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Review of Reactive & Proactive Routing Protocols for Vehicular Adhoc Networks

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ABSTRACT

Vehicular Ad-hoc Networks (VANETs) is attracting considerable attention from the research community and the automotive industry to improve the services of Intelligent Transportation System (ITS). As today's transportation system encounter with serious challenges in terms of safeties while on road, its efficiency and it would be environmental friendly, hence the concept of "ITS" has introduced. Due to the high cost in implementation and its complexity of implementing such a system in world. Hence, it relies that work over VANET on simulation would be done.

Vehicular ad-hoc networks (VANETs) are considered to be the special application of infrastructure-less wireless Mobile ad-hoc network (MANET). In these networks, vehicles are used as nodes. This paper based on review between Ad hoc on demand Distance Vector routing protocol (AODV) and Destination sequenced distance vector routing (DSDV) in VANET. Finally the performance of the VANET is evaluated in terms of end-end delay, packet delivery ratio and throughput.

Keywords: AODV, DSDV, MANET and VANET.

INTRODUCTION

As per the World Health Organization (WHO) statistics, millions of peoples around the world are killed every year in road accidents. According to article published in Deutsche Welle by Murali Krishnan dated 29.04.2010, In "India's record in deaths has touched at least 14 deaths per hour in 2009 against 13 the year 2008". While light vehicles i.e. LMV and motor cycles were responsible for over 40% deaths. The rush during busy hours was the most fatal phases. Also as per article published by WHO (article in Times of India, by Deepak Kumar Dash, TNN in Aug 17, 2009). India also leads the world in road accident deaths. Beside all this, some of the common problems are to be sorted out in "Miles of Traffic Jam" on highway and the "Search for best Parking zones" in any unknown city.

For all these critical reasons, the Government, many social activists and Automotive Industries express lot of attention over traffic management and regulation of a systematic traffic. They are deploy many resources to make slow down the adverse effect of vehicle traffic on environment, so that put awareness on road safety with increasing "Jam free" traffic. By its traffic mechanisms efficiency.

The advancements in areas of IT and Communications have opened a new range of probable possibilities. It provides one of the most important areas is the study of the communication between vehicles and Road Side Units, which lead to the emergence of the concept of Vehicular Network communication.

MANET

It is an infrastructure less IP based network of mobile and wireless machine nodes connected with wireless radio. In operation, the MANET nodes not have a centralized administration mechanism. It is known for its routable network properties where each node act as a "router" to forward the traffic to other specified node in the network.

Types of MANET

There are different types of MANETs comprise as following:

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Intelligent vehicular ad hoc networks (InVANETs) - It make use of artificial intelligence to tackle unexpected situations like vehicle collision and accidents.

Vehicular ad hoc networks (VANETs) – Enables effective communication with another vehicle or helps to communicate with roadside equipments.

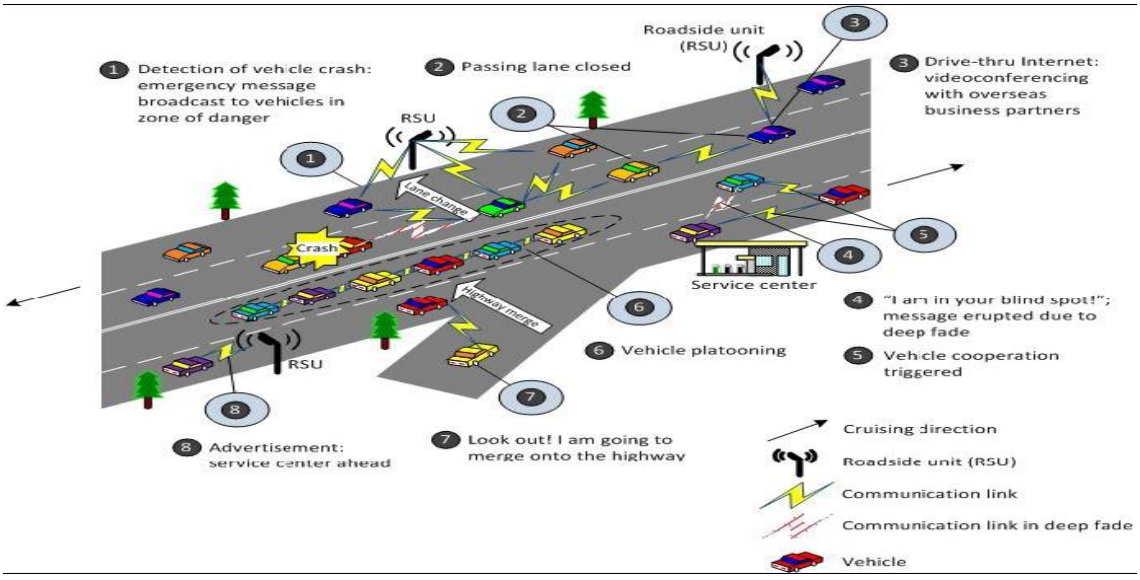
Internet Based Mobile Ad hoc Networks (iMANET) – helps to link fixed as well as mobile nodes.

Characteristics of MANET

- In MANET, every node acts as both router and the host. That is it is autonomous in working .
- Multi-hop wireless radio relaying- When a source node and destination node for a message is out of the radio range, the MANETs are capable of multi-hop routing.
- Distributed nature of operation for routing and its security and host configuration. A common firewall protection is not present here.
- The nodes have free to join or they may leave the network anytime, it's making the network topology dynamic in nature.
- Mobile nodes have limited memory, power and light weight property features.
- The reliability, efficiency, stability and capacity of wireless links are often inferior when compared with wired network links. This shows the unstable link bandwidth of wireless network links.
- Mobile and its behaviour which required minimum human intervention to configure the network.
- All nodes have identical properties with similar responsibilities and capabilities and hence it forms a completely symmetric environment.
- Density of high user and high level of user mobility.
- Nodal connectivity is intermittent.

VANET (Vehicular Ad Hoc Networks) is a recent advance in wireless networks have led to the introduction of a new type of networks. VANETs [1] are subclass of Mobile Ad Hoc Networks (MANETs). VANET nodes having high mobility than MANETs network. VANETs provide us with the infrastructure for developing new systems to enhance drivers' and passengers' safety with their comfort. VANETs are provided self organizing networks formed between moving vehicles equipped with wireless communication devices. VANETs possess a few distinguishing characteristics from MANETs are as:

- Patterned Mobility.
- Highly dynamic topology.
- Propagation Model.
- Unlimited Battery Power and Storage.
- On-board Sensors.



WIRELESS Ad-Hoc NETWORK

A wireless ad-hoc network is a decentralized type of wireless network. The network ad hoc because it does not rely on a pre-existing infrastructure, like as routers exist in wired networks or access points in operational (infrastructure) wireless networks. Instead, every node has participates in routing by forwarding data for other nodes, and so that the determination of nodes has forward the data is made dynamically based on the network connectivity. Other hand to the classic routing, ad hoc networks can use the streaming for forwarding the data.

An ad hoc network typically refers to any set of networks where all devices have equal status on a network and are free to associate with any other ad hoc network devices in their connectivity range. Oftenly, ad hoc network is a mode of operation of IEEE 802.11 wireless networks.

VANET

A Vehicular Ad-Hoc Network or VANET is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every car into a wireless router or node. VANET offers several benefits to organizations of every size. While such a network have certain safety concerns (for example, if one of them not safely type an email while driving), this does not affect VANET's potential as it a productivity beneficial tool. Global Positioning and navigation systems can benefit, as they can be integrated linked with traffic reports to provide the fastest route to work.

A computer can turn a traffic jam into a productive work time by having his email downloaded and read to him by the desk board computer, or if traffic is smooth, read it by him. It would also permit him to free, VoIP services like as Google Talk or Skype application between callers, put down telecommunications charges. Next future applications could have incorporate some control making automatic adjustments to maintain safe distances between vehicles or alerting the driver of emergency vehicles, when it in the accidental area. To put support message differentiation in VANET, IEEE 802.11e standard it would be incorporated in vehicular communication.

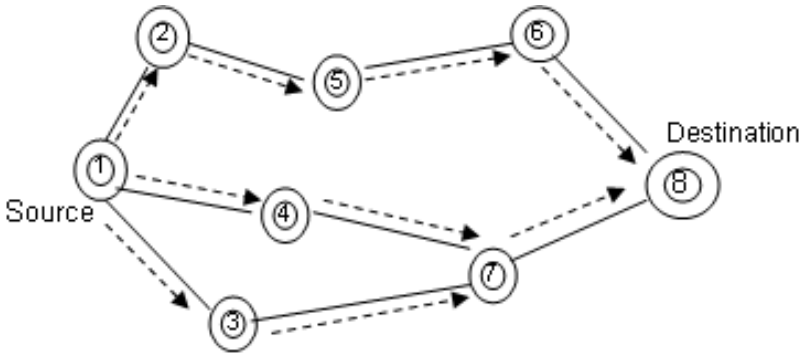
VANET ROUTING PROTOCOLS

All of the standard wireless protocol companies are continuously experimenting on VANET. This includes all the Bluetooth, IEEE protocols, Integrated Resource Analyses and Wi-Fi. There are also some VANET experiments by using cellular and satellite technologies. Dedicated Short Range Communications (DSRC) is a protocol that has been specifically for use with VANET. DSRC has several advantages: it already is operating on 5.9 GHz, it is bit easy to individualize and it is oriented to the idea of transmitting along a street grid framework--as opposed to the Omni directional transmission, it is standard for mostly wireless protocols.

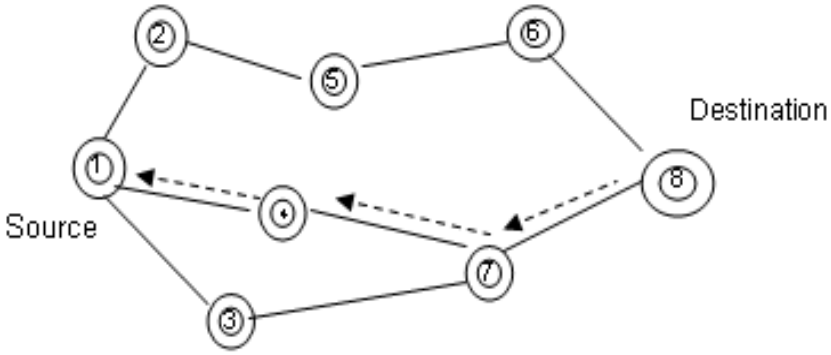
AODV

Ad hoc On-Demand Distance Vector (AODV) Routing is a routing protocol for mobile ad hoc networks (MANETs) and other wireless ad-hoc networks. It is developed in Nokia Research Center, California University, Santa Barbara and Cincinnati University jointly by C. Perkins, S. Das and. Belding-Royer. It is a routing reactive protocol, means that it establishes a route to a destination when demand occurs. In internet most common routing protocols are proactive; it means they find routing paths with their own independently by the usage of the paths. AODV as the indicates, a distance-vector routing protocol. AODV avoids the counting up to the infinite problem of other protocols of distance-vector by using sequence numbers on route updates, a technique explored by DSDV. AODV is also capable of both unicast routing and multicast routing.

Working: In AODV, the network is silent until a connection is required. At that point the network node that needs connectivity, it broadcasts a request for connection. Other AODV nodes has forward that message, and it record the node that it coming from, creating temporary routes back to the needy node. When a node receives such message and already has a route to the desired node, it will send a message back through a temporary route to requesting node. The needy node then starts using the route that has the least number of hops through other nodes. Unused route entries in the routing tables are recycled after prescribe time. When connectivity fails, a routing error is passed back to a transmitting node, and the process repeats again. Due to complexity of the protocol is to lower the number of messages to conserve the capacity of the network. For example, A sequence number for each route request. Nodes can use this sequence number so that they do not repeat for route requests that they have already passed on.



Route request (RREQ)



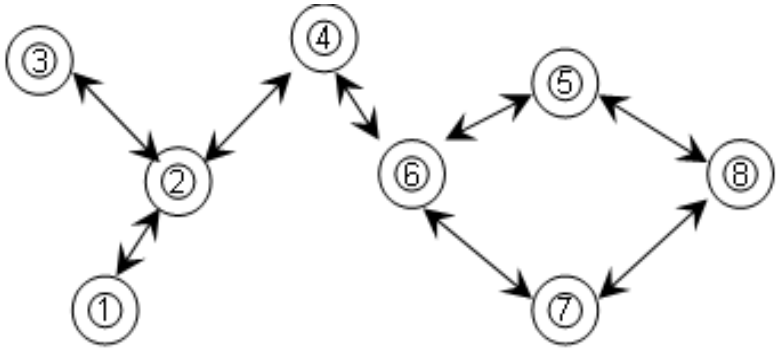
Route reply (RREP)

Another important feature is that the route requests have a "time to live" number that limits how many times they can be retransmitted in the network. One more feature is that if a route request fails, another request of route may not be sent until twice as much time has passed as the timeout of the previous route request. The most important advantage of AODV is that it creates no extra traffic for communication along existing links or connectivity. Distance vector routing is also simple, and it doesn't require much memory or lengthy calculation. However AODV requires little more time to establish a connection, and the initial communication is heavier to establish a route than some other approaches.

DSDV

This is destination sequenced distance vector routing protocol. Packets are transmitted between the stations of the network by using routing table, which are stored at each station of the network. Every routing table at each of the stations list all available destinations and the number hops to each. Each rout table entry is tagged with unique sequence number, which is originating by the destination station. To maintained the consistency of the routing table in a dynamically varying topology each station periodically transmit updates and transmit immediately when significant new information is available.

Routing information is advertised by broadcasting or multicasting the packet which are transmitted periodically and incrementally as topological changes are detected.



Route reply (RREP)

Tentative Routing Table

Destination	Next Hop	Metric	Sequence Number
N1	N4	3	S400N1
N2	N4	2	S300N2
N3	N4	3	S450N3
N4	N4	1	S200N4
N5	N5	1	S210N5
N6	N6	0	S800N6
N7	N7	1	S220N7
N8	N5 & N7	2	S350N8

It required regular update its routing table which uses up battery power and small amount of bandwidth, even when the network is ideal. Thus DSDV is not suitable for highly dynamic or large scale network.

APPLICATION OF VANET

VANET nodes having high mobility than MANETs network. VANETs provide us with the infrastructure for developing new systems to enhance safety and comfort for "drivers and passengers". VANETs are self organizing networks formed between moving vehicles equipped with wireless communication devices. For V2V communication-based applications such as the pre-crash sensing, blind spot warning, electronic emergency brake light, and reliable forward collision avoidance, every vehicle has broadcasts information periodically about its position, acceleration, heading, turn signal status, vehicle speed and so on,

LIMITATION OF VANET

Vehicular networks ensure that the information received from any vehicle is promptly and correctly propagated to nearby running vehicles, to avoid accidents. It is a crucial point is that how to ensure the information transmitted is correct, when the neighbouring vehicles are rapidly changing and moving in and out of range. Current trust management schemes for vehicular networks establish trust by voting on the decision received by several nearby nodes. It might just be enough to check the validity of incoming information. Due to the inferior nature of vehicular networks, reputation system for mobile ad hoc networks (MANETs) cannot be applied to vehicular ad hoc networks (VANET). We point out several limitations of trust management schemes for VANET. In particular, we identify the problem of information cascading and over sampling, which commonly arise in social networks. Over sampling is a situation in which a node observing two or more nodes, takes into consideration both their opinions equally without knowing that they might have influenced each other in decision making. We show that decision by simple voting for making leads to over sampling and gives incorrect results. We also propose an algorithm to overcome this problem in VANET.

When developing an application for use is VANET it is vital to be aware of the limitations that are present in this environment. The main challenges are capacity, restrictions, limited connectivity and competing alternative technologies.

FUTURE WORK

The same task can also be implemented on satellite or air traffic along with vehicular network. Also more protocols can be implemented with keeping the aspect of attack on the network because that is the major issue which must be kept in mind while calculating various performance matrices. The work can also be implemented with various mobility models like two ray-ground and FSO (free space communication).

CONCLUSION

In this paper we discussed routing in VANET and it is concluded that in this work, we focused on the routing problem in VANET. We have presented a study to AODV and DSDV; it is clearly that the AODV protocol works properly as compare to DSDV in VANET scenarios for high and moderate mobility.

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