ISSN:0975-9646

Performance Analysis of DSDV, DSR Routing Protocols in Vehicular Ad-Hoc Network(Vanets)

V.Anji Reddy[1], P.Siva Prasuna[2], Rittika.D.Varu[3], P.Nikhila[4], N.SriLakshmi[5]

Lendi Institute of Engineering & Technology, Jonnada (v), Vizianagaram, A.P.

Abstract: VANET has played a very important role in safety issues on roads. A VANET is an ephemeral, rapidly changing wireless network formed among vehicles and roadside units which are able to communicate with one another. In a VANET, vehicles must be equipped with wireless transceivers and computerized control modules that allow them to act as a network node. Many of us work today on networks and most of us didn't have a chance to work in the network design. What if we got the chance to work on the designing part than which protocol will you choose to implement on the network. So, in this condition we have to choose correct routing protocol. The theme of our paper is "Analysis of Routing Protocols i.e., DSR (Dynamic Source Routing) and DSDV (Destination Sequence Distance Vector) in VANET" is that we can calculate different types of performance metrics such as Throughput, End-To-End Delay. By calculating such type of performance we can estimate which Vanets protocol is better by comparing the same metric in all the routing protocols. Conclusion was reached about which protocol works better in different scenarios.

Keyword: Vehicular Ad Hoc Networks (VANET), Routing Protocols DSR and DSDV.

1. INTRODUCTION

Vehicle to vehicle communication are an emerging type of networks in which vehicles use a dynamic exchange of data between nearby vehicles providing each other with information such as safety warnings and traffic information. Vehicles are equipped with sensing, computing and wireless devices, so as to communicate to road-side infrastructure(V2I) and other vehicles(V2V). A VANET uses cars as mobile nodes in a MANET to create a mobile network [1]. Vehicle connected to one and other through an ad hoc form a wireless network called "Vehicular Ad Hoc Network".

Vehicular Ad-hoc networks are known as inter vehicle communication (IVC), Dedicated Short Range Communication (DSRC) or WAVE. The theme of these projects is to create new network algorithms or modify the existing for use in a vehicular environment. To improve traffic and safety efficiency in vehicles, significant research efforts have been [2] made to integrate computing and communication technologies into vehicles, which has resulted in the development of intelligent transportation systems. Thus, Vehicular ad hoc networks will assist the drivers of vehicles and help to make safer roads by reducing the number of automobile accidents [3].

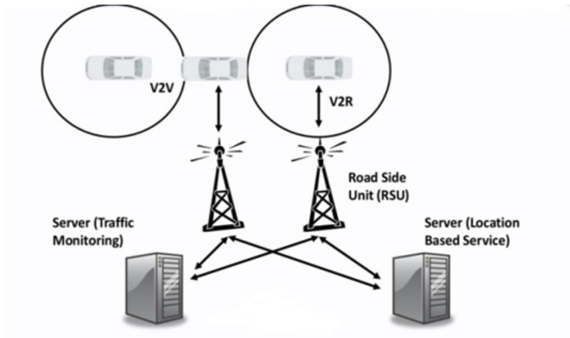

Fig 1.1. VANET Architecture

Characteristics of Vanet:

Many different and sometimes competing design goals have to be taken into account for VANETs to ensure their commercial success. When equipped with WAVE (Wireless Access for Vehicular Environment, a novel type of wireless access dedicated to vehicle-to-vehicle and vehicle-to-roadside communications), in Figure 1 it forms a highly dynamic network. Although, some characteristics of VANETs resembles with the characteristics of MANETs but there are specific features which can be categorized as follows:

Highly dynamic topology: The high speed of the vehicles along with the availability of choices of multiple paths defines the dynamic topology of VANETs.

Frequent disconnected network: The high speed of the vehicles in one way defines the dynamic topology whereas on the other hand necessitates the frequent requirements of the roadside unit lack of which results a frequent disconnections.

Mobility modeling and Prediction: The prediction of vehicle position and their movements is very difficult. This features of mobility modeling and prediction in VANETs is based on the availability of predefined roadmaps models. The speed of the vehicles is again an important for efficient network design.

Communication Environment: Once we are having a mobility model, yet we are not done. As the mobility model may have different features depending upon road architecture, highways, or city environments. Communicating in these situations has to be taken care.

Hard delay constraints: At the time of emergency, delivery of messages on time is a critical problem. Therefore, handle such situations rather talking only about high data rates in not sufficient.

Interaction with onboard sensors: Sensors are the mode of communications. Sensors can read data related to velocity of the vehicle, direction and can communicate to the data center. Thus sensors can be used in link formation and in routing protocols.

Unlimited Battery Power and Storage:
Nodes in VANETs do not suffer power and storage limitation as in sensor networks; therefore optimizing duty cycle is not as relevant as in sensor networks.

2. ROUTING PROTOCOLS

A **routing protocol** specified show routers communicate with each other, information that makes them to select routes between any of the two nodes on a network. Routing protocols determine the specific route to be chosen. Each router has information only of networks attached to it directly. A routing protocol will pass this information among immediate neighbors first, and then throughout the network. There are many ways to classify the VANET routing protocols, depending on how the protocols handle the packet to deliver from source to destination. But Routing protocols are broadly classified into three types:

- Table driven (proactive) routing protocol.
- On – demand (reactive) routing protocol.

6.5.1 Table driven (Proactive) routing protocol:
The table-driven approach is similar to the connectionless approach of forwarding data packets, with no regard to when and how frequently such routes are desired. It relies on an underlying routing table update mechanism that involves the constant propagation of routing information. Here, a route to every other node in ad hoc network is always available, regardless of whether or not it is needed. Table 6.1 represents proactive protocols which are result of enhancement from their predecessor protocols. The various table driven ad hoc routing protocols are as follows: -

- Destination Sequenced Distance Vector (DSDV).
- Fisheye state routing.

On-demand (Reactive) routing protocol:
These protocols try to eliminate the conventional routing tables and consequently reduce the need for updating these tables to track changes in the network topology. In the On-Demand approach, when a node desires a route to a new destination, it will have to wait until such a route can be discovered i.e. routes are discovered whenever a source node have packets to send and maintain it until either the route is no longer desired or it becomes inaccessible, and finally remove it by route deletion procedure. Table 6.2 represents reactive protocols which are result of enhancement from their predecessor protocols. The various on demand driven unicast based routing protocols are as follows:

- Ad Hoc On Demand Distance Vector Routing (AODV)
- Dynamic Source Routing (DSR)

We have chosen two routing protocols each from proactive and reactive naming as below:

- DSR (Dynamic Source Routing).
- DSDV (Destination Sequenced Distance Vector).

Dynamic Source Routing:
The Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. DSR helps to maintain the source routing, in which, every neighbor in DSR maintains the entire network route from source to the destination [4]. The DSR protocol allows nodes to discover a source route across multiple network hops to any destination in the ad hoc network. Each data packet carries its header, list of nodes through which the packet must pass and avoiding the need for updating routing information in the intermediate nodes through which the packet is forwarded. To send a packet, a source node first consults its route cache. If there is an unexpired route, use it. Otherwise, initiate a route discovery.

Route Discovery: Source node launches a RREQ (ROUTE_REQUEST) by flooding. A RREP(ROUTE_REPLY) is generated when
The route request reaches the destination. An intermediate node has an unexpired route to the destination.

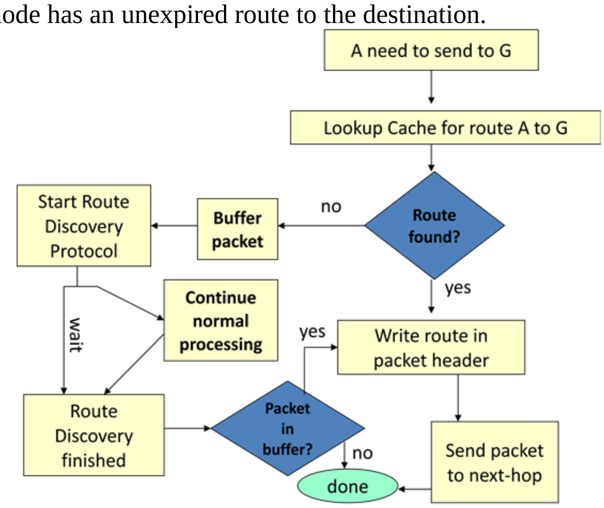

Fig 2.1 Route Discovery

Route Maintenance: When a node detects a link breakage, it generates a RERR (ROUTE_ERROR) packet. The packet traverses to the source in the backward direction. The source removes all contaminated routes, and if necessary, initiates another RREQ.

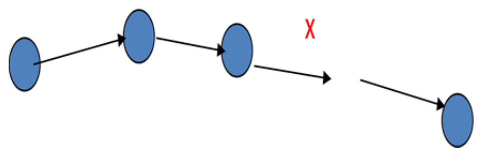

Fig 2.2 Route Maintenance

Advantages:
In a reactive (on-demand) approach such as this, a route is established only when it is required and hence the need to find routes to all other nodes in the network as required by the table-driven approach is eliminated.

Disadvantages:
Route maintenance mechanism does not locally repair a broken link.
Route cache information could also result in inconsistencies during the route reconstruction phase.

Destination Sequenced Distance Vector (DSDV):

It is a proactive routing protocol in which every node maintains a table of information in the presence of every other node in the network [5], the cost metric towards each destination and a sequence number that is created by the destination itself. This table will update route information. A node transmits routing table periodically or when significant new information is available about some route. Whenever a node wants to send packet, it uses the routing table stored locally. For each destination, a node knows which of its neighbor leads to the shortest path to the destination [6].

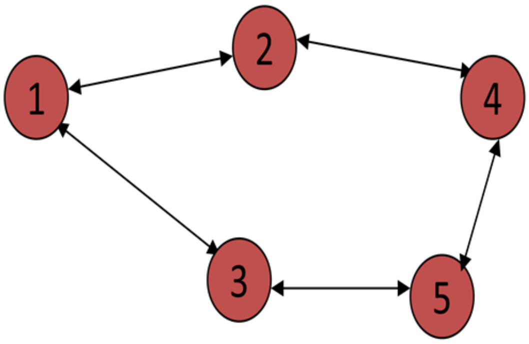

Fig 2.3 DSDV Routing Protocol

We consider only the number of hops as the cost for sending a message from a source to a destination. Suppose node 1 wants to send a message to node 5. Since the shortest path between 1 and 5 passes through 3, 1 will send the message to 3.

Advantages:

- DSDV is an efficient protocol for route discovery. Whenever a route to a new destination is required, it already exists at the source.
- Latency for route discovery is very low.

Disadvantages:

- DSDV needs to send a lot of control messages. These messages are important for maintaining the network topology at each node.
- It generates high volume of traffic for high-density.

3. Performance Metrics

Throughput:

The rate of successful message delivery over a communication channel. The data these messages belong to may be delivered over a physical or logical link or it can pass through a certain network nodes. Throughput is usually measured in bits per seconds (bit/s or bps), and sometimes in data packets per second (p/s or bps) or data packets per time slots.

End-to-End Delay:

The End-To-End delay calculates the duration of a packet. The notation for the End-To-End delay is End Time – Start Time.

4. Simulator And Mobility Model

NS2:

NS (network **simulator**) is a name for series of discrete event network simulators. The process of creation of a network simulator that contains a sufficient number of high-quality which is tested and maintained models requires a lot of work. It is an event driven packet level network simulator developed as part of the VINT project (Virtual Internet Testbed). Version 1 was developed in 1995 and version 2 released in 1996. In version 2 is a scripting language called Object-oriented Tcl (OTcl) which is an open source software package available for both Windows and Linux platforms. The result of an on-going effort of research and development that is administrated by researchers at Berkeley. It is an event simulator targeted at networking research. NS-2 has many and expanding uses including:

- We can evaluate the performance of existing network protocols.
- We can evaluate new network protocols before use.
- It is not possible to run large scale experiments in real experiments.
- To simulate a variety of IP networks.

Vanet Mobisim:

VanetMobiSim, a generator of realistic vehicular movement traces for telecommunication networks simulators. VanetMobiSim is an extension to CanuMobiSim. CanuMobiSim provides efficient, easily extensible mobility architecture. But, it suffers from a reduced level of detail in specific scenarios. Hence VanetMobiSim is aimed at extending the vehicular mobility support of CanuMobiSim to a higher degree of realism. In the following, for reasons of space, we are only listing the original additions introduced by VanetMobiSim, but it is to note that the complete tool integrates all of the CanuMobiSim features, providing a very wide set of possibilities in simulating vehicular mobility [7].

5. Simulation Parameters

The configuration parameters assumed for simulation in the following table i.e.

Table1: simulation parameters

simulator	Ns-2.34
Antenna Model	Antenna/Omini Antenna
RadioPropagation Model	Nakagami
Mac Type	IEEE 802.11P
Interface Queue Type	Queue/DropTail/PriQueue
Routing Protocols	DSR,DSDV
Number of vehicles	20,40,60,80
Network interface type	Phy/wireless phy

6. Result And Analysis

In order to evaluate performance metrics for each case different simulations are carried out and then average value is used for plotting graphs. We see that the data packets that were successfully delivered at destinations by the number data packets that were sent by sources for the different routing protocols.

Graph:

Throughput:

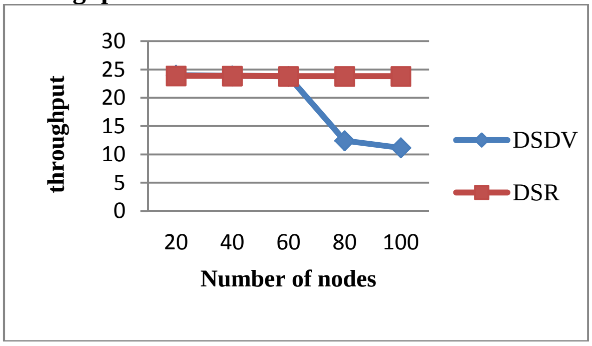

Fig 6.1 Throughput vs. no of nodes

End-To-End Delay:

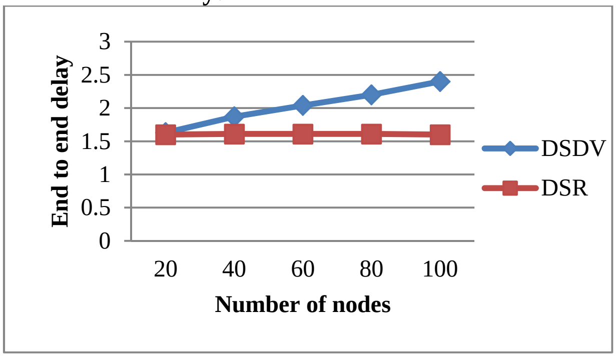

Fig 6.2 End-to-end delay vs. no of nodes

7. CONCLUSION

The main goal of this paper is to analysis the various routing protocols and to evaluate these routing protocols with different parameter in VANET. In this paper we use VanetMobisim and NS2 to simulate DSDV and DSR routing protocols with realistic mobility model. From the results, we analyzed that the DSR preferable for end-to-end delay as compare to DSDV.As number of nodes increases throughput of DSR increases compare to DSDV.

REFERENCES:

[1] wikipedia.org/wiki/Vehicular_ad_hoc_network

[2] Panos Papadimitrators and Jean Pierre Hubaux, “Secure Vehicular Communications: Results and Challenges Ahead”, ACM SIGMOBILE, 2008.

[3]Nathan Balo,”Introduction to Vehicular Ad Hoc Networks and the Broadcast Storm Problem”.

[4] D. Johnson, D. A. Maltz, Y.-C. Hu, “The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)"}, IETF Internet Draft, work in progress, draft-ietf-manet-dsr-09.txt, April 2003.

[5] Dharmendra Sutariya, Shrikant Pradhan, “Evaluation of Routing Protocols for Vanets in City Scenarios” 978-1-4577 IEEE, 2011.

[6] Comparative Study of AODV, DSDV and DSR Routing Protocols in Vehicular Network Using EstiNet Simulator [Monika, Sanjay Batish and Amardeep Dhiman]

[7]J.H¨arri, F.Filali, C.Bonnet, Marco Fiore “VanetMobiSim: Generating Realistic Mobility Patterns for VANETs”