's current capacity in terms of energy and traffic. The primary The objective of The RCRP's goals go beyond only extending the network's lifespan and decreasing node congestion. Figure 2 clearly indicates that, when compared to other methods, RCRP may greatly postpone the first node failure. Figure 3 depicts an essential feature of RCRP: the ability to identify a trustworthy path. Figure 3 depicts the discovery of an path that uses significantly less energy than others, making it a more energy-efficient alternative is used to route a packet.

Finally, RCRP extends network longevity while avoiding congestion.

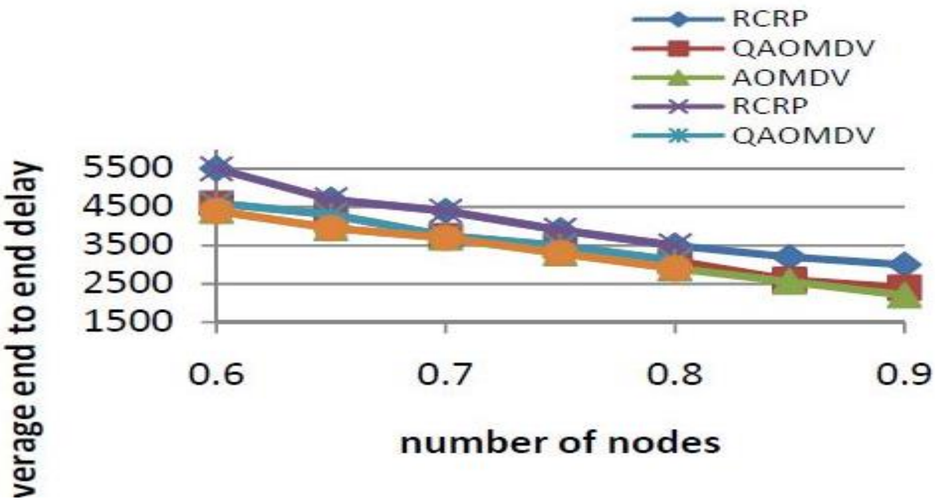



**Fig 3:** When nodes vary, average end-to-end latency

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