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Efficient Data Broadcasting For VANET's Using PROAODV, SUMO and MOVE

M. Sumadhuri[1], M.C. Mamatha[2], B.L. Mamatha[3]

[1,2,3]**Electronics and Communication, JNTUA,BITIT, Hindupur, Andhra Pradesh, INDIA**

Abstract

Vehicular Ad-hoc Network belongs to a class of Mobile Ad-hoc Network. In MANET's mobiles are consider as a nodes, in VANET's moving vehicles on road is consider as a nodes. In MANET's there are numbers of routing protocols, all protocols are not applicable for VANET's. VANET's are highly dynamic due to high speed and mobility, they are moving in different direction with different speed and they have to follow some traffic rules. MANET's protocol cannot deal with such dynamicity of network nodes. According to previous comparative studies suggested AODV a well known MANET protocol is also used for VANET's because it provides dynamic changes in network and makes efficient utilization of network resources. AODV is particularly used for congestion control in VANET's by efficiently dealing with the AODV 'route request'. In this paper we propose Proactive AODV; it is the protocol that uses the information from the AODV routing table to minimize the congestion in VANET's. The main purpose of PRO-AODV is it does not require the execution of any additional logic, it is sufficient to know only the size of the routing table at each node.

Keywords: *Vehicular Ad-hoc Network (VANET), Mobile Ad-hoc Network (MANET), Ad-hoc On-Demand Distance Vector (AODV), Proactive Ad-hoc On Demand Distance vector (PRO-AODV).*

1. INTRODUCTION

The ITS (Intelligent transportation system) depends on Vehicular Ad-hoc Networks (VANET's). In Vehicular Ad-hoc Network its architecture consists of AU(Application Unit), OBU (On-Board Unit), RSU (Road side unit). The On-Board unit is present in the vehicles; it also consists of memory to store data and also interfacing device to communicate with other OBU's of Vehicles. Application Unit may resides in the On-Board Unit(OBU) and Road Side Unit(RSU), the device which using the application is called the provider and the device which uses the application is described as users.

The RSU is a fixed wireless device which is connected backbone to the network. It fix along the Road side. RSU is connected with Internet service provider. It provides internet connection to the vehicles which are present in the network.

VANET's communication type consists of vehicle to vehicle communication, Vehicle to Road Side Unit and Vehicle to Infrastructure communication. In these intelligent transportation systems, Vehicles communicate with each other and also with Road Side Infrastructure to provide a long list of applications varying from transit safety to driver assistance and Internet access.

The high speed mobility of vehicles in VANET's result in a rapidly and dynamically changing network topology and we know that MANET routing protocols cannot handle nodes in VANET's.

In this paper we focus to minimizing the congestion in the vehicular Ad-hoc Network. We adopt a protocol called Ad-hoc On-demand distance vector routing protocol as we known routing protocol in Mobile Ad-hoc network. We propose a novel probabilistic scheme to minimize rebroadcasting of control packet in the network. There are two classes of routing protocol in Vehicular Ad-hoc Network topology based and geo-graphic based. Geo-graphic based protocol uses additional services and equipment. We would also like to mention our focus is to improve the state of the art for more general purpose scenarios where broadcasting is unavailable rather than specific scenarios. Where multicast and unicast may work. AODV is known to be a more advantageous for Vehicular Ad-hoc Network Compare to other protocols. AODV relies on broadcasting RREQ packets to setup communication path. These characteristic of AODV may be problematic for Vehicular Ad-hoc Network because communication paths are highly unstable in VANET's and the round of route request protocol broadcasting will occur much more frequently than in MANET's. Thus straight forward adaption of Ad-hoc On-demand distance vector for VANET's is likely to cause congestion in the network. Our observation is that conventional AODV follows trivial congestion control mechanism. Our simulation also reveal that a VANET's becomes congested if it is allowed to be perform reveal the default of RREQ packet broadcast.

Our main aim in the paper is to reduce the congestion of a vehicular Ad-hoc Network by controlling Route Request broadcast. We propose a simple solution that utilizes the information available in a nodes routing table. Our solution is, if the number of routing table entries is below some threshold then. We will allow the corresponding node to broadcast; otherwise the node will broadcast the RREQ packet with some a priori probability. For our system all information which is required are easily available in the AODV routing table at each node, no extra overhead is incurred.

2. Overview of AODV

Communication method

Ad-hoc on demand distance vector routing protocol is method of routing messages between mobile computers.
It allows nodes in the network to pass information through their neighbors to nodes with which they cannot directly communicate.

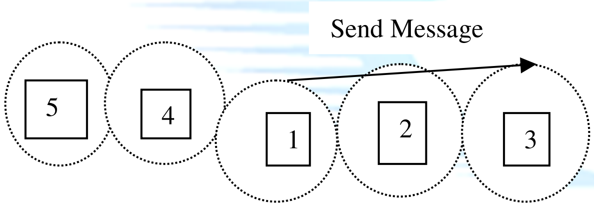

Fig 1 Setup of 5 nodes on a network

A Figure shows a setup of 5 nodes on a network. The circles illustrate network range of communication for each node. Because of the limited range each node can communicate only with the node next to it. Nodes keep track of its neighbors by listening for a hello message that each node broadcast at set interval.

As shown in the figure node1wants to send a message to node3 but unfortunately it is unsure for the route to get there. When one node needs to send a message to another node that is not its neighbor it broadcast a route request message. The route request contains some bits information like source, destination, lifespan of message and a sequence of number with a unique ID.

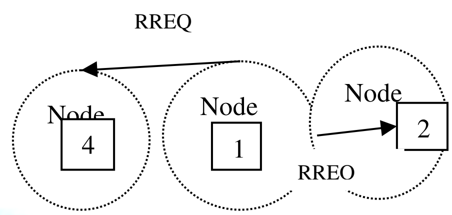

Fig 2 Route request in Network setup

As Shown in figure Node1 wishes to send a message to node3. The neighbors of node1 are node2 and node4. Node1 cannot directly communicate with node3, node1 sends out a RREQ. The RREQ is heard by node4 and node2.
When node1 neighbor receive the RREQ message they can either reply with a route reply message or rebroadcast the RREQ message to their own set of neighbors. They replay with RREP message if they are the destination or they know a route to the destination.

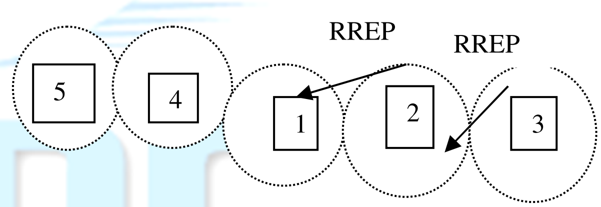

Fig 3 Node2 has a route to Node3

Figure 3 Shows the node2 has a route to node3 and replies to the RREQ by sending out a RREP. Node 4 on the other hand does not have a route to Node 3 so it rebroadcast the RREQ

Routing table entries of an AODV consists of
- Destination IP Address
- Destination sequence number
- Valid destination sequence number flag
- Other state and routing flags

- Network interface
- Hop count
- Next hop count
- List of precursors
- Life time.

3. Proposed System

In Proactive AODV we propose that all the nodes in the network will check the number of entries in its routing table before broadcasting a Route request packet. If the node x is Nx, then x will drop the message with certain probability P if Nx>θ, otherwise x will broadcast the message.

In case node x and node y are neighbors in a network. Upon receiving a RREQ message, node y computes the probability P using two parameters. A and B where A is the probability that node y shares a neighbor with node x and B is the scaling parameter. Each node in the network has a communication disc that is the circular area whose radius is equal to the distance upto which node's radio signal is functional. And assume that each node in the network topology has the same communication radius r.

As we know that in Proactive routing nodes maintain a table of routes to every destination in the network topology, for this reason they periodically exchange information. At all times the routes to all destinations are ready to use.

As we know that in Proactive routing scheme the routing information like next forwarding hop is maintained in back ground regardless of communication request. Control packets are sending and folded among all nodes, to maintain the path and link state between any pair of nodes even though some paths are never used. A table is then constructed within a node such that each entry in the table indicates the next hop node towards a certain destination. The main advantage of proactive or table-driven routing protocol is that there is no route discovery since route to the destination is maintained in the background and is always available upon look up.

The same method we followed in the PRO-AODV is that we taken the routing table information from AODV and as per Proactive routing scheme the table driven is maintained by all the nodes in the network, whatever information in the table or if any up-to-date changes in the network topology everything information is exchanged by all the nodes in the network.
As we mentioned in the network set up all nodes consists of Circular Communicating disc with same radius r, we can easily get the distance from one neighbor to another neighbor. In this PRO-AODV scheme we taken AODV routing table according to probabilistic the route information is maintained by all the nodes , so before sending information from source node to destination node all the information is periodically exchange with all node and route to all destination are ready to use all the time.

4. Simulation and Results

In this proposed system we are going to use NS2.35 software to run simulation and to compare the obtain graphs for AODV and PRO_AODV and we are also using SUMO, Simulation for Urban Mobility and MOVE is the software used for VANET's

In SUMO and the MOVE we are going to create realistic mobility model for VANET's. In our proposed system first we built one realistic mobility model and by using AODV protocol we broadcast data between source and destination. The routing information is used for PRO-AODV, according to probabilistic routing table is constructed and routing table is maintained by all the nodes in the network setup, according to route table data is broadcast between source and destination. After performing simulation we use parameters like Packet delivery ratio, Throughput and End-to-End delay to compare the performance of AODV and PRO-AODV.

For the experimental setup , we have to setup some parameters as shown in the Table 1 below

Table -1: Simulation Parameters

Parameters	Values
Simulator	NS2.35
Protocol	AODV, PRO-AODV
Antenna	Omni Antenna
Traffic Source	TCP,UDP
Application Agent	CBR
Mobility Model	Random Waypoint
Simulation area	1000*1000
Packet size	512
Channel	Wireless Channel
MAC	802.11
Number of Nodes	24

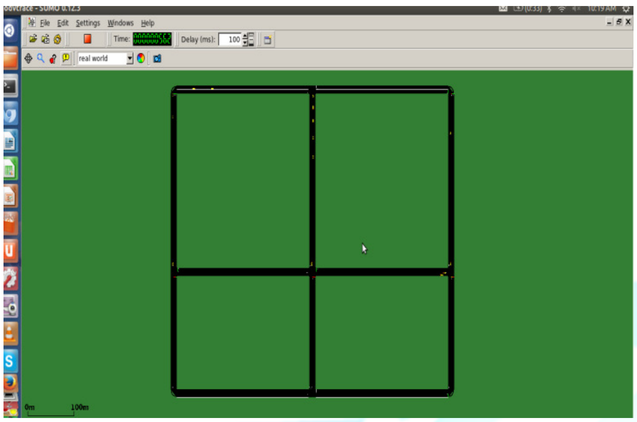

Fig 4 Realistic mobility Model for VANET's created using SUMO and MOVE

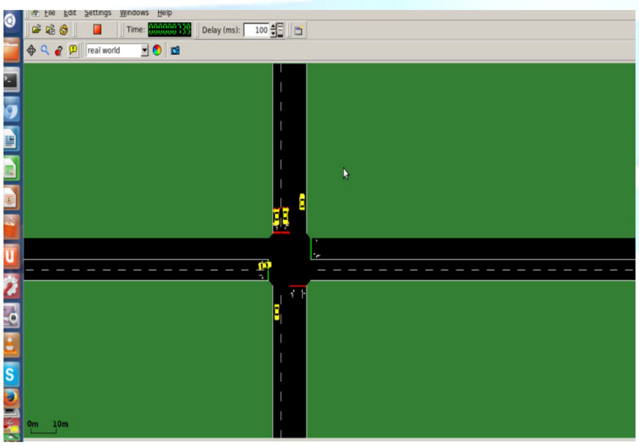

Fig. 5 Vehicles movement on road

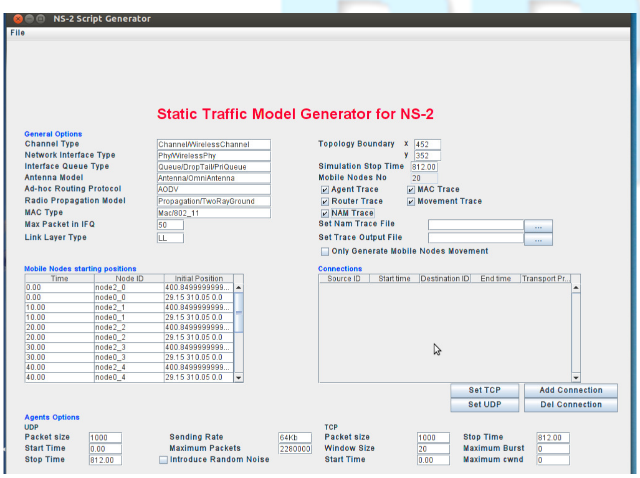

Fig. 6 Static Traffic Model Generator using NS2

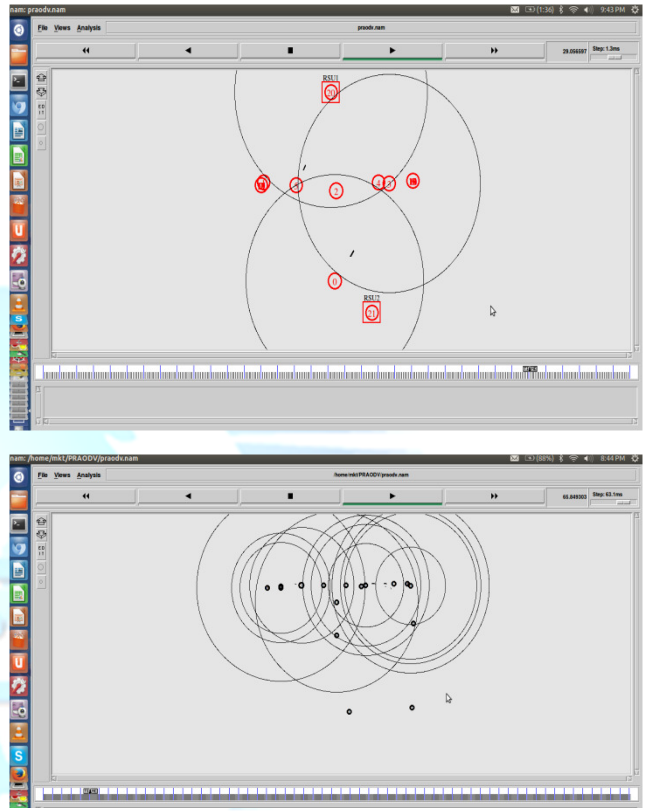

Fig 7 NAM results obtain from NS2

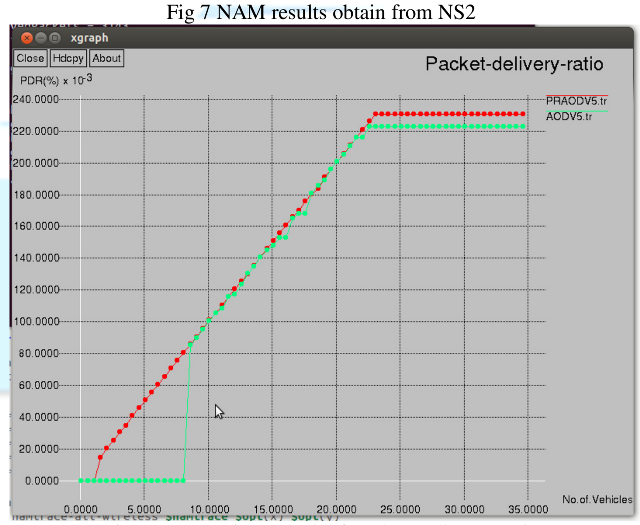

Fig. 8. Comparison graph of Packet Delivery Ratio

The Fig 8 Shows the Comparison graph of Packet Delivery Ratio, X-axis taken as No of Vehicles and Y-axis has taken Packet Delivery Ratio (%).Green Color line in graph shows AODV and Red color graph shows PRO-

AODV, by observing graph we can say that PRO-AODV provides more Packet Delivery Ratio (%).

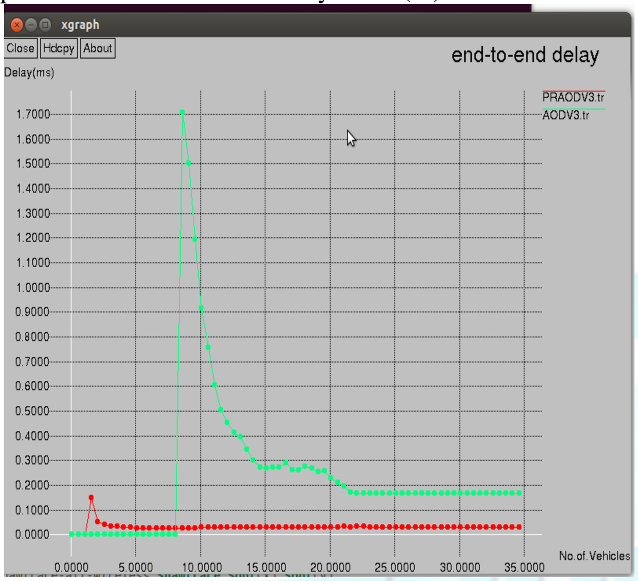

Fig. 9. Comparison graph of End to End Delay

The Fig 9 Shows the Comparison graph of End-to-End Delay, X-axis taken as No of Vehicles and Y-axis has taken End-to-End Delay. Green Color line in graph shows AODV end to end delay and Red Line graph shows PRO-AODV End-to-End Delay by comparing to graph lines we can say that AODV have more end-to-end delay.

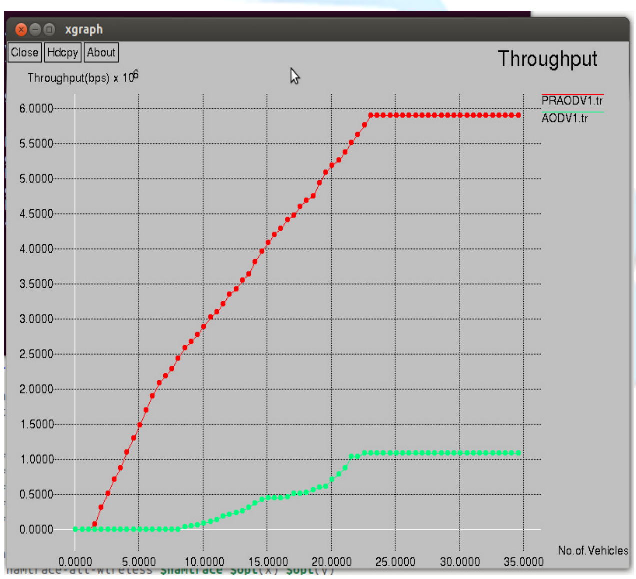

Fig. 10. Comparison graph from throughput

The Fig 10 Shows the Comparison graph of Throughput, X-axis taken as No of Vehicles and Y-axis has taken Throughput. Green Color line in graph shows the AODV and Red Line graph shows PRO-AODV by observing graph we can say PRO-AODV provides more Throughput.

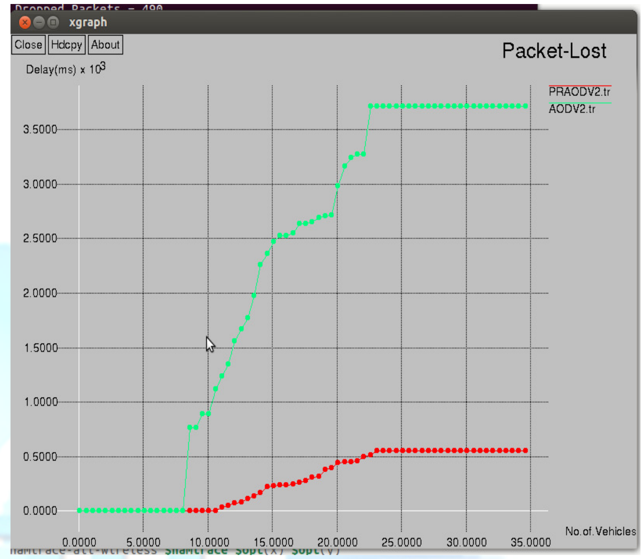

Fig 11 Comparison graph of Packet Lost

The Fig 11 Shows the Comparison graph of Packet Loss, X-axis taken as No of Vehicles and Y-axis has taken Delay. Graph Shows the Comparison for Peer to Peer system E2E graph and Infrastructure Based System E2E.Green Color line in graph shows AODV Packet lost and Red Line graph shows PRO-AODV packet lost by comparing to graph lines we can say that AODV have more packet lost.

```
GeneratedPackets = 3368
ReceivedPackets = 2410
Packet Delivery Ratio = 71.5558
Total Dropped Packets = 957
Average End-to-End Delay = 82.0059 ms
```

Fig 12 Results obtain for PRO-AODV

```
GeneratedPackets = 3634
ReceivedPackets = 3143
Packet Delivery Ratio = 86.4887
Total Dropped Packets = 490
Average End-to-End Delay = 116.793 ms
```

Fig. 13 Results obtain for AODV

5. Conclusions

The main objective of this paper is to improve the efficiency of data between vehicles. As we mentioned VANET's are highly dynamic due to high speed and mobility, they are moving in different direction with different speed and they have to follow some traffic rules. MANET's protocol cannot deal with such dynamicity of network nodes. AODV is particularly used for congestion control in VANET's by efficiently dealing with the AODV 'route request'. Proactive AODV; it is the protocol that uses the information from the AODV routing table to minimize the congestion in VANET's. In this technique it uses the routing table of AODV and all the information in the network topology will be shared by all the nodes, and as all the nodes know about neighbor nodes if source node wants to share information to destination node according to probabilistic source node hops shortest distance to send information. Since all information will be shared by all the nodes congestion will be controlled and in this technique there will be less delay because every time no needs to find the path to share information from source to destination. PRO-AODV is it does not require the execution of any additional logic, it is sufficient to know only the size of the routing table at each node.

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[5] IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 2, Issue 6, Dec-Jan, 2015 **ISSN: 2320 – 8791 (Impact Factor: 1.479)** **www.ijreat.org** Efficient Data Broadcasting Between Vehicles In VANET's Using DSDR

BIOGRAPHIES

Miss. M.Sumadhuri received Bachelor's Degree in Electronics and Communication Engineering from B.I.T Institute of Technology, Hindupur affiliated to JNTU, Anantapur, Andhra Pradesh and pursuing Master's Degree in Digital Systems and Computer Electronics at B.I.T Institute of Technology, Hindupur affiliated to JNTU Anantapur, Andhra Pradesh.

Miss. M.C.Mamatha received Bachelor's Degree in Electronics and Communication Engineering from Vijayanagara Engineering College, Bellary and Master's Degree in Power Electronics from St.Joseph Engineering College, Mangalore and pursuing PHD in wireless communication from VTU, Belgaum. She is working as Assistant Professor at B.I.T. Institute of Technology, Hindupur affiliated to JNTU Anantapur, Andhra Pradesh.

Mrs. Mamatha B.L. is currently working as an Assistant Professor in ECE department, BIT Institute of Technology, Hindupur, India. She received Bachelor's Degree in Electronics and Communication Engineering from VTU, Belgaum, Karnataka and she received Master's degree in Digital Systems and Computer Electronics from JNTUA, Anantapur. Her research areas are Wireless Networking, MANET's, VANET's and Embedded Systems.