Efficient of OLSR Proactive Topology based Routing Protocol in VANET

Krunal M. Makwana[1] Hitesh C. Patel[2]
[1]P.G. Student [2]Assistant Professor
[1,2]Department of Information Technology
[1,2]Kalol Institute of Technology and Research Center Kalol, India

Abstract— Vehicular Ad Hoc Network (VANET) is an emerging new technology. It has to serves a wide range of applications under different scenario. It establishes wireless connections between vehicles. It is beneficial in providing safety to the road users and comfort to the passengers. With the increase in motorization, urbanization and population growth, road accidents are also increasing at a very fast rate.The reasons behind these accidents are lack of earlier knowledge about traffic congestion, road condition, lane changing, etc. All these problems can be solved with VANET. Routing protocols and other techniques must be adapted to vehicular specific capabilities and requirements. A variety of research has been done on routing and several protocols have been proposed with their implementation. We are interested to evaluate efficiency of OLSR is based on the link state algorithm and it is proactive in nature. It employs periodic exchange of messages to maintain topology information of the network at each node. This paper presents the Efficient OLSR algorithm which is based on OLSR routing protocol with some changed in MPR technology.

Key words: VANET, Routing Protocol, OLSR, MPR

I. INTRODUCTION

VANET stand for Vehicular Ad-hoc Network which is a new technology that has emerged during recent years with a view to increase road safety and comfort of road users. This alarming situation has evolved a need of new technology for road safety of passengers known as VANET.

The concept of VANET is straightforward it takes the widely adopted and inexpensive wireless local area network (WLAN) technology which connects notebook computers to each other and the Internet.The networks formed in VANET are self-organizing, self-configuring and the vehicles are equipped with On Board Units (OBUs) that helps to form a wireless network that helps vehicles to communicate and exchange of information during their movement on roads. The other applications of VANET are convenience applications for the comfort of passengers such as parking space availability, weather updates, nearby gas station or restaurant and free route discovery; and commercial applications like downloading music, toll-payment, web access, advertisement, etc.

Rest of the paper is arranged as follows: In section II Literature Review, In section III Routing Protocols, In section IV Proposed Concept, In section V Simulation Results and Analysis, In section VI Concludes the paper and last Contains References.

II. LITERATURE REVIEW

A. Performance Evaluation of AODV and OLSR in Highly Fading Vehicular Ad hoc Network Environments

In This Paper, AODV and OLSR routing protocols evaluated under one radio channel called nakagami fading model using NS-2 and check the performance of it.which is show that the classes of its respective types for example, whether it is proactive or reactive.

B. Performance Comparison of AODV and OLSR in VANETs Urban Environments under Realistic Mobility Patterns

This paper evaluated the performance of AODV and OLSR under the realistic urban scenarios. It study these protocols with different metrics such as called node mobility and vehicle density. Paper show that the effects of clustering created by cars which is aggregating and made some impacts on the evaluation and performance metrics and the Result shows that the OLSR has better performance than AODV.

C. Intelligent OLSR Routing Protocol Optimization for VANET

In VANET, there are the coverage of WiFi is limited and with high mobility of the nodes generate always frequent changes in topology and the fragmentations of networks. For these reasons, we taking into account that there is no any central manager entity, which can routing a packets via the network it is one of the challenging task.

D. Performance Evaluation of Routing Protocols in VANETS by using TCP Variants on OMNET++ Simulator

The paper aims to use different tcp variants to investigate the performance of the routing protocol in vanet. paper used two routing protocol called AODV and OLSR which have been considered with three different TCP variants. There are two parameters like Delay and Throughput consider to grade the routing protocol. Results show that the OLSR routing protocol achieve better throughput compare to the AODV protocol.

E. Performance Evaluation of OLSR and AODV Protocols in a VANET Crossroad Scenario

In this paper the mobility is used called CAVENET and as a simulator NS3 is used. Given model is a generated map-based model to simulate with given environment. The area which is represented by a map which is generated before the simulation start it consists various vertical and horizontal roads which is made of two lanes and allowing the some motion in the two directions.

III. ROUTING PROTOCOLS

The routing protocols are classified into five categories Which are as following like Topology based, Position based, Cluster based, Geo cast and last is Broadcast. These protocols are characterized on the basis of their area / application where they are most suitable. This section presents only topology based routing protocol and OLSR.

A. Topology Based Routing Protocols

In this routing protocol they mostly used links information that exists in the network to perform packet forwarding and they are further divided into Proactive and Reactive.

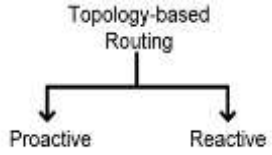

Fig. 1: Types of Topology-based Routing

1) 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 usage. As a result it reduces the burden in the network.

Reactive routing consists of route discovery phase in which the query packets are flooded into the network for the path search and this phase completes when route is found.

2) Proactive Routing Protocols

The proactive routing means that the routing information, like next forwarding hop is maintained in the background irrespective of communication requests. 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.

B. OLSR Protocol

OLSR stand for Optimized Link State Routing Protocol which is based on link state and proactive in nature. This protocol inherits the property and feature of link state algorithm. It is proactive in nature, so it has advantage of having the routes immediately available when it is needed.

The protocol thus supports a nodal mobility that can be traced through its local control messages, which depends upon the frequency of these messages. We have chosen this protocol because its provide numbers of features which is suitable for highly dynamic networks.

Some features are following ones [10]:

- Using OLSR, we can know immediately know the status of link.
- It can easily integrated with the existing operating systems and devices.
- The OLSR protocol is well suited for high density networks.

In a pure link state protocol, here all the links with its neighbor nodes are declared and are flooded automatically into the whole network. it is an optimization of a pure link state protocol for vanet. It provide some benefit like reduces the size of control packets: instead of all links as well as declares only a its subset of links with its neighbours Known as its multipoint relay selectors. Second advantage is that it minimizes flooding of this control traffic with the help of by selected nodes, known as multipoint relays, it diffuse its messages in the network. Only the multipoint relays have ability to retransmit its broadcast messages. These techniques significantly help-full to reduces the number of retransmissions in a flooding or broadcast procedure.

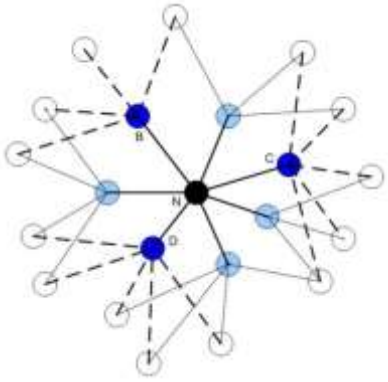

Fig. 2: Multipoint Relays of node

In which every node periodically broadcasts its HELLO messages, which contain the information about its neighbors and status of the link. Generally this type of messages are transmitted in the way like broadcast, further which are received by all one-hop(N) neighbors. It contain the list of addresses of the neighbors.

In Neighbor table, every node store the information about its one hop neighbors called N, also store the link status with this neighbors, and a list out two-hop neighbors N2, these one hop neighbors give access to. The link may be in any form like unidirectional, bi-directional or MPR.

If we want to build the intra-forwarding then there is a need a database for routing packets, in which every node broadcasts specific control messages which is known as Topology Control (TC) messages. These messages are forwarded like usual broadcast messages into the whole network. It is sent periodically by every node in the network to declare its MPR Selector set, i.e., which contain the message with list of neighbors who have selected the sender node multipoint relay.

Each node maintains a routing table which allows it to route the packets for other destinations in the network. The routing table is built from this database by tracking the connected pairs in a descending order. Every nodes in whole network maintains its topology table, in which it store the information about the network topology which is obtained from the TC messages. As well as node store information about the MPR of other nodes in this table.

IV. PROPOSED CONCEPT

The use of MPR technique is provide one uniqueness in OLSR among other link state routing protocol. This proposed work made some changed in this technique and try to covered all the nodes in a network and minimizing the flooding of control messages.

A. *Control Flow Diagram*

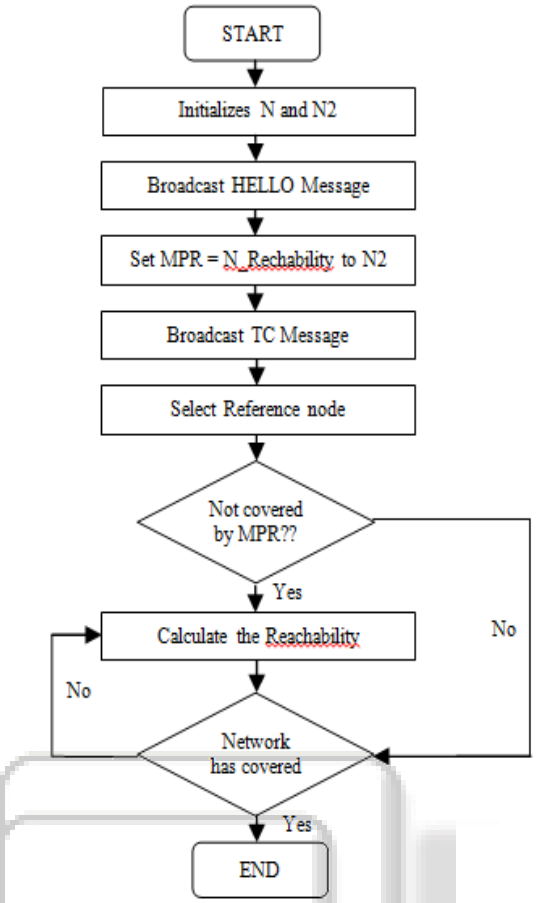

Fig. 3: Control Flow Diagram

B. *Algorithm Parameters*

1) N: N is a 1-hop neighbor.
2) N2: N2 is a 2-hop neighbors.
3) MPR: A node which is selected by its 1-hop neighbor, which is a set of selected neighbor nodes (N2).
4) Reachability: The route from 1-hop neighbors to 2 -hop neighbors.
5) Hello Message: It has information about the neighbors node and status of the link.
6) TC Message: It is forwarded like broadcast message contain list of neighbors.

C. *Proposed Algorithm*

1) Step 1: Initializes N and N2.
2) Step 2: Broadcast HELLO Messages and update data in neighbor table.
3) Step 3: Add to the MPR set those node in N which are the nodes to provide reachability to a node in N2.
4) Step 4: Broadcast TC (Topology Control) Message and update records in topology table.
5) Step 5:For remaining node Select one reference node, the node which covered most nodes in N2 and then select the nodes in N which have angel between the reference Node and selected node are near 90◦, 180◦ and 270◦, add it to the MPR.
6) Step 6: Check exist nodes in N2 which are not covered by at least one node in the MPR set. If No, then go to step 8.
7) Step 7: Calculate the reachability for each node in N and Select as a MPR with highest N_willingness among the nodes in N with non-zero reachability.
8) Step 8: Check Whole network has covered. If No, then go to step 7.

V. SIMULATION RESULTS AND ANALYSIS

In This section we evaluate the performance of routing protocols of VANET in an open environment. For this thesis we have conducted network simulator-2 and used um-olsr version 1.0 patch-2014.

A. *Performance Metrics*

We have considered following performance metrics.

1) Packet Delivery Ratio (PDR):

As a output this metric gives the ratio of the successfully received data packets at destination side with total no of generated data packets.

2) Average End-to-End Delay:

This metric show the delay which is from generated by source node to the packet reception destination node.

3) Normalized Routing Overhead (NRO):

This metric indicates the number of routing packets transmitted per data packet delivered to the destination.

B. *Simulation Parameters*

In order to evaluate the performance of OLSR and Efficient OLSR performed some set of experiments and test some performance metrics.

Simulation Parameters	
Simulator	NS-2
Propagation model	Two-Ray Ground
Number Of Nodes	20,40,60,80
Simulation Time	300 s
Traffic type	CBR/UDP
Speed	20-40 km/h
Packet size	512 bytes
Transmission Rate	20 kbps
Simulation Area	600 m × 600 m
MAC protocol	Mac/802_11

Table 1: Simulation Parameters.

C. *Analysis and Results*

Fig.4 is show that the End to End delay of Efficient OLSR is decreases as compare to OLSR because of MPR.Fig.5 is show that the Packet Delivery Ratio of Efficient OLSR is more than the OLSR as the network size increases with more nodes in it.Fig.6 is show that the Routing Overhead of Efficient OLSR is high compare to OLSR because of updates occurs in routing tables.

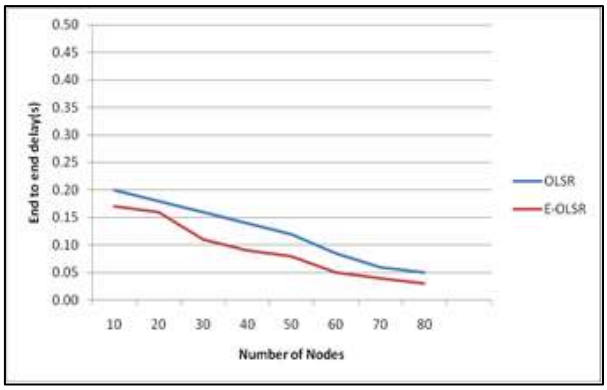

Fig. 4: End to End Delay v/s Nodes

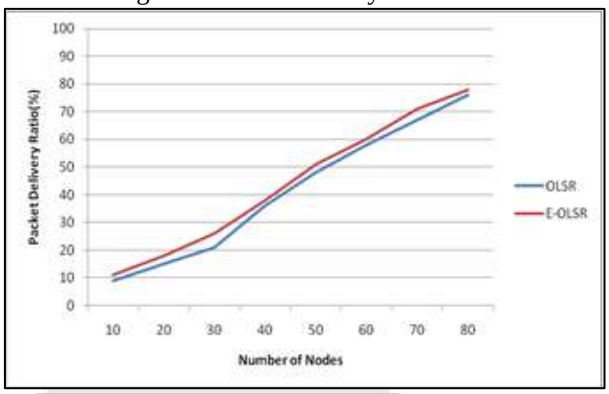

Fig. 5: Packet Delivery Ratio v/s Nodes

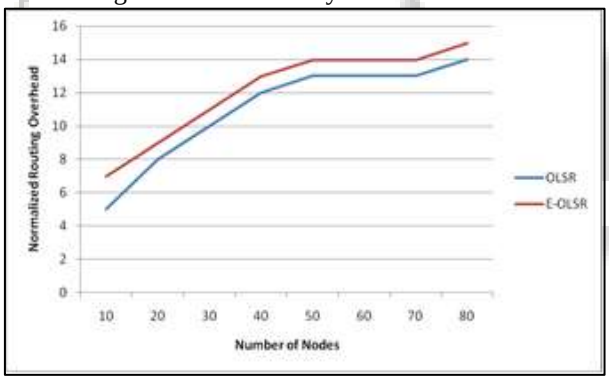

Fig. 6: Normalized Routing Overhead v/s Nodes

VI. CONCLUSION

The report include the overview of VANET system and introduced Efficient OLSR based on OLSR. we have evaluated the performance of both protocols and results show that the performance of Efficient OLSR routing protocol has better compare to OLSR under some parameter metrics. the proposed system increase the efficiency and made some changed in MPR technology based on OLSR routing protocol which is feasible for VANET.

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