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SYSTEMATIC ANALYSIS ON VEHICULAR AD-HOC ROUTING PROTOCOL

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Abstract: VANET is a new powerful technology focused mainly to ensure vehicles to move safely in high speed in midst of relative large number of closely spaced vehicles promising traffic management. Vehicles can be connected to the network using the existing infrastructure with IEEE standards such as IEEE 802.11P. VANET mainly concentrates on the vehicular density which varies from time to time. Vehicles in VANET behave like transceivers (receiving and sending simultaneously in midst of continuous highly changing dynamic network). This paper explores the challenges of the routing techniques in literature with an aim of performing improvement in comparison of routing protocol for VANET.

Keywords: Design flow; SoC Platform; Simulation; Prototyping; Communication Architecture; ASIPs

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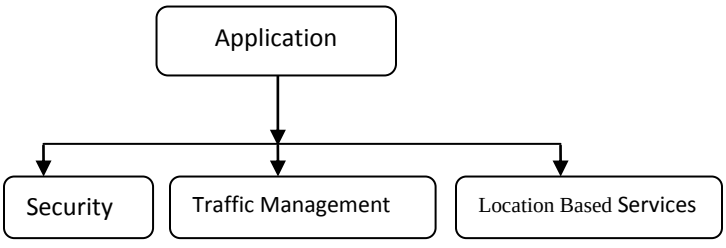
INTRODUCTION

A wireless network is a technology that helps user to access information and services electronically, over a wide geographic area. Wireless networks can be classified in two types: - infrastructure network and infrastructure less (ad hoc) networks. Infrastructure network consists of a network with fixed and wired gateways. Infrastructure network consists of a network with fixed and wired gateways. Infrastructure network consist of network without any wires. A mobile host within its communication radius communicates with each other via building a bridge in the network. When it goes out of the base station geographically, it transfers the ongoing call or data session from one channel which is a part of core network to another channel. Whereas in case of satellite communications it transfers the satellite control responsibility from on earth station to another without loss or interruption of services

MANETS are mobile, they use wireless connections to connect to various networks which can change locations and configure itself on the fly. Vehicular AdHoc Networks (VANETs) have emerged as a new powerful technology with an aim of providing safety for the persons sitting in the vehicles. VANET, a subclass of mobile Ad hoc network gives a better approach for future intelligent transportation system (ITS). These network complexities rely for their functionality on the moving vehicles.

Features and applications of VANET:

Wireless Access for Vehicular Environment (WAVE) dedicated to vehicles to vehicles and vehicles to roadside communication devices along with other roadside units together for a dynamic network, VANET. These are distributed with good mobile communication network and limited patterns of restriction. The applications are classified according to their needs.

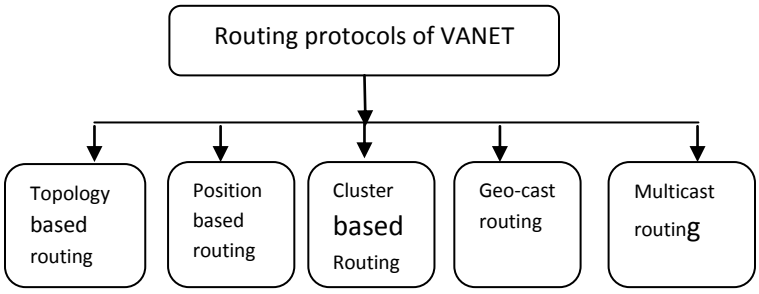


VANET ensures ubiquitous road connectivity with fast message discrimination and collision avoidance under security. Intelligent Transportation Service (ITS) responsible for vehicle to vehicle communication monitors on traffic, traffic flows and collision prevention. VANET also

provides additional features of internet connectivity to moving vehicle enabling to access emails online and chatting etc.

Protocols behind VANET:

Protocols are characterized based on the specific areas.



Topology based routing

Topology based routing establishes the routes for sending information from source to destination. It is further classified into proactive and reactive. While former maintains a routing information throughout nodes irrespective of data transfer and latter ensures that each node maintains a vector of distances only on demand. This overcomes the former consumption of heavy bandwidth.

Proactive

Proactive protocol allows the network node to store all the routing information for all other nodes irrespective of its need. Every time it has to broadcast the details. Proactive protocols usually depend on shortest path algorithms to determine which route will be chosen, it generally follows store and forward with two routing strategies: Link state strategy and distance vector strategy.

Link state strategy

Source-Tree Adaptive Routing (STAR):

Each node builds a partial topology graph which has aggregate information about its neighbor along with the source hierarchy of the neighbors. This is mainly suitable for large scale networks which help in eliminating frequent updates with proposed large memory and processing the entire network.

2) Cluster head Gateway Switch Routing (CGSR)

CGSR is a clustered multihop performed on cluster head reducing the size of the vector table. This involves more time in clustering and also any changes in clustering results breakage of multiple paths.

3) Optimized link state routing protocol (OLSR)

OLSR contains a routing table information about all possible routes to network nodes. Each node in the network selects a set of neighbor nodes called as multipoint relays (MPR) which retransmits its packets. The neighbor nodes which are not in its MPR set can only read and process the packet.

Distance vector strategy:

4) Destination Sequenced Distance Vector Routing (DSDV*)*

Each DSDV node maintains two routing tables: one for forwarding packets and one for advertising incremental routing packets. It guarantees the loop free routes and controls the traffic by reducing the control message and monitoring the frequent updates. This is suitable only for small networks with multiple paths whereas not suitable for dynamic networks as it requires high bandwidth.

5) Fisheye state routing (FSR)

The node periodically updates its table with the latest information received from neighboring nodes and not the entire network. The nodes are broadcasted in different frequencies depending on the destination .In case of large networks it broadcasts with less frequency as it goes far.

B. Reactive (on demand) protocols

Reactive routing routes when a node needs to communicate with each other. Reactive routing floods the query packets are into the network for searching the path and terminates when found. Reactive routing protocols are applicable to the large size of the mobile ad hoc networks which are highly mobility and frequent topology changes. The various types of reactive routing protocols are AODV, DSR, PGB,TORA, ZRP.

1) Ad-hoc on-demand distance vector (AODV)

AODV implements two operations such as *Identification* and *maintaining the route.* On querying, the nodes record the address and then maintain it in its routing table. This identification and maintain the previous hop is called backward learning. Once the packet reaches the destination the acknowledgement packet is sent to the source via backward learning path. AODV routing protocol is proposed for mobile ad hoc network.

2) Dynamic source routing (DSR)

DSR uses source routing the intermediate nodes are indicated by the source on the routing table. In DSR, the query packet copies ID headers of the intermediate nodes that it has traversed. The destination then retrieves the entire path from the query packet, and uses it to respond to the source.

3) **Preferred Group Broadcasting** (***PGB)***

PGB helps to reduce the broadcast overhead associated with AODV's route discovery and to provide route stability especially important in VANETs where fast moving vehicles are used as wireless hosts. Based on the received signal of the broadcast, receivers can determine whether they are in the preferred group and which one in the group to broadcast.

4) Temporally Ordered Routing Algorithm (TORA)

TORA is a distributed routing protocol using multi hop routes. TORA reduce the communication overhead by adapting frequent network changes. A node would construct the directed graph by broadcasting query packets. A receiving node will update itself only when the replying packet is less than other packets in the list. 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.

4) Zone routing protocol (ZRP)

ZRP is defined as a collection of nodes which are in a zone radius. The protocol divides the network into non overlapping zones with each network having a unique id and zone id measured by GPS. Zone .This is defined as a collection of nodes which are in a zone radius.

III. POSITION-BASED ROUTING PROTOCOL

Position or geographic routing protocol is based on the positional information in routing process. They share the property of using geographic positioning information in order to select the next forwarding hops. Position based routing is broadly divided in two types: Position based greedy V2V protocols, Delay Tolerant Protocols. Position based routing consists of class of routing algorithm. This protocol helps each node is able to decide its location and the location of its neighbors through the Geographic Position System (GPS) assistance.

Delay tolerant network (DTN) protocols

DTN is a wireless network designed to perform efficiently in networks with some characteristics like frequent disconnection communication, large scale, long unavoidable delays, limited bandwidth, power constraints and high bit fault rates. In this network, all nodes help each other to forward packets (store and forward scheme). These nodes may have a limited transmission range; so packets transmission will take large delays.

GREEDY PERIMETER STATELESS ROUTING (GPSR)

GPSR, greedy routing protocol in VANETs forwards packets to other intermediate nodes continuously (greedy forward), until the packet reaches its final destination. If there is no neighboring node close to the destination due to high mobility network, it uses perimeter forwarding to decide to which node has to deliver the packet GPSR when there is a link failure in a frequent topology change (it holds old position information) which is handled by perimeter forwarding, leading to high packet loss and more latency time due to the large number of hops.

GEOGRAPHIC SOURCE ROUTING:

GPCR protocol is designed to be suitable for the high mobility environments (as in city) based on the greedy forwarding technique, this technique aims to forward the packet to a neighbor node which is closest to the location of the destination.

CLUSTER BASED ROUTING PROTOCOLS

Cluster based routing is preferred in clusters. A collective group of nodes together forms a cluster and a node which is the cluster head will broadcast the packet to cluster. Good scalability can be provided for large networks but network delays and overhead are incurred when forming clusters in highly mobile VANET. The cluster may not be very efficient because frequent changing heads.

GEO CAST ROUTING PROTOCOLS:

Geo cast routing is basically a location based multicast routing. The main objective of the protocol is to deliver the packet from source node to all other nodes within a specified geographical region (Zone of Relevance ZOR). Geocast sends packets from a source to a group of destinations using geographic addresses.

MULTICAST ROUTING PROTOCOLS:

In case of multicasting the clusters are divided for the network to clusters, each cluster has a cluster head to manage communication inside and outside the cluster. It sends one copy to multiple nodes with minimum network consumption and packet delivery delay.

EFFICIENCY OF VANET

- VANET guarantees optimal path and also reduces resource consumption with efficient network throughput and packet delivery.
- The connection established is proposed to be stable in terms of available bandwidth, transmission interference and congestion by avoiding collision.
- It ensures reliable broadcasting and multicasting transmission.

CONCLUSION:

In this paper routing protocols for VANETS are reviewed with its efficiency to handle multiple situations. The bandwidth and technique of storing through proper communication with the nodes are analyzed. The high and the low consumption of bandwidth lead to the flooding as the node density increases. Due to high mobility, dynamic formation is a time consuming process. High packet delivery ratios can be achieved by delivery long packet delays when the network is highly partitioned. Thus the use of traffic information is proved to be a great importance and demonstrated better performance especially with complex mobility patterns of vehicular environment.

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