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Dynamic load balance using enhanced AOMDV routing in MANET

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Abstract
The link in dynamic network is failure due to movement of nodes and these nodes speed is also not similar. The nodes in MANET having different mobility speed and the reason is data not received at destination, if link is congested. The message is sends by sender and the number of data packets of messages are blocked in link is occurring the possibility of congestion. Multipath routing is the one of the solution to resolve the congestion by splitting the extra load. Thus multipath AOMDV protocol is able to reducing the congestion by dividing the traffic in several paths. In this research work we proposed the congestion control multipath queue estimation routing to divide the load in network efficiently. IN AOMDV the link failures in the primary path, through which data is sending actually taking place, cause the source to choose an alternate path instead of initiating another route establishment. The proposed approach can result is reduced delay since packets stored in queue buffered is also forward to other nodes when an alternate path is available. The proposed approach is provides the technique to estimate the queue size at the time of sending data packets to destination node and if the destination node. The TALB-AOMDV protocol is also estimate the buffer size but it also measure the buffer size with respect to previous transmission. The proposed scheme is not compare the queue size with previous data but enhance the queue size if the packets incoming is also fast. After all the congestion possibility is removes by handling the packets and also the data packets forwarded by intermediate nodes the queue size is again reach to normal level. The performance of proposed scheme is evaluated through different performance metrics and simulated in NS-R simulator.

Keywords
Congestion, AOMDV, Queue, TALB-AOMDV, Multipath, Load balancing, Routing.

1.Introduction
The Mobile Ad-hoc network is a collection of mobile nodes. Which are connected to wireless links, and without infrastructure less and without any central administrator? The topology of network is changes dynamically because wireless mobile nodes are free to move. These nodes act as sender, receiver and intermediate router depending on situation of network. Each node consists of a limited battery power which gets reduced by time. In order to perform a network consistently, it's essential that we should distribute the load among the nodes properly so that the depletion of energy will get decreased and network lifetime increases.

The main working of load balancing is to divert traffic from nodes and the path that exist in the congestion network. If there is no load balancing technique it will reason delayed increases. Most of the routing protocols which they consider load balancing metrics suitable to select in order to a path high performance.

1.1Ad-hoc On-Demand distance vector routing protocol (AODV)
AODV routing protocol used on-demand method, to transfer the data source to destination. In on-demand technique, mobile nodes that are not concerned in any transmission, and do not maintain any routing information. AODV makes use of DSDV [1] (Destination-Sequenced Distance Vector) protocol to maintain the destination sequence numbers in order to ensure that most recent routing information is get selected in between nodes. This sequence number increases monotonically whenever a new message is sent. As greater the sequence number of route has, the fresher the route is. If there are two or more routes to a destination, then that node will be selected which has greatest sequence number. AODV establishes route table entries dynamically at intermediate nodes according to which packet is forwarded to next hop node which is listed in the route table entry. The packet size in AODV is always same. The Route discovery process is initiated only if a source node wants to establish a path to a destination node for which it has no existing route in its route table entries. For Route Discovery process, source node broadcast the Route Request (RREQ) message which is destined for the destination and waits for the Route Reply (RREP) message.

1.2Congestion and the need of balancing
The main purpose of the protocol, the load balance has to divert the traffic from the congestion paths and nodes which exist in or big amounts of the data in transmit from to other nodes or host route [2]. Most of the routing protocols try to avoid congestion on routes and consider a metric to measure and compute the amount of congestion on the routes and the nodes

are between source and destination. To solve the traffic congestion on routes where there are relatively total throughput and reduced the latency generally increases the traffic congestion, including packet loss rate, end-to-end delay and battery power consumption. Since routing protocols use for the route as a routing metric.

2.Literature survey

Gaurav Pathak, Krishan Kumar, [3] "Traffic aware load balancing in AOMDV for mobile Ad-hoc networks" As per author they also became more diverse and wide due to that better performance is needed in MANETs. QoS is needed for applications for an efficient communication and load balancing is a feature in the routing protocol that can help in a better use of the resources and can help to increase the performance of the network. They propose a new approach for load balancing in AOMDV routing protocol for MANETs that can enhance the network performance by selecting paths using the temporal load on the intermediate nodes and by distributing the load between the free nodes while transmission of data, that is proved by simulations in NS-2.

Ms. Madhuri Shinde, Dr. Shitalkumar Jain,[4] "PALBMRP: Power Aware Load Balancing.

Multipath Routing Protocol for MANET" According to author Most of the existing energy efficient protocols focuses on selection a route or path through the nodes with maximum residual energy and share a network traffic blindly along with generated paths. Network congestion caused due to traffic and node packet moving capability based on its residual energy are not careful that leads to increasing number of dead nodes and result in more energy depletion. According to author they have proposed a Power Aware Load Balancing Multipath Routing Protocol (PALBMRP) that selects an optimal energy efficient route based on multiple parameters i.e. residual energy, delay, congestion and hop count and execute load balancing by considering nodes minimum residual energy to transmit packets according to its capacity.

Sunita Gupta, Ghanshyam Prasad Dubey,[5] "Enhanced Load Balancing and Delay Constraint AOMDV Routing in MANET" According to author predictable congestion management multipath mechanism is to limit the delay and management rate that's the most reason for congestion and provide higher performance of the network. In this analysis the expected congestion management theme with AOMDV protocol square measure uses information measure estimation technique. The information measure estimation is finished through acknowledgement delay distinction. Sender changes causing rate in line with this delay distinction so avoiding congestion. Dynamic queuing reduces further overhead in network and AOMDV balances load by multiple causing methods. The performance comparison of traditional AOMDV routing, existing analysis is compare with expected theme and known that the expected theme is provides higher routing performance by minimizing delay and management overhead.

Sujata V. Mallapur1 Siddarama R. Patil, , Jayashree V. Agarkhed, [6] "Load Balancing Technique for Congestion Control Multipath Routing Protocol in MANETs" According to author introduces an efficient routing technique called the multipath load balancing technique for congestion control (MLBCC) in MANETs to efficiently balance the load between multiple paths by reducing the congestion. MLBCC introduces a congestion control mechanism and a load balancing mechanism during the data transmission process. The congestion control mechanism detects the congestion by using an arrival rate and an outgoing rate at a particular time interval T. The load balancing mechanism selects a gateway node by using the link cost and the path cost to efficiently distribute the load by selecting the most desirable paths. For an efficient flow of distribution, a node availability degree standard deviation parameter is introduced.

Saleh A. Alghamdi, [7] "Load balancing ad hoc on-demand multipath distance vector (LBAOMDV) routing protocol" According to researchers working in the area of a mobile ad hoc network (MANET) attempt to conserve the battery energy of individual nodes to reduce the frequency of a node breakdown. The model of multiple-path on demand data routing protocols has been an effective method for the majority of MANET application scenarios in recent times. The availability of multiple paths for data transfer can both prove to be effective as well as dismal in certain cases. The choice of the most suitable path is always delicate, if not associated with exact metrics of concern. The contribution of this work load balancing ad hoc on-demand multipath distance vector (LBAOMDV) protocol, an adaptation of AOMDV, and an ad hoc on-demand multipath distance vector protocol. The adaption is done in order to enhance the reliability of the given network by considering the parameter of path weight (energy)

of all the available multiple paths. The LBAOMDV regulates the fair tradition of both node energy and available bandwidth by exploiting the availability of multiple paths for data transfer.

Sujata V. Mallapur, Siddarama R. Patil, Jayashree V. Agarkhed,[8] "Multipath Load Balancing Technique for Congestion Control in Mobile Ad Hoc Networks" According to author discussed explores an efficient routing technique called multipath load balancing technique for congestion control (MLBCC) in MANETs to efficiently balance the load among the multiple paths by reducing congestion. They propose protocol performs two major functions during the data transmission process, firstly, congestion detection by using an arrival rate and an outgoing rate at a particular time interval T. Secondly, choice of gateway node using link cost and the path cost to efficiently distribute the load by selecting the most desirable paths.

D.Maheshwari, R. Nedunchezhian,[9] "Load Balancing in Mobile Ad Hoc Networks A Survey" This title aims to survey research articles pertaining to load balancing research problem in mobile ad hoc networks. Here various approaches are taken into account and literatures' key ideas are presented.
Monika Malik, Partibha Yadav, Ajay Dureja[10] " Performance Analysis of Load Balancing in MANET using On-demand Multipath Routing Protocol" In this title , we approach LBA-AOMDV, an efficient load balancing algorithm using AOMDV (Ad-hoc On-demand Multipath Distance Vector) protocol for multipath route discovery and their maintenance. To analyze the performance of load balancing we focused on those nodes which have least load and can give maximum throughput. The simulation results are carried out by using NS-2.35.

Mahamed Abdelmadjid Allalili, Zoulikha Mekkakia Maaza, Ali Kies, Redouane Belbachir [11]"Distributed Traffic by Load-Balancing Approach for AOMDV In Ad-Hoc Networks" This title presents a new approach to load balancing based on residual energy of nodes for distribute the traffic evenly among the network nodes. We are exploiting the multipath routing protocol AOMDV, which defines link-disjoint paths between the source and the destination in every route discovery. We add the energy metric for load balancing (ELB-AOMDV). The performance is compared between ELB-AOMDV and LBAOMDV.

3.Proposed congestion control scheme

The section describe how the actual implementation done and execute. Network load balancing is a challenging task in mobile ad hoc network due to node characteristics and link availability issue but some of the area requires tuning and controlling the congestion and network load balance. The step by step process involves balancing the network load according to capacity of the network.

Algorithm: Dynamic Load Balance using Enhanced AOMDV routing in MANET

Input:

q_i: queue of node i
c_i: processing capacity of node i
l_i: location on node i
p_{ij}: path between node i to j
s: source node
r: receiver node

Output: packet send, receives, percentage of data receives, throughput, delay and normal routing load

Procedure:

If s search the fresh route than
i node receives the route packet
i update the status of utilization (q_i, c_i, l_i)
If i utilization < threshold than
forward route packet to connected hop
else
busy message sends to s node
end if
if r get the route message by $p_{ij} > 1$ than
select best two alternative path
send route reply to s node
s send data by selected path
end if
else
route not found next time slice research the route
end if
packet send (s, r, data)
if p_{ij} is found && incoming flow > outgoing flow than
j store the packet in q_j
utilized the c_j of j
updated l_i while node move
forward packet to next hop
hop count = hop count + 1
if j utilization > threshold than
send message to s node to rate control
else
normal flow execute
end if
else if p_{ij} is found && incoming flow < outgoing flow than

normal flow execute
forward packet to next hop
hop count = hop count + 1
else
new route search
end i

4.Result description

In MANET nodes movement is unpredictable and because of that the number of connections, radio range of communication and grid layout of network is set according to maintain connectivity between the neighbour nodes. The simulation parameters are selected for communication is mentioned in table 1. The performance of TALB-AOMDV and proposed multipath routing is measured according to these given parameters. The total numbers of connections are taken 5 to 35 and simulation time is taken 200 seconds. The proposed protocol is minimizes the congestion and improve performance in same given parameters. The simulation is done in NS-2 version 2.31.

Table 1 Simulation parameters

Parameters	**Value**
Network Type	MANET
Nodes/Devices	5 to 35
Physical Medium	Wireless
Simulation Time	200 seconds
MAC Layer	802.11
Routing Protocol	AOMDV
Traffic Type	CBR
Number of Connection	5 to 35
Propagation radio model	Two ray ground
Rate	10 Packet/s

4.1Packet send analysis

The all senders in network is sends data to destination. The number of senders that data is not delivery in on time is not sends any new data till the current one is not received at destination end. In this graph the performance of two congestion control scheme is compare and finally the result is the performance of proposed congestion control queue management technique is better than the previous TALB-AOMDV protocol in MANET. The different scenarios of network with different connection in between sender and receiver is shows the packet sending in case of proposed scheme is better that means it handles the congestion more efficiently than previous scheme.

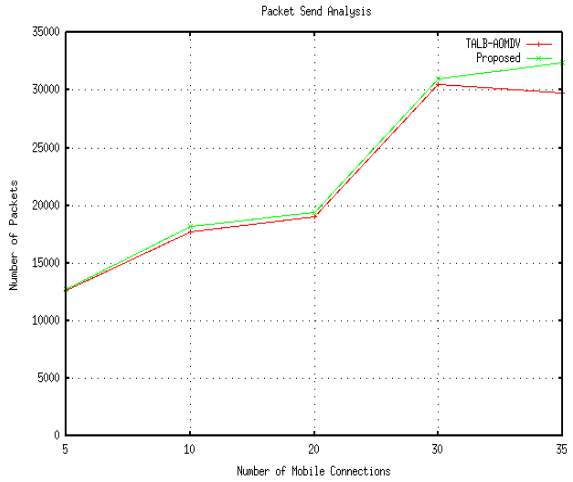

Figure1 Packets Sending Analysis

4.2Packets receiving analysis

The congestion possibility in wireless connection is more due to limited available bandwidth and in MANET nodes movement is also another problem. The possibility of packet dropping in network is more if the less number of packets are received at destination in a given simulation. This graph illustrates the packet receiving analysis of original TALB-AOMDV and proposed congestion control queue based multipath routing. The number of packets received in TALB-AOMDV is about 9700 highest in 10 connections and lowest about 6200 in 35 connections. This is shows that the performance of proposed scheme is reduces the congestion and provides more reliable communication then TBR-AOMDV.

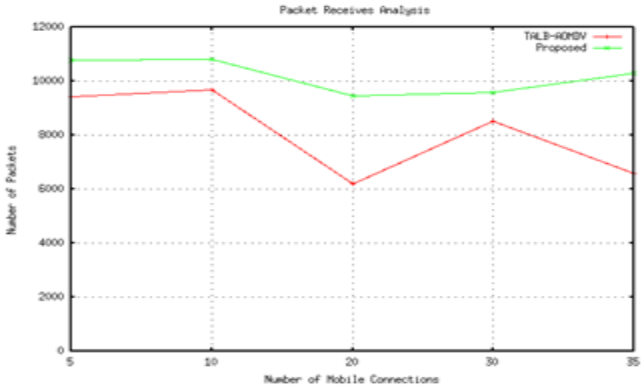

Figure 2 Packets receiving analysis

4.3Packet delivery ratio analysis

PDR (Packet Delivery Ratio) is calculated the percentage ratio of of data is delivered in network. The PDR is the percentage ratio of number of packets is received from sending in network. In this graph the

PDR analyses of TALB-AOMDV and proposed queue length estimation scheme is evaluated in given simulation time of 200 seconds. The AOMDV is provides the alternative path to deliver the data in network for balancing the load but not handle buffer capacity of nodes. The queue estimation of intermediate code is not easy to handle the congestion in MANET. In this graph, in case of TALB-AOMDV the PDF is about 77% in connection 15 and worst in heavy load about 21% but in case of proposed multipath routing the PDF is about 82 %. It means the proposed scheme is balance the load properly in network and improves the network performance.

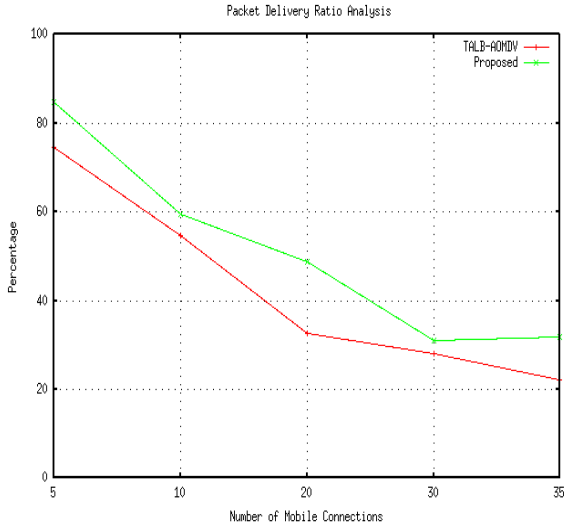

Figure 2 PDR Analysis

4.4Normalize routing load

The number of routing packets is flooded in network through sender to finding destination. The Route (RREQ) is send by sender and forward to next node in network. The routing packets flooding are playing the significant role in connection establishment and also the more routing packets flooding are also a question mark on link reliability because it indicates that due to congestion in network the strong link is congested and data is not forwarded to destination. In this graph routing packets flooding of TALB-AOMDV is flooded more routing packets as compare to proposed queue estimation based multipath routing but in case of proposed scheme the routing load is very low and good news is less than one, that is the sigh of better multipath routing. The proposed node queue estimation technique balance the load properly by that the option of retransmission is reduce and routing performance are increases. The TALB-AOMDV protocol is not able to handle overhead properly because it just provides the queue space for routing and data packets.

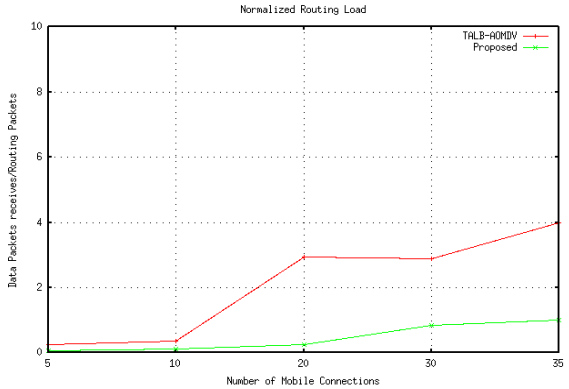

Figure 4 Routing overhead analysis

4.5Average delay

The number of data packets are not reached at destination in a definite time interval that why delay in network is enhanced. The congestion in network is enhances the possibility of link expiration time because of that same data is take extra time to reach at destination in network. In this graph the delay performance is evaluated and the performance of proposed congestion control queue estimation scheme in all connections are provides less delay in network, that shows the congestion in network is come to an end. The congestion free routing performance is also enhancing the packet receiving and reduces the loss of data in network.

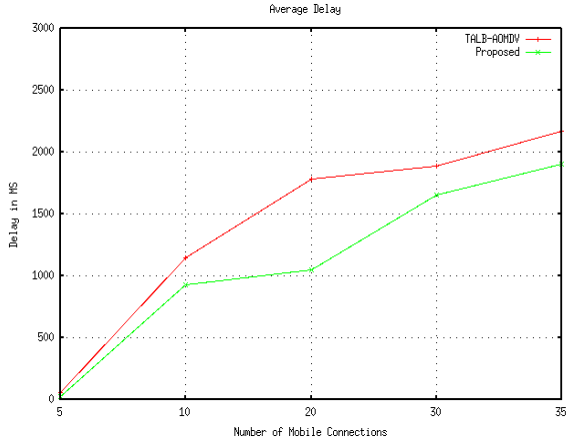

Figure 5 Delay analysis

4.6Throughput performance analysis

The number of data packets are received at destination in per unit of is evaluated through throughput performance metrics. In this graph the performance of different connections in both the protocols is evaluated and observes that the performance of proposed congestion control scheme

is provides the better results. The throughput in case of proposed queue estimation based routing is about receive more than 300 packets/seconds but in case of TALB-AOMDV is about only 200 packets / second. In enhancing the connection load in network increases then the TALB-AOMDV performance is degrades but the proposed queue estimation routing performance is improves at the end of simulation.

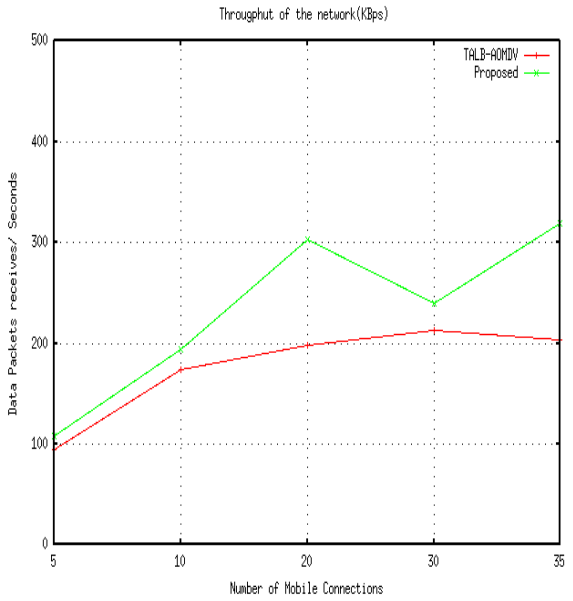

Figure 6 Throughput analysis

5.Conclusion and future work

A The routing protocols of MANET are fully different from wireless routing protocols because here the mobile nodes are moves continuously and in motion form all sending, receiving and forwarding data packets in network. The single path routing protocols are not provides better results in this type of dynamic network. The multipath protocols are reliable and more efficient then unipath. The alternative route is instantaneously available if the current one is fail due to problem of congestion and collision. On the other hand, mobile node has restricted computational capacities like bandwidth and buffer suspect. In MANET this proposed scheme demands for efficient multipath routing have resulted in substantial awareness by researchers in the area of load balancing in MANET. The proposed multipath congestion control approach is rich in resources like bandwidth and having a ability to grip the intense load in network that ease the possibility of congestion. The proposed scheme is maximized mobile nodes packet delivery ratio (PDR), throughput and balanced the load as a result the packet receiving is enhanced. The performance of proposed queue estimation based routing is provides better results as compare to TALB-AOMDV. The proposed approach is improves the performance by handling the congestion more efficiently then TALB-AOMDV. The TALB-AOMDV is also able to handle congestion but it is only based on very old approach. The proposed load balancing approach is handle the congestion and provides better performance then TALB-AOMDV. The data loss in network is reduced but the NBA is after proposed scheme is not provides. The load balancing in network is required to handle the problem of congestion and the problem of congestion in any network is not possible to remove but the difference in congestion and attack is not justified without security scheme in MANET. In future we will propose the concept of security scheme against jamming attack because this attack is also congested link by flooding attacker unwanted packets in network. The Intrusion Detection System (IDS) is the technique to detect and prevent attacker from network. The attacker node is not receiving packets and the attacker is not sender but it is receiver. Now the IDS is work as that the malicious node is behaves as sender and broadcast unwanted packets to all nodes then detect it and block their presence in network.

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