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SOLVING TRAFFIC CONGESTION –AN APPLICATION OF VANET

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Abstract— **Vehicular Ad Hoc Network (VANET) is an evolving technology of today's world and is expected to be all pervasive in the near future. The vehicles in VANET possess mobility as well as computational processing power. The vehicles collaboratively form the ad-hoc network and are peers of each other. This paper discusses solving Traffic Congestion as an application of VANET. We have simulated the work of mobility on Network Simulator Too l(NS2),in which we have simulated the traffic roads with the help of SUMO(Simulation of urban mobility) using routing protocol AODV.**

Keywords— **VANET, MANET, Network Simulation, NS2.35, SUMO**

I. INTRODUCTION

The recent advancements in wireless networking are responsible for entire change in communication model as seen today. This is because it is easy to deploy and setup. These wireless networks can be classified either mobile infrastructure or ad-hoc depending on how they are deployed. Mobile infrastructure have fixed deployment model while ad-hoc have flexible mobile model. The fixed mode requires an infrastructure to be deployed before devices (called nodes) start to communicate with each other. The devices in this model communicate with infrastructure as well as with each other. . In ad-hoc scenario every node act as a router i.e. it is capable of accepting and forwarding data and does not require any fixed infrastructure. Vehicular Ad-Hoc Network (VANET) is a subclass or a special kind of Mobile Ad-Hoc Network (MANET). In MANET, the nodes are free to move in any fashion, while in VANETs the movement is restricted and are supposed to move in an organized fashion. The main concern for the VANETs is to provide comfort and safety to the passengers.

Traffic congestion is a major problem in metropolitan cities like Delhi, Mumbai, Bangalore, etc. Congestion leads to wastage of time and money, often people are stuck for hours in a traffic jam. Traffic jam's happens due to accidents, natural calamity, improper driving or due to various other reasons. Long unmanageable jam's happens/ affects other people because drivers are unaware of the situation ahead. If the drivers that are away from the affected area can be made aware of the problem, they can either change their route to the destination or can halt for a while until it is good to go. If this happens then the problem will be localized and thus will be easier to manage. The information of the situation can be displayed through text messages on the dash board or even through an image of the affected area collected by vehicles in that area, so that passengers have a better understanding of the seriousness of the problem.

II. ROUTING PROTOCOL

There are several traditional wireline networks and some ideas of them are used in ad- hoc networks. Some of the traditional approaches:

1. **Distance Vector**: In this each node broadcast the information to its neighbors instead of broadcasting it to all to monitor the cost of outgoing links and to keep the estimation of shortest distance to every node in the network. This information can then be used to recalculate routing table using shortest path algorithm.
2. **Link State**: Every node maintains cost per each link of the entire topology. Each node periodically floods the link costs of outgoing links to all the other nodes in the network.

   Nodes update their records and apply shortest path algorithm to choose the next hop.
3. **Source Routing**: Packets travel along the complete path pre-decided at the source.
4. **Flooding**: Source distributes information among neighbors who again send this info to their neighbors and so on. By the use of sequence numbers for packets, a node is able to send packet only once.

III. AD-HOC ON DEMAND DISTANCE VECTOR (AODV)

It is a distance vector routing protocol for ad-hoc networks. It is a reactive routing protocol that finds the routes on demand so it has low bandwidth consumption and nodes do not have store inactive routes to the destination. AODV does not interfere if the routes are valid between the source and the destination. AODV uses <Route Requests (RREQs), Route Replies (RREPs), Route Errors (RERRs)> messages to find and establish the connection between source and the destination. The greater the sequence number, the fresher is the route. AODV uses sequence numbers to ensure freedom from loops and maintain fresh routes to the destination. When a route to destination is requested and it is unavailable then a RREQ is flooded to its neighbor until it reaches the desired destination or to a node where a route to destination is stored. Then a RREP is sent back to the source and the found route is made available to the source. RERR messages are initiated when a node detects that next hop/node does not have a valid route thereby removing routing entry. When a RERR is received by source, it can reinitiate RREQ.

In Ad-Hoc On Demand Distance Vector (AODV), routing tables are maintained to avoid those entries of nodes that do not exist in the route from source to destination. In AODV managing routing table information handled with the destination sequence numbers. When nodes in the network detects that a route is not valid anymore for communication it delete all the related entries from the routing table for those invalid routes. And sends the RREP to current active neighboring nodes that route is not valid anymore for communication. AODV maintains only the loop free routes.

IV. VEHICULAR COMMUNICATION

1. Vehicle To Vehicle

Vehicle-to-Vehicle or V2V, is an ad-hoc network of vehicles, not involving any infrastructure, so vehicles can communicate directly. In this communication vehicles can even track other far-off vehicles. Vehicles have a DSRC trans-receiver placed on board through which they will disseminate the data and also track other vehicles. In this manner vehicles could share and receive essential information among them. Thus, if there is a collision ahead on the road and the driver is not able to see the car ahead could transmit the information and the driver behind it can know about the situation and can take necessary steps. The V2V systems would be smart enough to handle the request themselves if the driver does not respond to the warnings. The main purpose is to provide safety to drive passengers and drivers.

2. Vehicle To Infrastructure

Vehicle-to-Infrastructure or V2I is a communication between vehicles (i.e. nodes) and Road Side Infrastructure. So for this kind of communication integrated communication system under the roads called Vehicle Infrastructure Integration (VII) is required. It is an initiative fostering research for a series of technologies linking road vehicles to their surroundings. This technology draws on several disciplines, including computer science, electrical engineering, automotive engineering and almost every other discipline. VII is specifically for road transport, although similar technologies are under development are in place for other modes of transport. For example, in Planes, ground-based beacons are used for automated guidance, that allows the autopilot to fly the plane without human intervention. In highway engineering, enhancing the safety of a roadway improves the overall efficiency. VII targets improvements in both safety and efficiency. VII is that branch of engineering that deals with the study and implementation of a series of techniques to achieve communication among vehicles and infrastructure bases in order to improve road safety.

ISSUES OF ROUTING IN VANETS

Even though VANETs are capable of enabling many novel applications, the design of effective intervehicular communications remains as a challenge. The nodes in VANETs are themselves formed by vehicles with high mobility. Nodes in VANETs join and leave the network frequently, which results frequent path disruptions. The time varying vehicle density results in a rapid change in topology, which makes preserving a route a difficult task. This in turn, results in low throughput and high routing overhead. The well-known hidden terminal problem [4] affects the performance in VANETs causing low packet reception rate. Interference from the high-rise building induces problems such as routing loops and forwarding in wrong direction, which increases delay. The issue of temporary network fragmentation and the issue of broadcast storm [5] further complicate the design of routing protocols in VANETs. The routing protocols in VANETs should be capable of establishing the routes dynamically and maintaining the routes during the communication process. They should be capable of discovering alternate routes quickly on-the-fly in the event of losing the path

Algorithm Or Procedure

1. Location of Desired road map
2. Generation of vehicular traffic and Movement
3. Generated their mobility in TCL
4. Generated Network Traffic
5. Complied On NS2

6. Do performance evaluation via generated TRACE file.

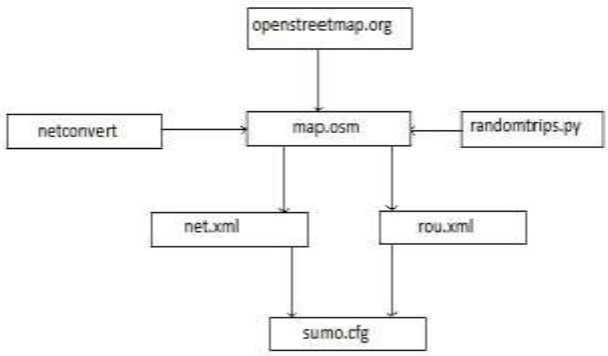

Fig 1. Sumo Scenario Setup

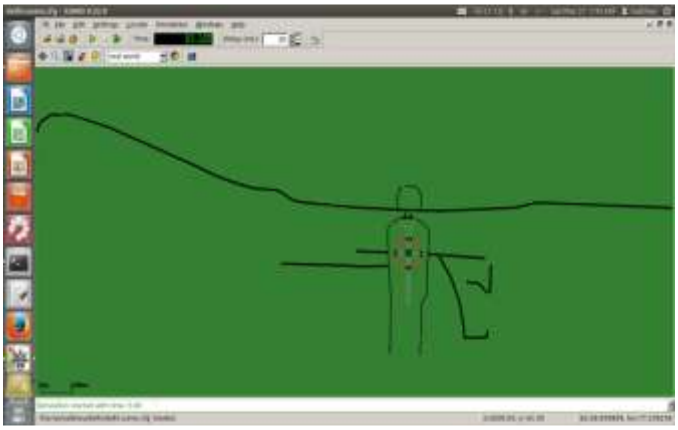

Fig. Road Map

The Traffic and Road Map is generated using SUMO (Simulation of Urban MObility) and the mobility is then exported.

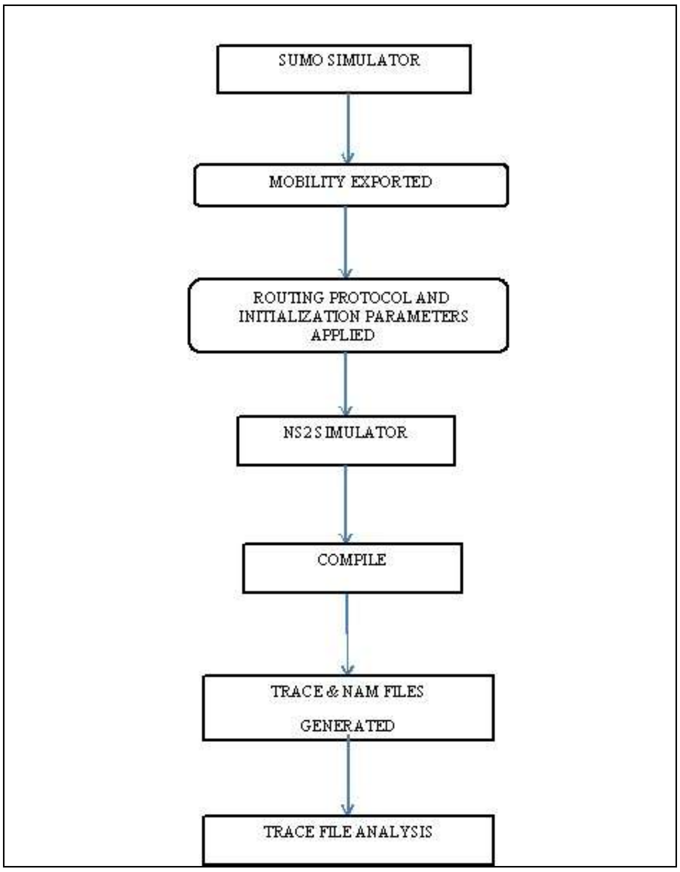

Fig. NS-2 Scenario Setup

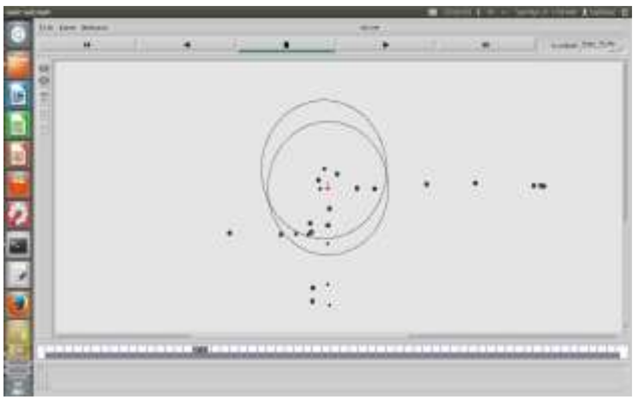

Fig. NS-2 Simulation

In this paper, VANET's simulation is done over a Peer-to-Peer ad-hoc network and TCP traffic is used for the comparison and analysis of QoS Metrics of a Network by using Network Simulator (ns-2.35). The simulation is performed of protocol AODV on the basis of various performance metrics: packets generated, packets received, packet delivery ratio, Average end-to-end delay, Average throughput.

Protocol	Generated Packets	Received Packets	Packet Delivery Ratio	Average End-to-End Delay[ms]	Average Throughput [kbps]
AODV	18540	14500	0.7821	144.578	758.34

Fig. QoS Metrics

V. CONCLUSION

The routing protocol used is AODV and is evaluated on the basis of various QoS metrics like throughput, end-to-end-delay, packet delivery ratio, etc. The approximately real simulation of movement of vehicles and topology of roads by using Vanet mobility model generator, was successfully accomplished from which precious referential value can be obtained for the simulation research of V ANET. The simulation results showed that the delay of AODV protocol can be exploited to get the result.

VI. REFERENCES

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