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An Assessment of Clustering and Its Protocols in VANET

A. Mythili
Ph.D. Research Scholar,
Bharathiar University, Coimbatore.
mythili.a@grd.edu.in

Abstract: Vehicular ad-hoc Network (VANET) is fundamentally a collection of vehicles and keen access points for communication, transmission and gathering information of nodes and environment for managing traffic loads. Thus the steering of destination, supervise speed and track of vehicles becomes a critical issue in VANETs. Previous researchers only focus on individually. VANETs will enhance driver safety and reduce traffic deaths and injuries by implementing collision avoidance and warning systems. In this paper, I am going to describe the importance of clustering in VANET and also subcategories of clustering and its protocols.

Keywords: VANET, Clustering, Protocols, Algorithm.

I. INTRODUCTION

Vehicular networks are fast emerging for developing and deploying new and traditional applications VANETs are characterized by high mobility, rapidly changing topology, and ephemeral, one-time interactions. Vehicular ad-hoc Network is a communication system in which vehicle can communicate with other vehicles and roadside units. It helps to reduce traffic jams, congestion, and accidents and provide safety to vehicles and drivers. It reduces the wastage of fuel and time. Vehicular networks are fast emerging for developing and deploying new and traditional applications VANETs are characterized by high mobility, rapidly changing topology, and ephemeral, one-time interactions.

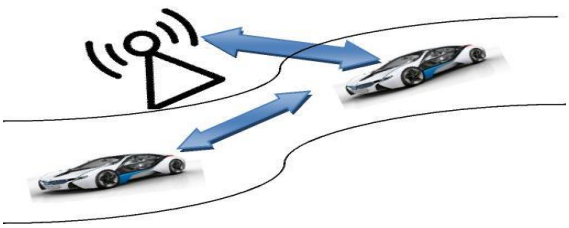

Fig.1 (vehicular ad-hoc network)

Due to vibrant nature of VANET, routing of destination, velocity and path management becomes hot topics of research. Many routing protocols are used to find the routs and manage communications. But it's very difficult to maintain the link because of vibrant nature. [3]

II. CLUSTERING

Clustering is the process of separating the network into a different group of vehicles. These smaller groups of vehicles are called clusters. Every cluster has a cluster member who plays the role of cluster head and enables the communication

Between the cluster members and also between different clusters. [4] Nodes that gain communication services to different cluster heads are called Gateway nodes. Clustering is responsible for end to end delivery and it also reduces the delay. Other nodes directly communicate with the cluster head. [5]

2.1 Need of clustering

- Clustering is used for following purposes;
- To decrease the routing overhead
- To enhance the message delivery
- Proper usage of network bandwidth [5]

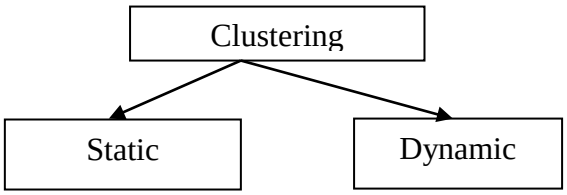

Fig. 2 (Types of Clustering)

2.2 *Types of clustering*

Clustering is divided into two subcategories according to the character of cluster formation

Static clustering: In this kind, the stable cluster is formed. Sometimes these clusters also contain RSU. In this case, cluster works inside the range of RSU. These clusters are not scalable. Cluster formation and preservation is easy for static clustering. Routing protocols are easily designed. But scalability and other factors decrease the performance of this network.[6] Static cluster moves in the same direction with the same velocity. There is no need of reconfiguration of the cluster in static clustering.

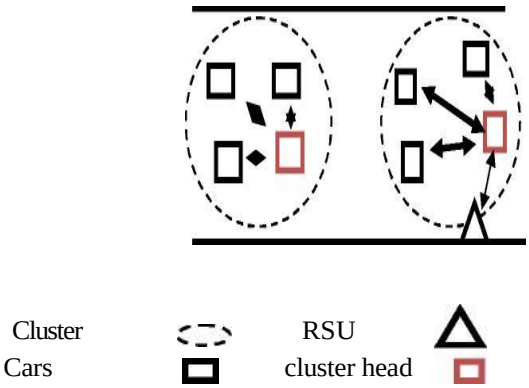

Fig. 3 (Static Clustering)

Dynamic clustering: - In this type, cluster creation did dynamically in the smallest amount of time. Due to the vibrant nature of the network cluster reconfiguration is need .clusters heads are changed because of high mobility. Cluster reconfiguration and range of cluster head depend on the thickness of the area. These clusters are easily scalable. [7]

III. CLUSTERING PROTOCOLS

Clustering protocols partitioned the network into clusters on the basis of velocity; route etc.

Clustering based routing protocols are –

3.1. Certificate based protocols

These protocols are used for privacy conservation**.** Certificate production and revocation are done in this protocol. [8].Every node which want to be valid node in the network and have effective communication, should take an offline certificate and a pair keys (public and private keys) from the offline office before connecting to the network If a node did not take a certificate, based on our scheme this node cannot do anything in the network.

3.2. Mobility based protocols

Formation of cluster and selection of cluster head is based on the mobility factor .other parameters such as speed and direction are also used. This category further divided into two subcategories:

- Lane Based
- Speed Based

3.3 Ion mobility based protocols

These protocols do not consider mobility factor. It depends on the density of the network. Clusters are formed automatically and communication depends on the gateway nodes. One of the mobility protocols is cluster based location routing (CBLR).

3.4 *Destination based clustering protocols*

This technique takes into account the current position, speed, relative and final destination of the vehicle for cluster formation. Using the navigation system the destination is identified.

3.5 Token based clustered data gathering protocol(TCDGP)

TCDGP inherits the two major characteristics from CDGP: (i) the use of a clustering technique in V2V and V2I architectures, and (ii) the use of a retransmission mechanism in the case of erroneous data. Moreover, to minimize the number of lost slots and the waiting time of vehicles, we propose a new Token based Dynamic SDMA (TD-SDMA) technique which will be used in the local data collection phase.

IV. CLUSTERING ALGORITHM

Clustering algorithms are designed to make cluster process efficient and secure. Mainly the following types of clustering algorithms are developed.

A. Cluster formation Algorithm: - A cluster is a small group of vehicles containing a cluster head, a gateway node, and more than one member. Formation algorithm is developing to make cluster, cluster head selection, choose gateway and enable communication.

B. Cluster maintenance Algorithms: - These algorithms are used to recover the links and cluster from any type of failure. A member node is dead when cluster does receive message send by that node. A node rejoins the cluster when it stops receiving the messages send by the cluster head. Maintenance algorithm also describe the following methods

- Joining the Cluster
- Leaving the Cluster
- Merging the Cluster
- Resigning Procedure of Cluster Head.[9]

CONCLUSION AND FUTURE WORK

In this paper, I have discussed the overall outline of the concept of clustering in VANET. I have focused several techniques for clustering and various types of clustering in VANET and some clustering protocols which control the VANET and compose the network more efficient. VANET is a hot area of research and a lot of work done on VANET but some problems still need to address.

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