



Low Energy Adaptive Cluster Head Selection Using Leach and M-Leach Protocols in Wireless Sensor Network

¹Manisha *, ²Surya Prakesh Sharma

¹Computer Science, ²Asst Professor CS Deptt,

^{1,2} Noida Institute Engineering College Knowledge Park II, Institutional Area,
Greater Noida, Uttar Pradesh, India

Abstract— A Wireless sensor network has recently become more attractive and interested area in research field. It consists of low-cost, low power, and energy-constrained sensors responsible for monitoring a physical phenomenon and reporting to sink node where the end-user can access the data. Saving energy and therefore extending the wireless sensor network lifetime, involves various great challenges. wireless sensor network are formed by hundreds or thousands and n node that gather information from a group of sensor nodes in which one node will act as a cluster head and remaining nodes will act as members nodes. In these network sensor node are dependent on low energy. As per energy is a challenging issue in wireless sensor networks, clustering models are used to overcome this problem by using LEACH protocols ,M-LEACH cluster is supervise by lead node called cluster head (CH). The main purpose of CH maintain the affiliated node and communicate with other cluster node. Cluster heads collect the data from respective cluster's node in surrounding environment and send it to base station. this paper provide a methods for clustering and choiced cluster head election method using LEACH ,M-LEACH low energy protocol and mobility low energy protocol in wireless sensor environment various technique to improve energy efficiency. Its presents a comparison between the different methods on the basis on the network lifetime. Packet delivery ratio get consider the fix and mobile nodes in each responsible node.

Keywords— Cluster Algorithm, Residual Energy, M-LEACH, LEACH, and Mobility.

I. INTRODUCTION

wireless sensor network consists a group of sensor nodes interconnected with various communication channel. every sensor node connected with sensor device, limited energy ,limited battery power supply etc. Wireless sensor network WSN[1] is self organised network proposed by large number of micro sensor that randomly deployed in monitoring regional through wireless communication. this application widely used in military field surveillance, medical logistics management, environmental monitoring agriculture and other commercial area. Since WSNs consist of many sensors with limited energy, an energy-efficient network protocol is an important consideration in WSN applications. the battery power consumption of sensor node are limited. since normally the sensor gathers information, process them and send it to mobile sink node

for further processing. mobile sink are more effective for data gathering rather than reporting data through long ,multi hop routes. therefore no human interaction may be required to ensure their organization. self organization is a machine that allow having an organization system without centralized entity and without control. its maintain structure of the network for a long period of time. and minimizes energy consumption.

Most of self organization algorithms take into account the structure of sensor each sensor consists of three units

1. event detection
2. calculation
3. communication

All these components are related with battery. therefore today two major protocols related to network based on clustering and multi-hop routing[2]

Many routing protocols for WSNs have appeared in the literature. In applications using direct transmission (DT) protocols. Wireless sensor Networks ^[2]can offer unique benefits and versatility with respect to low-power and low-cost rapid development for many applications which do not need human supervision. The nodes in WSNs are usually battery-operated sensing devices with limited energy resources and replacing or replenishing the batteries is usually not an option. Thus energy efficiency is one of the most important issues and designing power-efficient protocols is critical for prolonging the lifetime. Clustering network is an efficient and scalable way to organize^[3]. A fundamental challenge for these wireless sensor networks is to meet stringent Quality-of-Service requirements including high target detection probability, low false alarm rate, and bounded detection delay. Routing is an essential requirement to any routing protocols. As the node cause route path breakage at any instant of routing a packet,robustness is essential to re-establish the route at the earliest without much delay. In view of the need for energy saving ,sensor networks are mainly organized

either in clustered hierarchical manner or as sector-based. In both cases much work has been reported to accommodate mobility.

In self-organized clustered hierarchical category the LEACH protocols is an elegant solution to the energy constraint problem. It forms enough number of clusters in a self-organized manner at the start. LEACH protocols does not consider the mobility of sensor nodes after the "Set-up phase" of cluster within a round, it performs poorly with serious data loss in the environment of node mobility. Mobility support in WSNs is crucial for a very high percentage of application scenarios and, most notably, for the Internet of Things. It is, thus, important to know the existing solutions for mobility in WSNs, identifying their main characteristics and limitations. With this in mind, we firstly present a survey of models for mobility support in WSNs.

II. OVERVIEW OF CLUSTERING

Basic concepts

Clustering means grouping sensor nodes geographically close into sets called "cluster". The nodes belonging in a group can execute different functions from other nodes each cluster represent a particular node called cluster head. The node which energy level is high make a possibility to become a cluster head. The cluster head made by a specific metric or combination of metrics. It is its responsible for coordination between the different member node in a group of cluster, its forward aggregate data to sink node through cluster heads.

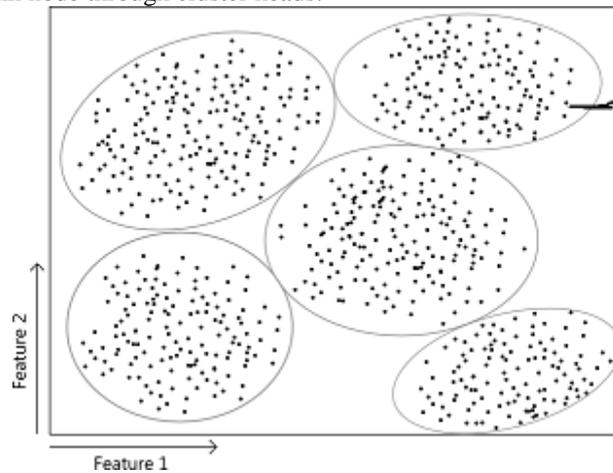


fig 1. number of node in cluster group

In a cluster, each node can communicate with their cluster head directly or through multi-hop, it stores all information of own cluster and some other cluster. Clusters work to minimize the size of routing table and the number of messages exchanged in the network.

Cluster members have different status and serve different functions. Clusters are two types: ordinary node, gateway.

Gateway node : A node which belongs to more than one cluster becomes a Gateway. A gateway is responsible for communication between cluster heads and minimize the number of gateways.

Ordinary node : This is an ordinary node never send received packets. It always captures that packet which are destined Advantages of clustering scheme have several advantages for delay reduction, are listed below.

- Network lifetime prolonged.
- Energy efficiency and distribution, reducing the consumed energy and redundancy reduction.
- Easy maintenance : network easier management.
- Data aggregation and summarization reducing volume and transmitted data

III. TAXONOMY OF CLUSTER METHODS

3.1 Cluster characteristics

Cluster characteristics related to properties and internal structure related to others. Important attributes are given below.

Cluster count: It's based on number of clusters, which classified into two types: fixed cluster and variable one. CHs are predetermined and thus the number of clusters are preset. Randomly picking CHs from the deployed sensors usually yields variable number of clusters

Stability: The cluster size and clustering protocols in WSNs can be classified into two classes: uniform and non-uniform ones. That means same size cluster and different size clusters in the network. It is considered fixed since sensors do not switch among clusters and the number of clusters stays the same throughout the network lifespan.

Intra-cluster schemes: It includes two classes in WSNs network. Single hops and multi-hops methods. In single hops methods, all nodes in the cluster transmit data to its designated CH directly and multi-hops methods the communication between a sensor and its corresponding CH is provided by data relaying. It requires some time connectivity, especially when the nodes communication range is limited.

Inter-Cluster communication: When the CH does not have long haul communication capabilities, all CHs communicate to the base-station directly. In that case, the clustering scheme has to ensure the feasibility of establishing an inter-CH route from every CH to the base-station.

3.2 Clustering process

Cluster analysis is to assign observations to groups (clusters") so that observations within each group are similar to one another with respect to variables or attributes of interest, and the groups themselves stand apart from one another. In other words, the objective is to divide the observations into homogeneous and distinct groups.

The following attributes are deemed relevant

When CHs are just regular sensors nodes, clustering has to be performed in a distributed manner without coordination. In few approaches, a centralized authority partitions the nodes offline and controls the cluster membership. Hybrid schemes can also be found; especially when CHs are rich in resources. In the later case, inter-CHs coordination is performed in a distributed manner, while each individual CH takes charge of forming its own cluster.

3.3 Objective of node grouping:

Clustering algorithms in the literature varies in their objectives. Often the clustering objective is set in order to facilitate meeting the applications requirements. For example if the application is sensitive to data latency, intra and inter-cluster connectivity and the length of the data routing paths are usually considered as criteria for CH selection and node grouping Cluster-head selection: CHs can be pre-assigned or picked randomly from the deployed set of nodes.

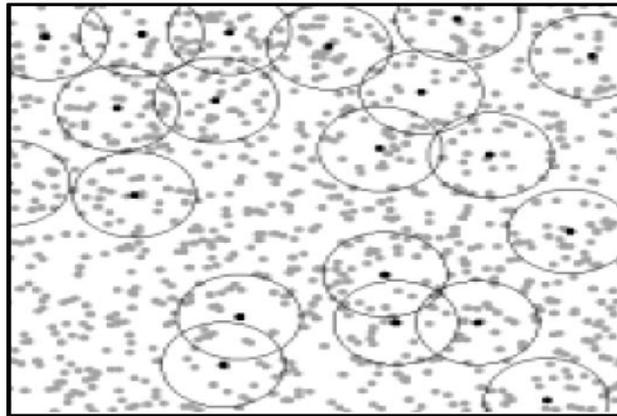


fig 2.Forms recruit nodes in their communication range (circles).

Algorithm complexity: Depending on the objective and the methodology, numerous clustering algorithms have been proposed. The complexity and convergence rate of these algorithms can be constant or dependent on the number of CHs and/or sensors.

Cluster-head capabilities: The network model influences the clustering approach; particularly the node capabilities and the scope of the in network processing.

The following attributes of the CH node are differentiating factors among clustering schemes:

Mobility: When a CH is mobile, sensor's membership dynamically changes and the clusters would need to be continuously maintained. On the other hand, stationary CH tends to yield stable clusters and facilitate intra- and inter-cluster network management. Sometimes, CHs can travel for limited distances to reposition itself for better network performance. Node types: As indicated earlier, in some setups a subset of the deployed sensors are designated as CHs while in others CHs are equipped with significantly more computation and communication resources.

Role: A CH can simply act as a relay for the traffic generated by the sensors in its cluster or perform aggregation/fusion of collected sensors' data. Sometime, a CH acts as a sink or a base-station that takes actions based on the detected phenomena or targets.

Functionality: Cluster head can have four functionalities:

transmission, aggregation, management and maintaining structure. its transmits the information generated by the sensor nodes in its cluster as a relay, and its aggregates the collected information from sensor nodes in its cluster network.

Uniformity of energy: Based on uniformity of energy ,nodes are cluster two type :homogeneous or heterogeneous ones.In homogeneous CHs are elected based in a random way or other because all the nodes assigned with equal energy but in heterogeneous all the nodes are different energy.

3.4 Advantages of clustering

The major advantages of clustering in wireless sensor networks are listed [15] below:

- Clustering in sensor networks offers the spatial reprocess of all the used resources which increases the capacity of system. For example, the clusters that are not neighbour scan be used at the same frequency for wireless communication.

3.5 Disadvantages of clustering

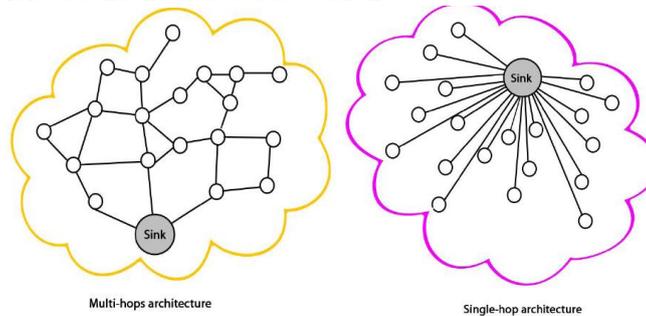
There are some disadvantages of clustering also which are as follows [16]:

- The spending of energy on cluster-heads has not been tackled because nodes will absorb with more calculation and communiqué of data to superior level.
- In this clustering there is no real life situation but only an idyllic network is assumed

We would like to note that some of these attributes are mutually exclusive, e.g. preset or variable cluster count, and some are not. For example, a clustering process may have multiple objectives. It is also worth noting that network clustering can influence or be influenced by the planned network and link layer protocols. We plan to hint on the implications of routing and MAC protocols when we summarize the published clustering schemes

3.6 Sensor Network Architecture

Design of WSN is influenced by factors such as scalability, fault tolerance and power consumption. The basic kind of sensor network architecture: 1. Layered Architecture: In this type, there is a single base station. Base station acts as access point and it is connected to the wired network. Base station collects all the data from the nodes for further processing .2. Clustered Architecture: In this type, nodes are arranged in clusters and these are governed by a cluster head. Each cluster group exchanges the messages in between their groups only. Cluster heads can communicate with each other and they are responsible to send the data to base station.



Issues due to Highly Mobile Environment Mobility leads to deterioration in the quality of an established link and, therefore, data transmission is prone to failure, which in turn increases the rate of packet retransmission.2. Mobility leads to frequent route changes, which result in a considerable packet delivery delay.3

A mobile node cannot immediately begin transmitting data upon joining a network, because its neighbours should first discover its presence and decide how to collaborate with it. This requires sometime.4. In contention-based MAC protocols, mobility may increase packet collision while in schedule-based MAC protocols, two-hop neighbourhood information becomes inconsistent once nodes enter or leave, leading to schedule inconsistencies.

IV. LITERATURE SURVEY

A survey of clustering algorithms for WSNs was presented by Abbasi *et al.* [32]. The authors of that survey presented a taxonomy and classification of typical clustering schemes, then summarized different clustering algorithms for WSNs based on classification of variable convergence time protocols and constant convergence time algorithms, and highlighted their objectives, features, complexity, *etc.* Finally, these clustering approaches were compared based on a few metrics such as convergence rate, cluster stability, cluster overlapping, location-awareness and support for node mobility. clustering methods for WSNs, such as more scalability, less overheads, and easy maintenance, and then present a classification of WSN clustering schemes based on a total of eight clustering attributes. The authors also analyzed altogether six popular WSN clustering algorithms, such as LEACH, PEGASIS, HEED, EEUC, and *etc.*, and compared these WSN clustering algorithms, including various attributes popular clustering algorithms for WSNs, such as LEACH, TL-LEACH, EECS, TEEN, APTEEN, and *etc.* Additionally, the survey compared these clustering protocols in terms of energy consumption and network lifetime. In the event of movement of cluster heads

4.1 Mobile LEACH:

The M-LEACH allows mobility of non-cluster-head nodes and cluster-head during the setup and steady state phase. M-LEACH also considers remaining energy of the node in selection of cluster-head. Some assumptions are also assumed in M-LEACH like other clustering routing protocols. Initially all nodes are homogeneous in sense of antenna gain, all nodes have their location information through GPS and Base station is considered fixed in M-LEACH. Distributed setup phase of LEACH is modified by M-LEACH in order to select suitable cluster-head. In M-LEACH cluster-heads are elected on the basis of attenuation model [17]. Optimum cluster-heads are selected to lessen the power of attenuation. Other criteria of cluster-head selection are mobility speed. Node with minimum mobility and lowest attenuation power is selected as cluster head M-LEACH. Then selected cluster-heads broadcast their status to all nodes in transmission range. Non-cluster-head nodes compute their willingness from multiple cluster-heads and select the cluster-head with maximum residual energy. In steady state phase, if nodes move away from cluster-head or cluster-head.

moves away from its member nodes then other cluster-head becomes suitable for member nodes. It results into inefficient clustering formation. To deal this problem M-LEACH provides handover mechanism for nodes to switch on to new cluster-head. When nodes decide to make handoff, send DIS-JOIN message to current cluster-head and also send JOIN - REQ to new cluster-head. After handoff occurring cluster heads re- schedule the transmission pattern.

V. MOTIVATION

In the area of WSNs, energy efficient routing protocols has been always a hot research area but the mobility factor is not addressed in an appropriate level as it is evident that majority of the routing protocols assumes the nodes to be static. But

we can find that in most of the applications where wireless sensor networks are involved like disaster applications or medical care etc the nodes can be mobile. So mobility of the nodes i.e. either the source or the sink has to be considered. Literature have shown that mobile sink assisted routing helps to reduce energy consumption to a great extent. Hence we thought of developing an energy efficient routing algorithm which is supported by the mobility of multiple sinks.

VI. PROBLEM DEFINITION

Routing is an important networking activity as it is the major factor that affects the efficiency of a network in terms of delay, throughput, energy consumption etc. WSNs consist of hundreds and thousands of tiny sensors or motes which are deployed randomly in an area where the sensing of a particular event has to be done. There are a variety of applications which employ WSNs like disaster rescue operations, wild fire protection, war zones, engineering, medical and agriculture fields, robotics etc where the direct intervention of human is comparatively risky or sometimes impossible. In many cases replacing the batteries are also not feasible because of its huge number as well as the restrictions of the deployed region. If one node goes out of power and dies off the entire connectivity can be affected which makes the intention of the network futile. Because of the resource constraint nature, the power backup capabilities are very limited and the only possible way to retain the network connectivity is to efficiently use the available energy so as to extend the lifetime of the entire network. So the proper design of every layer in protocol stack is very important. Network layer activities especially routing can save energy to a great extent because the communication process consumes more energy compared to sensing and other processing activities and hence our focus is on development of an energy efficient routing protocol so as to enhance the life time of the entire network.

VII. RELATED WORK

The hierarchical routing protocols are mainly comprised of two phases: the first phase is the cluster formation phase, and the second phase is the routing phase; several protocols are observed as hierarchical protocols such as Low-Energy Adaptive Clustering Hierarchy (LEACH), mobility-LEACH (M-LEACH) Protocol, as well as many other protocols which are to be discussed in the following subsections. In this paper we proposed mobility LEACH protocols based on LEACH, which is also suitable for mobile wireless sensor networks. Where n no of nodes were connected to boost the efficiency and throughput of the communication [4, 6]. Each and every node in the network is ready to transfer the data at any point of movement. Transferring of data was done through cluster nodes. In existing the transfer of data are done only in one node i.e. distribution of data were done through a single intermediate node, so they were collusion problem, energy loss were occurred and losses of data also occurred. To avoid this problem data can transfer at any node through network can solve this collusion and energy loss problem.

Transfers of the data are done through selection of node in a network and choose the cluster head which have the long lasting life to transfer the data. Cluster head selection should be based on node density, bandwidth of the node, long-lasting energy, communication cost and so on. The network lifetime should be evaluated by the mobile nodes. The cluster of nodes should elect the cluster head and the cluster head maintains the Report about the nodes in the topology, so it can reduce the energy conservation problem and every node in a cluster have an equal energy no losses of energy will occurred. The Cluster Head should be varied from hop of the nodes.

LEACH is to support mobility addressed in LEACH-Mobile, "LEACH-M" [6]. The basic and main idea in LEACH-M is to confirm, whether a mobile sensor node is able to communicate with a specific cluster head or not. This is implemented by transfer a message, which requests for data transmission back to mobile sensor node from cluster head within a time slot allocated by TDMA schedule of a wireless sensor cluster. If the mobile sensor node does not receive the data transmission from cluster head within an allocated time slot according to TDMA schedule, it sends a join-request message at next TDMA time slot allocated.

Then it decides the cluster to which it will belong for this moment by receiving cluster join-back messages back from specific cluster heads. The LEACH-M protocol achieves definite improvement in data transfer success rates as mobile nodes increase compared to the non-mobility centric LEACH protocol.

LEACH-M handles node mobility well, if the cluster heads are more or less stationary. But it is not true in all the cases, as the cluster head election happens from the same set of mobile nodes. Also the cluster head rotation is purely random and depends on the number of times the node was a cluster head in earlier rounds of TDMA, which is exactly the same way as in basic LEACH protocol. But as the cluster head keeps moving before the rotation happens, cluster itself gets disturbed and an enormous amount of packet loss may occur until the formation of the next new cluster under a new head.

In this paper we propose an improvement to the LEACH-M protocol, which is suitable for mobile wireless sensor networks. The basic idea of this LEACH-Mobile-Enhanced (LEACH-ME) protocol is to make sure as much as possible that the cluster heads are from the group of mobile nodes having minimum node mobility or they are in a group motion with the other cluster members. With the modified cluster heads election process, the proposed protocol makes sure that the clusters are disturbed minimally in the event of movement of cluster heads.

7.1 Leach-Mobile-Enhanced Protocol

7.1.1 LEACH Routing Phases : LEACH is the earliest proposed single hop clustering routing protocol in WSN. It can save network energy greatly compared with none cluster routing algorithm. the cluster update constantly in operation and one updating process is called a round. The cycle of each round contains two stages: setup phase ,steady state phase **Set up phase** is the establishment phase of the cluster, **steady-state phase** is the stable data transfer phase.

set-up phase; Each node generates a random number between 0 to 1, and compares this number with the threshold value $T(n)$. If the number is less than $T(n)$, the node is selected as a cluster-head, the threshold $T(n)$ is set as follows

$$T(n) = \begin{cases} \frac{p}{1 - p * (r \bmod \frac{1}{p})} & \text{if } n \in G \\ 0 & \text{if } n \notin G \end{cases}$$

Where;

n refers the node identification in the current sensor network.

p is the percentage of cluster-head

r is The current round number

G is the set of nodes that have not been elected as cluster head in the last $1/p$ rounds

Steady state phase; In this phase, the cluster head and non cluster head nodes receives a message at the given time slot according to the TDMA time schedule of sensor cluster ,and then its show minimum energy consumption. its send actual receiving data, to cluster head and base station.

7.1.2 Cluster Head Election and Maintenance in LEACH-M

In LEACH-M uses the same set-up procedure used in the basic LEACH protocol. In LEACH, the nodes organize themselves into local clusters, with one node acting as the local base station or cluster-head. If the cluster heads are chosen a priori and fixed throughout the system lifetime, as in conventional clustering algorithms, it is easy to see that these sensors chosen to be cluster-heads would die quickly due to overloading, ending the useful lifetime of all nodes belonging to those clusters. Thus LEACH includes randomized rotation of the high-energy cluster-head position such that it rotates among the various sensors in order not to drain the battery of a single sensor. In addition, LEACH performs local data fusion to “compress” the amount of data being sent from the clusters to the base station, further reducing energy dissipation and enhancing system lifetime.

Sensors elect themselves to be local cluster-heads at any given time with a certain probability. These cluster head nodes broadcast their status to other sensors in the network. Each sensor node determines to which cluster it wants to belong by choosing the cluster-head that requires the minimum. Communication energy². Once all the nodes are organized into clusters, each cluster-head creates a schedule for the nodes in its cluster.

In view of mobility centric environment, the election of a cluster or the job rotation of the cluster head on purely energy level, without considering the node mobility can cause serious problem. A node with sufficiently rich energy level, taking over the duty of cluster head possessing high mobility, may move out of the cluster, causing the cluster to become headless. The situation causes the cluster to go for a new cluster head. But again the mobility of the nodes is not considered causing the same process to repeat. To cope with the situation of cluster head going out of reach due to mobility, the head rotation process needs to consider the node’s mobility. The nodes need to maintain certain additional information to make room for handling mobility.

Role: to indicate if the sensor is acting as a Cluster head CH (value=1) or as a participating node (value=0) in the zone

Mobility Factor: calculated based on the number of times that a node changes from one cluster to another or on the basis of remoteness.

Members List: if the node is a cluster head, a list which contains references to the nodes associated with its Cluster.

TDMA Schedule: Time slot information, when data need to be collected from the sensor nodes by the cluster head. The node needs to maintain all these four information, In which the mobility factor is the one with prime importance for the election of cluster head.

1) Mobility factor based on transition count

The mobility factor is calculated based on the number of times the node moves from one cluster to another.

2) Mobility factor through the Concept of Remoteness

Mobility measure should have a linear relationship with link change rate. If all the nodes in the cluster are in group motion like in RPGM [7], even though the nodes are in motion, the average link change is minimal, maintaining high spatial dependency. The node movement in such scenarios doesn’t make any breakage of association with the cluster head. So remoteness can be treated as a measure of mobility factor.

Let $ni(t), i = 0, 1, 2, 3, \dots, N-1$, where N is the number of nodes, represents the location vector of node i at time t and $dij(t) = |nj(t) - ni(t)|$, the distance from node i to j at time

t . Then the remoteness from node i to node j at time t is $Rij(t) = F(dij(t))$, where F is the function of remoteness.

For a simple choice of F as identity function, the remoteness is just the distance between the nodes.

The method is explained in steps as given below. We denote $\{a\}$ as the normal node, c as the cluster head. The following steps illustrate cluster head election process.

1. Cluster head c sends ACTIVE message to all its cluster members to wake up simultaneously. ACTIVE: $c \rightarrow \{a\}$: wake up
2. Upon receiving the ACTIVE message, all cluster members broadcast their IDs with time-stamp. All cluster member nodes set time-out to receive broadcast of their entire neighbouring node IDs. The ID_broadcast helps individual node to know its neighbours. ID_broadcast: $\{a\} \rightarrow$ NEIGHBORS: know_neighbors
3. Once the broadcast ID timer expires, each node calculates the remoteness based on the IDs received and the time at which the IDs are received. The calculated remoteness information is broadcast by each node. The process helps to know the remoteness of neighbours of each other. remoteness: $\{a\} \rightarrow$ NEIGHBORS :know remoteness

4. Once all the remoteness values of neighbours are received nodes can go for cluster head election, where the node with minimal mobility factor is elected as cluster head, provided its energy level is not below the threshold. The cluster head election need not be done at every TDMA time slot. ACTIVE time slot can be introduced periodically after a certain number of regular TDMA periods. The periodicity can be decided based on the active mobility of the nodes.

Steady State phase in LEACH-M

In LEACH-M scheme, the non-cluster head nodes instead of sending the data to the cluster head in their allotted time slot in the TDMA schedule wait for a request (REQ_Data) from the cluster head to send data. In the vicinity of mobility it may happen that the REQ_Data sent to a particular node by the cluster head is not received by the node, since it is moved to a new location which is not in the radio range of its current cluster head. After sending the REQ_Data, if no response is obtained from the node before the frame slot allotted for that node, the node will be marked as mobile-suspect. If the same thing repeats for the next time slot allotted for the same node, then the suspect node is declared as mobile and the frame slot for that node is deleted from the TDMA schedule. On the other hand, if the node doesn't receive any REQ_Data from the cluster head when it is awake, it marks itself as suspect of non-member of cluster. During the next frame slot allotted to this node, if the same thing repeats, then it takes the decision that it is not a member of the cluster.

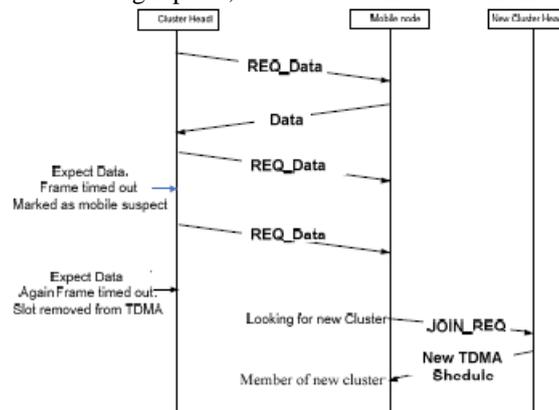


Figure.2 Message sequences for cluster join of a mobile node

Once a node becomes a non-member in any of the cluster, it looks for a cluster to join by sending a broadcast JOIN_REQ. The cluster head hearing the JOIN_REQ allots a time slot in its TDMA schedule and broadcasts it to all the node members including the new member. Upon receiving the new TDMA schedule the mobile node now becomes part of the cluster and uses the new cluster schedule. The sequence of messages are shown in Figure 2

VIII. PROPOSED WORK

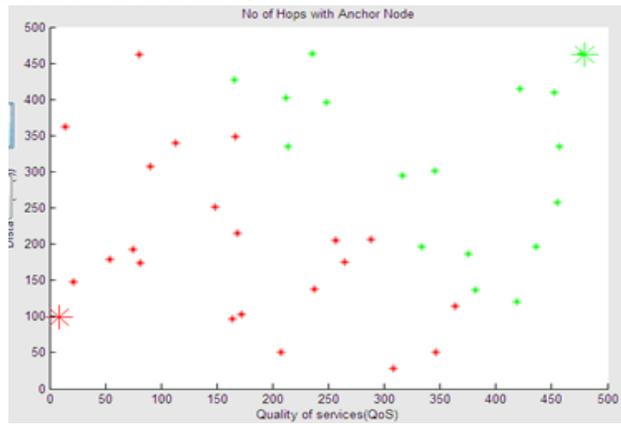
In this paper we proposed mobility LEACH protocols based on LEACH, which is also suitable for mobile wireless sensor. Where n no of nodes were connected to boost the efficiency and throughput of the communication [4, 6]. Each and every node in the network is ready to transfer the data at any point of movement. Transferring of data was done through cluster nodes. In existing the transfer of data are done only in one node i.e. distribution of data were done through a single intermediate node,

IX. EXPERIMENTAL RESULTS

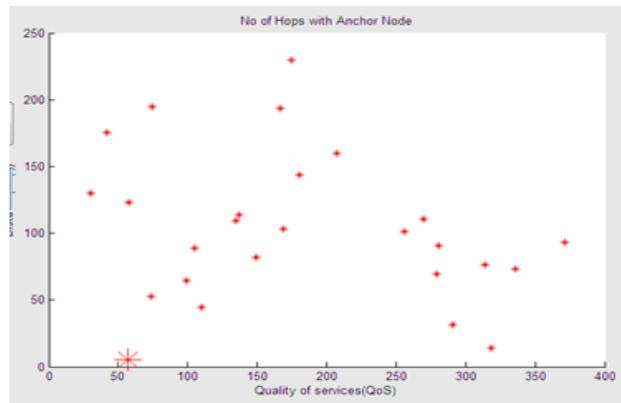
Parameter	Value
Area	400*400
Number of Node	User point of view
Sink Co-Ordination	(100,500)
E_o	1 Jule
E_{TX}	50nj/bit/m ²
E_{DA}	0.5jule
E_{FS}	10pj/bit/m ²
E_{amp}	0.0013*0.00001pj/bit ⁴
Packet	4000bytes
R_{max}	2500

To evaluate the performance of LEACH -M, we simulated LEACH and LEACH-M using N random nodes with topology for a 400m * 400m network region. The base station is located at (100,500) in the center of the 400m * 400m field. We simulated the Wireless Sensor Network to get the number of data packets that are successful in reaching base station. The simulation is run by changing the mobility factor for LEACH and LEACH-M. We also simulated the amount of energy dissipations for the data packets transmitted.

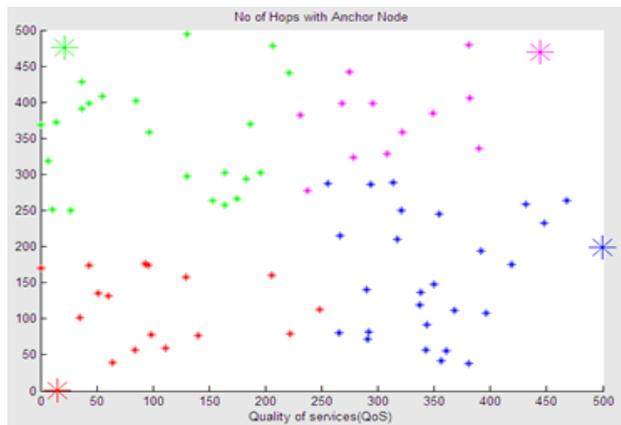
At low mobility , the performance of LEACH and LEACH-M are comparable. but as mobility increase , there is define improvement in average successful communication rate in LEACH-M. At the mobility factor of 4.0 the successful communication rate is 16%,Which is better than LEACH.



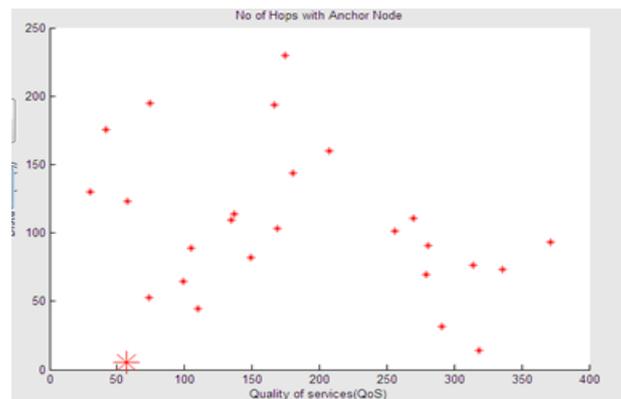
: 40 Hops with Anchor nodes in Wireless network



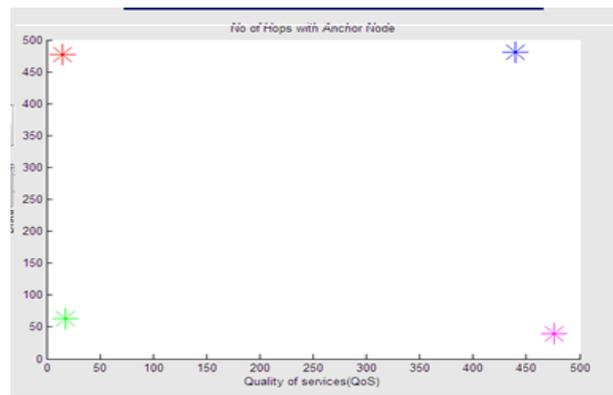
cluster head in destination mobility for 40 node



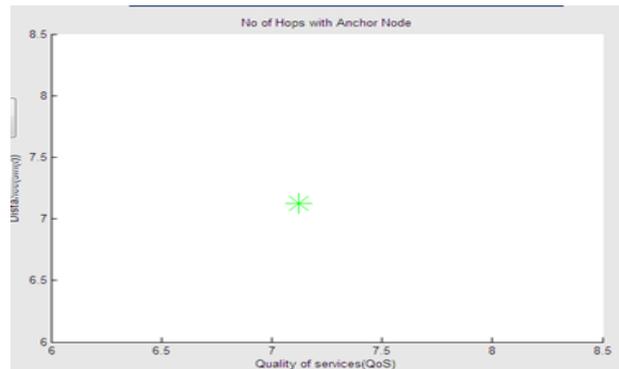
80 Hops with Anchor nodes in Wireless network



cluster head in destination mobility for 40 node

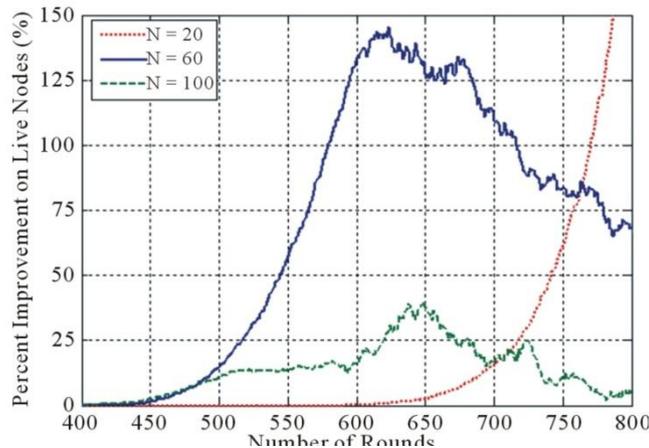


Destination Anchor 80 node in Wireless network



Final cluster head for 40 nodes in wireless network

Performance scalability



energy overhead of LEACH and LEAC-M protocols against the Mobility factor

X. CONCLUSION

In this paper , We describe how LEACH-M protocols is better than LEACH to handled mobility modulation . this paper proposed LEACH-M protocols where nodes isolated due to mobility from the cluster are reconnected with new cluster through the appropriate way. The proposed LEACH-M protocols follows the same reconnection mechanism for isolated nodes . its uses the concepts of remoteness for electing cluster head.

The simulation result show that LEACH-M the average successful communication rate is reasonable at very high mobility.

REFERENCE

- [1] Li, C.; Zhang, H.X.; Hao, B.B.; Li, J.D. A survey on routing protocols for large-scale wireless sensor networks. Sensors 2011, 11, 3498–3526.
- [2] 15. Younis, O.; Fahmy, S. HEED: A hybrid, energy-efficient, distributed clustering approach for adhoc sensor networks. IEEE Trans. Mobile Comput. 2004, 3, 366–379.
- [3] .Buttayan, L.; Schaffer, P. PANEL: Position-based aggregator node election in wireless sensor networks. Int. J. Distrib. Sens. Netw. 2010, 2010, 1–16.
- [4] Ye, M.; Li, C.; Chen, G.; Wu, J. An energy efficient clustering scheme in wireless sensor networks. Ad Hoc Sens. Wirel. Netw. 2006, 3, 99–119.

- [5] .Hong, J.; Kook, J.; Lee, S.; Kwon, D.; Yi, S. T-LEACH: The method of threshold-based cluster head replacement for wireless sensor networks. *Inf. Syst. Front.* 2009, 11, 513–521.
- [6] Deosarkar, B.P.; Yada, N.S.; Yadav, R.P. Cluster Head Selection in Clustering Algorithms for Wireless Sensor Networks: A Survey. In *Proceedings of the 2008 International Conference on Computing, Communication and Networking*, Virgin Islands, USA, 3–7 August 2008; pp. 1–8.
- [7] Hu Gang,Xie Dongmei,Wu Yuanzhong,Research and Improvement of LEACH for Wireless Sensor Network. *Chinese Journal of Sensor and Actuators.*2007.20(6):1 391-13628.
- [8] D. J. Dechene, A. El Jardali, M. Luccini, and A. Sauer, “A Survey of Clustering Algorithms for Wireless,” Department of Electrical and Computer Engineering The University Of Western Ontario London,Ontario, Canada
- [9] Kumar, G.S.; Vinu Paul, M.V.; Jacob, K.P. "Mobility Metric based LEACH-Mobile Protocol", *Advanced Computing and Communications*, 2008. ADCOM 2008. 16th International Conference on, On page(s): 248 – 253.
- [10] R.U.Anitha and Dr.P.Kamalakkannan, "A Survey on Energy Efficient Routing Protocols in Wireless Sensor Networks", *International Research Journal of Mobile and Wireless Communications*, Vol 03, Issue 01, ISSN: 2249-6491 pp 100-105, January-April 2012.
- [11] Karim, L.; Nasser, N. "Energy Efficient and Fault Tolerant Routing Protocol for Mobile Sensor Network", *Communications (ICC)*, 2011 IEEE International Conference on, On page(s):1-5.
- [12] Changle Li *, Hanxiao Zhang, BinbinHao and Jiandong Li,A Survey on Routing Protocols for Large-Scale Wireless SensorNetworks,*Sensors* 2011.