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A REVIEW ON TOPOLOGY BASED ROUTING PROTOCOL IN VANET

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ABSTRACT:- A Vehicular Ad-hoc Network (VANET) is a subtype of Mobile Ad-hoc Network (MANET) that is used to provide communications between nearby vehicles and between vehicles and the roadside fixed infrastructure. Due to the unique characteristics of the network routing in Vehicular Ad hoc Networks is a challenging task because the network contains high mobility of nodes, dynamically changing topology and highly partitioned network. The concept of VANETs is quite simple: by incorporating the data sharing capabilities and wireless communication, the vehicles can be turned into a network providing similar services like the ones with which we are used to in our homes or officies. So, VANET is a promising approach for the intelligent transportation system (ITS). The design of routing protocols in VANETs is important and necessary issue for support the smart ITS. This paper represents the topology based routing protocol in VANET. These routing protocols use link's information that exists in the network to perform the packet forwarding.

KeyWords:- VANET,OLSR,STAR,AODV,DSDV,DSR.

I. INTRODUCTION

Vehicular Ad hoc Networks (VANETs) are special kind of Mobile Ad Hoc Networks (MANETs) that are formed between moving vehicles on road an as-needed basis. Due to emerging technology, VANET enables a wide range of applications, including intelligent transportation, road safety, passenger convenience, information and entertainment. They help to create safer roads by scrattering information regarding the traffic scenario and road conditions among the participating vehicles in a timely manner. VANET is not only provide the safety applications, but also disseminate valuable, real-time information to the users such as transit systems, mobile e-commerce, weather information, internet access and other multimedia applications. VANETs also enable automated highway applications, where the vehicles are able

to cruise without the help of their drivers, even though such applications have not yet become realistic.

VANET is not restricted up to Vehicle-to-Vehicle communication, it also takes benefits of infrastructure which are roadside that can participate in communication between vehicles, but our main focus is on Vehicle-to-Vehicle communication. There are various challenges for VANET such as high speed of vehicle, dynamic route finding, roadside objects, building, reflecting objects, other obstacles in path of radio communication, different direction of vehicles, concern about privacy, authorization of vehicle, security of data and sharing of multimedia services. High speed of vehicle requires regular update of routing table whereas dynamic route finding would result into high time loss before static communication. In VANET there are Various user group which are mostly used in traffic management agencies, getting popular, highway safety agencies, law enforcement agencies and emergency services.
There are six types of routing protocols in VANETs are topology based, position based, geocast based, cluster based, broadcast based and infrastructure based. Here we discuss only topology based routing based protocols.

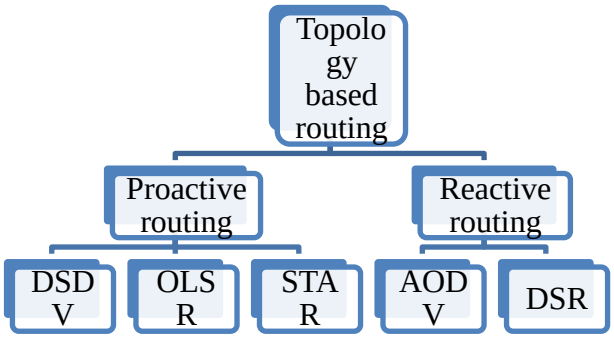

Fig:-routing protocols

II. Proactive routing protocols:- The first is a **proactive routing protocol**, which relies on the periodic broadcast of data network topology. Popular proactive protocol are OLSR (Optimized Link State Routing),DSDV(Destination-sequenced Distance-vector Routing) and STAR(Source-tree adaptive routing). The proactive routing means that the routing information is maintained in the background irrespective of communication requests, like next forwarding hop. 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 in real

time application it provides low latency. The various types of proactive routing protocols are: OLSR, DSDV,STAR are explained below:-.

(a) Destination-sequenced Distance-vector Routing(DSDV):-

DSDV is based on the Bellman Ford algorithm which is a table-driven routing scheme for ad hoc mobile networks. It was developed by C. Perkins and P. Bhagwat in 1994. It eliminates route looping, reduces control message overhead and increases convergence speed. In DSDV, each node maintains a next-hop table, which it exchanges with its neighbors. There are two types of next-hop table exchanges: periodic full-table broadcast and event-driven incremental updating. With the help of node mobility we can determine the relative frequency of the full-table broadcast and the incremental updating. The source node appends a sequence number in each data packet sent during a next-hop table broadcast or incremental updating. This sequence number is propagated by all nodes receiving the corresponding distance-vector updates, and is stored in the next-hop table entry of these nodes. After receiving a new next-hop table from its neighbor, a node updates its route to a destination only if the new sequence number is larger than the recorded one, or if the new sequence number is the same as the recorded one, but the new route is shorter. In order to further reduce the control message overhead, a settling time is estimated for each route. If the settling time of the route has expired and the route remains optimal than a node updates to its neighbours with a new route only.

(b) Optimized Link State Routing Protocol (OLSR)

The Optimized Link State Routing Protocol (OLSR) is developed for mobile ad hoc networks. It operates as a table driven, proactive protocol, i.e. exchanges topology information with other nodes of the network regularly. Each node selects a set of its neighbor nodes as "multipoint relays" (MPR). In OLSR, only nodes, selected as such MPRs are responsible for forwarding control traffic, intended for diffusion into the entire network. MPRs provide an efficient mechanism for flooding control traffic by reducing the number of transmissions required. Nodes, selected as MPRs, also have a special responsibility when declaring link state information in the network. Indeed, the only requirement for OLSR to provide shortest path routes to all destinations is that MPR nodes declare link-state information for their MPR selectors. Additional available link-state information may be utilized, e.g., for redundancy. Nodes which have been selected as multipoint relays by some neighbor node(s) announce this information periodically in their control messages. Thereby a node announces to the network, that it has reachability to the nodes which have selected it as an MPR. In route calculation, the MPRs are used to form the route from a given node to any destination in the network. Furthermore, the protocol uses the MPRs to facilitate efficient flooding of control messages in the network.

(c) Source-Tree Adaptive Routing (STAR)

Source-Tree Adaptive Routing (STAR) is another link State protocol. By eliminating periodic updates it reduces overhead on the network. This protocol can be suitable for large scale networks but it needs large memory and processing because it has to maintain large trees for whole network. The Each node maintains a source tree. Each node builds a partial topology

graph using aggregates of neighbor information learnt using an underlying neighbor discovery protocol and source trees reported by the neighbors.

III. Reactive/Ad hoc Based Routing:-

Reactive routing opens the route only when it is necessary for a node to communicate with each other. It maintains only the routes that are currently in usage. As a result it reduces the burden in the network. Reactive routing consists of route discovery phase in which the query packets are flooded into the network for the path search and this phase completes when route is found. The various types of reactive routing protocols are AODV and DSR.

(a) Ad Hoc On Demand Distance Vector (AODV)

In AODV, whenever a source node has to communicate with a destination node such that it has no routing information in its table, it first initiates route discovery process. The node broadcasts a route request (RREQ) packet to all its neighbors. The route request packets contains source address, source sequence number, broadcast ID, destination address, destination sequence number and hop count. The source address and broadcast ID uniquely identifies a RREQ. The source sequence number is for maintaining the freshness of information about the reverse route to the source. The destination sequence number specifies how fresh a route to the destination must be before it can be accepted by the source. If a neighbor knows the route to the destination, it replies with a route reply control message RREP that propagates through the reserve path. Otherwise, the neighbor will re-broadcast the RREQ until an active route is found or the maximum number of hops is reached.

AODV routing protocol is proposed for mobile ad hoc network. AODV offers low network overhead by reducing messages flooding in the network; that when compared to proactive routing protocols, besides reducing the requirement of memory size; by minimizing the routing tables which keep only entries for recent active routes, also keeps next hop for a route rather than the whole route. It also provides dynamically updates for adapting the route conditions and eliminates looping in routes; by using destination sequence numbers. So AODV is flexible to highly dynamic network topology and large-scale network. However, it causes large delays in a route discovery, also route failure may require a new route discovery which produces additional delays that decrease the data transmission rate and increase the network overhead.

(b) Dynamic Source Routing (DSR) 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 packet (source routing), and uses it to respond to the source. The source can establish a path to the destination as a result. 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.

The Dynamic Source Routing (DSR) protocol presented in which utilize source routing & maintain active routes. It has two phases route discovery & route maintenance.

Pros

- Beacon less.
- To obtain route between nodes, it has small overload on the network. It uses caching which reduce load on the network for future route discovery.
- In DSR no periodical update is required.

Cons

- If there are too many nodes in the network the route information within the header will lead to byte overhead.
- Unnecessary flooding burden the network.
- It performs worse in high mobility pattern.
- Unable to repair broken links locally

IV. Conclusion

In this paper we are presents survey on different topology based reactive routing protocols and discuss about Vehicular ad hoc network is a special form of MANET which is a vehicle to vehicle and vehicle to roadside wireless communication network and we have investigated the merits and demerits of different reactive routing protocols for inter-vehicle communication in VANET. By studying different on demand routing protocol in VANET we have seen that further performance evaluation is required to verify performance of a routing protocol with other routing protocols based on various traffic scenarios. The most common MANET routing protocol that has been applied to VANET is the Ad hoc On-demand Distance Vector (AODV).

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