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A Review on Clustering in VANET

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ABSTRACT: Vehicular ad-hoc Network (VANET) is basically arrangement of vehicles and dedicated access points for communication, transmission and collecting information of nodes and environment for managing traffic loads. Thus the routing of destination, manage speed and direction of vehicles becomes a critical issue in VANETs. Previous researches only focus on individually. In this paper, we describe the importance of clustering in VANET and also different types of clustering and clustering protocols.

KEYWORDS: VANET, Clustering, protocols, algorithm.

I. INTRODUCTION

Vehicular ad-hoc Network is a communication system in which vehicle can communicate with other vehicles and road side 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. [1] Vehicles move in different directions with different speed on road and send and receive data. VANET enable three types of communication such as vehicle-to-vehicles (V2V), vehicle-to-infrastructure (V2I) and infrastructure-to- infrastructure (I2I). V2I communication provide information about road, weather and also avail other network services.V2V communication provides the information about the traffic jams, construction works and other type of disasters on road. I2I communication is used to share the information between infrastructure units. [2]

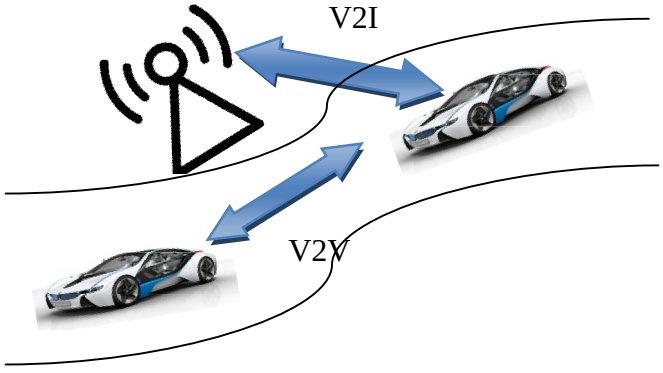

Fig.1 (vehicular ad-hoc network)

Due to dynamic nature of VANET, routing of destination, speed and direction 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 dynamic nature. [3]

II. CLUSTERING

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

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

A. Need of clustering :- Clustering is used for following requirements –

- To decrease the routing overhead
- To enhance the message delivery
- To proper use the network bandwidth[5]

B. Types of clustering

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

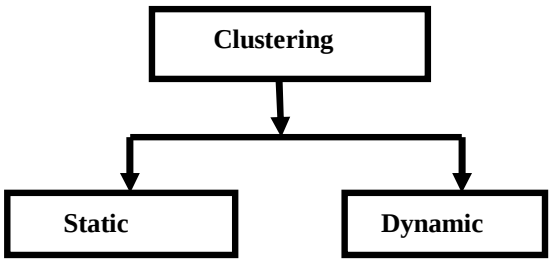

Fig. 2 (Types of clustering)

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

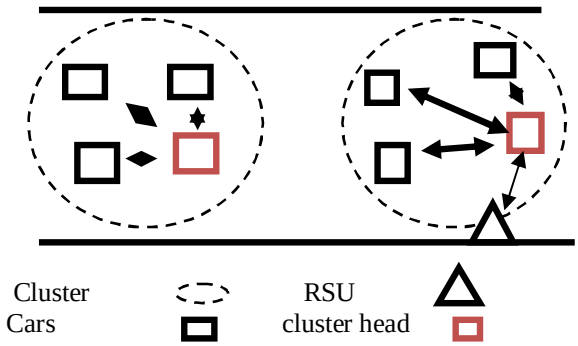

Fig. 3 (Static Clustering)

- *Dynamic clustering:* - In this type, cluster formation done dynamically in minimum time. Due to the dynamic nature of the network cluster reconfiguration is need .clusters heads are changed because of high mobility. Cluster reconfiguration and range of cluster head depends on the density of the area. These clusters are easily scalable.[7]

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III. CLUSTER BASED PROTOCOLS

Clustering protocols partitioned the network into clusters on the bases of speed; direction etc. clustering based routing protocols are –

A. 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 sub categories –

- Lane based
- Speed based

B. Non 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 non mobility protocols is cluster based location routing (CBLR).

C. Certificate based protocols

These protocols are used for privacy preservation**.** Certificate generation and revocation is done in this protocol. [8]

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 maintenances 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. Maintenances algorithm also describe the following methods-

- joining the cluster
- leaving the cluster
- merging the cluster
- resigning procedure of cluster head.[9]

V. CONCLUSION AND FUTURE WORK

In this paper, we have overview on the concept of clustering in VANET. There are many techniques for clustering's we focus on static and dynamic clustering and some clustering protocols which influence the VANET and make the network more efficient. VANET is a hot area of research and a lot of work done on VANET but some problems are still needs to address.

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