# LACC Protocol: An Enhanced EAOMDV Protocol to Reduce Packet Loss in MANET

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***Abstract***- *Last decade has witnessed wide growth of Mobile ad-hoc networks (MANETs). Mobile ad-hoc network is self-configurable and adaptive. MANETs use wireless connections to connect various networks. There are number of issues and challenges in a mobile ad hoc network. Due to many number of nodes transmitting packets over the network, the chances of losing the packets over the network increases to a great extent. Also, with the increase in size of data packets, the congestion over the network increases which may lead to packet loses. In this paper, various link failure recovery and congestion control techniques have been discussed.*

***Keywords***- MANET, Congestion-Control, AODV.

## I. INTRODUCTION

Ad-hoc Network is defined as the collection of two or more wireless devices which have the capability of communicating with each other without the help of any centralized administrator. These networks are generally referred to as MANETs (Mobile Ad-hoc Networks). MANETs consists of collection of nodes which are free to move within the network and each node acts not only as a terminal but also as a router that has the functionality to forward the data. Mobile nodes can communicate directly via wireless link if they are within each other's radio range and if not, they rely on other neighboring nodes which act as routers to relay [1]. In MANET each node (Mobile Device) acts as a router, which helps in forwarding packets from a source to destination. MANET nodes can be personal devices such as laptop, mobile phones etc [2]. Mobile ad-hoc networks are suited for use in situations where an infrastructure is unavailable or deploy one is not cost effective.

The designing of a reliable and efficient routing strategy is a very challenging problem in MANETs because of their mobile nature and limited amount of resources. In order to use these limited resources efficiently, an intelligent routing strategy is required which should also be adaptable to the changing conditions of the network, like, size of the network, traffic density and network partitioning [2]. Mobile ad-hoc network shows unexpected behavior with multiple data streams under heavy traffic load such as multimedia data when it is send to common destination. The main reason for packet loss, protocol overhead, and delay to find new route in MANET is due to congestion. So, In order to deal with all these issues, the routing in MANETs needs to be congestion adaptive due to these problems service quality is affected.

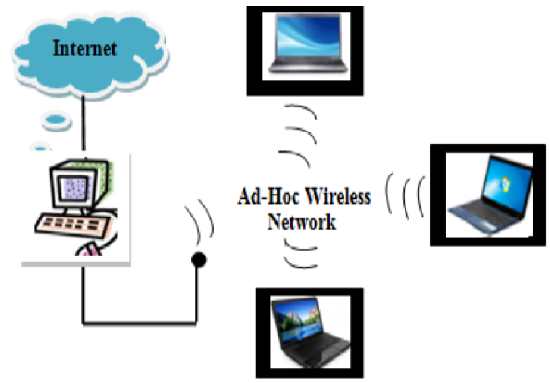



Fig. 1: Mobile Ad-Hoc Network

One of the most important and a difficult mechanism to maintain in ad hoc networking is the routing mechanism. An ad hoc routing protocol is nothing but an agreement amongst nodes as to how they control routing packets amongst themselves [7]. The nodes in an ad hoc network discover routes as they do not have any prior knowledge about the network topology routing protocols in MANETs are classified into three different categories according to their functionality: 1. Reactive Routing Protocol***:*** It is also called the On Demand routing protocol. They don't maintain routing information or routing activity at the network nodes if there is no communication. It means that it creates the routes only when desired by the source node. E.g. AODV, DSR. 2. Proactive Routing Protocol: It maintains the routing information even before it is needed. They attempt to maintain up to date information from each node to every other node in the network [8]. Routes information is generally kept in the routing tables and is periodically updated as the network topology changes.

## II. RELATED WORK

Several algorithms have been proposed so far to obtain efficient routing over MANET. This section describes there search background of this article. Lot of efforts has been taken on handling route failures and congestion in Mobile Ad hoc Networks. Based on the working principles the existing protocols are classified into four categories.

A. **Backup route(s) on the failure of primary route**. AODV with backup routing (AODV-BR) [8] and multipath AODV [9], source nodes create alternative routes to the destination, and on failure of any one of them, nodes deliver data packets using an alternative route; however, they suffer from two problems: out of date route and duplicate packet transmission In AODV-Based Backup routing Scheme(AODV-BBS) [10], each node maintains two hop neighborhood information for finding alternative routes, but the maintenance of multiple alternative paths is difficult, costly, and time-consuming, which in turn reduces data delivery performances of the network.

B. **Multiple routes to balance traffic loads***:* The second category of routing protocols uses multiple routes to balance traffic loads on the event of congestion [4] or route failures and thus improve the network performance. Distributed Multipath Dynamic Source Routing (DM - DSR) protocol [11] improves QoS with respect to end-to-end reliability; Split Multipath Routing (SMR)[5] uses multiple routes to split traffic and moderate congestion; nodes in Congestion-adaptive Routing Protocol (CRP)[6] use bypass routes to mitigate congestion, etc., but the problem is that multiple route maintenance overhead affects the network performance significantly.

C. **Link failure recovery process***:* Local Repair AODV based on Link Prediction, LRAODV_LP [2], if a node detects that the signal strength goes below a predefined threshold, it initiates a fresh route discovery rather than sending error message backward. In Implicit Backup Routing-AODV (IBR-AODV) [12], a neighbor of an active route temporarily stores overheard data packets and acts like a backup node. Whenever any link failure occurs in the network, this backup node creates new route to the destination and sends data packets.

T. Senthil kumaran et.al [3] have proposed an early congestion detection and optimal control routing in MANET called as EDOCR. Initially EDOCR segregates network in to spares and dense region by using mean of neighbors. After segregation of networks, it initiates an optimal route discovery process to find a route to destination. This optimal route discovery is reducing the RREQ overhead during the route discovery operation. All the primary path nodes periodically calculate its queue status at node level. While using early congestion detection technique, node detects congestion that is likely to happen and sends warning message to Neighbors. Now EDOCR utilizes the non-congested predecessor node of a congested node and initiates optimal route discovery process to find an alternate non-congested path for a destination. Thus, EDOCR improves performance in terms of reducing delay, routing overhead and increases packet delivery ratio without incurring any significant additional cost. The performance of EDOCR was compared with EDAODV, EDCSCAODV and AODV using the Ns-2 simulator. The result reveals significant improvement over EDAODV, EDCSCAODV and AODV routing schemes.

Yanyong Zhang et.al [7] have proposed new a two-level congestion detection scheme that provides an accurate node-level and flow-level congestion measurements in an energy-efficient way in ad hoc networks. Simulation results show the node-level congestion measurement, which uses the set of buffer occupancy, packet drop rate, and channel loading as an indication of congestion, accurately portrays the congestion level by decoupling the measurement from various MAC protocol characteristics. The flow-level congestion measurement based on the node-level congestion measurement provides sfined-grained congestion information in the network. For energy-efficiency, the lazy channel loading measurement saves a lot of energy needed to accurately measure the channel loading while maintaining the same level of accuracy as synchronous measurements. Simulation results show the proposed mechanism significantly cut down the energy needed to accurately measure congestion while maintaining high level of accuracy needed for timely congestion control.

Mr.S.A.Jain et.al [10] have proposed Ant Colony algorithm which has been used in Mobile Network since long because of isomorphism between them In MANET, routes may fail due to failure of links that may be caused by movement of nodes. In addition when mobility speed is high, link failures occur more causing delivery ratio to decrease. So the problem of packet losses and delays can be solved to a certain extent by detecting the link failures.Packet delivery failures due to wireless link collisions may incur unnecessary route reestablishments from the source node. Thus this type of route reestablishment can be prevented if there exists a mechanism different mechanisms for the link failure detection by using alternate route finding from the nearer of the faulty node resulting into improvement in throughput, and end to end delay parameters. Thus performance of MANET will be significantly increased, along with TCP throughput.

Xiaoqin Chen et.al [11] have proposed congestion-aware routing (CARM). CARM utilizes two mechanisms to improve the routing protocol adaptability to congestion. Firstly, the weighted channel delay (WCD) is used to select high throughput routes with low congestion. The second mechanism that CARM employs is the avoidance of mismatched link data-rate routes via the use of effective link data-rate categories (ELDCs). In short, the protocol tackles congestion via several approaches, taking into account causes, indicators and effects. The decisions made by CARM are performed locally.The simulation results demonstrate that CARM outperforms DSR due to its adaptability to congestion protocol for mobile ad hoc networks which uses a metric incorporating data-rate, MAC overhead, and buffer delay to combat congestion.

Consolee Mbarushimana et.al [12] have proposed a Type of Service Aware routing protocol (TSA), an enhancement to AODV, which uses both the ToS and traditional hop count as route selection metrics.TSA is a cross-layer congestion-avoidance routing protocol in which the routes through nodes engaged with delay sensitive traffic for extended periods are only selected as the last resort, even when they are shorter. Avoiding busy nodes alleviates congestion, results in less packets drop and in a short end-to-end delay. In addition, TSA distributes the load on a large area, thus increasing the spatial reuse. Simulation study reveals that TSA considerably improves the throughput and packet delay of both low and high prior. Journal of Theoretical and Applied Information Technology 10th August 2013. Vol. 54 No.1 © 2005 - 2013 JATIT & LLS. All rights reserved. ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195 76.

## III. PROBLEM STATEMENT

In the existing work link failure does not consider. In MANET due to the mobility of nodes as it is a self configured network link failure is the major issue. Packet loss is the major issue due to failure of link. In MANET battery power and mobility both are important parameters to increase the life-time of network and we get the best optimal alternative route from source to destination when one of the link gets failed.

The congestion is likely to occur when incoming traffic exceeds the network capacity which results in increased delay and packet loss. In order to overcome these issues, in this paper, congestion detection and recovery technique is proposed in mobile ad hoc network.

## IV. LACC MECHANISM

1) Link Failure Recovery Algorithm
2) Congestion Control Algorithm

### 1) Link Failure Recovery Algorithm

**Link Recovery**

Step1: deploy the nodes in the network.

Step 2: select the source node and destination node. Establish the path from source to destination using EAOMDV. Transfer packets from source to destination.

Step3: because of mobility of each node link failure problem can be occurred. Link failure will be detected using the HELLO message.

Link failure occur due to reduce in received signal strength Link failure leads to route failure between nodes and reduces the network Throughput. Link failure detection can be performed using either periodic HELLO messages or link layer feedback. These HELLO messages are local advertisements for the continued presence of the link. In our proposed LACC the nodes exchange HELLO messages periodically to ensure link connectivity. The following two parameters are associated with a HELLO message: HELLO_ INTERVAL is the maximum time interval between two consecutive HELLO message transmissions and HELLO_ LOSS allowed is the maximum number of loss of HELLO messages that a node can tolerate before it declares the link breakage. If a node does not receive any HELLO message from its neighbor node within HELLO_LOSS allowed x HELLO_ INTERVAL, then the node assumes that the link is not available for data transmission.

If link faiure detected So, at that time we have to select alternate path from source to destination for packet delivery.

Step 4: select alternate path, consider parameters battery power and mobility of nodes.

Each node energy is updated using below calculations.

Energy is required for each operation like transmission of packet, receiving of packet and even in idle situation.

$$E_{consumed} = \sum_{i=1,j=2}^{n} M\,ij + Ep$$

Where $M_{ij}$ = energy required to route packet from node I to node j.

$E_R = E_{total} - E_{consumed}$[8]

$E_p$ = energy required to calculate the position of node.

Similarly, for calculation of mobility,

$$M_v = 1/T \sum_{t=1}^{t} \sqrt{(xt - x(t-1))2 + (yt - y(t-1)2}$$

$M_{v}$ = mobility
$(x_t, Y_t)$ defines the position of node v at time T.
T= time duration =10ms appro.

Step5: when link failure occurs than the node previous to link failure node floods message to its adjacent node in the forwarding position to get the reply message of battery power and mobility of each node[15].

Step 6: message sender node selects the node which has the highest battery power and lowest mobility.

Step:7 Stop

**2) Congestion control Algorithm**

Step1: deploy the nodes in the network.

Step 2: select the source node and destination node. Establish the path from source to destination using EAOMDV. Transfer packets from source to destination.

Step 3: Congestion in a network is likely to occur when number of packets arriving at node exceeds its queue length.

Congestion status of the node can be categorized into following three states:

1. Normal.
2. Medium.
3. High.

Lower limit for queue length = 15.
Upper limit for queue length = 40.

When upper limit crosses there is need for congestion control.

Queue length
Lq <=15 → normal.
LL <= Lq <= UL → medium
Lq>UL →high.

Step 4: if Queue length> upper limit
Select alternate optimal path for data transmission based on energy and mobility.

W=a*E+b*M
a+b=1

we will select the path for which w is greater.
a=0.7
b=0.3

we have given more priority to energy as compare to mobility.

## V. PROPOSED TOOL TO BE USED

The NS-2 simulator is a powerful program for network simulation. It is an open source based simulator that uses two languages OTcl/C++, to create a simulation environment. NS-2 includes support for the simulation of both wired and wireless networks especially MANETs. It is a packet-level simulator capable of having a discrete event scheduler for packet and timer expiration. There are a number of network components and protocols that the NS-2 implements . The NS-2 simulator allows experimenting with existing network protocols.

Function of NS-2 as the simulation is being run, the TCL script is being divided into the following portion.
1. Network topology
2. Connection
3. Traffic and Agents
4. Events schedule

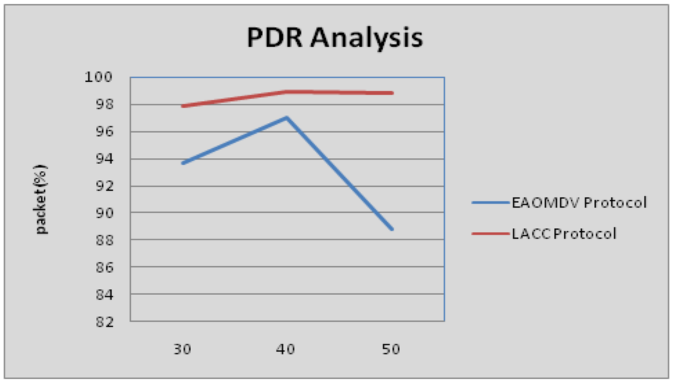
NAM is an animations tool for viewing network simulation trace and real world packet trace data. The design theory behind NAM was to create an animator that is able to read large amount of animation data set and be extensible enough so that it could be used in different network visualization situation. In order to handle large amount of data set a minimum amount of information kept in memory. Events commands are kept in a file and reread from the file whenever necessary

## VI. SIMULATION AND RESULTS

**1) Packet Delivery Ratio(percentage):**

Formula = (packet received)/(packet send)*100
Greater value represents better performance of protocol

| | EAOMDV Protocol | LACC Protocol |
|---|---|---|
| 30 | 93.6 | 97.87 |
| 40 | 97 | 98.88 |
| 50 | 88.76 | 98.76 |

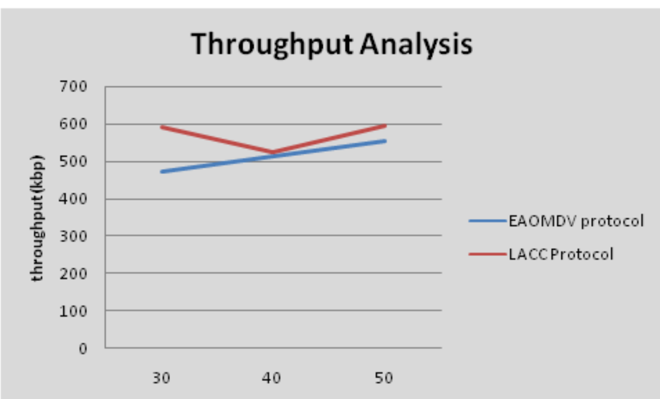



**2) Throughput(kbps):**

It is data received per unit of time. It shows the performance of the network.

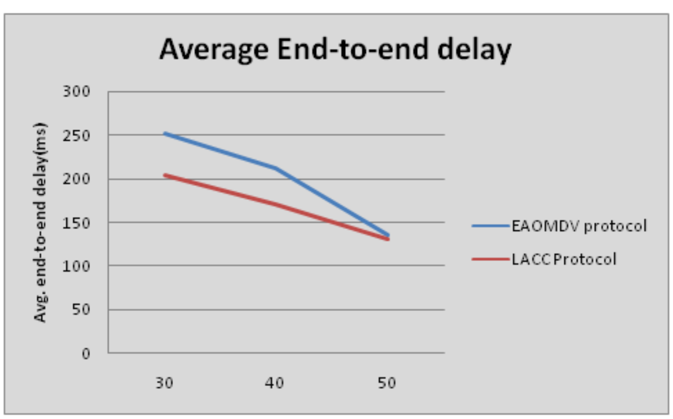
Formula = (received packet)/time*8*1/1000.

| No of nodes | EAOMDV protocol | LACC Protocol |
|---|---|---|
| 30 | 472.82 | 588.91 |
| 40 | 512.63 | 524.10 |
| 50 | 553.89 | 593.20 |




**3) Average end to end delay(ms):**

Formula = (start time – end time)/count.




## VII. CONCLUSION AND FUTURE WORK

From the above graph we can conclude that in our proposed throughput has been increased. Packet delivery ratio has also been increased. Average end to end is decreased Mobile. Ad Hoc networks are self organized networks whose nodes are free to move randomly. Mobile nodes can communicate with each other without the help of the existing network infrastructure. Routing in MANET is very important topic. We have presented an efficient methodology to control congestion in the network. We have chosen queue length parameter for congestion. Because of mobility of a node, it can move randomly anywhere. So at that time existing path will be broken between source and destination. So we have proposed link recovery methodology based on battery power and mobility parameter. Our ultimate goal is achieved to provide reliable, congestion free path for packet transmission to improve various parameters like packet delivery ratio, throughput.

We can also apply this protocol for hybrid network.

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