A Modified Approach for Cluster Head Selection on the basis of Energy, Bandwidth and Black List Status of nodes in MANET

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Abstract— **Mobile Ad hoc networks is formed by many mobile nodes which communicate with each other through wireless links. As nodes have limited energy, bandwidth so it is a big challenge for MANETs. Clustering is a technique which manages the exchange of data among the nodes. Basically, a group of nodes is known as cluster among which a cluster head is selected. Now a days, Cluster head selection is a major issue and many protocols were developed for this like LEACH, weighted clustering protocols (HEED) etc .In this we proposed a better protocol for cluster head selection and compare our results with LEACH protocol which is generally on energy basis by considering various parameters like bandwidth, energy and blacklist status of node.**

***Index Terms*—** MANET, Cluster Head Selection, Bandwidth, Energy

I. INTRODUCTION

Mobile Ad hoc Networks (MANETS) comprises of many mobile nodes which interacts with each other without using any fixed infrastructure through direct wireless links. The main problem in MANETS is that there is no central administration so network failure occurs as the node move out of the transmission rang of other nodes. The infrastructure of this network is totally dynamic so some routing protocol must be essential for data forwarding. The other main problems of MANETS are the limited bandwidth, battery power limited security of the network. So to increase the lifetime of the network it is necessary to overcome these problems. As the area of MANETS grows day by day so security also becomes the major concern. There are lot of attacks which imposed on the network like spoofing, denial of service which decreases the network lifetime. So, it is necessary to manage the nodes in a network during the technique which is known as clustering.

A.Clustering

Clustering is a technique to divide a network into particular group of nodes and manage the transmission of data among these nodes. A particular group of nodes is known as cluster. In a cluster one node is selected as cluster head and other nodes are gathered around this cluster head. Custer head perform the following functions:-

a) Cluster head is connected to each node in a group.

b) It maintains the information regarding the cluster

c) It receives the data from the cluster nodes and transmit that data to the base station.

So the selection of the cluster head is very difficult task and many protocols were developed for this process like LEACH which considers only energy as a main parameter for selection of cluster head.

B. LEACH

LEACH stands for Low-Energy Adaptive Clustering Hierarchy protocol which assumes energy as an important parameter for cluster head selection. It is an energy efficient protocol in which the randomized selection of cluster head takes place on energy basis. If the energy of that node is higher among other nodes then that particular node is selected as cluster head. Other factors like throughput, security ,black list status do not consider for selection of cluster head.

Some other protocols were also proposed for cluster head selection which selects cluster head on the basis of unique identifiers assigned to the nodes, connectivity of nodes, transmission power, according to weight values of the nodes.

The main disadvantage of previous techniques is that there must be more time required for cluster head selection and lifetime of the network decreases. In this paper we proposed a new approach for the cluster head selection which is based on

the factors like bandwidth, energy and checking black list status nodes like the selected node attacker node or not. Previous protocols were based on random selection of cluster head either on the basis of energy or security by considering the unique ids assigned to nodes. We perform the implementation in MATLAB which provides better results by considering the factors like bandwidth, security ,energy and compare these results with the LEACH protocol which only assumes energy as a important parameter and also follows the random selection approach for the cluster head selection.

II.LITERATURE SURVEY

Abhishek Majumder in (2010) proposed a paper "A Cluster-Based Topology Control for Ad Hoc Networks"**,** In which the presence of transient network links, mobility and limited battery power of nodes in MANETs challenges such networks to scale and perform efficiently under varying network condition. Most of the topology control algorithms which must proposed have high control overhead to find and maintain route from source to destination. They also have high maintenance cost of topology. To minimize the main problems of routing overhead and topology maintenance cost CBRP (Cluster Based Routing Protocol) was developed which performs better than other protocols in most of the cases .Here. an approach of energy and mobility aware clustering is presented which evaluate the performance improvement gain, rate of cluster head changes, throughput, delay and routing overhead of the network is evaluated using NS2. Simulation results show that this approach is better in performance as compared to CBRP.

Mr.Rahul A Jichkar proposed a paper in 2013"Cluster Based Performance Improvement Strategies for Mobile Ad Hoc Network" which defines many clustering techniques that helps in improvement of power conservation, increasing of battery usage as well as lifetime of the network. It mainly focuses on the major issues of cluster head selection like energy, traffic load etc.

A.S.Salunkhe ,Dr.S.V.Sankpal represents a paper in 2013 "Performance Evaluation Using Cluster Based Routing Protocol for MANET" in which a new clustering algorithm is proposed and is inspired from the bird flight that represents travelling of birds in long distances is V shaped and conserves their energy by changing the leader of the flock..Flock represents the group of bird. This algorithm does not contain any fixed infrastructure and considers transmission range, node mobility of the nodes and simulation performed on NS2 simulator.

ALAK ROY in (2014) proposed a paper "Mobility Based Cluster Head Selection Algorithm for Mobile Ad-Hoc Network**"** in which an algorithm is proposed for cluster head selection and maintenance. This algorithm binds the node with the cluster which further reduces the explicit message passing for cluster maintenance. As we know MANETs have limited energy resources and there is a large no. of message passing required for the data transmission. So, with this approach there is no need for message passing during data transmission.

Rani Al-Maharmah proposed a paper in (2015), "A Multi-Aware Cluster Head Maintenance for Mobile Ad Hoc Networks" In this paper an approach is proposed Multi Aware Cluster Head Maintenance (MACHM) which selects the cluster head on the basis of a weighted formula .This formula include mobility of nodes, load balancing and energy consideration. The results compared with the Weighted Clustering Algorithm (WCA) and concluded that this protocol works better.

Barfunga, S.P. in (2012) proposed a paper, "Energy efficient cluster based routing protocol for Wireless Sensor Networks" in which a hierarchical and cluster based protocol is proposed and cluster head selection is done by the base station. Data is transmitted in a multi hop way and then simulation is carried out.

III.PROBLEMS WITH EXISTING SYSTEM

In wireless communication, the main focus is to enhance the network lifetime for efficient and optimal utilization of resources. The wireless consist of large number of sensor node and a base station that serve a gateway to some other network .Sensor node collect the data and send that data to the base station. Selection of cluster head is one of the major issues. For that many energy efficient protocol have been designed to enhance stability period, network life-time and throughput of the network. Earlier the cluster head selection was made on random basis, with the help of an equation. Every node has the some probability to turn into cluster head. n (n=p×N) nodes are randomly selected as cluster heads, and then, the energy of each node is defined .In cluster formation phase, each node decides whether to turn into cluster head or not by comparing with energy . Later on an new protocol was designed that consider random selection along with white list and black list concept which define the status of node, whether to select a node as a cluster head or not .According to this protocol if the node is white listed then it is accepted as the cluster head and if it is blacklisted it is not included. As by doing this nodes that are white listed are included during cluster formation. This protocol was quite efficient but problem was that it does not consider other parameters. They entirely depend on the security .Though this protocol was highly securely but it could increase the lifetime of the system .As a security protocol it was efficient but it does not consider any lifetime parameter. Life time enhancement is a parameter, and needs to be improved .as it is also effect the cluster head selection.

So, there is a need to design a protocol that will consider the enhancement in lifetime as per cluster head selection approach is optimize .A network that enhances stability period, network life-time and throughput to be designed .

IV.METHODOLOGY

In wireless communication, the main focus is to enhance the network lifetime for efficient and optimal utilization of resources. The wireless consist of large number of sensor node and a base station that serve a gateway to some other network .sensor node collect the data and send that data to the base station. Selection of cluster head is one of the major issues There is need to design a protocol that will increase the lifetime of network, Earlier the protocol designed were secure but didn't consider the any other parameter, like energy,bandwidth etc .As we know that by increasing the number of parameter the network become more efficient by considering security parameter alone the network cannot be made efficient . So by designing a new protocol there will be enhancement in the lifetime of the network ,also the technique of cluster head selection will be enhanced ,along with security and bandwidth.

So a new protocol is to be designed by considering these factors:

1. A protocol that will enhanced the life time of the network
2. A protocol that consider the security parameter but along with that it should consider the energy and bandwidth parameter too.
3. A protocol that can enhance cluster head selection technique.

In WSNs, the network node energy is often limited, so the efficient use of energy is necessary in topology control. Cluster head selection is a major problem, In earlier approach cluster head was formed first and then the cluster was formed, but that was not an efficient method, also the parameter's used were less .Previously in many technique only the security factor. Many protocols were designed but were not that much efficient so a new protocol is to be developed that will enhance the cluster head selection. A new approach is implemented in the thesis work that will solve the problem of enhancement of cluster head selection.

So in thesis work a new approach is made in which a node is selected on the basis of its blacklist status, bandwidth, and energy along with DSBCA algorithm. DSBCA follows a distributed approach to establish hierarchical structure in self-organizing mode without central control. DSBCA selects the random nodes to trigger clustering process first. Then the trigger node calculates its connected density and distance from the base station to determine cluster. So according to this new approach, first the cluster is formed and then the cluster head is selected. In this firstly temporary cluster head is made, then a range is set according to which a cluster is formed and from it finally the permanent cluster head is formed. The node that is made cluster head is selected on the basis of these three factor, if a node satisfy these conditions it will be considered as the cluster head. Following three condition are checked ,firstly weather the node is having higher energy or not ,after that it is having high bandwidth and at last weather its blacklist status is zero .if node is satisfying theses condition it is consider as cluster head .In this way the cluster head is selected . So in thesis first the cluster is formed and then the cluster head is made .This is an effect protocol that will enhance the cluster head selection technique .also by increasing number of parameter the network become efficient.

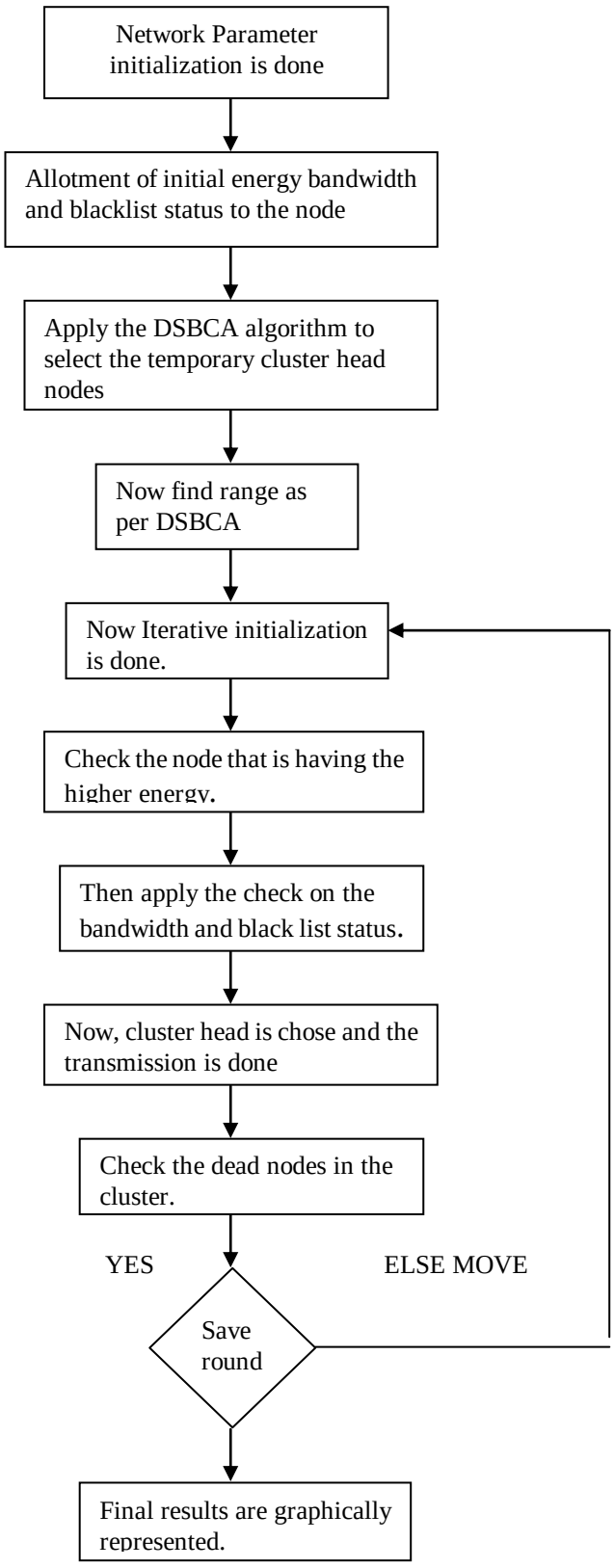

Fig 1:- Implementation Flow Chart

1.Firstly the network parameters like energy, bandwidth etc are initialized to a network which consists of the number of nodes.

2.After the initializations of the network parameters, allot the initial energy, bandwidth and the blacklist status to the nodes as we have to chose the cluster head node.

3.Now apply the DSBCA algorithm to the cluster, for the selection of the temporary cluster heads nodes among the various nodes of cluster in a network .DSBCA stands for Balanced Clustering Algorithm with Distributed Self Organization whose main purpose is to create clusters with balanced energy consumption.

4.After the selection of the temporary cluster head from the cluster .now find the range as per the DSBCA algorithm.

5.As the range is find by DSBCA algorithm, next are iterations initializations, as cluster head is to be chosen among many nodes.

6.Now the node having high energy is checked among so many nodes, and are selected for further checks, as the that node will be selected as the cluster head node.

7.After selecting the nodes having high energy, next is to check the node having high bandwidth. Also the blacklist status of the node is checked, if the node is having high bandwidth and its black list status is zero than that node is selected as the cluster head node.

8.After selecting the cluster head according to high energy, high bandwidth and having black list status equal to zero, that cluster head is transmitted.

9After the transmission of the cluster head node. Now check the dead node. If it is present, then save the round and move to the final result, but if it is not present, then move back to the step 5, and repeat the steps, till the result is obtained.

10.Finally the results that are obtained are graphically represented.

V..IMPLEMENTATION AND RESULTS

MATLAB is used for implementation. Below figures describes the results of implementation in MATLAB environment.

A. Assigning nodes to a network

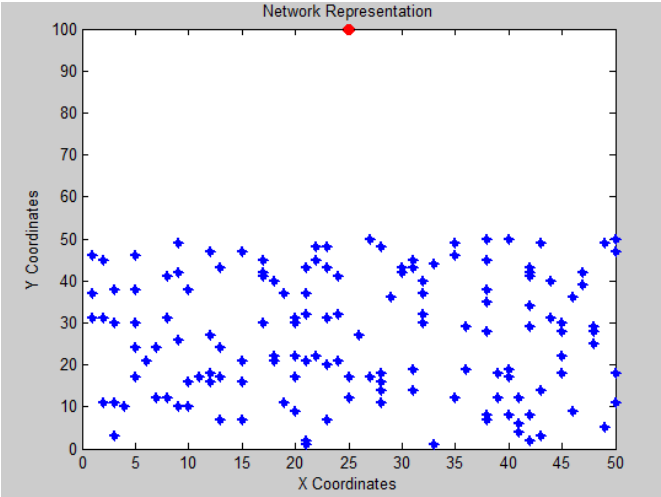

Fig 2:-Assigning Nodes

This figure represents the assigning of 150 nodes to a network and initialization of parameters like energy, bandwidth ,blacklist status of nodes is done here. We can assign any number of nodes to the network. Energy includes both data transmission , receiving and amplification energy.

B.Cluster head selection

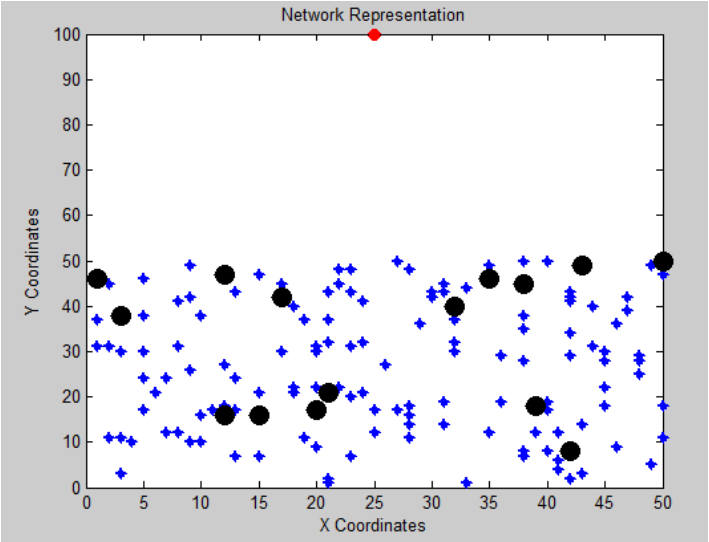

Fig 3:-Cluster head Selection

Figure 3 represents the selection of cluster head on the basis of bandwidth, energy ,attacker or blacklist status of nodes. The nodes transfer the data to the cluster head and cluster head then transmits this data to the base station. Firstly we check the nodes having maximum energy by providing a certain threshold energy and then check for maximum bandwidth. If that node has maximum bandwidth then we check for attacker status of node. If the node is not attacker node then we select that node as cluster head.

C.Finding dead nodes in the network

In figure 4 we count the number of nodes which become dead during data transmission and whose energy level becomes zero .If the cluster head node becomes dead after several rounds then we elect another node as a cluster head. Here after 2200 rounds nodes become dead.

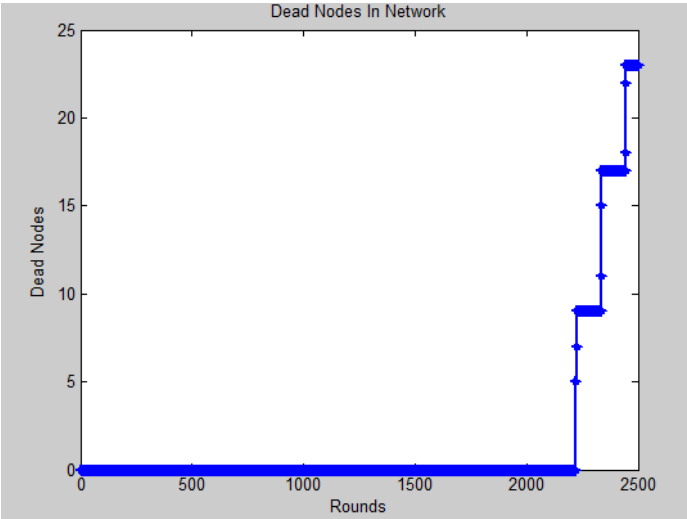

Fig 4 :- Dead nodes representation.

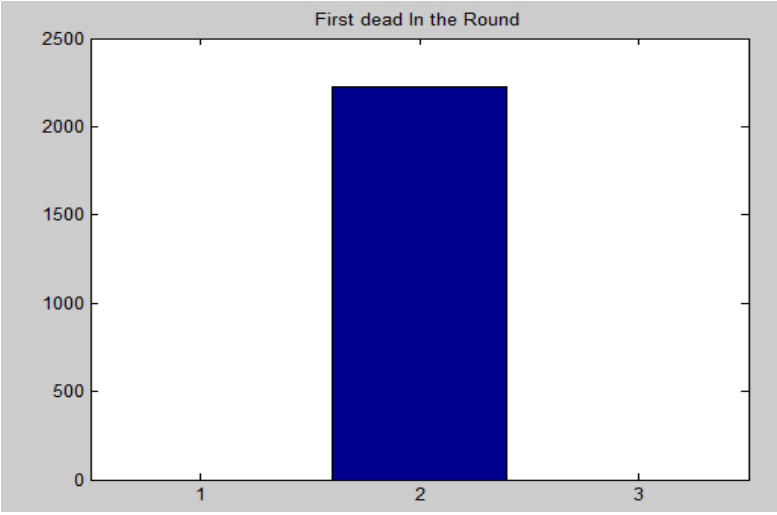

Fig 6:- First dead node in the round

D.Lifetime of network

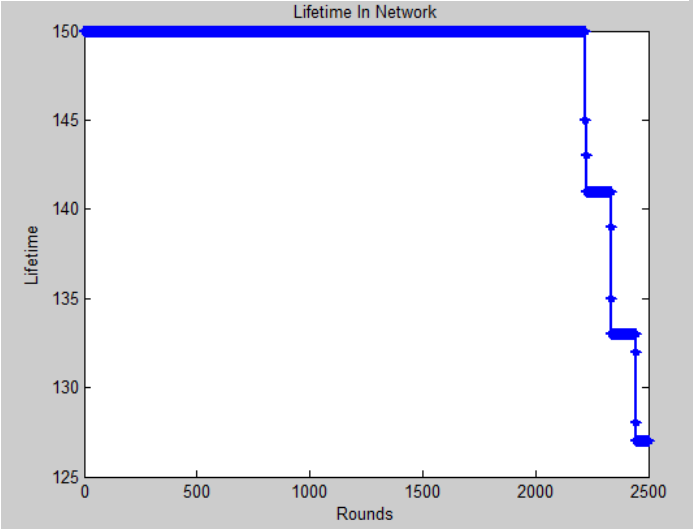

Fig 5:- Lifetime of nodes in a network

Figure 5 represents the lifetime of nodes in a network. If the energy of the node is more then the lifetime of that node also becomes more .Here nodes start becoming dead after 2200 rounds so the energy of nodes is more and lifetime of the network also increases.

E. First dead node representation

Figure 6represents the round when the fisrt dead occurs in a network lifetime.

Figure 7 represents the dead round of LEACH protocol. In LEACH random selection of cluster heads is done and the lifetime of the network is less and nodes become dead in earlier stages. In this approximately at 1000 rounds nodes becoming start dead.

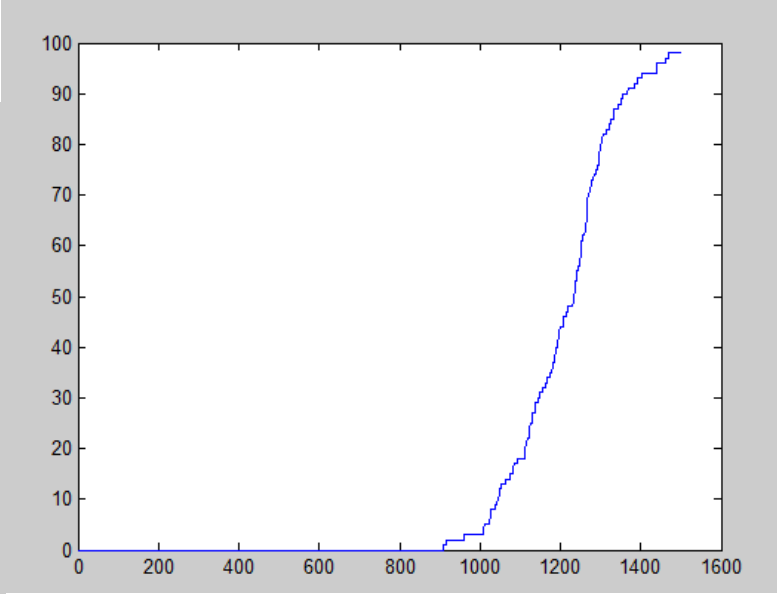

Fig 7:-First dead representation in LEACH

F.Comparison between LEACH and new algorithm

Figures below represents the comparison between the new protocol and LEACH Protocol .In Figure 8we represents the rounds at which the nodes become dead. in a network .Here, red curve represents the new or proposed work and blue curve represents the LEACH protocol.

Figure 9 represents the round at which first node becomes dead in a network .Here blue bar represents the LEACH and red bar represents the new protocol or approach.

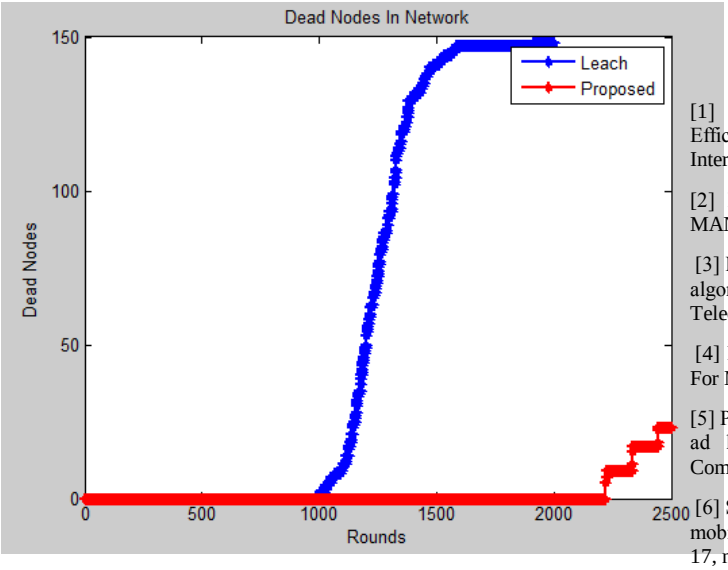

Fig 8:-Comparing LEACH and Proposed approach

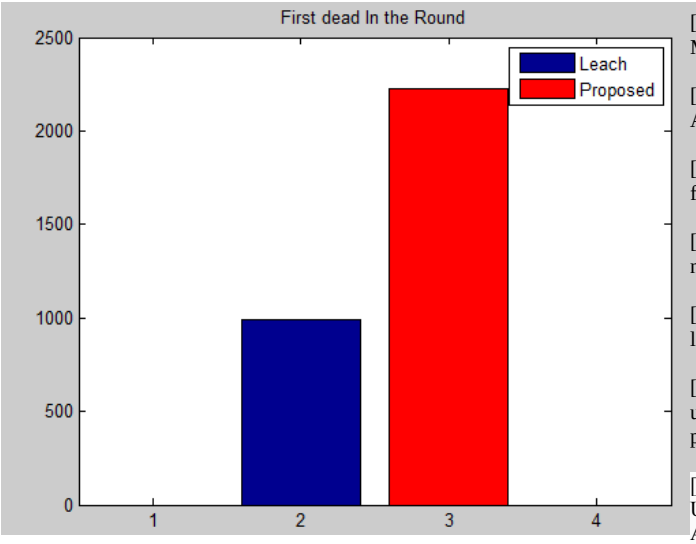

Fig 9:-Comparison of first dead rounds of LEACH and proposed work

VI. CONCLUSION AND FUTURE SCOPE

Cluster Head Selection is a very crucial task. There are many number of protocols present for selection of cluster head on the basis of energy and random selection which results in decreasing of network lifetime due to imbalanced energy consumption and nodes become dead at the earlier rounds .So, here we proposed a new protocol in which the cluster head selection is performed on the basis of bandwidth, energy of node like transmission or receiver energy and by checking the black list status of that node. Then we compare our results with LEACH protocol and concluded that this protocol works better than LEACH and increases the network lifetime. For future scope, we can implement this protocol in optimization algorithms, image segmentation like to divide any digital image into different regions and in various other fields like artificial intelligence.

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