Performance Evaluation of DSDV, AODV and LSGR Protocol in Ad –Hoc Networks

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***Abstract*— Ad Hoc network is a infrastructureless network which are mainly used for various types of wireless communication. This network is broadly categorized in to two types mobile ad hoc networks (MANET) vehicular ad hoc network (VANET) utilizes vehicles as mobile nodes in a MANET to constitute a mobile network. Many routing protocols for MANET have designed. The main protocols involved Ad-hoc On-demand Distance Vector (AODV), Destination-Sequenced Distance-Vector (DSDV) routing protocol and Link State Geographical Routing Protocol (LSGR).The performance of each protocol has been evaluated in terms of throughput, the normalized routing load, packet delivery ratio, delay etc. A network simulator-2.35 (NS-2) has been utilized for performance assessment of LSGR, AODV and DSDV. By considering the performance of each protocol it has been observed that LSGR protocol perform better than the DSDV and AODV protocol in ad hoc networks.**

Keywords—DSDV, AODV, LSGR, VANET, MANET.

I. Introduction

Each of the past three centuries has been dominated by various technologies. The 18th century was the era of great mechanical systems accompanying the industrial revolution. The 19th century was the steam engine. During the 20th century the key technology was information gathering, processing, managing and distribution. Now we are moving towards the tremendous revolution for communication technology. So with the advancement of OSI and TCP/IP model of communication researchers are moving towards Ad Hoc networks for fulfillment of various application needs.

The ad hoc networks mainly based on MANET and VANET. VANET is the extension of VANET. A MANET is a self organizing network and infrastructure less network which work without central coordination. In this every device works as a node. For example PDA, laptop, camera, printer etc can be connected and created ad hoc networks for various application needs. So here each device represents the node and each node act as a transceiver. In this way each node act as a router in this network. The node uses a wireless medium for channel in the radio range.

On the other hand in VANET vehicle represent the node. The number of vehicles is increasing day by day. Each vehicle contains various wireless devices. So for the communicating and transferring the information between the vehicles VANET is a solution. With the enhancement of road safety and providing good quality of services the information should be reached to concerned destination without any collision. For this the efficient routing protocol should be designed. In such a routing protocol the node should be intelligent and should work when they are mobile.

A. The main characteristics of VANETs

1) Highly dynamic topology

Since vehicles are moving at high speed, the topology formed by VANETs is always changing. On highways, vehicles are moving at the speed of 60 mph (25 m/Sec). Suppose the radio range between two vehicles is 250 m. Then the link between the two vehicles lasts at most 10 Sec.

Frequently disconnected network (Intermittent connectivity)

The highly dynamic topology results in frequently disconnected network since the link between two vehicles can quickly disappear while the two nodes are transmitting information. The problem is further exacerbated by heterogeneous node density where frequently behavior roads have more cars than non-frequently travelled roads. Moreover, (non) rush hours only result in disparate node density, thus disconnectivity. A robust routing protocol needs to recognize the frequent disconnectivity and provides an alternative link quickly to ensure uninterrupted communication

2) Patterned Mobility

Vehicles take after a certain mobility pattern that is an element of the underlying streets, the traffic lights, as far as possible, activity condition, and drivers' driving conduct. On account of the specific mobility pattern, assessment of VANET routing protocols just bodes well from follows got from the pattern. There are different VANET mobility trace generators produced for the very motivation behind testing VANET routing protocols in simulation.

3) Propagation Model

In VANETs, the propagation model is typically not thought to be free space on account of the vicinity of structures, trees, and different vehicles. A VANET propagation model ought to well consider the impacts of free standing objects and in addition, potential interference of wireless communication from different vehicles or broadly conveyed individual access points.

4) Unlimited Battery Power and Storage

Nodes in VANETs are not subject to power and capacity constraint as in sensor systems, another class of ad hoc

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networks where nodes are basically static. Nodes are expected to have sufficient vitality and computing power. So, optimizing duty cycle is not as applicable as it is in sensor systems.

5) On-board Sensors

Nodes are thought to be outfitted with sensors to give data helpful for routing purposes. Numerous VANET routing protocols have accepted the accessibility of GPS unit from the on-board Navigation framework. Position information from the GPS unit and velocity from speedometer gives great illustrations to plenty of data that can conceivably be acquired by sensors to be used to improve routing choices.

B. APPLICATIONS OF VANET

Vehicular ad-hoc network applications range from street security applications to the vehicle or to the driver, to excitement and business applications for travelers.VANET applications are broadly classified as under.

Safety Applications: In VANET this application covers security related issue, for example, collision avoidance and cooperative driving It is not limited to this only but it also address the congestion problem and improve the traffic control in efficient manner..

Military Applications: This application is widely used for communication among the soldiers for performing different defense related tasks. In this node moves with high speeds. So for providing the reliable and secure communication efficient protocol should be designed. It should also handle the real time traffic support.

Emergency Operations: It covers all the operations where traditional communication system fail due to natural calamities like war, flood, land slide, earth quake etc. For such type of problem this network is deployed in efficient manner.

Traffic Management: VANET is useful in electronic toll collection and parking availability in the city. It helps in locating the free available slot for given geographical areas.

C. OVERVIEW OF DSDV, AODV AND LSGR PROTOCOL

Destination sequenced distance vector routing protocol (DSDV) : This routing protocol is proactive routing protocol or table driven protocol . In this every node has a routing table for the concerned destination. It is the extension of Bell man ford algorithm. The source node forwards its packet through shortest hop count. It updates its routing entry regularly based on latest sequence number.

Ad Hoc On demand distance vector protocol (AODV): It is also known as reactive protocol. In this protocol source node establish the route when there is a need to transmit the data. The source node firstly sends the route request through flooding in the entire coverage region. When the concerned node gets the route request, reply the destination information through unicast. This protocol uses a control packet exchange for the data transmission.

Link State Geographical Routing Protocol (LSGR): This protocol combine the best feature of link state and the geographical routing protocols in VANET. It is a scalable and robust protocol for traffic support. Greedy forwarding approach is mainly used in geographical based routing. This approach selects the shortest distance to the intended destination as a next hop. In this protocol link quality is also considered for effective routing.

II. RELATED WORK

Roberto Baldessari et al. [11] proposed a solution that gives dynamic network connectivity management for vehicular communication. This approach empowers IP communication between vehicles and also among vehicles and nodes in the Internet by means of access focuses along the road. Mobile IPv6 is used for worldwide IP mobility and location-based routing (PBRV) for effective and versatile remote multihop communication in the ad hoc network. The integrated incorporated arrangement both IPv6 and PBR; presents a IPv6 Proxy helps in network mobility which protects the mobile node connected to the vehicle-vehicles system from the adhoc network characteristics.

Shastri et al. [23] demonstrates the comparison of performance metrics for unicast and multicast routing .This research paper asses the performance of VANET utilizing different Quality of service parameters, which influences the network communication performance , likewise dissect the Quality of service performance parameters for multicasting and unicasting uses in high density and low density environment. These mechanisms ascertain the proficiency for VANET system in unicast protocols and multicast protocols for routing, likewise breaking connection among nodes amid transmission in DSR and analyze their effectiveness to obtain the result.

Rainer Baumann et al. [12] explored the impact of various mobility models on the execution of ad hoc network routing protocols. As a benchmark, prevalent irregular waypoint versatility model is utilized and second model is taking into account a vehicular movement test system .Finally, as third model, a novel portability model is proposed in view of vectorized road maps and pace limit data removed from a geographic data framework. With the two considered routing protocols, the arbitrary waypoint versatility model has a tendency to prompt generously higher execution than novel portability model, apparently more sensible versatility models.

Christoph Sommer et al.[13] created a coordinated traffic/system simulation device for assessing system protocols in real VANET situations. In this work,well-contemplated micro simulation models and remote ad hoc network models utilized from the space of transportation and traffic science and the systems administration group, individually. It could be demonstrated that system simulations that make utilization of reasonable traffic models deliver immeasurably distinctive results than those depending on regularly utilized oversimplified models, while their appropriation causes just insignificant execution punishments.

Dharmendra Sutariya et al. [24] built up a practical city mobility model with utilization of MOVE to assess the execution of directing conventions in city activity situations. The execution of protocols AODV, AOMDV, DSDV and DSR are analyzed on the premise of system simulations. Results are then investigated taking into account the distinctive Performance measurements to discover their suitability of these protocols for vehicular region systems.

C. Perkins et al.[6] proposed a routing protocol called Ad hoc On-Demand Distance Vector (AODV) routing protocol for utilization by mobile nodes in an ad hoc system. It offers brisk adjustment to dynamic connection conditions; low transforming and memory overhead, low system use, and decides unicast courses to destinations inside the ad hoc system. It utilizes destination arrangement numbers to guarantee circle flexibility at all times, avoiding issues, connected with traditional distance vector protocols.

B Parno et al.[8] propose a routing protocol called AODV_BD for VANET that enhances the Ad hoc On-Demand Distance Vector protocol by making it diminish the packet delay. The experiments of simulation give an effective way to deal with evaluation the protocol execution of a VANET. They have also discussed the VANETs and the typical routing protocol: the ad hoc on-demand routing protocol (AODV) in MANETs and the advanced routing protocol AODV_OBD for protocol AODV; also introduced a viable mobility model that empower the reproduction explore more veritable. At that point it utilize network simulation tool (NS2) to simulate the two routing protocols in ad hoc networks based on Linux and afterward looks at and investigations the simulation comes about and do execution advancement. It can be derive that AODV_OBD protocol affects the packet delay to a certain degree contrasted with AODV protocol.

An enhanced strategy is exhibited by LuoChao et al. [19]. The proposed plan recommends that every source node keeps up an option path to the predetermined destination node. At the point when the essential route fizzles, the source node will utilize the backup path to deliver packet. Simulation results demonstrate that this adjustment can enhance the packet delivery part as well as diminish the normal delay, the directing overhead and the route discovery recurrence.

C. Lochert et al. [15] presented a position-based methodology which mitigates this issue and has the capacity discover powerful routes inside city environments. The calculation needs worldwide learning of the city topology as it is given by a static road map. Given this data the sender decides the intersections that must be crossed by the bundle utilizing the Dijkstra algorithm. Sending between intersections is then done in a position-based fashion .This short paper indicates how position-based routing can be applied to a city situation without expecting that hubs have admittance to a static road map and without utilizing source routing.

Lee et al. [2] observed that the expense of planarization, the non-uniform conveyance of vehicles, and radio deterrents make GPSR's border mode wasteful in urban setups. A few upgrades have been proposed, for example, GPCR, which utilizes the idea of intersecting nodes to control the following street sections that packets ought to take after. Nonetheless, the idea of intersecting hubs itself is tricky and difficult to keep up in an element urban environment. It has been described that GpsrJ+ that further enhances the PDR of GPCR with insignificant alteration by foreseeing on which street portion its neighboring intersection node will forward bundles too. GpsrJ+ contrasts from GPCR as choices about which street fragment to turn does not have to be made by intersection nodes. Besides, GpsrJ+ does not require a lavish planarization method since it utilizes the common planar highlight of urban maps. Therefore, GpsrJ+ diminishes the hop count include utilized the border mode by as much as 200% contrasted with GPSR. It hence permits geographic directing plans to come back to the greedy mode speedier.

Karp et al.[3] presented Greedy Perimeter Stateless Routing, GPSR, a routing algorithm that uses geography to attain to little every node routing state, little routing protocol message intricacy, and amazingly hearty packet conveyance on thickly conveyed remote systems. GPSR produces protocols traffic in an amount autonomous of the length of the paths through the system, and along these lines creates a steady, low volume of routing protocol messages as versatility builds, yet doesn't experience the ill effects of diminished strength in finding routes.

X. Jiang et al. [6] categorize current geocast routing protocols into two categories: data-transmission and routing creation oriented protocols. Three conventions are shown that forward information packets to a geocast area utilizing distinctive procedures LBM, Geo GRID. Two protocols are also presented that make routes to send information packets to a geocast area: GeoTORA and a Mesh-based GRP.

III. PROBLEM IDENTIFICATION

Geographic routing protocols (greedy routing protocols) are mostly used in VANETs. In greedy routing protocols that node is chosen as next hop which is close to the destination so that in each step greatest progress towards destination can be achieved. If there is no such neighbor that is near to destination then this routing strategy can fail, so node chosen as next hop in this strategy will be close to destination but in the other hand farther from the source which implies that link between source and that chosen node is very weak. As a result signal strength of the transmitted signal from source to destination will decrease with distance which in turn leads to increase in two performance metrics: packet dropping ratio and end to end delay.

IV. PROPOSED WORK

Instead of choosing a node that is at a one hop distance, node with 2 hop or 3 hop distance will be chosen as next hop which in turn incorporate both the features packet advance and transmission reliability. If two or three hop neighbors are not in the range then choose one hop neighbor as a forwarder. If the distance between two neighboring nodes reduced then node chooses as forwarder will be at more hop distance.

The NS2 simulator has been used for the validation of the proposed work. The simulation mainly focuses on the performance comparison of the routing protocols: AODV and LSGR in VANET. In this paper, performances have been

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evaluated in terms of packet delivery ratio, network throughput, packet send and received, delay and normalized routing load. All simulations have been done on Network Simulator NS2.35 with the help of awk script trace file.

TABLE 1: SIMULATION PARAMETERS

Parameter	Value
Simulation time	50 sec
No.of nodes	14
Map size	1500 X 1200 m
Routing protocols	AODV,DSDV,LSGR
MAC protocol	802.11
Propagation model	Two Ray Ground Model
Channel Type	Wireless Channel
Network Interface Type	Phy/ Wireless Phy

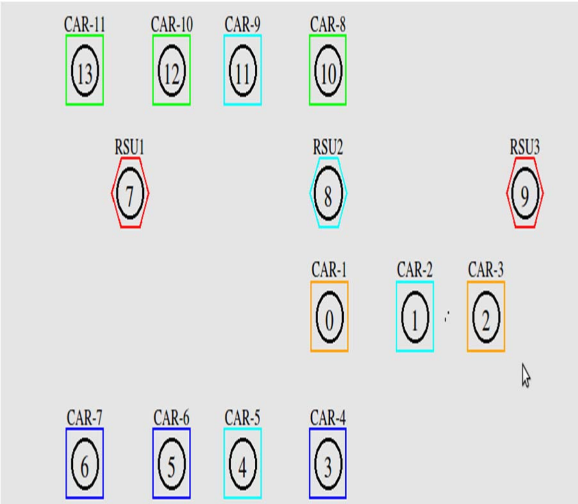

Fig. 1. Simulation Scenario

V. RESULTS AND DISCUSSIONS

Fig. 2 shows the comparison for three protocols DSDV, AODV and LSGR with delay used as metric. The delay is lowest for LSGR and the delay for DSDV is better than the AODV. So in terms of delay, performance of LSGR is best.

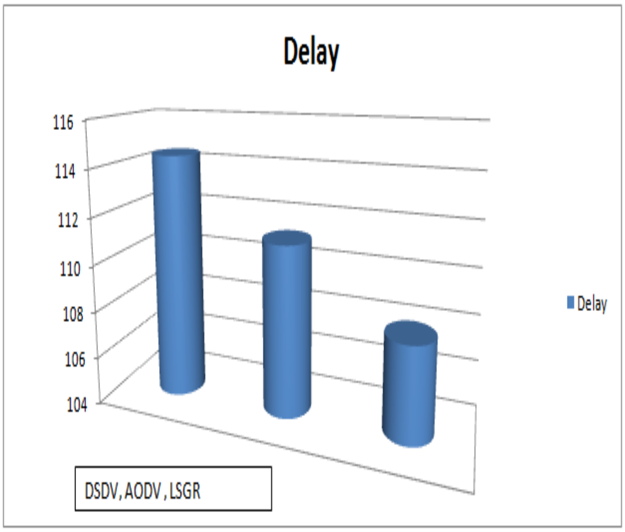

Fig. 2. Comparative delay caclulation

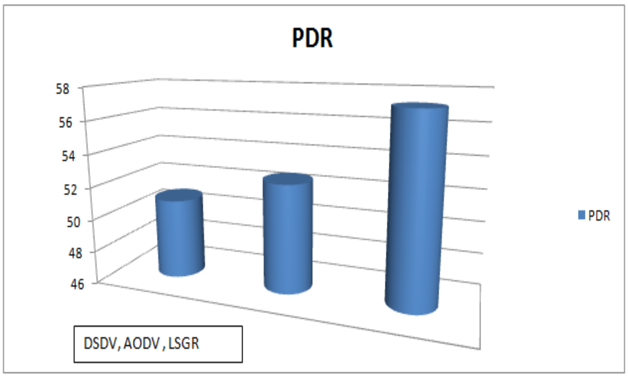

Fig. 3. Comparative PDR

Fig. 3 shows the comparison for three protocols DSDV, AODV and LSGR with PDR used as metrics. The PDR is lowest for DSDV and the PDR for LSGR it is better than the AODV. So in terms of PDR, performance of LSGR is best. From the fig it is clear that PDR for LSGR is above 55. That is why it is best suitable from other two protocols in context of PDR.

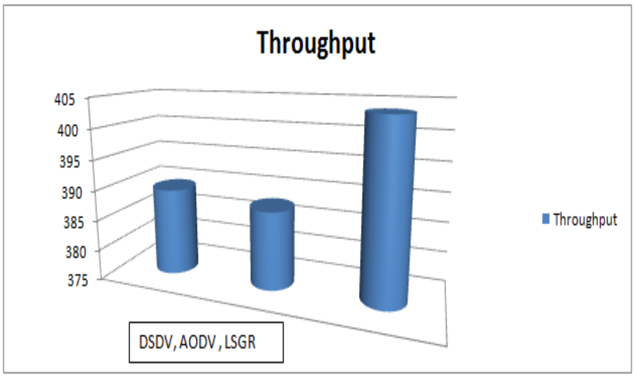

Fig. 4. Comparative Throughput

Fig. 4 shows the comparison for three protocols DSDV, AODV and LSGR with throughput used as metric. The throughput is lowest for AODV and the throughput for LSGR is better than the DSDV. So in terms of throughput, performance of LSGR is best.

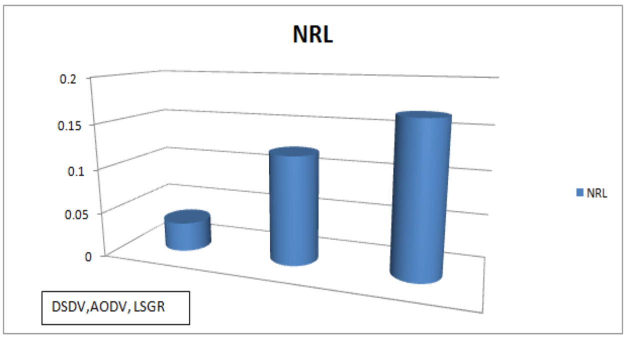

Fig. 5. Comparative NRL

Fig. 5 shows the comparison for three protocols DSDV, AODV and LSGR with NRL used as metrics. The NRL is lowest for DSDV and the NRL for LSGR is better than the AODV. So in terms of NRL performance of DSDV is best.

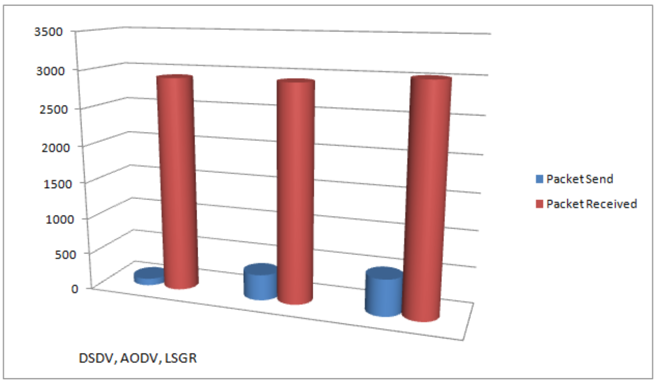

Fig. 6. Comparative packets send/received

Fig. 6 shows the no. of packet send and received for protocol DSDV, AODV and LSGR.As in LSGR, there is less difference between no. of packet sent and received as compared to AODV, DSDV so here performance of LSGR is best.

The Overall performance of these protocols is as follows.

TABLE 2: SIMULATION RESULTS

Parameter	DSDV	AODV	LSGR
Delay	114.45	111.23	108.02
PDR	50.9287	52.6213	57.5225
Throughput	389.49	387.81	403.57
NRL	0.033	0.121	0.167
Packet Send	95	353	502
Packet Received	2909	2916	3015

VI. CONCLUSIONS

It is an improvement over greedy forwarding mechansim because while choosing forwarder it takes geographic distance between source and forwarder into account to improve transmission reliability along with packet advance.

It is an improvement over existing LSGR protocol because it gives priority to the nodes that are in the same direction as of destination over those that are in opposite direction.

LSGR is implemented and integrated in NS2.35 with the help of make file.

It is simulated for different scenario and analyzed for its performance with the help of awk scripts with respect to QoS metrics like PDR, NRL etc.

Performance of this mechanism is also compared with AODV and DSDV routing protocols with the help of QoS metrics like PDR, NRL etc.

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