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Improving Performance of END- to-END Data (Packet) Transmission using Routing Matrix in VANET

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ABSTRACT

Vehicular Ad Hoc Network (VANET) is sub group of mobile ad hoc network (MANET).This network are becoming the main stream of network research have been carried out from many aspects. It is an emerging new technology to exchange the information between vehicles to vehicles. This technology considered as one of most noticeable technologies for improving the efficiency and safety of transportation system. For the development of the intelligent transport system (ITS) having the ability for both self-management and also self-organization, making them reliable as a highly mobile network system. Here I am trying to combine the two methodology of the routing matrix which will gives the better performance in terms of transmission speed, better throughput and end-2-end delay.

Keywords: VANETS, routing metrics, reliability metrics, connectivity metrics, ad hoc network

I. INTRODUCTION

Vehicular Ad Hoc Networks (VANET) have been proved for its great potential in various application prospects including the enhancement of traffic safety, the optimization of traffic flow and the infotainment services like finding nearest hotel ,email services ,audio or video sharing. It uses wireless technology to create an ad hoc network and communicate among moving vehicles. In vanet every vehicle is considered as wireless router or forwarder, allowing vehicle around 250 meters to 1000 meters coverage range to do communication with other vehicle and construct a network with wide range. The wireless communication in VANETS between vehicle –to –vehicle (V2V) and vehicle –to –infrastructure (V2I).For the car - to -car or any other vehicle communication there is ON BOARD UNIT (OBU) and for the vehicle to infrastructure ROAD SIDE UNIT (RSU) like sensor, wifi network is available. Vehicle do communication either one hop or multihop communication. In one hop communication vehicle directly communicating to the target node, whereas in multihop communication source node does not communicate directly, it will use relay node. In the nature of VANETS multihop communication gets the need for robust routing protocols, where more than one route is exists between the source and target vehicle [9].

Concerning the routing protocol, the selection of best path among multi-paths depends on routing metric[8].The path obtains the best metric will be selected, and hence designing routing metrics for VANETS technology is becoming an important issue and has gained the focus of research in this area. VANETS technology can be applied for an extensive variety of safety and comfort applications like Intersection lane changing, collision warning, road hazard notifications, overtaking vehicle warning,

traffic vigilance.

The goal of routing protocol is to offer best route among the node vehicles by minimizing the overhead. The wireless infrastructure focused mainly on the Media Access Protocol (MAC) protocol with the standardization of IEEE802.11P and Dedicated Short Range Communication (DSRC) supporting the Internet version 6 (IPV6) protocols [9].

II. VANET SYSTEM DOMAIN

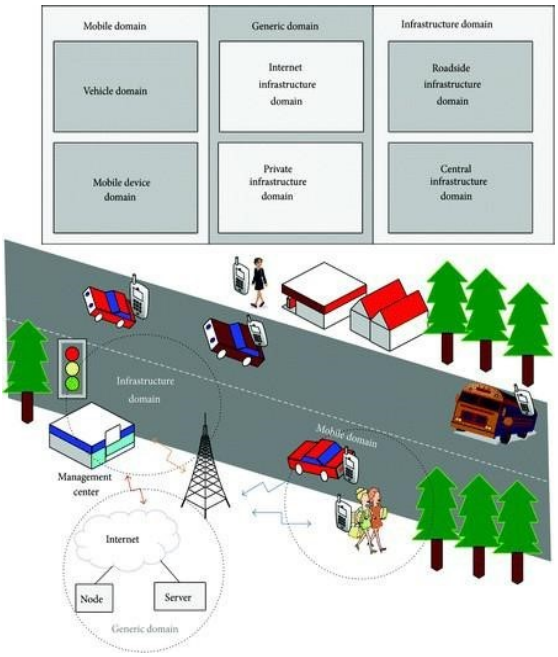

Figure 1.system domain

The mobile domain contains two parts : the vehicle domain and the mobile device domain. The vehicle domain comprises all kind of vehicles such as cars and buses. The mobile device domain comprises all kind of portable devices like personal navigation devices and smartphones. Within the infrastructure domain, there are two domains : the roadside infrastructure domain and central infrastructure domain. The roadside infrastructure domain contains roadside unit entities like traffic light. The central infrastructure domain contains infrastructure domain contains infrastructure management centers such as traffic management center ahd vehicle management centers. However the development of VANETS architecture varies from region to region. In the car-2-x communication system which is pursed by the car-to car communication consortium, the reference architecture is little different car-2-car communication consortium is the major driving forces for vehicle communication.

III. LITERATURE SURVEY

STABLE ROUTING PROTCOL [1]. The proposed protocol has two phases, namely the route formation phase and route maintenance phase. The route formation phase use the ROUTE_REQ and ROUTE_REPLY control messages for forming the routes and select the best stable route using the STABLE_ROUTE function. The route maintenance phase uses the next best route when link failure happens in transmitting route.

Unicast routing protocol and multicast routing protocol [2]. Unicast routing protocol like AODV and DSR, multicast routing protocol like ODMRP and ADMR. Compare both protocol performance in terms of following metrics like average end to end delay, packet delivery ratio, and normalised routing load.

AODV and AOMDV ROUTING PROTOCOL.[3] In this paper proposed AOMDV which overcome the limitations of AODV.The benefit of such technique is fault tolerance, bandwidth increasing and security improvement. The multipath routing protocol will follow alternate path from source to destination when one of discovered path is failed. Once the information will receive at the destination then after that particular node in the channel will get free and ultimately it will reduce the traffic congestion. AODV and AOMDV both the protocol compared the performance in terms of different traffic pattern. Constant bit rate and use datagram protocol.

DREAM PROTOCL [4]. In this paper performance analysis of DREAM and LAR in city as well as in highway environments with different metrics are presemted.in order to provide realistic vehicular traffic movements an extended version of IDM

(intelligent driver model) is used. Distance effect routing algorithm for mobility (DREAM) routes the packet in the network by geographical location of the node.Location table store all the location of network node and or also location packet is flooded to update the location by neighboring node.

DREAM PROTOCOL [5]. In this paper a performance evaluation of geographical protocol DREAM (distance routing effect algorithm for mobility), in VANETS using vehicle mobility based on real road map is presented. In this protocol when source wants to send message to destination node, it stats by looking for its location table and receives information about its geographical position. If direction is valid source node send the message to all one hop neighbors in the forwarding zone determined by the direction. If no information about the location is available for destination, then recovery procedure must be executed by flooding partially or entirely the network in order to reach the destination. When node receive message first it checks if it is the destination node or not. If this is the case it send the acknowledgement to the source node otherwise repeat the same procedure until it is reached to destination.

IV. PROPOSED METHODOLOGY

In our proposed work we define two methodology reliability matrix (RM) and connectivity matrix (CM) to find the reliable route with less overhead. A Reliable Path Selection (RPS) protocols has been proposed to provide best path without any discontinuity of network with less overhead between the source and destination.

A. RELIABILITY MATRIX

A reliability matrix (RM) is proposed to evaluate link reliability between the vehicle nodes. Connectivity matrix, speed, direction, distance are taken as parameter which is shown in equation (1) to calculate the reliability matrix value to discover the stable reliable route between the vehicles. These parameter values are getting by initiating a route discovery mechanism where beacon (Hello) message are initiated by the source node to next node and create a Sorted Route Table (SRT) by using equation (2). Because of dynamic topology of the network and mobility of the vehicles, routing the packet becomes a challenging job.

1. RM(S, D) = {CM, r, d, v}...EQUATION 1
2. RM(S,D) = $\sum_{J=1}^{n-1}$ RM(j,j+1)...EQUATION 2

In equation (1) 'S' signify Source vehicle and 'D' signify destination vehicle. **CM** signify connectivity matrix used to select next node based upon the threshold value. If the node threshold value is greater than 0.5 than the node can be used as next routing node otherwise it is not eligible for next forwarded node. This mechanism is used In order to reduce the routing overhead and bandwidth by selecting the best node which leads you to the destination node. 'R' indicates the communication range between the vehicles. In our proposed system we consider the two matrix value for range 0 and 1, i.e. if the vehicle are in the direct communication range with the target node than the matrix value will be 1 otherwise it will be 0 i.e. multihop communication. For direction 'D' we have assigned three values 1, 0.5 and 0.2. Matrix value 1 will be consider if the source and destination vehicle are travel in the same direction, like that 0.5 if both 'S' and 'D' are coming towards each other and 0.2 if both are in opposite direction. Here 'V' denotes velocity of the vehicle where 1 matrix value has assigned if vehicles are moving in the same speed otherwise 0.

Reliability matrix parameter table filed

parameter	condition	value
range	Vehicles are in the communication range	1
	Vehicles are not in the communication range	0
direction	Vehicles are travelling in same direction	1
	Vehicles are travelling in opposite direction	0.2
velocity	Vehicles are travelling is same speed	1
	Vehicles are in different speed	0
Connectivity matrix	Threshold value is >0.5	eligible
	Threshold value is <0.5	Not eligible

Figure 2. parameter of relaibilty matrix

B. CONNECTIVITY MATRIX

Connectivity matrix method is used to reduce the overhead during route discovery process by selecting next forward node. This technique is deliberated probability of success of next node to link target node. This probability is determined by behavior of previous node to reach the target node via outgoing link.

- Cm=Number of success obtained/Number of attempt node
- Cm=Cmk + (1-k)Cm-1….. EQUATION 1.

Here Cmk is the next node and (1-k)CM-1 is the previous node. In preliminary attempt every nodes connectivity matrix value is considered as 1on each outgoing link and a threshold value for **cmk** is assigned as 0.5. For each attempt, each node updates connectivity matrix value. Any node which has threshold value greater than 0.5 than that node is appropriate to be discovered for connectivity or select as next routing node. The node which has less threshold value will reject because it will give overhead issues. Through this technique we can select the next node that will lead you to destination node with less delay and overhead.

SYSTEM DESIGN

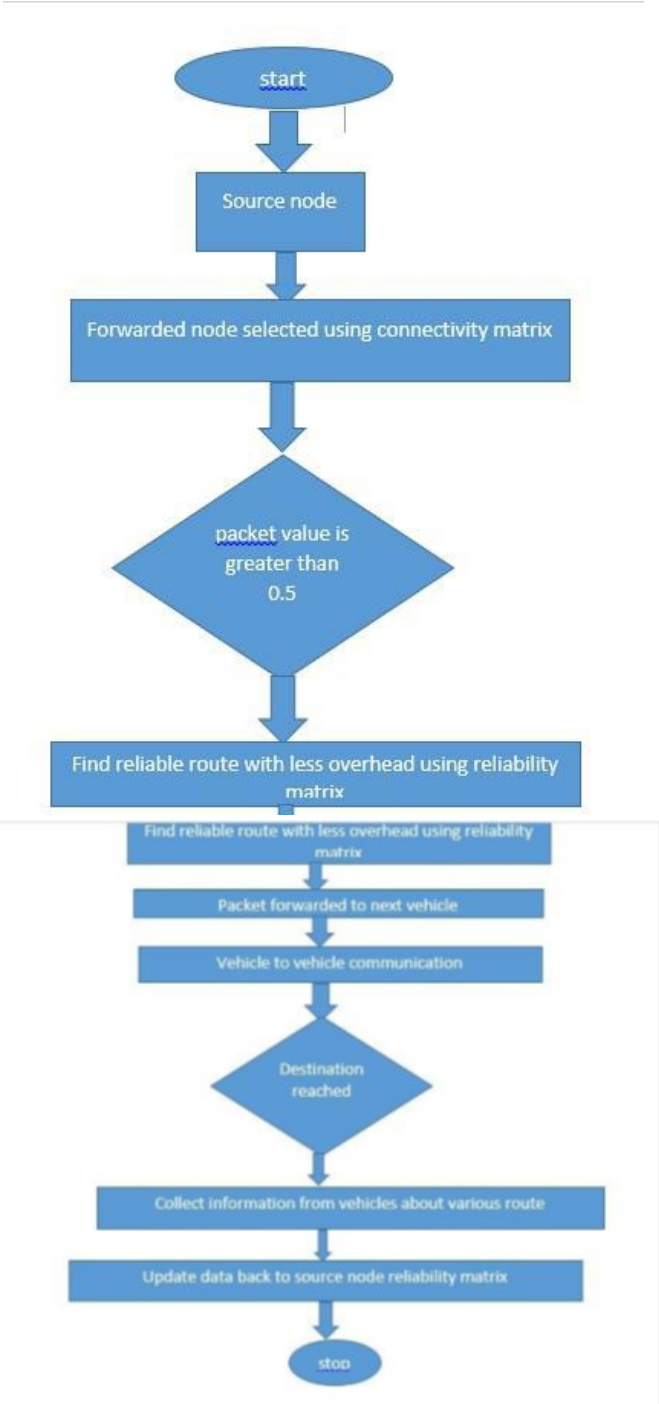

Figure 3.system design

VI. RESULT ANALYSIS

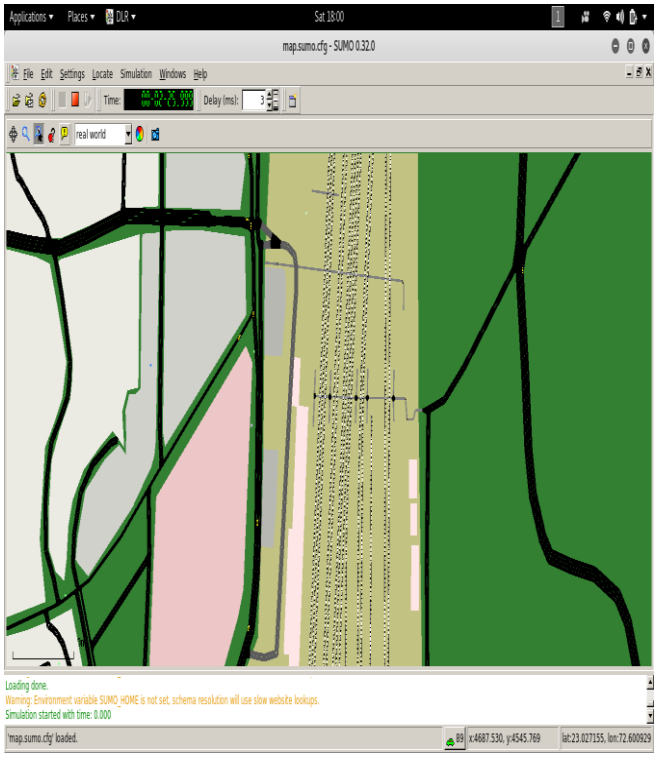

Figure 4. traffic map

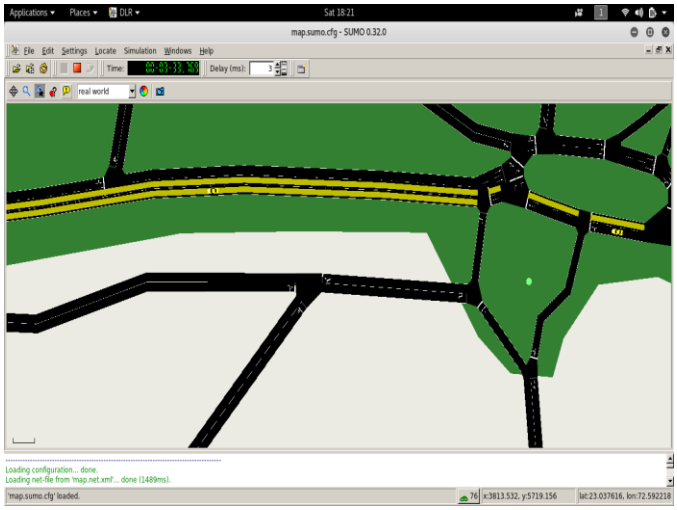

Figure 5. Movement of vehicles

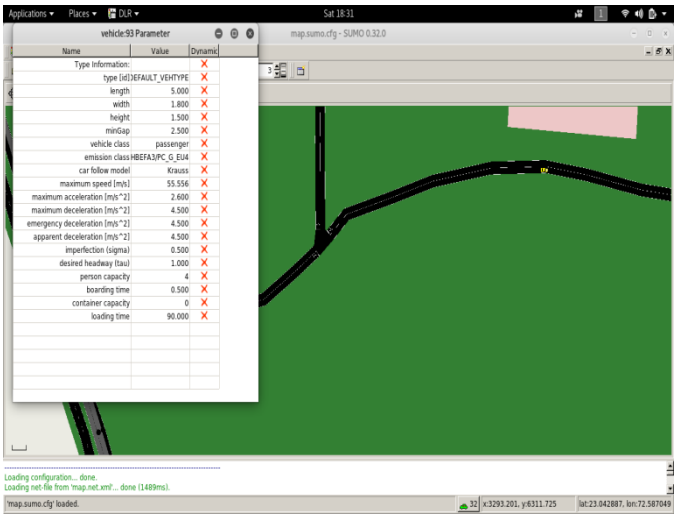

Figure 6. Static parameter

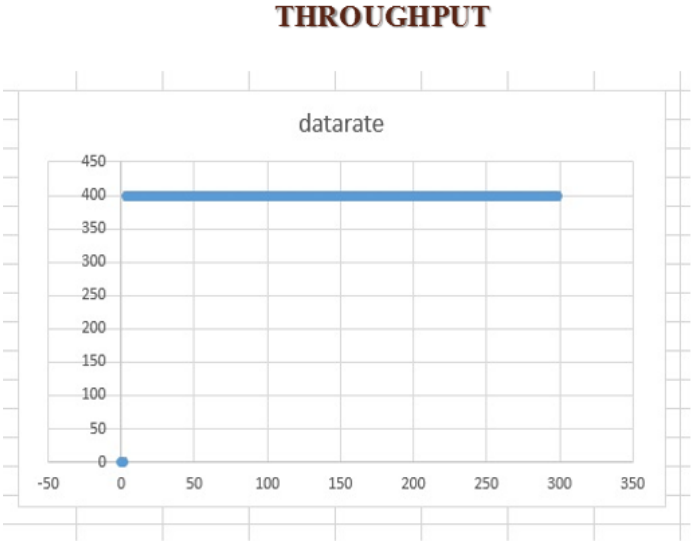

Figure 7.datarate

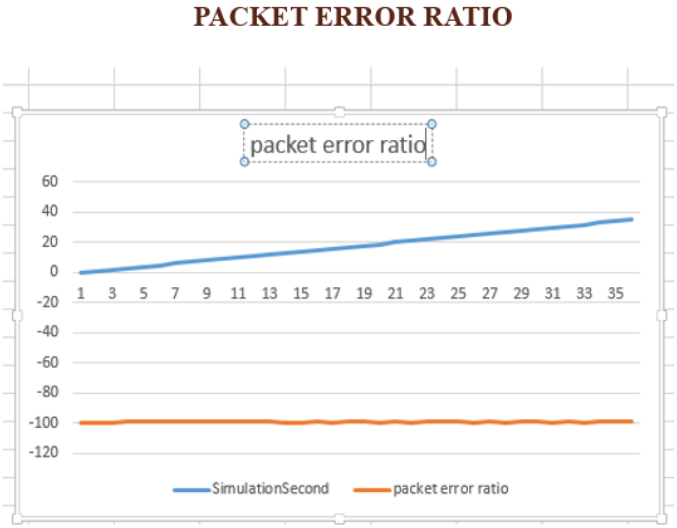

Figure 8. Psssacket error ratio

VII. CONCLUSION

This paper is considering the implementation of connectivity as well as reliability matrix as routing metrics for reliable path selection and for the improving the QOS. The reliable route can be calculated by design parameters like vehicles direction, speed and distance. The best path is selected to forward the packet between source and destination node by using SRT table. During the design process some assumption has made regarding speed, direction, distance and threshold vale. In future delay constraint can be estimated in VANETS analytically by considering above parameters.

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