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Load Balancing & Channel Assignment for Cluster Based MANET in Heterogeneous Network

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ABSTRACT: Energy and bandwidth efficiency is most important in the MANET network. By using the coordinated protocol with infrastructure there is a lack in the channel allocation dynamically. For effective communication in the Manet, efficiency of bandwidth is most commonly considered. So two types of mechanism are proposed they are dynamic channel allocation algorithm and cooperative load balancing algorithm. Dynamic channel allocation algorithm, power level was continuously monitored by the cluster head in the network.The cooperative load balancing algorithm is used to detect the overload of cluster heads and shift their load to the other cluster head with more available resources.By achieving the better bandwidth efficiency and throughput, the network is created in cluster basis heterogeneous with load balancing and channel allocation techniques. Heterogeneous network model is included for providing the mechanism in different environment which illustrates the resource utilization in dynamic topology.

KEYWORDS: bandwidth efficiency, load balancing, dynamic channel allocation

I. INTRODUCTION

A mobile ad-hoc network (MANET) is the infrastructure less network. The group of mobile devices isinterconnected by wirelessly and continuously self-configuring infrastructure. The topology of the network was unpredictable. Mobile ad hoc networks (MANETs) are forming a temporary network dynamically. It does not use any existing infrastructure. It allows the topology of the network and interconnections between nodes to change rapidly.

1.1. APPLICATIONS OF MANET

MANET was used in many practical applications, such as, Personal area network,Military applications, Disaster applications such as flood, earthquake. Etc..,

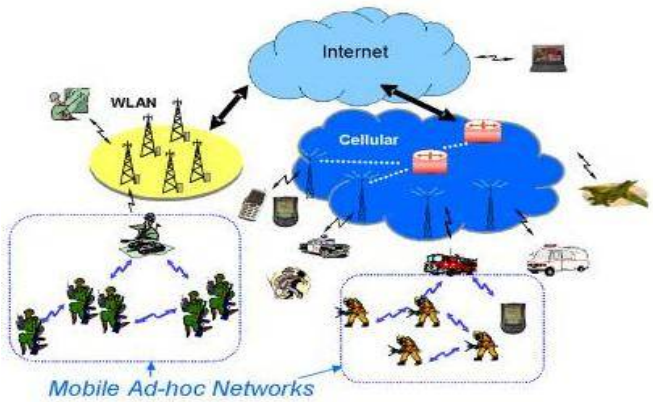

Figure 1.1: Mobile Ad-hoc Network

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II. RELATED WORK

In the multihop wireless network, the CSMA method used to enable the similar radio resources to be allocated in different b locations; it leads to increased bandwidth efficiency due to hidden terminal problems. Various reservation techniques can be used to over the hidden terminal problem. Before the packet transmission, RTS/CTS packet exchange mechanism used to overcome the hidden terminal problem. The modifications of RTS/CTS mechanism has to be proposed to increase the bandwidth efficiency.

In coordinated MAC protocol, the channel controllers perform the channel assignment with channel reuse concept .the concept of cellular network used to access the channel through the base station, which has the fixed infrastructure. There are two type of channel allocation used in cellular system that are centralized and distributed allocation scheme. In centralized dynamic channel allocation method, the central coordinator can assign the available channels to the various cells. This type of systems having the high overhead so it cannot be suitable to MANETs .Distributed allocation, each cell in the network is assigned a number of channels, the channel are exchanged between the adjacent cells. This method cannot be directly applied to the Manet.

III. EXISTING SYSTEM

MANET has to be grown as essential in the developing applications. The energy and bandwidth efficiency are needed for transmission efficiently. The MAC protocol uses the bandwidth utilization efficiently with coordinated and uncoordinated protocols. In multi –hop wireless networks, CSMA techniques enable the same resources to be used in different locations which lead to the increased bandwidth efficiency due to hidden terminal problem. The bandwidth efficiency is the most important in the MANET for the packet transmission.so here two mechanisms are used dynamic channel allocation and load balancing algorithms.

1. Dynamic channel allocation algorithm:
In dynamic channel allocation algorithm, the channel controllers are reacting to increasing the network load by increasing their sharing of bandwidth. In this algorithm the cluster head continuously monitor the power level in the all available channels in the network. If the load was increases, the cluster head uses the additional channel to support the non-uniform network load, it increases the interference in the system. It also leads to the low latency links with an efficient communication with all nodes of the network.

2. Cooperative Load balancing algorithm:

In this algorithm, the loads on the cluster head start from the requirement of the ordinary nodes. Many nodes in a network have the capability access to more than one cluster head. The basic idea of the cooperative load balancing algorithm is that the active nodes can continuously monitor the load of the cluster headand the load interchanged between the heavily loaded to the ones with available resources.

The nodes can the capability to detect the channel depletion at the administrator and transfer their load to other cluster head with more available resources. The node can release the available resource with capability to shift, can be used for other nodes that do not have access to any other cluster heads. The total number of nodes that access the channel was increased. It also increases the service rate and the throughputof the system.

In this existing system, focused on bandwidth utilization and channel handover is not implemented. And leave the full adaptation of the system for delay sensitive communication as future work

Disadvantages:

- Communication delay is occurred
- Resources are used only for the existing assigned users
- Less reliability in packet transmission

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IV. PROPOSED SYSTEM

The proposed system implement a new network model by integrating the cluster based MANET with heterogeneous topology. The routing process of CH is perform the communication here the channel is assigned dynamically. Also the information about the next-hop is updated is used for achieving reliability. Integrating the MAC and Routing process is performing the transmission. The cluster head is continuously monitor the power level in all the available channels in the network and check the availability of the channels by comparing measured levels of power with predefined threshold value. Each node in the network is used to exchange their information using the distributed push approach. i.e. each node send hello packet to cluster head regularly. A cluster member node added their IP address into the hello packets and cluster head adds the IP address of its cluster member node into its cluster member into its HELLO messages as well. When a source node seeks to setup a connection to a destination, source sends a route request message to its cluster head CH.

It also uses the dynamic channel allocation and load balancing algorithm for providing data between the source and destination users. In this model, the base station is considered as the primary channel coordinator. The heavy load traffic stream is tackled by accessing the channel with the help of data slots of CH in entire duration

Advantages:

- Reliability is achieved
- Delay is highly reduced in routing of packet.
- High efficiency in resource utilization

4.1 SYSTEM ARCHITECTURE:

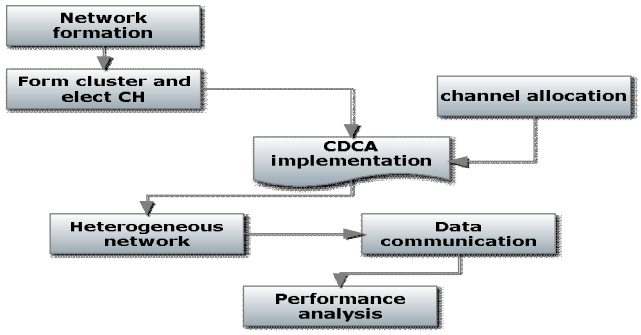

Fig: 4.1.system architecture

Network formation:

The network is created with number of mobile nodes according to MANETinfrastructure.The communication is performed between the mobile nodes. For efficiency, the clusters are formed in the network with the mobile nodes. Channel allocation is performed for the efficient communication between the clusters.

Form the cluster and elect cluster head:

The clusters are formed based on the range of the system. Here the range was assigned as 1010*1010m.cluster head was elected by their residual energy. Initially each node having the some energy, due to their mobility the energy was reduced. The CDCA protocol comprised the load balancing and dynamic channel allocation algorithm.

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Load Balancing and Dynamic Channel Allocation:

With the dynamic channel allocation algorithm, the network transmission range is sensed periodically to get available channels.Since the number of data slots is fixed, the cluster head can only offer channel access to a nodes within the group. Due to dynamic nature of nodes, theload on the cluster head originates from the demands of the ordinary nodes.In this the active nodes can continuously monitor the load of the channel coordinators and switch from the ones with available resources.

Heterogeneous Network:

The network is created with the Base station to perform efficient channel allocation and routing of packets. The route is established with the help of control packets such RREQ and RREP. The source and the destination communication are performed with the Cluster head and base station. The channel is assigned is assigned including the CDCA protocol.

Performance analysis:

The performance of the proposed system is compared with the existing system. The analysis is processed for the metrics such as throughput, end-end delay, and packet delivery ratio, routing overhead.Also the network lifetime of the system is increased.

FLOW DIAGRAM:

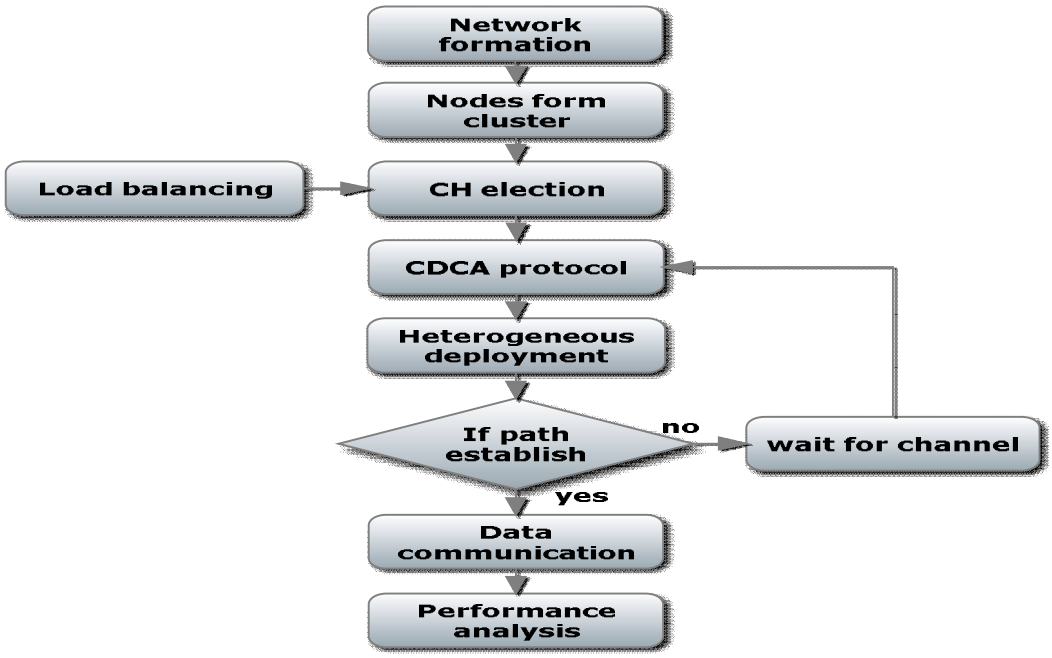

Fig:4.2. Flow diagram of the system

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V. RESULTS

In this section, analyze and compare the performance of proposed system with existing system.

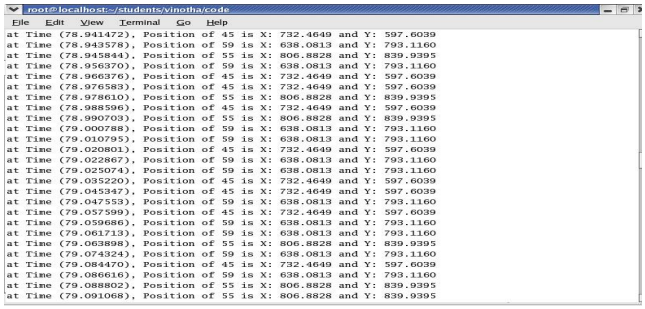

Fig: 5.1. Tracefile generation

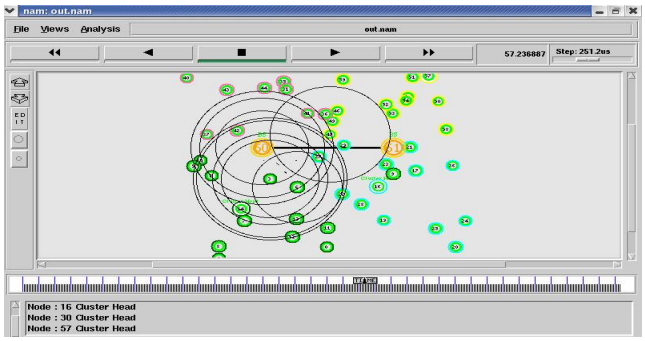

Fig: 5.2. Data transfer in the heterogeneous network

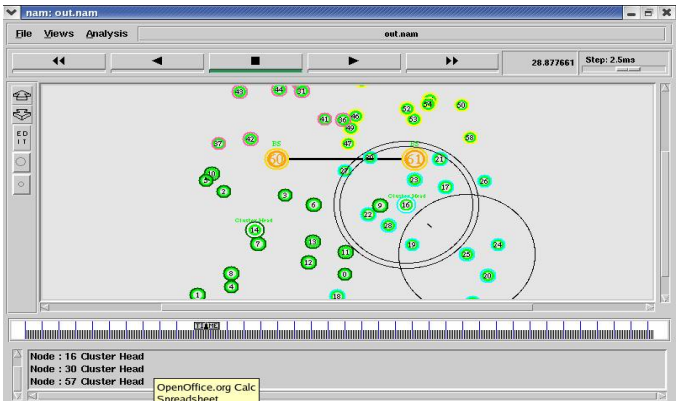

Fig: 5.3. Load balancing and channel allocation

(a) Packet Delivery Ratio:

Packet delivery ratio (PDR) is defined as the no.of packets received by destination divided by the no.of packets transmitted by the source

$$PDR = \frac{\sum \text{No of packets received}}{\sum \text{No of packets transmitted}}$$

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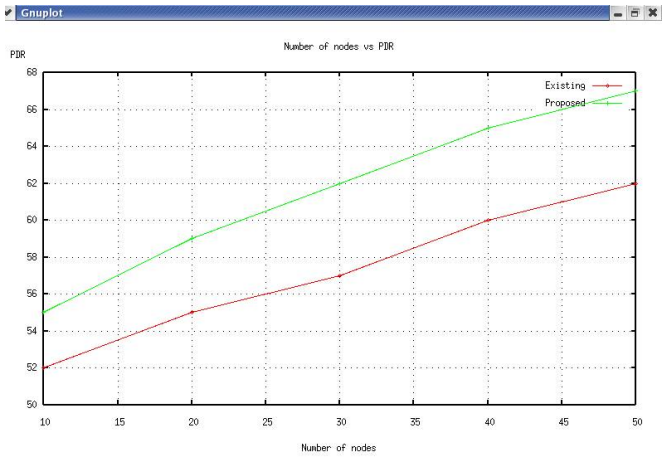

Fig: 5.4. PDR vs. Nodes

(b) Throughput:

It defined as the packets received by the receiver within the given amount of time period. In the graph throughput was increases with increment in number of demand.

$$\text{Throughput} = \frac{\Sigma \text{ Number of packets received}}{\text{Time}}$$

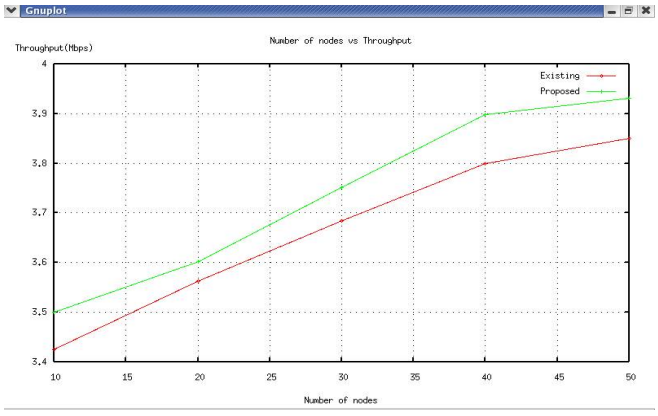

Fig: 5.5. Throughput vs. nodes

(c) End to End delay:

end –to-end delay of a packet is defined as the time taken by the packets travel from source to the destination.

$$\text{End} - \text{to end delay} = \frac{\sum (\text{arrive time-send time})}{}$$

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∑ No of connection

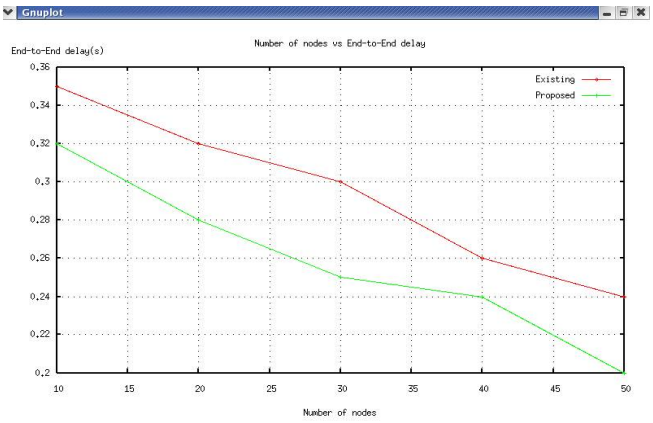

Fig: 5.6. End to end delay vs. nodes

(d) Routing overhead:

Both routing and data packets have to share the same network bandwidth most of the times.

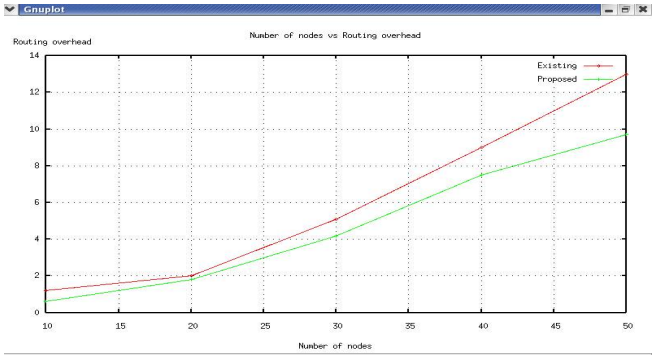

Fig: 5.7.Routing overhead vs. nodes

VI. CONCLUSION

In this project, the proposed system used the heterogeneous deployment in cluster based MANET. There are two algorithm proposed for delay sensitive communications. The cluster head continuously observe the power level in the available channels in the network and check availability of the channels by comparing the measured power levels. If the load on the cluster head increases above the capacity, the cluster head starts usingan additional channel with the lowest power level measurement. The mobiledevice in a MANET is free to move individually, and will therefore changeits links to other devices frequently. The difficult of the MANET is to properlyretain the information required toassign route traffic in each device. In this project, an efficient routing protocol is proposed forimproving the performance strategies in cluster based MANET. The channel is assigned dynamically by knowing the next-hop neighbors of CH. Load balancing and channel allocation are performed in this heterogeneous environment. The results show increased performance in terms of its parameters.

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