

# A Modified Agent Based AODV Routing Protocol for MANET's

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**Abstract**— Mobile ad-hoc networks (MANET) consists several mobile nodes that communicate to each other without any centralized control. In such network where there is no infrastructure, mobility of nodes is a major concern. In MANET nothing is fixed, topology is dynamic so it can be changed. Hence in such network timely response for time critical task is a major challenge. In this paper our proposed work introduces agents in Ad-hoc On Demand Distance Vector Routing Protocol (AODV) in order to make it better than existing AODV routing protocol.

**Keywords**- MANET, AGENTS, AODV.

## I. INTRODUCTION

MANET is a collection of several mobile nodes that communicate or collaborate to each other via wireless means. In such network each node acts as both host and router. At Present AODV routing protocol is frequently used in ad-hoc network. Frequently changes in ad-hoc network topology have been a major concern for the data packet routing in the ad-hoc networks. Traditional AODV does not work on quality of service parameter. In this paper we have used the concept of MOBILE AGENT in traditional AODV so that we can decrease the network delay and routing overhead and increase the throughput in compare to the traditional AODV.

## II. ROUTING PROTOCOL AODV

AODV routing protocol is a reactive routing protocol. It starts the route discovery only when demand originate by the source node for a particular destination node. AODV is dynamic by nature. In AODV each mobile node functions not only as host but also as specialized router. In AODV, each intercede node when receives the route request then it stores or saves the route back to the originator of the request so that the RREP can be unicast from destination to that originator. AODV protocol has two important factor.

### A. ROUTE DISCOVERY :

When a source node wants to transmit the data packet but there is no existing route, originator node broadcasts a RREQ to its one hop neighbour node, its neighbour node broadcast the RREQ to other node and so on, this phenomenon will not interrupt until unless it found the destination node. Each node in the network consist

sequence number counter to check the freshness of route in order to avoid undesirable looping problem and Request ID which is the evidence of identity for the route request packet.

### B. ROUTE MAINTENANCE

As network is dynamic in nature so any node can leave its position and move to some another location. Hence in such case when a node does not find out its next hop it will generate a RERR (route error) packet. The RERR packet consist the sequence number increased by the last sequence number plus one and hop count is equal to infinite and sends to all the participating neighbour nodes, now this node will act of passing RERR packet from one neighbour nodes to another neighbour node. This process will continue until the RERR packet is sent to all of the active nodes. After receiving this information, nodes remove all the routes that contain wrong node. Now source node will starts again a route discovery process by sending a RREQ (that consist sequence number incremented by one from the last sequence number) and RREQ ID to all the one hop neighbour node and process repeats same as previous route discovery process.

## III. PROBLEM STATEMENT ABOUT AODV

The inherent problem with traditional AODV is its single path selection with reactive approach that claims to be best at a particular instant of time but topology is dynamic hence it may be changed and network may have better route but AODV does not check for it and continue to the already selected path another scenario can be if any node move away from the established path between source to destination then route error comes and source has to broadcast the route request to its neighbour hence reroute discovery that increases control overhead, network latency and decreases the overall throughput of the network. That is why we have used the concept of mobile agents in AODV.

## IV. WHAT IS MOBILE AGENT

Mobile Agents are simple packet that carry the data and search into the network for the available routes. Agents leave the knowledge that acquired through study of the network behind the nodes that they travel to, so that other agents can use this information. As in computer networks there are various different devices that are connected to the networks where mobile devices. Mobile Agents help to accumulate and distribute connectivity information for a dynamic wireless network.

**V. PROPOSED APPROACH- MAR-AODV**

This MAR-AODV is a improved AODV routing protocol based on mobile agents. In MAR-AODV agents works on the rule of spontaneous, indirect coordination between agents , where the trace left in environment by an action stimulates the performance of a subsequent action. Mobile agent not only update routing information but also look the routing table information left by other mobile agents. By this information mobile agents are able to get the routing information about the mobile nodes it has not visited yet. Each agent is free to all other agents in aspect of its code and data. Agent can move freely in whole network and because of its small size, transmission overhead is very low. Agents communicate to other agents indirectly by mobile node routing table in order to find out shortest best route . As agent helps to find out best possible route between mobile nodes so if any particular time any node moves to other location and out from the range of other nodes then through agent a node can switch from current node to the better route node. Hence route latency can be minimized by agent because agents save the time that waste in discovery of route again else in traditional AODV whenever RERR (route error)comes it stars from the initial stage and again broadcast the RREQ (route request) packet to its one hop neighbour nodes and repeats the whole route discovery process. By agent , MAR-AODV avoid the unnecessary route discovery process by searching the alternative paths and updating these paths into the routing table of mobile nodes. Agents not only decrease the network delay but also increase the over all throughput of the network.and minimize the routing overhead .

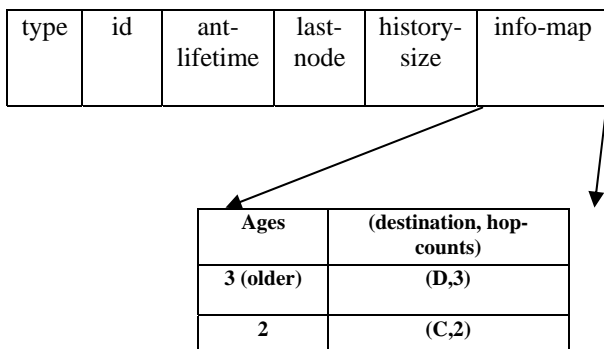


Fig -1.0 MOBILE AGENT FORMAT

In fig-1.0 “type” field describe whether the type is mobile agent or “hello” message. The “id” is used for the unique identification of mobile agent packet. The ant-lifetime is used to stored the expiry time of agent. It is current time plus agents expiry time. Last node records the previous node just visited. History size defines the size of info map. Info-map gives the information about routing collected by the agent. In the info map, field “age” keep the sequence of the node visited. Larger the value of age field, older the information is.

**A. HOW MOBILE AGENT WORKS:**

As the topology of network is dynamic because connection between mobile nodes is established and destroyed when nodes move in and out of range of each other. The mobile agent store the history list where it has been. When a node receives a mobile agent it get the information of mobile agent and update its routing table with best possible routes. The routing agents communicate indirectly to each other by writing the information to the routing table of mobile nodes, but do not read information from the mobile nodes. When any agent comes to such node it updates the nodes routing information by its(agent) collective information as well as it reads routing information from the local routing table that build as per the routing information collected by other agents. Hence by the help of local routing table of each mobile node, agents can communicate to each other indirectly and help to determine the best possible routes to the mobile node.

**B. DETERMINATION OF AVERAGE NUMBER OF MOBILE AGENTS IN AD-HOC NETWORK:**

In an ad-hoc network that consists N number of mobile nodes, if a node is able to create a new mobile agent after every C seconds with a determinate lifetime of T seconds, then after a relative long period in comparison to the agent’s life time, the average number of agents (n) is

$$n = NT/C$$

where n = average number of mobile agent  
 N = number of mobile nodes  
 T = expiry time of mobile agent  
 C = time interval to create a new agent

**VI. GENERATION OF AGENTS IN AD-HOC NETWORK**

When the NS-2 simulator initialize, nodes are generated from number node 0 to number node N-1. In a serial manner node number 0 generate a mobile agent and send it out, and then the node number1 and othe all other nodes in NS-2 environment. After every interval of C each node repeats the generation of agent. Every agent has a life-time of T seconds. When a node get the agent then firstly it will check life-time of agent in order to decide whether to drop the agent or not. In the NS-2 simulator environment, all node works according to the timer of the NS-2 system. Hence time clock in all mobile node is synchronized according to the timer of the NS-2 simulator environment clock. In NS-2 when the simulator clock starts or initialize all the mobile nodes synchronized according to the timer of NS-2 simulator clock hence the timing to generate the agents after every C seconds is appropriate and after every C second, node from 0 to N-1 will generate the agents. In another environment clock timer would be different and so the variation would occur in generation of mobile agents according to the simulation environment. Hence synchronization among the mobile nodes would be different as the synchronization of nodes in the NS-2 environment.

### VII. SIMULATION PARAMETERS

Parameters	Value
Number of nodes	20, 30
Traffic type	CBR
MAC type	802.11 MAC layer
Mobility Model	Random motion
Environment Size	1000*800
Radio Propagation Model	Two Ray Ground
Packet size	512 bytes
Pause time(ms) at simulation	20, 40, 60, 80
Simulation time (ms)	80
Simulation Routing Protocol	MAR-AODV, AODV

### VIII. SIMULATION RESULTS

#### A. Average End to End Delay:

It consists delay in buffering during route discovery, delay in queue at interface queue, retransmission delays and propagation delay.

As in graph shown in fig 2.0 and fig 2.1 delay in the case of MAR-AODV is less than delay in the case of AODV which depicts that MAR-AODV is better than AODV.

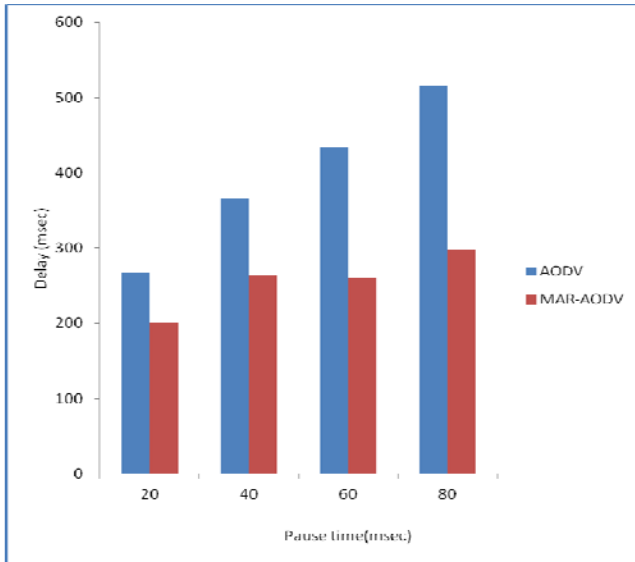


Fig 2.0 Pause time Vs Delay for 20 nodes

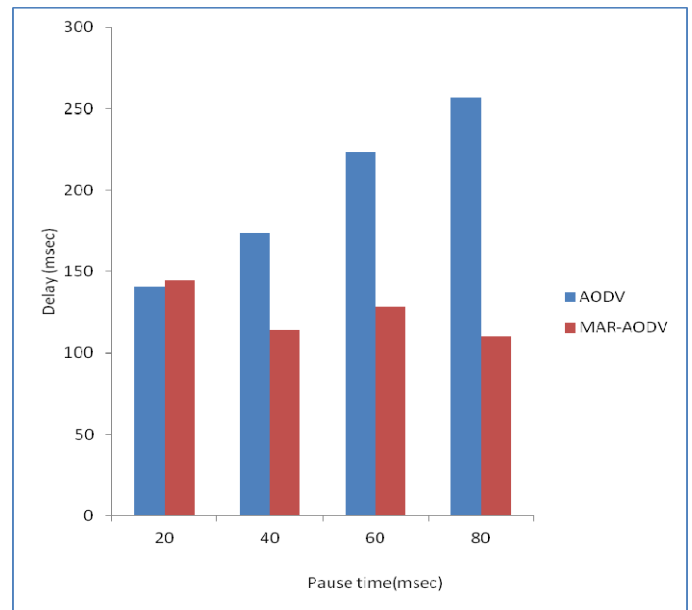


Fig 2.1 Pause time Vs Delay for 30 nodes

#### B. Packet Delivery Ratio:

It is the ratio of packet that are successfully delivered to a destination as compared to the number of packets that have been sent out by the sender. A high packet delivery is desired for any network.

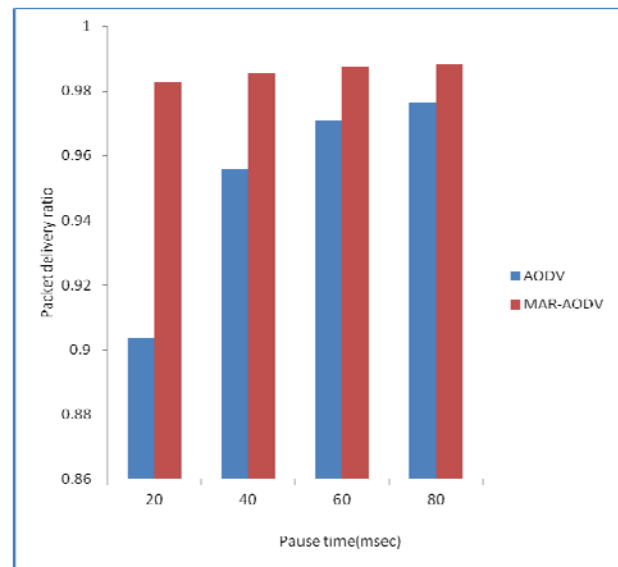


Fig 3.0 Pause time Vs Packet delivery for 20 nodes

As in graph shown in fig 3.0 packet delivery ratio in the case of MAR-AODV is better than AODV which is desired by any network for good performance and same the case for 30 nodes.

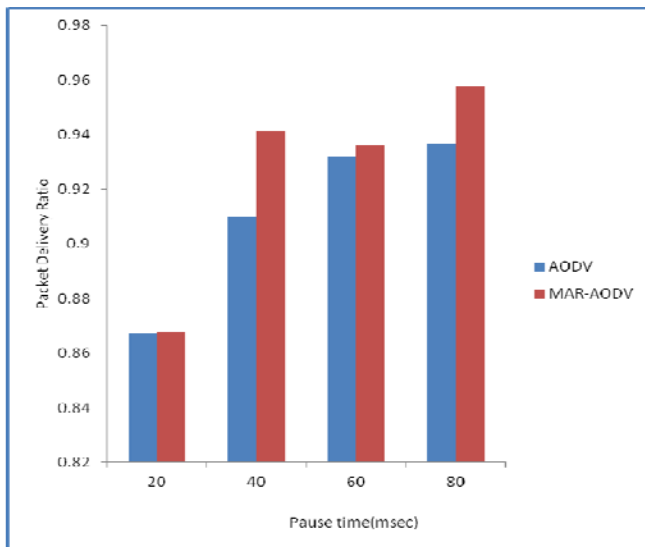


Fig- 3.1 Pause time Vs Packet Delivery Ratio for 30 nodes

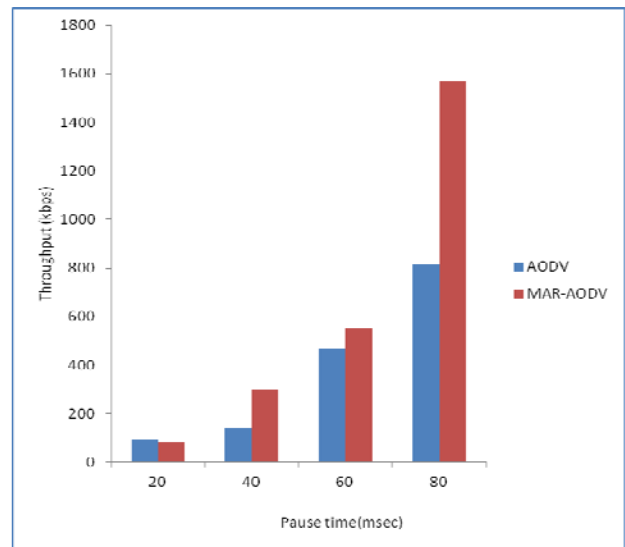


Fig-4.1 Pause time Vs Throughput for 30 nodes

C. Throughput:

It is the ratio between total number of packets received by the receiver to the total time it takes for the receiver to get the last packet.

As shown in fig 4.0 throughput in case of MAR-AODV is better than throughput in case of AODV. This describe the importance of mobile agents in the ad-hoc networks. We have analysed all the results on 20 nodes and 30 nodes, in both the cases delay in MAR-AODV is lesser than traditional AODV delay. While Packet Delivery Ratio is improved in MAR-AODV in comparison to traditional AODV in both the cases 20 node and 30 node. Throughput is better than in MAR- AODV in comparison to traditional AODV for 20 nodes.

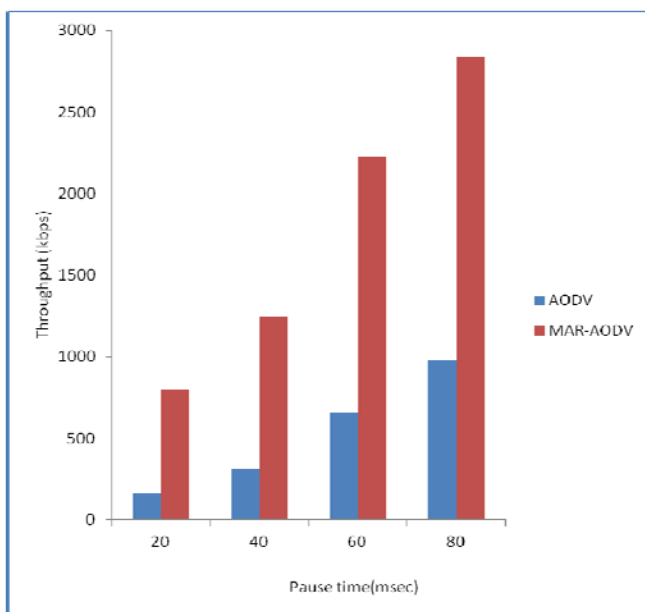


Fig- 4.0 Pause time Vs Throughput for 20 nodes

In the above fig-4.1 throughput in case of MAR-AODV is better than the throughput in case of AODV for 30 nodes.

IX. CONCLUSION

In this paper we have proposed the improvement of traditional AODV by the help of mobile agents. We have done simulation on NS-2 and analysed results depict that MAR-AODV is better than traditional AODV in the aspects of delay, packet delivery ratio, throughput . We did analysis on 20 nodes and 30 nodes and in both the cases ( 20 nodes and 30 nodes) MAR-AODV is proved better than Traditional AODV.

X. FUTURE SCOPE

In MAR-AODV, to recognize the number of agents we have concluded manually the value of number of agents. A new protocol should be automatic to adapt the changes in topology and data traffic. So in future by this updation we can make MAR-AODV more effective and responsive as quick adaptation to conclude number of mobile agents according to the changes in topology. This makes MAR-AODV more powerful and delay would also be minimized as manually configured work to evaluate mobile agents would be reduced.

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