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An Improved AODV for Vehicular City Environment

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ABSTRACT: Vehicular Ad Hoc Network (VANET) is a sub type of Mobile Ad Hoc Networks (MANET). Vehicular Ad Hoc Network (VANET) offers wireless communication betweenvehicles and road side infrastructure. The communication among vehicles is utilized for comfort, safety and for entertainment purpose as well. The communication performance is based onon how better the routing occurs in the network. Routing of data is based ononthe routing protocols being employed in network. In this paper our primarily objective is to measure and enhance theAd hoc On Demand Distance Vector (AODV)performance in terms of different performance metrics i.e. end to end delay and Throughput with varying no. of mobile nodes (100, 150, 200, 250) or vehicle node density such as high vehicle-node density, medium vehicle-node density and low vehicle-node density with fixed mobility 10m/s. For the performance measurement of routing protocols a simulation tool 'OPNET Simulator v14.5' has been employed. OPNET (Optimized Network Engineering Tool) is a commercial network modeler environment utilized for simulations of both wireless and wired networks.

KEYWORDS: Ad-hoc network; AODV;OPNET;MANET;ART;VANET.

I. INTRODUCTION

The developing needs of wireless communication and wireless devices have tend to research on self healing, self organizing networks without the disturbance of any pre-established or centralized management [2]. The networks with the cut of any pre-established or centralized management are called Ad hoc networks [4]. Ad hoc Networks are the type of wireless networks that utilizes multi hop radio relay.

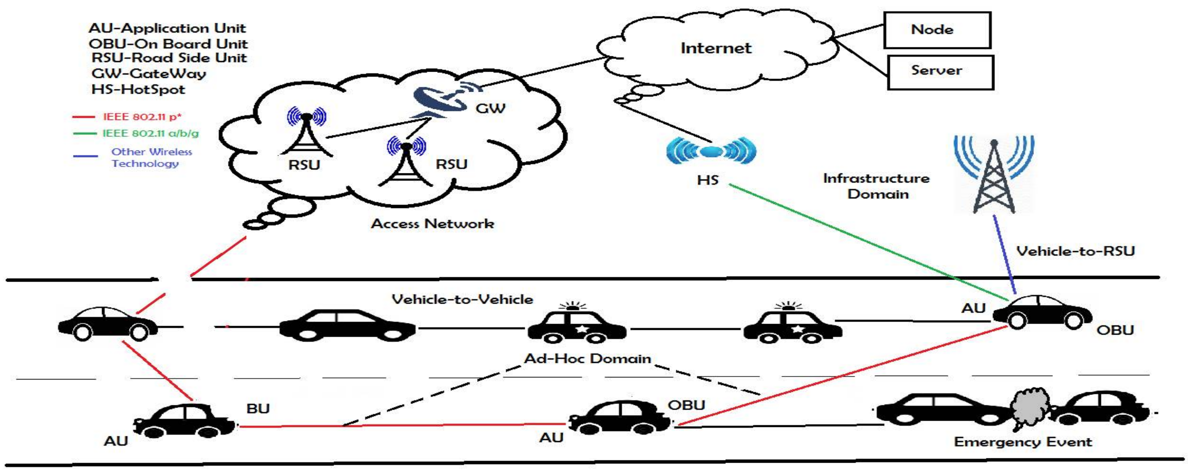

Figure 1: Working structure of VANET

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Vehicular Ad hoc Networks (VANET) is the subclass of Mobile Ad Hoc Networks (MANETs) [4]. It is the most grown technology that confers Intelligent Transportation System (ITS) in wireless communication between road side equipment (RSUs) to vehicles and vehicles to vehicles(V2V) according to IEEE 802.11p standard [2]. VANET offers wide range of non-security and security applications. Security application offers security to the travelers i.e.collision detection, lane change warning etc. It also offers comfort and commercial applications to the road users i.e. audio exchanging, video exchanging, weather information, electronic payments, electronic toll collect, route guidance, mobile E-commerce etc. Fig 1.1[1] illustrates the overallVehicular Ad hoc Network (VANET) working structure.

Traffic security is a significant challenge granted by the major players in the automotive industry and by various governments. Traffic delays proceed to increase and wasting several hours. Apart from traffic efficiency and security, characteristics i.e.payment services, entertainment, information updates and internet access can be unified into vehicles to enhance passenger comfort. Generally a driver, has incomplete information about speed, road conditions and vehicles location around them, and is pushed to make decisions like lane changing and breaking without the advantage of entire data. Real time communication between vehicles and vehicles to RSU can enhance traffic security and efficiency [7]. Vehicular Ad hoc Networks (VANETs), subtype of mobile ad hoc networks (MANET) [8], were formulated with a perspective to enable real-time communication among mobile nodes (vehicles or road side infrastructure) over wireless connections, mainly with a view to enable traffic efficiency and security. The communication among two or more nodes in a Vehicular Ad hoc Networks (VANET) faces several unique issues [8]. This is particularly true for safety-critical applications i.e. pre-crash sensing,lane change, collision avoidance etc. Factors i.e. high vehicle speeds, traffic density, total message size and low signal latencies etc. introduce challenges that builds traditional wireless technologies and protocols inappropriate for Vehicular Ad hoc Networks (VANETs). Besides from the performance challenges, there are various security challenges unique to VANET i.e.verifying validity of message data, authenticating message sender, offering node privacy with non-repudiation, availability, certificate revocation etc. All these security and performance needs contribute to build VANET securable applications.

Safety Applications of VANET:

Vulnerable Individual Protection: It involves facilities i.e. audio message for blind person.

On Coming Traffic Warning: It supports the driver about overtaking manoeuvers, by offering information about incoming traffic.

Traffic Signal Violation:RSU flood messages to alert vehicles about violation in traffic signal.

Public Safety: Public safety applications are needed if an accident has been physically informed. It warns the vehicles so that they can provide a way to the emergency vehicle.

Electronic Brake Warning: It reports the driver that sudden braking is performed by a preceding vehicle.

Post Crash Notification: Vehicle included in accident warns other coming vehicles by flooding alerting messages.

Intersection Violation Warning: This Intersection violation alerting application warns drivers when they are going to pass over a red light.

II. LITERATURE REVIEW

SheraliZeadellyet. al [1]: In this, writers showed a survey of wireless access standards for VANETs and some modelers existed for VANET simulations. Writers also emphasized some challenges required to be approached to enable the ubiquitous deployment and widespread adoption of reliable, scalable, secure and robust VANET. According to writers report, traffic modelersare utilized for transportation and traffic engineering. Network modelers are utilized to measure network protocols.

SunXiet.al[2]: Here writers, examined the VANET feasibility and its routing protocols, and also enforced a VANET network model. For the simulation objective, writers utilized NS2 simulation tool. Writers utilized three performance indexes for simulation, average end to end delay, get ratio and route costs. Simulation results illustrated that for a reliable and frequent changing MANET, reactive protocols are more appropriate for VANET as compared to proactive ones.

Thodeti Srikanth et. al [3]: In this, writers found an effective routing protocols for routing in MANET technology. Writers implemented reactive and proactive protocols utilizing OPNET IT Guru Academic Edition simulator 9.14. Parameters utilized by writers were end-to-end packet delivery, routing overhead. For the analysis objective authors

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utilized HTTP lower and high load traffic. Writers concluded that the network efficiency can be obtained by selecting the best appropriate protocols depending on network needs.

Omid Abedi et.al [4]: In this paper, authors removed route discovery phase by limiting neighbor distance and no. of found routes for the decrement of control overheads and building AODV usable for VANET. Writers utilizedGloMoSim for the simulation objective. Simulation was performed in a 1000*1000m regionand for 1000 seconds. Initial nodes placement was uniform, maximum speed of nodes was 20m/s. simulation results illustrated that speed had less impact on length of route in PAODV. In PAODV, the no. of hops increased with increasing no. of nodes.

Rahul kumaret. al [5]: Here writers, analyzed the AODV routing protocol by changing some perimeters value in AODV to enhance the protocol efficiency and build an optimized AODV i.e. EAODV. Writers employed OPNET 14.5 modeler for their simulation objective. Parameters utilized for simulation were RTS threshold, buffer size, long retry limit, data rates, active route time out. Simulation results showed that EAODV has better routing and QOS results as compared to AODV Protocol.

III. AODV ROUTING PROTOCOL

Routing is a technique to establish and to choose a particular path for sending data from source node to destination node [14, 16]. There are several routing algorithm planned for ad-hoc networks. Several VANET routing protocols can be categorized in two wide classes: proactive or Table Driven Routing Protocols (DSDV, FSR, OLSR) and reactive or On-demand routing protocols (AODV, TORA, DSR).

Ad hoc On Demand Distance Vector (AODV) is a pure reactive routing protocol which is capable of both multicasting and unicasting. In Ad hoc On Demand Distance Vector (AODV), like all reactive protocols, it operates on demand basis when it is needed by the nodes inside the network [8, 14]. When source node has to forward some data to target node then in starting it propagates Route Request (RREQ) message which is sent by intermediary nodes until destination is arrived. A route response message is unicasted back to the source if the recipient is either the node utilizing the requested address, or it has a legal route to the requested address .

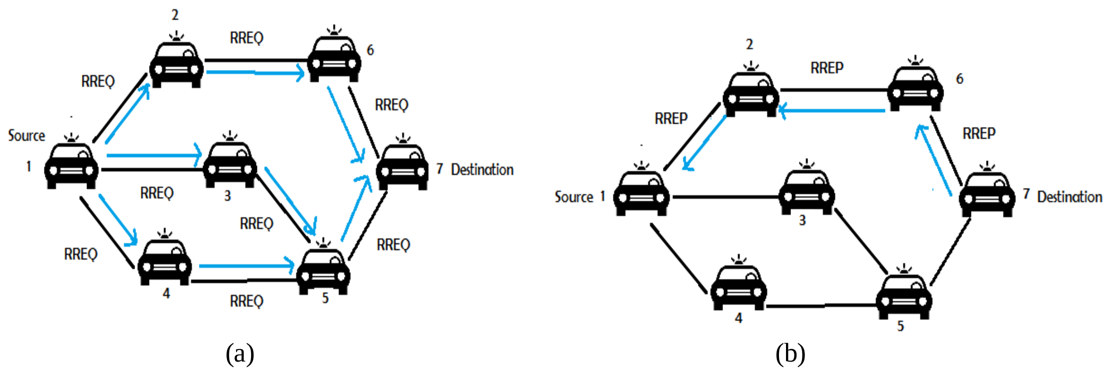

Figure 2 : AODV Route Discovery Process.(a) Propagation of the RREQ.(b) Path of the RREP to the source.

Workingof Ad Hoc On Demand Distance Vector Routing (AODV): In this kind of routing [14, 16] permits the interaction between two nodes through intermediate nodes, if those two nodes are not inside the range of one another. To built a route between source nodeto the destination node, AODV utilizing route discovery phase, along which Route Request message (RREQ) messages are flooded to all its neighbor nodes. This phase builds sure that these routes do not make any loops and discover only the shortest possible route to the target node. It also utilizes destination sequence no. for every route entry, which guarantees the loop free route, this is the one of the important advantage of AODV routing protocol. For instance if two different sources forward two different requests to a same target node, then a

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requesting node chooses the one with highest sequence no. In the route discovery stage various control messages are described in AODV that are explained as follows.

RREQ (Route Request): Whenany node wishes to interact with other node then it flood route request message (RREQ) to its neighboring nodes [14, 16]. This message is sent by all intermediary nodes until destination is arrived. The route request messages (RREQ) has the some information i.e. source and destination IP address, RREQ id or broadcast id, source and destination sequence no. and a counter**.**

RREP (Route Reply): When any intermediary nodes obtained Route Request (RREQ) message then it unicast the route reply message (RREP) to source either it is valid destination or it has route to destination node and reverse route is built between source and destination node[14, 16]. Every route reply message (RREP) packet contains some information i.e. destination sequence no., hop count, source and destination IP address.

RERR (Route Error): Whenever there is any connection failure arises in the routing procedure then route error message (RERR) is utilized for connection failure notifications. The route error message (RERR) contains some information i.e.Unreachable Destination node Sequence Number,Unreachable Destination node IP Address.

IV. SIMULATION METHODOLOGY

A simulation tool 'Riverbed is used for simulating AODV routing protocol and improving its performance on 100 and 200 nodes. OPNET is a network simulator that provides multiple solutions for managing networks and applications e.g. planning, network operation, research and development (R&D), network engineering and performance management. It allows the user to design and study the network communication devices, protocols, individual applications and also simulate the performance of routing protocol. It supports many wireless technologies and standards such as, IEEE 802.11, IEEE 802.15.1, IEEE 802.16, IEEE 802.20 and satellite networks.

In the proposed algorithm, how different parameters affects energy consumption through routing is shown. Three performance parameters Active route time out, Hello Interval and Time-To-Live are considered. First of all Set Active Route time as any value A, Hello Interval as any value Y and TTL as any value T and calculate the results of Quality of service(Q) and routing results for that value A, B and Z. After taking the previous value suppose a constant value is added in the value of Active Route Timeout and Hello Interval so that the value becomes A' and B'. Then again the simulation takes place in different scenarios and calculates the result of QoS(Q') for A', B' and Z. Compare both the results of QoS i.e. Q and Q'. If Q' is better than Q then the optimized value of Active Route Timeout(A') and Hello Interval(B') is obtained. If not, then the optimized value of Active Route Timeout and Hello Interval is A and B. Now, add a constant value to TTL and apply it on better results of QoS (either Q or Q') to obtain a new QoS(Q''). Compare it with previously obtained improved QoS. If better results are obtained, then optimized value of TTL is taken as Z' else it is Z.

V. RESULT

The simulation studies involve network topology with 100 and 200 nodes. The proposed multipath algorithm implemented in Riverbed. Results show that the proposed multipath algorithm improved the throughput value and decreases the delay. Fig 5.1 and fig 5.2 shows throughput comparison between normal and improved AODV.

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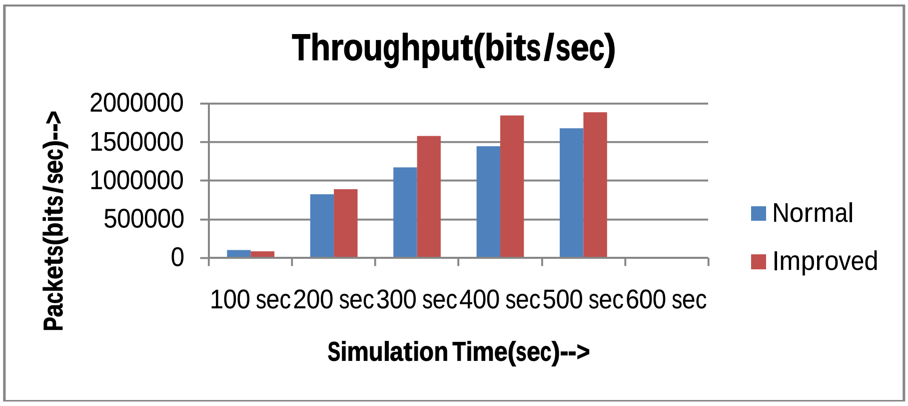

Fig 3 :Throughput Comparison of at 100 nodes

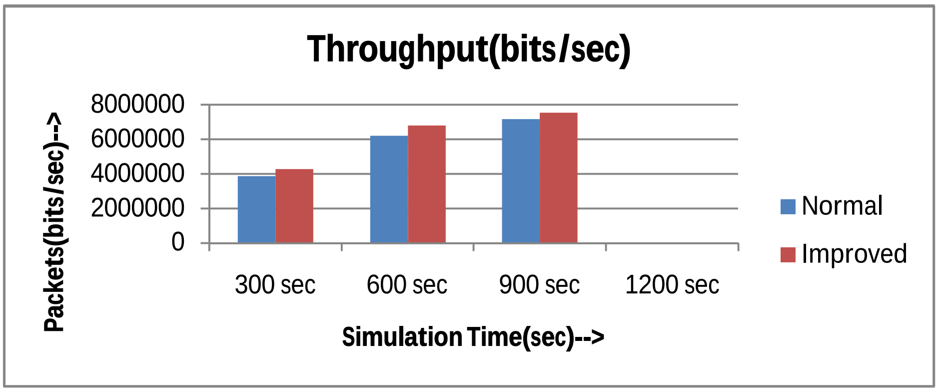

Fig 4 :Throughput Comparison of at 200 nodes

VI. CONCLUSION

In this research paper, AODV routing protocol with changing no. of vehicles or moving nodes (100, 150, 200 and 250) and a static speed of 10 meter per second with 100s pause time has been measured and enhanced. AODV protocol is measured and enhances with respect to two performance metrics: throughput and packet end to end delay. These performance metrics utilized in our evaluation shows two aspects of network performance. Throughput and Packet end to end delay addresses the protocols reliabilityThe simulation model of VANET network is modeled utilizing OPNET 14.5 simulator and examined and enhances for AODV routing protocol. We used some methodology to enhance the AODV protocol performance by changing the parameters value i.e. Time to live (TTL),Active Route Timeoutand Hello Interval and build E-AODV routing protocol. We used this enhanced AODV (E-AODV) to different no. of nodes i.e. 100, 150, 200 and 250 and concluded that this is efficient in all the situations. It is concluded that E-AODV has better QOS i.e. end to end delay and throughput in comparison of AODV protocol.

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