Routing Solutions of GJIBR for Unica sting and Multicasting over AODV in VANET

Komala C R, N. K. Srinath

Abstract: VANET (Vehicular Ad hoc Network) is a kind of MANET (Mobile Ad hoc Network) in which vehicles create an ad hoc network for communication. Due to high mobility, routing in VANET is very challenging and existing routing protocols have high packet loss and delay. VANET applications require high packet delivery ratio, this problem is dealt and the routing solutions are proposed for VANET with higher packet delivery ratio compared to existing protocols. The methodology for routing adopted in GJIBR is geographic junction based routing. In additions to vehicles, junctions a special kind of node with transmitting, receiving and storing facility is added at various places which also relay the packets. Junctions are stationary and placed to improve the packet delivery ratio. The routing from vehicle to vehicle is implemented by using junctions as relays. Junctions store the packets from vehicles temporarily and decide the next vehicles to forward or relay the packet. The choice of relay decides the packet success ratio, delay and throughput. The routing solutions proposed in this research work are all about selection of relay. The relay selection must be done with criteria (i) Number of hops to destination vehicle must be less (ii) Redundant relay so that even if packet fails in one path, it can reach through another path and (iii) Relay is a must in the path to destination vehicle.

Index Terms*: *AODV, GJIBR, MANET and VANET.

I. INTRODUCTION

As of late, most new vehicles come effectively outfitted with GPS recipients and route frameworks. Vehicle producers, for example, Ford, GM, and BMW have effectively declared endeavors to incorporate noteworthy registering power inside their autos and Chrysler turned into the main vehicle maker to incorporate Internet access in a couple of its 2009 line of vehicles. This pattern is required to proceed and sooner rather than later, the quantity of vehicles furnished with processing advancements and remote system interfaces will increment drastically. Institutionalization is as of now in progress for correspondence to and from vehicles. Despite the fact that VANETs show incredible guarantee, their prosperity is reliant on whether VANET directing conventions can fulfill the throughput and postpone necessities of utilizations sent on these systems. Accordingly, this paper plans to respond to addresses, for example, Do existing MANET steering conventions function admirably in VANET? If not, what are the fundamental qualities of VANETs that impact steering and how might they be joined in better conventions?

VANETs are portrayed by (a) High hub portability, (b) Constrained hubs developments (c) Obstacles-overwhelming organization fields, and (d) Large number of hubs, which all add to the correspondence challenges. To begin with, vehicles are constantly moving along the streets at higher rates than in a MANET. Along these lines a VANET will exhibit a constantly evolving structure, and correspondence joins are required to be legitimate for couple of minutes or seconds. Next, the developments of vehicles are compelled on streets; consequently the current guides put a point of confinement to the topologies accessible in VANETs, when contrasted with MANETs. The qualities of VANETs likewise sway the sending of bundles. Three primary sending difficulties were recognized: next bounce determination, lining controls, and ways spans. Conventions, for example, DSR keep up arrangements of neighbors, which are utilized to decide the following jump. In the event that the rundowns are not exact, the best next jump could be missed, or surprisingly more dreadful, a vehicle hub which is now out of the transmission range could be picked. Keeping up state-of-the-art records requires visit "hi" bundle broadcasting. However, a lot of broadcasting will result in a substantial correspondence overhead. Consequently, the inquiry is the means by which to utilize exact hub positions in the choice of the following bounce without acquiring an excess of overhead. Vehicular specially appointed systems frequently experience clog quicker than very much planned wired systems, prompting top of the line to-end deferrals and jitter notwithstanding for moderate traffic. This especially impacts postpone touchy however less tolerant applications, for example, traffic or mishap observing. The last sending test considered arrangements with abusing the information of directing ways term to improve the execution of existing conventions. Frequently, a hub in a vehicular specially appointed system will attempt to set up a correspondence way when the goal is inaccessible. Different occasions, the way will be set up just to have it break a couple of moments later because of the developments of hubs. The inquiries at that point are: Can vehicular traffic data be utilized to precisely assess the length of association/detachment periods between hubs in VANETs? Can these assessments be utilized to streamline the course choice and information exchanges?

The main objectives of this research work are to improve the data transmission and routing in VANET's and its characteristics by incorporating them into design of the protocol.

1. Mechanism to update geographic location information using junctions
2. Adapt the routing protocol to find the shortest path using the geographic location information

Revised Manuscript Received on May 06, 2019

Mrs. Komala C R , Ph.D Research scholar, Electronics Engineering, JAIN University, Bangalore, India

Dr. N. K. Srinath, Professor and Dean, Department of Computer science and Engineering, R.V.C.E, Bangalore, India

.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

3. Forwarding of packet using the routing protocol

Unicast routing provides one to one communication in VANET. Multicast is defined by delivering multicast packets from a single source vehicle to all multicast members by multi-hop communication. Geo casting provides routing in a geographic region specified. Broadcast provides many to many communication in the network.

Unicast steering gives balanced routing from one to one in the better communication of VANET. Multicast is characterized by conveying multicast frames/packets from a solitary source vehicle to all multicast individuals by multi-jump correspondence. For the region specified geographic, the Geo casting routing will provide better communications for the transmission of the packets from one node to other nodes and its give numerous to numerous communication in the system. In VANETs, vehicles speak with one another or with the street side units (RSU) to maintain a strategic distance from mishaps and deals. For this correspondence, VANETs need a directing convention which causes vehicles to trade data in the system. Because of dynamic nature of VANET, directing the bundles in the vehicular system is one of the difficult errands [1]. Vehicular Ad-hoc Network (VANET) is an accumulation of correspondence vehicles, moving in various headings. The vehicles structure a correspondence gathering to scatter wanted data [2]. Because of insecure availability, high versatility and system parceling, data steering in VANETs ends up troublesome and testing, accordingly making a requirement for productive VANET directing conventions [3].

To know each node information among all other nodes and about its own node within the geographic, the geographic routing protocol is best data transmission by considering position by position and its determing servers node like GPS [4]. One trap of Geo cast is organize parceling and furthermore negative neighbors, which may block the best possible sending of messages [5]. Geographic source steering (GSR) convention utilizes a responsive area administration (RLS) to discover the situation of wanted correspondence accomplice and the digitized guide contains a road and street intersection data. In light of that, it discovers course that goes through a road and grouping of street capacities [6]. In AODV, each hub keeps up a directing table in which data with respect to ongoing dynamic courses and the following jump hub are kept. Note that, AODV diminishes the span of the directing table by putting away data about the following bounce in the steering table as opposed to putting away the total way [7].

In position based steering, every hub realizes its very own and neighbor hub geographic position by position deciding administrations like GPS. It doesn't keep up any directing table or trade any connection state data with neighbor hubs. Data from GPS gadget is utilized for directing choice. Different sorts of position based avaricious V2V conventions are GSR, GPSR, GPCR, CAR, A-STAR, STBR and so on [8]. AODV and AOMDV in VANET under V2V correspondence for parameters normal throughput, Number of Drop Packets and NRL with expanding number of vehicles [9]. Geo cast directing is fundamentally an area based multicast steering. Its goal is to convey the bundle from source hub to every single other hub inside a predetermined land district (Zone of Relevance ZOR). The different Geo cast directing conventions are IVG, DG-CASTOR and DRG [10]. An imperative element of AODV is the support of time sensitive states in every hub: a directing section not as of late utilized is terminated. If there should arise an occurrence of a course is broken the neighbors can be advised [11].Unicast Routing Protocol in VANET goes for information transmission from one source to one goal by methods for transmission through remotely multi bouncing or in a conveying and-sending peculiarity [12].

II. RELATED WORK

The solutions are designed for following network topology. Vehicles travel in all directions and there are some geographical junctions distributed throughout the network. The junctions have communication range through which it can transfer or receive data from any vehicles crossing the communication range.

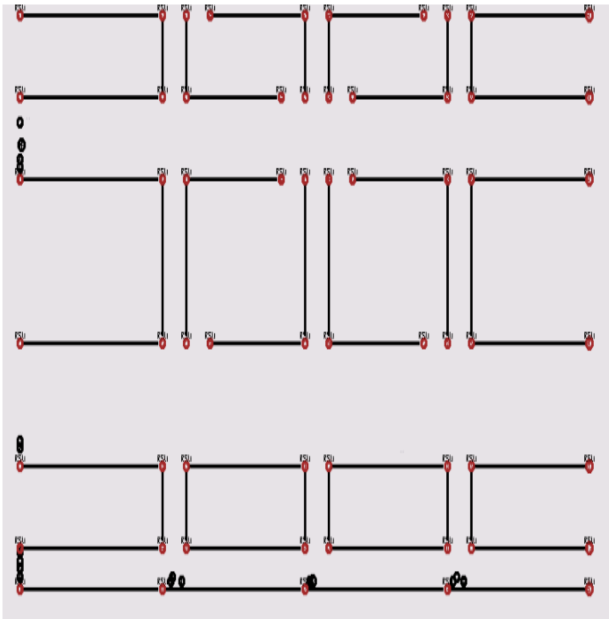


Fig.1.Network Topology of GJIBR

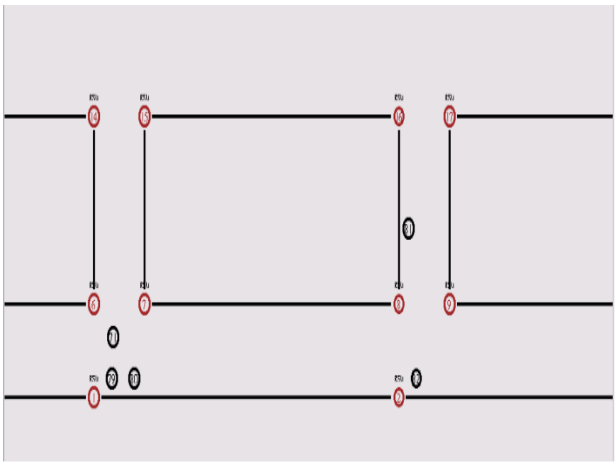


Fig.2. Vehicles moves on the lane

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

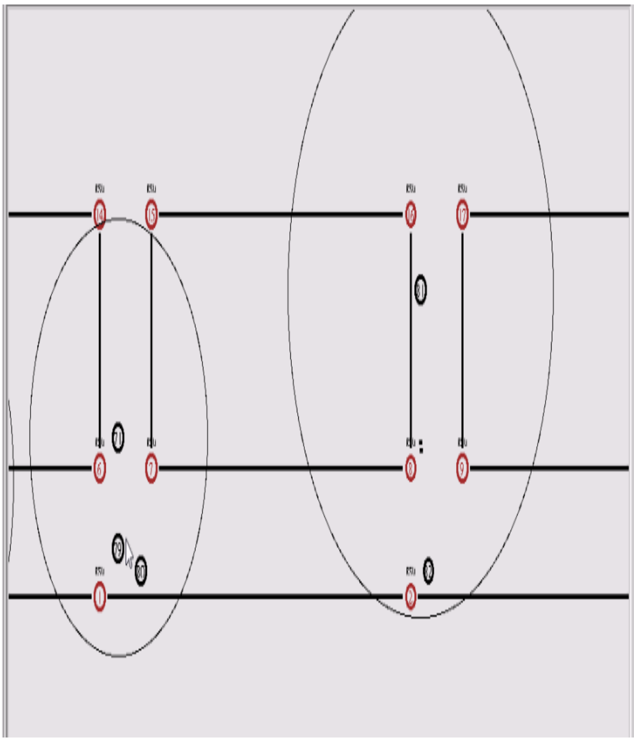


Fig.3. Vehicles communicate one to one through RSU (or junctions) as relays

1. GJIBR Unicasting:

The first routing solution proposed in this work is Geographical Junction Information Based Routing for one to one communication. The solution is based on development of routing protocol with assistance of junction to aid routing between vehicles. In this solution, the vehicles carry the packet and when they find that, they are not travelling in path to target, send the data to relay nearby and the relay decide the next hop vehicles which can carry the data to the target. This solution is implemented for unicasting of packets and tested for effectiveness.

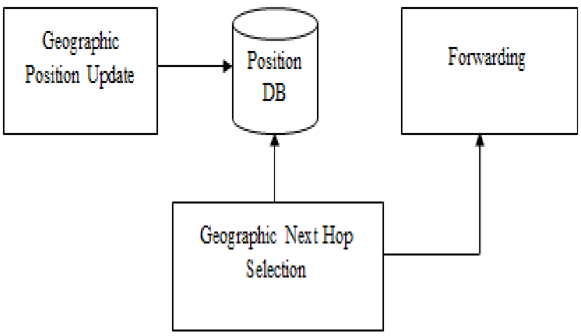


Fig.4. Architecture of GJIBR Unicasting

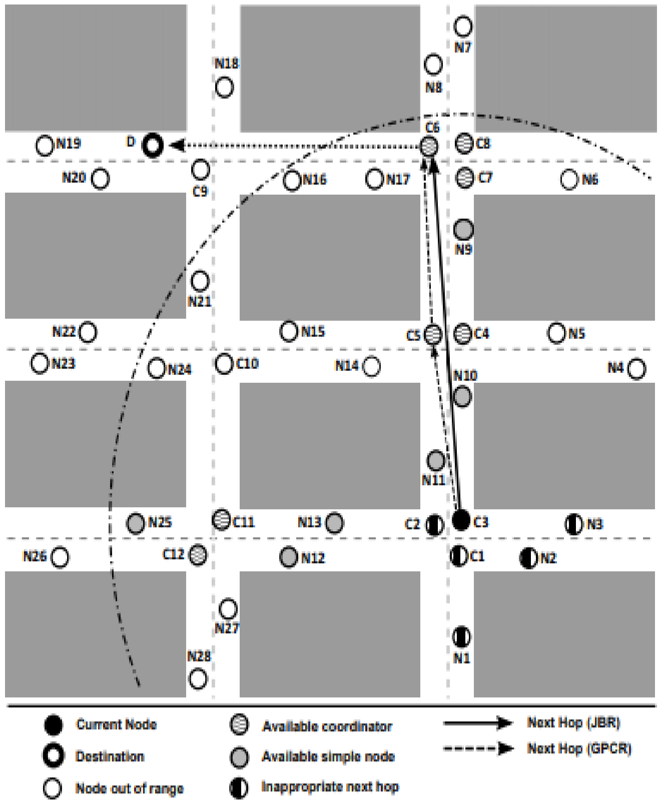


Fig.5. Route Discovery of GJIBR Unicasting

There are special nodes called junctions placed at intersections of road. All the vehicles passing near to junctions send their geographical latitude longitude information to the junctions. Junction store this information till expiry time after which they will automatically delete this information. This junction will act as a backbone of routing in the proposed solution. Geographic position update module in the junction captures the position broadcast from vehicles and saves the position information to the database. Geographic next hop selection algorithm selects the next hop for forwarding a unicast packet. Forwarder module forwards the packet to the next hop selected.

III. PROCEDURE FOR PAPER SUBMISSION

The next hop selection process is given below:
Input: Packet
Check if packet. Destination nodes location is in database
Divide the network to 4 regions N, E, W, and S from the point of view of the current junction.
Check the packet. Destination falls in which network part.
Select the junction close to packet. Destination from the network part
Forward the packet to the junction.
The preferred standpoint in this arrangement, regardless of whether the objective vehicle is moved from the publicized position, the parcel goes in the development direction way towards the objective vehicle,

*Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication*

along these lines deferral and system overhead is decreased. Before depicting the proposed calculation, it is important to give a few definitions and the supposition of the proposition depends on. The facilitator each hub situated at an intersection and basic hub each hub set amidst a street (for example between two intersections). It is accepted that each vehicle-hub is furnished with a GPS gadget indicating its position. As a rule, GPS is right now an extensively accessible element in car fundamental hardware. Taking into account that each hub is outfitted with a computerized guide of the boulevards of the city where it moves. The blend of these two suspicions can offer data with respect to whether one hub is in an intersection (and accordingly is an organizer) or is put amidst a street (and along these lines is a straightforward hub). Thus, there is no requirement for additional signal messages, as in GPCR, so as to show that a hub goes about as an organizer. This is an incredible improvement over GPCR, which causes expanded overhead and execution corruption. Each hub occasionally communicates hi messages, which contain data about the hub's directions. These messages have additionally a field called iscoord , where every hub reports in the event that it is an organizer or not. When a welcome message is gotten, the getting hub stores the ID (or IP address), the co-ordinates and the iscoord variable of the hub that sent the message, just as the timestamp at which the welcome message was gotten. On the off chance that another welcome message from a similar hub is gotten in a matter of seconds, the accepting hub basically refreshes its data in the rundown. Be that as it may, if a welcome message from a hub isn't gotten inside a specific timeframe, at that point the enlistment of the specific hub is erased from the neighbors' rundown. In addition, each hub that needs to make an impression on a goal, must know always the geographic position of the last mentioned. For this reason, it is accepted that every goal hub floods intermittent messages, called inquiries, which incorporate its directions, with the goal that the information source knows about its position. One could advance that technique to conquer the flooding issue; in any case, the streamlining of this strategy is out of the extent of this work.

2. GJIBR Multicasting:

The second solution is an extension of GJIBR (Solution 1) for multicasting. In this solution a geographical multicast backbone is established to relay the packets. The backbone nodes are junctions and the vehicles travelling between junctions are used for relay of the packets between junctions. Different from unicast, in case of geographic position update, node also updates the information about which multicast group it belongs to. Junctions establish a backbone among themselves using a minimal spanning tree algorithm, any packet to a multicast group is relayed on the junction spanning tree and each node checks if the multicast packet is addressed to a node in it junction area by looking at position updates. If the vehicular node is the area, packet is delivered to it.

The network is split to N*N zones. For each zone, a zone leader node is selected. When a multicast group is created with nodes, the each node advertises its group it is present to the zone leader. Multicast group is identified by an integer id. The zone leaders establish a routing broadcast among themselves using a minimal spanning tree. When a node wants to route packet to a multicast group, it puts the group as destination and forwards the data packet. The packet travels along the routing backbone. Each zone leader node along the routing broadcast sends the packet to the nodes in its zone, when a node is in the multicast group.

The effectiveness on the multicasting depends on the routing backbone established. The routing backbone is established between the zone leaders in way to reduce the delay by optimizing the distance between the zone leader nodes. The geographical distance between zone leader nodes is given as cost. Using Kruskal minimum spanning tree algorithm, a path is established among the zone leader nodes. This multicast backbone is used for multicasting the packets.

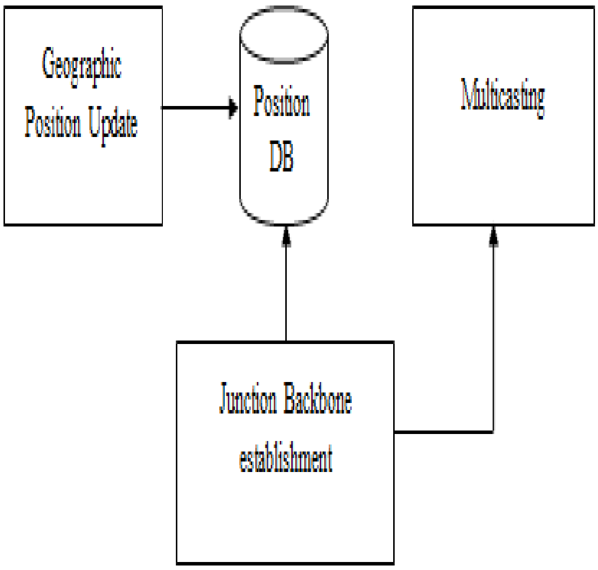


Fig.6. Architecture of GJIBR Multicasting

I. RESULT ANALYSIS

Routing is highly challenging in VANET environment due to high mobility and unpredictable mobility behavior. Routing protocols for VANET comes under following categories

1. Ad hoc
2. Cluster-based
3. Broadcast
4. Geo cast
5. Position-based.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

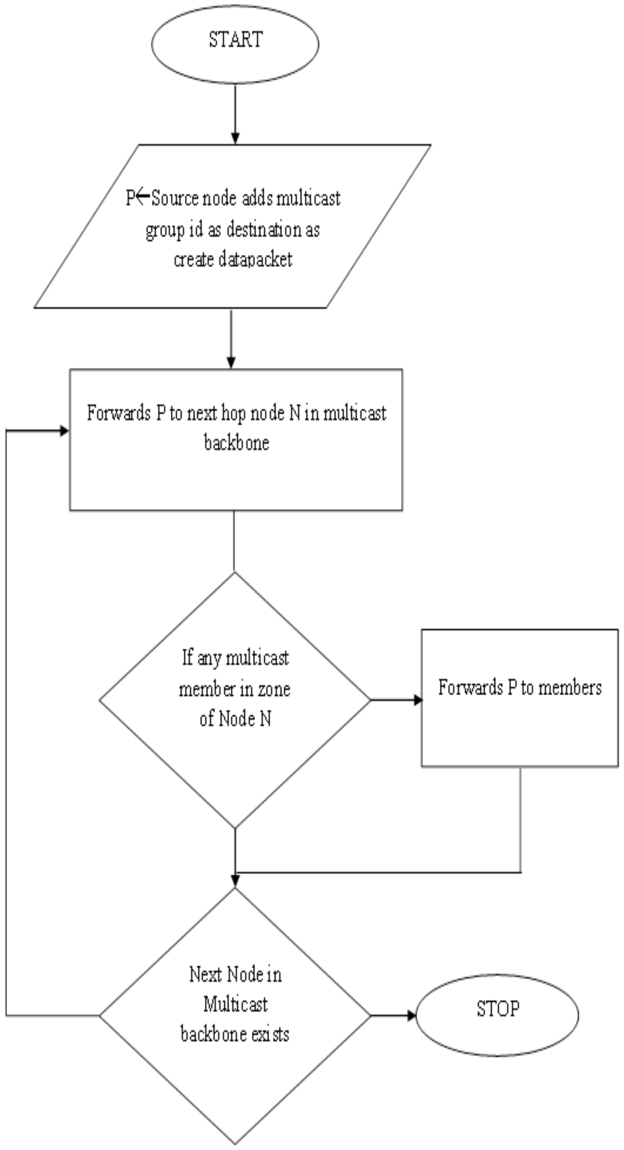


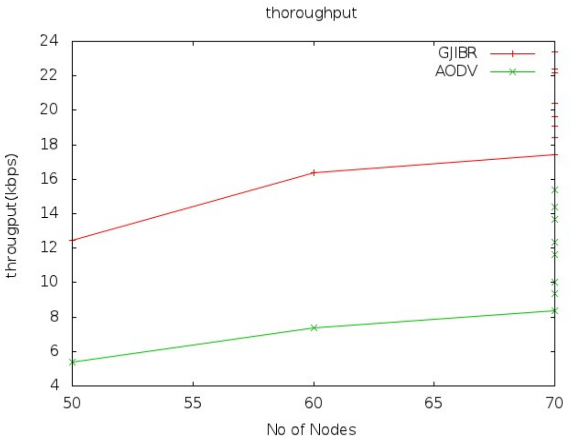
Fig.7. Flowchart of multicasting

In ad hoc, vehicles route packet without any additional infrastructure and create a network among them. Routing is on demand and the network fails for high degree of movement of nodes. In cluster based, based on the speed and direction of movement of vehicles, clusters are created and cluster head vehicle is selected for each cluster. Vehicles send data to cluster head and it is propagated via cluster heads to the target cluster head and finally to the vehicle. The solution works only for vehicles moving in straight directions. Broadcast solution is based on propagation of packets along all direction such that packet can reach the target vehicle in any of the path. Network overhead is very high is the broadcast based solutions. Geo cast is similar to broadcast but broadcasting is more towards the direction of target vehicles, it can reduce the network overhead compared to broadcast but still not efficient. Position based or geographical routing is most effective for VANET as the vehicle movement is restricted on lanes distributed on geographical areas and GPS is quite common in vehicle nowadays. Using position information for routing will be able to achieve lower delay and reduce network overhead due to routing of packets on unnecessary path. This motivated to design a geographic routing solution in this work.

The routing solutions of GJIBR for unicasting and multicasting are implemented on NS2 Simulator and the solutions are tested for different size of network. Performance of the proposed solutions is compared to existing solutions in terms of throughput, delay, packet success ratio and the network overhead.

Table I. Simulation Setup

Parameter	Value
Area consider for Simulation for the proposed work	1500m x 1500m
Vehicles consider for data transmission and validation	150-250-350
CBR sources consider in number for simulation	1-20
Transmission of the data in distance	400 m
Total time taken for Simulation	300 s
Velocity of the Vehicle	25-55 miles per hour
Total rate consider for CBR	0.5 – 5 packet per second
Protocol used for MAC to transmit the data	IEEE 802.11 DCF
Total number bits for packet size to transmit the Data	512 bytes



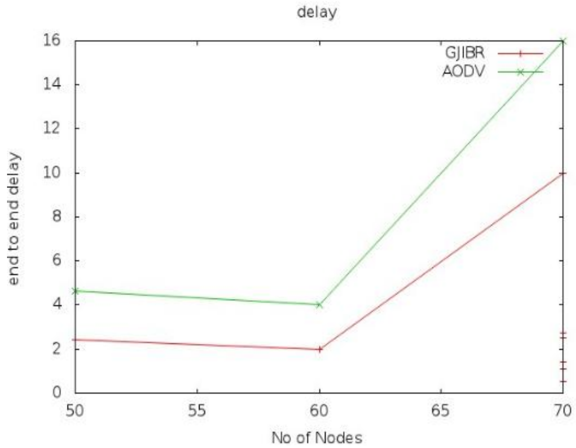
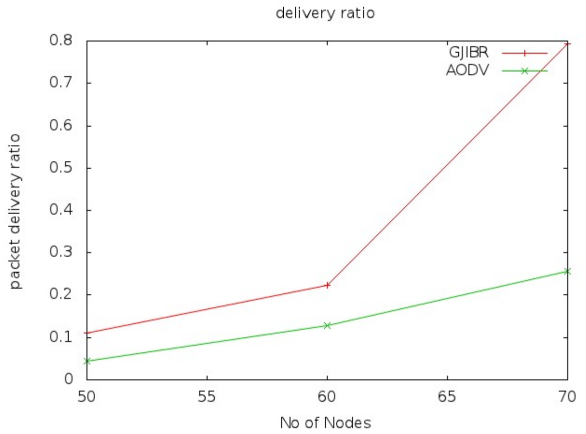


Fig.8.Throughput **Fig.9. Delay Time**

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication



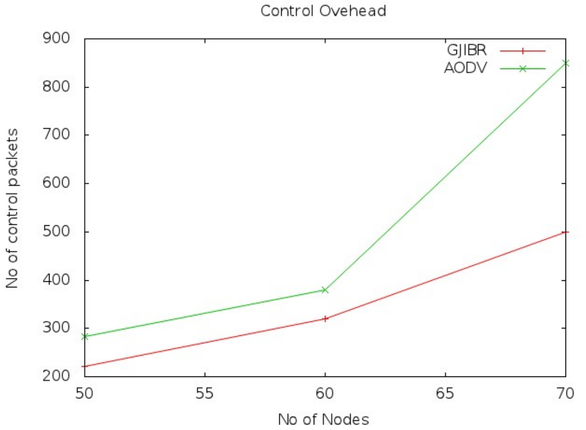


Fig.10.Packet Delivery Ratio

Fig.11. Control Overhead

II. CONCLUSION

Two solutions are proposed in this work. Both the solutions were based on the availability of junction nodes in the VANET network in addition to the vehicles. The junctions are static nodes located at various spots in the VANET network. Each junction has facilities for storing, transmission and reception of packets. Junctions act as relay in path of vehicle to vehicle communication. Solution 1 is based on selection of target junction for relay of packet based on destination vehicle position and selection of vehicle for relaying the packet between junctions based on trajectory of vehicle movement. Solution 2 is based on the adaption of solution 1 for multicasting case where a geographical multicast backbone using junctions is established and packet is transmitted along this multicast path for multicasting the packets. In both solution 1 and solution 2 the relay of packets between the junctions were realized only using vehicles in the network , but it cannot work for all density of vehicles and movements, so to solve this problem solution 3 is proposed in which the junctions are also connected via cellular backhaul. The choice between usage of cellular backhaul or vehicular network is done using fuzzy optimization of cost and delay. All the three solutions were implemented for the case of unicasting and multicasting. In both cases the performance of solutions was better than AODV. Simulation results indicated that the proposed solutions fared better than existing solutions in terms of delay, packet success ratio and network overhead. As a future work, instead of static junctions, mobile junctions with limited and predictable mobility can be considered and the solutions must be adapted for it. The idea behind doing it is to use slowly and predictable movement based on vehicles that can be used as junctions to solve the scalability bottlenecks.

REFERENCES

1. Neha Goel, gaurav Sharma, and Isha Dhyani, "An investigation of position based VANET directing conventions", IEEE, DOI : 10.1109/CCAA.2016.7813803.
2. Pooja Rani, Nitin Sharma and Pariniyojit kumar singh, "Execution Comparison of VANET Routing Protocols", IEEE, DOI : 10.1109/wicom.2011.6040428
3. Shilpi Dhankhar, Shilpy Agrawal, "VANETs: A Survey on Routing Protocols and Issues",International Journal of Innovative Research in Science Engineering and Technology, ISSN ONLINE(2319-8753)PRINT(2347-6710)
4. Bijan Paul, Md. Ibrahim and Md. Abu Naser Bikas, "VANET Routing Protocols: Pros and Cons", International Journal of Computer Applications (0975 – 8887) Volume 20– No.3, April 2011
5. Rakesh Kumar and Mayank Dave , "A Comparative Study of Various Routing Protocols in VANET", IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 4, No 1, July 2011 ISSN (Online): 1694-0814
6. Dhananjay Sudhakar GaikwadMukesh Zaveri, "VANET Routing Protocols and Mobility Models: A Survey", D.C. Wyld et al. (Eds.): NeCoM/WeST/WiMoN 2011, CCIS 197, pp. 334– 342, 2011. © Springer-Verlag Berlin Heidelberg 2011
7. Anas Abu Taleb , "VANET Routing Protocols and Architectures: An Overview", Journal of Computer Science, 2018, 14 (3): 423.434 DOI: 10.3844/jcssp.2018.423.434
8. Bijan Paul, Mohammed J. Islam, "Overview over VANET Routing Protocols for Vehicle to Vehicle Communication ", IOSR Journal of Computer Engineering (IOSRJCE) ISSN: 2278-0661, ISBN: 2278-8727 Volume 7, Issue 5 (Nov-Dec. 2012), PP 01-09
9. Prof. Shivendu Dubey, Anurag Nema and Prof. Ashok Verma, "AODV and AOMDV Routing Protocol with 801.11p in VANET," International Journal of Advanced Research in Computer Science and Software Engineering, Volume 6, Issue 6, June 2016 ISSN: 2277 128X
10. Vimmi A Gajbhiye, Ratnaprabha W. Jasutkar, "Investigation of Efficient Routing Protocols for VANET", International Journal of Scientific and Engineering Research Volume 4, Issue3, March-2013, ISSN 2229-5518
11. Ms. Vimmi A. Gajbhiye, Prof. Ratnaprabha W. Jasutkar, "A Review and Comparative Study of Routing Protocols for VANET ", IJACKD JOURNAL OF RESEARCH | VOL 2 | ISSUE 1 |FEBRUARY 2013|Page 11 ISSN (Print):2278-5698
12. Imtisunep T Longchar, Rwngouti Chamframary, Dip Jyoti Deka and T Sivakumar , "A Survey on Unicast Routing Protocols for
13. VANET ", (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (2) , 2015, 1390-1392, ISSN 0975-9646

AUTHOR PROFILE

Komala CR received her B.E. in Electronics and Communication Engineering from Mysore University in 2001 and M.Tech in Computer Science and Engineering from Visvesvaraya Technological University in 2011. At Present pursuing Ph.D in Electronics Engineering at Jain University and her research area includes wireless networks, Ad hoc networks and Vehicular Ad hoc networks. Publications: 12 papers in national conferences and 3 international journals.

Dr. N.K. Srinath presently working as a Professor and Dean (Student Affairs) in the department of Computer Science and Engineering at Rashtreeya Vidyalaya College of Engineering, Bangalore. Publications: 03 Papers in national conferences, 18 in international conferences and 42 international journals.