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A Review on Various Clustering Protocols in Vehicular Adhoc Network (VANETs)

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ABSTRACT

The new study in cluster-based MAC and redirecting schemes for Vehicle Offer Hoc Networks (VANETs) motivates the prerequisite for a well balanced VANET clustering algorithm. As a result of highly cellular nature of VANETs, mobility must play an integrated position in group formation. We present a story, mobility-based clustering scheme for Vehicle Offer hoc Networks, which employs the Affinity Propagation algorithm in a spread manner. The proposed algorithm views common vehicular mobility throughout group development, which provides clusters with high stability. Simulation results confirm the superior efficiency of the proposed algorithm, when comparing to different acknowledged mobility-based clustering techniques. Clustering efficiency is assessed when it comes to average group head period, average group member period, average rate of group head change, and average amount of clusters. Cellular communities in compared to wired communities have distinctive characteristics. In cellular communities, regular system topology improvements may bring about by node mobility, which are rare in wired networks. In comparison to the secure url capacity of wired communities, wireless url capacity continually differs because of the affects from transmission energy, phone sensitivity, noise, fading and interference. Furthermore, wireless cellular communities have a high error rate, energy restrictions and bandwidth limitations.

Keywords: - Clustering, VANETs, Clustering Protocols

I. INTRODUCTION

Increasing vehicles on roads contributes to much type of problems arises such as for instance traffic congestion, accidents on roads, air pollution that causes serious injury to humanity. To overcome all such problems, the study introduces us with the new technology called VANET (vehicular ad-hoc network) [1]. Vehicular Adhoc Networks is recognized as as a unique form of mobile adhoc networks (MANETs) [2]. VANETs shows us the whole information regarding roads that's how traveling on roads with safety, which speed must be followed, which lane is safer, also detects the situation occurs as a result of environment conditions such as for example flood, fading, raining as a result of that your signal drops among and the whole information isn't reached to the user [4,6]. VANET uses cars as mobile nodes. VANET turns every participating car right into a wireless router or node allowing cars approximate 100 to 300 meters of every other. The very first systems which will integrate this technology are police and fire brigade to get in touch together of safety purpose by introduction the technology of VANETS [3]. The vehicles often relocate an organized fashion rather than moving randomly the

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proposed scheme of VANET is on the basis of the collaboration among users through their cellular devices that's smart phones by giving the update details about nearby traffic so that they may manage their lane traveling [9]. Creating the information concerning the traffic control with the help on GPS and NAVIGATION the driver gets the entire details about the traffic ahead. The little units throughout the roads can avoid many accidents the machine such as for example Road Side Unit (RSU) which directly attached to the consumer to update the traffic information and secondly On Board Unit (OBU) which shows the data on the vehicle board that the automobile in the leading and one side or at the rear travels with just how much speed and the length maintained from your car or truck [41].It shows the whole details about all of the vehicles that travel in exactly the same lane or nearby lane VANET is dependent on wireless technologies such as for example mobile data or wifi connections. The major intend of VANETs is always to absolute the users choice traveling and build their drive safe and comfortable [6].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 between cluster members and also between different clusters. 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. [18]

II. CHARACTERISTICS OF VANETS

VANET has some unique characteristics which will make it distinctive from MANET in addition to challenging for designing VANET applications.

a) High dynamic topology: The topology of VANET changes because of the movement of vehicles at high speed. Suppose two vehicles are moving at the speed of 20m/sec and the radio range between them is 160 m. the link between the two vehicles will last 160/20 = 8 sec.

b) Frequent disconnected network**:** From the highly dynamic topology results we observe that frequent disconnection occur between two vehicles when they are exchanging information. This disconnection will occur mostly in sparse network.

c) Mobility Modeling: The mobility pattern of vehicles depends upon traffic environment, roads structure, the speed of vehicles, driver's driving behavior and etc**.**

d) Battery and storage capacity: In modern vehicles battery and storage is unlimited. Thus it's enough computing power which will be unavailable in MANET. It's great for effective communication & making routing decisions.

e) Communication environment: The communication environment between vehicles is significantly different in sparse network & dense network. In dense network building, trees & other objects behave as obstacles and in sparse network like high-way this things are absent. And so the routing approach of sparse & dense network is likely to be different.

f) Interaction with onboard sensors: The present position & the movement of nodes can certainly be sensed by onboard sensors like GPS device. It will help for effective communication & routing decisions.

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III. BASIS ELEMENTS OF VANET

A. Road Side Unit (Rsu) [15]

It is the small kind of device which is fixed along the road side which helps to locate the nearby junctions and parking the RSU is a network which is dedicated shoot communication based on radio technology so that the other user can also get the same information and forward to other user.

B. On Board Unit (Obu)

It is a device placed on the board of the vehicle so that it can get the information through RSU to define the particular range of vehicle and lane. The main function of OBU is to define the area geographically routing network and congestion control network, transfer message and data security

C. Application Unit (Au)

The application unit detects the message which is forward by OBU .it is inbuilt function in the vehicle so that the provider or user can access the right information. This application also used to run the internet.

IV. CHALLENGES IN VANETS

A. Bandwidth Limitations

It is the main issue in the VANET [29] technology that the center coordinator is absent which can cause the problem in communication nodes the limited range of the bandwidth is (10- 20 mhz). The proper use of bandwidth helps us to get the message on time and reduces the time delay.

B. Signal Fading

This problem occurs due to signal loss or fading is also the problem as it occurs due to the uncertain change in the environment condition by raining or wind blow which breaks the signal and user is unable to get the information

C. Connectivity

Connectivity also effect the signal some time as if the user travels on the congested are or on highway where the signal changes at random on that way it is touch some time to get the signal for further information

V. 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

VI. TYPES OF CLUSTERING [17]

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

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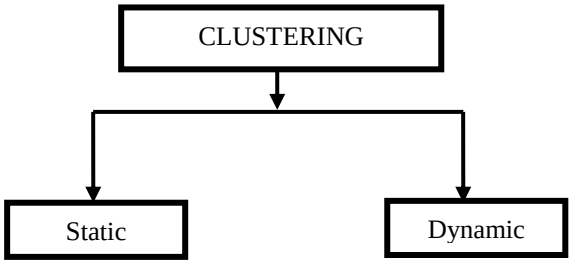

Fig 1: Types of Clustering

A. 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.

B. 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.

VII. SURVEY FOR CLUSTERING PROTOCOLS [19]

For efficient communication among the nodes in the network, stable clustering is required. In this direction, many researchers have used various techniques to form a stable cluster among the nodes. Some of these techniques consist of the use of signal strength received, node position from the cluster head, velocity of the nodes and direction and destination of node. Keeping in view of the above issues, the detailed taxonomy of various clustering algorithm is described in Fig. 2

A. Predictive Clustering

In predictive clustering, the cluster structure is determined by the current geographic position of vehicles and its future behavior. This vehicle traffic information helps to associate priorities which then assist in cluster formation. The future position and the intended destinations of vehicles have been used in the literature to form clusters in VANETs.

B. Backbone Based Clustering

Backbone based clustering technique is based on forming a backbone for cluster communication. The backbone then performs the communication and assists in CH election among the members of the cluster.

C. MAC Based Clustering

Several Medium Access Control (MAC) based clustering techniques have been proposed for cluster formation in VANETs. These techniques use IEEE 802.11 MAC protocol to generate clusters.

D. Traditional Clustering

This section discusses the Traditional Clustering techniques used in VANETs. These techniques are further divided in to active and passive clustering based upon the role of nodes in VANET.

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E. Hybrid Clustering

Hybrid clustering techniques combine two or more existing techniques such as use of artificial intelligence, fuzzy logic etc.

F. Secure Clustering

VANETs can support applications and services for safety and comfort for the passengers on the road and assist in improving the efficiency of the road transportation network. However, many serious challenges remain to be solved before efficient and secure VANET technology becomes available. One of these challenges is an efficient authentication of messages using cryptographic techniques. Solutions for secure International Journal of Computer Applications clustering in VANETs require efficient clustering algorithms in terms of complexity, scalability, availability and reach ability.

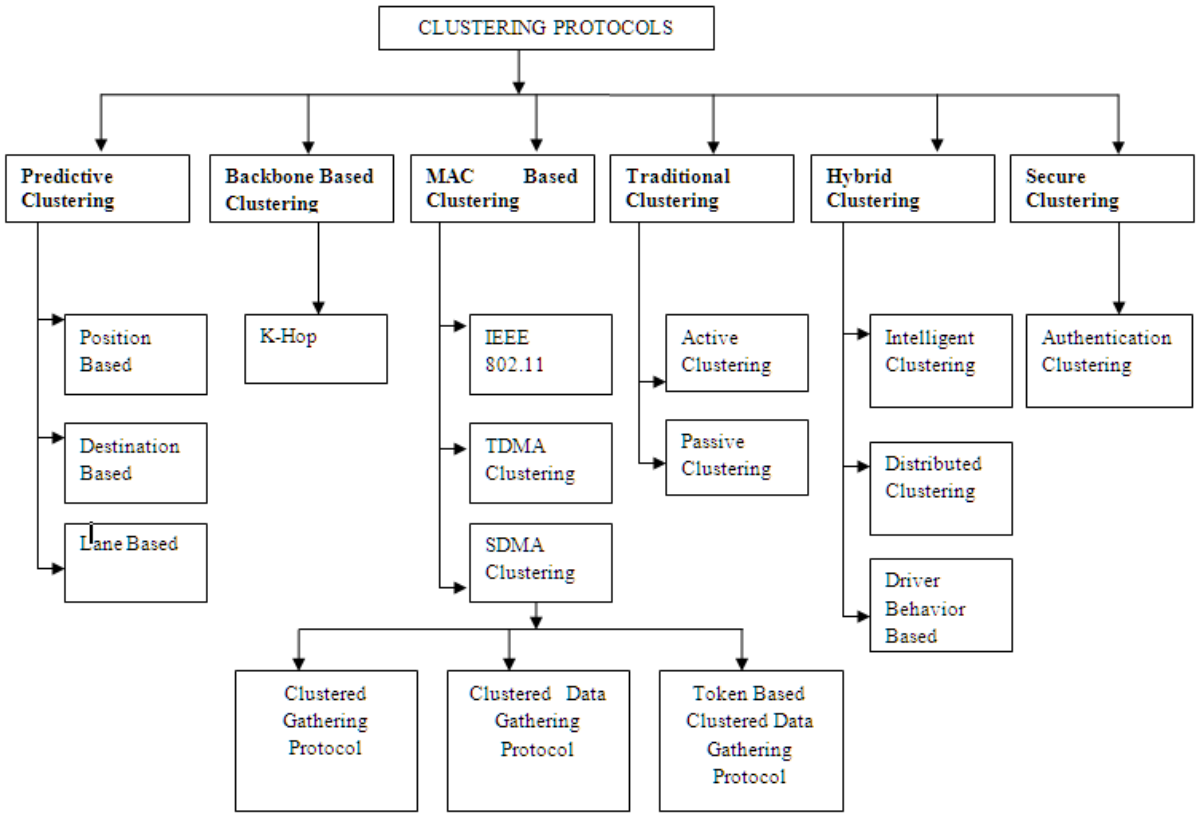

Fig 2: Clustering Protocols

VIII. 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.

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Maintenance algorithm also describe the following methods

- Joining the Cluster
- Leaving the Cluster
- Merging the Cluster
- Resigning Procedure of Cluster Head

IX. VEHICULAR MOBILITY MODEL

As portrayed in [13], a mobility model clearly influences the simulation results. Ergo, since simple models like the Arbitrary Waypoint mobility model don't contemplate cars 'particular motion habits, they can't be placed on simulation of vehicular networks. Accordingly, we produced in [5] a fresh reasonable mobility model, called Vehicular Flexibility Model (VMM), that's agreeable with the maxims of the typical structure for mobility models generation defined in [14], and capable of modeling detail by detail vehicular actions in numerous traffic conditions. Following the typical classification planned by [15], VMM has a tiny and a macroscopic portion:

A. Macro-Mobility

The macro-model is represented with a graph where vertices and ends signify, respectively, junction and path elements. As planned by [16], an excellent means to fix arbitrarily generate graphs on a particular simulation region is Voronoi tessellations predicated on spread items within the simulation region which signify limitations (e.g., buildings). Consequently, we obtain a planar graph representing a set of downtown streets, intersections and obstacles. Then, in order to boost the reality, as heavy areas such as for example town centers have a larger amount of limitations which in turn increase how many Voronoi domains, the model produces clusters of limitations with different densities, eventually creating clusters of Voronoi domains. Determine 1(a) gifts a arbitrary topological road with evenly distribute obstacles.

B. Micro-Mobility

Micro-Mobility When considering micro-mobility, you need to look at the driver's position of view. Whenever a driver techniques an intersection, it should slow down then act in line with the traffic signs or traffic lights he or she reads, and to the current presence of different cars approaching the same intersection. To obtain an identical conduct, the existing Wise Driver Product [17] is prolonged to gain the Sophisticated Wise Driver Product (AIDM) supporting intersection management. To this end, deceleration and speed types influenced by the Akcelik's acceleration/deceleration model [18] are added in vicinity of path intersections, to ensure that vehicles approaching a traffic light or perhaps a crossroad minimize their speeds or stop. Included will also be a set of principles describing what taken by individuals at intersections with regards to the class of traffic signs, their state of traffic lights and different vehicles presently within the intersection or looking forward to their turns.

X. CONCLUSION

Cellular systems in comparison to wired systems have distinctive characteristics. In cellular systems, repeated system topology changes would bring about by node flexibility, which are rare in wired networks. In contrast to the stable url capacity of wired systems, wireless url capacity frequently ranges due to the impacts from

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transmission power, phone sensitivity, sound, falling and interference. Furthermore, wireless cellular systems have a high error rate, power limitations and bandwidth constraints.

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