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SURVEY OF UNICAST ROUTING PROTOCOLS OF VEHICULAR AD HOC NETWORKS

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Abstract: The main goal for securing the vehicular ad hoc network is to provide the safety of messages .In vehicular ad hoc network in which communication will help to improve traffic safety and emergency messages for improving efficiency by exchanging information among among vehicles .In this paper we propose a centralized scheduling technique by controlling congestion for safety messages. In this paper we propose a new equivalent parameter to explain the effect of vehicular movement on the connectivity of highway segments in VANET.
Keyword—Medium Access Control, Directional Antennas, Wireless Ad hoc Networks.

I. INTRODUCTION

Vehicular ad hoc network is an important emerging application of mobile ad hoc network and a new type of network which is expected to supportable huge spectrum of mobile distributed applications that operated in vehicles. VANET is a part of mobile ad hoc network, means every node move freely within network coverage ,each node communicate with other nodes. The security of VANET has mostly directed the attention of today's research efforts while have comprehensive solution to protects the network from adverse attack and collision occurrence. This paper summarise about the various routing protocols of VANET.

This paper is organized as follows. First, we provide a brief introduction to VANET and their classification in Section 2. We then introduce the MAC issues caused by directional antennas in Section 3. Section 4 gives the classification of directional MAC protocols and describes them. We compare the protocols in Section 5. Section 6 conclusion.

II. VEHICULAR AD-HOC NETWORKS

Definition and components Vehicular Ad Hoc Networks are considered as an extension of Mobile Ad Hoc Networks (MANETs); in a VANET each vehicle is a node of the wireless network, equipped with an On-Board Unit (OBU) The function of the OBU is to exchange information with other vehicles or access points in the road, called Road Side Units (RSU).. The RSU distributes this data, along with data from road sensors, weather centers, traffic control centers, etc. to the vehicles and also provides commercial services such as parking space booking, Internet access and gas payment. The network makes extensive use of wireless communications to achieve its goals but although wireless communications reached a level of maturity, a lot more is required to implement such a complex system. VANET makes each of the participating vehicles to a wireless node or router, allowing cars approximately 100 to 300 meters of each other to connect and, in turn, create a network with a wide range. Each and every vehicle in the network is expected to send message about its speed, location and direction for every 300 msec. When the cars go out of its network, other vehicles can join in, connecting vehicles to one another so that a mobile Internet is created. It is believed that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purposes. Ad hoc networks have been studied for some time but VANET will form the biggest ad hoc network ever implemented, therefore issues of stability, reliability and scalability are of concern. The general architecture of VANET communication along with Road Side Unit (RSU) is show in Fig. 1.1

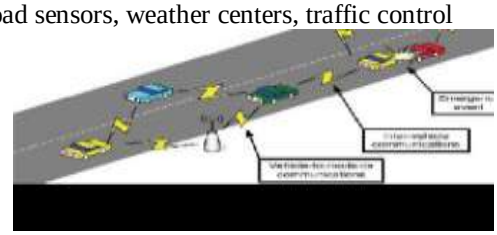

Fig 1.1vehicular ad hoc network

A. Characteristics of VANET

VANET has some unique characterstics which make it different from MANET as well as challenging for VANET applications.

Variant topology: - Due to high speed and continuous movement of vehicles the network topology is highly dynamic. The topology of VANET changes due to movement of vehicles at high speed.

Frequently disconnected network: The dynamic network topology causes frequent node disconnections; the link between the vehicles can be easily lost causing packet loss intransmissions. this disconnection occur mostly in sparse network.

Unlimited battery power and storage: The nodes have no restriction of power consumption, since the vehicles battery provides sufficient amount for all the operations. It is helpful for the effective communication.

Mobility Modelling: The mobility pattern of vehicles depends on traffic environment, road structure, speed of vehicles, driver's driving behavior and so on.

III. VANET UNICAST ROUTING PROTOCOLS

The characteristic of highly dynamic topology makes the design of efficient routing protocols of VANET more challenging. The routing protocols of VANET can be

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classified in to two main categories such as topology based routing protocols and position based routing protocols. The classification of routing protocols is shown in figure

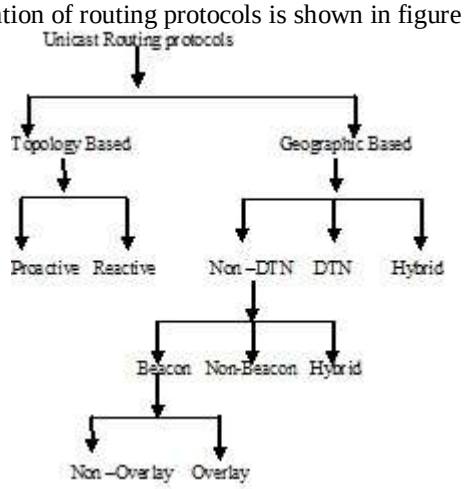

Fig. 2.unicast routing protocols

The routing protocols of VANET can be classified in to two categories :Topology Based routing and Geographic Based routing.

Topology-based routing and Geographic routing. The first one is considered a the traditional way of routing packets in MANETs. The second one is more specific to the VANET nature. We will now go through both of them.

3.1Topology-based routing protocols:- The main characteristic of the Topology-based routing protocols is that they only use the links information. It means that we don't really care where is the node, but we just base the routing tables on which nodes are connected together. This is a very efficient method for MANETs, but let's see how it performs for VANETs.We can separate them in proactive protocols and reactive protocols.

3.1.1) Proactive protocol: -In the proactive protocols, the nodes are periodically sending route discovery packets in order to know the structure of the actual network.

3.1.2) Reactive protocol:- On the other hand, the reactive protocols are working "on demand". It is only when a node needs to transfer a packet that it will send the route discovery packet.

In the proactive routing, every node has a routing table that it updates on a periodic manner. It means at every moment each node knows the next hop to all the destinations. The strength of these protocols is that they provide low-latency for real-time applications. When node S (Source) needs to send a packet to node D (Destination), it just have to check in the table and send it. This is why it is very efficient. But on the flip side, it means that the network is periodically flooded with route discovery packets. Another issue with this kind of routing is that there are some paths that are almost never used but we still have to maintain the routes. It implies that we generate a lot of unnecessary traffic and therefore we lose a lot of efficiency, especially with the high mobility environment of vehicular networks

Reactive routing presents a lot of interesting features. In opposition to proactive routing, the discovery mechanism is triggered only when a node wants to communicate and the route is maintained only during the transmission of packets. This permits to reduce flooding of the network and also avoid the unused path problem. But as it is always a tradeoff, what we gain in network traffic, we lose in time of transmission. Let's get back to our example where node S wants to send packet to node D. This time node S has to start with the discovery phase where he will find a route from S to D. When it finds the route, it then can send the packet. So the time to transmit information is longer. This mechanism suits better the nature of VANETs because we are in a highly mobile environment the route are changing very fast. So it is better to find a route at the time of transmitting, because we are sure that this route is still up.

The most known reactive protocols are Ad hoc on demand Distance Vector (AODV) and Dynamic Source Routing (DSR).Topology-based routing is definitely not the best solution for VANETs. These protocols were not designed to cope with nodes that are moving so fast.Lochert et al [8] performed some evaluation studies on these protocols and the results are that they all have the same problem: performance degrades as the network density increases. The main issue is the route discovery mechanism. Because it is based only on links information, the routes are always changing and the nodes have to perform several route discovery phases to succeed in transmitting packets to another node.

3.2) Geographic routing protocols: The position-based routing algorithms forwarding mechanism is based on the location of the destination node. This means that all nodes are aware of their proper location. This is why geographic routing requires a GPS (Geographic Positioning System). Every node is sending a beacon to figure out which other nodes are in the range of communication. They become the one-hop neighbor nodes. In order to prevent collision, the beacons are sent with a random Packet Delay Variation (PDV) to avoid collision of the beacon packets. The main strength of this category of protocols is that we don't need to establish a route to forward a packet, this is why it is best suited to VANETs. Let's revisit the example of node S wanting to transmit to node D. Node Swill forward his packet to the one-hop neighbor node that is the closest of node D and so on until reaching it.

Geographic routing protocols contain three (3) main categories: None Delay Tolerant Network (None-DTN), Delay Tolerant Network (DTN) and Hybrid.

3.2.1)Non-Delay Tolerant Network:-The None-DTN are designed for highly dense network because if there is no route between two nodes (disconnectivity) the packet is lost.DTN permits to keep these packets in the node until they can deliver the packet to a closest node. This is why there are more designed for sparse network. Hybrid systems combine the two modes. They are designed to cope with partially connected network. Because we are in urban environment, the None-DTN category is the best choice.

The first three(3) subdivision of None-DTN are Beacon, None-Beacon and Hybrid. We will only focus on the Beacon category because it contains the most diversified and mature

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protocols. Within this category we can classify the protocols in two (2)classes: Non-Overlay and Overlay routing protocols.

None Delay Tolerant Network None-DTN principal mechanism is to forward the packets to the next hop closest to the destination node. This greedy approach has a flaw, it can happen that no other node is closer to the destination than the node itself but it cannot reach the destination. We call this particular node the local maximum, because that's the furthest local node that the packet can travel to. If all the protocols in this category are based on this approach, each of them handles the local maximum issue in its proper way.
2.1.1)Non-Overlay Routing:-With the None-Overlay routing algorithms, every node has the same importance. However, with the Overlay routing algorithms, some nodes are more important for the routing protocol. They are called the overlaid nodes. It is very similar to the concept of peers and super peers in a Peer-to-Peer network. The overlaid nodes make the biggest part of the processing job. In the context of a vehicular network, we can easily see that the most important decisions are taken at the crossroads. Hence, the nodes that are located on this junctions,are the chosen ones. The routing along the roads is easier because it is always in the same direction.

A.) Chosen protocols: DRG, IVG, GPSR+AGF and CAR For the Geocast protocols, we chose to simulate the DRG and IVG protocols. The other options are variations of these protocols, so it will be easy to adapt our simulation module in order to extend it to these versions.For the Unicast protocols, we decided to choose two different protocols in the Geographic, None-DTN, Beacon category.
The reasons are the ones put in bold in the section IV-D.In the None-Overlay routing category, we decided to choose GPSR+AGF. Greedy Perimeter Stateless Routing (GPRS) is usually used as a reference protocol when it comes to analyze the performance of another routing algorithm. We decided to implement a variation of this protocol: GPSR+ Advance Greedy Forwarding (AGF).
On the other hand, for the Overlay routing category, we chose the Connectivity-Aware Routing(CAR) protocol. It basically adapts the variation of the famous topology-based routing protocol (AODV+PGB) in order to consider the geographic location of the nodes.

B.) CAR is an overlay protocol based on the AODV path discovery and the Preferred Group Broadcast (PGB) to find routes. PGB was designed to provide route stability and reduce broadcast overhead. Each node that receive the packet determines if it is in the preferred group and which node in the group will broadcast (since only one node in the group will forward the packets). But they added the AGF mechanism to cope with the VANETs challenging nature. The clever part of this protocol is that nodes are not storing the whole path like in AODV but only the anchor points. Anchor points are nodes that are in a junction. The node detect itself if he is an anchor point, by checking if its velocity vector is not parallel to the velocity vector of the previous node. so another points are the overlaid nodes, and routing between them is done through AGF. CAR also provides a additional routing mechanism. It selects some nodes to become guarding nodes. The guarding nodes have three (3) different functions: filter packets, redirect packets and add routing information to packets. We will implement and compare these four (4) routing protocols for our applications. In the Veins framework, there is no implementation of the network layer. So our task is to create the four (4) modules simulating the routing behaviors.

IV. CONCLUSION

The main goal of this paper is to identify different issues in ad hoc routing protocols and to to evaluate these routing protocols against each other in VANET .An efficient routing protocol enables effective and fast delivery of packets when vehicles communicate among each other. In this paper survey on routing protocols ranging to recently proposed protocols for VANET has been examined. It is determined that different routing protocols suffers in highly mobile nature. The exciting field of routing protocols is a key component of the design of the network layer, this is why we have to make a pre-selection before running the trials within the simulation results. This paper determine about various issues of routing protocols.

REFERENCES

[1] F. Martinez, C. Toh, J. Cano, C. Calafate, and P. Manzoni, CA, " survey and comparative study of simulators for vehicular ad hoc networks (VANETs)," Wireless Communications and Mobile Computing, 2009.
[2] G. Karagiannis, O. Altintas, E. Ekici, G. Heijenk, B. Jarupan, K. Lin, and T. Weil, "Vehicular networking: A survey and tutorial on requirements, architectures, challenges, standards and solutions," Communications Surveys & Tutorials, IEEE, 2011
[3] Roger Michoud, Ana Mar´ıa Orozco, Gonzalo Llano"Mobile ad hoc routing protocols survey for design of VANET application," Swiss Federal Institute of TechnologyLausanne EPFL, Switzerland,2006
[4] Wai Chen, Ratul K. Guha, Taek Jin Kwon, John Lee and Irene Y. Hsu, "A Survey and Challenges in Routing and Data Dissemination in Vehicular Ad-hoc Networks," proceeding of the 2008 IEEE international conference on vehicular electronics and safety Columbus ,22-24,2008.
[5] Bijan Paul,Md Ibrahim,Md Abu Naser Bikas, "VANET Routing protocols:Pros and Cons," International Journal of Computer Applications(0975-8887)April 2011.
[6] C. Maihofer, ".A survey of geocasting routing protocols,." IEEE Communications Surveys and Tutorials, 2004.
[7] C. Lochert, ".A routing strategy for vehicular ad

 Copyright 2015.All rights reserved.

hoc network in the city environments,". Proc. of IEEE Intelligent Vehicles Symposium, 2003.
[8] Komal Sharma, ".A Comphrehensive survey on various routing protocols of VANET ,". Proc of IEEE Vehicle symposium.2003.
[9] Y.-B. Ko and N.H. Vaidya, "Location-aided routing (LAR) in mobile ad hoc networks," Wireless Networks, vol. 6, no. 4, pp. 307–321, 2000.
[10] He Tong Zou,"vehicle to vehicle safety messaging in DSRC",in proc ACM VANET,oct2004,pp19-28
[11] Giuseppe Alteniese ,"space division multiple acess for robust ad hoc communication network" in proc IEEE ITSC aug 2001,pp.962-967.
[12] V. Dumitrescu and J. Guo, "Context assisted routing protocols for inter-vehicle wireless communication," in Proceedings of the IEEE Intelligent Vehicles Symposium, pp. 594–600, 2005.
[13] Fan Li and Yu Wang," Rouing in vehicular ad hoc network: A survey," University of North Carolina at Charlotte, IEEE vehicular technology magazine june 2007 .
[14] A. Bachir and A. Benslimane, "A multicast protocol in ad hoc networks inter-vehicle geocast," in Proceedings of IEEE Semiannual Vehicular Technology Conference, Vol. 4, 2003, pp. 2456-2460.

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