An Efficient Cluster Head Selection Approach for Maintaining High Energy, Throughput and Trust to Enhance Lifetime in Manet

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Abstract— **Wireless network is more than huge at this present time. This brings the need of mobile ad hoc networks (MANET's) into consideration. MANAT is totally different from the classic networks like changing mobility of the nodes, rapid change of the network topology and limited bandwidth and so on. The another big consideration in MANET which is a massive challenge for it is the selection of the cluster head (CH) as it consists of large no. of nodes. This selection of the CH is based on the energy efficiency for most of the algorithms but it is still a question of dispute in MANET. The CH is the node which usually represents the whole cluster as a single unit or called the leader of group and carries extra responsibilities like updating routing table, managing cluster process, discovering new routes and so forth. The rest of the nodes present in the cluster are ordinary nodes which pass on their entire information to CH for the purpose of communication and are called member nodes (MN). Inter cluster links are made which can communicate with one or more clusters & are called gateway nodes (GN). Some of the common features of MANET are limited battery, routing issues and mobility issues etc. MANET is entirely independent network which has no infrastructure. So clustering is done because it allows fast connections, better topology management and routing. In mobile ad hoc network energy efficiency and fault tolerance are two main important factors which should be taken into consideration. A variety of cluster based protocols are proposed by different researchers and their main focus is to how to reduce energy consumption, reduces single link failure, reuse bandwidth and check the trust issue of the nodes..**

Keywords: Cluster Head, MANET, life time, Energy Efficiency, bandwidth, trust.

I. INTRODUCTION

Mobile Ad Hoc Networks (MANET) is different from typical networks in may features like mobility of the nodes, restricted bandwidth and express change of the network topology. MANETS are self-motivated network with no defined transportation available. The fixed wired systems are protected then wireless networks. The attacks may occur from any direction and can target any node.

When the wireless mobile system came into existence, they faced many difficulties. With time, Engineers came up with many solutions. The base station (BS) in a area act as a transreceiver. When someone wants to communicate is near to the BS, it will be easy for nodes to send signals directly to BS. But if the nodes are bit far, the best solution is to make a direct line of sight with BS. If nodes are more distant then they will not be able to send any data to BS means no communication. To solve these problems, Energy efficient protocols are introduced in which clusters are formed instead of individual nodes.
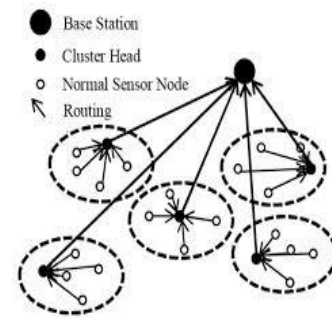

Fig 1 shows: the basic diagram for various clusters communicating with the base station.

In Cluster architecture, a network is divided into group of self managed nodes called Clusters. Clustering is done to divide the network into virtual groups based upon some set of rules called protocols. Their main goal is to achieve mobility and scalability in large networks. Cluster based routing is done to address heterogeneity of nodes and to limit routing knowledge that sustain in the network, which increases the routing life time and decreases the routing control overhead. There are basically three type of nodes: Cluster Head, Cluster Members and Cluster gateways.

Algorithm of clustering consists of two parts. One is Cluster Formation and other is Cluster Maintenance. In the Cluster formation, first of all Cluster Head is selected among the cluster nodes as shown in fig below. Cluster Maintenance came into picture when there are node movements. So, it requests to do re-affiliations along with ordinary nodes and cluster heads.
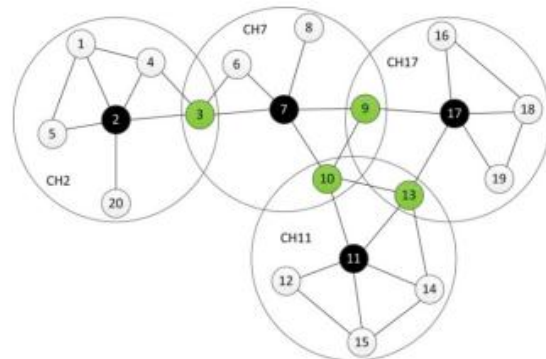

Fig 2 shows: an example of clustering architecture

The Cluster Head (CH) is nominated on the basis of many features one of mostly used is energy efficiency. The CH is responsible for intra-cluster as well as inter-cluster communication. The Cluster Members (CM) are ordinary nodes which pass on their information to their elected CH which further pass on the same information to BS. The third term is Cluster Gateways. They are not cluster head but they make the links with other neighboring cluster gateways and forward information among them as seen in the fig below:
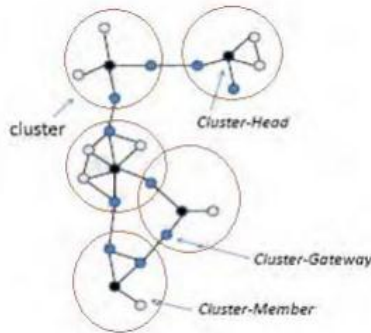

Fig 3 shows: three types of nodes in clustering

Wireless sensor network has two kind of nodes. One is sensor nodes with limited energy factor and other is base station which is without energy restriction. Communication involves three main steps. First is reception of information from cluster members, second is processing and compression and third is transmission of this processed information to base station.

One node per cluster is selected as CH during the election process in which it consider the energy limitation and processing. Multiple clusters in one cluster give rise to cluster reformation, routing problem and complicated Quality of Service (QOS) issues.

Wireless networks consume power for each work they perform with restricted power they have which leads to decrease their life span. So, the most important issue here is energy efficiency. The main concerns of the sensors are energy and achieving maximum QoS. Engineers deal with such issues to enhance the QoS factor to maximum. Sensor are divided into clusters which have many benefits like enhanced coverage of the network , decrease in transportation cost, most important is reduction in energy utilization and improved QoS. We proposed here QoS based protocol of routing to decrease congestion in network and enhanced the energy and life span which will be fault tolerant.

II. RELATED WORK

A.S.Salunkhe and Dr.S.V.Sankpal, evaluated that in Mobile Ad Hoc Networks (MANETS), Clustering routing based protocol may adequately enhance its   Scalability, routing performance and most important Energy Efficiency. In their paper, they proposed a newly-fangled clustering algorithm integrated along with a routing protocol. Our Approach is motivated from bird flocking actions where birds tour long distances in flocks and preserve energy by frequently shifting the boss of the Flock. We have largely concerted on

clustering algorithm and calculated our clustering algorithm based on moment-to moment decisions of entity nodes during communication. In this approach, they divided into chunk nodes known as clusters in the network. The clusters are enthusiastically re-assembled and maintained using unambiguous algorithms and techniques. Their proposed routing scheme shows a pose based routing come within reach of which incorporates vibrant choice of the gateway nodes to shrink the number of control packets snowed under the network mandatory for competent routing of data packets. Their work presents direction-finding algorithm, cluster algorithm and mock-up location.

Wojciech Bednarczyk and Piotr Gajewski in 2013 evaluated, An Enhanced Algorithm for MANET Clustering Based on Weighted Parameters. In this paper Mobile Ad-Hoc network (MANET) is a type of communication network which is used for data communication stuck between a mobile nodes using wireless channels. Clustering is evolved as an important explore topic in MANETs as it improves the structure presentation of outsized MANETs. Clustering is known as the process which divides the set of connections into nodes called groups also called clusters. Each cluster own a Cluster Head (CH) as arranger or manager within the foundation. This paper proposes a clustering method for MANETs, which is weighted clustering algorithm. The performances of the algorithm are evaluated through replication and the results are hopeful.

A.E.Narayanan, R. Devi and Dr.A.Vincent Jaya kumar introduces, An Energy Efficient Cluster Head Selection For Fault tolerant Routing In Manet. In their paper they worked on latest advance in Mobile Ad hoc Network and led to several new-fangled techniques purposely premeditated for MANET where energy wakefulness is a vital contemplation. In MANET, clustering is a key steering system used to diminish energy expenditure. The viability of a clustering scheme can be largely resolute by the involvedness of the cluster head medley. Optimizing cluster head range allows the network to be more capable by minimizing the signaling visual projection and for ensuring the network connectivity is maintained despite of topology changes. In this present paper, energy proficient cluster head selection for fault-tolerant steering is proposed and evaluated. Main purpose of this sort of cluster head selection is to get the most out of the CHs liveliness and also diminish single link collapse in MANET. Recreation fallout show that our projected model could improved realization of fault tolerance and lengthen the lifetime of the network

Raihana Ferdous, Elankayer Sithirasenan, worked on Trust-based Cluster head Selection Algorithm for Mobile Ad hoc Networks. In this paper, they had worked on Mobile Ad hoc Networks (MANETs) which consist of a huge amount of fairly low-powered mobile nodes which are communicating in a network by means of telephone lines signals. Clustering is one of the techniques used to supervise data switch over in the middle of interacting nodes. Each one assembly of nodes has one or more selected Cluster head(s), where all Cluster heads are interrelated for forming a communication spinal column to send out data. Additionally, Cluster heads should

be proficient of underneath communication with restricted energy sources for longer phase of time. Disobedient nodes and cluster heads can exhaust energy speedily and lessen the total life duration of the network. In this situation, medley of superlative cluster heads with trusted in sequence becomes grave for the overall performance. In their effort, they projected Cluster head(s) medley algorithm based on an efficient conviction model. This algorithm aims to opt for trustworthy and upright stable cluster head(s) that can afford safe and sound communication via accommodating nodes. Simulations are conducted to appraise trusted Cluster head(s) in stipulations of clusters immovability, endurance and throughput.

Sivaprakasam P., Gunavathi R. in 2011 evaluated, An efficient cluster head election algorithm based on maximum weight for MANET. They represented that in the last two decades, there is fascination in the exploit of internet and communication expertise in the field of portable Ad Hoc Network which motivated the researchers to roll over in those areas. There were some algorithms anticipated for electing the proficient Cluster heads. The cluster heads are having supplementary farm duties resembling to lessen the re-affiliation, topology changes and the firmness of the on stipulate networks. They projected a new proficient cluster head selection algorithm based on the highest heaviness in which it takes deliberation of five dissimilar weight parameters. In this paper they analyses the cluster head changes, energy expenditure, life instance of the network and end to end holdup of the nodes. The investigational result also shows that projected algorithm is better than the offered Weighted Clustering Algorithms.

Neha Gupta, Manish Shrivastava and Angad Singh worked on Greedy Cluster Head Selection Based Routing Protocol For Mobile Ad Hoc Networks. In this, the Ad-hoc networking is a mock-up in wireless device connections, which stand for the users deficient to communicate with apiece further form a transitory network, with no form of regional supervision. Every node participating in the network acts as host and a router both and as a result is ready to frontward packets for supplementary nodes. For this reason, a direction-finding code of behavior is needed. Which means that the direction-finding code of behavior should try to decrease control traffic, such as interrupted update messages. Cluster creation in Ad-hoc network is an imperative concern. Clustering in (MANETs) has numerous compensation compared to the conventional networks. But the extremely dynamic and unstable environment of MANETs makes it complex for the cluster based direction-finding protocol to split a mobile network into clusters and willpower of cluster heads for each cluster. In recent research years, a number of direction-finding protocols and group based protocols have been projected for mobile ad hoc networks and important along with them are DSR, AODV protocols. This investigation provides an general idea of these protocols by presenting their uniqueness, functionality, remuneration and boundaries and then makes their proportional psychoanalysis so to study their recital and match up to some of offered works on clustering in

MANETs. We pigeonhole the works as position based, Neighbor based, influence Based, imitation astuteness Based, Mobility based and burden Based. They have also represented the conclusion of these techniques and give advice for a best clustering loom based on the surveillance. The idea is to make annotations about how the presentation of these protocols can be enhanced. We also wished-for new technique for cluster head selection for humanizing effectiveness of by and large algorithm.

III. METHODLOGY

In the present wireless senor arrangement, every sensor nodes are used for the communication to distribute information. The main problem in the sensor network is the selection of the cluster head. In conventional approaches the method used for cluster head selection were not competent. Along with that the parameters like energy, bandwidth etc was not considered. So in this work a new algorithm is proposed for the enhancement of cluster head selection. The selection is done by considering the energy, bandwidth and the trust values. Along with this the DSBCA algorithm is used. DSBCA follows a scattered approach to set up hierarchical configuration in self-organizing manner with no central control. In this work the parameters of the network are initialized by using DSBCA algorithm. After that the node having the high energy is selected, this condition is for selection of the temporary cluster head. After this the bandwidth and the trust values are checked and finally the cluster head is formed. With the help of the trust value the attacker node is found, before choosing the cluster head it is checked whether the node is reliable or not .On the basis of the probability value it is checked whether the node satisfy the condition for becoming the cluster head .By choosing the node with superior energy the life instant of the network is increased as the stability of the node will be increased. The bandwidth of the system will increase the speed of the data transmission. This is an efficient protocol for the cluster head selection as various parameters are considered that will increase the performance of the network.

A mobile ad hoc network (MANET) is a incessantly self-configuring, infrastructure-less network of mobile devices coupled without wires. AD HOC is Latin word which means "for this" (i.e., for this idea). Every appliance in a MANET is liberated to move without help on any path, and will thus alter its acquaintances to other campaign frequently.

Micro sensors hold thousands of sensing nodes in any network. It is advantageous to construct these nodes as cheap and as energy-efficient as possible and rely on their huge figures to achieve high quality outcome. System protocols must be intended to pull off fault tolerance in the existence of individual node disappointment while minimizing energy expenditure. In addition, while the restricted wireless channel bandwidth must be shared mutual among all the sensors in the network, routing protocols for these networks should be able to execute local partnership to diminish bandwidth necessities. Sooner or later, the data that being sensed by the nodes must be transmitted to a control center or base station, where the end-user can access the data. In our effort, we reflect micro sensor networks where
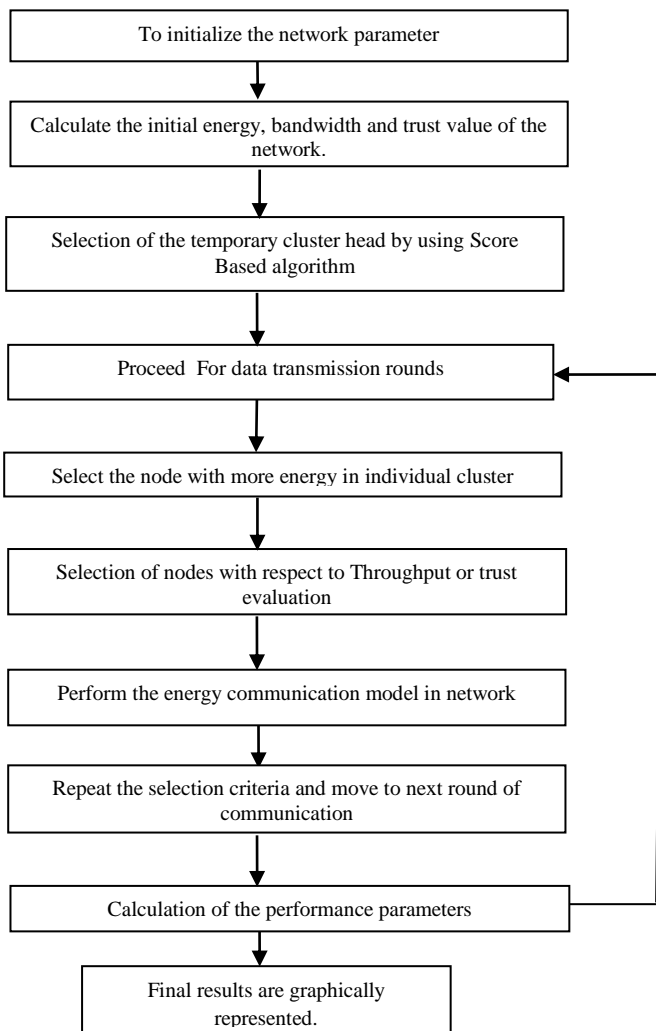
the base station is permanent fixed and positioned far from the sensors and every single one nodes are homogeneous and energy embarrassed. Therefore, communication sandwiched between sensor nodes and base station is costly, and there are no high-energy nodes from first to last from which communication can carry on. When we analyze the advantages, disadvantages of traditional routing protocols by means of our model of sensor networks, we have made LEACH (Low-Energy Adaptive Clustering Hierarchy), a clustering-based protocol that lessen energy dissipation of the sensor networks.

The features of LEACH are:

- Limited to a small area organization and control for cluster set-upend function.
- Randomized revolution of the cluster base stations or cluster-heads and the equivalent clusters.
- Local firmness to diminish inclusive communication.

Clustering is one of the significant methods for prolonging the network lifespan sensor networks. It involves assemblage of sensor nodes into the clusters and electing cluster heads (CHs) the clusters. CHs gather the information from different cluster's nodes and forward that data to base station. A challenge that the network faces is election of cluster head.

FLOW DIAGRAM:

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┌─────────────────────────────────────────┐
│     To initialize the network parameter   │
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                    ▼
┌─────────────────────────────────────────┐
│ Calculate the initial energy, bandwidth   │
│ and trust value of the network.           │
└─────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────┐
│ Selection of the temporary cluster head   │
│ by using Score Based algorithm            │
└─────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────┐
│ Proceed  For data transmission rounds     │◄──┐
└─────────────────────────────────────────┘    │
                    │                            │
                    ▼                            │
┌─────────────────────────────────────────┐    │
│ Select the node with more energy in       │    │
│ individual cluster                        │    │
└─────────────────────────────────────────┘    │
                    │                            │
                    ▼                            │
┌─────────────────────────────────────────┐    │
│ Selection of nodes with respect to        │    │
│ Throughput or trust evaluation            │    │
└─────────────────────────────────────────┘    │
                    │                            │
                    ▼                            │
┌─────────────────────────────────────────┐    │
│ Perform the energy communication model    │    │
│ in network                                │    │
└─────────────────────────────────────────┘    │
                    │                            │
                    ▼                            │
┌─────────────────────────────────────────┐    │
│ Repeat the selection criteria and move    │    │
│ to next round of communication            │    │
└─────────────────────────────────────────┘    │
                    │                            │
                    ▼                            │
┌─────────────────────────────────────────┐    │
│ Calculation of the performance parameters │────┘
└─────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────┐
│ Final results are graphically             │
│ represented.                              │
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1. Initially the network is designed having number of nodes by initializing the various parameters like bandwidth, energy and trust value of the system.

2. The next step after the designing the network is to chose the cluster head node among various nodes present in the cluster by allotting the initial energy, bandwidth and the trust value of the node.

3. After initializing the parameter next step is to select the temporary cluster head among the various nodes present in the cluster by applying score based clustering algorithm.

4. Next step is to find the range by using score based clustering algorithm after the selection of the temporary cluster head.

5. In this step as the range is finding by score based clustering algorithm, next are iterations initializations, as cluster head is to be chosen among many nodes.

6. After this the node having higher energy among the node in the cluster is checked and are selected for further checks, as the that node will be selected as the cluster head node

7. Next step after the selection of the node having highest energy ,the node with high bandwidth is selected and also the trust value of the node is checked , if the node is having high bandwidth and is having high trust value that node is selected as the cluster head.

8. After the selection of the cluster head on the basis of the high energy, bandwidth and the trust value the data is transmitted.

9. After 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 calculations of the results are done and are graphically represented.

IV. OBJECTIVES AND PROBLEM FORMULATION

The transmission of the data without wire is termed as the wireless communication. The data is send to receiver without any physical link. In network various node are present among which the communication is done. The nodes will send data to the base station and then base station will further send it to the end user when we talk about wireless communication, our main focus is always on how we get optimal utilization and increase lifetime of the network resources. There are large number of sensor networks in the wireless region with a base station, which is used to communicate between various gateways of other networks, collect the data to be transmitted form sensor networks and pass then to base station first and then to gateways of the other network. .while the clustering of the node is done one of the major issues that arise is the selection of the cluster head . As cluster heads will send the data through the nodes to the base station. So cluster head section is done in such a way that the stability of the cluster head and the life time of the network increased. For the well-organized network, the life time should be more and the energy burning up be less. Scheming the necessities for cluster head selection is a main issue and for it we need to

make a appropriate protocol that boost the network life time of the system. Also the protocol designed earlier does not consider parameter like bandwidth, energy, trust etc. By increasing the network parameter the efficiency of the system increases. So keeping all these problems in consideration there is a need to design a new algorithm in which these problem of the wireless communication are resolved. There is a need to design a protocol that will increase the life time of the network, also the technique of selecting the cluster head will be enhanced, and the security of the network is also considered. So designing other new protocols for enhancing lifetime is mandatory. New protocols should be designed which will consider following parameters:

- A protocol which will increase the life span of the network.
- A protocol which will increase methds for the selection of cluster head.
- A protocol which will consider security considerations along with the parameters like bandwidth and energy too.

V. EXPERIMENTAL RESULTS

Matlab version 7.10.0.499(R2010a) is used to for taking the readings on the graph. In our work we have taken many reading by taking different cases. One of each case is studied here. The fig 4 shown below represents the dead nodes in WSN network of our proposed work. As seen in the graph the nodes are working till 2000 rounds and after that they are becoming dead. The number fig 5 shows, the life time of the proposed work statics. The nodes are alive till 2500 rounds.
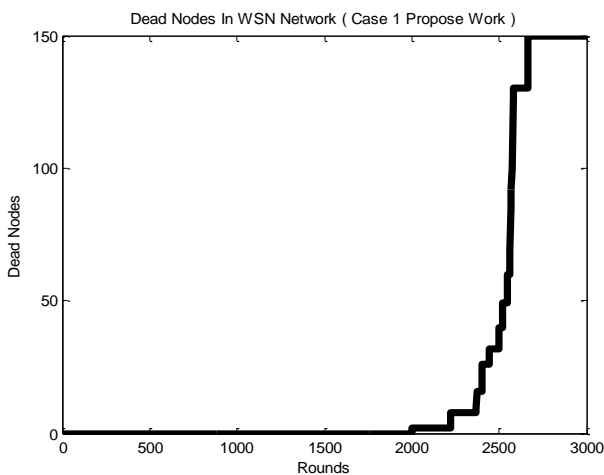
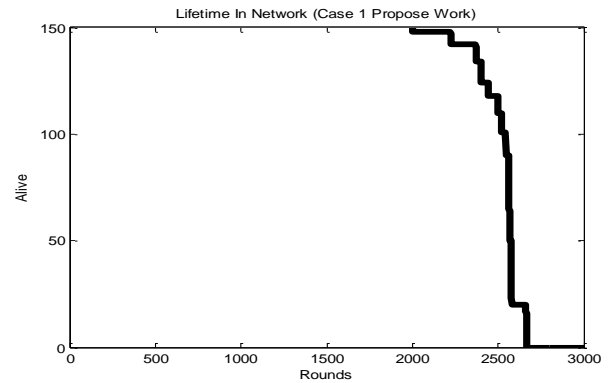Figure No:- 4 shows the graph between dead nodes and number of rounds in the network.

Figure No:- 5 shows the graph between the alive nodes and number of rounds in the network

The next fig 6 shows first dead nodes in the WSN network. We have taken five cases as above of dead nodes and lifetime of the network in accordance to our proposed work. According to its approach we got this graph showing the variation of nodes from 2000 to 23500 rounds.
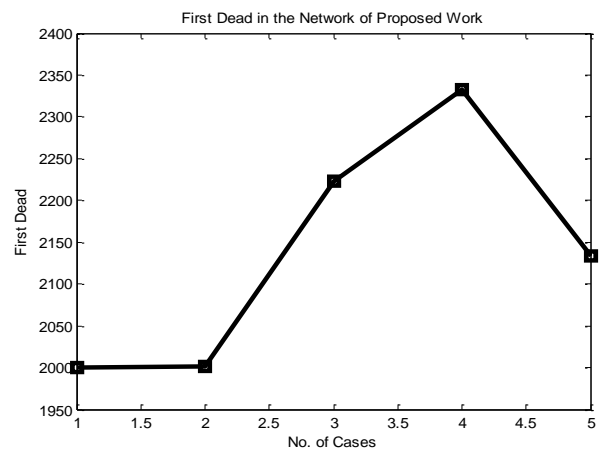

Figure No:- 6 shows the graph between the first dead and number of cases of our proposed work.

Fig 7 and fig 8 shows the dead nodes in WSN network and lifetime of the network in case of traditional leach protocol with which we will compare our results.
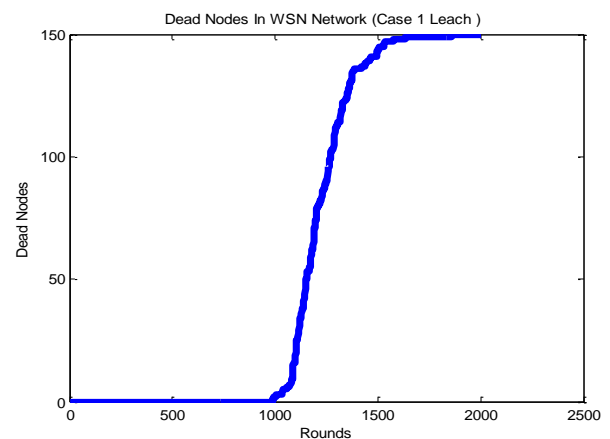

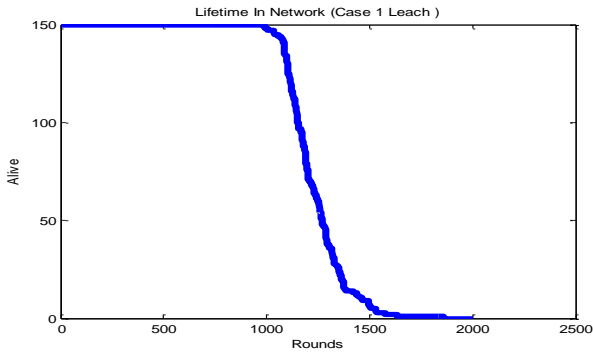Figure No:- 7 shows the graph between the dead nodes and number of rounds in case of Leach.

Figure No:- 8 shows the graph between the alive and number of rounds showing the lifetime in Leach.

The next fig 9 shows first dead nodes in the WSN network. We have taken five cases as above of dead nodes and lifetime of the network in established leach approach. According to this, we got this graph showing the variation of nodes from 980 to 1040 rounds.
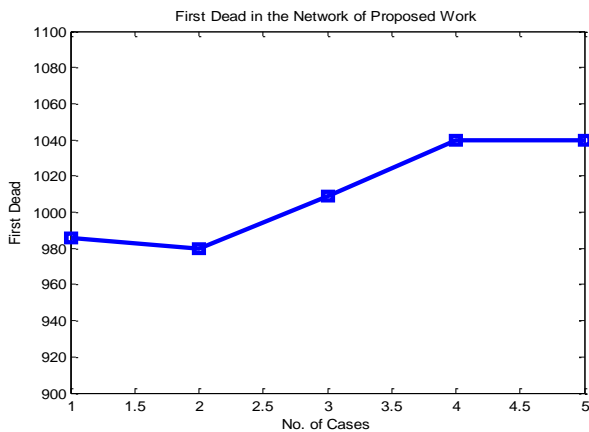

Figure No:- 9 shows the graph between the first dead and number of cases in Leach.

The next two figures, fig 10 and fig 11 shows, the comparison between leach verses our proposed work graphically. In fig 10, blue line showing the readings on traditional leach and black line shows our proposed work readings taking dead nodes onto account. In fig 11, blue line showing the readings on traditional leach and black line shows our proposed work readings taking life time nodes onto account.
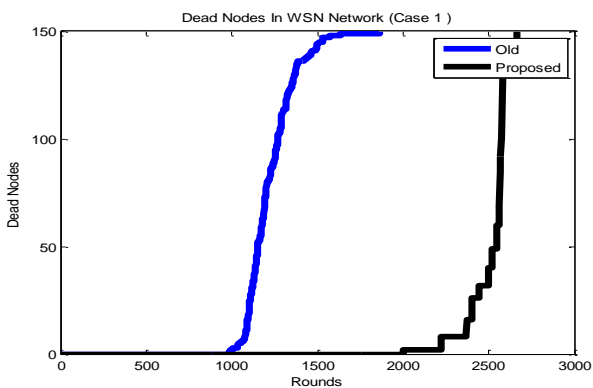

Figure No:- 10 shows the graph of comparison between leach and our proposed work showing the dead nodes.
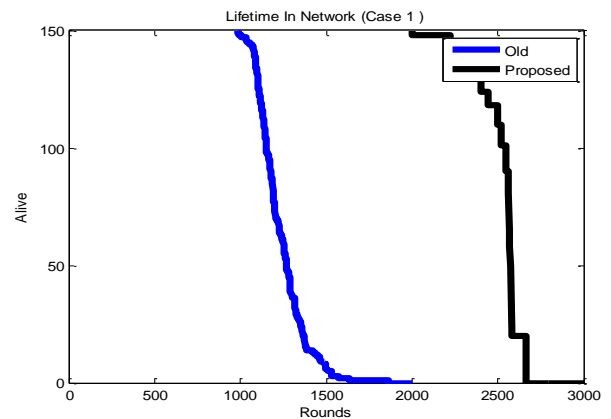

Figure No:- 11 shows the graph of comparison between the leach and proposed work showing lifetime of the nodes

fig 12 shows the comparison and variation in the old verses new proposed technique. The old statics shows the the reading with blue line at the value 1000 to 1100 rounds. Our works proposal shows the values with black line at 2000 to 2400 rounds making it better the traditional leach.
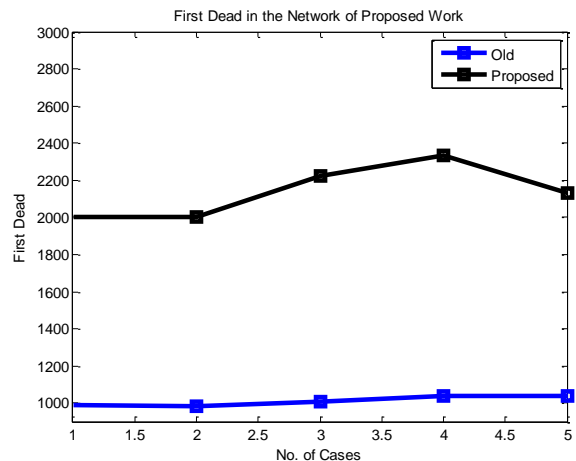

Figure No: - 12 show the graph of final comparison of old leach and our proposed showing different number of cases and first dead nodes.

VI. CONCLUSION AND FUTURE SCOPE

In the present times, there are a lot of protocols in which the cluster heads are selected on various number of parameters mainly on the basis of energy and other like random selection of weight or priority parameters which may result in loss or decrease in life time of the network. There may be many reasons for these loses like improper and imbalanced consumption of energy, or like nodes become dead or energy less at any stage of the network. In the traditional algorithm the security of the network was not consider. The status of the node was not checked before the transmission of the data. With the help of the node status the attacker node is found, before choosing the cluster head it is checked whether the node is reliable or not. So in this proposed work a new protocol is proposed in which the node status is defined along with this the parameters like energy and bandwidth is also defined. From the results obtained it is concluded that the proposed algorithm is more proficient than the conventional algorithm for the cluster head

selection. This protocol is designed in which the security of the network is increased also the bandwidth and the energy parameter is consider .As the numeral quality of examine parameters increased, the network presentation is also improved. . Our proposed work is better approach for the cluster head selection. The selection of the cluster heads in the cluster should be done in such a way that the performance of the network should be increased. As in this work the status of the node is checked and the QOS parameters are also increased .So in future, this approach can be further enhanced with the help of optimization algorithm. Optimization algorithms give the best optimizes results. So in these algorithms can be used for further form improving the network stability and selection of the cluster head. When we think for its future scope, we may implement this approach for image segmentation, digital imaging, optimization, artificial image intelligence.

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