



# **Performance of Cluster Based Routing Protocol Using VANET**

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**ABSTRACT:** In view, this paper provides a review of various routing techniques based on clustering algorithm. The main motive is to select a particular technique that exist in literature depending on the need of Vehicular Ad Hoc Network (VANET) is subclass of Mobile Ad Hoc Network (MANET) which has become active area for research, standardization, and development because it has tremendous potential to improve vehicle and road safety, traffic efficiency. There are lot of challenges in VANET to route the packet to destination because of high mobility involved in the network. keeping the constraint of mobility applications. Clustering in VANET is a control scheme to manage media access and make VANET as a global topology. Most algorithms and protocols are derived from Mobile Ad-hoc Network (MANET) which have some challenges and regarding issues. The architecture of VANETs with the application and constraints of routing protocols is explained in this paper. It searches the motivation behind the development of these clustering protocols. In this paper classification of various clustering routing protocols is done on the basis of following parameters i.e. research methodology, their advantages and disadvantage, various challenges and problems faced during the implementation of routing technique.

**KEYWORDS:** Clustering, Routing Protocols, Vehicular Ad Hoc Network (VANET), V2V, V2I, ITS.

## **I.INTRODUCTION**

Due to the development of technology in Mobile Ad Hoc Network and in vehicles, a lot of momentum is gain in the field of Vehicular Ad Hoc Network (VANET). VANET have become a growing field of study for the researchers from different fields including Mechanics, Electronics, Networking etc. VANET represent a evolution of wireless ad hoc networks that enable inter vehicle communication and communication with infrastructure or roadside equipment. The term Intelligent Transportation System (ITS) refers to add information and communication technology to infrastructure and vehicles in order to improve the safety of road transportation and road sides or the nearby buildings. Communication in vehicles is possible through the On-Board-Unit (OBU) installed in the vehicles over a Dedicated Short Range communication (DSRC).

VANETs follow the IEEE 802.11p standards assigned to Wireless Ad Hoc Vehicular Environment .

In this paper, a detailed description of routing protocols which are used in clustering of vehicles is presented. Clustering based routing protocols are dependent on the position and size of clusters. The greatest advantage of Clustering based routing protocol in comparison to other routing protocols is that it helps to reduce the overhead involved in the network and delay of the network. It helps to increase the safety of the vehicles and it increases the packet delivery.

## **II.RELATED WORK**

In paper[1], S.Sadek M. Noha et al (2015), have discussed about Intelligent Transportation Systems (ITS) that have been receiving significant interest from various stakeholders worldwide. ITS promise major enhancements to the



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efficiency, safety, convenience and sustainability of transportation systems. To satisfy the diverse vehicular application requirements, this paper had proposed, an integration of IEEE 802.11-based VANET and LTE cellular network using mobile vehicular gateways. IEEE 802.11 g is used for V2V communications and LTE for V2I communications. A burst communication technique is applied to prevent packet losses in the critical uplink ITS traffic. A performance simulation-based study was conducted to validate the feasibility of the proposed system in an urban vehicular environment. The system performance was evaluated in terms of data loss, data rate, delay and jitter. The results indicated that the proposed Multi-RAT system offers acceptable performance that meets the requirements of the different vehicular applications

In paper[2], **Mor Annu (2013)**, had discussed about, Vehicular Ad Hoc Network (VANET) which is a sub class of mobile ad hoc networks. VANET is most advanced technology for intelligent transportation system that provides wireless communication among vehicles and vehicle to road side equipments, according to IEEE 802.11p standard for end to end communication between vehicles. One of the most important routing protocols used in ad hoc networks was AODV. This protocol is connectivity based reactive protocol that searches routes only when they are needed because bandwidth is limited and topology frequently changed. It always exchanges control packets between neighbor nodes for routing. In this article author presented cross layer technique that found channel security at link layer to AODV routing protocol to improve the communication in vehicles for safety purpose. To reduce the packet delay in AODV, the routing protocol (AODV\_BD), was proposed. It reduced the packet delay in AODV and made routes more stable.

In paper[3], **T.Karthikeyan and B. Subramani (2014)**, had surveyed about QoS based agent routing algorithms in MANET, WSN and VANET. One of the most challenging tasks in Ad-hoc Network (MANET & VANET) is Quality of Service (QoS) which is determined by numerous parameters such as bandwidth and delay constraints, varying channel conditions, power limitations, node mobility, dynamic topology, packet delivery ratio, end-to-end delay and connection duration. With the increasing demand for real time applications in the Wireless Sensor Network (WSN), real time critical events anticipate an efficient quality-of-service (QoS) based routing for data delivery from the network infrastructure. Designing such QoS based agent routing protocol to meet the reliability and delay guarantee of critical events while preserving the energy efficiency was a challenging task.

In paper[4], **Tejpreet Singh et al (2013)**, had discussed about VANETs, that are highly dynamic in nature due to mobility of nodes and this dynamic nature caused topological change in the network, which may affect the communication and security of whole network. There are various attacks which may effect the network, but wormhole attack is one the harmful attack which may affect the communication in VANET. This is so because wormhole may lead to attacks like Denial of service attack, data tampering, masquerading etc. In this paper performance of different routing protocols were analysed on the basis of metrics like throughput, end-to-end delay and jitter. Performance of routing protocols were analysed in two cases first, without wormhole attack and second is with wormhole attack and it has been checked how much performance of routing protocols AODV, OLSR and ZRP was degraded with wormhole attack.

In paper[5], **Kshirsagar Suresh Nikhil and Dr. U. S. Sutar (2015)**, have thrown light on accident prevention and traffic signal control for ambulance, police van, and normal vehicles too. To overcome this they have implemented a highway model, intersection model that manages vehicle mobility and shows the actual communication between vehicle to vehicle (V2V) and vehicle to infrastructure (V2I). The security of VANET technology is one of the most critical issues because their information transmission is propagated in open access environments. Over a period of years, VANET has received increased attention as the potential technology to enhance active and preventative safety on the road

### III. LEACH PROTOCOL

**Low-energy adaptive clustering hierarchy "LEACH"** is a TDMA-based MAC protocol which is integrated with clustering and a simple routing protocol in [wireless sensor networks](#) (WSNs). The goal of LEACH is to lower the energy consumption required to create and maintain clusters in order to improve the life time of a wireless sensor network.



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LEACH is a hierarchical protocol in which most nodes transmit to cluster heads, and the cluster heads aggregate and compress the data and forward it to the base station (sink). Each node uses a [stochastic](#) algorithm at each round to determine whether it will become a cluster head in this round. LEACH assumes that each node has a radio powerful enough to directly reach the base station or the nearest cluster head, but that using this radio at full power all the time would waste energy.

All nodes that are not cluster heads only communicate with the cluster head in a TDMA fashion, according to the schedule created by the cluster head. They do so using the minimum energy needed to reach the cluster head, and only need to keep their radios on during their time.

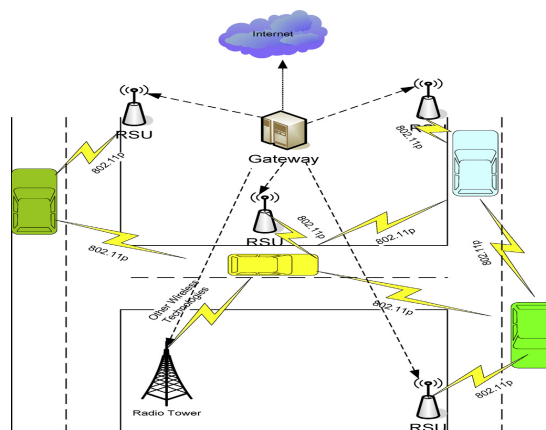
## PROPERTIES OF LEACH PROTOCOL

- 1.Cluster based Random cluster head selection each round with rotation. Or cluster head selection based on sensor having highest energy
- 2.Cluster membership adaptive
- 3.Data aggregation at cluster head
- 4.Cluster head communicate directly with sink or user
- 5.Communication done with cluster head via TDMA
- 6.Threshold value

## IV.VANET ARCHITECTURE

Reduce the traffic jams and fuel consumption of the vehicles Effective utilization of ITS can improve the driving comfort and it can also increase the safety and it helps to reduce the traffic jams. The communication in VANETs is carried out in two ways either from Vehicle-to-Vehicle or From Vehicle-to-Road side units installed on VANET Architecture consists of a Road Side Unit (RSU) and an On-Board Unit (OBU) that is installed in the vehicles. The vehicles transmit messages from OBU to another OBU or from OBU to RSU and messages can be transceived from RSU to RSU as described in Figure 1.

If any vehicles transmits a message but there is no other vehicle in the specific range a certain vehicle, then the message is stored at the RSU and can be retrieved when any vehicle comes in the its Range3.VANET represent a evolution of wireless ad hoc networks that enable inter vehicle communication and communication with infrastructure or roadside equipment.





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## Communication Pattern in VANETs

Various communication patterns with purpose, communication mechanism, direction, QoS is all described with an example4.

**Beaconing:** Information is updated about the speed, position and the nearby vehicles among the nodes. The data packets are broadcasted through link layer over single-hop communication.

**Geobroadcast:** Information about sudden occurrence of an even or an abnormality is broadcasted over a larger area in which sender attaches the determined location with message.

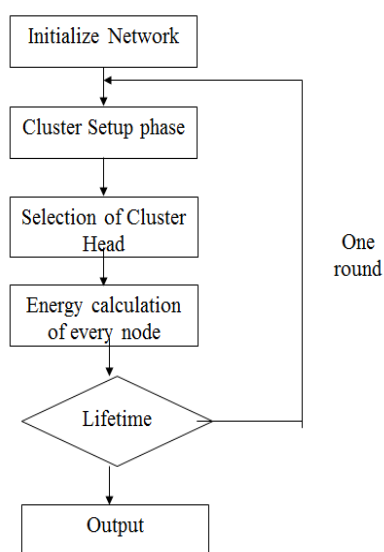
**Unicast Routing:** Unicast transportation of messages specified direction. Multi-hop communication is more suitable for this communication..

**Advanced information Dissemination:** Provides information to the vehicles that experiences a delay due to network partitioning. The messages with high priority are handled first when the bandwidth is available for a limited period.

**Information Aggregation:** Communication overhead is reduced which in turn decreases the probability of collision and dropping of packets.

An efficient fault tolerant service discovery protocol for VANETs is proposed in 7. Due to faulty components between service provider and service requester there is decrease in dropped connections and service request satisfaction. This decrease in connections and service request satisfaction can be improved by fault tolerant techniques. In Fault Tolerant Location based Vehicular Service Discovery Protocol (FTLocVSDP) requester specifies the region of interest within the request and the protocol uses discovery of location based services.

## V.BLOCK DIAGRAM OF CLUSTER FORMATION





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## Constraints and Challenges

Due to the dynamic nature of VANETs, routing has various challenges and constraints with respect to management of Quality of Service (QoS) for various services:

Rapid topology changes due to mobility.

Variation in vehicle velocity and density on the road.

❖ Sparse distribution of vehicles in some geographical leads to loss in connectivity among vehicles resulting in declining performance of network

❖ Efficient clustering and selection of Cluster Head (CH) based upon some predefined criteria Intrusion detection and security

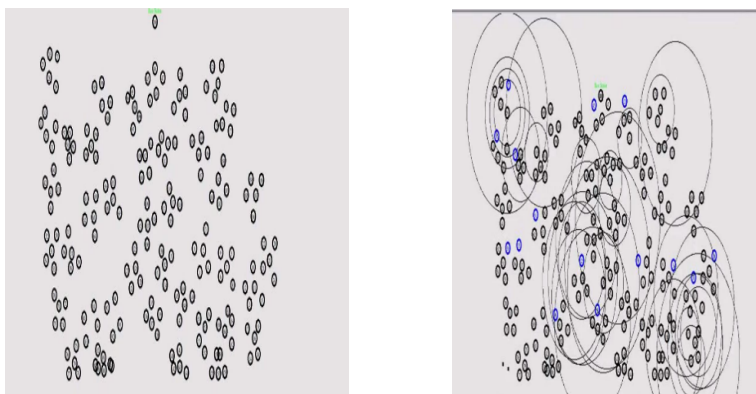
## Applications of Routing

The Categories for routing application can be divided into three classes namely safety, transport efficiency and infotainment. Fast message dissemination and collision avoidance can be categorized under safety application. Route update and traffic monitoring are the major applications which are categorized under transport efficiency category. Other applications like asking for nearest petrol pump, nearest car parking location or room available in hotel or nearest service station which are not crucial but can increase comfort for people are categorized as infotainment application .

Some more important applications of routing in VANET are:

- 1.Alert generator
- 2.vehicle maintenance

## VI.RESULT ANALYSIS



## VII.CONCLUSION AND FUTURE WORK

From the Last few years, Vehicular Ad Hoc Network is the most emerging and new technology which is combination of networking and transportation and it is used in various application fields such as Rescue and surveillance operations, entertainment etc. For all these applications, there is a requirement of efficient routing techniques within the constraints such as Mobility and topological changes in the network. This paper provides a complete classification of various clustering based routing schemes with their relative advantages and disadvantages of each other. In future, we would implement one of the above defined schemes and compare its performance over the other schemes of its category.

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