IJCSE International Journal of Computer Sciences and Engineering Open Access
Review Paper Volume-4, Issue-7 E-ISSN: 2347-2693

Review of Various VANET Protocols Using NS-2 Simulator

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Available online at: www.ijcseonline.org

Received:11/Jun/2016 Revised: 22/Jun/2016 Accepted: 16/Jul/2016 Published: 31/Jul/2016

***Abstract*—** Vehicular Ad-Hoc Networks are growing field of research. In this network most promising task is provide safety or other application to driver and passenger. It became key component of transportation. In this paper different routing protocol like AODV, DSR and M-DART are studied. At the end of paper outcomes of these protocols are discussed.

***Keywords*—** AODV; VANET; DSR RREQ; RREP.; M-DART

I. INTRODUCTION

In this current scenario VANET has most important application in vehicle to vehicle communication, vehicle to roadside communication, traffic monitoring, trust management, traffic monitoring and last but not the least named data networking. As when the vehicle became capable to commune with other automobiles and rode side units, then there would be less probability of congestion. Every time when a vehicle moves it starts transmitting its packets all around. When surrounding vehicle come near in a fixed limit range then it would become easier another vehicle to guess the probability of congestion and it can change its path to another and more safe direction. When a vehicle starts transmitting the information it actually transmit the packets which contains some fields like source address, destination address, hope count and all the essential information. These packets are transmitted by a vehicle which is moving on the road and other vehicles which are moving simultaneously on the highway too. These vehicles receive the packets and save the copies of information in their cache. Whenever the information is needed the required information is provided to the vehicle and thus we can reduce the chances of collision. In this field of VANET many areas are presented for research purpose as trust management, named data networking, collision avoidance etc. For data forwarding in such a network two kinds of protocols are used- proactive and reactive.

A. Proactive Routing Protocols

In these protocols entries of connected nodes are contained in the table node to node between sender and receiver. DSDV (Destination-Sequenced Distance Vector), MDART (Multipath Dynamic Address), OLSR (Optimized Link State Routing) are the types of proactive protocols.

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B. Reactive Routing Protocols

These protocols are in demand routing protocols which establish route from source to destination. Route is established whenever a node wishes to send data to another node. AODV (Ad-hoc On-demand Distance Vector), DSR (Dynamic Source Routing), TORA (Temporally Ordered Routing Algorithm) are on demand routing protocols.

II. LTERATURE REVIEW

A. Ad-hoc On Demand Distance Vector Routing Protocol- AODV

As it seems to be very complex to maintain a table at every node, to overcome this drawback on demand service comes into existence in which tables and routes are created only when required for communication purpose. AODV [5] works on following steps- Route Discovery and Route Maintenance. For discovering routes AODV broadcasts RREQ to all its neighboring nodes, this RREQ packet contains a source and destination address and their sequence numbers, broadcast ID and a counter that counts how many times a specific node has been generated RREQ[7]. After broadcasting the RREQ to all neighbors that the sender node acquires RREP from its neighbors. If a node receives a multiple RREQ message from same broadcast ID then it discards repeated route requests are made loop free communication. AODV is less with TTL (Time To Live) field which has a timer with a fixed and larger value. When there is no reply received, then time increases a step towards the larger value till it gets the maximum value. In the following example node S is sender node and node D is destination node. RREQ packet is first broadcasted and the in fig (b) destination node D unicast the RREP packet. AODV does not work on shortest path algorithms, it always reply those packets who came first. Whoever node's request it gets first, it starts communicating to that node
RREQ packet Broadcasted from S node-

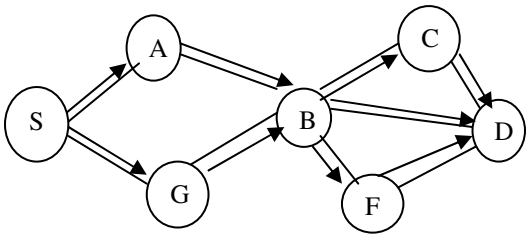


Fig 1: RREQ flood

RREP Packet is unicasted from destination node D to S node-

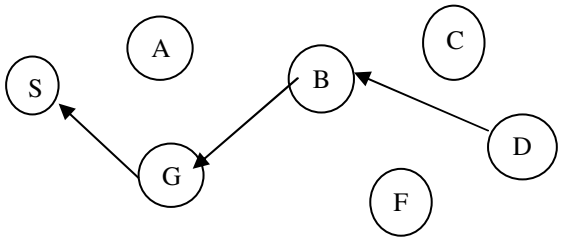


Fig 2: RREP reply

Routing tables are managed with destination sequence numbers. And those entries which are not being used since a long time are avoided. Here routing table of node S is shown below-

Destination Node	Next Node	No. of Hops	Sequence number
D	A	3	11
D	B	3	11

Table1: Routing Table of AODV protocol

In Route maintains those entries which are no more required for communication, are deleted from the table. And then a RREP is sent to all the neighboring nodes and make them aware about the unused and deleted nodes.

B. Dynamic Source Routing Protocol- DSR

It is an on demand or reactive protocol that decreases the amount of bandwidth consumed by control packets because it eliminates the need of periodic table update messages [6]. In this the sender node contains the complete information of nodes in its cache. Sender node keeps track of node to node route to destination. In route discovery phase if sender node wishes to transmit then only it checks the availability of unexpired routes. If such a route has been found, then sender node starts transmitting packets else searching process is continued. DSR uses Dijkshtra algorithms to find the shortest path among various routes. It always selects the shortest path to reply and to communicate with another node.

DSR Route Request-

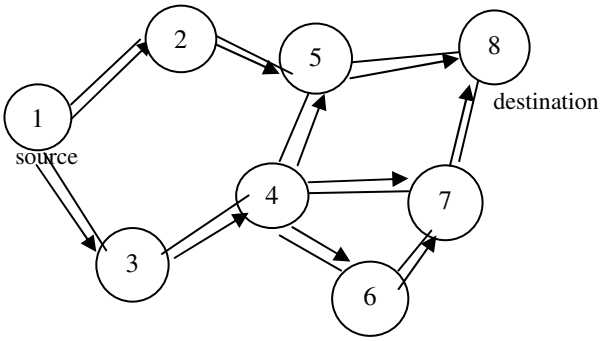


Fig 3: RREQ request

DSR Route Reply-

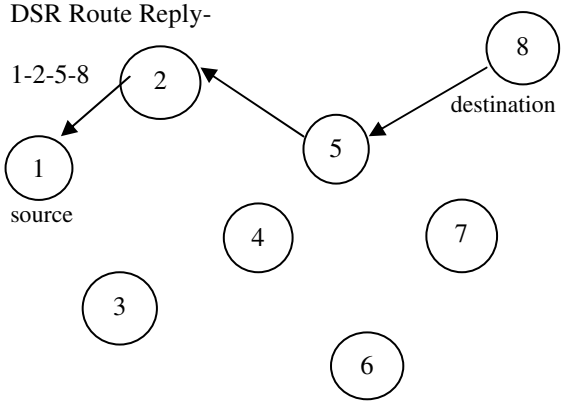


Fig 4: RREP DSR

Route maintenance mechanism works in case when topology has changed and the changed route is not required. To maintain the table from unused routes comes under route maintenance. Whenever any problem occur in transmission an error packet is sent

DSR Routing Table- node 1's routing table

Destination	**Next Node**	**Hop count**	**Sequence number**
8	2	2	14
8	3	3	14

Table2: DSR Routing Table

C. Multipath Dynamic Address Routing Protocol- MDART

This protocol is an extension of DART [8] protocol. DART protocol is based on shortest path scheme. It is a proactive multipath routing protocol. In this protocol the routing address of a node changes with node's movement because it is dynamic.

1) Address space

In this protocol a tree based structure is present of address spaces. This tree structure can be of complete binary tree type. Each node can have 0 or 2 children and all leaves are

at the same levels. In M-DART protocol all the nodes have a separate routing table and this routing table is present always as connections are available.

2) Route Discovery and Packet Forwarding

A routing table has been maintained at each node for keeping track of all the routes adjacent to that node. For providing a route to a packet, a node compares Most Significant Bit (MSB) [9] of both source and destination address. This protocol has multiple paths so it broadcasts packets to all its neighbors, then the nodes replies from any of the paths. It is not necessary that it would send data again by this same route. It can choose some another path to communicate with nodes between the source (S) and destination (D). In fig (5) sender node S is broadcasting packets to all the nodes. And Fig 6 shows multipath reply of packets from the destination node to the source node.

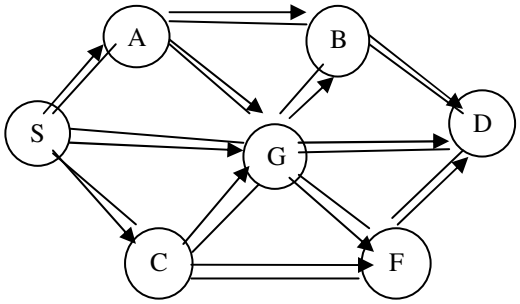


Fig 5: Broadcasting of packets

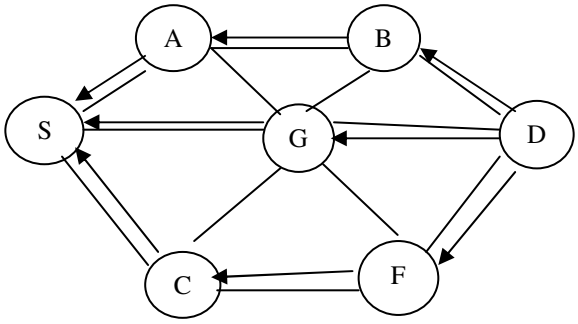


Fig 6: Reply of packets by different paths

VANET field has many major interesting projects as [1] for this a project named Network-On-Wheels (NOW) came into existence. But in the highly dynamic nature of vehicles it is a challenge for trust management. Another work was done [2] is about to proposing an NDN scheme by using geo-based location technique for data distribution. And as multiple numbers of vehicles forward their data so every time, many copies of cache are generated so here they have worked for reducing the redundancy too. Automotive collision avoidance is described [3]. As collision avoidance is getting prominence as traffic is increasing. The two methodologies named sensor based and ITS based are being used for this purpose. These systems provide vehicles to have a warning alarm for collision and avoidance system. But sometimes these systems can't provide reliable information to the driving system and provides inaccuracy in decision making [4]. As MANET protocols are failed to define specific needs of nodes in cities. So they have proposed an inter-vehicular routing protocol named GyTAR that chooses greedy strategy for collection of the nodes to reach to the target and then the packets are forwarded. AODV protocol is simulated in different scenarios [5]. AODV performance is analyzed by having various numbers of nodes like 4, 10 and 25 with parameters throughput, packet size, packet drops, delay etc. The implementation of DSR & DYMO protocols and analyzes their performances using PDR and good put matrices. As in its simulation results it is clearly shown that DYMO has better performance than DSR protocol [6]. AODV and DSR routing protocol performances on the basis of end to end delay parameters and throughput measurements [7]. Evaluation of table driven routing protocols with varying nodes, traffic load and pause time parameters [8]. These two protocols are MPOLSR and MDART. And the comparative study of unipath routing protocol AODV, AOMDV and MDART multipath routing protocols, is done [9]. Simulation parameters used are PDR, throughput, end to end delay and normalized routing overhead.

III. RESULTS

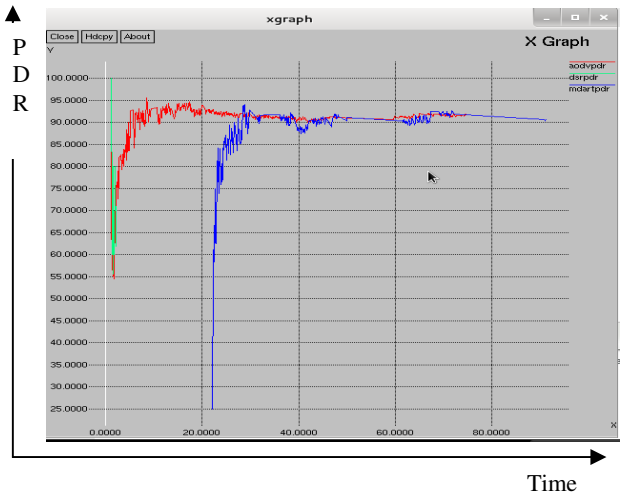
Simulation of protocols is done on ns-2.35.
Simulation table is shown below-

Parameter	Value
Number of node	50
Protocol	AODV, MDART, DSR
Simulation time	100
Mac	802_11
Prop	DropTail
Movement model	Randowaypoint
Antenna	2 ray gram
x	1000
y	1000

Table 3: Simulation Table

A. Packet Delivery Ratio

The graph 1 represents a PDR graph between base approach and the proposed approach. The packet delivery ratio of the proposed approach is better than the existing approach. Graph shows that the DSR protocol achieves increasing PDR at small amount of time and does not vary with respect to time.

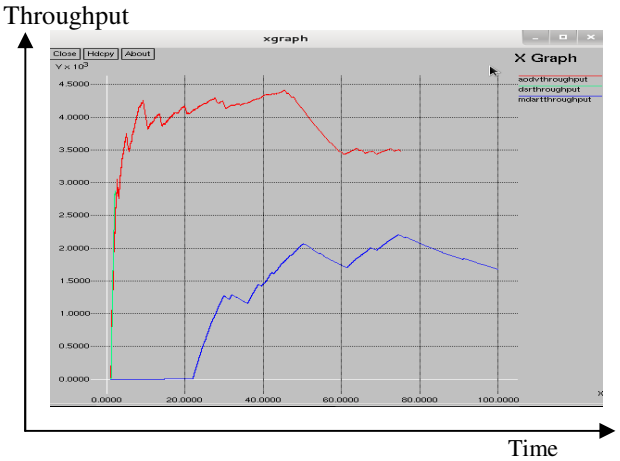


Graph-1: Comparison of AODV, DSR and M-DART protocols in terms of PDR

AODV gets highest in small time periods, but as time increases, it gets approximately same PDR while numbers of packets are transmitted and PDR in M-DART protocol increases as time varies and it achieves satisfactory PDR after some specific amount of time and does not get much change in the PDR after limited packet delivery.In the above graph of PDR comparison x- axis shows time and y-axis shows PDR parameters.

B. Throughput

The graph 2 represents a throughput graph among AODV, DSR and M-DART protocols. Y-axis denotes throughput and x-axis shows time variable. DSR achieves maximum throughput at starting time, whereas AODV achieves highest throughput among of DSR and M-DART protocols. M-DART protocol achieves satisfactory throughput, but less than DSR and M-DART.



Graph-2: Comparision of AODV, DSR and M-DART protocol in terms of Throughput

IV. CONCLUSION

Vehicular ad-hoc network is popular now a day there are lots of challenges in this network due its frequently change topology or highly movement of vehicles. In this paper three protocols named DSR, AODV and M-DART is studied and simulation of these protocols in a high speed environment is done. After simulating, results are extracted in the form of packet delivery ratio or throughput, on the basis of result it is concluded that M-DART performs better in terms of PDR as it gets maximum value of PDR among DSR and AODV. And in terms of throughput AODV performs better.

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