SURVEY OF TOPOLOGY BASED REACTIVE ROUTING PROTOCOLS IN VANET

Atul B.Kathole , Yogadhar Pande

ABSTRACT-- Vehicular ad-hoc networks (VANETs) offer a vast number of applications without any support from fixed infrastructure. Vehicular Ad Hoc Networks (VANET) is a subclass of Mobile ad hoc networks which provides a distinguished approach for Intelligent Transport System (ITS). The survey of routing protocols in VANET is important and necessary for smart ITS. These applications forward messages in a multi-hop fashion. Designing an efficient routing protocol for all VANET applications is very hard. Vehicular networking has various prospects and opportunity to facilitate various functions connected with traffic safety, traffic Effectiveness system infotainment and on their improvement.Hence a survey on routing protocols based on various parameters of VANET is a necessary issue in vehicle-to- vehicle (V2V) and infrastructure-to- vehicle (IVC) communication.In this paper we have studied about VANET and also have given a brief overview of different topology based reactive routing protocols in VANET along with major classifications.

Keywords*:* Vehicular ad-hoc networks (VANETs), Intelligent Transport System (ITS),Reactive Routing Protocol*.*

1. INTRODUCTION

VANET is an emerging technology to achieve intelligent inter-vehicle communications, seamless internet connectivity resulting in improved road safety, essential alerts and accessing comforts and entertainments. Recently, Vehicular communication systems have attracted much attention, fueled largely by the growing interest in Intelligent Transportation Systems (ITS). These systems are aimed at addressing critical issues like passenger safety and traffic congestion, by integrating information and communication technologies into transportation infrastructure and vehicles. They are built on top of self organizing networks, known as a Vehicular Ad hoc Networks (VANET), composed of mobile vehicles connected by wireless links. VANETs support two types of communication: vehicle - to- vehicle (V2V) and vehicle-to-infrastructure (V2I). While V2V deals with communication among vehicles themselves, V2I is concerned about transmitting information between a vehicle and the fixed infrastructure that is installed along the road. Such infrastructure may include gateways or base stations, and they provide services such as Internet access in VANETs. Vehicular networks share a number of similarities with MANETs in terms of self-organization, self-management, and low bandwidth. However unlike in MANETs, the network topology in vehicular networks is highly dynamic due to fast movement of vehicles and the topology is often constrained by the road structure. Furthermore, vehicles are likely to encounter a lot of obstacles such as traffic lights, buildings, or trees, resulting in poor channel quality and connectivity.

A. Specific Characteristics of VANET:

High Dynamic topology: The speed and choice of path defines the dynamic topology of VANET. If we assume two vehicles moving away from each

other with a speed of 60 mph (25m/sec) and if the transmission range is about 250m, then the link between these two vehicles will lost for only 5 seconds (250m/ 50ms-1). This defines its highly dynamic topology.

Frequent disconnected Network: The above feature necessitates that in about every 5 seconds or so, the nodes needed another link with nearby vehicle to maintain seamless connectivity. But in case of such failure, particularly in case of low vehicle density zone, frequent disruption of network connectivity will occur. Such problems are at times addressed by road-side deployment of relay nodes.

Mobility Modeling and Prediction: The above features for connectivity therefore needed the knowledge of node positions and their movements which as such is very difficult to predict keeping in view the nature and pattern of movement of each vehicle. Nonetheless, a mobility model and node prediction based on study of predefined roadways model and vehicle speed is of paramount importance for effective network design.

Communication Environment: The mobility model highly varies from highways to that of city environment. The node prediction design and routing algorithm also therefore need to adapt for these changes. Highway mobility model, which is essentially a one-dimensional model, is rather simple and easy to predict. But for city mobility model, street structure, variable node density, presence of buildings and trees that behave as obstacles to even small distance communication make the model application that very complex and difficult.

Hard Delay Constraints: The safety aspect (such as accidents, brake event) of VANET application warrants on time delivery of message to relevant nodes. It simply cannot compromise with any hard data delay in this regard. 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 location and their movement nature that are used for effective communication link and routing purposes.

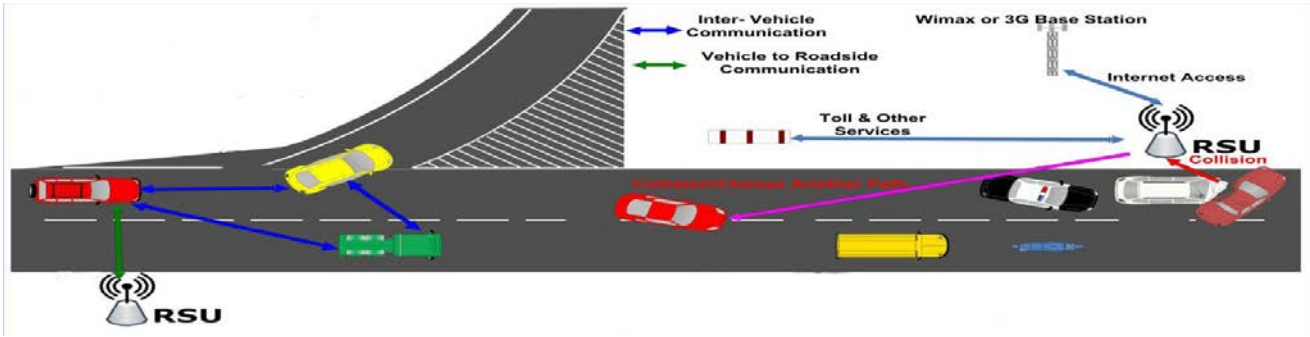


Fig 1: Vehicular adhoc networks and some possible applications

2. OVERVIEW OF ROUTING PROTOCOLS

Routing is the act of moving information across an internetwork from a source to a destination. Along the way, at least one intermediate node typically is encountered. Routing occurs at

Layer 3 (network layer) of the OSI model. In VANET, the routing protocols are classified into five categories: Topology based, Position based, Cluster based, Geocast, Broadcast. In this paper we are going to discuss about Topology Based Reactive Protocol.

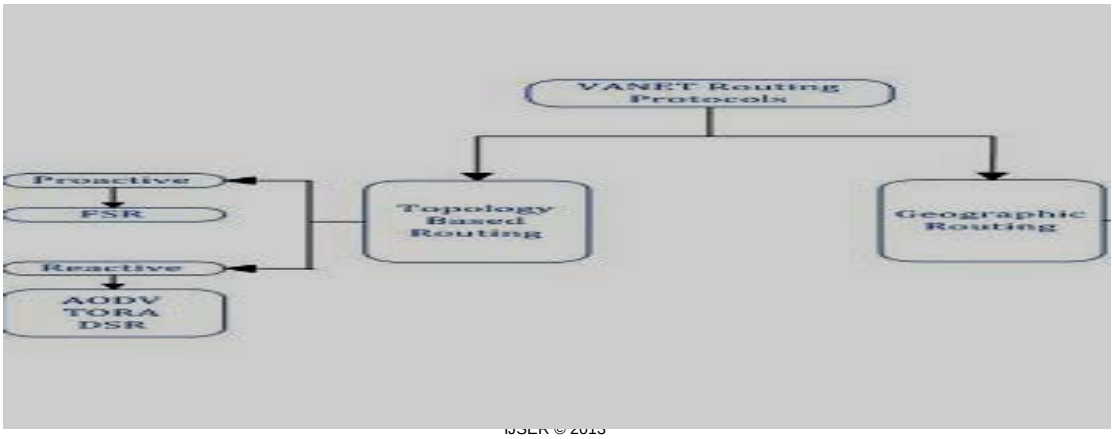
1. Topology Based Routing Protocols

These routing protocols use link information that exit in the network to perform packet forwarding. They discover the route and maintain it in a table before the sender starts transmitting data. They are further divided into reactive, proactive and hybrid protocols.

1.1 Proactive routing protocols

The proactive routing means that the routing information, like next forwarding hop is maintained in
the background irrespective of communication

requests. The advantage of proactive routing protocol is that there is no route discovery since the destination route is stored in the background, but the disadvantage of this protocol is that it provides low latency for real time applications



n. A table is constructed and maintained within a node. So that, each entry in the table indicates the next hop node towards a certain destination. It also leads to the maintenance of unused data paths, which causes the reduction in the available bandwidth.

1.2 Reactive routing protocols

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 routing consists of route discovery phase

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VANET", Journal of Information Engineering and Applications, ISSN 2224-5758, Vol 1, No.4, 2011

in which the query packets are flooded into the network for the path search and this phase completes when route is found. These protocols are called as on-demand routing protocols as they periodically update the routing table, when some data is there to send. The
various types of reactive routing protocols are AODV, DSR and TORA.

1.2.1 Ad Hoc on Demand Distance Vector routing (AODV)

AODV is a source initiated routing protocol and uses HELLO messages to identify its neighbors. Source node broadcasts a route request to its neighbors which fill forward to the destination. Then the destination unicast a route reply packet to the sender. Every node maintains

broadcast-id which increments for new RREQ. When a RREQ arrives at a node, it checks the broadcast id if it is less than or equal to previous message then it will discard the packet.

1.2.2 Temporally-Ordered Routing Algorithm (TORA)

TORA belongs to the family of link reversal routing in which directed a cyclic graph is built which directs the flow of packets and ensures its reachability to all nodes. A node would construct the directed graph by broadcasting query packets. On receiving a query packet, if node has a downward link to destination it will broadcast a reply packet; otherwise it simply drops the packet. A node on receiving a reply packet will update its height only if the height of replied packet is minimum of other reply packets. TORA Algorithm has the advantage that it gives a route to all the nodes in the network, but the maintenance of all these routes is difficult in VANET.

1.2.3 Dynamic Source Routing (DSR)

This protocol consists of two operations "Route Discovery" and "Route Maintenance" that makes it self-configuring and self-organizing. Another important property of DSR routing protocol is network type flexibility. It uses source routing instead of depending on intermediate node routing table. So routing overhead is always dependent on the path length. The limitation of this protocol is that the route maintenance process does not locally repair a broken link. The performance of the protocol briskly decreases with increasing mobility. The connection setup delay is higher than in table-driven protocols, this routing overhead is directly proportional to the path length

1.3 Hybrid routing protocols

Hybrid routing protocols is combination of reactive routing protocols and proactive routing protocols which reduce the control overhead of proactive routing protocols and decrease the initial Route discovery delay in reactive routing protocols. E.g. Zone Routing protocol (ZRP), Hybrid Routing Protocol (HARP) etc.

3. COMPARISON

Protocols	Prior Forwarding Method	Digital Map Requirement	Virtual Infrastructure Requirement	Realistic Traffic Flow	Recovery Strategy	Topology Dissemination
Reactive routing (AODV,DSR,TORA,DYMO)	Wireless multi hop Forwarding	No	No	Yes	Carry & Forward	On-Demand

Table 1: Comparison of topology based Reactive routing protocol

4. CONCLUSION

In this paper we have studied about the introduction of Vehicular ad-hoc networks (VANET),various characteristics of VANET. We have also studied about the three types of topology based routing protocols. The major requirement in VANET is the security. VANETs are more vulnerable to security attacks as they are infrastructure less and autonomous. Main objective of this paper is to address the different VANET topology based Reactive routing protocols. In order to provide secure communication and

transmission, researcher worked specifically on the security issues in VANETs and many secure routing protocols.

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