© 2018 IJSRSET | Volume 4 | Issue 10 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Comparative Study of Routing Protocol in VANET

Narayan Singh Thakre[1], Sameeksha Verma[2], Amit Chouksey[3]

[1]Department of Electronics and Communication, RGPV, Gyan Ganga College of Technology, Jabalpur, Madhya Pradesh, India

[2]Department of Electronics and Communication, RGPV, Annie Institute of Technology Research Center, Chhindwara, Madhya Pradesh, India

[3]Department of Electronics and Communication, RGPV, Gyan Ganga College of Technology, Jabalpur, Madhya Pradesh, India

ABSTRACT

Today the world is moving towards wireless system. In Wireless networks, the users want wireless connectivity irrespective of their geographic position and are gaining popularity to its peak today. In the coming years, VANET networks are very likely to be deployed and thus become the most suitable form of mobile ad hoc networks. It provides wireless communication among vehicles and vehicle-to-road side equipment. The performance of communication depends on the better routing takes place in the network. Routing of data depends on the routing protocols being used in network. In this article, we investigated about different routing protocols for VANET. The main aim of our study was to identify which routing method has better performance in highly mobile environment of VANET. The thesis works is based on comparison between Ad hoc on demand Distance Vector routing protocol (AODV), Modified Ad hoc on demand distance vector routing (MAODV) and Destination sequenced distance vector routing (DSDV) in VANET on the basis of energy and throughout. The tool which we used for the work of performance is Network Simulator 2 (NS-2).

Keywords : WSN, MANET, VANET, Routing Protocols

I. INTRODUCTION

Vehicular ad hoc networks (VANETs) have gained popularity in recent years. Traffic accidents, road congestion, fuel consumption, and environmental pollution due to the large number of vehicles have become serious global issues. Traffic incidents are persistent problems in both developed and developing countries, which result in huge loss of life and property. In order to overcome these issues and make the journey safer, we could think of brake warning sent from preceding car and collision warning, information about road condition and maintenance, detailed regional weather forecast, a warning of traffic jams, detailed information about an accident for the rescue team and many other things. These types of safety applications require low latency and high reliability.

Vehicular ad hoc network (VANET) is used to provide an efficient Traffic Information System (TIS). According to the National Highway Traffic Safety Administration (NHTSA), vehicle-to-vehicle (V2V) has a high lifesaving potential that address approximately 80 percent of multi-vehicle crashes. VANET is a subclass of Mobile Ad-hoc Network (MANET) which consists of number of nodes (vehicles) communicating with each other without a fixed infrastructure. However, compared to MANET, due to high mobility of vehicles, VANET has an extremely dynamic topology.

In 1999, the Federal communications commission of the United States allocated 75 MHz of bandwidth in the 5.9 GHz band for the new generation of a nationwide VANET. This wireless spectrum is commonly known as the dedicated short range communication (DSRC) spectrum, which has been used for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. In august 2006, the European Telecommunications standards institute has also allocated 30 MHz of spectrum in the 5.8 GHz band for ITS.

II. METHODS AND METARIAL

VANET is a particular type of MANET, in which vehicles act as nodes. Contrary to MANET, vehicles move on predefined roads, vehicles velocity depends on the speed signs and in addition these vehicles also have to follow traffic signs and traffic signals [3]. There are many challenges in VANET that are needed to be solved in order to provide reliable services. Stable and reliable routing in VANET is one of the major issues.

VANET has some special characteristics that distinguish it from other mobile ad hoc networks; the most important characteristics that differentiate VANET from MANET are high mobility, self-organization, distributed communication, road pattern restrictions, no restriction of network size and causing frequent links disconnections. All these challenges made VANETs environment a very challenging task for developing efficient routing protocols.

Several routing protocols have been developed to make routing more efficient and reliable in VANET. These routing protocols are classified into category based on following: topology-based routing, position-based routing, cluster based routing, geo cast-routing and broadcast-routing as shown in Figure1. These protocols are characterized on the basis of area / application where they are most suitable.

1. Topology based routing protocol

Several MANET routing protocols have used topology based routing approach. Topology based routing protocols is based on links information within the network to send the data packets from source to destination. These routing protocols use links information that exists in the network to perform packet forwarding. They are further classified into three groups.

- Proactive routing
- Reactive routing
- Hybrid routing

2. Proactive routing protocols

Proactive routing protocols are mostly based on shortest path algorithms. They keep information of all connected nodes in form of tables because these protocols are table based. Furthermore, these tables are also shared with their neighbors. Whenever any change occurs in network topology, every node updates its routing table. The strategies implemented in proactive algorithms are distance-vector routing such as DSDV and link-state routing such as OLSR. Destination-Sequenced Distance-Vector Routing (DSDV) based on the Bellman–Ford algorithm, which is a table-driven routing scheme for ad-hoc mobile networks. The main contribution of the algorithm was to solve the routing loop problem, increases the convergence speed, and minimizes overhead of the control message. In DSDV, all the nodes sustain a next-hop information table and are exchanged table's information with their neighbors. Each routing table contains a sequence number, the sequence numbers are generally even number if a link is present. Further, an odd number is used. The number is generated by the destination, and the emitter needs to send out the next update with this number. The DSDV provides a loop-free single path to the destination and sends two types of packets: full dump and incremental. In full dump packets, all the routing information is sent, whereas in the incremental type, only updates are sent. This function decreases bandwidth utilization by sending only updates instead of complete routing information. The incremental packet still increases the overhead in the network because the packets are so frequent and are therefore unsuitable for large-scale networks.

Optimized link state routing (OLSR) includes of well-known unicast routing protocols adapted to VANETs which does periodic flooding of control information using special nodes that act as Multi Point Relays (MPRs). OLSR maintains routing information by sending link state information. After each change in the topology every node sends updates to selective nodes. Thus, every node in the network receives updates only once. Unselected packets cannot retransmit updates; they can only read updated information.

The advantage of proactive routing protocol is that there is no route discovery since the destination route is stored in the background, but the disadvantage of this protocol is that it provides low latency for real time application. A table is constructed and maintained within a node. So that, each entry in the table indicates the next hop node towards a certain destination. It also leads to the maintenance of unused data paths, which causes the reduction in the available bandwidth. The various types of proactive routing protocols are: LSR, FSR.

3. Reactive routing protocols

Reactive routing opens the route only when it is necessary for a node to communicate with each other. It maintains only the routes that are currently in use; as a result it reduces the burden in the network. Reactive routing protocols are also known as on-demand driven, they regularly renew the routing table. It was designed in such a manner to overcome the overhead that was created by proactive routing protocols. However, reactive protocols use a flooding method for route discovery that initiates more routing overhead and also suffer from the initial route discovery process. Many reactive protocols have been proposed so far but in this section we briefly described about AODV and DSR.

Ad Hoc On-Demand Distance Vector (AODV) algorithm enables dynamic, self-starting, multi hop routing between participating mobile nodes wishing to establish and maintain an ad hoc network. AODV functions on demand basis when it is required by network, which is fulfilled by nodes within the network. Route discovery and route maintenance is also carried out on demand basis even if only two nodes need to communicate with each other. AODV reduces the need of nodes in order to always remain active and to continuously update routing information at each node. In other words, AODV maintains and discovers routes only when there is a need of communication among different nodes.

Dynamic source routing protocol (DSR) is an on-demand, whereby all the routing information is maintained at mobile nodes. DSR enables the network to be completely self-organizing and self-configuring, without any existing network infrastructure or administration. This protocol is composed of two operations

1. Route Discovery and
2. Route Maintenance.

In route discovery DSR discovers for the routes from source to destination. In DSR, data packets stored the routing information of all intermediate nodes in its header to reach at a particular destination. Routing information for every source node can be change at any time in the network and DSR updates it after each change occurs. Intermediate routers don´t need to have routing information to route the passing traffic, but they save routing information for their future use.

4. Hybrid routing protocols

Hybrid routing combines characteristics of both proactive and reactive routing protocols to make routing more scalable and efficient. Mostly hybrid routing protocols are zone based; it means the number of nodes are divided into different zones to make route discovery and maintenance more reliable. ZRP (zone routing protocol) uses Intra-zone and Inter-zone routing to provide flexible route discovery and route maintenance in the multiple ad hoc environments. Inter-zone routing performs route discovery through reactive routing protocol globally while intra-zone routing based on proactive routing in order to maintain route information within its own routing range. The overall characteristics of ZRP is that it reduces the network overhead that is caused by proactive routing and it also handles the network delay that is caused by reactive routing protocol. The drawback of ZRP is that it is not designed for the nodes that are highly dynamic and rapid change in topology such as VANET. In other words we can say that routing protocol is specifically designed for such network size is depending on limited number of nodes.

III. RESULTS AND DISCUSSION

1. **Residual Energy:** It is the remaining energy in the network when the communication is completed between the nodes in the network. Figure shows the Residual Energy under varying mobility of nodes i.e. 15, 25, 35, 45 nodes under of AODV, DSDV and MAODV.

TABLE 2: ENERGY

ENERGY	AODV	DSDV	MAODV
15 NODES	76.426	76.9502	76.442
25 NODES	76.18	76.8132	76.435
35 NODES	76.218	77.0171	76.428
45 NODES	76.423	76.9274	76.472

Figure shows the residual energy under varying mobility of nodes i.e. 15, 25, 35, 45 nodes under AODV, DSDV and MAODV routing protocol.

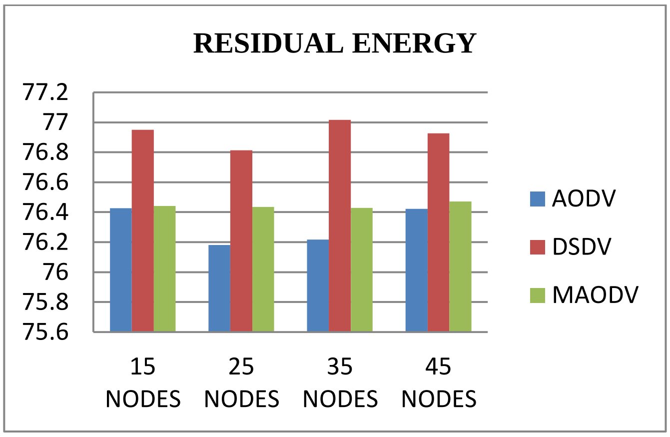

Figure 1: Residual Energy

2. **Throughput:** There are two representations of throughput; one is the amount of data transferred over the period of time expressed in kilobits per second (Kbps). The other is the packet delivery percentage obtained from a ratio of the number of data packets sent and the number of data packets received. Figure shows the Overall Throughput in Kbps under varying mobility of nodes i.e. 15, 25, 35 and 45 nodes under of AODV, DSDV and MAODV Protocols.

TABLE 2 : THROUGHPUT

THROUGHPUT	AODV	DSDV	MOADV
15 NODES	711.98	696.98	726.49
25 NODES	711.9	695.8	723.38
35 NODES	710.4	695.62	723.65
45 NODES	711.65	693.42	722.11

Figure shows the overall throughput in Kbps under varying mobility of nodes i.e. 15, 25, 35 and 45 nodes under of AODV, DSDV and MOADV.

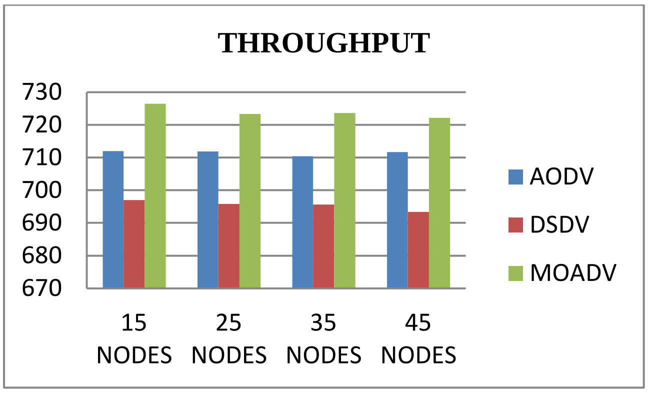

Figure 2: Throughput

IV. CONCLUSION

This paper revels the performance analysis of proactive and reactive routing protocols such as DSDV, AODV and MAODV respectively. The approach based on the simulation of fundamental yet major parameters such as residual energy and throughput on varying number of nodes, MAODV result in successful information. The simulation result shows that in MAODV routing protocol the energy remains constant and the value of throughput is giving the better performance on increasing the number of vehicles, which makes use of MAODV routing protocol is suitable for VANET.

V. REFERENCE

1. Schoch, E. Ulm Univ., Ulm Kargl, F.Weber,M. Leinmuller, T. "Communication patterns in VANETs" Volume: 46 , Issue: 11 Page(s): 119-125,Dated on Nover 2008.
2. 3. Saleet, H. Dept. of Syst. Design Eng., Univ. of Waterloo, Waterloo, ON, CanadaBasir, O., Langar, R.,Boutaba, R."Region-BasedLocation-Service-Management Protocol for VANETs" Volume: 59, Issue: 2 Page(s): 917- 931,Date on Feb. 2010.
3. 4. Tin-Yu Wu, Wei-Tsong Lee, Chih-Heng Ke "A Novel Geographic Routing Strategy over VANET" Page(s): 873- 879.
4. Suriyapaibonwattana, K. Fac. of Inf. Technol., King Mongkut's Inst. of Technol. Ladkrabang, Bangkok Pomavalai, C. "An Effective Safety Alert Broadcast Algorithm for VANET" Page(s): 247- 250 Dated on 21-23 Oct. 2008.
5. 6. Abedi, O. Iran Univ. of Sci. & Technol., Tehran Fathy, M. ; Taghiloo, J. "Enhancing AODV routing protocol using mobility parameters in VANET" Page(s): 229- 235,Dated on March 31 2008-April 4 2008.
6. 7. Abedi, O. Comput. Eng. Dept., Iran Univ. of Sci. & Technol. (IUST), Tehran, Iran Berangi, R. ; Azgomi, M.A. "Improving Route Stability and Overhead on AODV Routing Protocol and Make it Usable for VANET" Page(s): 464- 467.
7. 8. Manvi, S.S. Dept. of Inf. Sci. Eng., REVA Inst. of Technol. & Manage., Bangalore, India Kakkasageri, M.S. ; Mahapurush, C.V. ," Performance Analysis of AODV, DSR, and Swarm Intelligence Routing Protocols In Vehicular Ad Hoc Network Environment", Page(s): 21- 25
8. 9. Juan Angel Ferreiro-Lage ,Cristina Pereiro Gestoso, Oscar Rubiños Fernando Aguado Agelet,"Analysis of Unicast Routing Protocols for VANETs", Dated on April 20-April 25.
9. http://en.wikipedia.org/wiki/List_of_ad_hoc_routing_protocols.
10. http://en.wikipedia.org/wiki/Wireless_ad_hoc_network.
11. http://en.wikipedia.org/wiki/Mobile_ad-hoc_networks.
12. http://en.wikipedia.org/wiki/VANET.
13. http://www.ehow.com/list_6670042_vanet-routing-protocols.html.
14. http://en.wikipedia.org/wiki/AODV.
15. http://en.wikipedia.org/wiki/DSDV.