

Hybrid Routing Approach Depending on Different Message Types in VANET

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ABSTRACT

VANET is a technology that uses moving cars as nodes in a network to create mobile network. VANET is part of mobile ad-hoc network that facilitates communication between group of vehicles to provide driver safety, traffic updates, entertainment, data sharing etc. Some of the promises of VANET are intelligent traffic system, early warning signals for vehicles that could minimize road mishaps and provision of better in-transit communication. As the performance of communication depends on the selection of best route while communication & routing of data is done by routing protocols. To provide smart communication, it is must to make an analysis of routing protocols in VANET. It is assumed that every vehicle has the digital map of streets comprised junctions and streets segments. In this paper, cluster head and cluster members communicate with each other effectively. Cluster members generate messages as per their need. The cluster head gathers in formations from its neighboring cluster members.

Keywords: Beacon Message, Query Message, Geo-Cast Routing, Position Based Routing

I. INTRODUCTION

VEHICULAR ad hoc network (VANET) is an emerging technology that aims to provide wireless communication between moving vehicles, as well as between vehicles and infrastructure stations. The main motivation for use of VANETs is its potential for providing safety-related information to vehicles. Vehicles exchange status information, such as speed, acceleration, and position in the periodic messages called beacons to create awareness for surrounding vehicles, increase safety, and reduce accidents. Diverse non-safety applications also expected for VANETs, ranging from road traffic efficiency to commercial applications and infotainment, such as entertainment for road travellers making their journeys more pleasant. VANETs have some characteristics that differentiate them from other types of mobile ad hoc networks (MANETs). These

characteristics include fast node movements, a large network, and constrained mobility.

Routing is the process of selecting best paths in a network along which we can send our message. It is the process of sending a message from source to its destination. In network router performs it. It is the key feature of internet. Each intermediary device performs routing by passing along the message to next node over network. Routing tables are used to analyse the best path. Two major categories of routing protocols are topology based and position based. In VANET, the routing protocols are categorized into five categories, which are as: Topology based, Position based Broadcast. Cluster based, Geo cast based and broadcast based routing protocol.

Cluster Based Routing:

A group of nodes identifies themselves to be a part of cluster and a node is designated as cluster head will broadcast the packet to cluster. Good scalability provided for large networks but network delays and overhead incurred when forming clusters in highly mobile VANET. In cluster based routing virtual network infrastructure must be created through the clustering of nodes in order to provide scalability[1].

Broadcast Routing Protocol:

Broadcast routing is frequently used in VANET for sharing, traffic, weather and emergency, road conditions among vehicles and delivering advertisements and announcements.[1]

Geo Cast Routing Protocol:

Geo cast routing is a location based multicast routing. Its objective is to deliver the packet from source node to all other nodes within a specified geographical region (Zone of Relevance ZOR). In Geo cast routing vehicles outside the ZOR are not alerted to avoid unnecessary hasty reaction. Geo-cast routing, considered as a multicast service within a specific geographic region. It normally defines a forwarding zone where it directs the flooding of packets in order to reduce message overhead and network congestion caused by simply flooding packets everywhere. In the destination zone, unicast routing used to forward the packet. One pitfall of Geo cast is network partitioning and also unfavourable neighbours, which may hinder the proper forwarding of message.[2]

Position Based Routing Protocols:

Position based routing consists of class of routing algorithm. They share the property of using geographic positioning information in order to select the next forwarding hops. The packet is send without any map knowledge to the one hop neighbour, which is closest to destination. Position

based routing is beneficial since no global route from source node to destination node need to be created and maintained.[3]

Topology Based Routing Protocols:

These routing protocols use links information that exists in the network to perform packet forwarding. They further divided into Proactive, Reactive & Hybrid Protocols.

Proactive routing Protocols:

The proactive routing means that the routing information, like next forwarding hop is maintained in the background irrespective of communication requests. 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 it provides low latency for real time application.[5]

Reactive routing Protocols:

Reactive routing opens the route only when it wants to send packets to its destination for a node to communicate with each other. It maintains only the routes that are currently in use till the destination becomes inaccessible along every path from the source as a result it reduces the burden of the network.

Hybrid routing Protocols:

The hybrid protocols are introduced to reduce the control overhead of proactive routing protocols and decrease the initial route discovery delay in reactive routing protocols [6].

II. PROPOSED SCHEME

We have considered highway as scenario where traffic is bidirectional and each vehicle is equipped with GPS and digital map. Road is divided in some number of segment and each segment may have one or more cluster. Each cluster has a cluster head (CH)

through which the cluster members (CM) can communicate. We assumed that a vehicle have knowledge of cluster identification. Cluster members are able to generate messages according to their needs. Every cluster member have to send beacon messages to make the cluster head informed about the velocity, current location, direction, lifetime (depends on distance and velocity) etc.. By the message cluster head will get the knowledge of its cluster member and can update its routing table. Cluster head selected depending on its lifetime in current cluster.

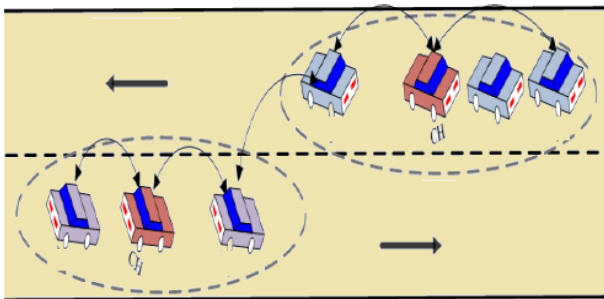


Figure 1. Cluster formation in bidirectional road scenario

Depending on the type of messages, we classify them in five groups.

Emergency Message (Messge_Type_1): Emergency message send to inform about an accident. Such message can also be generated by a vehicle which behaves abnormally like declaration exceeds a certain threshold, dramatic change of moving direction, major mechanical failure etc. We use geo-cast based routing here to let know all the nodes about some emergency condition. This type of emergency messages are sent to the nodes, which are present in that region.

Beacon message (Messge_Type_2): Beacon message sent by all vehicle to inform other vehicle about their status like velocity, current location, direction etc. Beacon message must be sent to the cluster head to make aware position and other necessary information.

Traffic condition Message (Messge_Type_3): This message is generated by a node, which detects traffic

signal breakdown, jamming information etc. As the traffic, condition is a necessary aspect so this information is broadcasted to every node.

Query Message (Messge_Type_4): Query message have to generate by a source node to know the nearest restaurant, parking zone, shopping mall etc. Cluster based routing is used here to know the position of desired destination. These routing protocols use links information that exists in the network to perform packet forwarding.

Depending on the priority of the messages, there are five types. The emergency messages have the highest priority. All the message types are kept in queue. The emergency message tops the list, followed by Beacon message, Traffic message, Query message1, Query message2. The queue also consists of type of protocols that is associated with the message types. The protocols those are used here as follows Geo cast based routing, Broadcast based routing, Position based routing and topology based routing.

Algorithm for Hybrid Routing
<pre> M_i= Message_Type_i If (M_i=Messge_Type_1) { Do Geo-cast Routing based on direction of source vehicle } Else { If (M_i= Messge_Type_2) { Update routing table of CH } Else { Check the routing table of CH If (the routing table has not any entry for the destination vehicle) Store and forward the message to its </pre>

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adjacent CH who is near to the destination
    Else
        Forward the message to the
destination
    }
    Else if(Mi= Messge_Type_3)
    {
        Do Broadcast based routing to all
vehicles
    }
    Else if(Mi= Messge_Type_4)
    {
        Do Position based routing on the
direction of source vehicle
    }
}

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IV. REFERENCES

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In case of emergency messages, an affected vehicle sends broadcast messages along with the geographical location. Beacon messages are sent by all vehicles to others about current location, velocity-using position based routing protocol. A node can let other vehicles know about road condition and traffic signal breakdown. A node can put query messages to other vehicles asking the location of nearby shopping mall or parking zone even a particular road condition-using broadcast based and position based routing protocol.

III. CONCLUSION

In this paper, we present an algorithm, which can be in use to reduce congestion of messages. The details of the algorithm is described. The picture-1 shows that a cluster is made of number of nodes and each node can communicate among themselves directly or via cluster head. An algorithm is used to restrict the cluster head from being over flooded. In this paper types of routing protocol is also briefly discussed. The present work of this paper will be implemented in future using above-mentioned algorithm by Network Simulator (NS2).