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Future of Routing Protocol in VANETs

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Abstract : *VANET (Vehicular Ad-hoc Network) is a part of mobile ad hoc networks (MANETs). Currently VANETs is new challenging network environment that pursues the concept of ubiquitous computing for future. Feature of VANETs such as dynamic topology, vehicle density, roadside infrastructure, power consumption make it much more challenging networks. Addition to that routing decision for different environment make it much more challenging task. The existing routing protocols for VANET are not efficient to meet every traffic scenarios. Thus need of advancement in routing protocol is needed which can satisfy the todays challeges. Our paper make comparative analysis of current popular routing protocol and depand on their flows try to suggest improvement to match current challenges of routing problem.*

Keywords *– VANETs, Routing protocol, MANETs, Topology based routing protocol, Geographic based routing protocol*

1. INTRODUCTION

Vehicular ad hoc network is a special kind of MANET in which vehicles and roadside equipment forms roadside wireless communication network. In VANETs vehicle act as node and form network, which is if type dynamic as well as self-organizing network. Node in network can act as server or act Client

In recent years, quantity of vehicles on road has increased drastically from being lower density per area to saturation of area. This type of situation creates more challenging questions like traffic management, roadblocks, alternative routes, etc. Ever-changing vehicle speed, density of vehicle on limited area, rural/ urban area, shape of road, environment -such factor make question related to management more complicated. Hence it gives need of enchantment on routing protocols that will satisfy such question. In our paper, we try to discuss existing popular protocols with their flows and future advancement on those routing protocols in VANET's.

2. FEATURE OF VANETS

VANET has some distinguishing features, which make it different from MANET as well as challenging for designing VANET applications.

- High dynamic topology

AS VANETs consist of vehicle with different speeds, therefore it creates high dynamic topology due to variation in speed.

- Mobility modeling

Vehicle density, road structure, traffic frequency, driver behavior are building blocks for mobility modeling.

- Battery power and storage capacity

Battery power and storage capacity management of vehicles is much more needed in effective communication decision.

- Communication environment

Type of communication environment like weather sparse or dense network are deciding factor in VANETs. Quantity of roadside equipment is much more in dense network than sparse network.

- On Board Unit Sensor(OBUS)

Interaction among vehicle can be done through Wireless Access for Vehicular Environment (WAVE) using OBUS. OBUS helps vehicle to locate another vehicles with device like GPS, Gyrometer.

3. ROUTING PROTOCOL

In VANETs routing protocol can be differentiated in two categories such as Topology based routing protocols & Position based routing protocols.

3.1 Topology based routing protocols

In Topology based protocol packet forwarding can be done through link information. Topology based routing protocol can be further divided into proactive and reactive protocol.

3.1.1 Proactive protocol

In proactive protocol, each node maintain table that holds information about neighbor nodes. Control packets are sent from current node to neighbor nodes, to get their current status after periodic amount of time. In this protocol route discovery is not required but unused path occupy moderate amount of bandwidth. Hence table with history information can be deciding factor for routing decision.

- Fisheye State Routing (FSR)
  In FSR [1] table driven routing protocol, every node collects information about all neighboring and update Global State Routing. FSR reduces routing overhead but it gives very poor performance in case of small ad hoc networks. Again increase in network size increases size of routing table size. Therefore by making area size session of table for node can decrease the size of overhead over increase size routing table.

3.2.2 Reactive Protocol

In Reactive protocol a.k.a. On demand routing protocol path discovery starts when node wants to communicate with another node. In reactive protocol, periodic updation of neighbor node does not require but flooding of messages can cause disruption in communication. However, for flooding message aggregate message packet can be solution.

- AODV
  Ad Hoc On Demand Distance Vector routing protocol [2] has two types of routing namely unicast and multicast routing protocol. AODV work efficiently for large-scale ad hoc network but duplicate packet can create heavy.
- Dynamic Source Routing (DSR)
  DSR protocol [3], which utilize source routing & maintain active routes. It also suffers from flooding messages. Hence Aggregate message can be solution over message forwarding.
- Temporally Ordered Routing Protocol (TORA)
  Temporally Ordered Routing Protocol [4] takes direct acyclic graph (DAG) as base as if it is the sending node's downward link. In this protocol source node act as root node and destination node become leaf node of source node tree. It works well for dense network but for sparse network it is not much of usable. DSR and AODV work well over it.

3.2 Geographic Routing Protocols

In Geographic routing protocol each node knows it's own & neighbor node geographic location, which is determined by service like GPS. It uses GPS like device to pin point location instead of routing table.

3.2.1 DTN

Delay Tolerant Network (DTN) uses carry & forward strategy to overcome frequent disconnection of nodes in the network. In carry based on some metric of nodes neighbors. It also suffers from flooding messages and it is unable to recover link in high mobility vehicles. Therefore to recover from link broken it can send RERR message like AODV protocol.

- VADD (Vehicle-Assisted Data Delivery)
  Vehicle-Assisted Data Delivery [5] is based on the idea of carry & forward approach by using predicable vehicle mobility. It gives high delivery ratio for multi hop data delivery. However, it causes large delay in case of change in traffic and vehicle density. To perform better data delivery it can take help of roadside equipment's as well as store and carry message structure.

- Geographical Opportunistic Routing (GeOpps)

Geographical Opportunistic Routing (GeOpps) [6] protocol next node is get selected on two factor. First is direction towards destination node and second is minimal arrival time for message forwarding. However, as navigation information is disclosed to network; this protocol is not much secure.

3.2.2 None-DTN

- BEACON
  In Beacon method 'Hello' message get send to neighbor node in periodic time. If some neighbor is unable to response to that message then that node considered as inactive node. Afterwards, unanswered node entry will get deleted from node table. However for junction location it does not have solution. Therefore, It should select proper path in case of junction by using two-hop beaconing.

3.2.3 Hybrid Routing Protocol

- TO-GO(Topology-assist Geo-Opportunistic Routing)
  In TO-GO [7] protocol packet delivery done through greedy and recovery forwarding method. It can select proper path in case of junction by using two-hop beaconing.

- GeoDTN+Nav
  GeoDTN+Nav [8] is a combination of DTN & Non-DTN mode, which includes a greedy mode, as well as a DTN mode. It can switch from Non-DTN to DTN mode. Therefore, based virtual navigation interface (VNI) it can determine its routing mode and forwarder. However, in case of sparse network this protocol does not give better performance.

4. CONCLUSION

In this paper, we have discussed the different routing protocols VANET with their flows that decrease their performance. As the same time also suggested method like aggregate message, duplicate message identifier method to appropriate protocol to increase their performance.

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