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Intelligent Transportation System Using Vehicular Ad-Hoc Network (VANET)

Prof. Sushilkumar S. Thakare[1], Prof. Rajdeep A. Geete[2]

Department of Electronics & Telecommunications Engineering, SNJBs Kantabai Bhavarlalji Jain College of Engineering, Chandwad, India

ABSTRACT: Accident rates have significantly grown as a result of an increase in the number of vehicles on the road in recent years. Due to the high volume of traffic, there are many automobiles on the road. For this reason, improving traffic safety and lowering traffic fatalities requires the development of new technology. Intelligent Transport Systems (ITS) are a cuttingedge innovation that improves traffic flow and road safety. Applications are provided in ITS for both safe and unsafe situations. A variety of methods will be used to develop intelligent transportation systems. The most common kind is vehicle ad hoc networks (VANET). The VANET network is edging away the competition as the most well-liked ITS network. Safety is spread out, confirming that In the midst of moving traffic, signs, and the roads, people feel secure. A "vehicular ad hoc network" (VANET) is a specific kind of wireless network. It is used for on-road automobile communication. The standard routing protocols work with mobile ad hoc networks (MANETs). However, it struggles with VANETs. Communication links break down more frequently in VANETs than in MANETs, making reliable routing more challenging. The reliability of the highway routing in VANETs has been investigated. In this study, we use the VANET intelligent transport system. The intelligent transport system helps in planning safe routes in advance and keeping track of where the automobiles are at all times. The first intelligent transport system with exact routing is proposed in this paper. To find the information about the cars from the source vehicle to the destination vehicle, a new method must be built. Results from simulations show that, in comparison to earlier literature surveys, the proposed scheme significantly produces favourable results.

KEYWORDS: Vehicular Ad-hoc Network (VANET), DSRC, IEEE 802.11, Sensor, OBU, RSU.

I.INTRODUCTION

Every day, a most of people die, and many people are injured in traffic accidents around the world. The desire to improve road safety information between vehicles to prevent accidents and also improve road safety was the main motivation behind the development of vehicular ad hoc networks (VANETs). VANETs are a promising technology to enable Communication among vehicles on roads. They are a special form of mobile ad hoc networks (MANETs) that provide vehicle-to-vehicle communications. It is assumed that each vehicle is equipped with a wireless communication facility to provide ad hoc network connectivity. VANETs tend to operate without an infrastructure, each and every vehicle in the network can send, receive messages to other vehicles in the network. Intelligent Transportation System (ITS) that will change our way to drive and help emergency services. VANETs allow vehicles to easily communicate among them and also with fixed infrastructure. This will not only improve the overall road safety, but also raise new commercial opportunities. Each vehicle is equipped with a short range communication device and controller nodes are placed in the intersection with traffic lights. Our proposal manages traffic information seeking to avoid accidents, although the information here is gathered from the vehicles themselves so no further infrastructure is needed.

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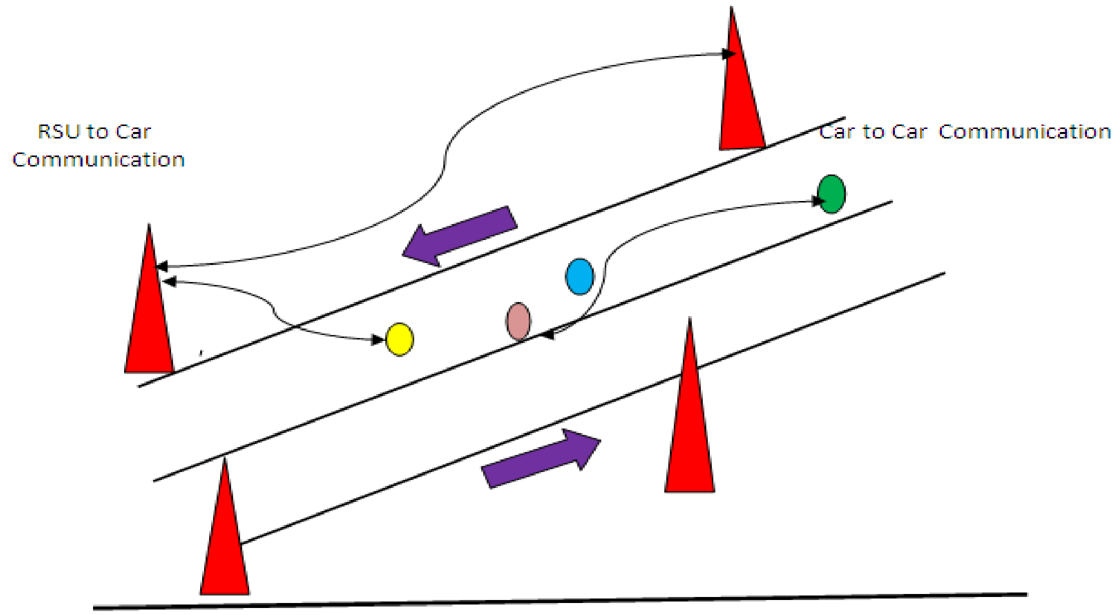

Figure 1: Structure Of VANET Ad-hoc Networks

So as to This allows for real-time communication between vehicles, allowing drivers to receive updates on the condition of the roads and other travel-related information. The most challenging issue may be the network's high mobility and frequent topology changes. As the cars adjust their speeds and/or lane usage, the network topology of VANETs may also change. These changes rely on the drivers and the traffic circumstances and are usually not planned in advance. Embedded wireless devices are the key components of creating cooperative active safety systems for autos. These applications, including as vehicle information detection and communication, are directly tied to the physical dynamics of both drivers and cars. Drivers receive warning messages from these systems, which rely on vehicle communication, and they may even quickly take control of the vehicle. Recent research on these cooperative vehicle safety (CVSS) systems has shown that significant performance improvements are possible by integrating the cyber components that are in charge of tracking other vehicles and detecting threats with the design of the system components related to vehicle dynamics. Vehicle safety systems provide a range of potential responses and warnings, from low-latency collision avoidance or warning systems to moderate-latency systems that give heads-up information about potential threats in the vehicle's non-immediate route. The primary sources and information distribution routes used by various systems vary. In order for active safety systems to function, vehicles must continuously scan a few hundred metres in all directions for possible hazards. The cars must communicate often in real-time over a designated short-range channel (DSRC) to complete this task. Roadside devices that provide traffic light or pedestrian-related information at intersections can assist vehicles in learning about their surroundings in addition to inter-vehicle communication. The ability to send real-time gathered information to and between vehicles with latencies of less than a few hundred milliseconds is the primary requirement of these active safety systems. Many auto manufacturers are creating prototypes of these systems.

II.RELATED WORK

The cyber components of DSRC-based safety systems are chosen to suit the demands of active safety. However, the current designs are unable to enable a fully-fledged CVSS in which numerous vehicles interact and communicate with one another. According to an early paper by the Vehicle Safety Communication Consortium (VSCC), the typical design of the CVSS system is an open design based on the structure presented. This report's information suggests that automobiles will send tracking messages every 100 milliseconds, across a distance of at least 150 metres (on average, 250 metres). The recommended distance is the range that the DSRC radio power is set at. Given the problems with the aforementioned

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network design, numerous improvements have recently been proposed to reduce required data rate by removing unwanted elements, here, the idea is that many applications require the same data elements to perform evasive maneuvers. The message dispatcher at the sender side will group data elements from application layer (i.e., the source) and decides how frequently each data element should be broadcast. The above methods focus on the computing module, as defined in this section, and try to improve its performance through observing the behavior of the application, or by incorporating limited physical process information in the design of the computing module. While the above improvements do enhance the performance of CVSS systems, these designs do not consider the mutual effects of computation, communication and physical processes on each other. In this, try to identify such mutual effects and propose a design that uses the knowledge of the tight coupling of cyber and physical processes to the benefit of a CVSS system.

A. Destination Sequenced Distance Vector (DSDV)

All routes are up to date before a necessity for the route arises thanks to DSDV's proactive nature. Each node's routing table contains information on the following hop, the cost of travelling to each destination, and a sequence number generated by the location itself. To share information about routes, each node trades this table. A node will periodically broadcast the routing table or whenever there is significantly new information about a particular route. The routing table that is kept locally is consulted by each node when it wants to send a packet. A node is aware of which of its neighbours will get them there faster for each destination. The route discovery process benefits from the use of DSDV. As a result route discovery has extremely little latency. Loop-free pathways are thus a guarantee of DSDV.

II.INTELLIGENT TRANSPORTATION LIGHT FOR VANETs

Each vehicle exchanges hello messages (HM) with its neighbours in order to keep track of how many other vehicles are within its gearbox range. The next step is for the vehicle to send a Statistic Message (SM) to the closest ITL, including the number of neighbours. As an illustration, C1 counts C2, C3, and C4 as its three neighbours. Observe that despite being inside its communication range, C7 is unable to communicate with it due to the obstructions represented by the buildings. When the car C5 cannot see any neighbours nearby, it sends an SM with a zero to the closest ITL. The messages transmitted to an ITL by each vehicle comprise the type of message (a new message called a Statistic Message, or SM), the vehicle's identifier, and the current value. the message's sending time, the number of neighbours inside the message's bits coverage range at that instant, and the ITL destination's IP address. The cars send this communication every two seconds. In this way, an automobile travelling at a speed of 40 km/h delivers 5 messages as it passes a 100 m. long street. As soon as a new message is received, the ITL will update the traffic statistics.

IV.PROTOCOL IMPLEMENTATION

Vehicle-to-vehicle and vehicle-to-roadside communications are supported by Dedicated Short Range Communications (DSRC), a short to medium range communications service. These communications have a wide range of uses, such as vehicle-to-vehicle communication, traffic information, and several more. High data throughput and reduced communication latency in constrained communication zones are the goals of DSRC. As a technique to improve driving comfort and safety, vanet are gaining popularity. As a component of the WAVE protocol in VANETs, the IEEE 802.11p MAC protocol has received a lot of attention.

V.PERFORMANCE EVALUATION

Simulations are carried out using Network Simulator (NS2) to assess the effects of mobility on the proposed dynamic priority management strategies and the IEEE 802.11p standard. The simulations are run for a 5-kilometer-long, 3-lane motorway with 10-meter-wide lanes. From 60 to 120 km/h, the speed of the vehicle varies. The MAC specifications for 802.11p are the same for all cars. The system time in each simulation is set to 100 s, and each vehicle's gearbox range is 250 m. In a V2V mode, vehicles converse. Each packet can be transmitted over 500 slots at a speed of 1.2 Mbps and contains 1024 bytes. In various node clusters, channel reuse is allowed. Different nodes compete for the channel at different times.

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A. Packet arrival rate

Total ratio of the number of received data packets to the number of total data packets sent by the source.

B. Average end-to-end delay

The average time for delivering a data packet is an successful transmission.

VI.INTELLIGENT TRANSPORTATION SYSTEM

As new vehicle-to-vehicle ad hoc networks expand on current roadside infrastructures (such as sensors, access points, and centralised servers), it is crucial to understand how these networks will affect the ITS applications used by end users. More importantly, it is important to identify the fundamental performance constraints of VANETs in order to increase their applicability to support the right higher level application services. A crucial element that can be utilised to assess novel methods, system designs, and architectural concepts is test bed environments. However, conducting experiments in live transportation systems can be expensive, dangerous, difficult to scale, and frequently lack appropriate means of control for thorough research. In order to get around these restrictions, simulated systems are effective. The highly changeable and unexpected nature of traffic situations as well as network communication patterns necessitates the use of simulation tools. In order to evaluate the advantages of ITS in a planning mode, as well as to generate scenarios, optimise control, and forecast network behaviour at the operational level for transportation professionals to develop efficient traffic management systems and to compare transportation alternatives, it is essential that such models also include realistic transportation models. In this study, we present a thorough assessment of the effect of mobility on the IEEE 802.11p MAC performance. Basic performance parameters including packet delivery ratio, throughput, and delay are assessed in the study. The relative speed presents an injustice issue in both broadcast and unicast circumstances. To reduce the impact of high mobility on network performance, we suggest two dynamic contention window techniques. While the second system provides service priority based on node relative speed, the first scheme adapts the dynamic degree of service priority to the number of neighbouring nodes. Numerous simulation results show how mobility significantly affects the performance of the IEEE 802.11p MAC, the unfairness issue in vehicle-to-vehicle (V2V) communications, and the efficacy of the suggested MAC designs.

VII.RESULTS

Intelligent Transportation System mechanism was compared with three different strategies and three strategies were analyzed in order to choose the best one among these strategies for vehicle communication. The performance evaluation metrics, the comparison of the Strategies and results have been described through the NS2 Simulator.

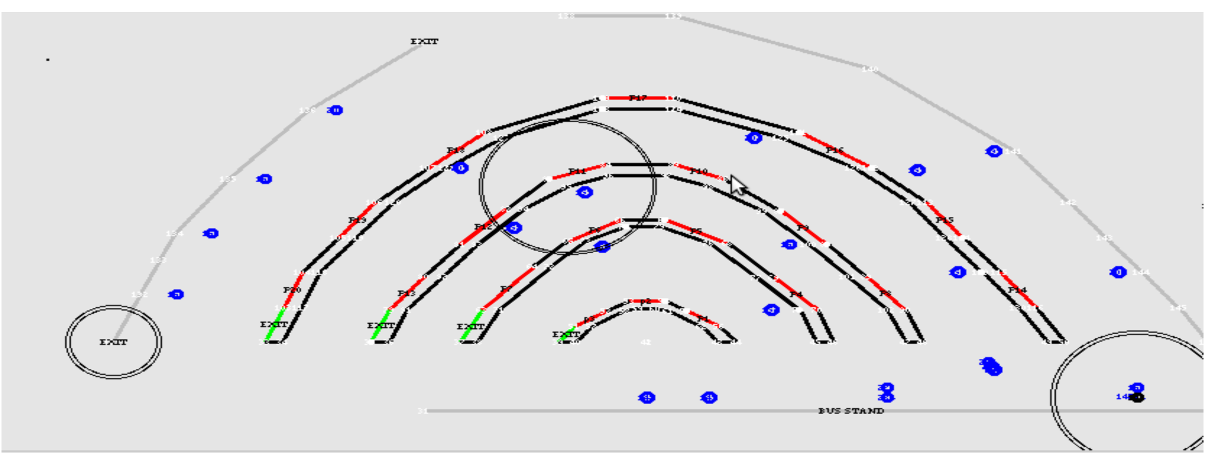

Figure 2: Intelligent Transportation System

Above fig.2 shows number of nodes can be created in the network.

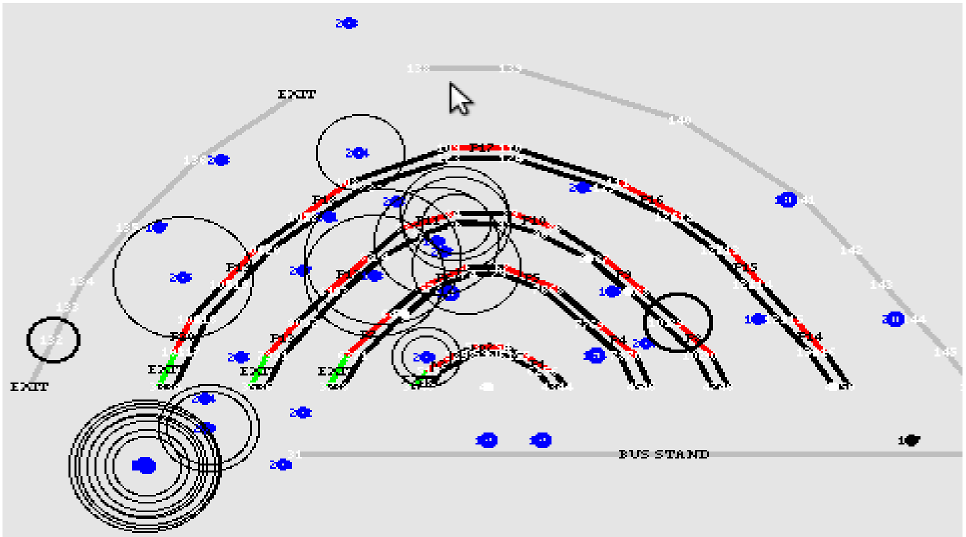

Figure 3: Communication Among Nodes

Above fig.3 shows number of vehicles can be communicated to avoid road accident between vehicles using 802.11p protocol.

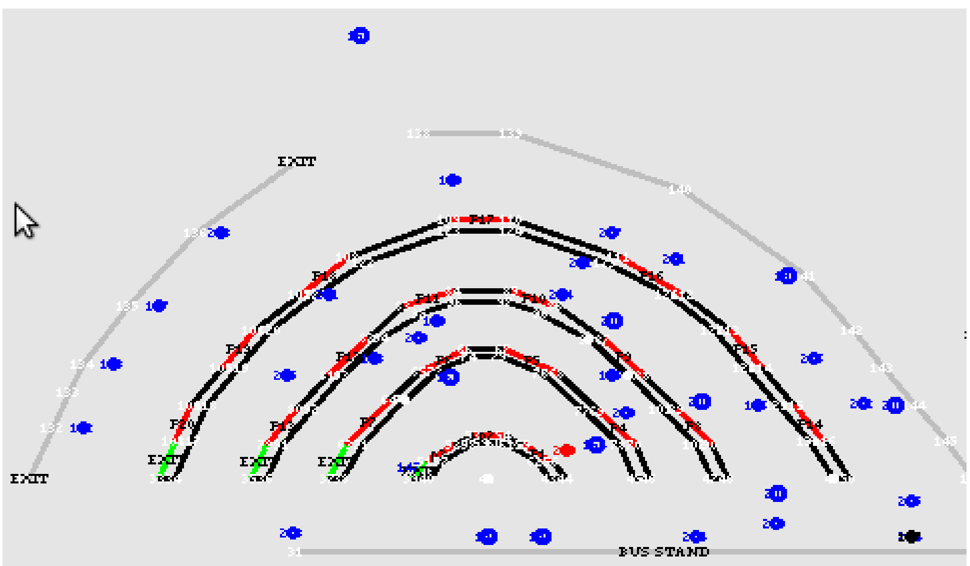

Figure 4: Indicating Warning Message

Above fig.4 shows nearby vehicles can change the light to indicate warning message about traffic congestion.

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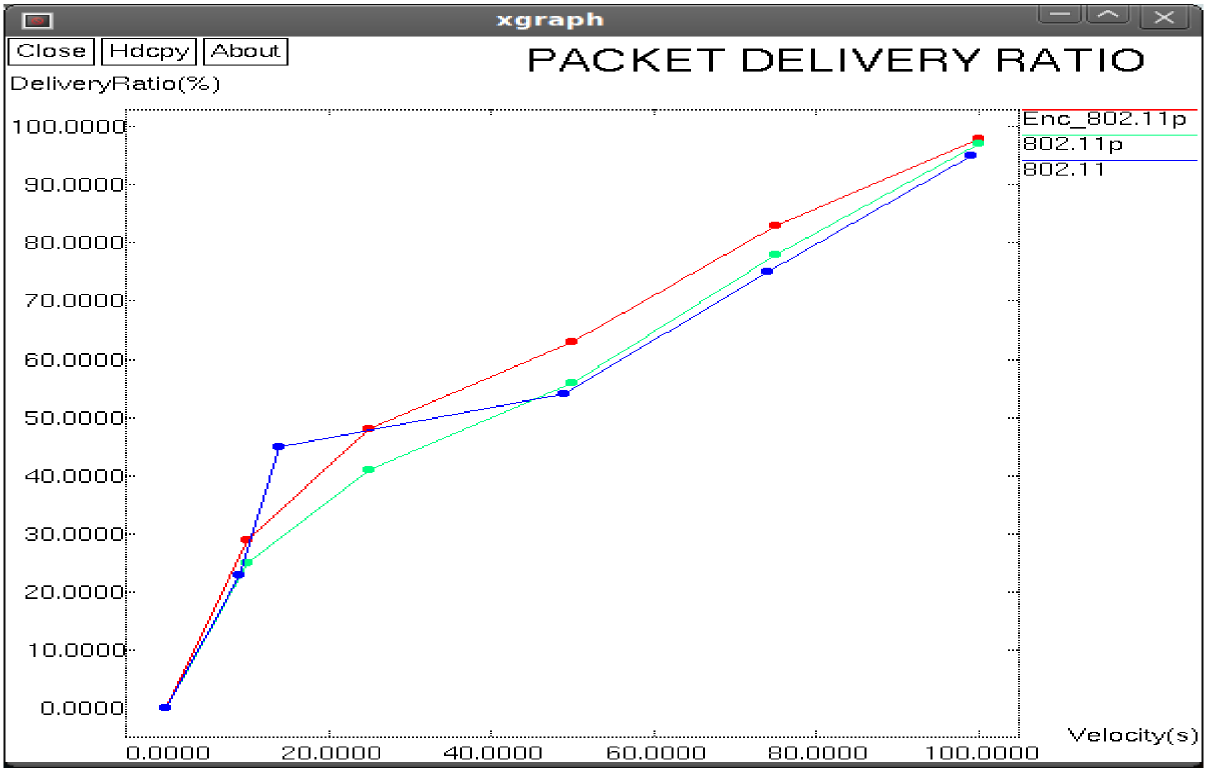

Figure 5: Packet Delivery Ratio

Above fig.5 shows the ratio of the number of delivered data packet to the destination using NS-2.

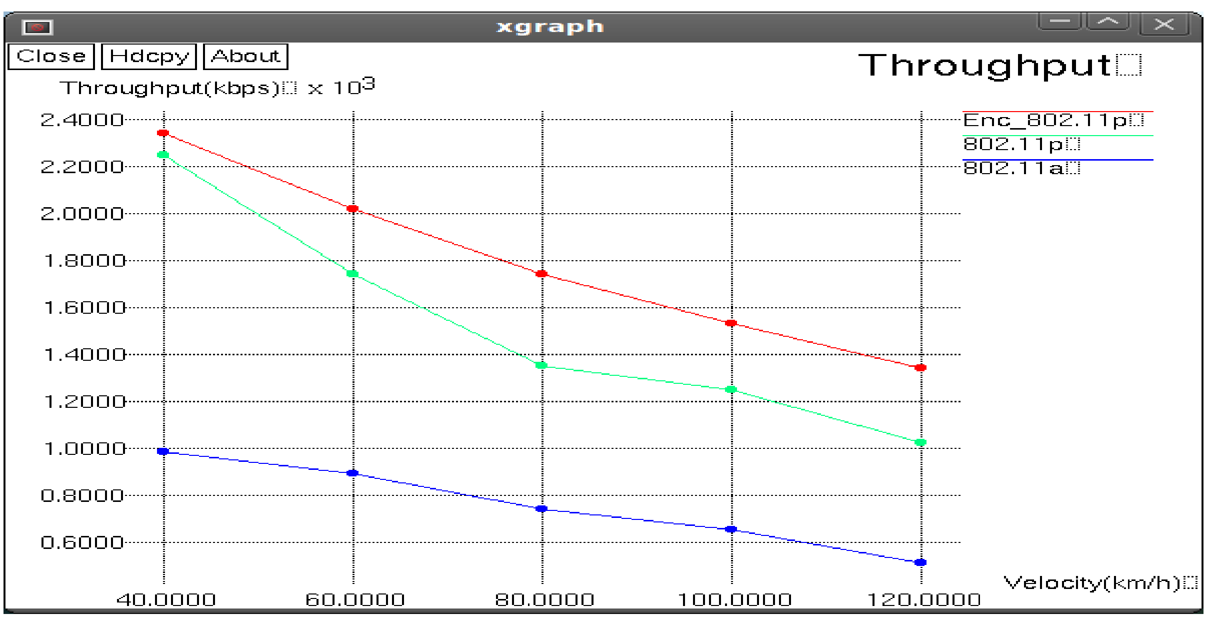

Figure 6: Throughput

Above fig.6 shows rate of successful message delivery over a communication channel using NS-2.

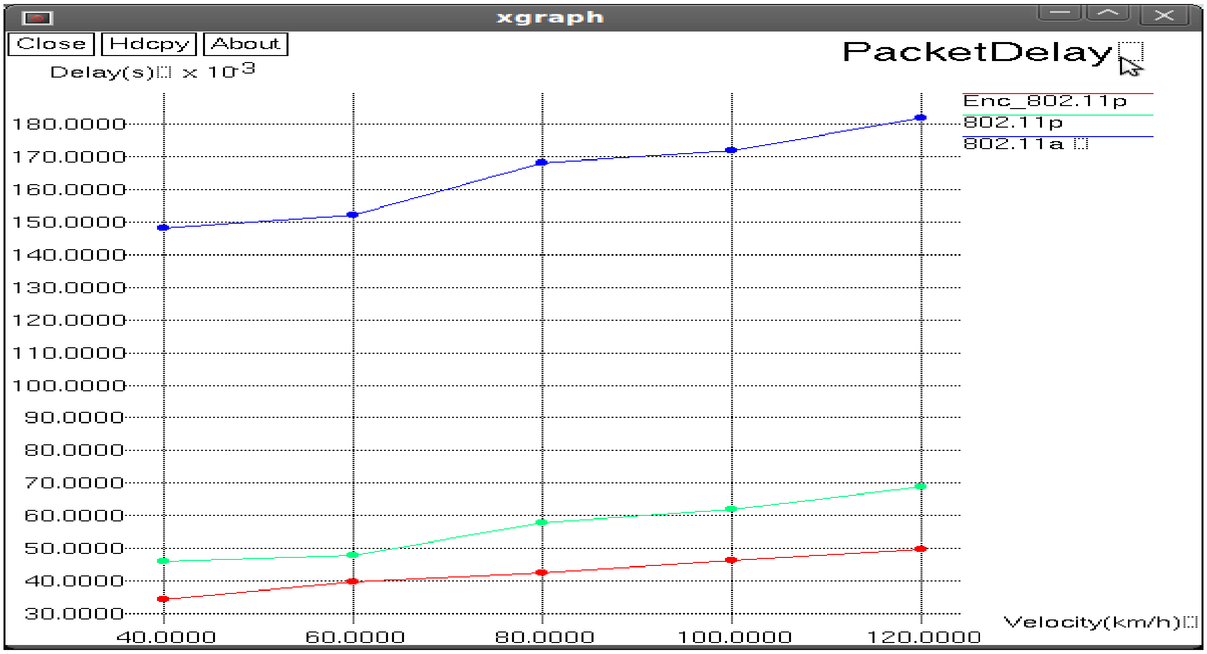

Figure 7: Average end-to-end Delay

Above fig.7 shows the end-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination.

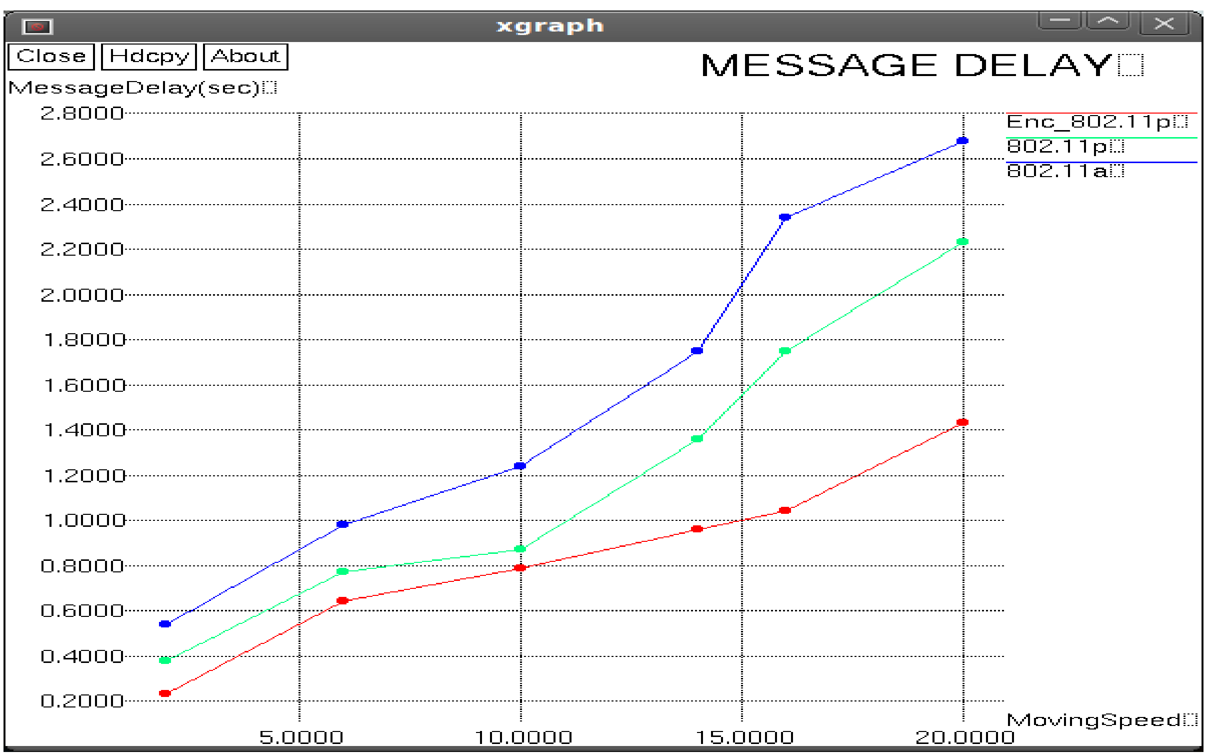

Figure 8: Message Delay

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Above Fig. 5 shows the delay of a network specifies how long it takes for a bit of data to travel across the network from one node or endpoint to another.

VIII.CONCLUSION

Three different intelligent transport system implementation methodologies have had their effectiveness examined and evaluated. Through the use of Intelligent Transportation Systems (ITS), for example, this research intends to enable accurate and effective evaluation of new vehicular network applications. The feasibility and performance restrictions of VANETs in supporting ITS are assessed, and a distributed simulation platform that merges transportation simulation and wireless network simulation is proposed and constructed. This platform offers a user-level simulation environment. The suggested simulation platform enables the dynamic interaction between the two simulation domains, enabling runtime control of the behaviour of the cars in the transportation simulation as they respond in real time to information exchange in the simulated communication network. To gauge Dynamic Route Planning's effectiveness when used in case studies, the proposed simulation platform VANETs, Using data gathered at the level of the transportation system, such as trip and delay time. In the case studies, three sample VANET dynamic adaptation techniques' abilities to improve application performance in conditions involving a high vehicle density are contrasted. The experiment's findings demonstrate that a VANET system may effectively enable dynamic route planning, as evidenced by up to a 118% increase in the number of vehicles reaching the target and a 36.2% decrease in travel time and 56.1% decrease in wait time.

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