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# An Energy Efficient Congestion Aware Routing Strategy Based on Genetic Algorithm for Mobile Adhoc Network

**Radhika Gupta[1], Jashwant Samar[2], Durgesh Wadbude[3]**

Research Scholar, Computer Science Engineering, Mittal Institute of Technology, Bhopal (M.P), India[1]

Asst. Professor, Computer Science Engineering, Mittal Institute of Technology, Bhopal (M.P), India[2]

Head of Department, Computer Science Engineering, Mittal Institute of Technology, Bhopal (M.P), India[3]

**Abstract**: In mobile adhoc network (MANET) all the nodes are in motion and runs on battery power. In such networks all the nodes communicate with each other via wireless transmission medium. And the message from source to destination is sent with the help of intermediate in range nodes. So dynamic path selection, routing and routing table updates are done in MANET. So to select proper path which is congestion free and in a short span of time is a challenging task. In this paper an energy efficient congestion aware routing strategy (EECARS) for MANET is proposed. The results show that the proposed scheme outperforms traditional DSDV protocol in MANET.A mobile unintentional network (MANET) may be an assortment of wireless mobile hosts forming a short lived network without the help of any complete infrastructure or centralized administration. Mobile Ad-hoc networks are self-organizing and self-configuring multichip wireless networks where, the structure of the network changes dynamically. This is principally because of the quality of the nodes. Nodes in these networks cooperating in an exceedingly friendly manner to participating themselves in multihop forwarding. The nodes within the network not solely act as hosts however additionally as routers that route data to/from different nodes in network. MANETs need associate efficient routing protocol that achieves the standard of service (QoS) mechanism. Routing protocol ought to be absolutely distributed; adjective to frequent topology amendment, Easy computation & maintenance, optimum and loop free route optimal use of resources, Collision ought to be minimum. MANET consider the shortest path with minimum hop count as optimum route with none thought traffic and so degrading the performance of the network so it's very essential to contemplate load equalization issue in routing mechanism. This Paper principally focuses on survey of varied load balanced Routing protocols for economic data transmission in MANETs.

**Keyword:** DSDV, Congestion, Network life free, MANET

## I. INTRODUCTION

Mobility and also the lack of any fastened infrastructure build Mobile Ad-hoc Networks (MANETs) terribly beautiful for brand spanking new age applications. There are lots of problems and challenges in coming up with a MANET network. At transport layer, end-systems will gather data regarding every used path: congestion state, capability and latency. This data will then be accustomed react to congestion events within the network by moving the traffic far from engorged paths [1].

Mobile Ad-hoc Networks (MANETs) are terribly beautiful for up to date applications. There are lots of problems and challenges in coming up with a MANET network. as a result of active topology structure and node amendment each second on its position, one among the live challenges is congestion, in MANET if sender node need to send knowledge into the therefore me specific receiver therefore terribly initial broadcast routing packet onto the network and obtain destination through the shortest path (if we tend to apply AODV) or minimum intermediate hop (if we use DSR) when obtaining path sender sends actual knowledge through unit-path link however at a similar time quite one sender share common link so congestion occur onto the network that's live issue for MANET. Therefore numerous investigator works therein filed for decrease of congestion from network. During this synopsis we tend to focus congestion minimization using multipath routing in ad-hoc network and transport layer base congestion management or rate analysis base congestion control in MANET.

In multipath technique sender sends knowledge through quite one path to receiver node that will increase the performance of the network control the only share path congestion at the moment we tend to additionally analyse rate of sender if sender rate larger than the receiver node therefore we tend to minimize the sending rate on the bases of transport layer technique.

### Multipath Routing

The process of discovering multiple routes among the distinct supply and single destination at the time of single

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route discovery corresponds to multi-path routing [1]. In MANET, the prevailing problems like scalability, security, network life time, etc. is handled by the multi-path routing protocols [2]. This protocol enhances the end-to-end output and offers load reconciliation in MANETs.

## II. MULTIPATH ROUTING ISSUES

**Multipath routing has some disadvantages [2]:**

**1. Route Request Storm**

A huge amount of route request messages ar created by the multipath reactive routing protocols. Once the intermediate node needs to method the duplicate request messages, there's an opportunity of reserve overhead packets be found out within the networks.

**2. Inefficient Route Discovery**

Certain multi-path routing protocols avoid intermediate node from forwarding a reply from its route cache so as to work out node-disjoint or link disjoint paths. Therefore the source must wait until it gets a reply from destination. Therefore the method of route discovery performed by the multipath routing protocol wants longer in comparison with DSR or AODV protocols.

## III. CONGESTION IN MANET

When the necessities become larger than most capability of the communication link particularly during multiple hosts making an attempt to access a shared media, congestion happens within the network. Congestion may additionally be caused during the subsequent conditions.

• When the load within the link goes on the far side the carrying capability.
• When the broadcasting packets ar surplus in nature.
• When additional variety of packets field has becomes outing and retransmitted •When the amount of node will increase.
• During variance of the packet delay [4].

The congestion detected within the network will strictly worsen network throughput [3]. It leads to the packet losses, bandwidth degradation and energy expenditure [5]. Once the congested network is left unattended i.e., once appropriate congestion control technique isn't dead, it leads to congestion collapse of the network. Therefore the knowledge won't deliver to destined node in effective manner [3]. Once the routing protocols in MANET don't seem to be acutely aware regarding the congestion, it leads to the subsequent problems.

• Long delay: this is still up the method of detection the congestion. Once the congestion is additional rigorous, it's higher to pick out an alternate new path. However the prevailing on-demand routing protocol delays the route searching process.
• High overhead: a lot of process and communication makes an attempt are needed for a brand new route discovery. If the multi-path routing is used, its desires further endeavour for upholding the multi-paths despite the existence of alternate route.
• Many packet losses: The congestion control technique makes an attempt to reduce the surplus load within the network by either reducing the sending rate at the sender aspect or by dropping the packets at the intermediate nodes or by execution each the method. This causes increased packet loss rate or minimum throughput.

**Estimation of Available Bandwidth**

The accessible residual bandwidth in every router depends on several factors like the length of the queue, queuing time, buffer size and length of the spare queue. We tend to assume every router is ready to calculate by itself the obtainable bandwidth and convert it into an index known as data rate Adjustment Index (DRAI), which can be explained later.

**Congestion Problem**

In a network with shared resources, wherever multiple senders vie for link bandwidth, it's necessary to regulate the info rate utilized by every sender so as to not overload the network. Packets that gain a router and can't be forwarded are dropped, consequently an excessive quantity of packets incoming at a network bottleneck results in several packet drops. These dropped packets may have already got travelled an extended method within the network and therefore consumed important resources. In addition, the lost packets usually trigger retransmissions that mean that even a lot of packets are sent into the network. So network congestion will severely deteriorate network throughput. If no applicable congestion control is performed this will cause a congestion collapse of the network, wherever nearly no information is with success delivered. Such a scenario occurred on the first internet, resulting in the event of the TCP congestion control mechanism.

**TCP Congestion Control**

On the internet, congestion control is within the responsibility of the transport layer, additional exactly of the Transmission control Protocol (TCP). TCP combines congestion control and responsibility mechanisms. this mixture permits performing arts congestion control while not the requirement for specific feedback concerning the congestion state of the network, and while not direct participation of the intermediate nodes. To find network congestion TCP merely observes occurring packet losses. Since on the internet missing packets are nearly always caused by congestion, a missing packet is taken as a symbol for network congestion.

TCP uses cumulative acknowledgments: a TCP receiver forever acknowledges the top of the so-far properly and fully received information once a new segment arrives. If segments are received out-of-order, i. e., some information is missing between the already known and also the recently incoming information, the last acknowledgment is sent once more (duplicate ACK). In TCP a window-based additive increase, multiplicative decrease mechanism is

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used. The window size is increased by one segment (i. e., additively) in each round-trip time once no packet losses occur. Just in case of the reception of a replica acknowledgment a transmission control protocol sender can initial assume that some packet rearrangement has occurred within the network. However upon reception of the fourth copy of an acknowledgment (Triple Duplicate ACK, TDACK) a congestion loss is assumed. During this case the missing segment is repeated and therefore the window size is cut in 0.5 (multiplicative decrease). Additionally, TCP uses a timeout that depends on the measured round-trip time of the connection. If this retransmission timeout (RTO) elapses while not an acknowledgment TCP concludes several congestion. Then the window size is reduced to 1 and therefore the unacknowledged segment is sent once more. The timeout till the next retransmission try if still no acknowledgment arrives is doubled. So this timeout grows exponentially.
During the primary part of a connection and after a timeout a mechanism named slow begin is used. It permits for a quicker convergence to the proper window size. Whereas slow begin is active, the window size isn't increased by one segment size for each round-trip time, however instead for each received acknowledgment. This suggests that in this part the window size grows exponentially.

## IV. PROPOSED ENERGY EFFICIENT CONGESTION AWARE ROUTING FOR MANET

**Routing_table_update**
**{**
**Each node initially advertises its neighbour'sinformation with rest of its neighbours.**
**If(neighbor of a node changes)**
**{**
**Each node advertises its neighbor mobile nodes to all other neighbors.**
**}**
**}**

**Route selection**
**{**
**Route discovery is done by sender according to routing tables shared.**
**Only those routes are selected which have minimum traffic based on Genetic algorithm**
**}**

**Genetic**
**{**
**The last best route selected for a particular sender and destination is chosen.**
**Then mutation and crossovers are performed on the selected sequence of nodes and then checked for congestion.**
**}**

In DSDV routing tables are periodically shared whether it changes or not.

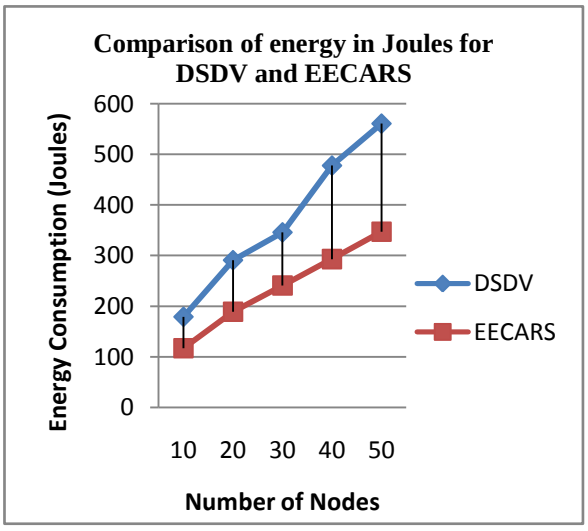
## V. EXPERIMENTAL SETUP AND RESULTS

In this work simulation of MANET is done using a network simulator named ns2. Following parameters were set for the mobile adhoc network configured.

| CONFIGURATION SETTINGS | |
|---|---|
| Propagation Medium | Two Way ground propagation |
| Routing protocol | DSDV/ Proposed strategy |
| Message Queue | Priority based drop tail |
| Number of nodes | 10,20,30,40,50 |
| Maximum Battery life simulated time | 2000 sec |

| Comparison of energy consumption in Joules | | |
|---|---|---|
| Number of Nodes | DSDV | EECARS |
| 10 | 179 | 117 |
| 20 | 291 | 189 |
| 30 | 346 | 241 |
| 40 | 478 | 293 |
| 50 | 561 | 347 |

| Comparison of network lifetime | | |
|---|---|---|
| Number of Nodes | DSDV | EECARS |
| 10 | 1600 | 1847 |
| 20 | 1497 | 1713 |
| 30 | 1273 | 1507 |
| 40 | 1094 | 1380 |
| 50 | 907 | 1210 |



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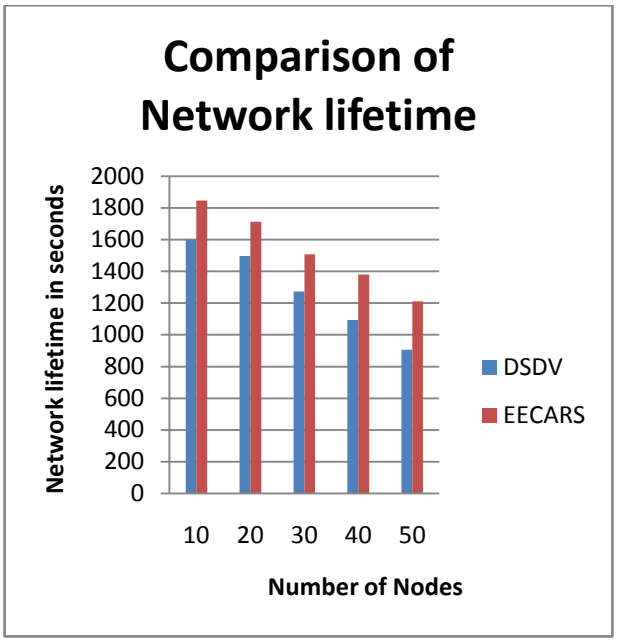


## VI. CONCLUSION

In this paper an energy efficient congestion aware routing scheme based on genetic algorithm is proposed. Proposed scheme is compared with traditional DSDV. Performance parameters are energy in Joules and lifetime of network. It is found that EECARS outperforms DSDV.

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**Jashwant-Samar** Research Scholar, Computer science Engineering, Mittal institute of technology, Bhopal (M.P), India

**Radhika Gupta** I have completed my thesis under the guides of prof. Jashwant Samar and research topic is "A Survey congestion based routing protocols for better performance of Mobile adhoc Networks, Computer science Engineering, Mittal institute of technology, Bhopal (M.P), India.