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# Best Path Finding using Location aware AODV for MANET

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## Abstract

***Ad-hoc network is collection of mobile, dynamic, wireless and arbitrarily located nodes. These nodes cooperate with each other to create infrastructure less ad-hoc network. Due to mobility of node, routes may change frequently. So guaranteed packet delivery and handling dynamic connectivity are the important issues of ad-hoc network. The proposed Location aware modified AODV is neither completely proactive nor does completely reactive protocol. It finds best path on demand basis using various parameters like node-id, timestamp, GPS coordinate, bandwidth, RTT, packet loss ratio etc. Due to the demand base nature, only the best path is selected compared to the shortest path.***

## Keywords

***Mobile Ad hoc Network, Round Trip time, Global Position System, AODV, Location Aware***

## 1. Introduction

In mobile ad hoc network, a temporary network is formed only using collection of nodes without any centralized body as network topology changes continuously. In MANET each node works as a router and autonomously performs mobile functionality. The link connectivity changes continuously due to mobility, to reflect this routing information also needs to get changed continuously. Guaranteeing delivery and the capability to handle dynamic connectivity are the most important issues for routing protocol in mobile ad hoc network. There are several paths from source to destination. The routing protocols find a route from source to destination and deliver the packet to correct destination. The performance of MANETs is related to efficiency of routing protocols and efficiency depends on several factors like convergence time after topology changes, bandwidth overhead to enable proper routing, power consumption. In MANET, there are three types of protocols viz. proactive, reactive and hybrid. Proactive maintain a continues view of the full topology of the network in each node. It is also called table driven protocols. Ex. DSDV, OLSR. Reactive protocol is an on demand protocols. It searches a route from source to destination as a when required. Ex. AODV, TORA. Hybrid protocol combination of proactive as well as reactive. It is used to find balanced between both protocols. Proactive operations are restricted to small domain, whereas, reactive protocols are used for locating outside those domains. Location aware modified AODV protocol is neither completely proactive nor reactive protocol. Here route discovery is performed on demand based from one node to other.

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## 2. Location aware modified AODV

Location aware modified AODV protocol finds best path among multi-path routing protocol for MANET. This protocol finds the best path for destination. For that we check various parameters to select best node and base on that select best path from source to destination. This protocol search best neighbourhood node in a network. Among these nodes we select best node to add it to the path from source to destination, where packet takes minimum time by consuming less energy. Various parameters that we check for finding routes are node id, timestamp, GPS coordinates, bandwidth, RTT, packet loss ratio. For selecting neighbour node mainly we check three parameters i.e. bandwidth, RTT and packet loss ratio. GPS coordinates gives us node position, which play a key role in finding best path. Healthy nodes are selected on the ratio of bandwidth > 70%, RTT < 15% and packet loss ratio < 15 %. i.e. bandwidth + RTT + packet loss ratio = 100 %. This computation gives us healthy nodes weight age. Performance matrices give brief idea about each parameter.

## 3. Literature Review

Here literature survey focuses on various route discovery problems in mobile ad – hoc network. Various problems like node mobility as mobility may result in frequent route failures, congestion, broadcast storm problem etc. path selection is essential for video streaming this concept introducing in [1]. [3] This paper suggests a new approach to utilize

location information (for instance, obtained global positioning system) to improve performance of routing protocols for ad hoc network [2][4] introduce a new Position and Neighbourhood based Routing (PNR) algorithm for mobile ad hoc networks which uses GPS and new algorithm to reduce the overhead caused by position update messages.[5] a new path-selection algorithm that unlike traditional shortest path algorithms, computes shortest paths with the above on-demand routing constraint. Various protocols: DSDV, AODV, FSR, LAR, OLSR, STAR and ZRP are compared in paper [6] [7] and [8]. Energy saving is the essential issue in MANET. In paper [9]-[12] various energy accuracy scheme is introduce that works on reducing waste full energy consumption and increases data transmission and life of network. In paper [13] [15], ANIMAL, GRID which tries to exploit location information in route discovery, packet relay, and route maintenance. [14] Explain the working of Ad hoc On-Demand Distance Vector (AODV) routing protocol is intended for use by mobile nodes in an ad hoc network.

## 4. Proposed Algorithm

Step-1 Broadcast the message in the network.
Step-2 Select the neighbourhood nodes
Step-3 Check healthy nodes with following criteria
Available Bandwidth < 70 % and RTT < 15% and PLR < 15 % = 100 %
Step-4 Select route in request zone by checking node GPS position
Step-5 compares node position with source node
If node distance > Source and node distance Destination
Step 4
Else
Search another route
Go to step 3

## 5. Performance matrices

- **Node id**
  Node id is nothing but node identification number.
- **Time Stamp**
  A timestamp is the current time of an event that is recorded by a computer.
- **GPS Coordinate**
  GPS coordinate gives the physical location of nodes. Here we calculate GPS position by broadcasting messages in the network.
- **Bandwidth**
  Bandwidth is relates to the amount of data that a link or network path can deliver per unit time. Bandwidth is proportional to energy level and traffic load. Therefore to check bandwidth, we check energy level and traffic load of node.
- **Round Trip Time**
  Round-trip time (RTT) is also known as the ping time. RTT is the length of time it takes for a signal (data packet) to be sent plus the length of time it takes for acknowledgment of that data packet to be received. This time delay therefore consists of transmission times between the two of a data packet. **Ping ( )** function is use to check round trip time.
- **Packet loss ratio**
  Packet loss occurs when one or more packets of data travelling across a computer network fail to reach their destination. Packet loss is distinguished as one of the three main error types encountered in digital communications. The other two being bit error and spurious packets caused due to noise. **Loss ( )** function is use to measure the packet loss ratio.

## 6. AODV

Ad-hoc On-demand Distance Vector (AODV) is a reactive routing distance vector algorithm. AODV use a simple request-replay mechanism for route discovery. Is a reactive protocol i.e. route discovers as and when necessary. AODV mainly use three messages to discover route i.e. Route Request, Route Replay, and Route Error. It use following parameters to discover route are Source address, Request Id, Destination Address, Source sequence no., Destination sequence number, Hop count.

**Working of AODV**
When a node wish to send a packet to destination. It checks its routing table to determine if it has a current route to the destination. If yes, forwards the packet to next hop node. If No, it initiates a route discovery process.

**Route Discovery**
It begins with broadcasting of RREQ to its neighbor's specific for certain destination. Once intermediate node receivers a Requite check its routing table for route to destination. If found send RREP to source. If not found it rebroadcast RREQ to

its neighbor nodes by setting up a reverse route path to source node in its route table.

## 7. Results

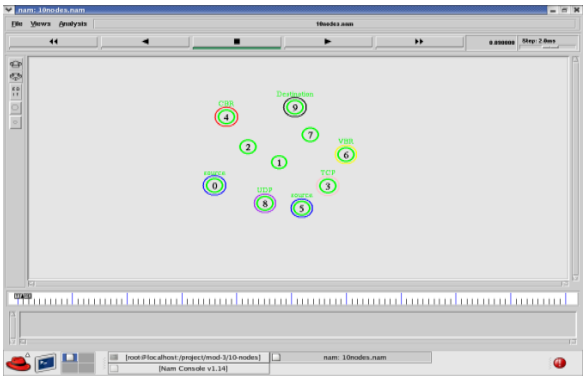

**Figure 1 : Topology**

In this figure, we have shown only 10 nodes. Same testing is further extended to 20, 30, 40 nodes. Where node 0 & 5 are source nodes and node 9 is the destination node. The topology is tested for two different traffics like CBR, VBR against TCP and UDP.

**Path Selection**

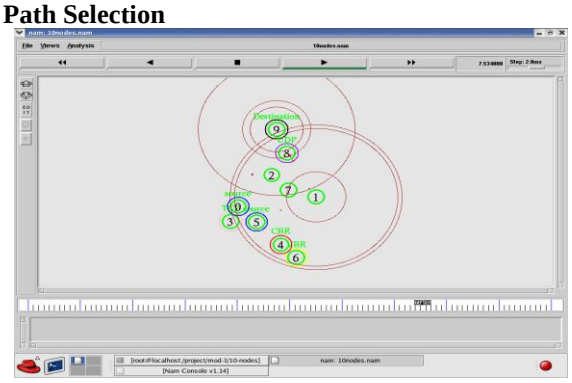

**Figure 2 : Path Selection**

Here, path 5 – 1- 9 is establish to send packet. There are also other paths but among them path 5-1 -9 is the best path.

## 8. Performance Evolution

We have implemented location aware modified AODV to find best path. It improve delivery ratio for wireless network. Location aware modified AODV is implemented on TCP and UDP on CBR as well as VBR. Performance of Location aware modified AODV and AODV is checked for packet delivery ratio, delay, throughput and energy. Then there results are compared.

**Throughput**

Packet delivery ratio is defined as the ratio of data packets received by the destinations to those generated by the sources.

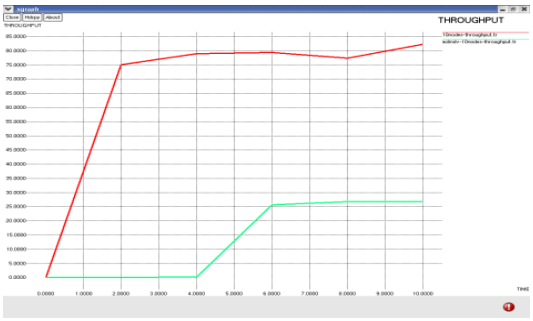


**Figure 3 Throughput**

**Packet Delivery Ratio**

∑ Number of packet receive / ∑ Number of packet send

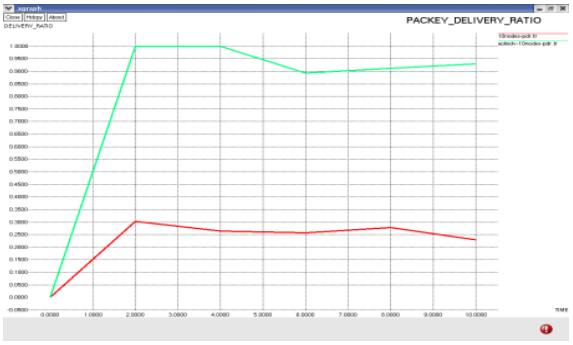


**Figure 4 : PDR**

**Delay**

∑(arrive time – send time) / ∑ number of connections

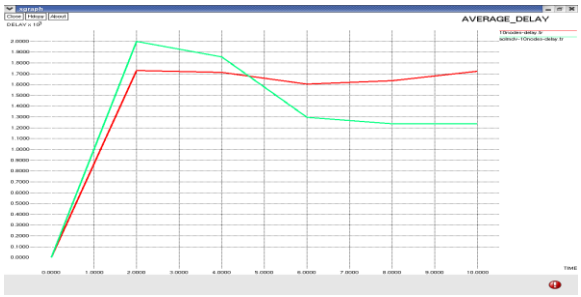


**Figure 5 : Delay**

The average end-to-end delay of data packets is the interval between the data packet generation time and the time when the last bit arrives at the destination.

**Energy**

Energy is converted in joules by multiplying power with time. Total energy consumed by each node is calculated as sum of transmitted and received energy for all control packets.

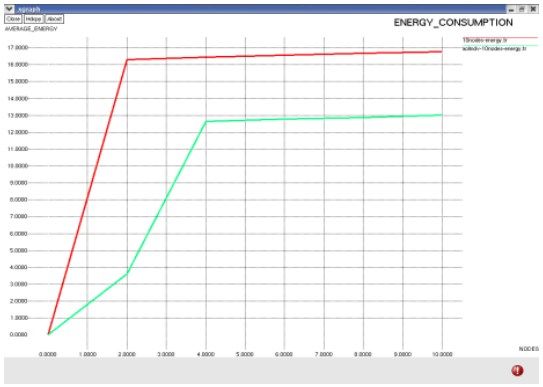


**Figure 6 : Energy**

## 9. Conclusion and Future Work

Location aware modified AODV has been proposed for selecting best path instead of only shortest path, for mobile ad hoc network. There are several advantages of the proposed location aware modified protocol. First, it works efficiently for network with more number of nodes. Path selection becomes easier as it restrict the request zone based on Source and Destination location (based on GPS co-ordinates) and then it checks healthy nodes. Second, packet delivers to destination in less duration, hence increases efficiency. It requires less number of intermediate nodes to forward packets. So packet delivery ratio is also higher.Third, it consumes less energy, as instead of generic packet forwarding, the packets get forwarded only to healthy nodes. This helps to improve performance on TCP and UDP connections.
We have done simulation testing in NS-2 for performance analysis of above parameters for two traffics CBR and VBR with varying number of nodes (10, 20 & 30). We conclude with the better results as compared with AODV viz. better Packet Delivery Ratio, less energy consumption and better throughput.

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