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Improving QoS and Reducing Energy Consumption in Cluster-Based VANET Routing Protocol

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Abstract- Wireless networks are classified into different types of networks namely infrastructure and infrastructure less networks. In infrastructure less network Vehicular adhoc network is an energy oriented multibroadcating network, nowadays due to the rapid growth and development in the automobile sector many accidents are occurring during driving a vehicle. In simulation environment various protocols are designed to monitor the network performance and to increase the network performance, in our proposed method we designed a new protocol named cluster based VANET routing protocol (CBVRP) to increase the network performance and to reduce the energy consumption. The protocol aims to minimize the energy consumption to increase the lifetime of the network and increasing the quality of service parameters like packet delivery ratio, reducing delay, reducing normalized routing overhead and increasing efficiency. The results shows that the proposed protocol improves the quality of service parameters and it consumes less energy compared with an existing protocol.

Keywords: VANET, Energy, Quality of Service.

I. INTRODUCTION

Wireless networks consists of different types of architectures namely distributed architecture, hybrid architecture, centralized architecture and clustered architecture. Cluster based vehicular adhoc networks comes under clustered architecture, here all nodes are energy oriented and each node in the architecture will be act as an server as well as clients. During the time of data transmission a group is formed, a group is called as a cluster, in a cluster one node will be assigned as a cluster head and remaining nodes will be assigned as cluster members. Cluster head is assigned depending on the energy availability in the node, distance between the node and the server node. Here all nodes in the network are dynamic so the topology can be changed time by time, during this process it consumes more power. Mobility plays an important role in VANET network, due to the mobility cluster heads can be changed period of time and any node can be joined or leaves the network at any point of time.

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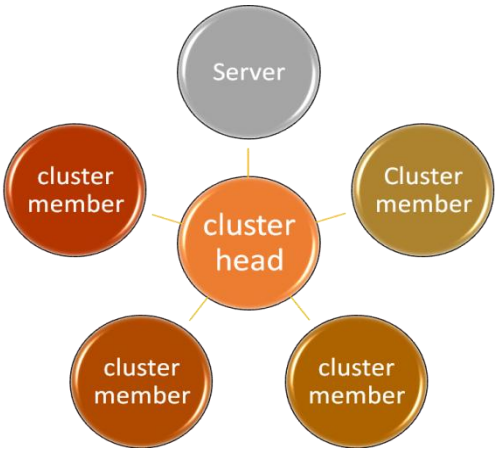

Fig.1 Clustered Architecture

The above figure shows that in a distributed architecture one node will be selected as a cluster head, one node will be selected as a server and other nodes will be considered as a cluster member in the network.

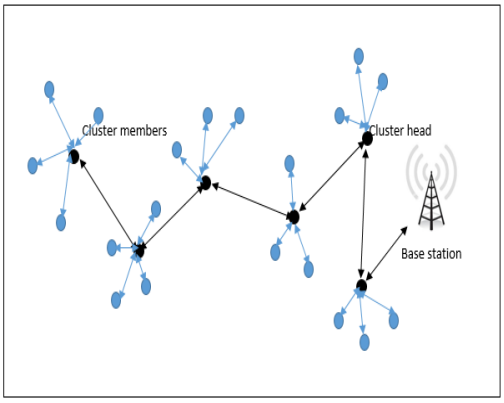

Fig.2 Clustered Architecture

In the above figure it shows that how the data transmission will be occurring in the vehicular adhoc networks. Initially a node wants to transmit a data from one network to another network means it sends a data to the cluster head and the cluster head forwards the data to the another cluster head through gateway node and finally it reaches the base station for transmission through another network.

II. ROUTING PROTOCOLS

A. CBR:

CBR is a clustered based routing protocol designed for vehicular adhoc networks. Initially it creates a group, in a group one node will be selected as an cluster head and the other nodes will be acts an member.

A cluster head will be selected based on the energy availability and distance, Cluster heads will communicate between each other through gateway nodes. It uses clustering structure to increasing the throughput and to decrease the end to end delay and energy consumption.

B.CBDRP:

CBDRP is a cluster based directional routing protocol develops for vehicular adhoc networks to increase the network performance. The main idea behind this protocol is to divide geographical area into grids and interchanging the beacon signals. In this network all nodes in the network waits for a T1 period of time, if no beacon signals will be received means a node sends a beacon signal APPLY signal to the network for T2 period of time. Based on this a cluster head will be elected and the data will be transmitted through the cluster head, if no node sends a reply message means a node transmitted APPLY signal will be automatically selected as an cluster head. Here 4 steps process is applied first and second step for route establishment, third step for route link failure and fourth step for disconnecting the link after data transmission.

C.CBVRP:

CBVRP is a clustered based vehicular adhoc network routing protocol designed for a VANET network. Here all nodes in the network are dynamic and this protocol is designed for communicate one vehicle to another vehicle and to communicate one vehicle network to another vehicle network through a base station to avoid accidents occurring in the roads. The main objective of the protocol is to reduce the normalized routing overhead, to reduce the delay and to increase the efficiency.

III. VEHICULAR ADHOC NETWORKS

In vehicular adhoc networks the communication is takes place between two categories namely vehicle to vehicle communication without any base station connected in the network, the second one is the vehicle to infrastructure network.

Fig.3 Types of Vehicular Communication

In the above figure it shows that the classification of vehicular communication in VANET environment.

Fig.4 Applications of VANET

In the above figure it shows that the applications of VANET, it uses in safety application, traffic management application and comfort-maintenance applications.

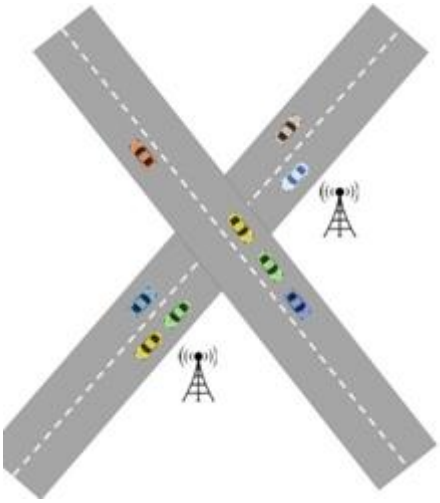

Fig.5 VANET Environment

In the above figure it shows that the formation of VANET environment here all nodes in the network are dynamic in nature.

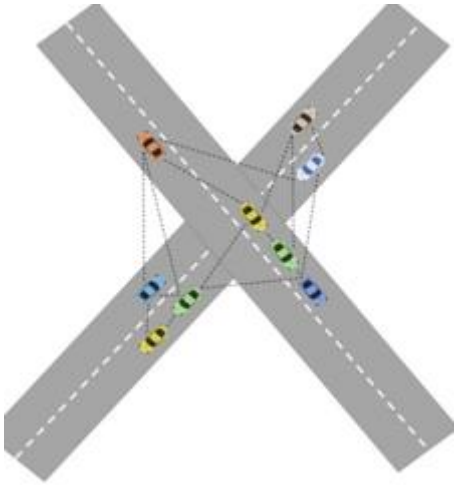

Fig.6 Vehicle to Vehicle Communication

In the above figure it shows that how the data communication is takes place in the VANET environment.

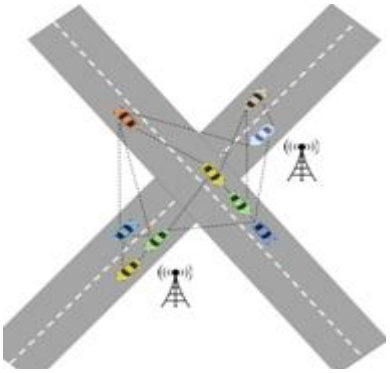

Fig.7 Vehicle to Vehicle Communication through BS

In the above figure it shows that during the data communication through base station how the cluster head will be selected and how the cluster heads transmits the datas through gateway nodes in the network.

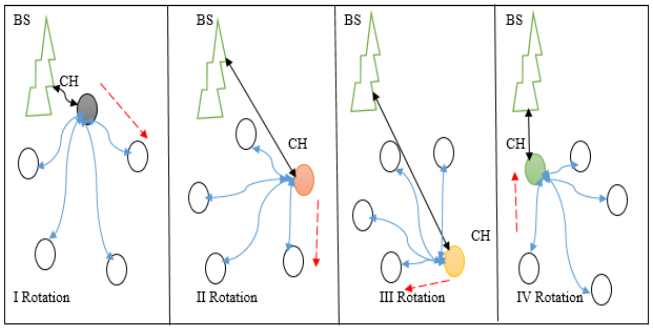

Fig.8 Cluster Head Selection

In the above figure it shows that the cluster head will be selected based on the energy in the node and the node distance from the base station. A cluster head varies time to time depending upon the energy availability in the node and the distance between the node from the base station at each period of time the clustered structured is rotated.

III PERFORMANCE EVALUATION

The performance of the network is evaluated by using the network simulator version 2.35.

TABLE 1
SIMULATION SETUP

Routing protocol	Adhoc on demand distance vector
Number of nodes	Vary from 50 to 300
Number of stable nodes	Vary from 4 to 6
Queuing type	Priority queue
Interval time	0.01ms
Antenna type	Omni directional antenna

IV SIMULATION RESULTS

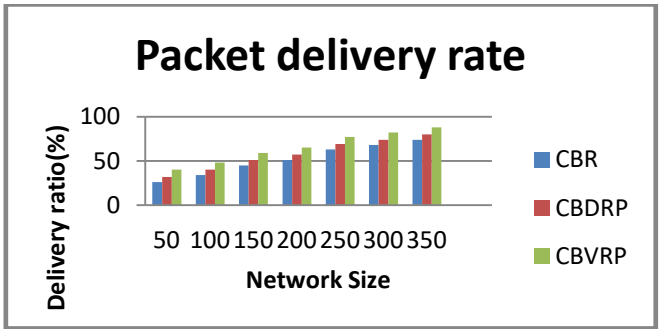

Fig.9 Packet delivery rate

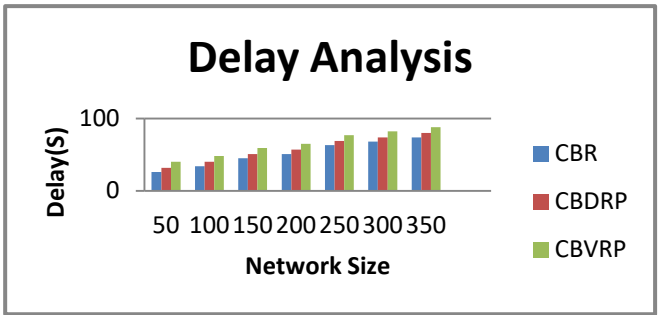

Fig.10 Delay Analysis

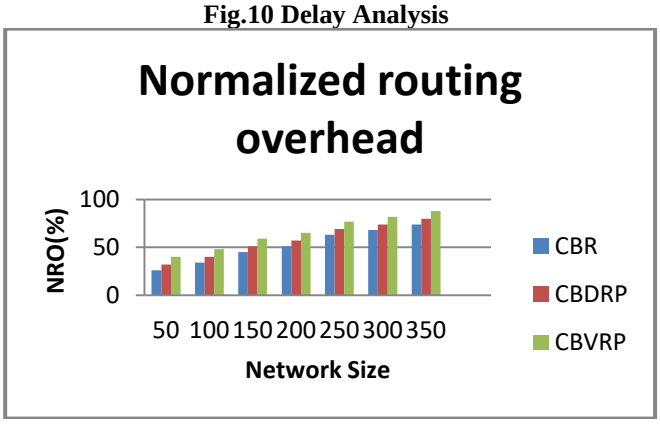

Fig.11 Normalized routing overhead

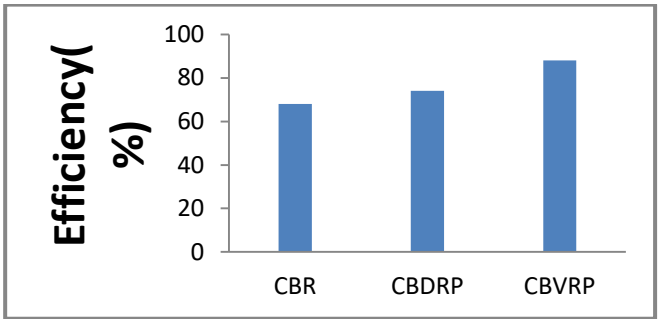

Fig.12 Efficiency

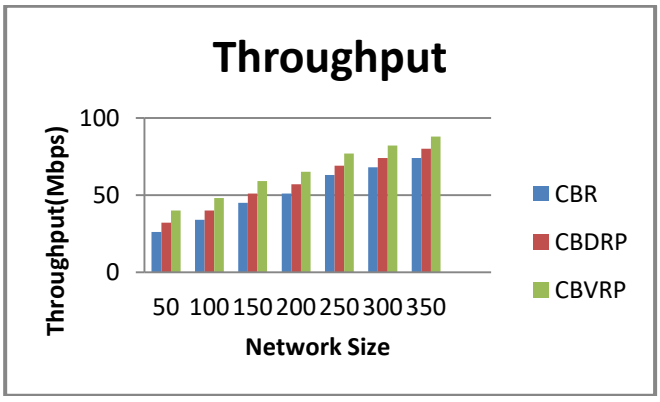

Fig.13 Throughput

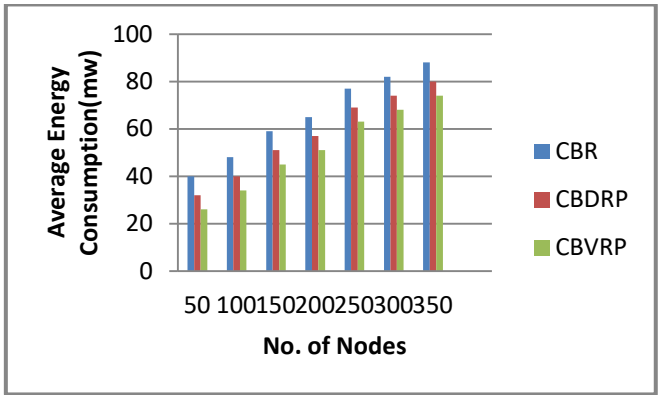

Fig.14 Energy Consumption

V CONCLUSIONS

In our proposed protocol cluster based vehicular adhoc network routing protocol is a energy efficient and congestion reduction routing protocol. The performance of the vehicular adhoc network can be calculated based on the quality of service parameters like packet delivery rate, delay, normalized routing overhead, efficiency, throughput and energy consumption.CBVRP consumes less energy compared with an CBR and CBDRP and QoS parameters like packet delivery rate, efficiency, throughput is high and delay is less during data transmission when compared with the existing routing protocol. Finally we conclude that CBVRP performs better and the performance of the network is high when compared with the existing protocols.

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