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A SURVEY ON ROUTING PERFORMANCE IN VANET

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ABSTRACT

Vehicular Ad-Hoc Networks (VANET) emerge from the principles of Mobile Ad-Hoc Networks (MANET). VANET considers vehicles as nodes in a network and transmits messages between these vehicles. Routing in VANET is a key challenge due to the unique features of the network which includes node movement and dynamic change in the network topology. Security is a major issue in VANET because it should provide a safety environment by transmitting warning message to the neighboring vehicles about road accidents, traffic jam or any type of attacks caused to the vehicles. The behavior of routing protocols rely on a variety of internal factors and external factors includes node movement, road topology and various hurdles that block the signals respectively. This needs an extremely flexible approach to deal with dynamic situations by choosing the best routing path and forwarding strategies and by using the appropriate models.

KEYWORDS: Vehicular Ad-Hoc Networks (VANET), Mobile Ad-hoc Networks (MANET), Routing Protocols, Security.

INTRODUCTION

Vehicular Ad-Hoc Networks (VANET) are the wireless networks which are formed by vehicles that act as nodes in the networks. These vehicles communicate with each other through a wireless channel. VANET's are the sub-class of Mobile Ad-Hoc Networks(MANET's) which inherits some features which includes movement of a node in a network, time varying density of nodes, regular disconnections, partition of a network and dynamic change in the network topology [iv]. VANET is a decentralized network in which each and every node present in the network act as host and router. Security and routing are the major challenges in VANET. The differences between VANET and MANET are as shown in table 1.

Table 1: Difference between MANET and VANET

Parameters	MANET	VANET
Production Cost	Low cost	High cost
Vary in Topology	Late	Very quick
Movement	Poor	Extreme
Bandwidth	100kbps	1000kbps
Range	100meter	500meter
Lifetime of a Node	Rely on available resources	Rely on vehicles lifetime
Multihop routing	Available	Not strongly available
Pattern of node movement	Random	Normal
Reliability	Average	High
Address scheme	Based on the attributes	Based on location
Data rate	11Mbps	27Mbps
Frequency	2.4GHz	5.9GHz
Environment	No infrastructure	Both infrastructure and infrastructure-less

VANET routing protocols are classified as shown in Figure 1

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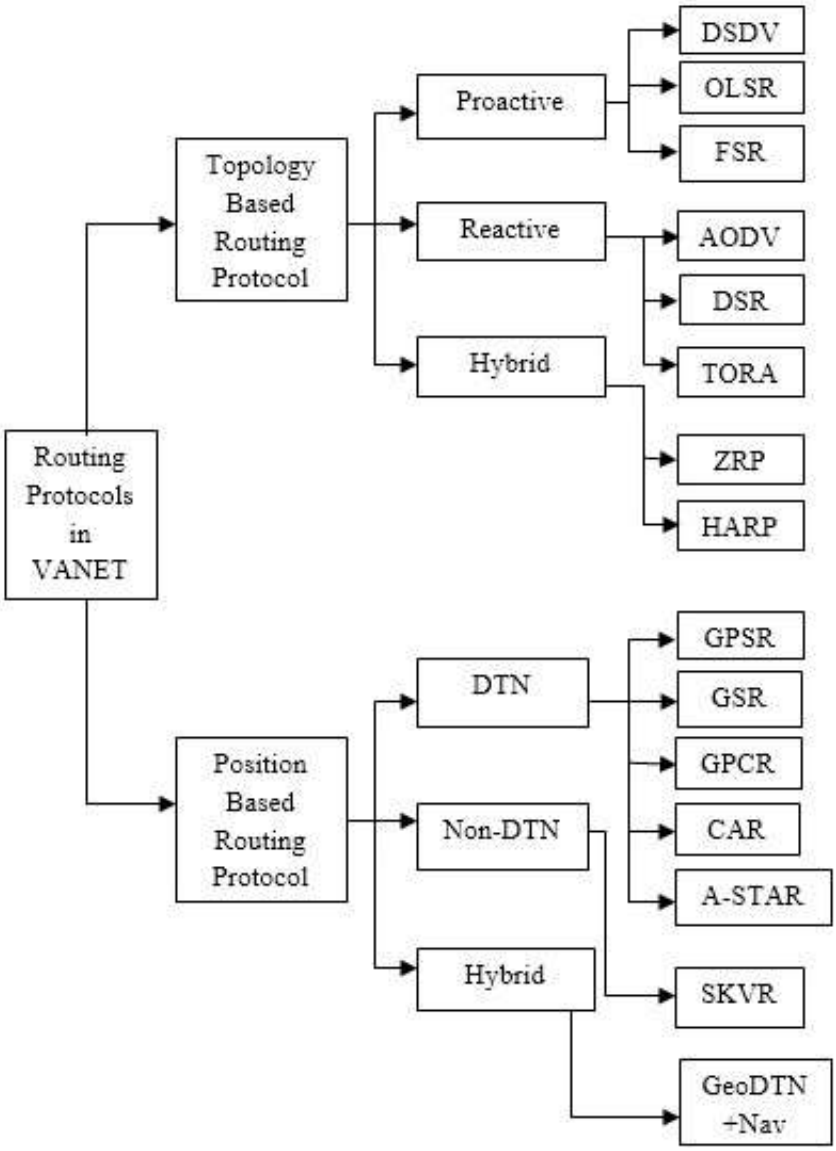

Figure 1: Classification of Routing Protocols in VANET

Topology based routing protocol

Topology based routing protocol sends the packet from the source to destination using the information of a link [viii]. In order to make the routing decisions, these routing protocols make use of the information of the communicating link and the global information of network topology. Best route in a network is identified by using IP address to identify nodes and for the route setup to forward the data.

Topology-based routing protocols can be further classified as follows

1. Proactive Routing Protocol
2. Reactive/Ad-Hoc Based Routing Protocol
3. Hybrid Routing Protocol

Proactive Routing Protocol

Proactive Routing Protocol maintains the routing information in the background regardless of communication requests. Because the destination route is saved in the background, route discovery is not possible. Each node in the network have to maintain the current routing information.

Destination-Sequenced Distance-Vector Routing (DSDV)

Destination sequenced distance vector routing protocol is one of the type of table driven protocol [i]. It regularly updates the routing table and minimizes the traffic and routing overheads. It assigns sequence number in order to avoid duplicate entries in the routing table and also every node will have the next hop table which the nodes share with its neighbors.

Optimized Link State Routing Protocol (OLSR)
It is one of the type of proactive protocol. Protocols in OLSR runs using wireless multipoint scheme and message flooding process is optimized for setting up a route or to maintain the route. Updating and maintaining the information are the main operations involved in OLSR.

Fisheye State Routing (FSR) protocol
It maintains the node topology table and updates network information to the neighboring nodes in the network. It decreases the size of the updated message.

Routing Protocol	Proactive Routing Protocol	Reactive Routing Protocol
Forwarding method	Wireless multi hop forwarding	Wireless
Digital map requirement	No	No
Virtual infrastructure requirement	No	No
Realistic traffic flow	Yes	Yes
Recovery strategy	Multihop forwarding	Carry and forward
Scenario	Urban	urban

Table 2: Comparison of topology based routing protocol

Reactive/Ad-Hoc Based Routing Protocol
Ad-Hoc On-Demand Distance Vector (AODV)
It is a reactive routing protocol that functions in a hop-by-hop pattern. It allows dynamic, self-starting, multi-hop routing between participating nodes. AODV also allows the nodes to maintain paths to destination which are not in active communication.

Dynamic Source Routing (DSR) Protocol
DSR is an on-demand routing protocol in which route discovery takes place when needed. Each node will have a cache, which the route to the node is stored instead of updating the routing table of the nodes. [i]

Temporally Ordered Routing (TORA) Protocol
It is an on-demand protocol. TORA generates a Direct Acyclic Graph (DAG) which consists of nodes between the source and the destination. Data in TORA will not be able to flow backwards.

Position Based Routing Protocol
Greedy Perimeter Stateless Routing (GPSR)
It is a position-based routing protocol. This protocol forwards packets using the greedy algorithm. In this the packets are forwarded through the neighboring nodes which has the shortest distance to the destination.

Geographic Source Routing (GSR) Protocol
It is a routing protocol which is used in VANET in which the algorithm receives a digital map through the GPS device and then it finds the nearest distance from source to destination on the digital map using Dijkstra algorithm and forwards the packets in the selected path. [iii]

Greedy Perimeter Coordinator Routing (GPCR) Protocol
It will search for the next hop node in order to construct the planarized graphs at the street intersection.

Anchor-Based Street and Traffic Aware Routing (A-STAR) Protocol
It combines the auxiliary anchor information in order to help the routing of packets in a network.

Connectivity-Aware Routing (CAR) Protocol
It finds a route from source to destination and maintains a cache of successful routes between several pairs of source and destination.

Routing Protocol	GPSR	GSR	GPCR	CAR	A-STAR	GeoDTN+Nav
Forwarding Strategy	Greedy	Greedy	Greedy	Trajectory	Greedy	Hybrid
Street Map Requirement	Yes	Yes	Yes	Yes	Yes	Yes
Simulation Scenario	Highway	City	City	Both city and highway	City	Highway
Delivery Rate Performance	Low	Low	Better	-	-	-
Real Time Communication Traffic Use	No	No	No	-	-	-
Recovery Strategy	Flooding	Flooding	Flooding	Node awareness	Flooding	Perimeter forward
Mobility Models	-	M-Grid	VANET MobSim	MTS	M-Grid	VANET MobSim
Propagation Models	Road blocking	-	Road blocking	2-ray ground	Road blocking	Road blocking

Table 3: Comparison of Position based Routing Protocol

CONCLUSION

One of the important challenges in VANET is forwarding data securely throughout the network. If forwarding the message is not secure, it might lead to malicious nodes in the network which causes traffic. After the study of multiple routing protocols in VANET, it is clear that few of the routing protocols does not provide security for data transmission.

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