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Performance Analysis of Routing Protocol for Video Streaming in Vehicular Network

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ABSTRACT: Vehicular ad-hoc network is a wireless attainable technology where vehicles communicate to form network. Video mode is one of the challenging modes of communication which provides information such as broadcasting the advertisement in the form of video and video conversation between the vehicles. Video streaming suffer from high packet loss and delay due to network partition caused by high mobility in vehicular network therefore dynamic routing protocols need to be used for quickly adapting network topology and efficient search for new path. In this paper performance of routing protocol such as DSR, AODV and AOMDV is done by transmitted the video in Manhattan mobility model.

KEYWORDS: Manhattan, Evalvid, Bonn-motion, Video streaming

I. INTRODUCTION

Vehicular Ad-hoc Network (VANET) is the sub class of mobile ad-hoc network where the vehicles tend to communicate with other vehicle or Roadside units which will be attached to base station or some fixed infrastructure. From last decades lost of focus was given by Intelligent Transportation Systems (ITS) for improving road safety and comfort in VANET [1].The key technologies to improve the road safety is communication of vehicle which take place in its limited topology. The communication can be vehicle to vehicle or vehicle to infrastructure where the information transmitted in the form of text or video [2].

Video is vital mode of communication in vehicular network, but the streaming of high quality video to fast-moving vehicles and dynamic nature of network is fundamental challenges. Therefore for the communication between the vehicles selection of routing protocol is important which influences the performance in such scenarios. By the help of routing protocol appropriate route can be selected towards the destination.

Routing protocols of VANET are categorized into five different types they are Cluster, Topology, Broadcast, Geo-cast routing and Position based routing protocol. Topology based routing protocol are broadly classified into proactive and reactive routing protocol. In proactive routing protocol, global topology information which is in the form of table are stored in each node and in reactive routing protocol exchanging of information and finding the path only when the node requires communication to its destination. In this paper we are using on-demand routing protocol for comparison.

II. RELATED WORK

A. *Video streaming:*

Video streaming support over VANETs is used to improve the effectiveness on emergency response in case of any accidents, streaming a live video from the accident location and broadcasting the information to other vehicle [3]. Video transmission is categorized into two type [4], interactive video which is two way communication such as video conference and video steaming which is one way communication, video are transmitted from one source to one destination or many. In paper [5] two basic approaches where used for supporting video streaming i.e, infrastructure based where video server is deployed in base station and vehicle to vehicle approach where video server is in the vehicle. In paper [6] v3 architecture is proposed where video streaming application is supported for vehicle-to-vehicle network. The architecture is divided into two parts they are video source trigger and Video data transfer. As the name indicate video source trigger will continuously trigger video sender to send back the video to receivers using signalling

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mechanism. The video data transfer uses a store carry- and-forward approach to transmit video data in a partitioned network environment. In paper [7] the quality of service analysis is done using OLSR protocol and also demonstrated the drawbacks in hierarchal protocols. In paper [8] Streaming Media Urban Grid is used to distribute the stream video across the VANET. Dynamically node is selected to forward the media access point based on TDMA scheme hence each node is given time-slot based on it the packet is forwarded. Drawback is high packet loss. In paper [9] random network coding techniques is proposed for data dissemination in VANETs. Initially it forms group which consists of group node, which broadcast the information to its one hop neighbour. Instead of transmitting original piece it transmit coded piece to its neighbour, if coded piece is not duplicate then it will store in its local memory. It will collect enough pieces for decoding. In paper [10] comparison of Inter-vehicle routing protocol for video streaming and text dissemination for VANET is done based on their quality. Routing protocol is classified into uni-casting, broadcasting and geo-casting approach. In uni-cast information are transmitted from one node to another node, broadcast information are sent from one node to many and in geo-cast information are disseminated to group of nodes.

B. *Routing protocol*

Protocol means set of rules which need to be followed by two communication entities to exchange the information which include establishment of route, forwarding decision and maintains of route during the failure.

a) *Ad-hoc On-demand Distance-Vector routing protocol (AODV)*

AODV routing protocol [11] uses on-demand approach to find route to its destination, where route is established only if source node wants to send the data packet to its destination.

In AODV, when source requires the path to desired destination it flood the Route Request packet in the network which contain source id, the destination id, the source sequence number, the destination sequence number, the broadcast id and the time to live (TTL). Destination sequence number contain up-to-date path to destination which helps in identification of recent path. When the intermediate node receives the Route Request, first it will check in its routing table whether the desired destination route is present. If there is valid route it sends the path of destination in Route Replay packet to source and if there is no valid route then it forwards the request. Intermediate node receives multiple Route Request, the duplicates are found using broadcast identifier and source identifier pair. If the packet time is expired then it is automatically discarded from the network. If the source does not get the replay then after the time out it need to rebroadcast the request.

b) Ad *hoc On-demand Multipath Distance Vector (AOMDV)*

AOMDV [12] protocol is an extension of Ad hoc on demand Distance Vector (AODV) routing protocol. To initiate the route discover process first the source node broadcast the RREQ. If the neighbour node contains the information of destination in its routing table or if neighbour node itself is destination then it sends RREP packet to each RREQ packet sent from source. If neighbour node does not contain the information then it will broadcast the RREQ packet. Once the destination receives the RREQ packet it replay with RREP packet to all the one hop neighbour which sent RREQ packet which form link-disjoint path from source to destination which is stored in routing table. Based on the timestamp the source will establish the path and send data. When the existing route fails other path is used to transmit the data and to eliminate the expired route hello message is broadcasted. If there is no path from source to destination then route discover process need to start.

c) Dynamic Source Routing protocol *(DSR)*

DSR [13] uses control packets to restrict the bandwidth consumption in the network. In route construction phase route is established by flooding Route Request packet to the network. If neighbour is not the destination then it will rebroadcast the packet. Rebroadcasting is done until time to live counter is not exceeded. If neighbour node is destination node then it will respond by sending Route Replay packet to source. The route request packet contains sequence number and the path it traversed. The intermediate node when receives this packet first it will check for sequence number if it is not a duplicate Route Request packet then it will be forwarded. This is used to avoid loop formation and multiple transmissions. Here node does not transmit hello message periodically to its neighbour nodes hence DSR is beacon-less. This protocol uses route cache to store the information extracted from source data packet

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C. *Vehicular mobility model*

i) *Manhattan mobility model*

Movement of vehicle in real environment consist of restriction by the objects such as building blocks, trees. Therefore mobility model has to support the real scenario. Here Manhattan mobility model [14] is used which will generate map-based model, which contain vertical and horizontal lines for road. Figure 1 shows the Manhattan mobility model where nodes move in horizontal and vertical direction based on the probability chosen.

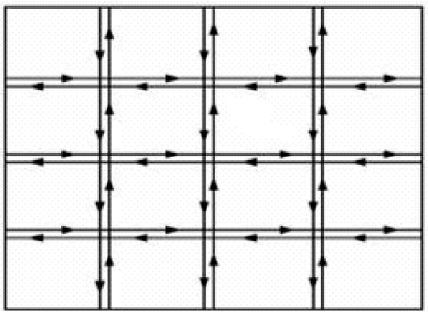

Figure 1: Manhattan mobility model

III. SIMULATION ENVIRONMENT

Bonn-motion [15] is a tool used for generate mobility model. The software uses is Java .The scenario generated by the Bonn-motion can be exported for network simulators such as ns2, ns3 GlomoSim/QualNet. There are different mobility model supported but we are considering Manhattan Grid model.

In this paper real time video is transmitted by using evalvid [16], the source video will be in raw YUV format which need to be compressed and transmitted. MPEG is used for compression and distributed in the network which can be decoded once it is received by the recipient. NS2 [17] is used for the simulation environment.

The following parameters are used for starting the simulation:

Mobility model	: Manhattan mobility model
Connection rate	: 10 packets/sec
Number of connection	: 10
Simulation time	: 200sec
Simulation area	: 1500 X 1500 m
Maximum node speed	: 10,20,30,40 and 50 m/s
Number of nodes	: 50,100,150 and 200
Protocols	: AODV, AOMDV, DSR

IV. EVALUATION AND RESULT

We have selected packet delivery ratio and throughput as the simulation parameter to evaluate the performance.

(a) Throughput: It refers to how many number of packets successfully delivered in given amount of time.

(b) Packet delivery ratio (PDR): It's a ratio number of successfully delivered packet to the number of packet sent by the source.

PDR = Number of packet received / Total number of packet sent

A] *Scenario I:* The number of node considered is 50, 100, 150, 200 and 250 in the simulation area of 1500 X 1500. Here the node density is varied and the performance of routing protocol is evaluated.

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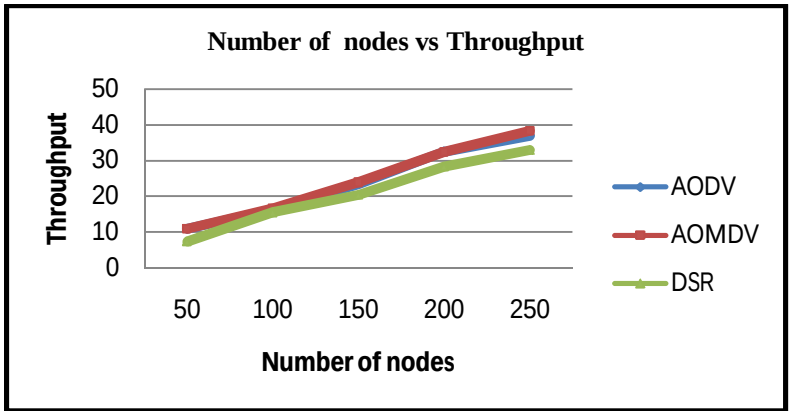

Figure 2: Throughput Vs Number of Nodes

From Figure 2, we infer that AODV and AOMDV have similar result whereas in DSR as the number of node increase packet delivered is reduced.

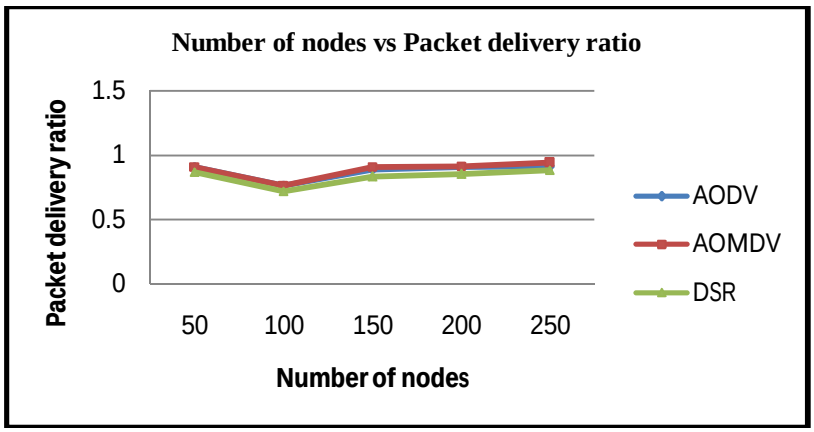

Figure 3: Number of Nodes Vs Packet delivery ratios

In Figure 3, three protocols have almost nearby value but AOMDV network delay is less compare to other two routing protocol.

B] *Scenario II:* In this scenario the mobility is varied by giving the speed of 10, 20, 30, 40 and 50. Based on different speed the throughput and packet delivery ratio is evaluated.

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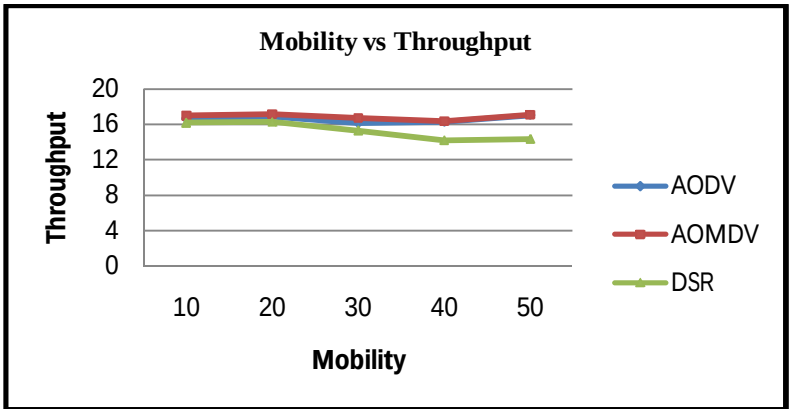

Figure 4: Mobility Vs Throughput

Figure 4 gives throughput analyses of the routing protocol, where AOMDV have high packet delivery to its destination.

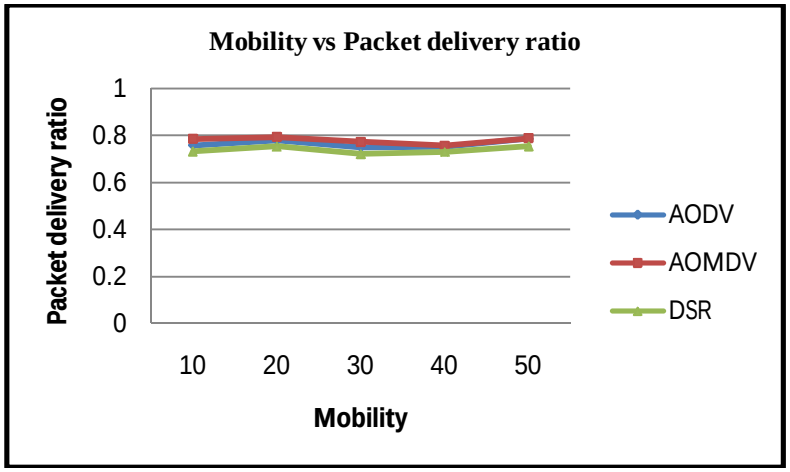

Figure 5: Mobility Vs Packet delivery ratios

In packet delivery ratio which is given in Figure 5 as the mobility increase the packet delivery ratio is increased in AOMDV.

V. Conclusion and Future Work

Analysis has been done for routing protocols in Manhattan mobility model. As the speed increases, the link duration decreases and hence overhead of routing increases and throughput deceases.

It has been observed that AOMDV achieves the higher throughput and packet delivery ratio where the routing overhead is low. Manhattan mobility model will generate the scenario as road, which is mainly suited for VANET environment. Mobility model also influence in performance of routing protocol.

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BIOGRAPHY

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