Performance Analysis of Routing protocol in VANET

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Abstract— Vehicular Ad-hoc Network (VANET) is a new network technology where the vehicular are used as mobile nodes to form a communication network. In VANET, routing protocols have a significant role in terms of the performance because they determine the way of sending and receiving packets between mobile nodes. In this work, We examine and analyze the performance of DSDV, AODV and TAODV routing protocol using different speed of nodes. The performance measurements; Packet Delivery Ratio, Residual Energy, Average End to End Delay and Average Throughput are examined with respect to 30 Speed, 40 Speed and 50 Speed. The objective of this study is to find the best routing protocol over all circumstances. Based on our validated results, TAODV performs the best among all evaluated protocols.

Keyword— VANET, Routing, AODV, TAODV, DSDV, NS-2.

I. INTRODUCTION

Vehicular Ad hoc Network (VANET) is one of the latest technologies evolved in IT industry. This technology is very beneficial in providing safety to the road users and comfort to the passengers. With the increase in motorization, urbanization and population growth, road accidents[7] 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 [1] using vehicle to vehicle communication[8]. The communication between vehicles that are one hop away is easy but the vehicles which are far away can communicate using multi hop communication. To make multi hop communication possible, the routing should be done very attentively. Routing protocol should be chosen in such a way so that the message reaches the destination within time.

Since speed of vehicles is very high and delay in message may lose the importance of message, a routing protocol for VANET is very important. VANET is a subclass of Mobile Ad hoc Network i.e. MANET. The mobility of VANET is higher than MANET. Because vehicles need to run on roads, the mobility pattern of VANET is restricted. Due to high speed of vehicles the topology of the network is very dynamic. Also there is no power constraint in vehicles. The traffic density on the roads plays a major role. If the traffic density is very low, the network can be partitioned. Because of all these characteristics, routing protocols which are better enough for MANET behave very strangely in VANET. Here we want to compare [11] the performance some routing protocols of MANET in VANET environment.

II. ROUTING PROTOCOLS

Trust based Ad-hoc On-demand Distance Vector (TAODV) Routing protocol:- TAODV, has several Salient features: (1) Nodes perform trusted routing behaviours mainly according to the trust relationships among them; (2) A node who performs malicious behaviours will eventually be detected and denied to the whole network; (3) System performance is improved by avoiding requesting and verifying certificates at every routing step.

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 neighbour leads to the shortest path to the destination [6].

![DSDV Routing Protocol](image)

**Figure: 1.1 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.

**Ad hoc On Demand Distance Vector (AODV):** AODV[10] is a reactive protocol. It is an improvement of DSDV, because it minimizes the number of broadcast packets [1] generated by creating route only when required. All nodes in the network maintain the route information in a table and participate in sharing their routing tables. The source node starts the route discovery process, when it wants to transfer data to the destination node. During this process, source node disseminates Route Request (RREQ) packet to its neighbours. If the neighbour nodes which receive RREQ, lack the information pertaining to the request, they forward the packets to their neighbour nodes. The following process goes on until RREQ reaches, the destination or the node who knows the path to the destination. Intermediate nodes set up a reverse path by recording the addresses of the neighbours in their tables when, they receive RREQ. When the destination node or the node which has information about the path to the destination receives RREQ, it sends back Route Reply (RREP) packet to the source node. This RREP packet is sent through the reverse course. The source node assimilates the course to destined node and the discovered course information is placed in the routing table, when it receives the RREP packet.

**III. RESULT ANALYSIS**

In this work, the random way point mobility model is used for the simulation of VANET routing protocols. The source-destination pairs are spread randomly over the network where the point to point link is established between them. Generally network simulators try to model the real world networks. The principle idea is that if a system can be modelled, then futures of the model can be changed and the corresponding results can be analysed.

**1.1 PACKET DELIVERY RATIO**

This is the fraction of the data packets received by the destination to those sent by the source. This classifies the ability of the protocol to discover routes. Figure and table shows the Packet delivery ratio. AODV, TAODV and DSDV for the various node Node Mobility.
1.2 THROUGHPUT
This is the fraction of the data packets received by the destination to those sent by the source. This classifies the ability of the protocol to discover routes. Figure and table show the Throughput under AODV, TAODV and DSDV for the various node density.

1.3 END TO END DELAY
This is the average delay between the sending of the data packet by the source and its receipt at the corresponding receiver. This includes all the delays caused during route acquisition, buffering and processing at intermediate nodes. Figure and table show the End to End Delay under AODV, TAODV and DSDV for the various node density.
4.4 SIMULATION RESULTS FOR RESIDUAL ENERGY

It is the total amount of remaining energy by the nodes after the completion of Communication or simulation. If a node is having 100% energy initially and having 70% energy after the simulation than the energy consumption by that node is 30%. The unit of it will be in Joules. Figure and table shows the Residual Energy.

IV. CONCLUSION

In this work we addressed the problem of identifying misbehaving of network that refuse to forward packets in vehicular ad hoc network and give the mechanism to handle them. The impact of such nodes decreases network performance, lowering the network average throughput. To mitigate the problem of misbehaving packet dropping, this work proposed a feasible solution for it on the top of clustering in TCP to avoid the misbehaving and our solution presents good performance in terms of Packet Delivery Ratio and Throughput but moderate performance in terms of end to end delay. In this work, we examined and analyzed the performance of DSDV, AODV and TAODV routing protocols. We considered the 30 Speed, 40 Speed and 50 Speed as the controlled parameters in our experiments to determine the best routing protocol. In our simulation, 3 protocols for the measured parameter; Packet Delivery Ratio, Average End to End Delay, Throughput.
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