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Data Dissemination In VANETS- A Review

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***Abstract*— Vehicular ad hoc networks (VANETS) have been appeared as a new area of data dissemination. Vehicular Ad hoc network is regarded as intelligent agent, in which vehicles provide aid to the end users. Vehicles in vehicular ad hoc networks are very unstable due to dynamic topology. Therefore to provide efficient data delivery from source node to destination node, clustering is one of the best panaceas (way out) for the above issue. In this paper we mainly emphasize on the process of clustering how the cluster head is elected and re-scheduled and what are the problems in stable clustering which leads to the betterment of clustering process in VANETS.**

***Index Terms*— Vehicular Ad Hoc network (VANETS), Clustering, Cluster head (CH), Gateway node (GW).**

I. INTRODUCTION

The question arises why there is great need for traffic control management system to provide aid to end users. As we all are familiar with roadside condition which results in high traffic jams and high possibility of accidents so there is great concern for high alerts. The way out for above issue is traffic control. Imperial liquid measure of fuel is wasted everyday when vehicle gets stuck in traffic congestion therefore to conserve the resources as well as to provide the safety to the passengers VANETS emerged as intelligent transportation system (ITS) in which mobile/vehicle node is capable of communicating with neighbouring mobile/vehicle node. Traffic control systems provide the assurance that the atmosphere is accident free. With the advancement in wireless communication, Federal communication commission (FCC) provide various standards to boost the communication among the vehicles in traffic control system [3]. Wireless access in vehicular environment (WAVE) and Dedicated Short Range Communication (DSRC) are the two standards defined by FCC in IEEE 1609.14 and 802.11p [3]. For inter-vehicle and roadside to vehicle type of communication domain, 75MHZ frequency spectrum is dedicated by FCC. DSRC standard was invented by USA [4].DSRC is allocated 802.11 MAC Layer plus IEEE 802.11a physical layer [4].As we all know in Vehicular Ad hoc network vehicles topology is highly dynamic thereby it require a high data transfer rate. IEEE 802.11 MAC suffers from high overhead rate [4]. So there is immense need to enhance the feature of DSRC standard. American society for testing and materials (ASTM) improved the DSRC standard to 802.11p which is regarded as WAVE [4].

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A. Architecture

The main components of Vehicular Ad hoc networks vehicles, roadside unit, on board unit (OBU). Vehicles are equipped with OBU and sensors to gather the information from roadside unit (infrastructure unit) or neighboring vehicles by broadcasting alert messages [8]. Wireless communication in traffic control system is of two type's inter-vehicle and roadside-vehicle type of communication

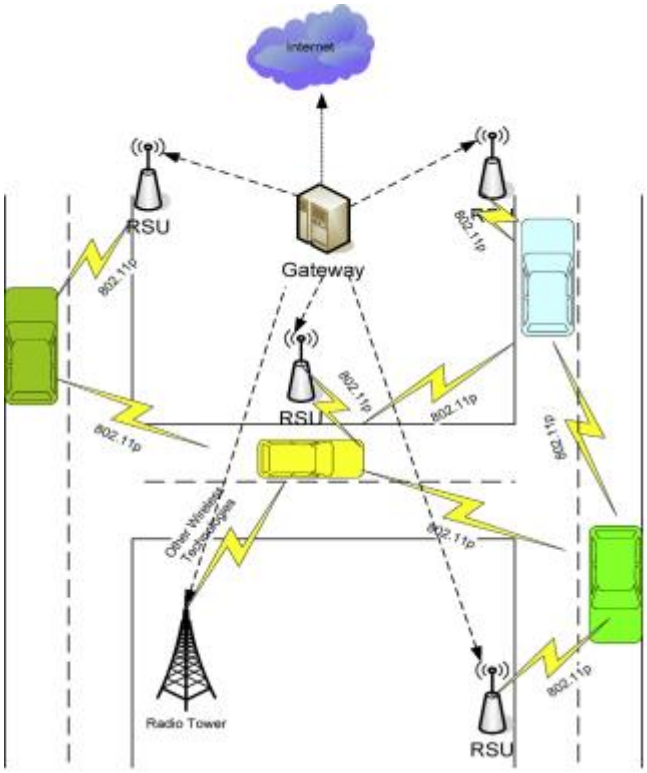

Fig 1: Generalized view of VANETs [6]

The inter-vehicle communication is also known as cooperative communication because the group of vehicles communicates with one another thus forming the cooperative driving atmosphere [1]. Further the inter-vehicle communication is of two types' naïve broadcasting and intelligent broadcasting. Naïve broadcasting broadcasts messages or beacons periodically which results in collision of messages whereas the intelligent broadcasting generates beacons on demand hence result in less collision of messages and efficient communication without delay. The vehicle-roadside type of communication is regarded as single hop broadcast where the roadside unit sends the broadcast message to all equipped vehicles in the vicinity [1]. It provides the high bandwidth link as well as the high mobility link between vehicles and roadside units.

B. *Routing Protocols in VANETs*

Main hindrances in VANETs scenario which leads to requirement of routing are dynamic topology changes, fast data rate, overhead issue, quality of

service(QoS)[4].Topology defines by which route the message gets delivered from source to destination [6]. Topology based route finding criteria is broadly divided into further two ways as proactive and reactive. Reactive protocols are also named as connection oriented protocols. In connection oriented protocols information is being exchanged with the help of route reply and request messages [1]. This is also known as statically forwarding packets. Proactive type of protocols or we can say connection oriented protocols is those where the current location of node is taken into consideration. The current location of a node is calculated on the information stored in header of source and destination node [1].Further the connection oriented protocols are classified into three categories: one-hop, multi-hop and cluster oriented. One hop approach removes the mobility issue. It basically establishes a complete connection from sender to receiver and further establishes the connection to next hop to forward the data packets [1]. One hop approach based routing protocols are TBF (trajectory based forwarding) and GPRS (greedy perimeter stateless routing) [1][6]. The Multi-hop protocol is used to remove the drawback of updating the routing table periodically [1].Examples of multi-hop routing protocols is AODV (ad hoc on demand distance vector) and DSR (dynamic source routing). Both AODV and DSR broadcast the request/reply messages to route the information from sender to receiver. Cluster based approach in connection oriented routing protocol reduces the route request and route communication cost [1]. GRID (location aware routing protocol) and CGSR (cluster gateway switch routing) are the two illustration of cluster based connection oriented routing protocols [1]. Vehicles regarded as cluster in cluster based approach. Each cluster has cluster head (CH) and gateway node (GW). Gateway node(GW) connects and act as communication agent between two clusters. Therefore only cluster head and gateway node broadcast the information to member nodes of cluster thereby further reduces the route request messages [1].Quality of service helps in betterment of services by calculating various parameters akin as throughput, packet delivery ratio, latency, and delay. Throughput is the amount of data transferred per unit time from source node to destination node. Fast the data transfer rate, maximum will be the throughput which results in efficient data dissemination process. Packet delivery ratio is the ratio of actual packets or data received to the total number of packets or data send. Latency basically refers to the speed of data dissemination process. Higher latency results in efficient data dissemination process among source node and destination node. Geo cast routing is based upon a location based multicast routing [27]. Its main function is to deliver the packet from one node to all other nodes within a specified geographical region (Zone of Relevance ZOR)[27]. It basically defines a forwarding zone to forward the flooding of packets in order to reduce message overhead [26]. In the destination zone, unicast routing can be used to forward the packets [26]. The various Geo cast routing protocols are IVG, DG-CASTOR and DRG [28].

II. CLUSTERING IN VANETS

Due to dynamic topology of nodes in VANETs, scalability issue arises. Clustering is a best strategy used to improve the scalability of mobile nodes due to high mobility factor of vehicles. Clustering divides t5he complete network into the smaller chunks of networks. Chunks of networks then regarded as clusters. Cluster structure consists of cluster head (CH), gateway Node (GN) or communicating node, member node (MN) [10]. Cluster head performs the correlating task to stabilize the cluster activities. Communicating node or gateway node is capable of hearing the communication between two clusters. Member nodes are the rest of the nodes of cluster who act as an ordinary member [10].

A. Types of Clustering

Clustering is of two types: Stationary Clusters and Mobile Clusters [9]. Stationary Cluster is normally the pre-defined clusters of the geographical region. Sometimes, RSUs (Road Side Units) having fixed infrastructure could also take participate in these types of clusters. In these situations, the cluster range can be equivalent to the transmission range of a RSU [10]. Design of routing protocol can be easy to use by using RSU because we do not have need to consider multi-hop situation. But, the fixed RSUs could lead a problem of frequent re-clustering. Frequent re- clustering is not needed because it can cause further cluster formation process of whole network. The physical clustering is only suitable for the applications where vehicles move with moderate speed [9].

III. LITERATURE SURVEY

Ho Y et al has explained the ad hoc network which does not include the fixed infrastructure to forward the data packets

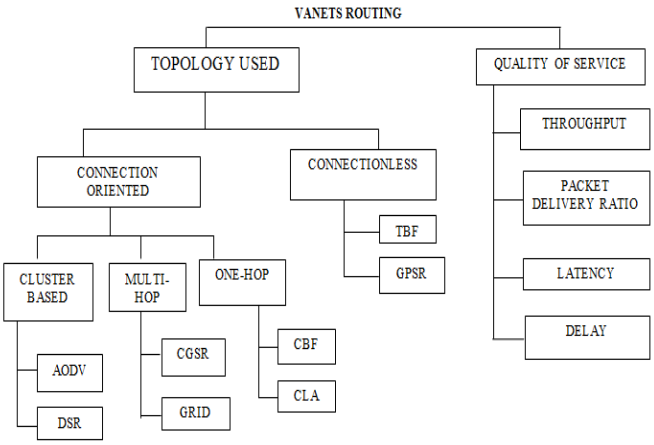

Fig 2: Generalized view of Routing Protocols in VANETs [1][6]

Protocols	Prior Forwarding method	Digital Map Requirement	Virtual infrastructure Requirements	Realistic Traffic Flow	Recovery Strategy
Proactive Protocols	Wireless multi hop Forwarding	No	No	Yes	Multi hop Forwarding
Reactive protocols	Wireless multi hop Forwarding	No	No	Yes	Carry and Forward
Position Based Reactive protocol	Heuristic Method	No	No	Yes	Carry and Forward
Delay bounded protocols	Carry and Forward	No	No	Yes	Multi hop Forwarding
Cluster based protocol	Wireless multi hop Forwarding	No	No	No	Carry and Forward
Geo cast Protocol	Wireless multi hop Forwarding	No	No	Yes	Flooding

Table 1: Comparison of Various Protocols [27]

The comparative study of different routing protocols and their weaknesses and strength is unfolded by considering suburban environment .**Toor Y** et al has surveyed the state of art for vehicle ad hoc network by reviewing the applications used in VANETS such as its safety applications. Suggestions are also made for the practical VANETS applications .**Dave M** et al emphasize on data push model on which many applications of VANETS has been developed upon. Moreover it describes the detailed information about the data dissemination protocols with its comparison. **Khilar P** et al has regarded the VANETS as new emerging technology to create an accident free environment. Furthermore, author survey many current issues like development, deployment, security challenges in different countries. **Atani E** et al has proposed a new 3-step approach for estimating the traffic volume. The author first collects the traffic information for different groups of vehicles. Then, a chaining technique between the clusters transmits this information to a roadside cloud. Finally, author employs a generalization method to extension of the total traffic volume from the collected data. Performance of the proposed approach that is new 3 step technique is evaluated using extensive simulation. **Dua** Et al has explained the various challenges like scalability, overhead to route the packets from source node to destination node in VANETS due to high mobility rate. The detailed description of all the existing routing protocols like AODV, DSR has been unfolded in it. **Indra A** et al has reviewed the existing protocols for VANETS and picturized them on various key attributes such as network, architecture, routing strategies, forwarding strategies, mobility model, QoS metrics. **Zedan H** et al has described VANETs as an application of MANETs and also describes the architecture, challenges, applications, of MANETs differ from those of VANETS. **Arya T** et al has regarded VANETS as insecure type of communication due to dynamic nature of vehicles. Reactive protocol AODV to keep more suitable for VANETs environment it add clustering feature to it. The new augmented AODV protocol has been developed. **Kaur M** et al has described the demand for VANETS for increasing day by day. Due to high mobility rate of vehicles there is great need for dynamic type of communication. Therefore a novel dynamic clustering scheme has been proposed to improve cluster lifetime in

dynamic environment. **Souza** et al defines a new clustering approach in which the author uses the location information to determine the relative mobility of nodes by broadcasting alert messages. Relative mobility metric that uses the location information is termed as Aggregate Local Mobility (ALM) metric. When two clusters come in each other communication range, process of merging takes place. In between the communication between two clusters, one of the cluster moves to contention state, before the expiry of contention time node which has smaller ALM is elected as CH. Due to dynamic topology of VANETs, the concept of ALM is highly unstable.

IV. OPEN CHALENGES

Clustering is the technique of partition the network into smaller groups of moving nodes embedded with computing and networked devices. It has several advantages including proper usage of bandwidth, distribution of resources and scalability. Cluster formation plays a vital role in VANETs for information gathering, aggregation and dissemination. Static clustering is a technique to form stable grouping of computing devices on the fly that does not have physical connections. The scheme forms a moving stable cluster on a lane between two intersections by considering parameters such as vehicle speed, direction and connectivity to other vehicles. The topology of VANETs is highly unstable because of the dynamic changes that keep on taking place due to the high speed of vehicles. Clustering is an effective way of stabilizing such networks. The goal of most of the clustering techniques is to minimize cluster re-organization and change of CH, which is unavoidable in dynamic nature of VANETs [28]. The nodes that lose their CH may not find nearby cluster immediately to join and may become CHs at the same time. In such situations clustering process will become unstable due to frequent changes in CH. Moreover, when CH leaves a cluster then cluster re-organization requires all nodes in the cluster to participate in CH re-election process [28]. This increases the CH election cost due to the involvement of large number of nodes. If number of nodes participating in re-clustering is limited to small number, the stability and efficiency of clustering can be enhanced [28].

V. CONCLUSION

Vehicular ad hoc networks have emerged as emerging technology which includes many wide range of applications such as rescue operations, multimedia, entertainment etc. for all these wide range of application we need efficient routing protocols for fast data transfer to meet the problem of high mobility factor of vehicular ad hoc networks(VANETs).This paper provides the complete view of routing protocols and also discuss the clustering process which is used to tackle with the scalability issue of the vehicular ad hoc networks

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