Enhanced Vehicular AD HOC Network Protocol to Improve Quality of Service in Vehicle to Vehicle Communication

Saloni Behal, Nitin Sharma, Simrandeep Singh

Abstract*: The vehicular ad-hoc networks (VANETs) are specific type or a sub form of Mobile ad hoc networks (MANETs). However the main problem which is related to this network is the Quality of Service (QoS) which mainly occurs due to rapid change topology nature in the network and lack of stability of communication. Consequently, some of the challenges that researcher focus on routing protocols for VANET. The problem which is faced by this network with these protocols is the dynamic environment in their route instability. This paper approaches the combination of Dynamic Source Routing protocol (DSR) and Particle Swarm Optimization Algorithm (PSO) to solve the problems of Routing protocols which help to improve the Quality of service (QoS) in the network. The approach which is introduced in this paper is to make use for making the better Quality of Service (QoS) in the VANET. The simulation results in MATLAB exactly predict the overall performances regarding the proposed work in terms of the packet drop ratio, transmission delay, channel utilization, Throughput and Energy consumption under varying conditions.

Index Terms: VANETs, Topology Routing Schemes, DSR and PSOA.

I. INTRODUCTION

In a few years, there is a great rise in the field of VANET. Generally it played out a crucial role in the communication of vehicles. Therefore, VANET gained a lot of attention from researchers specifically to construct the intelligent transportation system. The fundamental objective of this system is to give security and wellbeing to drivers. VANET is the most proper innovation so as to accomplish this objective. Each vehicle can communicate with each other to exchange an information regarding alert message, traffic jam etc. Or with Road side units (RSUs) to access internet. In spite of extensive advances in different angles, directing in VANET is testing and it causes the QoS of the system since finding a dependable way to transmit the data from source to goal is troublesome [1]. This problem is occurred due to dynamic nature of nodes and high speed mobility. VANET with RSUs having scheduling to transmit the data from source to destination with the help of intermediate nodes which work as agent between the source node and destination node to access the trustworthy path and to avoidance the link failure in the network [2]. In this paper to improve the QoS in the VANETs, the new approach is introduced which is the combination of Dynamic source routing protocol (DSR) and Particle swarm optimization algorithm (PSOA) it help to improve the QoS in the network from the previous work because in which both scenario work route finding with trusty path and route maintain to avoid the network breakage during transmission. When we implemented this approach to the network, the performance of the network becomes better. The study and the simulation results of QoS allows the system is protected from attackers and find best route to transmit the data, the motivation behind this paper is is to make use of networking in the VANET is without link failure and interruption due to highly dynamic nature of this network making QoS good without any link failure is very challenging. Major focus of the protocol designing will be improvement to transmitting the information without any interruption and design a solution to prevent these errors to make a smooth and ease to network which indicates the good quality of service of the VANET. The simple example of VANETs architecture as shown in figure 1.

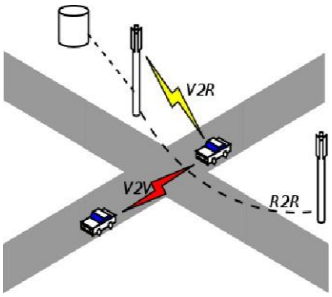

Fig 1. An example of VANETs

The rest of this paper is arranged in different sections as follows. In Section II, We deal with the previous related work. In Section III, we give ove/rall idea about the DSR (Dynamic source routing protocol) and PSOA (particle swarm optimization algorithm) in detail. Section IV gives the detail about proposed algorithm design in VANET. Section V explains the simulation of network and result of analysis. The last Section VI finishes up the paper with conclusion.

II. QoS RELATED SURVEY

For making the network quality of the system is unbreakable, it is crucial to develop plan and services that help the parameters of the network to improve the efficiency of the network to transmit the message information within the nodes In previous work, the data is transmitted over a single layer of OSI-ISO model to transmit the data from source to destination, when data is transmitted over

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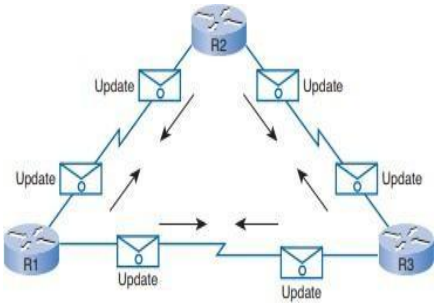
a single layer it creates collision between the network, traffic management increases at high rate due to which packet drop ratio increases accordingly that transmission delay also increases which means data loss and link failure during transmission. [3] To improve the quality of service of this network, there are many challenges like route discovery route maintain transmission without network breakage. From the last few years, many challenges have to face by ad hoc network due to unbounded size in the network and high mobility. To the best of our knowledge, the framework size, the mobility of the nodes is very high and unbounded size of geographical area of the network; it is not that easy to network connectivity between the vehicle nodes [4][5].In the previous years, the work done in this network isBased on the single stack layer it creates many difficulties in front of traffic management [6]. Network Layer has only responsibility to transmit the information from source to destination it helps to improve the services of the network but that improvement is not enough still networks face many problems in his Network, the speed of the nodes (vehicles) is not Calculated and sometimes due to very high speed of nodes, network is not able to catch the information the Internet of the vehicles was being a fa s c i n a t i n g concept. This aimed to initialize the plethora of various kinds of applications [7]. These applications were enhanced the QoS needs. The internet approached for the vehicles was reliant on VANET.VANET specifically for the automatic communication of vehicles. The other major role was seen in the traffic safety management. Due to the rise of designing a new and enhanced application for the vehicular ad hoc networks, a major issue increased which continued the provision for needs of the quality of service. The previous solutions were based on the single layers of a particular stack. Therefore, in this research a cross layered decision based routing was assisted which selected the best path for the delivery of the packets to meet the needs of QoS [8][9]. The present protocol gathered the information about the channel rate specifically in the decision making procedure. The performance parameters were described by an experiment. Subsequently, the three data rates were discussed for several kinds of applications in the urban areas [10].

Existing Scheduling Algorithm: It is a suitable vehicle hub for information transmission amid every interim of schedule vacancy assumes a primary job in setting up application explicit information correspondence needs. For the initials to pick a fitting vehicle hub for information transmission, vehicle explicit cases or qualities like as a:-



1. Location
2. Distance and
3. Wireless Channel Situations or support data rate is required.

Depending on these elements, we schedule the data communication for a particular time-slot [11].

The fundamental motivation behind this booking is to convey the guaranteed better nature of administrations by accomplishing higher framework throughput and bundle conveyance esteem while guaranteeing fruitful information transmission of parcels.

Types of Scheduling Algorithms:-

Round –Robin Algorithm: **-** It is an easy method in which a vehicle is a random selection from the Vehicle nodes regardless of their packets and data rates or any other information.

*Max-Rate***: -** It is a selection of relay vehicle nodes depends on the highest data rate at each time – slot.

*Weighted Round Robin***: -** The relay vehicle node is selected on the basis of weight and scale connected within the routing decision [12].

III AN OVERVIEW OF PROPOSED APPROACH OF DSR AND PSOA

The approach which is proposed in this paper is the combination of DSR and PSOA which keeps two main ways to improve the network service in the VANET areas:-

(i) Route Discovery: route discovery which defines that node has to find a route for transmitting the signal transmission from source to destination with the help of intermediate node.

(ii) Route Maintain: Route maintain involves the best path to find and avoid to interruption during transmission and it indentifies the whole connection is being able to transmitting or not [13].

A. DSR (Dynamic Source Routing Protocol)

Dynamic source Routing Protocol is an important protocol used for the static routes in the network. Dynamic Routing Protocol used to facilitate the routing data between the routers. In routing protocol, the routers read the data remote networks and automatically add the data in the routing tables. The best path is selected from the routing network and then routing table is added to the network. The main advantage of the dynamic routing protocol is that, when the topology changes then routing data is exchanged between the routers. The exchange of data between the routers found the new network path in case there is link failure in the network. There is no overhead take place in routing protocols. Dynamic Routing play a better role than static routing [14]. The Routing Protocol is set of procedure, algorithms and messages which are used exchange routing data and then route to routing table. The trading of information between the switches found the new system way on the off chance that there is connect disappointment in the system for networking. Overhead occur in steering conventions. Dynamic Routing assume a superior job than static directing [15].

Fig 2. Dynamic source Routing Protocol

The Routing Protocol is set of procedure, algorithms and messages which are used exchange routing data and then route to routing table. The main purpose of the routing protocol is:-

i) Discover remote network.
ii) Maintain and update route data.
iii) Choosing best path of the destination node.
iv) Choosing new path if the present path is not available.

The dynamic routing protocol depends on the algorithm and characteristics of the protocol. The operations of the routing protocol are mainly dependent on the unique operations of that routing protocol. The dynamic routing protocol is described with operations as:-

i) Router can send and receive data through Router can send and receive data through the interfaces.

ii) The same routing protocol share messages and data from the routers.

iii) When the network topology changes then routing protocol will broadcasts the message to other routers [16].

B. PARTICLE SWARM OPTIMIZATION

Particle Swarm Optimization (PSO) is an algorithm used for the purpose of the optimization in various applications because of its simple and optimal results. PSO is an evolutionary computation method is same as the Genetic Algorithm (GA).The swarms is called as particles are initialized and after that search the optimal results through updating the values. Kennedy proposed PSO in 1995, PSO based on various parameters such as Initialization, Inertia weight and different variants. The PSO method is described as:-

i) Construction Factor:- The variants PSO recognize the balance of the construction factor. This approach used to update the velocity factor which is described in:-

1. Routing protocol: - The routing protocols are initialized and after that there is searching of the required space for the optimal and better solution. It depends on various variants and also depends on the initialization. Weight which recognize the smaller and exploration in the value of this algorithm.

2. Mutation Operations**:-** The local and the global best particle is mutate by using several methods to prevent the PSO from stagnation in local minima [17].

IV. PROPOSED ALGORITHM DESIGN

In this paper, we will introduce a new approach which is combination of DSR (dynamic source routing protocol) and PSOA (particle swarm optimization algorithm) it helps to improve the more quality of service of the network then the previous work. in this approach the proposed work done is the addition of routing and Road side units(RSUs) which help it take out the route Discovery to find the path to transmit.

The node Route discovery is the first step in which route request transmission is validate then it connected to the the information from source to the destination with the help of any intermediate

This approach helps to avoid the road accident and traffic management and it provide message alert.

The work of this algorithm is to route maintains that there is no collision in between the network and then for the security purpose of this network take original identity of the network and then identify with the server this indicates with binary values (0, 1) if identity is true then the fit value is 1 if identity is wrong then the fit value is 0. PSOA, in this Algorithm the work is to select the best path for the nodes and selected path intermediate which is in free state and then it a a lot of time to find a request reply due heavy load on the network due to this challenges DSR protocol find error which indicates in the ratio of packet data and average transmission delay but with the addition of PSOA the existing algorithm which is introduced, it comes from Nature inspiring algorithm.

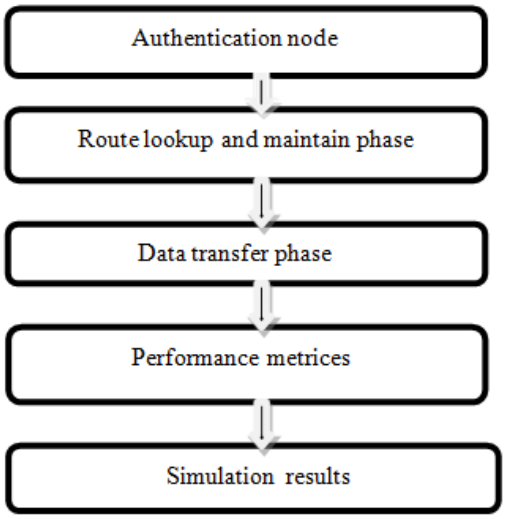


Fig 3. Phase of proposed system

V. SIMULATION STEPS AND RESULT ANALYSIS

In this section, we analyze test setup, trailed by execution evaluation estimations and further progressively about recreation results and look at. The reproductions are finished using MATLAB test framework to contrast the parameters the following performance metrics are considered for evaluation of DSR protocol PSO algorithm:

1) Packet drop ratio (PDR): The packet losses while transmitting the data from source to the destination that loss becomes the packet drop ratio. In the network due to dynamic nature the packet loss highly increases to find the error Where the connectivity lost.

2) Transmission delay*:* The delay which is found when network is not able to stable their connectivity and with the right path to transmit the data it takes lot of time to transmit the data.

3) Channel utilization: The efficiency of channel during transmission the signal is called channel utilization.

4) Throughput: The parameter in which calculate

how much data is transferred from source to destination.

A. Dynamic Routing Protocol

Below figure 4 characterized that expanding the quantity of vehicles in the system amplify the parcel drop proportion. This outcome is fundamentally because of the high accessibility of countless gives a high likelihood that a vehicle will quite often be accessible to be estimated as a next – jump. Consequently the parcel drop proportion in the system is limited. An expanding in drop proportion demonstrates a fruitful parcel conveyance, proposing that the transmission deferral of the system additionally increments.

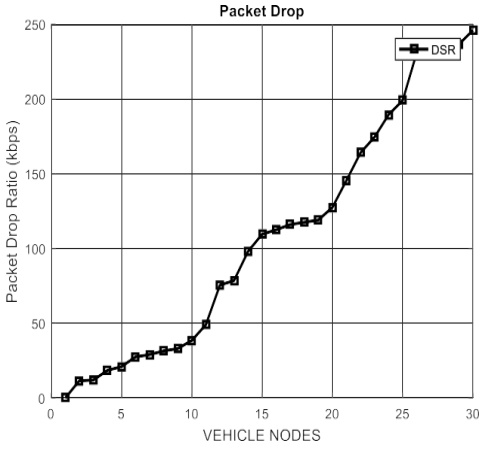


Fig 4. Packet Drop with Routing Protocol (DSR)

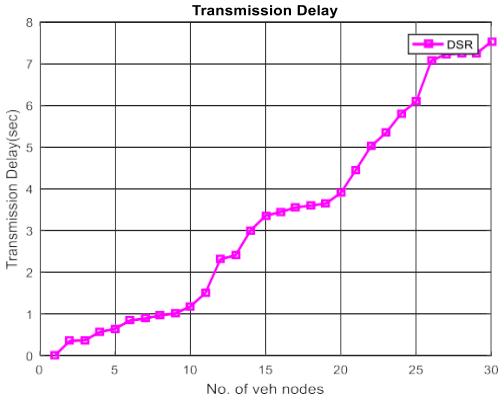


Fig 5. Transmission Delay with Routing Protocol (DSR)

The fig 5 shows that the end to end delay data transferring management increase the delay and loss the packets in the network. Average end to end delay of load balanced is round about 7.5 seconds at the start of transmission and as transmission goes on it becomes 7.5 second.

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Fig 6. Channel utilization with Routing Protocol (DSR)

The above figure 6 shows that the channel utilization also decreases, when the network throughput is lesser. To strengthen the above arguments it analyzed the number of elements in the increasing vehicle density.

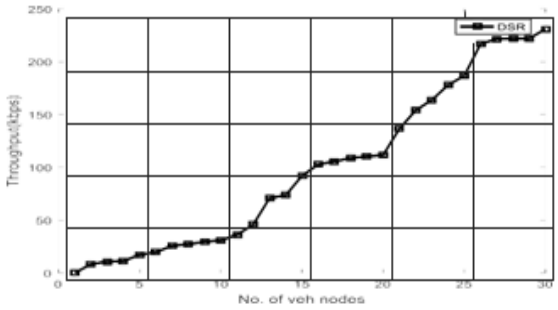


Fig 7. Throughput with Routing Protocol (DSR)

Normally decreases with the vehicle density. Defined the huge number of vehicles available for data transmission, the probability of choosing a node with a high-channel data rate is always present.

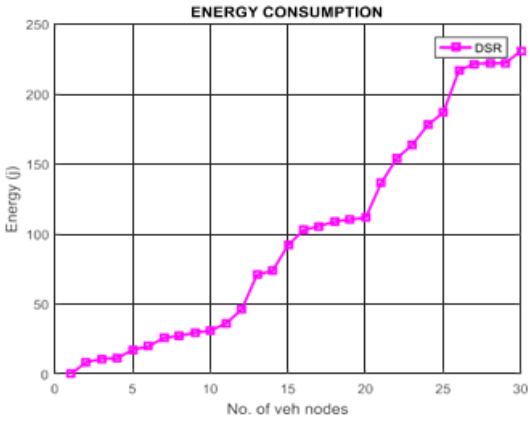


Fig 8. Energy Consumption with Routing Protocol (DSR)

Fig 8 defined that the energy consumption with dynamic source routing protocol the number of vehicle nodes also increases energy consumption due to routing packets control. The energy consumption is reduces by number of packet deliveries and reduce the network lifetime.

B. Nature Inspiring Algorithm (PSOA)

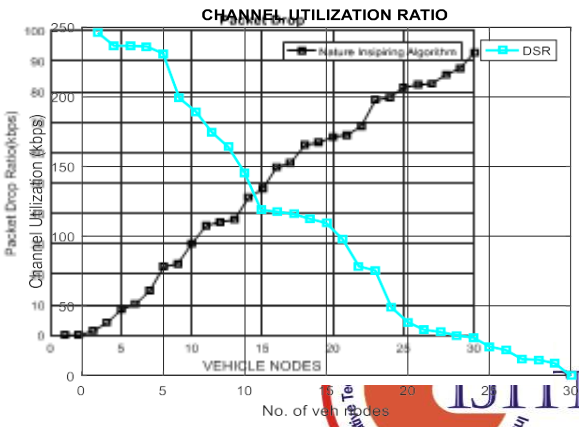


Fig 9. Packet Drop with proposed Method (PSOA)

Fig 9 shows the network minimize the packet drop ratio. This consequence is mainly due to the high availability of a huge number of nearest gives a high probability that a vehicle will almost always be available to be measured as a next –hop. Hence the packet drop ratio in the network is minimized. A decreasing in drop ratio indicates a successful packet delivery, suggesting that the transmission delay of the network also decreases.

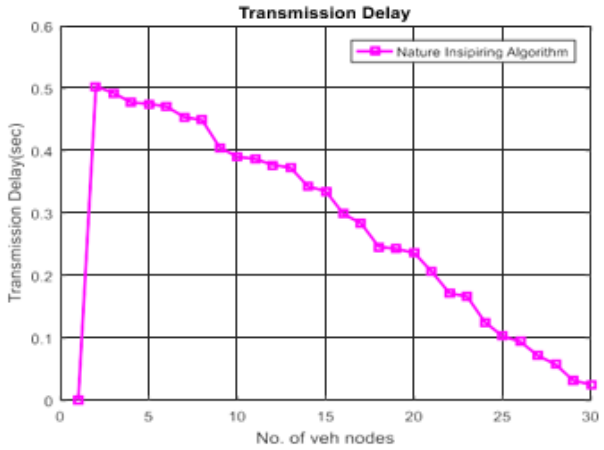


Fig 10. Transmission Delay with proposed Method (PSOA)

The above figure 10 shows that the end to end delay data transferring management increase the delay and loss the packets in the network. Average end to end delay of load balanced is round about 0.02 seconds at the start of transmission and as the transmission goes on it becomes 0.02 seconds.

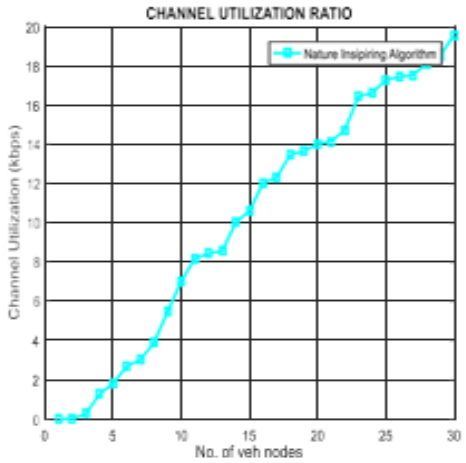


Fig 11. Channel Utilization Ratio with Proposed Method (PSOA)

The figure 11 shows that the channel utilization also increases, when the network throughput is maximized. To strengthen the above arguments we analyzed the number of elements in the increasing vehicle density.

Below. Fig 12 shows that the throughput normally increases with the vehicle density. Defined the huge number of vehicles available for data transmission, the probability of choosing a node with a high-channel data rate is always present.

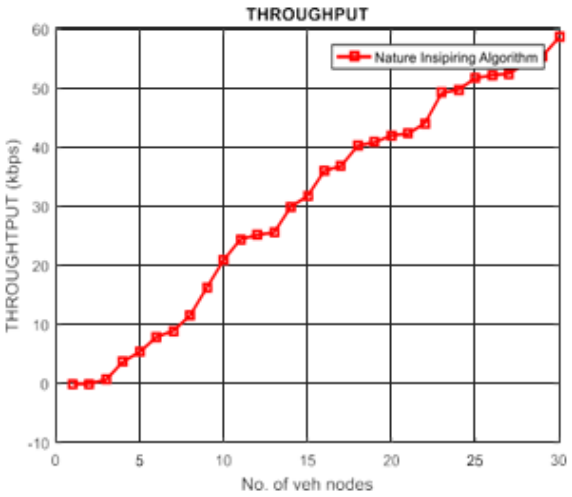


Fig 12. Throughput with Propoed Method (PSOA)

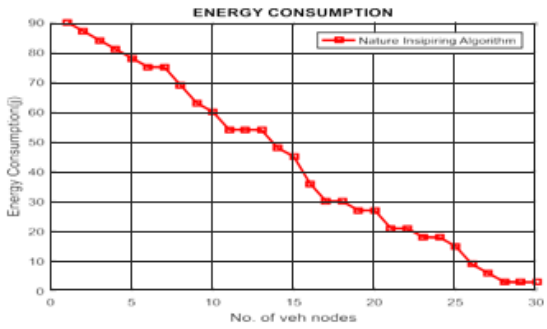


Fig 13. Energy Consumption with Propoed Method (PSOA)

Fig 13 defined that the energy consumption with dynamic source routing protocol the number of vehicle nodes also decreases energy consumption due to routing packets control. The energy consumption maximum by number of packet deliveries and improves the network lifetime.

C. Comparison

This is the comparison results in between the previous work and the proposed work.

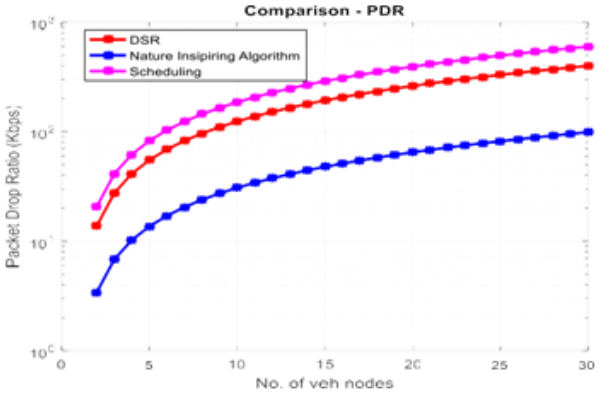


Fig 14. Comparison – PDR (Packet Delivery Ratio) kbps

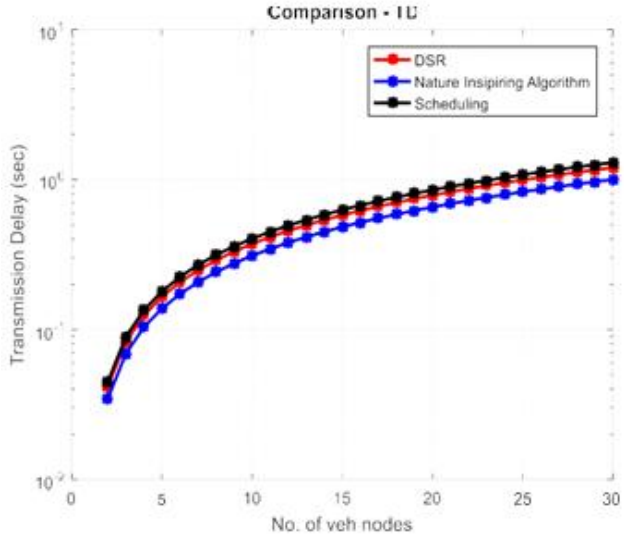


Fig 15. Comparison – Transmission Delay (Sec)

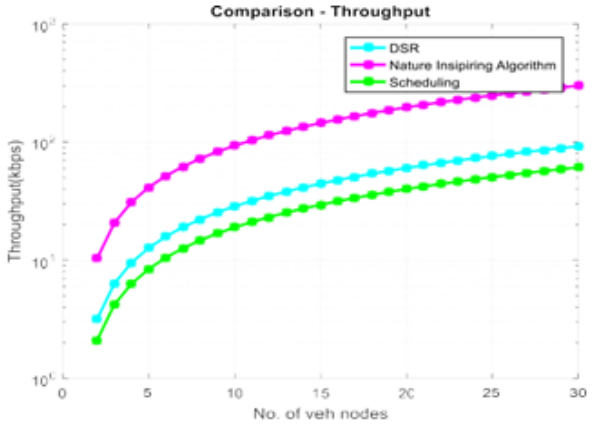


Fig 16. Comparison – Throughput (Kbps)

Fig 17. Comparison – Channel Utilization (Kbps)

The figure shows demonstrates that proposed approach and existing work are compared, whereas; if quantity of the vehicles increased in the network lead to reduce the packet delivery ratio. The reason is because of the huge quantity of the vehicles in the area of the transmission node. It is determined that huge number of neighbor node will be available close the vehicle nodes. Therefore, the packet delivery ratio will be reduced. The reducing factor of the PDR recognizes the delay in the transmission of nodes will be reduced with high probability of the packet delivery. Figure3.3 gives the description that there will be a gradual increase in the throughput.

When the speed of the vehicles is increased. It is given that huge quantity of the vehicles is required during the transmission; selection of the node may be high channel data rate. Figure 3.4 describes that the maximum usage of the channel when the throughput is high.

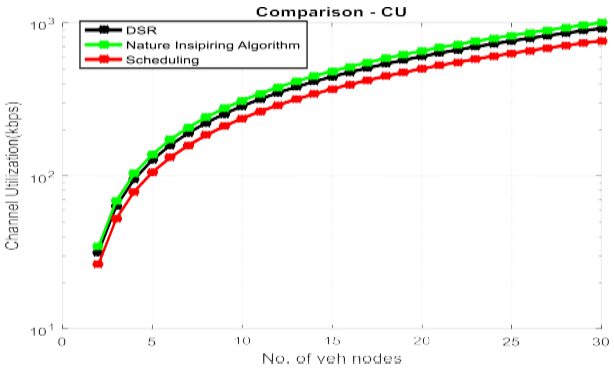
Table no.1 Comparison between proposed and existing other approaches.

Parameters	Routing Protocol Values	Proposed Values	Scheduling (Existing Work)
Throughput (kbps)	92	61	99
Transmission Delay (sec)	1.20	1.30	1.0
Channel Utilization (kbps)	920	764	1000
Packet Drop (kbps)	400	600	300

Table no. 1 defined that the performance analysis based on routing scenario, scheduling scenario. Optimization proposed) scenario and comparative analysis proposed work and existing work.

VI. CONCLUSION AND FUTURE SCOPE

The main concern is about the security in the communication in vehicular ad hoc networks. The main reason is due to the change in the topology and the minor devices in ad hoc network as comparison to wireless communication. The crucial thing for accessing connection several networks in quality of service communication is required. It is challenging issue for accessing connection several networks in quality of service communication. So optimization of the whole performance of the network is required. The security of the vehicular ad hoc network is during transmission of data, avoidance of congestion and collision in the network, pointing data from sender to receiver. For instance, a warning alert message are sent to other vehicles through broadcasting if there are chances of the collision ahead and the specific vehicle will slow down at that time. The secure application



includes emergency alert message, alert message about the network condition. The wireless local area network and cellular network are combined to form wireless network through different approaches for security of the network. In this research, dynamic source routing protocol and particle swarm optimization has been proposed. In dynamic source routing, information is transmitted from sender to receiver. Firstly, route request is forwarded for better communication between the source and destination, after that, the nearest node will acquire the route reply for communication between the nodes. If there is

loss of data during the communication then dynamic source routing algorithm helps in the maintenance and the management of the different paths of the route nature inspiring method leads to Optimization of the route that reduce the energy consumption and end to end delay. Overall, in proposed approach, the area of the network is initialized with the deployed number of vehicles and the road side units. The location of the sender and the receiver recognized for the transmission over the network. The distance and the matrix value are computed. In addition, dynamic source routing is implemented using different stages which are route discovery and route maintenance. And, then the optimization model is process for filtering.

In this paper, we conclude the better results for the improvement in network in vehicle to vehicle and vehicle to infrastructure communication than the previous results in which performance of quality of service provided some algorithms and protocols which makes a very good quality network in wireless communication. This survey can be used to develop a new solution which will provide the better QoS in the network due to dynamic environment in this network QoS is the main aim to improve which make a better network for communication. Mobiles are acquainted and used by us in our day to day life; likewise the future of VANETs is certainly.

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