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Efficient Energy Optimization in Wireless Mesh Network Using Cluster Point

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***Abstract*—Now a days Internet Technology leads to the expansion of new class of network called as Wireless Mesh Networks (WMNs). Which contains mesh topology arrange across different district performing various tasks such as data aggregation, communication etc. Energy is very big issue in Wireless Network. So, in this paper we used the Two Hop Clustering based approach which optimizes the energy in Wireless Mesh Network and Result shows the significant improvement in energy.**

Keywords: Wireless Mesh Network (WMN), Base Station (BS), Cluster Head (CH.)

I. INTRODUCTION

A Wireless Mesh Network (WMN) is an application of Ad Hoc Network. it is an upcoming equipment that has invites a number of researchers because of its extensive ability to monitor and diagnosis the physical world. It has a number of approaching applications such as broadband wireless access, industrial applications, transportation systems, health monitoring, military etc. and stable topology for next generation wireless networking due to the characteristics such as multi-hop communications, self-forming, self-healing, self-organization, etc [1].

Within the network radio nodes are used for communication in mesh network. Figure1. Shows the architecture of WMN consist of mesh clients, mesh routers and gateways. The mesh clients are laptop, phone and wireless devices etc. Mesh router forward the traffic to the internet gateway. The some advantages of WMN are self organization, low cost, reliability and scalability. Clustering point is a most important technique for optimize the energy efficient [2]. We used the two hop Clustering based approaches which optimize the energy in Wireless Mesh Network. Our Result shows the significant improvement in energy.

The left behind part of the paper is organized as follows: Related work is briefly discussed in Section 2. In Section 3 we discuss about our proposed work. Section 4 we simulate our work in MATAB for the energy efficient optimization in WMN and we conclude with future scope in Section 5.

II. RELATED WORK

According to LCM links grouped into different group.CA and link scheduling is flow based algorithm. The two types

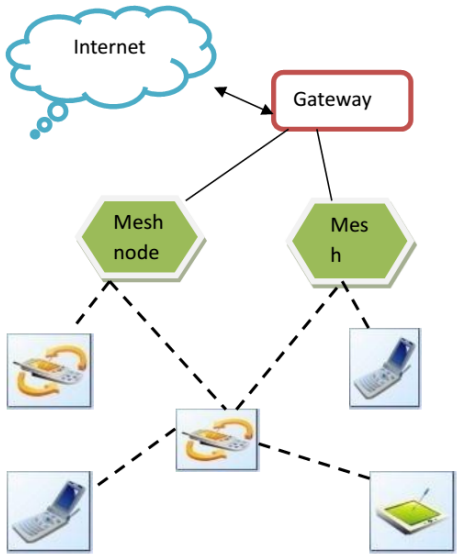

Fig. 1. Architecture of Wireless Mesh Network.

of algorithm can used CA (channel assignment) and link scheduling algorithm. i.e. improve performance and better capacity. Its improve packet delivery fraction, end-to-end delay, aggregate throughput, and fairness index and packet loss rate [3].

The classification framework based on scheduling algorithm. It focuses on scheduling algorithm which consider as scheduling data voice as well as video traffic [4]. The hierarchical agent-based secure and reliable multicast (HASRM) algorithm for security while used for electronic newspaper, magazine delivery, and multi-site business data distribution. it based on shortest path multicast tree. HASRM provide security like authenticate person can access the multicast data at any time. This algorithm extends the Hierarchical agent-based secure multicast for wireless mesh networks [5].

The main principle of HASRM algorithm is that to minimize the network cost by use of integrity mobility and service management. We working with clustering the three main elements are to be identifying in WSN: sensor nodes

(SN), CH and BS. The hundreds and more hundreds nodes sends the data to CH and CH receives the data from nodes and transmit to BS. In [6] explore a symmetric way of finding CHs for a regions called contour. Contour helps to aggregate the data from the region. Where the nodes are directly communicates to the BS takes more cost as compare to cost incurred using CHs. The high number of CHs gives better QoS in the network It is based on the regular graph theory and clustering method. There are three tiers: sensor, relay and BS tiers. These tiers are hierarchical and BS tier sits on the top of the system. Most of the nodes belong to senor tiers and relay tiers nodes can communicate with each other [7]. That suggested Residual Energy Efficient Heterogeneous (REEH) clustered hierarchy protocol for Wireless Sensor Networks to extend the life time of network [8].

In [9] where author consider the regular mesh topology for q=3,4,6,8 and it is provide the Systematic approach to select the CH in network systems based on the idea of k-dominating sets. Weight Election Protocol (WEP) for cluster based heterogeneous wireless sensor network. In which each sensor node has power control and easily throw the data to other sensor nodes [10]. A distributed clustering approach for long-lived ad hoc sensor networks named as Hybrid Energy-Efficient Distributed clustering (HEED). This protocol occasionally selects CH according to node remaining energy and node degree [11]. Hierarchical agent-based secure and reliable multicast (HASRM) algorithm for security while used for electronic newspaper, magazine delivery, and multi-site business data distribution. it based on shortest path multicast tree. HASRM provide security like authenticate person can access the multicast data at any time [12]. It discussed about mobile robots can be used successfully in a mesh network. It to improve the overall cost of network [13].

III. PROPOSED WORK

A Cluster Head (CH) is a node that collect the data from their neighboring nodes and compressed the data and send to Base Station (BS) [14]. It means CH working in two steps:a). CH receives the data from their neighboring nodes. b). The CH takes the data from their nodes and Compressed the data and sends to BS.

In our proposed work the some nodes are direct communicated to the BS and some nodes sends the data to CH and CH receive the data and sends to the BS. The following steps are:

1) The energy required by a node to communicate with its neighbour e nodes.
2) CH receives the data from their nodes and forward to Collection point. Direct nodes are directly sends the message to BS.
3) Compressed the data between BS and CHs.

For the wireless communication network, the radio model is used as used in [15].If the communication distance is more than the distance d0 multipath channel is used otherwise free space model is used for the network. So, the transmission energy of transmitting a k-bit message over a distance d is using this model network is:

$$E_{tx}(k,d) = k * E_{elec} + k* \in_{amp} *d^n \quad (1)$$

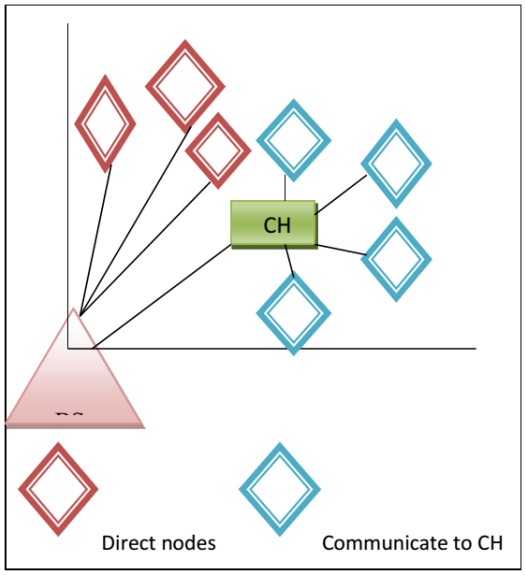

Fig. 2. Shows the Two Hop Clustering Approach in WMNs.

The equation 1 is used when path is lost and amplification factor are defined in equation 2 for free space and equation 3 for multipath space network.

$$E_{tx}(k,d) = \{k * E_{elec} + k* \in_{amp} *d^n, (d < d_0) \quad (2)$$

$$E_{tx}(k,d) = \{k * E_{elec} + k* \in_{fs} *d^n, (d > d_0) \quad (3)$$

Figure. 2 described the proposed work. In which some nodes have no CH, that nodes directly communicate to BS and some nodes sends the data to CH and CH then receive the data from the nodes and sends to the BS. which nodes sends the directly message to BS that take lots of energy as compare to other nodes which used the CH. Let the e1 be the energy that expended by the neighboring nodes of CH and CH receive the data from these nodes and sends to BS. The some nodes are direct sends the data to BS i.e. e2 energy is required by these direct nodes. E is energy that CH sends the data to BS. the energy expended by the nodes to CH is:

$$E + K(e_1) \oplus P(t_k^q - 1) \quad (4)$$

If there is no cluster in the network then it means the node is direct communicates to the network is:

$$PE(t_k^q - 1) \quad (5)$$

Subtracting the equation 4 from 5. The equation 6 gives the total energy required to our network is:

$$E + k(e_1)p(t_k^q - 1) - PE(t_k^q - 1) \quad (6)$$

A. *FLOW CHART:*

The flow chart shows the execution steps of our work. First to check the node types and then which nodes have near to CH that nodes sends the data to first to CH, then CH receive the data from the nodes and sends to the BS. If the nodes have

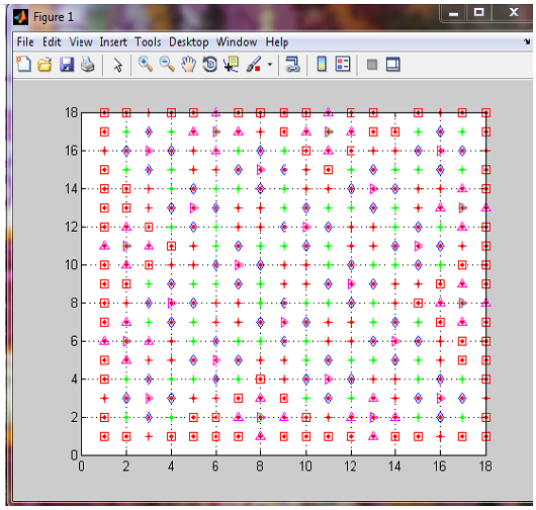

Fig. 4. Execution of two hop clustering approaches

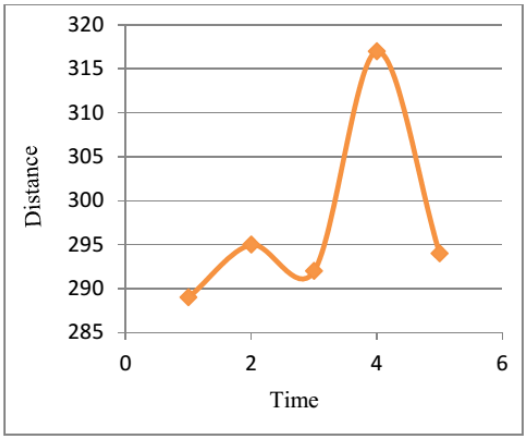

Fig. 5. Latency Observed with asynchronous time.

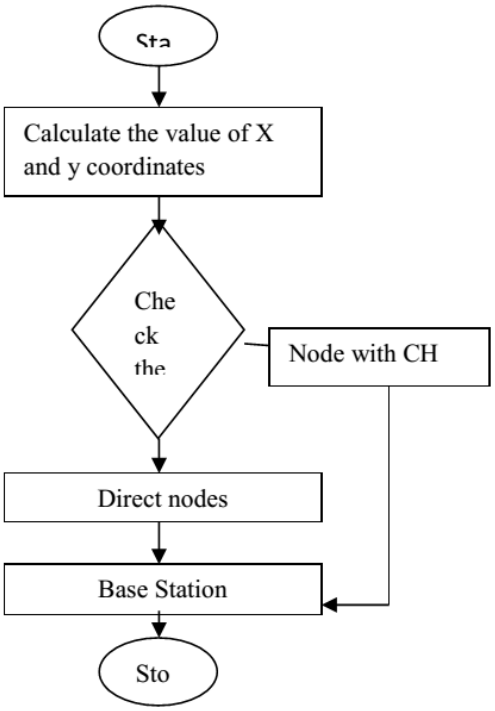

Fig. 3. Flow Chart for Clustering Point.

no cluster heads then it directly sends to the BS. Which nodes directly sends the data to BS, its take more time and energy as compare to the CH sends the BS.

IV. ALGORITHM

In the algorithm we first initialize the network size, n i j, which is at the intersection of ith and jth column is adjacent to the nodes in clustering. Each square in the center as one cluster head (CH) .Some nodes along the boundaries that directly sends the data to BS .CHs receive the data from the k=1 and k=2 hop and All the CHs transmit the data to the BS. Algorithm for our proposed work as follows:

Initialization network size;
$A = (x1, y2), (x2, y2).....(xN, yN)$

1) Step 1: Intersection of ith Row and jth Column is adjacent to the nodes in 1 level clustering. n i+1j, n i-1j, n ij+1, n ij-1
2) Calculate CH; $x = i(2k+1)modt_k^q$ Y=i
3) Calculate the energy for direct nodes to BS
4) Calculate the energy for nodes to CH
5) CH receive the data from nodes and sends to the BS.

V. RESULT

We designed and implemented our result by using Matlab. The underlying 2D-Basegrid had R=20 rows and C=20 columns. Every node in system had a buffer size to hold 80 messages and always send out a 5 bytes message. CH receives the message from nodes and transmitted to BS.The total numbers of nodes N=400 are distributed to the squared shape network field. The BS is fixed at . The parameters values are same as Leach [10].System reliability, lifetime enhancement and energy efficiency are the parameters for the performance evaluation for clustering approach. In Figure 5. Shows the relationship between Time and Distance. if we increases the time then distance will be also increases .it means time is asynchronies . in Figure.6 we increase the execution time then numbers of rounds will be time will increases. Figure.7 shows the energy increases then time will be decreases.

VI. CONCLUSION AND FUTURE WORK

We proposed a Two Hop Clustering in WMN with Cluster Heads for data aggregation. By focusing on regular mesh topologies; we presented an approach for selecting a cluster head in these topologies. Cluster Heads directly sends the message to BS then it takes efficient energy. in our approach the inner layer the energy required by a node to communicate with its neighbour e and the outer layer the energy required by a node to communicate with its neighbour e1, where CH is receive the data from both level. Cluster heads receive the data and send to BS. Finally, the simulation results present efficient energy optimization in wireless mesh network. In the future, we implement this approach with different mesh topology for q=3,6, 8. Two hop clustering to detection the collision issues and security.

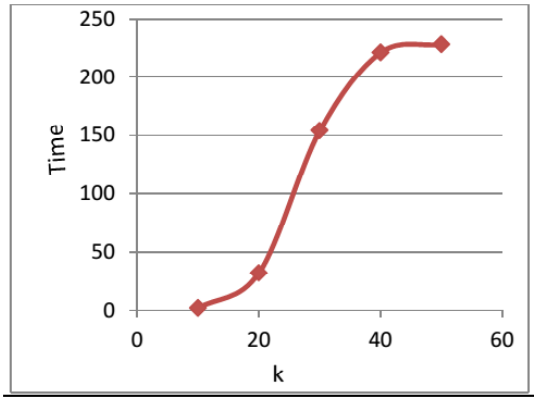

Fig. 6. K vs. Time in WMN with CH sends to BS.

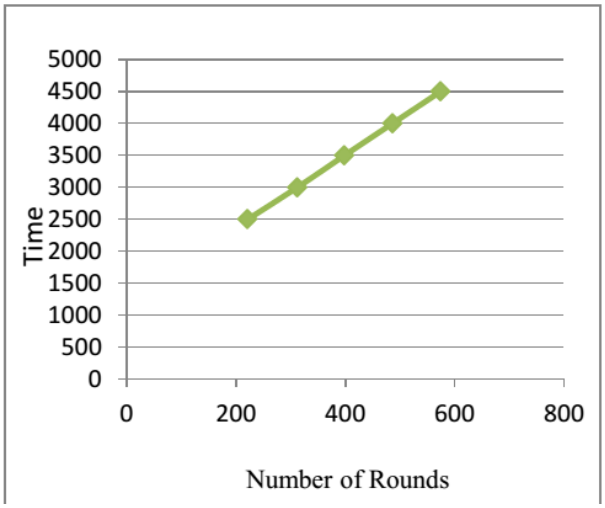

Fig. 7. Relationship between Time and Rounds.

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