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An Efficient Routing Mechanism for Vehicular Ad Hoc Networks

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Abstract—Vehicular Ad-hoc Network is a new technology which have become dominant of all the wireless communication with time. It is a group of mobile nodes (vehicles) which forms a infrastructure less temporary network. To route a packet to destination, a node uses intermediate nodes. In VANET, because of frequent topology changes and disconnection of path, it is difficult to provide an efficient protocol. This research work states that, geographical approach routing will have low end to end delay and maximum packet delivery ratio. In this paper we analyze the performance of Greedy Perimeter Stateless Routing Protocol (GPSR) [4] which is a location based protocol and compared it with Ad hoc On Demand Distance Vector Routing protocol (AODV) [3]. To measure and evaluate the parameters NS-2.33 is used as network simulator and Simulation of Urban Mobility (SUMO) as traffic simulator.

Keywords- *VANET, GPSR, AODV Average end to end Delay, Packet Delivery Rati, Ns 2.33, SUMO.*

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I. INTRODUCTION

Vehicular Ad-hoc Networks (VANETs) includes V2V communication and V2I communication and VANETs are the key component of Intelligent Transport System. It needs proper routing protocols to main good performance. A VANET protocol needs to help moving vehicles locate their appropriate routing paths and delay less data transmission in a very unstable vehicular movement. A topology-based routing protocol, which uses instantly or previous build paths to carry out data transmission usually consumes large amount of control packets – including the route request/reply packets or other packets able to ensure transmission reliability. Such a routing protocol is indeed unfit for especially with high mobility, because the ore-set paths may break from time to time, wasting the limited bandwidth resource. To pursue more efficient and delay less data transmission, this paper suggest to go for location or position based approach for routing data, i.e. the position based protocol would give better performance than reactive or proactive protocols. In this research work we compare the average end-to-end delay and packet delivery ratio of a location based protocol called Greedy Perimeter Stateless Routing Protocol (GPSR) with a reactive protocol called AODV.

II. BACKROUND STUDY

A. Topology-based and Position-based

Topology-based routing protocol can be reactive, proactive or hybrid. A proactive protocol such as DSDV, broadcasts packets continuously to maintain topology information and directly locates a route when necessary; by contrast, a reactive routing protocol, such as AODV will produce paths by control packets. For position-based routing protocol such as GPSR, nodes will use Global Positioning System (GPS) to obtain the geographical information for packet transmission. A brief survey on routing protocols is provided below to facilitate further discussions.

B. Ad-hoic On Demand distance Vector:

AODV [3] is one of the reactive protocol which find the path using two control packets such as Route Request (RREQ) and Route Reply (RREP). In case of finding a damaged path during the transmission, it will send Route Error packet to inform surrounding nodes which involves a large amount of control packets and therefore it is ineffective.

C. Greedy Perimeter Stateless Routing protocol:

GPSR [4] is a position predicated routing protocol which used GPS to obtain the location information of the nodes. It is less affected by topological changes and ergo reinforce network scalability. When facing a vacuous topology it will commence the surrounding mode to bypass the block until finding a congruous relay and then pass on to the greedy forwarding mode. Two modes in GPSR: Greedy forwarding mode and Perimeter forwarding mode.

Greedy forwarding is shown in Fig. 1, if X wants to transmit a packet to the destination, the neighbor which is closest to the destination D is node Y, which is thus chosen as next transmission hop.

Perimeter forwarding: in Fig. 2, greedy forward fails. I.e. X finds no other neighbor closest to D than itself, it is then transmits to relay packet along W or Y bypassing the vacant part of the topology and then greedy forwarding continues.

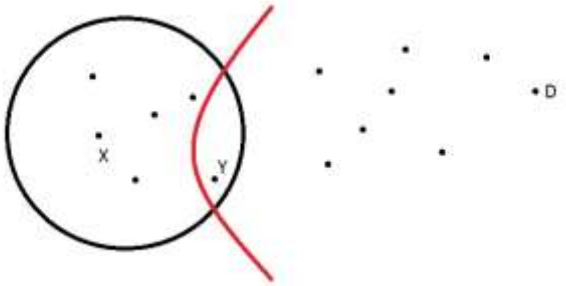

Fig. 1: Greedy Forwarding

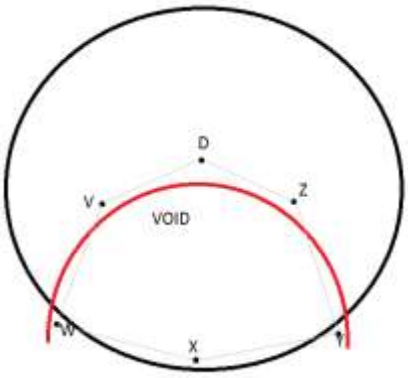

Fig. 2: Perimeter Forwarding

III. LITERATURE SURVEY

Chung-Ming Huang, Shih-Yang Lin, et.al (2015) proposed Time –based Greedy Forwarding Algorithm in Vehicular Ad hoc Networks. The main goal of this paper is to reduce the transmission delay. The proposed TGF culls the farthest conveyance from the sender to be the packet forwarder, which is decided by the receiver themselves.

Ankita Dixit, Shweta Singh, et.al (2015) created a Comparative Study of P-AODV and Improved AODV in VANET. In this paper two enhanced protocol Prior AODV and Improved AODV is compared on the basis of different parameters such as PDR, velocity, normalized routing load.
Po-Jen Chuang and Tzu-Lun Huang (2015) proposed an Efficient Vehicular Ad hoc network Routing based on Junctions. In is this paper a new position based protocol is used in which control packets is used to collect the approaching-the-junction information and base d on the information, moving vehicles adapt their paths dynamically.
Singh. S, Kumari. P, et.al (2015) gave the Comparative Analysis of Sundry Routing protocols in VANET like AODV, AOMDV, DSDV, and DSR by varying the velocity of vehicles and then comparing their performances with reverence to throughput, end to end delay and packet delivery ratio.Using the Template

IV. RELATED WORK

Vehicular Ad hoc Network is an infrastructure less network. Routing protocols in VANET are divided into proactive, reactive and location based protocol. Proactive routing protocol will have the route to the destination in the routing table by keep exchanging the routing information periodically. Reactive protocol is an On-demand protocol which use RREQ and RREP control packets to find the route to the destination only when there are data to transmit. Due to the high mobility of the vehicles in VANET routing path will be damaged easily and it gives delay during the data transmission which is unaffordable. This average end-to-end delay can be reduced by using the geographical approach in routing protocols. Using the location information of the node, source can choose which should be the next hop node. A position based protocol called Greedy Perimeter Stateless Routing Protocol which uses position of nodes to find next hop. Greedy forwarding is the algorithm followed by this protocol. Node which is in the propagation range of source which is closest to the destination will be selected as the forwarding node. Neighbor table which has the location information of that node and neighbor nodes will be broadcasted periodically, so that each node has the node location which is closest to the destination. Through this Geographical approach average end to end delay at the time of transmission of data will be very less.

V. GPSR ALGORITHM:

```
if (Greedy transmission mode) {
      use the greedy mode to find the next hop;
If (next hop not found) {
     use PERI mode in GPSR to find the next hop;
      switch the transmission to PERI;
      }
}
else {
If (there is neighbor closer to the destination) {
      use the improved greedy mode to find the next
hop;
      switch the transmission mode to Greedy;
If (next hop not found) {
      use PERI mode in GPSR to find the next hop;
      switch the transmission to PERI;
      }
}
```

VI. SIMULATION PROCEDURE

For VANET, there are large number of simulators. This paper uses SUMO (Simulation of Urban Mobility) as a traffic simulator to produce a vehicular mobile mode. The network simulators are capable of simulating any communication network if a concrete configuration of vehicular environment is present. NS 2.33 is used as network simulator here.

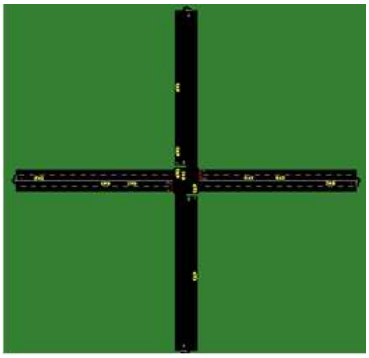

Fig. 3: Traffic Junction in SUMO

In this MOVE software is used for the purport of simulation as it capable of handling both the mobility simulation and network simulation. It has SUMO and NS2. It engenders the tcl file required by the NS2 for network simulation. It is achieved by engendering opportune map, nodes and mobility. Additionally authentic maps of any location can be given as a scenario.

Fig. 4: MOVE Simulator

VII. RESULTS

We performed simulation of the GPSR a location based protocol and compared it with an On-Demand or reactive Protocol AODV in terms of average end-to-end delay and throughput.

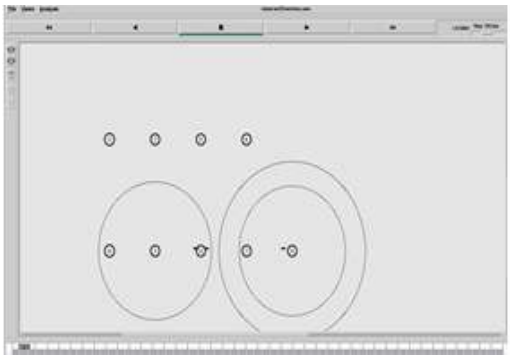

Fig. 5: AODV

Fig. 5 shows the transmission of packets from node 3 to node 8 using AODV. In this if follows the path through node 4 and 7 to reach node 8.

Fig. 6 shows the transmission of packets from node 3 to node 8 using GPSR. In this from node 3 the packet is transmitted to node 7 and then it is forwarded to node 8. Node 7 is the greedy forward node which is a closest node to the destination and also in the propagation range of node 3.

Fig. 7 and Fig. 8 shows the result obtained in AODV protocol and GPSR protocol. In that the average end-to-end delay is very less while using GPSR compared to AODV.

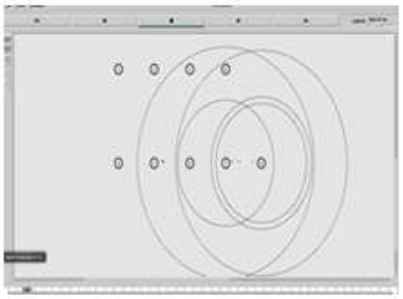

Fig. 6: GPSR

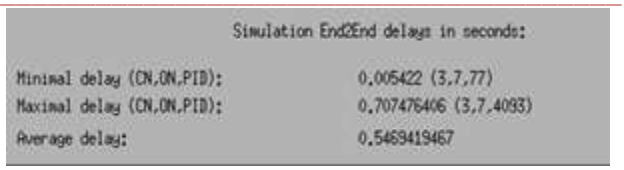

Fig. 7: Average end-to-end delay of AODV

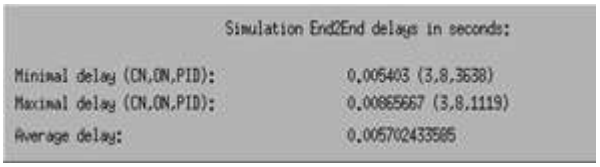

Fig. 8: Average end-to-end delay of GPSR

Fig. 9 shows the no of packets received using AODV protocol. Based on the information, the PDR achieved is 88%. Fig. 10 shows the number of packets received in the same scenario using GPSR. In this PDR achieved is 99% which shows that geographical routing would increase the performance of Vehicular Ad hoc Network.

Fig. 9: Number of sent and received packets in AODV

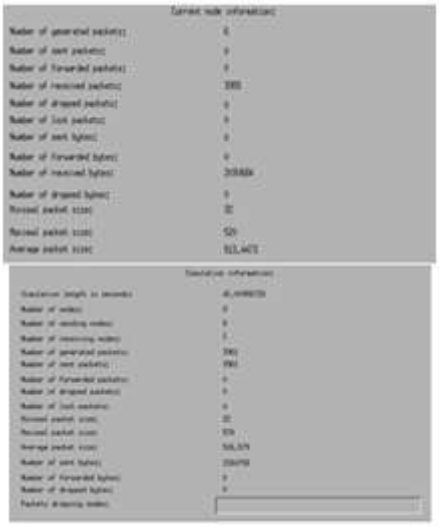

Fig. 10: Number of sent and received packets in GPSR

VIII. CONCLUSION

The contribution of this paper is, understanding the various types of protocols in VANET in which location based

approach decreases the delay in transmission of packets from source to destination and increases the throughput. In case of reactive protocol it is otherwise when compared to location based.

IX. FUTURE SCOPE

The control packets in exchanging the location information may also be the problem in Vehicular Ad hoc network. In case of denser network it will be high. Future work may involve in the analysis based on different conditions of network.

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