Analysis of Routing Scheme of VANETs

VAISHALI ARYA[1], MR SANJAY JANGRA[2]
ADVANCED INSTITUTE OF MANAGEMENT & TECHNOLOGY, PALWAL (FARIDABAD), India

Abstract - The vehicular adhoc network is the decentralized type of network in which no central controller is present in the network. The routing is the major issue of vehicular adhoc network. The routing protocols are broadly classified into reactive, proactive and hybrid type of routing protocols. In this review paper, various routing protocols are reviewed and analyzed in terms of certain parameters

Keywords - *VANETs, Proactive, Reactive, Hybrid*

I. INTRODUCTION

VANET stands for Vehicular ad hoc network which is the subset of MANET. This method is widely utilized nowadays in vehicular technology in order to avoid the road accidents ratio [1]. It provides the safe driving, informed about traffic, gas price, internet connectivity and lodging information by establishing connection between the cars and road infrastructures. There are two types of communication provided by this method such as V2V and V2I. The communication between the cars is provided by vehicle to vehicle and vehicle to infrastructure is communication with RSU by which vast services are offered to drivers and passengers. The innovation of the new technologies leads to new possibilities and better environment to live. Vehicular ad hoc networks are the one such technology that provide various advantages and remove the major issue of road accidents. In this case nodes are the cars and considered as the special case of MANETs. In order to from a connection between the moving vehicles, this protocol combines the recent advances of the wireless network. When devices make dynamic topology they are termed as Vehicular ad hoc network. It is a network of highly mobile vehicles moving at a relatively high speed. Vehicles in vanet communicate through vehicle to vehicle communication, vehicle to infrastructure. The main motive of using vanet is to make vehicles intelligent enough so that they can communicate among themselves without human interference [2]. All the vehicles in vanet are equipped with maps, sensors and wireless connection which help them in establishing communication among other nodes. This method offers the Intelligent Transportation System to the vehicular for performing vehicular communication. For the efficient execution of the technology provide various routing protocols. Routing is the process in which the packets are transferred from the source to destination using optimal routing path. Therefore, it is the process which finds out the best path for the forwarding of the packets. In case of bridging, it is mainly divergence. There are numerous applications of ITSs which are related to the vehicle transportation. They consist of various components such as computers, communications, sensors and control techniques and management techniques. The functioning of transportation systems is enhanced by the working of these components all together. The safety and efficiency of the ground transportation networks is enhanced with the help of real-time information gathered from these systems [3]. The warnings related to environmental hazards, and traffic and road conditions can be delivered by the vehicles with the help of VANETs. The information related to any issue such as road closure, accident, traffic jam etc. is transferred by the vehicles to other vehicles so that the driver can avoid such routes and prevent more troubles. The vehicles can distribute the information or warnings to all other vehicles through communication. The VANETs can be deployed in emergency scenarios due to their least configuration and ease of deployment characteristics. In case there is a need to assemble vehicles for help or inform the authorities regarding any serious issues the messages help in transmitting these messages. Therefore, VANETs provides various advantages in the real time applications.

II. ROUTING PROTOCOLS IN VANETS

In the VANETs, there are various challenges among those is the development of the dynamic routing protocol [4].With the help of this protocol, information is distributed easily from one node to another node. The traditional MANET differs from the routing in VANET due to utilized topologies is highly dynamic as compared to previous. All the developed protocols for MANET environment was tested on VANET.
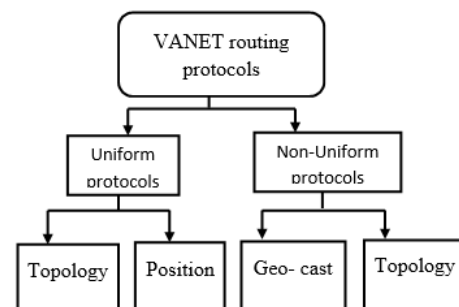

Fig.1: Routing in VANET

a) Topology Based Routing Protocols

It is the protocol in which links information has been utilized in order to perform packet forwarding. For sending packets from source to destination, it is necessary to have links information. With the help of links information, packet forwarding is performed within the network [5]. Topology based routing protocols are divided into two categories such as proactive and reactive routing. Proactive routing is also known as table-driven method and reactive routing protocol is known as on-demand method.

b) Position Based Routing Protocols

This protocol has been utilized for the location purposes as it determine the exact position of source node, neighbour node and the destination node. All the information about the nodes such as position is maintained by the use of GPS and it also determine the exact co-ordinates of the nodes in all directions, which lead to route discovery mechanism. When a packet is transferred by the source node, it obtained all the information about the location co-ordinates (x, y) of the destination. In this routing protocol, it is not necessary to update the routing table, establish or maintain the route. Location tracking has been utilized by this protocol in order to perform all its activity and some kind of forwarding strategy for the implementation of forwarding the packets via the source node.

c) Cluster Based Routing

It is the routing protocol, with the help of which a cluster is generated between the nodes or vehicles. There is a unique cluster-head in the cluster which contains the group of nodes within each cluster. This cluster is responsible for intra and inter-cluster communication [6]. A direct link is setup between the nodes in order to communicate within the cluster and designated cluster-heads are responsible for the inter-cluster communication. Within the cluster a cluster-head broadcasts the packet to all the nodes in the cluster based routing which1 improves the scalability for a large network of nodes. In the VANET, network delay and overhead increase for high mobility feature. The various Clusters based routing protocols are HCB, CBDRP, CBLR and CBR.

d) Broadcast Routing

It is the routing protocol that has been utilized in VANET for sharing information among vehicles such as when an accident or an event occurs, then it transmit the information to all nodes. It also known as flooding based routing protocol [7]. An essential role is played by the broadcast routing protocol in the emergency situations when the messages have to deliver quickly and in efficient manner in almost all safety applications. The broadcast routing protocol has a major disadvantage such as the hidden node problem and the high possibility of collision in the messages. With the help of broadcasting protocols messages has been transferred to vehicles within the communication range and it also transfer the messages to all the vehicles in the network. Sub-parts of broadcasting protocols are BROADCOMM and DV-CAST.

e) Geo Cast Routing

This routing is also termed as the location based multicast routing protocol. The main objecting of this protocol is to transfer packets from source node to all other nodes within a specified geographical region.

In order to avoid unnecessary rapid reaction, this routing protocol does not alert any information outside the ZOR [8]. Within a specific geographic region, it is considered as the multicast service. The various Geo cast routing protocols are IVG, DG-CASTOR and DRG. The packets are flooded to the forwarding zone so that there is reduction in the network congestion and message overhead. This condition happens due to the presence of packets everywhere.

III. LITERATURE REVIEW

Aji Setiabudi, et.al (2016) presented the emerging technology that has been widely utilized for the moving vehicles known as Vehicular Ad-hoc Network. In this network nodes are moving vehicles using which large mobile network range is created using efficient routing protocol [9]. In this paper, author compared the Greedy Perimeter Stateless Routing with Zone Routing Protocol using various parameters. These parameters are average throughput, packet delivery ratio, end to end delay, and packet loss in VANET environment. For the simulation process they utilize the NS2 and Vanet Mobisim in the area of dense and sparse. As per performed experiments, it is concluded that performance of GPSR method is better as compared to ZRP.

Seung-Seok Kang, et.al (2017) presented two methods for the development of VANET using which movement of vehicles on the street is tested by the system known as SUMO and a PC organize test system is bns-3. A particularly appointed routing calculation is required for VANET, keeping in mind the end goal to set up correspondence between the auto and street frameworks. A particularly appointed routing calculation is required for VANET, keeping in mind the end goal to set up correspondence between the auto and street frameworks [10]. A particular course was used for the development of the autos in VANET and TCP or UDP parcels are traded. The execution of the conveyance rate was estimated by three impromptu directing calculations [46]. This is because of actualities that directing data is kept up by sending auto much of the time and sender needs to reconstruct the refreshed course that outcomes in the debasement of the parcel conveyance rate. There is diminish in the normal throughput, when the auto moves speedier and there is increment in the standard deviation.

Ilker BASARAN, et.al (2016) presented the safety and soothe of driving in highways and urban streets has been improved due to vehicular ad hoc networks. It has seen the positive effects of the conventional measures on the decline of injuries due to accidents. Still, there are number of accidents occurred in daily basis [11]. This issue is overcome by VANETs by providing additional information to the driver with the help of which driver took immediate action in the adverse situations. Hence, for the transmission of message among vehicles, VANETs requires efficient routing protocols. In this paper, performances of four essential non-delay tolerant routing protocols, namely GPSR, GPSR+AGF, GSR, and GPSRJ+ was evaluated. All these protocols are outdated but initially they inspire many routing methods and used as comparison benchmark when it is required to introduce a new routing protocol. Packet Delivery Ratio, Average Delay, Traffic Control Overhead, and Average Hop Count were the evaluation metrics.

Abdul Kareem Basil, et.al (2017) presented the performance evaluation of AODV and OLSR for vehicular ad hoc networks, with the help of network simulator NS-3 for the simulation in two cross-roads scenarios. With the help of this innovative approach of VANET, the road safety is enhanced as numbers of vehicles around the globe increases day by day. The SUMO technology has been utilized to handle the special characteristics which must be followed by the vehicle as the crossroad junction has its own restrict traffic regulations [12]. The clustering effect in the crossroad was investigated by the two scenarios which contains the significant features. In these two routing protocols, the network metrics like the throughput, PDR, and end to end delay were evaluated. When the congestion occurs, the performance of the OLSR is better than the AODV in both the scenarios of the network metrics [55]. Both methods show poor performances in terms of delay but in the high congestion time optimal performance is shown by OLSR method.

Rakesh Kumar, et.al (2012) presented an intelligent transportation system in this paper has been utilized for the wireless network environment based on the vehicular ad-hoc networks. In the VANET applications build upon the data push communication model where information is disseminated to set of vehicles [13]. There are so many types of VANET applications and their communication protocol needs a systematic literature survey. In this paper mainly define the VANET applications based on the various broadcasting data dissemination protocols are surveyed separately and their fundamental characteristics are revealed. They performed comparison at the end in order to determine the performance of every protocol.

Nikita Mangla, et.al (2015) presented that a self-organized network is framed with the help of Vehicular Ad hoc Networks (VANETs) in which a permanent infrastructure is not necessary. Various major problems are outlined in this paper which must be solved on urgent basis for this class of routing protocols and they also proposed various solutions to overcome these problems [54]. Author also proposed an algorithm for position based routing at Road Intersection in VANETs [14]. As per performed experiments, all the obtained results from proposed methods were compared with existing methods in order to implement following characteristics that are obstacle awareness, street awareness, no bottleneck and no full path selection.

Kchaou Manel, et.al (2017) presented the technology of intelligent transportation systems in this paper which has been utilized for providing the safety, comfort, efficiency while travelling on the road. Due to the number of accidents it is required to improve the condition of the roads with the help of an intelligent system. Therefore, the technology of VANET has been utilized widely to easy issues related to road accidents [15]. With the help of this drivers are guide about the upcoming obstacles so that they can take an appropriate step to avoid accidents on the roads. Hence, for this technology suitable routing protocols have been utilized. Author proposed a Speed based On Demand Vector link routing protocol in this paper which is a part of an AODV based routing protocol. This method improves the routing process and selects neighboring vehicles safely for the transmission of packets in the vehicle velocity. On the basis of the performed experiments, it is concluded that performance of proposed method is better as compared to AODV routing protocol in terms of transmission delay.

Ahmad Abuashour, et.al (2017) proposed an Intersection Dynamic VANET Routing protocol in this paper in a grid topology, this proposed method is a dynamic protocol works in a real time [16]. Without affecting the stability of the connected route, when packet reaches the intersection, it immediately applies the proposed method between the current intersection and the desired destination intersection. On the basis of the current location, destination location, and a maximum of the minimum average throughput for SCSRs this proposed method selects the best route. The main objective of this method is to increase the efficiency of network which is done by increasing the route throughput and decreasing the end-to-end delay. As per simulation results, it is demonstrated that performance of the proposed method is superior as compared to other existing methods.

TABLE OF COMPARISON

Author's Name	Year	Description	Outcomes
Aji Setiabudi, Amalia Ayu Pratiwi, Ardiansyah, Doan.Perdana, Riri Fitri Sari	2016	Presented the emerging technology that has been widely utilized for the moving vehicles known as Vehicular Ad-hoc Network. In this paper, author compared the Greedy Perimeter Stateless Routing with Zone Routing Protocol using various parameters.	As per performed experiments, it is concluded that performance of GPSR method is better as compared to ZRP.
Seung-Seok Kang, and Ye-Eun Chae, Seunguk Yeon	2017	presented two methods for the development of VANET using which movement of vehicles on the street is tested by the system known as SUMO and a PC organize test system is bns-3.	Te performance of the two proposed method is evaluated at the end.
Ilker basaran, hasan bulut	2016	Presented the safety and soothe of driving in highways and urban streets has been improved due to vehicular ad hoc networks. It has seen the positive effects of the conventional measures on the decline of injuries due to accidents.	All these protocols are outdated but initially they inspire many routing methods and used as comparison benchmark when it is required to introduce a new routing protocol.
Abdul Kareem Basil, Mahamod Ismail1, and Mohammed A. Altahrawi, Hussain Mahdi, and Nordin Ramli	2017	Presented the performance evaluation of AODV and OLSR for vehicular ad hoc networks, with the help of network simulator NS-3 for the simulation in two cross-roads scenarios.	When the congestion occurs, the performance of the OLSR is better than the AODV in both the scenarios of the network metrics. Both methods show poor performances in terms of delay but in the high congestion time optimal performance is shown by OLSR method.
Rakesh Kumar, Mayank Dave	2011	Represent a paper based on the VANET vehicular ad-hoc networks are upcoming wireless network environment for intelligent transportation system.	In this paper mainly define the VANET applications based on the various broadcasting data dissemination protocols are surveyed separately and their fundamental characteristics are revealed.
Nikita Mangla, Shambhawi Srivastava, Shweta Jha, Debasis Das	2015	Presented that a self-organized network is framed with the help of Vehicular Ad hoc Networks (VANETs) in which a permanent infrastructure is not necessary.	As per performed experiments, all the obtained results from proposed methods were compared with existing methods in order to implement following characteristics that are obstacle awareness, street awareness, no bottleneck and no full path selection.
Kchaou Manel, Chaari Lamia	2017	Presented the technology of intelligent transportation systems in this paper which has been utilized for providing the safety, comfort, efficiency while travelling on the road.	On the basis of the performed experiments, it is concluded that performance of proposed method is better as compared to AODV routing protocol in terms of transmission delay.
Ahmad Abuashour, Michel Kadoch	2017	An Intersection Dynamic VANET Routing protocol proposed in this paper in a grid topology, this proposed method is a dynamic protocol works in a real time.	As per simulation results, it is demonstrated that performance of the proposed method is superior as compared to other existing methods.

IV. CONCLUSION

In this work, it is concluded that vehicular adhoc network is the self-configuring type of network in which vehicles can communicate with each other. The routing protocols are used to establish path from source to destination. The routing protocols are broadly classified into reactive, proactive and hybrid type of protocols. In this paper, various different type of protocols are reviewed and analyzed in terms of different parameters.

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