

A SURVEY ON THE ROUTING PROTOCOLS IN VANET

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Abstract—VANET is specialized application of MANET. The need VANET is felt as the number of vehicles are swelling remarkably thereby the traffic density has grown many times. The voluminous traffic density results in more and more accidents. Therefore the manufactures, researchers and Government are forced to improve the on-road safety along-side improving the quality of the roads. As the Wireless technology is improving day by day, various new type of networks, such as Vehicular Ad Hoc Network (VANET) have emerged. VANET is nothing but a communication protocol between Road side Units and vehicles and /or between a vehicle and other near-by vehicle. As the importance of smart cities and labs conceptualized [1] in the recent years where VANETs plays an important role. VANET helps in basic concept of smart cities as it can transmit the traffic information and help driver to drive with safely. An effort is made to provide a survey of various Intelligent Traffic Systems (ITS) and routing protocols. VANET

Keywords—VANE; Smart City Framework; Intelligent traffic Lights (ITLs); Intelligent Traffic System (ITS); Routing Protocol

INTRODUCTION

Vehicular density is one of the parameter of the development of a country. As India is also a developing country the traffic is growing at a faster pace than the population. This, double paced race, contribute to Road

safety and it became the main issue for governments and car manufacturers to tackle with. The researcher and car manufacturer

are focusing this issue while developing new cars. IT is helping the car design towards Road Safety. The advancement in wireless

technologies has also opened a new area of research – Vehicular ad hoc network (VANET). Researchers are designing and developing new protocols to help the vehicles can communicate with fellow vehicles directly or indirectly. In VANET moving cars are considered as a nodes in a network with the help of these nodes a mobile adhoc network is generated [2].

VANETs are basically concerned about the presentations which are associated with traffic management and road safety issues. In modern era where cities are full of traffic residents needs that the problem of congested roads be addressed effectively. The VANETs can be used to improve the movement by predicting the road density and / or light system, and the vehicles can be routed on a less dense and /or less traffic light roads by knowing their destinations. In the beginning the VANETs are only concentrating on rad safety aspects, but in cities like Amsterdam Vehicle2Grid pilot program is proposed, in this residents will be able to use the battery in their electric car to store their locally produced energy.

Pollution and congestion reduction, accidents prevention, safer roads are some of the benefits of VANETs. The development of an efficient system in VANETs has many important benefits, to the traffic police as well as to the drivers. Proper traffic alerts and updated information about traffic incidents will make safe driving, increase road safety and reduce the traffic jams in the city. It also helps to identify where the traffic rules violations takes place. Furthermore, it also helps in economic ways; real-time traffic alerting will reduce trip time and fuel consumption and therefore decrease pollution as well [3]. So it is definitely beneficial in many ways.

OBJECTIVES OF VANET:

The VANET is natural successor of MANET. VANET mostly behaves like the MANET technology. Both the technologies needs to operate on wifi, low bandwidth, and requires to have self-organization, self-management. But the basic difference between the two technologies is that VANET operates on the high speed nodes movement and the mobility mode is uncertain [in contrast to MANET] of the mobile nodes (vehicles) along the paths. This requirements defines the key issue in designing an efficient routing protocol which stresses upgradation in MANET architecture so as to cater the needs of the fast mobility in nodes present in the VANET in an efficient manner. Keeping theses in mind various research issues are dealt with while designing an appropriate routing protocol. It is therefore important to address the main characteristics of VANET that may be kept in mind while designing various **routing** protocols.

SPECIFIC CHARACTERISTICS OF VANET

HIGH DYNAMIC TOPOLOGY: I moving at very past pace. The average permitted on highways are 90 kms per hour(25m/sec), and if two vehicles are moving in opposite directions and if the transmission range is about 250m, then the link between these two vehicles will last for only 5 seconds (250m/ 50ms-1). This defines its highly dynamic topology.

FREQUENTDISCONNECTED NETWORK:

The above parameter leads to the fact that with in every 5 seconds or so, the nodes needed link must be refreshed either with nearby vehicle or with the road side units to maintain seamless connectivity.

MOBILITY MODELING AND

PREDICTION: The above parameter, for maintaining link it will be better if the knowledge of node's position and their movements can be predicted, but the knowledge of both is very difficult to predict as the nature and pattern of movement of each vehicle and / or its driver.

COMMUNICATION ENVIRONMENT: The nodes movement and its pattern varies as the nodes move on highways) (at a high speed with regular patter) or in city environment (at slow speed but with zig-zag pattern). This leads in changes in design of routing algorithm.

HARD DELAY CONSTRAINTS: To deal with the safety aspect (such as fatal accidents, breakdown events) of VANET, the foremost requirement is that the messages must reach on time to relevant nodes. Therefore high data rates are not as important an issue for VANET as overcoming the issues of hard delay constraints.

INTERACTION WITH ONBOARD

SENSORS: This sensors helps in providing node's location and their movement pattern which is required for effective communication link and routing purposes.

ROUTING PROTOCOLS

As it is discussed, the basic objective of VANET and MANET is same in most facets except that in VANET the nodes movement is very high and in all most all the cases it is unpredictable. This means that most of the MANET routing protocols can be used / applicable in VANET also.

Initially well-known AdHoc routing protocols such as AODV (Ad Hoc on demand distance vector) and DSR (Dynamic source routing), Position-based, Cluster-based, Broadcast-based or Geocast-based are therefore are applied on VANET as well. However, after simulating these algorithms in VANET frequent communication breaks are observed which is mainly due to the fact that the nodes in VANET are highly dynamic in nature. To meet the VANET challenges, these existing algorithms are suitably modified. [4] The summary of the modifications are listed below:

Sr No	Type	Modified Routing algorithm (improved)
1	AODV	PR-AODV (Predicted AODV) – (Proposed by Namboodiri et al. [5]) Here, to predict the lifeline (activeness) of the active nodes, node

		position and their speed information are fed in AODV. This modified algorithm is referred as PR-AODV and it generates a new alternate link before the estimated link lifetime of the node expires. (In AODV, the link created only after the failure of connectivity occurs). PR-AODV-M (PR-AODV-maximum) – it computed the maximum predicted life time of the various routes options (in contrast to selecting shortest path as in PRAODV or AODV)			hurdles. A-STAR works in conjunction with GPCR algorithm. Here statistical or dynamical maps are used to evaluate traffic condition and identify path with high connectivity for packet delivery.
2	Position Based Routing Algorithm	GPSR (Greedy Perimeter stateless Routing) – better suited for highway conditions (Where the mobility of the node is fast) and may not be suitable in city model where the speed of vehicles is slow due to slow moving traffic forcing the node to move slow and in unpredicted manner. GPCR (Greedy Perimeter coordinate Routing)-modified is improved to handle city scenario also. Here, a restrictive greedy algorithm is proposed and adapted when nodes are in city and a GPSR routing protocol is adapted when at the nodes reaches some junction of streets. A-STAR (Anchor based street and traffic aware Routing). In city slow traffic is not the only hurdle but here hi-rise buildings may create	3	Cluster Based Routing Algorithm	COIN (Clustering for Open IVC Network) (by Bhum et al.) LORA-CBF (Location based Routing Algorithm using Cluster based Flooding) (by Santo et al.) These protocols deals with dynamic movement scheme, these techniques takes care of predictable actions may be taken by driver under certain circumstances. By doing this, aby adding a little extra cost the tolerance limit of inter-vehicle distances is increased.
				Broadcast based Routing Algorithm	BROADCAST COMM (Broadcast Communication) – by Durresti et al. Here, some only nodes are responsible of handling the messages in the network. These nodes are termed as virtual cells (cell reflector). These cells move along the vehicles on the highway. UMB (Urban Multi-hop Broadcast Protocol): In this algorithm, each node keeps tracks of the farthest nodes and broadcasts the message to it which in turns rebroadcast it. At the street junctures, repeaters may be installed to forward the message to

		all road segments. V-TRADE (Vector-based Tracking Detection);
4	Geo Casting based Routing Algorithm (Geographic region based)	Based on ZOR (Zone of relevance) – This is a location based multicast routing protocol.

Conclusions:

VANET is an emerging and attractive technology dedicated to safety and comfort services to the vehicle users. Owing to its high dynamic topology and unpredictable channel distribution, it aspires for a suitable routing protocol algorithm that can generate a near seamless network connectivity among the vehicular nodes. This opens up one among the major research challenges in VANET. In present survey an attempt is made to deal with the various scenarios possible designing the protocols for VANET. Here the protocols are reviewed briefly for their applicability.

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