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Technique of Data Transfer Between Road Side Unit and Vehicles in Vanet

C. V. Krutharth* and S. Kayalvizhi*

ABSTRACT

Vehicular ad hoc networks using Wireless local area network (WLAN) technology have recently received considerable attention. Vehicle to vehicle communication is significant for road safety and convenience. VANET addresses the problem of link failure during multi-hop communication for efficient routing in VANET. The important types of communications were vehicle to vehicle and roadside unit communications. The proposed system based on cellular network and vehicle to road side unit. This proposed system provides two routing (CAR & MPTCP) techniques which can work in VANET for multi hop communication. These techniques for multihop data exchange between RSU and vehicles is done very carefully so that these techniques will increase the file transfer out comes between road side unit and vehicles in VANET .The velocity vector based MPTCP is contributed to existing MPTCP. The performance of existing MPTCP & improved multipath TCP is compared during the multi-hop data exchange between road side unit and vehicles.

IndexTerms: Vanet, RSU, Connectiveaware Routing, Greedy Forwarding, MPTCP, IMPTCP

I. INTRODUCTION

Vehicular ad hoc network is an upcoming technology in which the information is transferred between the vehicles for the better communications between the vehicles that may be moving autonomously that is without driver. this techniques will improve the file transfer techniques and traffic congestions than if each vehicle tries to solve these problems individually. Vehicles, are equipped with wireless communication capability, are capable of communicating with each other and with roadside and infrastructures. Vehicular network is a special category of Mobile Ad-hoc Networks (MANETs). Even though all the characteristics and concerns apply for vehicular networks, some of the elements are different.

Vehicles, in communicating with Roadside units different wireless technologies can be used. The wireless technologies used may be short range such as Wi-Fi and a long-range technology of cellular networks. If both technologies exist in together, they will have a collective overall capacity. The preference among the existing wireless channels depends on communication requirement of applications and the different available service applications use channel that fulfill their communication requirement. The final intention is to provision both safety applications and non-safety applications that enhance the driving experience of drivers with reliable communication.

1.1. Communication modes in VANETS

In Vehicular network, there are about three communication mode, which are used for different Intelligent Transport Systems (ITS) applications:

Vehicle-to-Vehicle (V2V) Communication

Vehicle-to-vehicle communication, or V2V for short, allows vehicles to communicate with other vehicles in a given area. Each vehicle broadcasts its own speed and direction, making it easier to avoid potential collisions.

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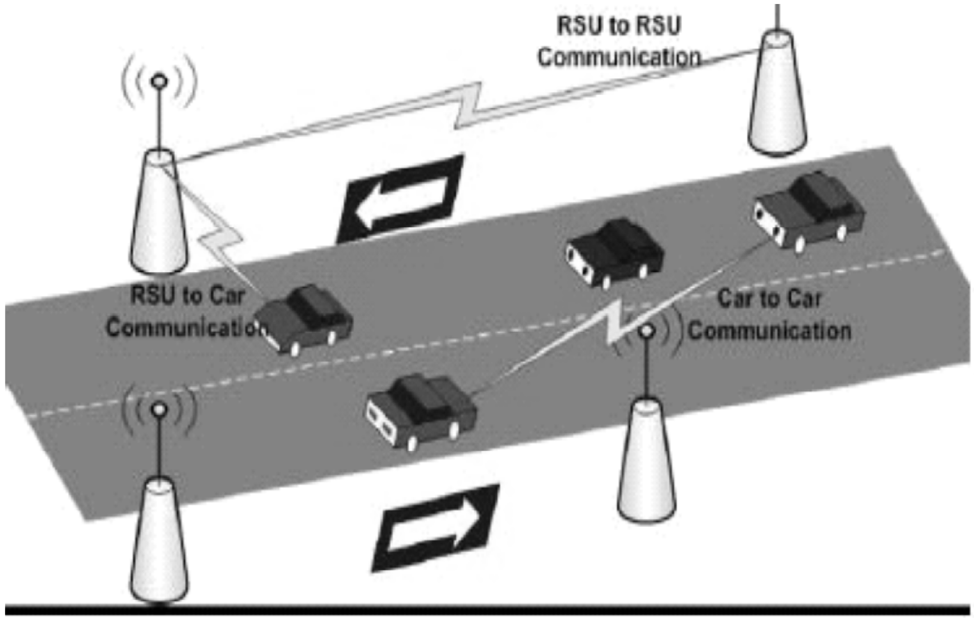


Figure 1: Vanet Structure

V2I/I2V Communication: is a type of communication that is between the roadside units infrastructures and vehicles. There are a lot of Intelligent Transport Systems (ITS) application that use this kind of communication mode. It could use both short-range and long- range wireless technology, such as Wi-Fi, 3G etc. This communication is usually used to get in contact with other large networks like Internet.

I2I Communication: is a communication between roadside unit infrastructures, for a better efficiency. When there is a situation that vehicles at far wants to communicate though RSU this kind of communication may happen. There are applications that could make use of this communication mode. One example is when an ambulances is going in a road the first road side unit may inform to all road that the ambulances is going.

2. METHODOLOGY

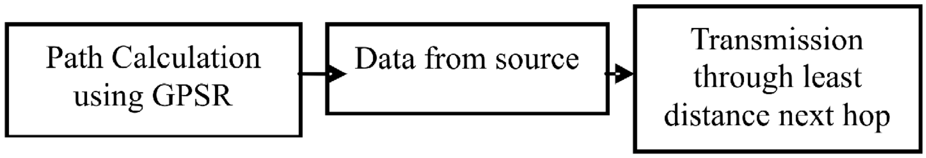
2.1. Greedy Forwarding[1]

Greedy forwarding is a novel based routing protocol. it uses the source destination address and velocity vector and by using those information's the packet is transferred from source to the destination. it uses mode recovery strategy if next hop is not found then the packet is dropped if the next hop is found then the packet is forwarded to the destination . it will check whether the packet has reached the destination or not if the packet has reached then it will stop transferring the packets. otherwise it will retransmit the data packets from source node to the destination node out of locally available routes with the help of GPS that will selects the routes automatically. Greedy choice in choosing the packet's next hop. Specifically, if the node knows its radio neighbors positions, the locally optimal choice of the next hop is the neighbor is geographically closest to a packet's destination. Forwarding in this regime follows successively in closer geographic hops, until the destination is reached.

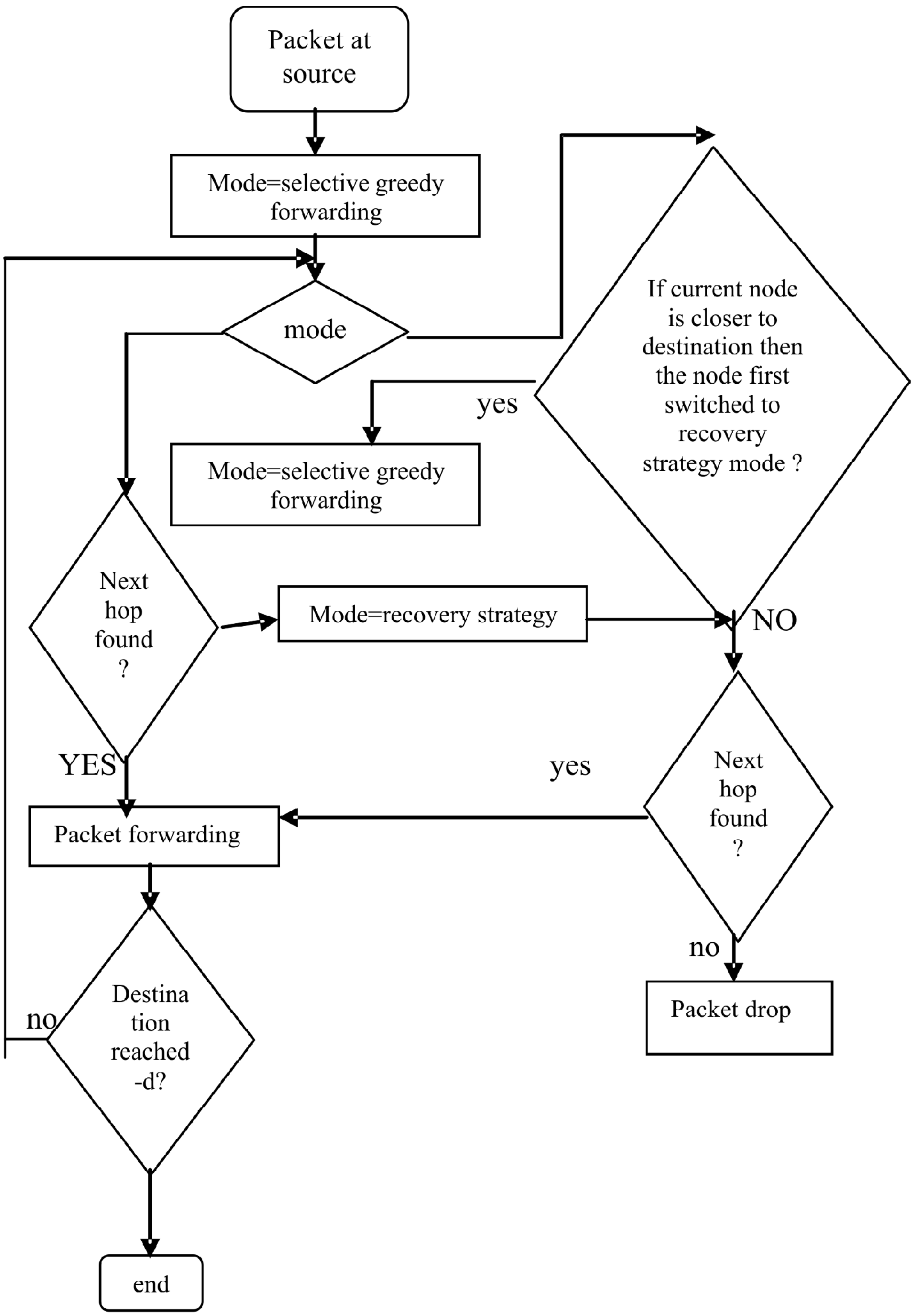
The source node (x) selects a next hop from its neighbor (y) if it is closer to the destination and forwards its data. Otherwise, This greedy forwarding process repeats until the packet reaches D.

Define the topologies on which greedy forwarding fails; and characterize the frequency of greedy forwarding failure by the density of nodes in a network.

2.2. Block diagram



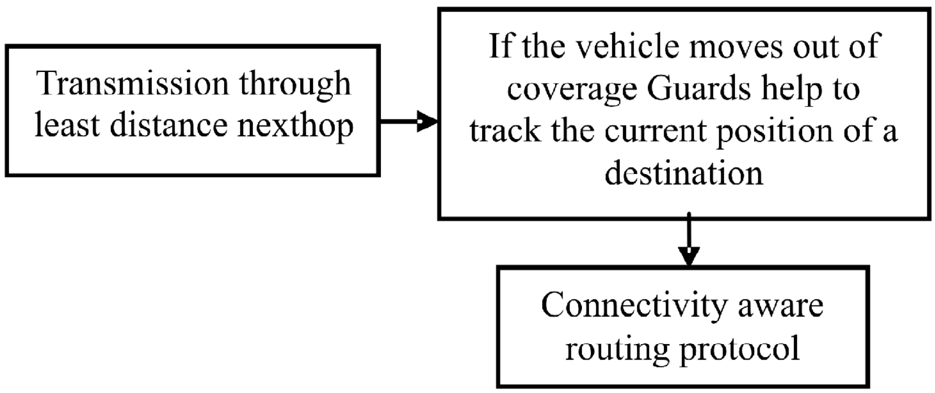
FLOW CHART



2.3. Connective Aware Routing[1]

CAR[1] integrates the locating destinations with the help of finding routes between the source node and the destination nodes .and by integrating them for the formation of the path between them for data transfer between the source and the destination nodes. Guards help to track the current position of the destination, even if it travels a substantial distance from its initially known location.

The routless guard node acts as end node and it will control direction speed, and reroute the packets to the destination node. End node will now send a notification to source. Then, the source node send data to RSU and RSU send data to destination. So data packet is not dropped out.



2.3.1. When the network is fully connected

To initiate the data transmission between the source and the destination vehicular nodes a route request beaconing message is send from source vehicular node to the destination node after receiving the RRBM the path is formed between the source and the destination nodes for the data transmission of the data between the vehicular nodes in the fully connected network there will be more intermediate nodes so that the data is transmitted between the vehicles and finally reaches the destination for transmission of the entire data is done here in this method.

In this method we can find one difficulty while transferring the packets from source to the destination through the intermediate nodes the problem is placed at the junctions of the city or routes where the packets are being transmitted in that situation the intermediate node which is holding the packets of data have to react in an appropriate manner, n the figure 2 the car c has to find the nearest neighboring node and have to transfer the packets to that intermediate node. this is the situation faced at the junctions while transferring the datr from source to the destination. once the nearest path is found at the junctions the flow will continue and the data packets are transferred to the destination node without out any loss of data that is being transferred it is one of the common types of modes that we face in our everyday life

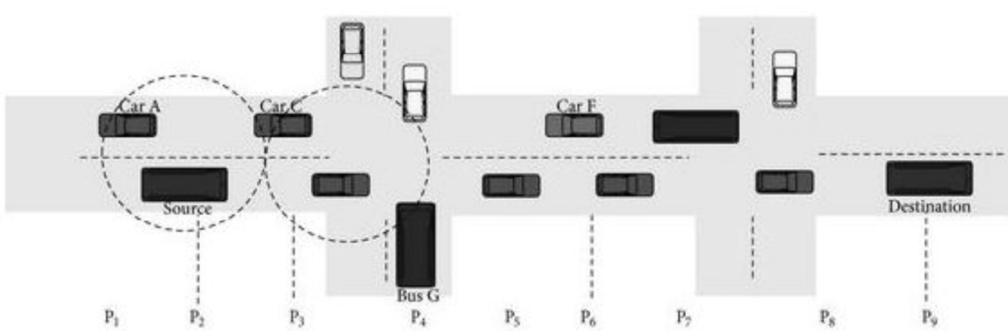


Figure 2: Fully connected network

2.3.2. When the network is sparse

In this subsection, we consider a very special case that is when the network is sparse .with less number of nodes in the traffic or road or route.in this case the nodes have to act appropriately while transferring the data from source to destination in this case the node that is currently having the packet data have to wait until the next nearest node is found if it is found then it will transfer the data to that node. if in case if the nearest node is not found then the node having the data packets will hold the data which is called store carry and forward method .it will hold the data until the life time of the packets expires. And it will drop the packet if the life time of the packet expires and the transmission is stopped until the next node is available at a nearest position.

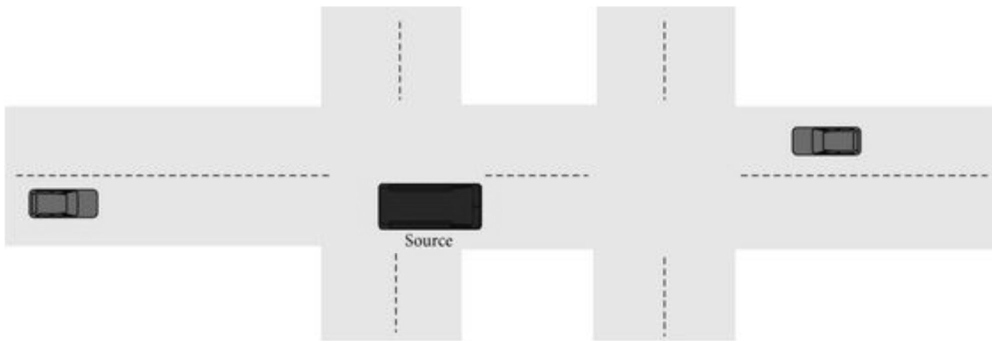


Figure 3: Sparse Network

3. MULTIPATH TCP ROUTING PROTOCOL[13]

Multipath tcp is a technique in which multiple paths can be used for finding the nearest path between the source node and the destination node. in this technique the moving vehicle can utilize the cellular networks for the transforming and storing the packet data in the nodes. it also uses the road side units for transmission of the data packets

Multipath TCP MPTCP as the names implies it is used for using the single host over multiple connections. between the source node and destination the vehicles uses the 3g network for short duration of time later road side units are brought into action for the transmission of data between the source node to the destination node.

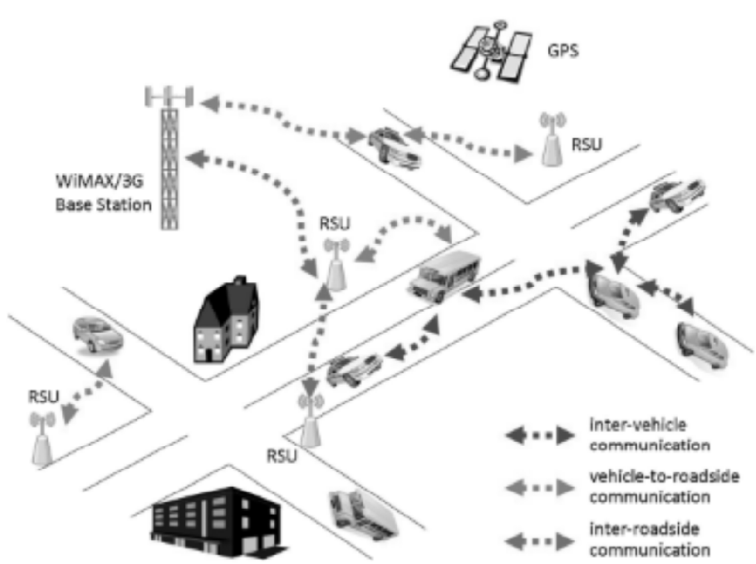
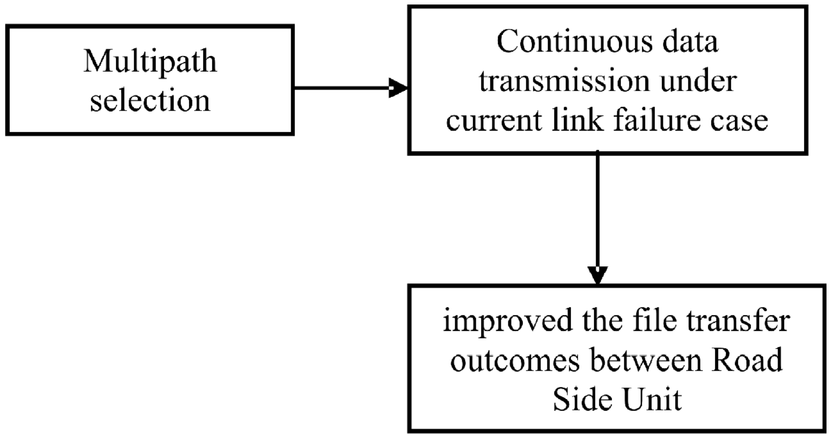
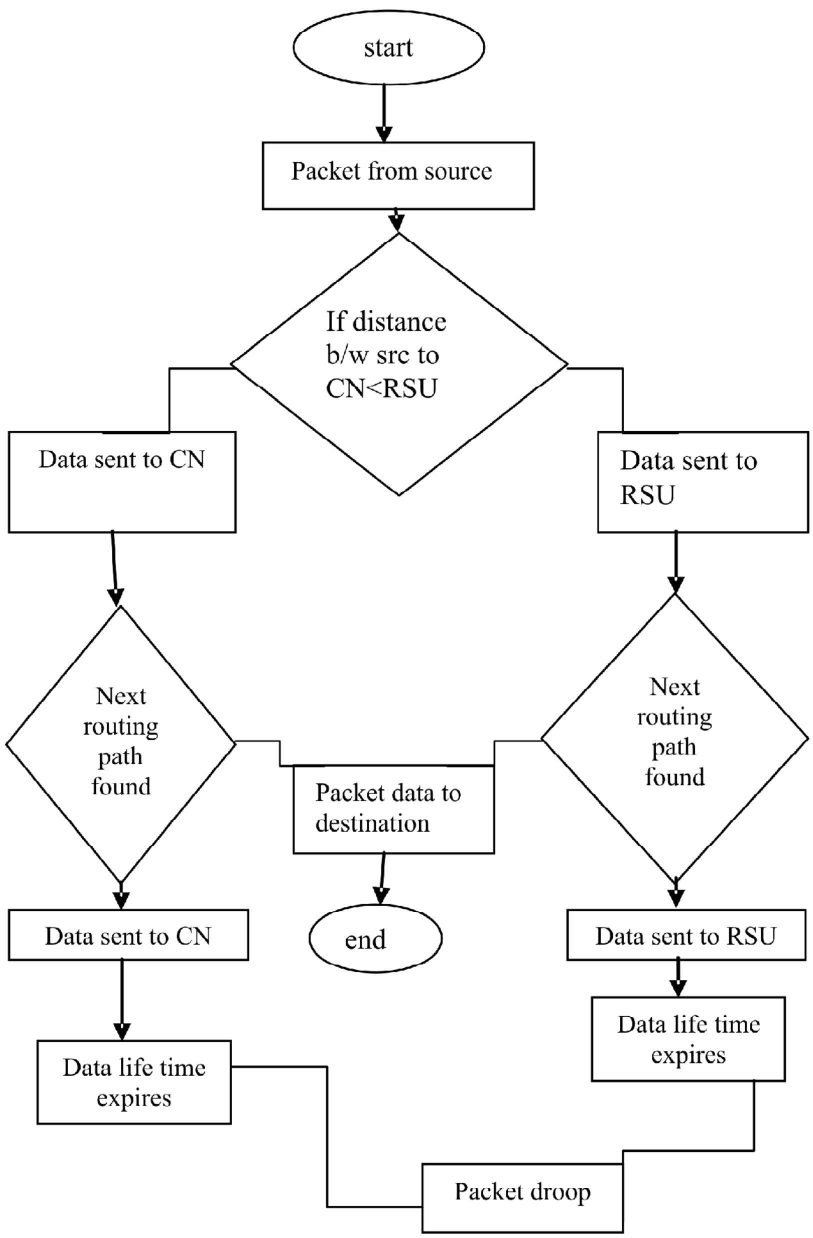


Figure 4: Multipath TCP Structure

3.2. Block Diagram

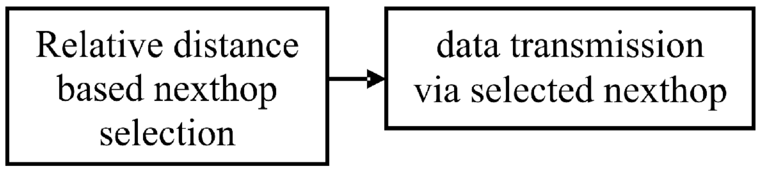


3.3. Flow Chart



4. IMPROVED MPTCP

Relative distance based next hop selection is contributed to improve existing Multipath TCP. When the source node arrives in between cellular AP and RSU, source node does not know where to send the data. On such condition it determines the distance from destination node to Cellular AP and RSU. It selects the AP that is nearer to destination. But if the distance is higher than the distance between source node and destination is lesser than the distance of destination node then source directly sends data to destination node. The improved MPTCP technique achieves better performance with reduced hop count when compared to the existing MPTCP technique.



5. PERFORMANCE EVALUATION

5.1. Throughput

It is the amount of time taken by the packet to reach the destination.

Throughput (bits/s) = Total Data / Data Transmission duration

5.2. End to end delay

The average time taken by a data packet to arrive in the destination. It also includes the delay caused by route discovery process and the queue in data packet transmission. Only the data packets that successfully delivered to destinations that counted. The lower value of end to end delay means the better performance of the protocol.

Σ (arrive time – send time) / Σ Number of connections

5.3. Routing Overhead

This metric represents the ratio of the amount of routing-related control packet transmissions to the amount of data transmissions.

6. SIMULATION RESULTS

simulator	Network simulator
Number of nodes	random
Interface type	Phy/wireless phy
Mac type	802.11*
Queue type	Drop tail&prarioratyqueue
Queue length	fifty packets
Antenna type	Omni antenna
Propagation type	Two ray ground type
Routing protocol	ADOV and AMODV
Transport agent	UDP and TCP
Application agent	CBR and FTP
area	652*652
Simulation time	200 seconds

6.1. Improved Multipath TCP

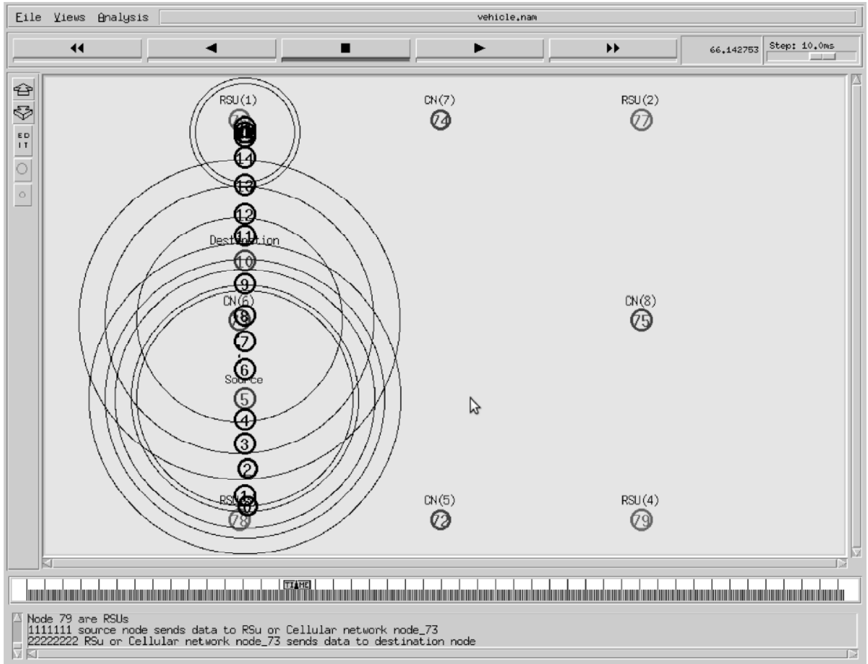


Figure 5: Connectivity of nodes in IMPTCP

6.2. Multipath TCP

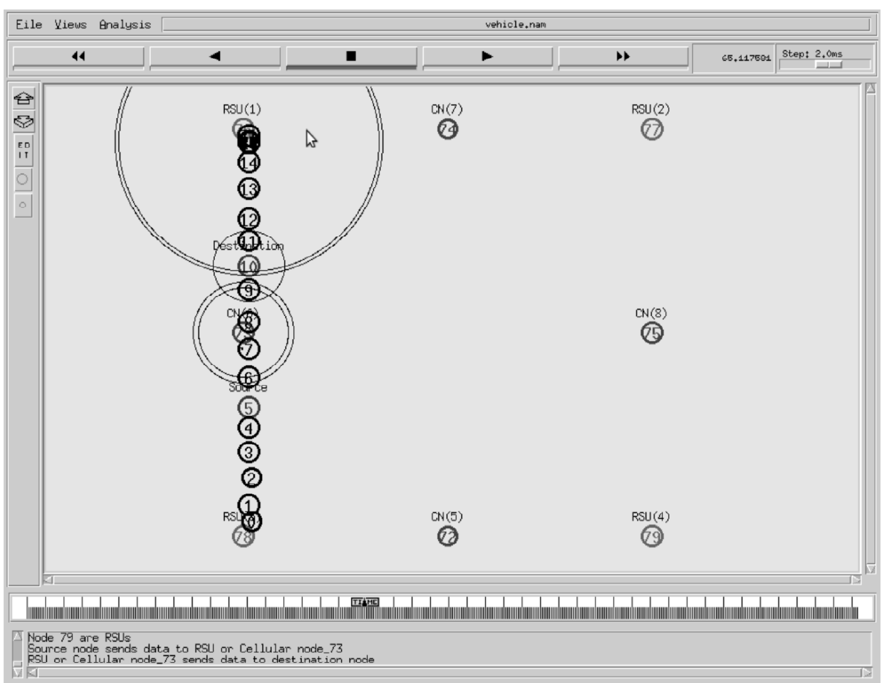


Figure 6: Connectivity of nodes in MPTCP

7. COMPARARATIVE GRAPHS

Throughput, delay and over head of the multipath TCP and improved multipath TCP are plotted in graphs and they will clearly show that which of them will be the effective system for data transmission between the road side unit and the vehicle in VANETS.from the below graphs we can clearly understand that improved multi path TCP will be more efficient in data transferring the data between the road side unit and vehicles in VANET without any loss of data.

So with the help of this improved multi path TCP we can transfer data at better rates using the road side units in VANET.

Throughput

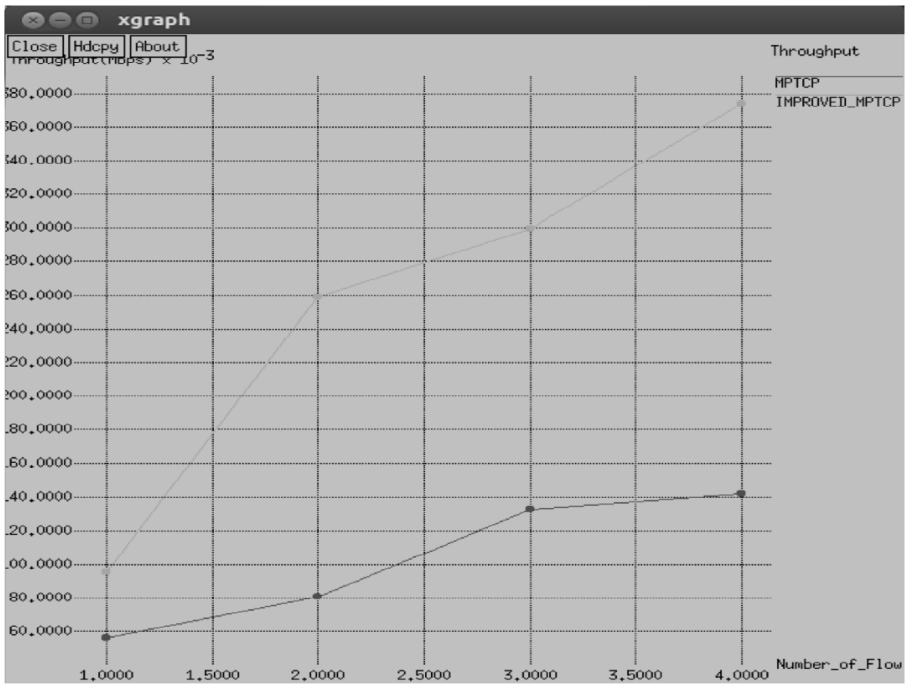


Figure 7: Graph of throughput performance

Delay

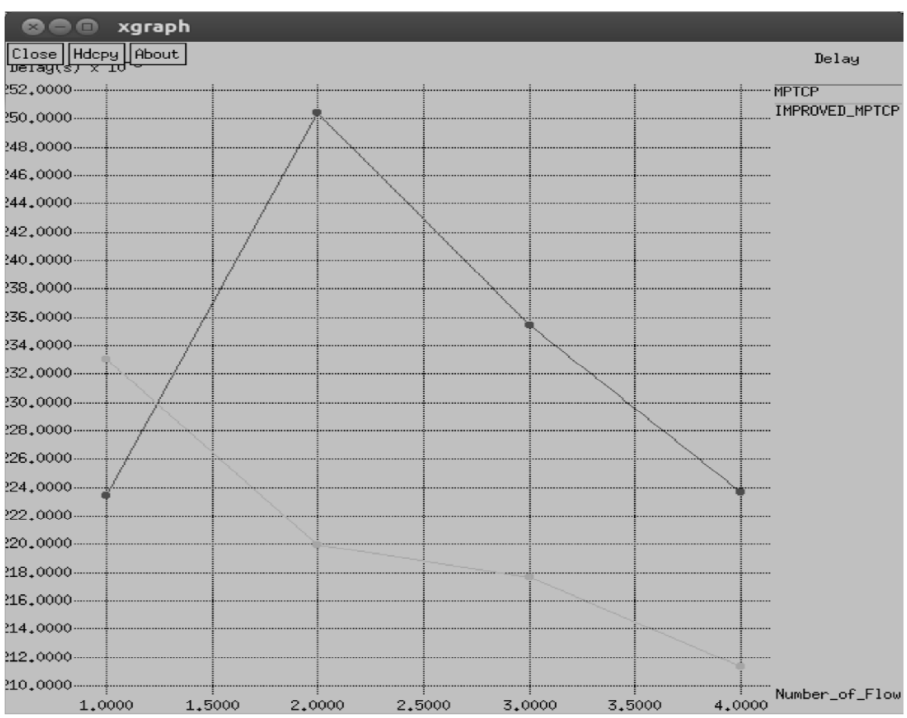


Figure 8: Graph of delay performance

Overhead

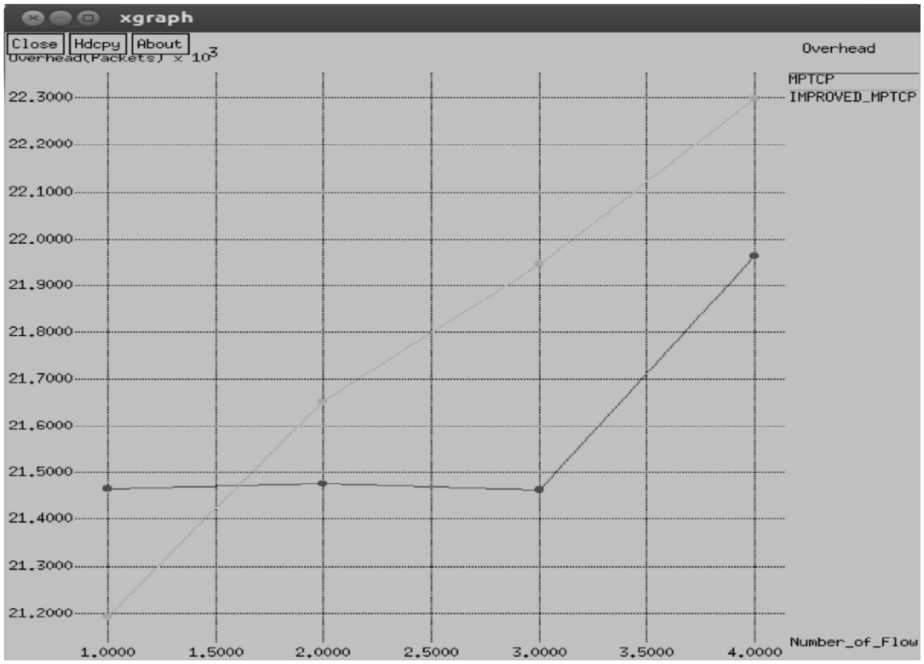


Figure 9: Graph on routing over head

7. CONCLUSION AND FUTURE WORK

In this the main problem of link failure between the nodes is taken into consideration in VANETS .we presented a connective aware routing and road side units into consideration which is a simple scenario for the exchange of data in vehicular ad hoc network .in which the road side units provide a continuous link between the vehicular nodes for the exchange of data .it provides a continuous link. the band width and transmission power effects the throughput and the receiver interphase of experiments. The multipath tcp and the improved multipath tcp is evaluated and the readings are noted and the graphs are plotted which will shows the performance of the IMTCP is far better than MTCP in performance

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