

## **Enhanced Routing Protocol To Improve Data Transfer Rate and Qos In VANET**

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**Abstract**—The vehicular ad hoc network is a dynamic network in which mobile nodes can leave or join the network when they want. In this network major issues are routing, security and quality of service. The routing protocol is used for establishing path from start node to end node. These routing protocols are broadly grouped in reactive, proactive and hybrid. AODV is under reactive routing protocol which broadcast the route request to all neighboring node and then those nodes will forward the request to their neighboring nodes. This process helps in selecting the best path. AODV protocol is the best performing routing protocol when number of nodes for communication is more in number. In our proposed work, we use AODV multicast the route request to root nodes only and then ant colony optimization (ACO) technique is applied to optimize the path. It will generate a path with shortest distance and leads to improve throughput, reduce packet delivery ratio and delay as compared with existing protocol.

**Keywords**—VANET, AODV, ACO, QoS, packet delivery ratio, throughput

### **I. INTRODUCTION**

The boom in technology has increased the use of sensors. Sensor is a device which is used for detecting change in environment. Sensors are of two type wireless and wired sensor. Wired sensors are those which use cables to transfer data from device to computer system whereas wireless sensor is that which can be deployed anywhere in the network and is not connected with any cable. These sensors form a network when a group of them are deployed at any location; this network is known as wireless sensor network. Wireless sensors network further is grouped into two categories: infrastructure based and infrastructure less wireless sensor network. An infrastructure based network is that in which sensors communicate with each other through a dedicated device called access point. Infrastructure less wireless sensor network do not require any dedicated device, communication occur directly among devices. When devices are connected wirelessly, they are termed as wireless ad hoc networks (WANET).

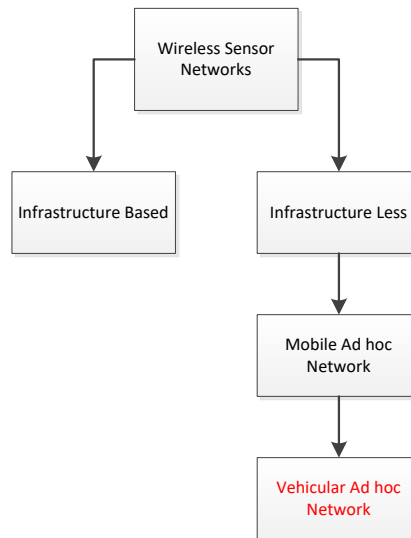


Figure 1: VANET Introduction

WANET is a dynamic and a self-configuring network consisting of freely moving nodes. It establish infrastructure less network, devices can join or leave the network whenever they want. When the portable devices are vehicles then that network is termed as vehicular ad hoc network (VANET).

VANET can be defined as a self configured wireless network. It is a sub-part of MANET. The key to VANET is that it considers moving cars as nodes to transfer the data within the network as shown in Figure 2. VANET communication system can be of two types: vehicle to vehicle (V2V) and vehicle to infrastructure (V2I). This communication system helps in transferring data, internet access, detect traffic congestion. VANET use GPS for finding geographic position of nodes. The nodes present in VANET network have very high mobility which leads to change in topology dynamically[1].

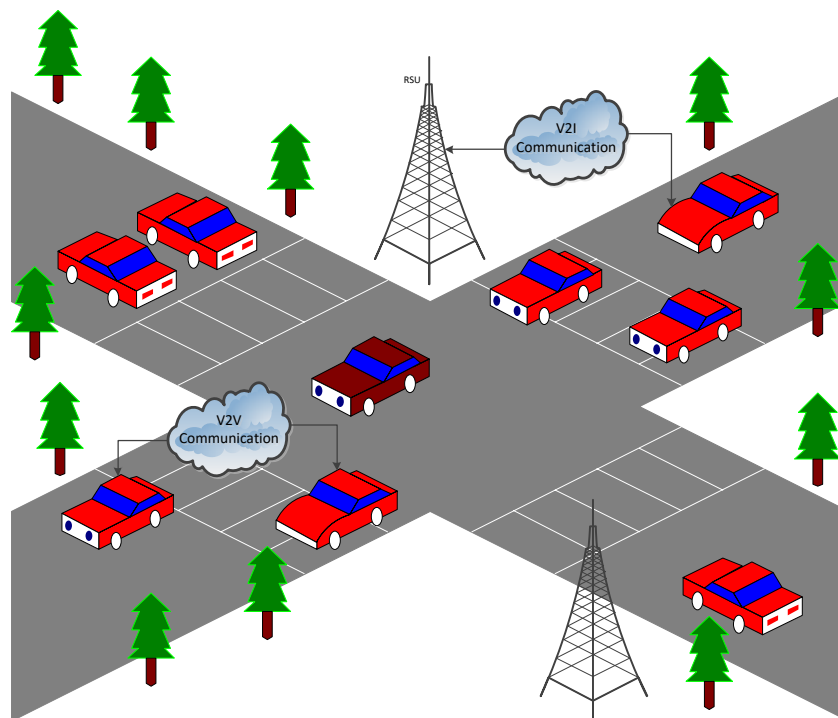


Figure 2: Communication in VANET

When devices make dynamic topology they are termed as Vehicular ad hoc network (VANET). It is a network of highly mobile vehicles moving at a relatively high speed. Vehicles in VANET communicate through one vehicle to another vehicle communication and vehicle to-infrastructure. Nodes communicate through DSRC standard that utilizes the IEEE 802.11p standard for wireless communication [2]. The main motive of using VANET is to make vehicles intelligent enough so that they can communicate among themselves without human interference. All the vehicles in VANET are equipped with maps, sensors and wireless connection which help them in establishing communication among other nodes.

The rest part of the paper is defined in order as follows. Section II include present work, Section III gives description literature survey. Section IV provides a description of research techniques. Section V provides packet delivery ratio, experimental results, comparison of throughput and delay in packet delivery. In Section VI we come to the conclusion our research work.

## II. PRESENT WORK

In AODV protocol, source selects best path from start node to end node deployed on hop count and sequence number [3]. The path will select from start node to end node on the grounds of hop sequence and count number. Here, AODV will multicast the route request packet directly to the root node and then root node will find the path. AODV protocol is merged with the ant colony optimization technique to optimize the path by using pheromone concentration in the selected path. The path which has selected is shortest and reliable. Because of high node transportability there are very chances of link failure which reduce quality of service. Buffer size parameter is added to reduce the probability of congestion in the network hence maintaining the quality of service in the network.

## III. LITERATURE REVIEW

Basil et al. [4] explains the execution assessment of OLSR and AODV for vehicular specially appointed systems, with the assistance of system test system NS-3 for the re-enactment in two cross-streets situations. With the assistance of this inventive procedure of VANET, the street wellbeing is improved as quantities of vehicles on every side of the world expand step by step. The SUMO innovation has been used to deal with the extraordinary attributes which should be trailed by the vehicle as the intersection has its own limit movement controls. The bunching impact in the intersection was examined by the two situations which contains the noteworthy highlights. In these two steering conventions, the systems measurements like PDR, the throughput and end to end delay were assessed. At the point when the blockage happens, the execution of the OLSR is superior to the AODV in both the situations of the system measurements [4]. The two techniques demonstrate poor exhibitions regarding delay yet in the high blockage time ideal execution is appeared by OLSR strategy.

Feng et al. [5] displayed in the vehicle specially appointed system (VANET) a fundamental part is played by the key hubs for the spread of data, for which assessment of imperative hubs is important. In this paper, VANETMobiSim was used to examine the time advancement of vital hubs for VANET which depends on the Intelligent Driver Model with Lane Changes (IDMLC). This strategy is actualized by building the fleeting system show at first after which the advancement of critical hubs in VANET was dissected based on four transient measurements. Subsequently, acquired outcomes exhibited that the positioning of essential hubs are not influenced by the correspondence span of VANET [5]. The positioning of critical hub is steady because of development of required hubs, for example, transient degree, entropy degree centrality. The key hubs in VANET are critical if there should arise an occurrence of transient closeness centrality. According to what comes about, it is reasoned that the significance of hubs in VANET can't be assessed with the assistance of fleeting closeness centrality. Subsequently, these outcomes help to pick suitable technique for the assessment of the hubs significance in VANET.

Kaur et al. [6] represents a viable routing system assumes an indispensable part, to advance the Quality of Service parameters. To deal with this, Ant Colony Optimization (ACO) has been connected and to complete the analysis Opportunistic Network Environment (ONE) simulator is being utilized to learn about packet fall, overhead proportion, normal inactivity and throughput. We examined essentially four execution measurements (overhead proportion, normal dormancy packet fall and throughput) signs that our proposed approach is more successful and reliable in correlation of existing directing calculation. The objective of refining the QoS in these frameworks is finished using ONE test framework [6]. A meta-heuristic figuring, Ant Colony Optimization (ACO) is associated with procure coordinating set-up and the proliferation is finished in ONE test framework. To make the re-enactment more illustrative an honest to goodness city plots with the test system has been coordinated.

Kaur et al. [7] explains Vehicular Ad hoc Network is a unique type of the Mobile Ad hoc Network which has gotten exceptional consideration with the developing period. It is equipped for giving information correspondence between the portable vehicles. It concentrates on security related applications and Internet getting to related applications. There is On Board Units (OBUs) and Road Side Units (RSUs) in the essential model of the VANETs. As every one of these units are convey through an open remote medium, so there will be more risk to the system. As the security data, for example, the client's personality, following inclinations and so forth can be influenced by assault in pernicious hub on the off chance that the hub isn't legitimately ensured. Hence, there is a need of security necessities to secure it [7]. The paper portrays different necessities, qualities, testing issues and strategies of security in VANETs. In this paper a hypothetical examination of various security methods of Vehicular Ad hoc Networks has been done which think about various plans at various levels like equipment, confirmation, protection and affirmation systems and so on.

Mokhtar et al. [8] explains Vehicular Ad hoc arranges are unique instance of specially appointed systems that, other than lacking foundation, imparting substances move with different increasing speeds. As needed, this obstructs setting up solid end-to-end correspondence ways and having effective information exchange. In this manner, there are distinctive system concerns and security challenges in VANETs to get the accessibility of pervasive availability, secure correspondences, and notoriety administration frameworks which influence the trust in participation and arrangement between versatile systems administration substances [8]. In study paper distinctive primary worries of VANET have been examined, for example, security highlights, difficulties, and assaults of VANETs, because of various system layers we order the security assaults of VANETs.

Kumar, et al. [11] represent a paper in view of the VANET vehicular specially appointed systems are up and coming remote system condition for canny transportation framework. In the VANET applications expand upon the information push correspondence display where data is scattered to set of vehicles. There are such a significant number of kinds of VANET applications and their correspondence convention needs an orderly writing overview. In this paper for the most part characterize the VANET applications in light of the different telecom information spread conventions are reviewed independently and their major qualities are uncovered.

#### IV. RESEARCH METHODOLOGY

In the vehicular ad hoc network, there is no central controller due to which nodes are free to join the network or leave the network when they desired.

AODV protocol is one of the examples of this protocol by which path is created between start node and end node. It broadcast the request when source wants to create a path between start node and end node [10]. By broadcasting the data means the request will be send from source to all its intermediate nodes. In AODV, no communication is done till path establishment process is done. Start node when

need connection, it will broadcast route request message for connection. All the intermediate nodes present in the network will forward the message and will store the information of the requested node [11]. This process helps in creating a series of temporary routes towards requesting node.

Node receiving the request messages stores a route towards the requesting node. The origin node will use that route which contains minimum number of hop counts through other nodes. All the entries which were not used in path establishment will get erased and are re-entered after some time. If any route failure occurs, the routing error message is send back to the route initiated node and the whole process of establishing the route is repeated from starting.

This research work is based on the path formation to end node from start node using multicasting approach and improves the quality of service by improving the packet delivery ratio, delay and throughput in the network.

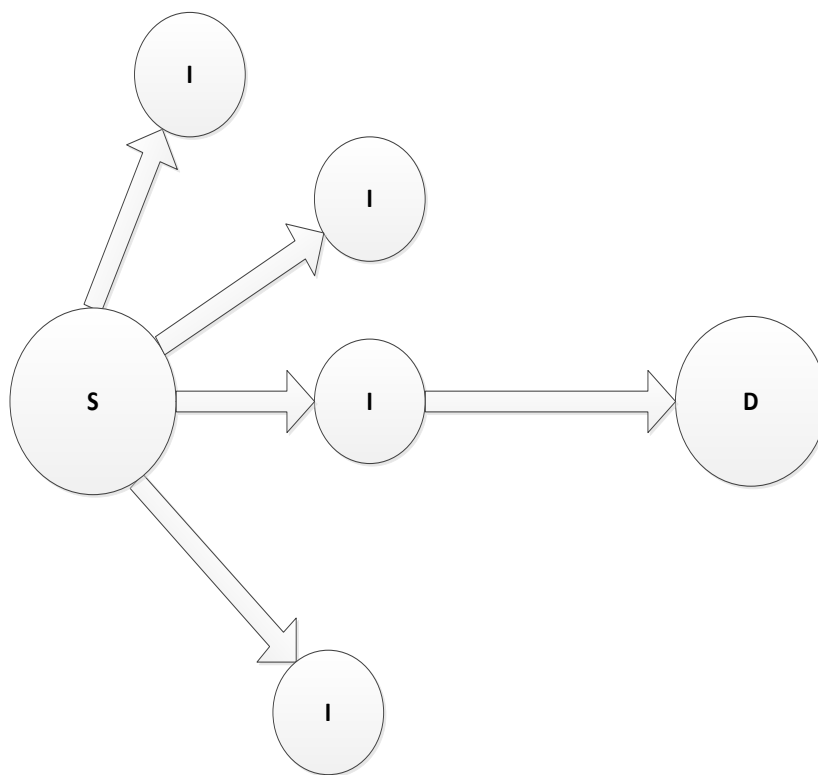


Figure 3: Broadcast

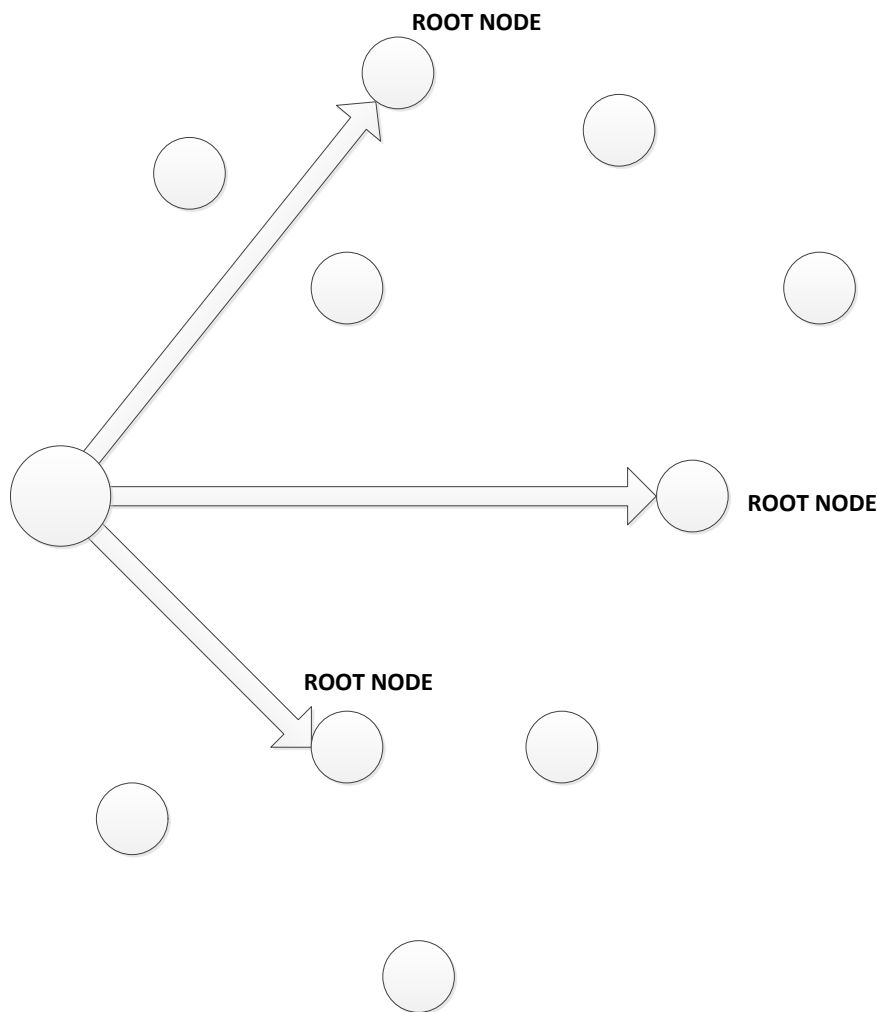


Figure 4: Multicast

In the network, the root nodes are selected in the network for the path creation from start node to end node. The root nodes are selected on the basis of node speed and maximum nodes in the range. The vehicle node which has least speed and maximum number of nodes in the range is selected as the root node.

The node which wants to be in communication with the destination, firstly start node sends the route request message to root node, path will be established to end node based on the existence of end node entry in the routing table otherwise the root node send route request message to another root node. Finding end node is done using ant colony optimization technique. The ant colony optimization algorithm takes the initial coordinates of each node coordinates of their adjacent nodes. The distance is calculated between each node and pheromones is updated which has least distance from start node to end node. This process is repeated until end node is found in the network. When the destination found in the network, then the root node revert back with the route reply packet and route will be confirmed from start node to end node.

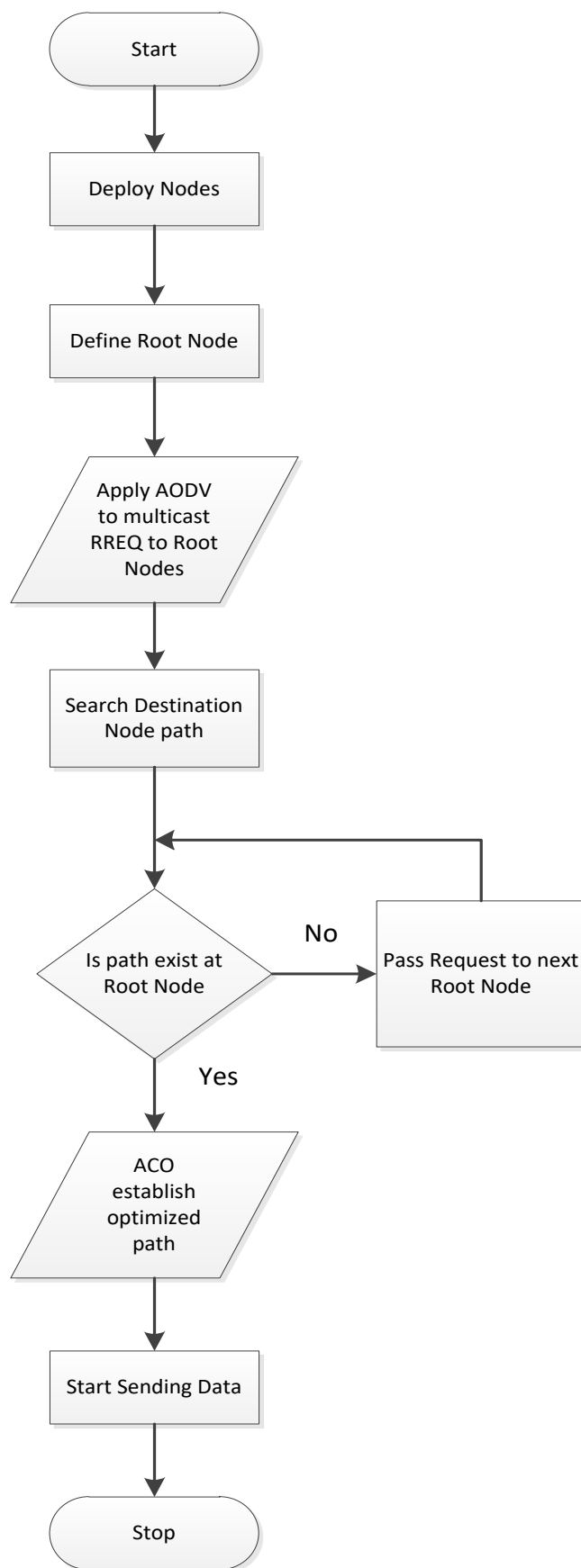


Figure 5: Proposed Flowchart

**Proposed Algorithm:**

Input: Vehicle nodes

Output: Best path Selection from start node to end node

1. Establish network having definite number of vehicles nodes
2. Select root node ()
  - a. For i to number of nodes
  - b. if (coverage area , stability and buffer size of node(i) > coverage area and stability of node(i+1))
  - c. Root node=Node(i)
  - d. else
  - e. Root node=Node(i+1)
3. Source send route request message to root node
4. if( destination is the range of root node )
5. Reply back to source with route reply packet
6. Else
7. Forward route request to next root node
8. Repeat step 4 to 7 until destination found
9. Source start sending data to destination

**V. EXPERIMENTAL RESULTS**

The proposed algorithm has been executed in NS2 and the results are analyzed by making comparisons amongst the proposed and existing approaches in terms of throughput, packet delivery ratio.

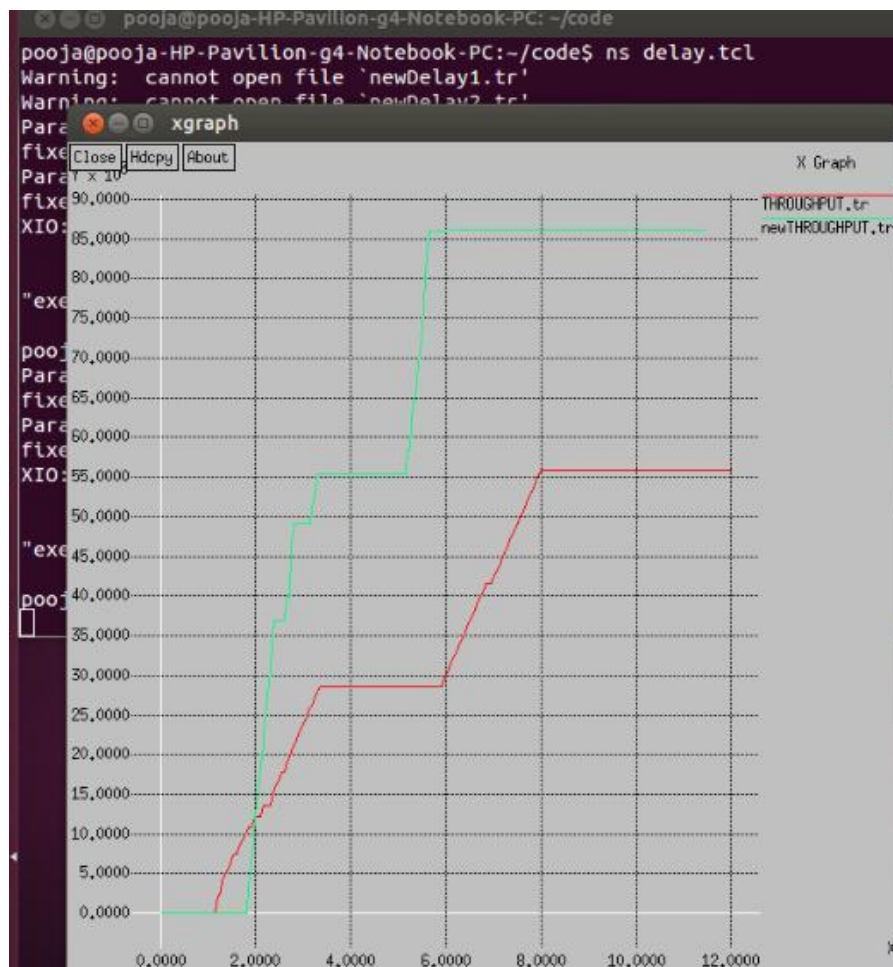


Figure 6: Throughput Comparison

As shown in Figure 6, the comparison between the throughput of proposed and existing technique has been shown in graph. From where it is concluded that throughput of proposed technique is high as compared to existing technique.

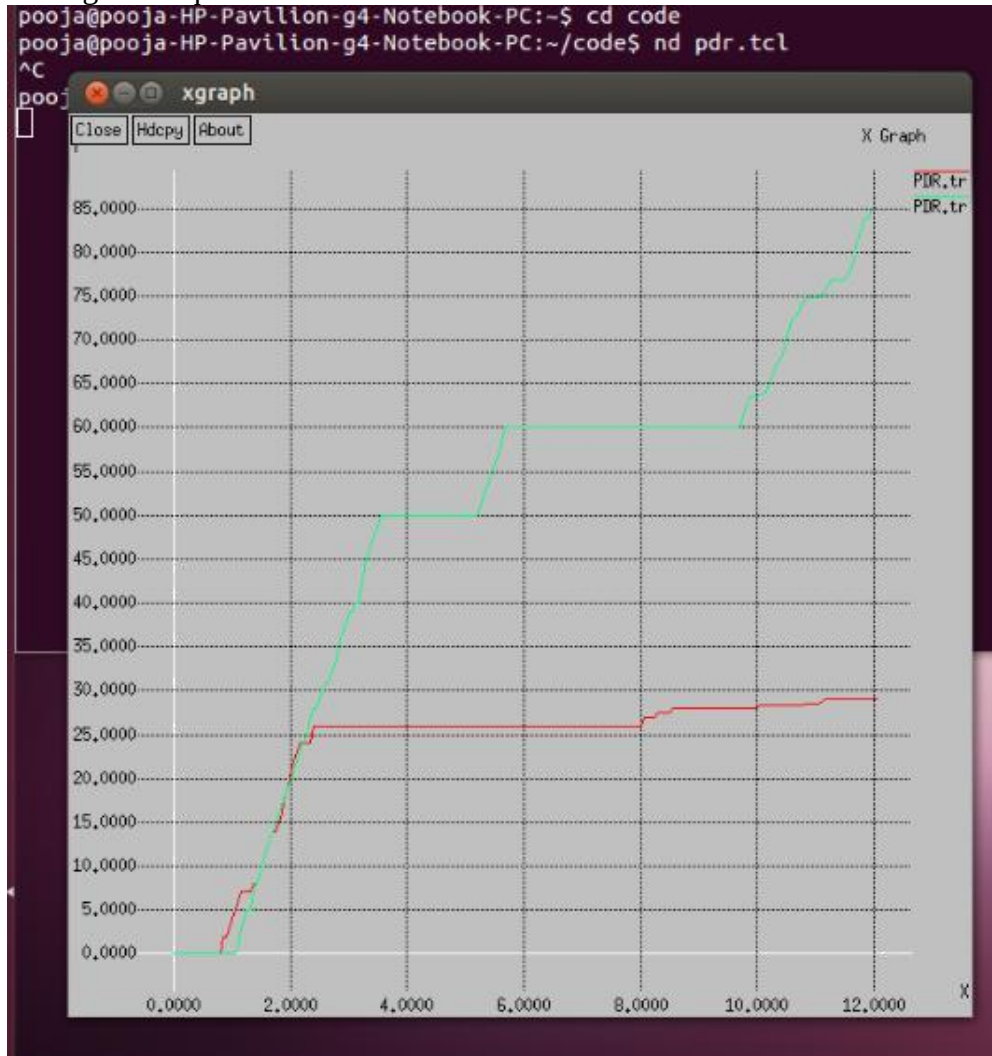


Figure 7: Packet Delivery Ratio Comparison

As shown in Figure 7, on the basis of comparison between the proposed and existing method, it is concluded that the occurring of packet loss is less in the proposed protocol as compared to existing protocol.

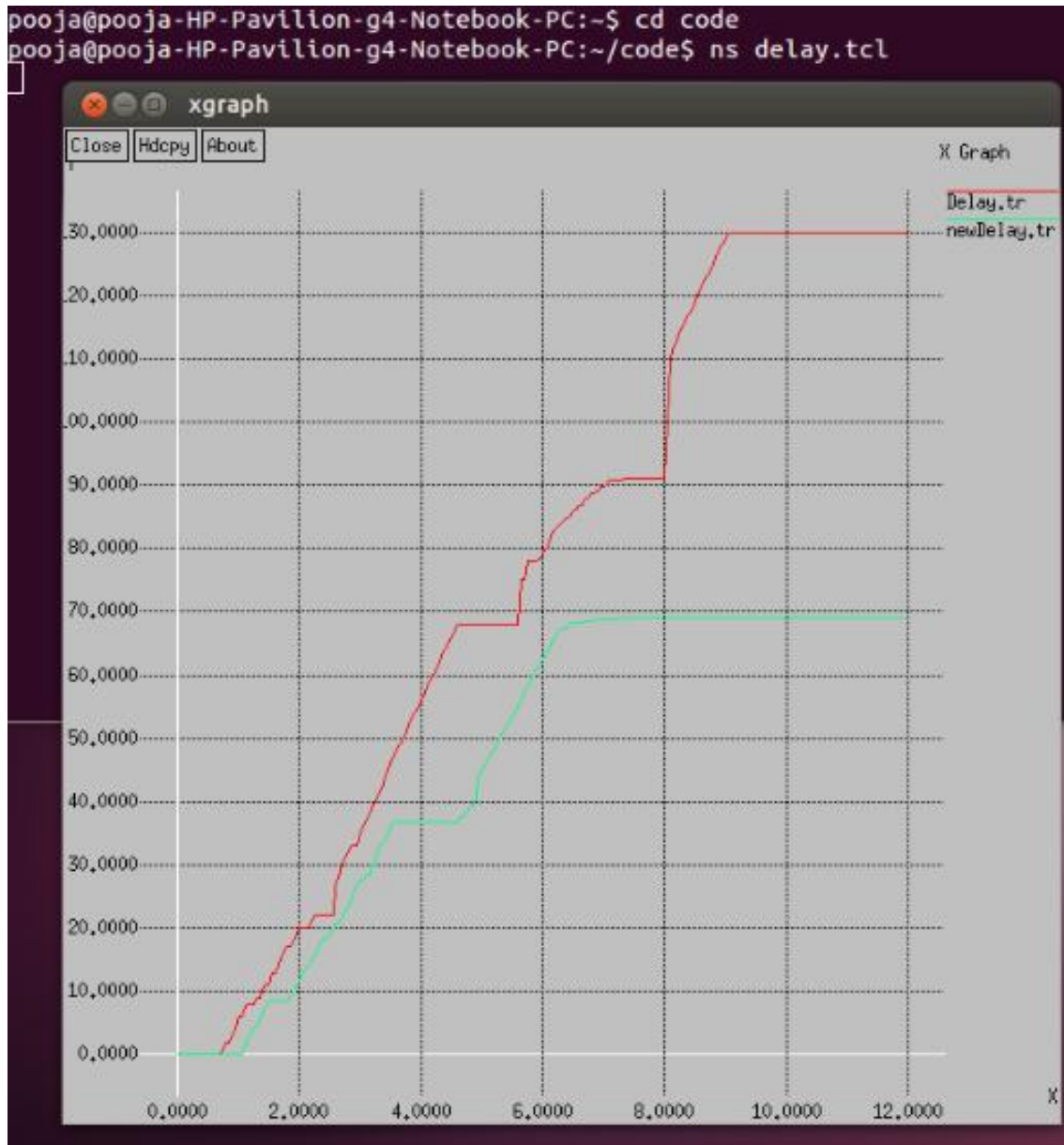


Figure 8: Delay Comparison

As shown in Figure 8, the delay comparison between the proposed protocol and existing protocol was done which analyzed that delay is less in proposed protocol as compared to existing protocol.

## VI. CONCLUSION

In the vehicular ad hoc network, there is no central controller due to which nodes are free to join the network or leave the network when they desired. The efficiency of the network is reduced due to this dynamic nature of the network. The classification of routing protocols is done in three categories such as reactive, proactive and hybrid. The optimal path from start node to end node is established by the reactive routing protocol such as AODV protocol. This path is selected with the help of hop count and sequence number. In the base paper, the improvement in AODV protocol is proposed for the link recovery in case of link failure. Using connectivity process, the recovery node will be selected and the vehicle node which has maximum node connectivity is selected as the best recovery node.

For future work, this research can be extended to identify the traffic analysis on road, if every vehicle has a GPS service. The accuracy of results can be enhanced by using performance parameters such as routing overhead, packet received and packet loss.

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