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International Journal OF Engineering Sciences & Management Research

SURVAY OF ROUTING PROTOCOL FOR VEHICULAR AD- HOC NETWORK (VANET)

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KEYWORDS: Routing protocols VANET and MANET, V2V, V2I carry-and-forward.

ABSTRACT

Vehicular Ad hoc Network (VANET) is the network of vehicles and road side units. In VANET,there are the two parameters of communication can be done to provide a list of applications like emergency vehicle warning, safety etc. The various vehicles known as vehicle to vehicle and between vehicles and roadside units known as vehicle to roadside communication. Working of the such kind of communication between vehicles depends on the various routing protocols. The effective routing protocol is needed to route the data from source to destination node in VANET. Routing process in Vehicular Ad hoc Networks is a challenging task due to the unique characteristics of the network such as high mobility of nodes, dynamically changing topology and highly partitioned network .So for this we use a (MANET) routing protocol MANET protocols, in contrast, are designed for resource constrained wireless environment. It is a challenge to ensure reliable, continuous and seamless communication in the presence of the speeding vehicles.The basic MANET routing protocols are AODV and DSR. The performance of routing protocols depends on various internal factors such as mobility of nodes and external factors such as road topology and an obstacles that block the signals. The routing protocols fall into two major categories of topology-based and position-based routing.

INTRODUCTION

Vehicular Ad hoc Networks (VANETs) are special kind of Mobile Ad Hoc Networks (MANETs) that are formed between moving vehicles on an as needed basis. VANETs having most of the unique characteristics such as high mobility of nodes, time varying density of nodes, frequently disconnections, highly partitioned network and dynamically changing topology, which makes (VANET) more challenging [3].VANET is one of an influencing areas for the improvement of Intelligent Transportation System (ITS) in order to provide safety and comfort to the road users. The vehicles and road side units act as nodes of vehicular network. Each vehicular node behaves as router in network. In VANET mostly they prefer V2Vcommuniction than V2I due to reduction of cost of infrastructure.In VANET, movement of nodes can be determined by using motion random directions. The nodes in route from source node to destination node dissociates due to random movements. Therefore implementation of efficient routing protocol is very important. Most of the routing protocols use position based and map based approach [1].Many Ad hoc protocols used in VANET have a poor performance. Even MANET routing is not the best strategy for effective routing in VANET. The VANET assists vehicle drivers to communicate and to coordinate among themselves in order to avoid any critical situation through Vehicle to Vehicle communication e.g. road side accidents, traffic jams, speed control, free passage of emergency vehicles and unseen obstacles etc. The feasibility and quality of the non-safety applications will be dependent on the characteristics of the ad hoc network. VANETs have some dissimilar properties then MANETs like road pattern restrictions, no restriction on network size, dynamic topology, mobility models, and infinite energy supply, localization functionality and so on. All these characteristics made VANET environment a challenging for developing efficient routing protocols. The major factor in it is the rapidly moving mobile nodes.

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Fig 1 Vehicular Ad Hoc Network overview

The main goal of VANET is providing safety assurance and comfort for passengers. Each vehicle installed with VANET device will be a node in the Ad-hoc network and can accept & transmit other messages through the wireless network. Collision alert message, Road signal arms and in place traffic view will give the driver necessary tool to decide the best path along the way.

OVERVIEW OF ROUTING PROTOCOLS

Routing in VANETs has been analyzed widely within the past few decades. Since VANET is a particular kind of ad hoc network, the main difference between MANETs and VANETs is the mobility pattern and suddenly changing topologies. The most unremarkably used various adhoc routing protocols are first enforced in MANETs are tested in the various scenarios and then analyzed to be used in a VANET environment. We want a technique that will assigns distinctive logical addresses to vehicles however available routing protocols don't assure that the allocation of duplicate logical addresses must be rejected within the vehicular networks. Thus, in an exceedingly VANET atmosphere, various existing addressing algorithms employed in MANETs are rarely appropriate. VANET related problems like configuration, number of vehicles at varied times of the day, demographics, mobility patterns, random change in vehicles incoming and outgoing the network and also the indisputable reason is that the dimensions of the road are usually lesser than the transmission coverage; all these build the utilization of typical adhoc routing protocols inappropriate. Routing protocols for VANETs are mainly classified in two different categories according to their position accusation and the route update method. They are:

- Position Based Routing Protocol
- Topology Based Routing Protocol
- Broadcast Based Routing Protocol
- Cluster Based Routing Protocol
- Geo Cast Based Routing Protocol

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A. Topology based routing protocol

These routing protocols use links' information that exists in the network to perform packet forwarding. They can further be divided into proactive (table driven) and reactive (on-demand) routing.

Proactive (table-driven): Proactive routing carries the distinct feature: the routing information such as the next forwarding hop is maintained in the background regardless of communication requests. Control packets are constantly broadcast and flooded among nodes to maintain the paths or the link states between any pair of nodes even though some of paths are never used. A table is then constructed within a node such that each entry in the table indicates the next hop node toward a certain destination. The advantage of the proactive routing protocols is that there is no route discovery since route to the destination is maintained in the background and is always available upon lookup. Despite its good property of providing low latency for real-time applications, the maintenance of unused paths occupies a significant part of the available bandwidth, especially in highly mobile VANETs.

Fisheye State Routing (Iwata, 1999; Pei, 2000) is an efficient link state routing that maintains a topology map at each node and propagates link state updates with only immediate neighbors not the entire network. Furthermore, the link state information is broadcast in different frequencies for different entries depending on their hop distance to the current node. Entries that are further away are broadcast with lower frequency than ones that are closer. The reduction in broadcast overhead is traded for the imprecision in routing. However, the imprecision gets corrected as packets approach progressively closer to the destination.

Reactive (On Demand): Reactive routing opens a route only when it is necessary for a node to communicate with another node. It maintains only the routes that are currently in use, thereby reducing the burden on the network. Reactive routings typically have a route discovery phase where query packets are flooded into the network in search of a path. The phase completes when a route is found.

AODV – In Ad Hoc On Demand Distance Vector (AODV) (Perkins, 1999) routing, upon receipt of a broadcast query (RREQ), nodes record the address of the node sending the query in their routing table (Figure 2a). This procedure of recording its previous hop is called *backward learning*. Upon arriving at the destination, a reply packet (RREP) is then sent through the complete path obtained from backward learning to the source (Figure 2b). At each stop of the path, the node would record its previous hop, thus establishing the *forward* path from the source. The flooding of query and sending of reply establish a full duplex path. After the path has been established, it is maintained as long as the source uses it. A link failure will be reported recursively to the source and will in turn trigger another query-response procedure to find a new route.

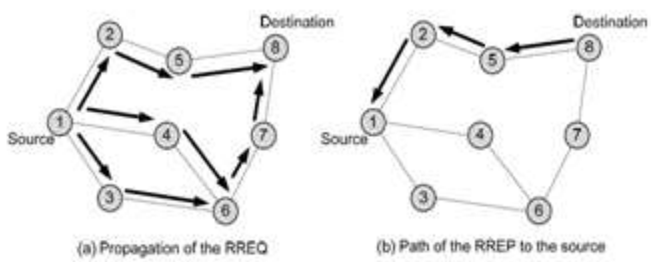

Fig 2 AODV route discovery

DSR – Dynamic Source Routing (DSR) (Johnson, 1996) uses *source routing*, that is, the source indicates in a data packet's the sequence of intermediate nodes on the routing path. In DSR, the query packet copies in its header the IDs of the intermediate nodes that it has traversed. The destination then retrieves the entire path from the query

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packet (a la source routing), and uses it to respond to the source. As a result, the source can establish a path to the destination. If we allow the destination to send multiple route replies, the source node may receive and store multiple routes from the destination. An alternative route can be used when some link in the current route breaks. In a network with low mobility, this is advantageous over AODV since the alternative route can be tried before DSR initiates another flood for route discovery.

There are two major differences between AODV and DSR. The first is that in AODV data packets carry the destination address, whereas in DSR, data packets carry the full routing information. This means that DSR has potentially more routing overheads than AODV. Furthermore, as the network diameter increases, the amount of overhead in the data packet will continue to increase. The second difference is that in AODV, route reply packets carry the destination address and the sequence number, whereas, in DSR, route reply packets carry the address of each node along the route.

TORA – Temporally Ordered Routing Algorithm (TORA) (Park, 2007) routing belongs to a family of link reversal routing algorithms where a directed acyclic graph (DAG) toward the destination is built based on the height of the tree rooted at the source. The directed acyclic graph directs the flow of packets and ensures reachability to all nodes. When a node has a packet to send, it broadcasts the packet. Its neighbor only broadcasts the packet if it is the sending node's downward link based on the DAG. A node would construct the directed graph by broadcasting a query packet. Upon receiving a query packet, if a node has a downward link to the destination, it will broadcast a reply packet; otherwise, it simply drops the packet. A node, upon receiving a reply packet, will update its height only if the height from the reply packet gives the minimum of all the heights from reply packets it has received so far. It then rebroadcasts the reply packet.

The advantages of TORA are that the execution of the algorithm gives a route to *all* the nodes in the network and that it has reduced far-reaching control messages to a set of neighboring nodes. However, because it provides a route to all the nodes in the network, maintenance of these routes can be overwhelmingly heavy, especially in highly dynamic VANETs.

Evaluation of the Topology-based Routing: Jaap et al. (2005) has evaluated AODV, DSR, FSR, and TORA in city traffic scenarios on the network simulator ns-2. The city mobility model is based on a Manhattan-like road network of eight horizontal and vertical roads. The speed of the vehicles is determined based on the Intelligent-Driver Model (IDM) where a vehicle's speed is adjusted by other surrounding vehicles and road topology such as intersections (Helbing 2002). From their simulation, it is shown that AODV has the best performance and lowest control overhead. It is followed by FSR, DSR, and then TORA. DSR suffers from a very high delay because source routes change continuously due to high mobility. Its route overhead is comparable to FSR yet higher than AODV since DSR keeps route information within the packet header. The common characteristic among all four routing protocols is that performance degrades as network densities increase, indicating their scalability problem.

Lochert et al. (2003) conducted an evaluation study of Geographic Source Routing (See Section on GSR), AODV, and DSR in a small part of a map of Berlin. The movements of 955 vehicles are simulated by the traffic flow simulator Videlio (Kronjäger, et al., 1999) that incorporates a special lane changing model. The evaluation also considers a basic form of *obstacle modeling* in the propagation model. The obstacle modeling states that spaces between streets are assumed to be buildings and, therefore, radio waves cannot propagate through them. Simulation results have shown that AODV performs better than DSR for the same reason mentioned above because large packet overhead creates a significant bandwidth overload and mobility causes frequent route breakage. However, both of the topology-based reactive routing protocols do not perform as good as GSR.

Geographic (Position-based) Routing: In geographic (position-based) routing, the forwarding decision by a node is primarily made based on the position of a packet's destination and the position of the node's one-hop neighbors. The position of the destination is stored in the header of the packet by the source. The position of the node's one-hop neighbors is obtained by the beacons sent periodically with random jitter (to prevent collision). Nodes that are within a node's radio range will become neighbors of the node. Geographic routing assumes each node knows its

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location, and the sending node knows the receiving node's location by the increasing popularity of Global Position System (GPS) unit from an onboard Navigation System and the recent research on location services (Flury, 2006; Li, 2000; Yu, 2004), respectively. Since geographic routing protocols do not exchange link state information and do not maintain established routes like proactive and reactive topology-based routings do, they are more robust and promising to the highly dynamic environments like VANETs. In other words, route is determined based on the geographic location of neighboring nodes as the packet is forwarded. There is no need of link state exchange or route setup.

APPLICATIONS

Major applications of VANET embody providing safety data, traffic management, toll services, location primarily based services and documentary. One among the foremost applications of VANET embody providing safety connected data to avoid collisions, reducing compile of vehicles when associate accident and providing warnings associated with state of roads and intersections. Mounted with the security connected data are the liability connected messages, which might confirm that vehicles are present at the location of the accident and later facilitate in fixing responsibility for the accident.

A. Intelligent transportation applications Intelligent transport system(ITS) that embody a range of applications like on global positioning system, traffic observation, analysis of traffic jam, management of traffic system, and diversion of routes which support the traffic scenario. As an example, existing roadside unit observing traffic on the roads and send all the information to a central authority that analyze them to control traffic flow so that the best traffic signal schedules will be designed. This type of associate "feedback" loop will be reduced to a great extent by VANETs wherever conveyance nodes exchange various road scenarios among themselves. In the case of an accident on the road, the nearby vehicles will share this data to roadside sensors that then sends warning messages to the oncoming vehicles or communicate with emergency response unit. To establish the blind crossing and updating the routing table entries to forestall collisions, and supply data question facilities of various nearby places of interest on a given route by communicating with roadside units, as an example, coming fuel stations or hotels, for all these services VANETs may be used. These varieties of services can be served by VANETs by the using some geocast or broadcast routing schemes to communicate.

B. Comfort applications Those applications which permit the clients to share information either with alternative clients in vehicles or with others having anywhere on the web to improve comfort of clients are known as comfort applications. For instance, VANETs allows vehicular nodes to connect with web to so that the back seat passengers will play games or transfer music. Usually, some dynamic or fastened allotted networks to internet gateways are summed up with the networks, so that it will send the data packets to the VANETs and therefore the web. These kind applications are implemented by using unicast routing protocols because this is the primary communication technique. However, different types of communication techniques may also be added to support V2V communications in VANETs. For instance, addition of the new vehicular networks will modify the range and enhance the property in the rural areas.

C. Collision Avoidance Vehicles to vehicles and vehicles to roadside unit communications will save several lives and forestall injuries. According to this application, if a vehicle reduces its speed considerably once identifying an accident then vehicle broadcast its location to its neighbor vehicles. And different receivers can try to transfer the message to the vehicles further behind them and therefore the vehicle in question can emit some alarm to its vehicles and different vehicles behind. During this process, a lot of vehicles way behind can get an alarm signal before they see the accident and may take any better decision.

D. Cooperative Driving The drivers play a major role during this application. Like turn conflict warning, violation warning, curve warning, lane merging warning etc. These services might nobly lower the life-endangering accidents. In fact, several of the accidents come back from the dearth of cooperation between drivers. Given a lot of information concerning the doable conflicts, we will stop several accidents.

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E. Traffic improvement
In this application the vehicles may function as knowledge collectors and forward the traffic fettle information for VANETs. During this application, vehicles may discover if the amount of neighbouring vehicles is too large and or the speed of vehicles is simply too slow, then transfer this data to vehicles approaching that location. The knowledge is transferred by vehicles travelling in different direction so it should be propagated quicker to the vehicles toward the congestion location. The vehicles approaching the congestion location can have enough time to settle on different routes.
F. Payment Services This application is incredibly appropriate for toll assortment while not even decelerating the vehicle or waiting in line.
G. Location-based Services Finding the nearest fuel station, motels, cafes etc is done effectively by exploitation of location based service. GPS system is used to elaborate these kinds of services in VANET. The various applications of VANETs are [3] to assist the driver, data dissemination, parking problems, emergency vehicle warning, maintenance of minimum security distance, internet connectivity, peer to peer application, congestion on the road, information about intersections, and many more.
H. The most well known applications include, "*Advance Driver Assistance Systems (ADASE2)*, *Crash Avoidance Matrices Partnership (CAMP)*, *CARTALK2000* and *Fleet Net"* that were developed under collaboration of various governments and major car manufacturers [9].

CONCLUSION
In this paper we comparatively study the performance of routing protocol By learning various routing protocols in VANET supported numerous traffic situations, we have analyzed that more analysis is needed to verify the numerous characteristics of a routing protocols. The last table shows the comparative analysis of all the above stated routing protocols. The domain of Vehicular Ad Hoc Network (VANET) and its related analysis are still in progression phases. The restricted practical deployable choices beneath completely different projects are strictly simulation based before their actual implementations.

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