# Dynamic Cluster Head Selection to Minimize the Energy Consumption in Wireless Sensor Networks

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**ABSTRACT-**The real world application is mainly depends on Wireless Sensor networks (WSNs).The Data Collection Scheme is the major task used in WSN. The Velocity Energy-efficient and Link-aware Cluster-Tree (VELCT) scheme for data collection in WSNs which failed to mitigate the problems of coverage distance, mobility, delay, traffic, tree intensity and end-to-end connection. The VELCT select the cluster head statically. The proposed dynamic clustering used to select the cluster head dynamically. At a certain amount of time, the clustering changes the cluster head dynamically. The Data Collection Tree (DCT) used to collect the information and tree formation is initiated. The dynamic cluster head is formed based on the tree formation formed in the cluster. The Proposed scheme minimizes the energy exploitation, reduces the end-to-end delay and traffic in cluster head in WSNs by effective usage of the DCT. The strength of this above proposed method used to reduce the energy consumption of the cluster head. The simulation results should increase the QoS parameters such as minimize the energy consumption, Packet delay, traffic in the network lifetime for wireless based network.

**Index Terms-**Wireless Sensor Networks, Data  Collection  Tree,  Data  Collection Node, Cluster Head, Cluster Member

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## 1. INTRODUCTION

It is obvious that specialized data gathering protocols offer high scalability should be applied in order to lifetime of network is preserved in environments. To grouping the sensor nodes into clusters has been widely adopted the research community to the scalability objective and achieve high energy efficiency and prolong network lifetime in large-scale WSN environments. Hierarchical Routing Protocols and data gathering protocols implies cluster based network of the sensor nodes in order to save the energy.

In each group cluster has a leader, which is called the cluster head (CH) and usually performs the special task and several common sensor nodes (SN) as cluster members. The cluster formation uses a two level hierarchy where the CH nodes form the higher level and the cluster-members nodes form the lower level. The sensor nodes periodically transmit their data to the corresponding CH nodes. However, the CH nodes send the time data to higher distances than the common nodes; they naturally spend energy at higher rates. In order to balance the energy consumption among all the nodes, to periodically re-elect new CHs in cluster.

### Communication between clusters

The communication between a sensor and its designated CH is assumed to be direct. In multi-hop intracluster communication the data is required. If we assume stationary sensor nodes and stationary CHs are normally lead to stable clusters with facilitated intracluster and intercluster network management. If the CHs or the nodes themselves are assumed to be mobile, the cluster member for each node should be dynamically change clusters to over time and need to be maintained continuously.

### Node structure and roles

In network models the CHs are assumed to be equipped with significantly more computation and communication resources are used. Every node in the WSN placed in the network statically and it can change the cluster continuously. Nodes can be placed based upon the position of the network located using mobility model.

### Cluster Functions

In this paper, it covers the approach used such as CH is statically placed and it changes the CH dynamically in them. The CH and CM are used to divide the number of nodes respectively based on the group of nodes.

## 2. LITERATURE SURVEY

In this section, it tells the sensor nodes placed statically and it can be arranged. The relay sensor node and act as cluster manually. The following discuss the cluster formation and Data aggregation Techniques.

### 2.1 Cluster formation

Sensor node is deployed in wireless sensor network that provides physical environment that produce similar data in close by sensor node and transmitting such type of data is easy. The facts are encourage using some kind of grouping of sensor nodes such that group of sensor node can be combine or compress with each data together and transmit only the relevant data. This group of sensor nodes in a densely deployed large scale sensor node is known as clustering. The way to combine the data and define the data belonging to a single cluster called data aggregation. Issues of clustering in wireless

sensor network have a major cause in a network, it means user can put all the full nodes, in term of energy in the network it can behave like cluster head and simple node in a cluster work as CM.

## 2.2 Data Aggregation Techniques

### LEACH [2]

LEACH (low-energy adaptive clustering hierarchy) is a cluster based protocol to minimize the energy, and reduce the transmission towards to the Base station. It reduces the network traffic and addition to this channel. LEACH has motivated the design of several other protocols and tries to improve the CH selection process.

These Protocols basically differ on the application and network architecture used in the design. Number of cluster based routing protocols proposed in survey for WSNs. LEACH gives the better energy consumption and performance compare to the large-scale WSNs, but it also increases the overhead to maintain. It is one of the hierarchical routing approaches for WSNs. It is a cluster based protocol that utilizes randomized rotation of local base station to evenly distribute the energy load among the sensors in the network. It uses localized coordination to enable scalability and robustness for dynamic networks, and includes the data fusion into the routing to reduce the amount of information to the BS. The sensor node in the cluster sends data to CH, CH tells the data and sends it to BS. The working of LEACH is broken up into rounds of actions.

The clusters are being created and each node decides whether or not to become a CH for the current round. This decision is based on the suggested

percentage of CHs for the network and the number of times the node has been used. The nodes are chosen based on choosing a random number between 0 and 1.
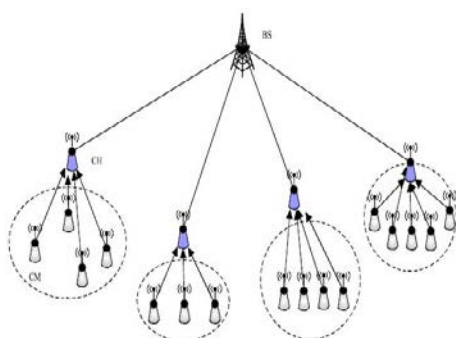
### SYSTEM MODEL



**Figure 1. Working of LEACH Protocol**

### LEACH-C [2]

LEACH-C (leach-centralized) protocol is an enhancement of LEACH. It uses a clustering algorithm to elect CH and same steady –state phase like as LEACH. During the set-up phase of LEACH-C, each node sends the information about it to BS such as current location and residual energy level. To maintain the clusters, the BS needs to ensure that the energy load is distributed among all the nodes. For this, BS computes the average node energy, and determines the nodes have low energy.

The nodes have energy above or average level can be select for the CHs for the current round. Once the CHs and other clusters are found, the Base Station broadcast a message that obtains the CH ID for each node. If the CH ID matches its own ID, the node is a CH, otherwise the node uses the TDMA slot for data transmission and goes sleep time to transmit data. LEACH uses distributed algorithm and offers no guarantee to the number of CHs. LEACH-C protocol can produce better performance by dispersing the CHs throughout the network. CM is a clustering-based and time-driven protocol which minimizes energy dissipation for data gathering with mobile sensor nodes. In this protocol, the cluster formation is done based on node's mobility. The sensor node uses the information obtained from GPS device to estimate its distances from all other CHs. Clustering-based data-gathering protocol works in rounds.
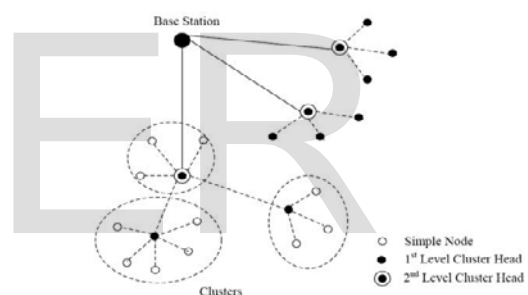
### SYSTEM MODEL



**Figure 2: Working Model of LEACH-C Protocol**

## 3. PROPOSED SYSTEM

In the Proposed System, the dynamic clustering used to group the nodes. It can be selected based upon the nodes placed in the WSN. The nodes are located anywhere in the network. The important way to group the nodes based on the cluster form in the network. After form the cluster, the tree formation of network has been initiated. The tree formation is initiated with the help of performing tree related techniques such as Breadth first Search, Depth first search and others.

Clustering is scheme for data aggregation in the WSNs. Each sensor node sends data to the aggregator node i.e., CH and then cluster head perform data aggregation process on the data and then send it to the base station (BS). Initiating aggregation function over CH still causes energy wastage. In case of homogeneous sensor network CH will soon change and again re-clustering has to be done which again cause energy consumption. In this work, the proposed algorithm that performs aggregation within the cluster. The major focus

on avoiding re clustering, reducing the overhead of clustering process, reduce the load over CH, and reduce the energy consumption within cluster in large-scale and dense sensor networks with the help of CH selection and cluster formation. To perform these functionalities we used an algorithm in which CHs are selected from different cluster in each round and data are sent to CH in multi-hop manner to prolong the lifetime of network.

Each technique consists of two phases: Dynamic set-up phase and Dynamic steady-state phase. Dynamic Set-up Phase divided into Intra-Tree Formation and Cluster Tree Selection. Dynamic Steady state Phase includes Transmission of data.

### 3.1 DYNAMIC SET-UP PHASE

#### 3.1.1 Intra-Tree Formation

This tree formation is initiated with the help of nodes available in the network. Each node should have the information about the neighbor nodes and their information is maintained dynamically. At the same time, the cluster used to select the cluster head i.e., the node has a high resuidal battery energy level and higher bandwidth level after form the cluster. After some more time, the nodes can change the cluster head and the information should be transferred to the new cluster head.

#### 3.1.2 Cluster-Tree Selection

The Cluster tree function and node information are periodically monitored by the CH and the frequent cluster formation information should be kept by them. In the selection of cluster head each node tells it will turn into cluster head or not have the average residual energy. At each round of cluster, the CH selection is changed with the help of the factors like packet-delay, higher bandwidth, less number of energy used by the node. The CM should be kept ideally because changes should reflect to the CH periodically. The nodes with less residual battery energy level turn into common nodes, and send the information about joining cluster to a cluster head.

### 3.2 DYNAMIC STEADY-STATE PHASE

#### 3.2.1 Transmission of Data

To determining good clusters, the base station needs to select that the energy load is evenly managed among all the sensor nodes. Sensor nodes sends the energy level to the BS, The BS computes average node energy, and determines which nodes have energy high or else below the average, some nodes having higher energy compare to average energy choose as CH for corresponding cluster. At some time, the CH sends the information to all other CM in the same cluster. The Energy gets low at one stage the CH change the node and information should transferred to the newly formed CH. The frequent way this above function take place and change the CH dynamically.

After forming the set-up phase, this phase is initiated. This phase used to transmission the data based on the cluster formation i e., the cluster formation is already take place in each round of information.

### CLUSTERING ALGORITHM- DYNAMIC CLUSTER [3]

```
Node-> i
For i 1 to n
i-> i+1
 end
CH -> j
while CH (j) -> i
 i>j
End while
For j 0 to CH -> i
 i -> i-1
CH -> j
End
Where
CH -> cluster head
```

### 4. SIMULATION

In this work, NS2 Simulator is used and work are checked and simulated with 50 nodes. The transmission range of network is 10 meters.

| Name of the Parameters | Values to measure/Protocols |
|---|---|
| Number of Nodes | 100 |
| Active nodes | 100 |
| Packet Size | 512 byte |
| Routing Protocol | AODV,DSR,DSDV |
| Energy Consumption | Increased energy Efficiency |

### 5. CONCLUSION

In this work, the major concentrate on the clustering within the limited number of nodes in the network. The transmission range should be increased and simulation with the other parameters is analyzed. The CH should be kept same as possible in the network. The CM and also the nodes should be changed periodically

based on the formation of cluster in the network.

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