



## Performance Evaluation of Energy Efficient Clumping Based Algorithm in MANET Using NS2

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**Abstract:** Energy efficient clumping formation of nodes in Mobile Ad-Hoc Networks (MANETs) is very important as nodes in MANETs typically activate unattended with a limited power source. Energy efficient clumping formation in MANET is one of the major issue because energy of one node in clumping may affect all other nodes and also effect on the life time of the Clumping Head. In this paper, propose a new algorithm technique – which is “Energy Efficient Clumping Based Algorithm (EECBA)” on the bases of energy efficient routing and minimized the flooding strategies. It is emphasis that clumping maintenance and formation at low cost the resources used that are mobility and high battery power. This algorithmic technique reduce the routing overhead, increase the network life time. The Performance metrics are delay, Throughput. The simulation will be done using NS2 network Simulator.

**Keywords:** Clumping Head, Energy Strength, mobility, Routing, EBCA, MANET.

### I. INTRODUCTION

Mobile devices coupled with the network interfaces will be an essential part of future computing environment consist of infra-structured and infrastructure-less mobile network. Wireless local area network based on 802.11 technology is the most prevalent infra-structure mobile network, where a mobile node communicate with a fixed based station. [1] MANET is an infrastructure-less multi-hop network where each node communicate with other nodes directly or indirectly through intermediate nodes. Thus each node in MANET works as router for maintain the routes and forwarding packets. MANET cloud potentially be used in various applications such as mobile classrooms, battlefield communication, remote conferencing and disaster relief applications.

MANET classified by two categories on the basis of their routing techniques. These techniques are flat routing and clumping base routing. In flat routing all nodes transfer a data to base station for communication [2]. In clumping base routing has clump head, which responsible for route between node and base stations. Clumping base routing is superior then flat routing in energy efficiency, due to decreasing amount of data transmission.

#### Terminology Used in EBCA [3]

- 1). Node ID: Unique Identification of all node within a clumping.
- 2). Clumping: A collection of nodes in which a particular node elected as head node. Each clumping has unique ID of the clump head.
- 3). Clumping nodes/members: Nodes which are not participate in neither gateway nor a clump head are represented with the members of the clumping.
- 4). Clumping Head: leader node of the clumping which play vital role for routing and data transferring.
- 5). Gateways Nodes: node that link information between two clumping's.

#### Neighbor Table [2]

It has following fields

- The ID of the neighbor that it has connectivity
- Role of the neighbor.
- Link status.

Table 1: Format of Neighbor Table

NEIGHBOR_ID	LINK-STATUS	ROLE
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But there are several problem faced by the Energy based Clumping algorithms (EBCA). Which are energy consumed by the head node and dynamic nature or mobility of nodes. Due to these problems clumping has short life time. In this paper, we propose an algorithm technique – which is “Energy Efficient Clumping Based Algorithm (EECBA)” base on energy efficient and minimized the flooding strategies. It is emphasis that clumping maintenance and formation at low

cost the resources. That reduce the routing overhead and efficient use of resources. The rest of this paper is organized as follows. Section 2 reviews some related work; Section 3 gives a proposed work; Section 4 gives an algorithm; we conclude with Section 5.

## II. RELATED WORK

In this section we will give overview on different Routing Protocols in MANET. Alak Roy et al. “Energy Efficient Cluster Based Routing in MANET” International Conference on Communication, Information & Computing Technology (ICCICT), Oct. 2012. It describes a “Signal and Energy Efficient Clustering (SEEC)” algorithm based on signal strength and energy level of nodes in MANET to improve system performance. The basic idea behind this algorithm is that it keeps head always alive & avoids re-election of cluster head thus takes care of cluster head by maintaining both battery power level and signal strength.

Numerous mechanisms of cluster head choice occur with an objective to deliver established and effective routing in the MANET system [1], [4], and [5]. Various mechanisms support not altering the cluster head to ease the signalling overhead involved in the process, which also makes the chosen node usage of their resources higher.

### I. Proposed Methodology

The main disadvantage that identified in Clumping based routing is short lifetime of the clumping head. Clumping head dies because of extra power indulgence. The proposed EECBA (Energy Efficient Clumping Based Algorithm) algorithm pay attention toward the clumping head formation and avoid re-election of clumping head (CH) keeps it's alive. Clumping head formation will done by calculate the energy value of the nodes.

Data structure to maintain the clumping head are follows:

- 1) **Improved Data Format of Hello Message:** Node participant's MANET transmission hello message in hello \_intervals of Seconds. Seconds; a nodes HELLO message contain its 'Clumping Adjacency Table'. Figure 2 show the modified head format of the hello message new field added in hello messages are Signal Strength', 'Battery Power Level' & 'mobility of nodes', which help to formation of clumping head (CH).

Table3: Layout of HELLO Packet

Node ID	NodeStatus	Mobility	Battery Power Level
.....	.....	.....	.....
Neighbor ID	Neighbor Status	Connection Status	Adjacent Clumping ID
.....	.....	.....	.....

2. **Proposed Data Structure for Head Table:** Clumping head maintain the Mobility of node, power level of all node and proposed a new format of clumping head.

Table 4: Layout of Head Table

Node ID	Mobility	Power Strength	Trusted value

3. **Clumping Formation:** In clumping based routing each node in the network broadcast Hello message specified its Node ID, Energy Strength, and mobility vector. Each node in the network compare their value of parameters like mobility of nodes and energy strength of each node. The node which has higher value of weightage value means low mobility and higher power are declared as head node of the clumping. When the mobility and energy strength of clumping head fall below the threshold value re-election of clumping head taken.

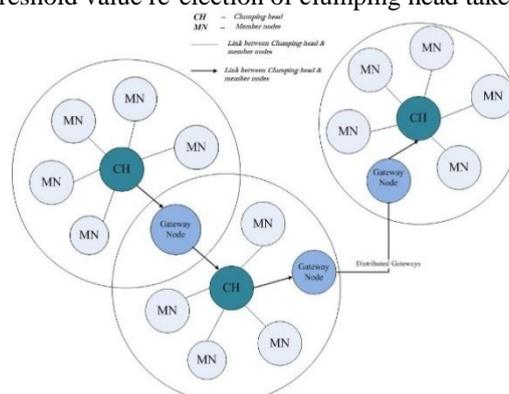


Figure 1: Clumping Formation

### III. SIMULATION SETUP

In these Simulation settings, we have created scenarios for 31 nodes with low mobility and calculate the energy of all node that are dynamically allocated to node clump nodes. Here, we present 3 out of 6 simulation diagrams. The wireless LAN has been considered as a component of the whole network and its nodes are using CBR based traffic. Using NS2 2.35 we have implemented the Hierarchical Routing on CBR traffic by the number of nodes 31. We simulate and analyzed the performance evaluation of Energy Efficient Clumping Based Algorithm. The simulation mainly focuses on the performance of the node Energy and routing strategies to react on the scenarios in MANET. Energy efficient clumping formation in MANET is one of the major issue because energy of one node in clumping may affect all other nodes and also effect on the life time of the clumping Head.



Figure 2: Simulation Setup (With Neighbor Discovery Process)

### IV. SIMULATION AND RESULTS

The EECBA algorithm was deployed using our Ns2 simulator. The simulation is accomplished 1300m\*1300m area and nodes are deployed randomly in the simulation area. The purpose of simulations was to compare QoS parameters in wireless MANET networks with EECBA algorithm in Energy efficient clumping base Algorithm. For simulation evaluations, we chose following QoS parameters:

A. **Average Throughput**– is the amount of data moved successfully from one place to another in a given time period.

$$\text{Throughput} = \frac{\text{Number of delivered packet} \times \text{Packet size} \times 8}{\text{Total duration of simulation}}$$

B. **Average end to end delay** –The average end-to-end delay of data packets is the interval between the data packet generation time and the time when the last bit arrives at the destination.

In the simulation of algorithm, the following results are obtained. These are the simulation results of algorithm EECBA.

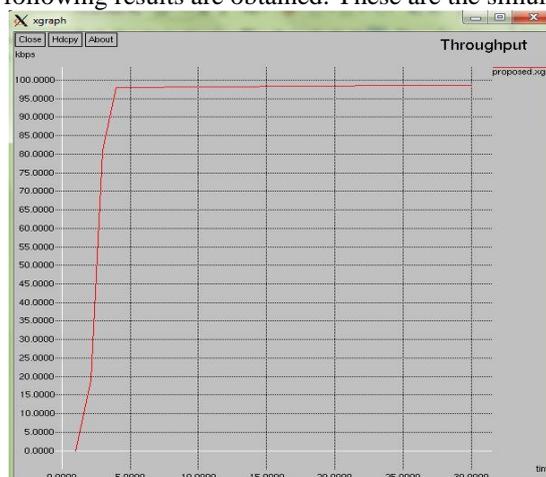


Figure 3: Throughput

Fig 3 shows the throughput rate of proposed technique, from the result we observe that proposed throughput rate is 98 kb/s with respect to time, the graph results proves that proposed algorithmic technique EECBA have high throughput rate in network.

Fig 4 show the delay analysis of proposed technique, from the result we observe that propose algorithmic technique have low delay. But with the increase the network size the delay will also effected.

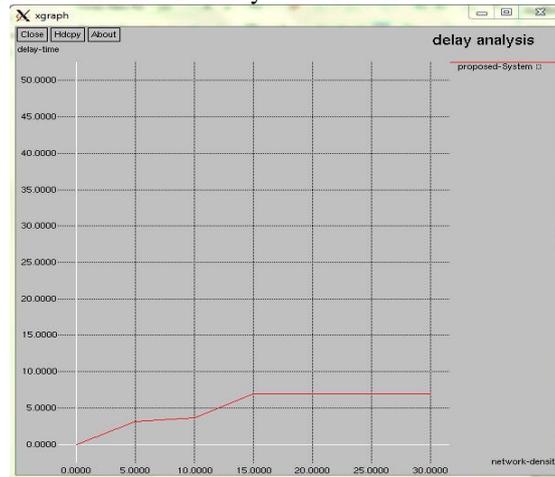


Figure 4: Delay Analysis

## V. CONCLUSION

In this paper, Simulation using NS2 for an energy efficient clumping algorithm is carried out. The name of the algorithm is "Energy efficient clumping based Algorithm" base on the mobility and energy value of clumping nodes that increase the life time of Cluster head. Its emphasis on the clumping maintenance and formation at low mobility rate and Efficient Energy Clumping. The main motive of this paper is to keep alive the head node and avoid re-election of clumping head. Our future work is tried to find the more energy effective algorithmic techniques to increase the life time of clumping head.

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