

# Analysis of Energy Based Cluster Head Selection Using CAODV Algorithm in MANET

J.Vijayalakshmi<sup>1\*</sup>, K.Prabu<sup>2</sup>

<sup>1,2</sup>Dept. of Computer Science, Sudharsan College of Arts & Science, Pudukkottai, Tamil Nadu, India – 622104, India

Corresponding author: kv.anandeesh@gmail.com

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**Abstract** – Clustering is the most broadly used performance resolution for Mobile Ad Hoc Networks enabling their scalability for a high quantity of mobile nodes. The intend of clustering schemes is pretty complex, appropriate to the very lively topology of such networks. The Proposed system is when the new node is entered the cluster in sometimes the fresh node will be the cluster head (CH). Because the head node can communicate to gateway in every transmission at the time cluster head energy level is decrease. When the clustering head reached in small energy level doesn't to broadcasting the packets the new node will become a CH. Because the fresh node have a maximum level of energy. So the proposed algorithm CAODV is increased packet delivery ratio better performance than the existing Distributed Weighted Clustering Algorithm (DWCA) using MATLAB simulink.

**Keywords** - MANET, CAODV Clustering, DWCA, Packet Delivery Ratio, Energy Consumption.

## I. INTRODUCTION

MANET is one of an ad hoc network in which nodes are connected by unwired links. In this topology of network changes rapidly and nodes can independently move in a network. Network can communicate with each other by using intermediate nodes like routers for point to point data transfer. Example are Personal area networking (laptops, mobile), emergency operations [1][2]. A main challenge in MANET is to select appropriate cluster heads. MANET was self generated and systematized by a clustering of mobile nodes and it consists of devices with several characteristics in terms of transmission power, energy, and capacity.

### CLUSTERING

Clustering method for isolating the network into different grouping of mobile nodes and runs the transmit data among the interacting nodes. Each group is known as cluster. In a cluster set of nodes gathered around a node known as cluster head. All cluster heads are interrelated with each other for reliable communication as limited energy resources are present. Each cluster is a architecture in which the cluster head (CH) responsible for maintenance of cluster and communication between the cluster nodes. [3][4] Cluster head selection have two variants,

i. Minimum Distance node Selection- Acc. to this progression, all node in a cluster should be located at certain minimum distance from the CH which is closer to it.

ii. Average Distance Selection- Acc. to this, each cluster in a network must have limited or average space within clustering members.

Basically three types of clustering nodes are Cluster Head, Cluster Member and Cluster Gateway[5].

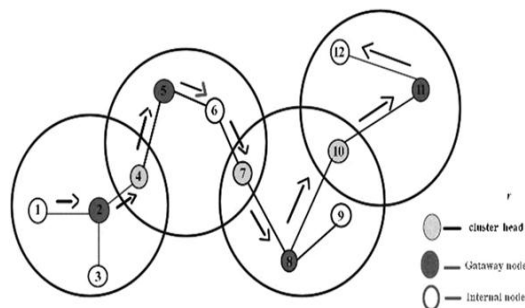


Figure 1 : Clustering in Manet

Here communicates done in 3 steps,

- At first the head node receives data from its normal(member) nodes.
- Then it squeezes the data.
- Finally transferring data to the base station.

**Advantages of Clustering:** [6] Lets the get better presentation of this Medium Access Control (MAC) layer protocol by increasing the spatial reuse, packet delivery ratio, scalability and energy consumption and handling

efficient mobility by reduced routing table size. Clusters during the transmission overhead by adding the routing tables after changes of topology occurred and it helps to collective structured information as the nodes of a cluster are lesser when compared to the further nodes of entire networks and here with every nodes stored only a fraction of routing information of the complete networks.

## II. CLUSTER HEAD SELECTION USING CAODV

In this we select a node as a leader node. [7][8] Initially, all nodes act as cluster heads and they transmit hello messages. These messages are received by each of the nodes from its neighboring nodes. When any node receives hello message from neighboring nodes then it adds a new entry in the neighbor table. When hello messages are received from all neighbor nodes then it assigns priority to each node according to energy level and total no. of nodes present. Then it compares the electing node with highest priority with itself, if priority of electing node is greater than that node's priority then it acts as a cluster head else if priority is not greater then node itself acts as a cluster head.

Generally cluster head selection includes following steps [9],

- Firstly we setup the threshold value and only those nodes will act as the cluster head whose value is greater than the threshold value.
- Then measure the energy level of the nodes and the node with maximum energy level will acts as the cluster head.
- When the node with is selected as the cluster head then the counter time must be setup for that node to stay as the cluster head for certain amount of time.
- After timeout of the first node, next maximum energy level among the nodes will be checked and the next node with maximum energy level will be selected as the cluster head.
- If in between new node arrived then the energy level for this node also be measured and compared with the threshold value.

### Existing Work

In the existing system only use cluster based routing protocol for Distributed Weighted Clustering Algorithm(DWCA). This algorithm is not built in energy efficient based concepts of cluster head selection. But the proposed work is energy efficient based cluster head selection using modified Clustering in Ad Hoc OnDemand Distance Vector Routing Protocol. This algorithm use existing DWCA routing protocol to modifying the cluster based and using transfer the packet. It can be used for large number of mobile nodes in the cluster. Clustering Ad hoc On demand Distance Vector (CAODV) is basically an improvement of several routing protocols. It minimizes the number of broadcasts by creating routes based on demand, which is not the case for other protocols. When any source node wants to send a packet to a destination, it broadcasts a

route request (RREQ) packet. The neighboring nodes in turn broadcast the packet to their neighbors and the process continues until the packet reaches the destination. This system is only use energy based cluster head selection algorithm that means when the cluster head energy is low that time don't transfer the packet so that cluster select the alternative cluster head. When the cluster head energy is low to enter the new node in the cluster. New node energy is high means that the node will be cluster head[10][11].

### Proposed Work

The proposed work is energy efficient based cluster head selection using CAODV routing protocol to transfer the packet. This system is only use energy based cluster head selection algorithm that means when the cluster head energy is low that time don't transfer the packet so that cluster select the substitute cluster head. When the CH energy is low to enter new node in the cluster. New node energy is high means that the node will be cluster head. So, our system does work more efficiently to select the cluster head than existing system[12]. The procedure can be understood by following CAODV algorithm:

- Step 1. Choose source and destination node.
- Step 2. Chosen node = source
- Step 3. While (chosen node! = destination)
- Step 4. Broadcast from chosen node
- Step 5. choose intermediate node by using CAODV.
- Step 6. Choose Cluster Head and Cluster Gateway
- Step 7. If Cluster head Energy! = Large
  - {
  - New Node Will be Cluster Head
  - Go to step 4.
  - }
  - Else
  - {
  - Update present node = Intermediate node.
  - }
- Step 8. End while.

Results: It varies from one network to another network. In our scenario value is energy based cluster head selection for all the packets transmission[13]. The following Figure.2 output of cluster head selection simulating MATLAB simulink using CAODV algorithm.

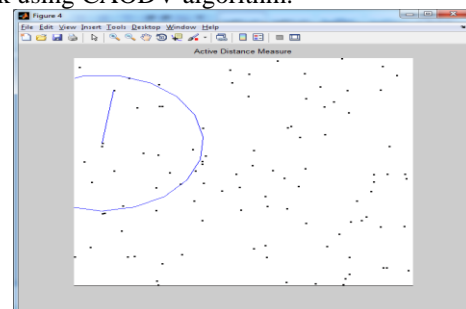


Figure 2 : Cluster Head Selection using CAODV

*Energy Consumption:* We have to reduce the energy consumption and interference of nodes or signals. A technique called topology control is used for reducing the energy consumption, interference among signals and extends the lifetime of network by selecting accurate transmission power for each node. Topology control includes parameters like energy efficiency, scalability, and k-connectivity and network lifetime is compared to existing algorithm DWCA. And Figure.3 modified Clustering in AODV Energy consumption comparisons.

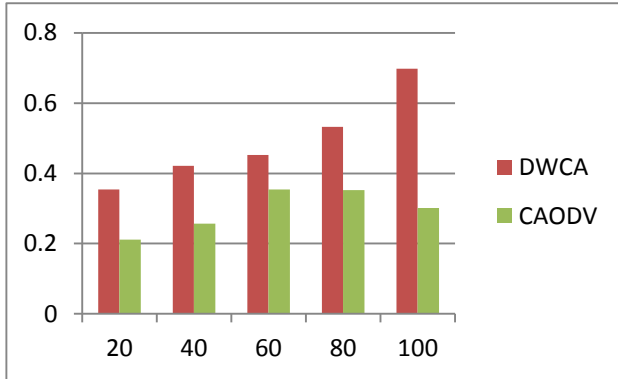


Figure 2: CAODV Energy Consumption Comparisons.

### III. SIMULATION AND RESULTS

The performance metrics of the proposed algorithm can be evaluated packet delivery ratio is increased compared to existing algorithm. And the Table 1 is values of simulation parameters.

Table 1 : Simulation parameters

Parameters	Value
Simulation	NS2
MAC Protocol	IEEE 802.11
Examine Protocol	CAODV, LCC, DWCA
Mobility Model	Random waypoint
No. of nodes	100
Transmission range	250 meters
Size of network	500m * 500m
Pause time	25s
Hello interval	5.0 s
Simulation duration	500 times

*Packet Delivery Ratio :* The packet transfer relationship is computed by separating the no.of packets received by the destination by the number of packets initiated by the application layer of the source. Specify the packet failure rate, which limits the highest performance of the network. The better the transfer relationship, the more complete and correct the routing protocol.

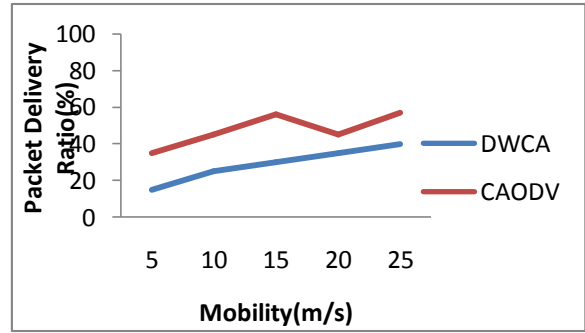


Figure 4 : Packet Delivery Ratio(%) Vs Mobility(m/s)

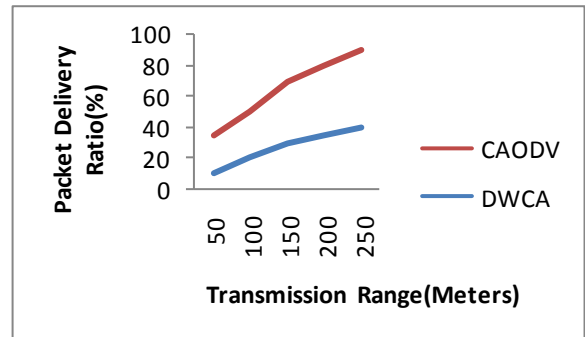


Figure 5 : Packet Delivery Ratio(%) Vs Transmission Range(meters)

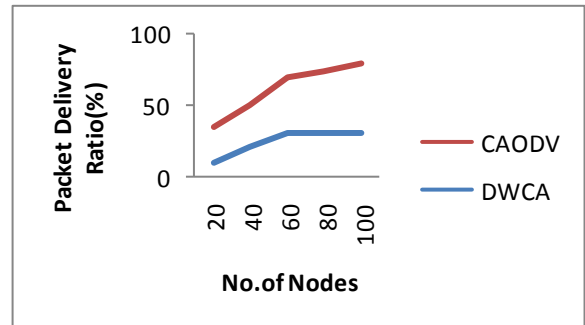


Figure 6 : Packet Delivery Ratio(%) Vs No. of Nodes

In Figure.4 the proposed CAODV algorithm provides better performance compared to existing DWCA algorithm and also increased packet delivery ratio with mobility is increased.

In Figure.5 the proposed CAODV algorithm provides better performance compared to existing DWCA algorithm and also increased packet delivery ratio with transmission range is increased.

In Figure.6 the proposed CAODV algorithm provides better performance compared to existing DWCA algorithm and also increased packet delivery ratio with number of node is increased.

#### IV. CONCLUSION

In this paper, Cluster Head Selection simulating MATLAB simulink using modified version of CAODV. The proposed protocol is energy based on packet transmission in cluster. The Proposed system when the new node is entered the cluster in sometimes the new node will be the cluster head. Because the head node can communicate to gateway in every transmission at the time of CH energy level is decrease. When the cluster head reached in minimum energy level doesn't to transmit the packets so the new node will become a cluster head. Because the new node have a maximum level of energy. So the proposed algorithm is increased the packet delivery ratio better performance than the existing algorithm.

#### REFERENCES

- [1] H.J.Cha, J.M. Kim and H.B. Ryou, "A study on the clustering scheme for node mobility in mobile Ad-hoc network", In *Advanced in Computer Science and its Applications*, Springer Berlin Heidelberg, Vol(279), Iss(1), Pages:1365-1369, 2014.
- [2] Mohd. Junedud Haque, Mohd Muntjir and Hussain Abu Sorrah, "A Comparative Survey of computation of cluster head in manet", *International Journal of computer applications*, Vol(118), Iss(3), Pages: 6-9, 2015.
- [3] Faraz Ahsan and Akhtab Hussain Khalid Hussain, Abdul Hanan Abdullah, Khalid M. Awan, "Cluster Head Selection Schemes for WSN and MANET: A Survey", *World Applied Sciences Journal*, Vol(23),Iss(5), Pages: 611-620, 2013.
- [4] Mrs.J.Vijayalakshmi and Dr.K.Prabu, "Performance Analysis of Clustering Schemes in MANETS", ICICI 2018 International Conference on Intelligent Data Communication Technologies and Internet of Things(ICICI), pp.808-813, 2018.
- [5] K. Ramesh and D. K. Somasundaram, "A comparative study of cluster head selection algorithms in wireless 11,sensor networks", *International Journal of Computer Science& Engineering Survey*, Vol (2), Iss (4), 2011.
- [6] Vijayakumar G et. Al, "Current Research Work on Routing Protocols for MANET : A Literature Survey", *International Journal of Computer Science and Engineering (IJCSE)*, Vol(02), Iss(03), pages:706-713, 2010.
- [7] Mrs.J.Vijayalakshmi and Dr.K.Prabu, "A Survey of Various Weighted based Clustering Algorithm for MANET", *International Journal of Data Mining Techniques and Applications*, Vol.07, Iss.01, pp.146-153, june 2018.
- [8] Ishita Chakraborty and Prodipto Das, "Data Fusion in Wireless Sensor Network- A Survey", *IJSRNSC*, Vol(5), Iss(6), pages:9-15, 2017.
- [9] Mrunal Gavhale, Pranav D. Sarat, "Survey on Algorithms for Efficient Cluster Formation and Cluster head selection in Manet", *International conference on information Security and Privacy*, Vol(78), Pages: 477-482, 2015.
- [10] Mandeep Singh and Mr.Gagangeet Singh, "A Secure and Efficient Cluster Head Selection Algorithm for Manet", *JNCET*, Vol(2), Iss(2), Pages: 49-52, June 2015.
- [11] Dr. M. Balamurugan and C. Kavi priya, "Energy Based Cluster Head Selection Algorithm in Manet", *IJCSET*, Vol(5), Iss(8), Pages: 312-315, Aug 2015.
- [12] Ghaidaa Muttasher Abdulsahab, Osamah Ibrahim Khalaf, Norrozila Sulaiman, Hamzah F.Zmezm and Harith Zmezm, "Improving Ad hoc Network Performance by Usinf an Efficinet

Cluster Based Routing Algorithm", *Indian Journal of Science and Technology*, Vol(8), Iss(30), Pages: 1-8, Nov 2015.

- [13] Supreet Kaur, Varsha Kumari, "Efficient Clustering with proposed Load balancing Technique for Manet", *International Journal of computer Applications*, Vol(111), Iss(13), Pages: 21-26, Feb 2015.

#### Author Profile

**J.Vijayalakshmi** received her MCA and M.Phil from Bharathidasan University, Tiruchirappalli in the year of 2007 and 2013. She is now Research Scholar in Bharathidasan University, Tiruchirappalli, Tamilnadu, India. Her Research interested is Ad hoc Networks. She has published more than 9 papers at various National/ International Conferences and Journals.



**Dr. K. Prabu** received his MCA and M.Phil from Annamalai University, Tamilnadu, India. He received his Ph.D Degree in Computer Applications from Manonmaniam Sundaranar University, Tirunelveli, India. He is now working as an Associate Professor in PG & Research Department of Computer Science, Sudharsan College of Arts & Science, Pudukkottai, Tamilnadu, India. He is a Reviewer of 06 National/International Journals. His Research interested is Adhoc Networks, Wireless & Mobile Computing, and Wireless Sensor Networks. He has published more than 50 technical papers at various National / International Conferences and Journals. He is a life member of ISTE, IACSIT, and IAENG.

