IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-7, Issue-2, Feb 2019 E-ISSN: 2347-2693

Enhanced Distributed Energy Efficient Clustering Protocol:Using Priority Queue

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DOI: https://doi.org/10.26438/ijcse/v7i2.126134 | Available online at: www.ijcseonline.org

Accepted: 12/Feb/2019, Published: 28/Feb/2019

Abstract- Today WSN are highly approached technology that used to interact several sensor nodes corresponding to at least common application. The WSN is affected by the problem of energy dissipation of the sensor node that collects and report the specific data to application monitoring node. The main reason to develop WSN network is to maximize the lifetime of the batteries that are constrained by the nodes during transmission. The clustering mechanism is the best and most efficient one to resolve the issue with the requirement of energy in WSN. In clustering the network is divided into smaller clusters and each cluster includes one cluster head and members. It is very much useful for reducing the energy dissipation and enhancing the lifetime of the network. In this paper we propose new clustering protocol Enhanced DEEC(Distributed Energy Efficient Clustering) along with priority queue to balance the energy in the WSN network and prolonging the lifetime of the network. The simulation results revealed the performace of the proposed technique is better than existing protocol DEEC. Energy consumed during overall packet transmission, packet drop ratio, number of packets transmitted to the base station and cluster head are considered parameters.

Keywords*: WSN, DEEC, Energy Consumption, Packet Drop Ratio, Packets to base station, packet to cluster head*

I. INTRODUCTION

The current situation associated with WSN required modifications to conserve energy since sensor nodes present within WSN have limited energy. As and when sensor nodes become exhausted, packet drop ratio starts to appear. Conservation of energy and increasing lifetime of the network hence becomes part of most of modern day researches. WSN is the collection of sensor nodes arranged to form distinct clusters. Every cluster consists of distinct types of nodes, some have higher and some have least energy associated with them. Probability of selection of cluster head is also associated with every node. [1]Physical parameters are associated with sensor network. These physical properties decide whether nodes can be selected as cluster head or node. In most of earlier work only single cluster head per round is selected. However in most of the situations multiple cluster heads are required to be operated upon since load is an issue that required being tackled using cluster head selection process. [2]Sensors nodes generally consist of flip flops capable of holding one bit of information. For this reason they are also known as bits. As the number of flip flop within network increases, number of bits that can be stored within the sensors also increases.[3] As the packets are exchanged between the nodes, energy is consumed. Energy consumption cause the network to degrade in terms of lifetime.[4]Cluster head selection is the next primary step. Selection of cluster head is based on greatest energy of hub related with it. As the cluster head is chosen, it will be selected to transfer the packet towards the destination. More packets cluster head can handle larger will be the dissipations of energy. As the cluster head energy is completely dissipated, packet drop ratio starts to increase. [5]hence after transmission of packets, energy of entire network will be consumed depending upon the packet being transmitted. Most of the researches focused on reducing the size of the packets in order to conserve energy but existing research does not focus on conserving packets which are dropped. [6] These conventions are LEACH, HEED, DEEC, EDEEC, SEP etc. A considerable measure of work is finished with these conventions and these are based on Group based convention. LEACH came into the presence in the grouping convention and it is the primary convention In DEEC, bunch head is chosen in the light of remaining energy associated with nodes present within WSN network. After the development of DEEC, application of DEEC is enhanced by the use of EDEEC. EDDEC causes the selection of nodes based on minimum distance and energy remaining and network is heterogeneous indicating nodes with different configurations. But LEACH is the homogeneous network.[7] In this paper, we examined Distributed Energy Efficient Clustering (DEEC) convention by assessing dead hubs for organize lifetime, energy utilization and energy adjusting and later new clustering convention has been presented which is the altered type of DEEC and it additionally enhances the execution.

Protocols used to conserve energy of the networks can be homogeneous or heterogeneous in nature. LEACH is a homogeneous protocol.

This paper is organized as follows. Section 2 describes the earlier work which is done towards energy efficiency and prolonging life time of network Section 3 gives in depth study of proposed system to reduce packet drop ratio. Section 4 gives the critical analysis of performance analysis of various protocols and compares it against the proposed work. The paper is finally concluded in section 5.

II. EARLIER WORK

2.1 **DEEC**

[7][8]Heterogeneous protocol ensuring prolonged lifetime of the network is DEEC. Distributed energy efficient clustering protocol for conserving or saving packet drops has following characteristics.

- Cluster head selection in DEEC is purely on the basis of probability assigned to it. Probability can be over 0.5 which result in selection of cluster head.
- Limited energy associated with the wireless sensor node and its lifetime depends upon number of packets it has tackled and lifetime during which it is switched on.
- DEEC is advancement of LEACH in which at every round multiple cluster heads are selected and hence load balancing is achieved.
- Two level heterogeneous protocols is supported through the application of DEEC.
- Hierarchical clustering with multilevel operation with 0 to N level is supported with this protocol.

In DEEC, every one of the hubs must have the thought regarding all out vitality and lasting information. Nodes have initial energy associated with them and this energy is known as reference energy used within the network to check cluster head construction.

2.2 **LEACH**

[9]–[11]this protocol is the first in the hierarchy of minimizing energy consumption associated with the node selection and packet transfer process. Packet transfer consumes energy and this protocol was used to minimize consumption to enhance lifetime of network.

- Arranging nodes in such a way that overall energy consumption of network is minimized.
- Source node can transfer the information to the cluster head from information is packed and is transferred towards base station.
- Calculations are applied to decide cluster head at each distinct round.
- Closest cluster head is selected to transfer the packets towards the destination. Because of this energy consumption is reduced.
- Nodes that become cluster head cannot be selected as cluster head again. That node which becomes cluster head will ultimately die down.
- At the end of each round, new cluster head is selected based on energy consumed and energy left.
- Finally information which is collected regarding energy of the network is forwarded to every node within the network.

Time division multiplexing is used in order to transfer multiple packets towards the destination. Packets are collected and then transmitted forward according to the time slot fixed. Cluster head selection mechanism is hence strictly on the basis of time and may cause problem if cluster head energy drains within the time slot. In that case packet drop ratio significantly enhances.
The DEEC protocol is modified in the proposed paper for minimum distance handling and priority queue to enhance lifetime of the network and reduce packet drop ratio.

2.3. **Priority Queue**

[12], [13]Priority queue is maintained in order to store the packets in case congestion is high. The priority queue is a queue which holds the jobs with priority number. The CH having minimum energy is giving highest priority for storing the packets. Least priority packets are dropped if queue becomes full. Subsequently packet drop ratio is decreased. Priority Queue is maintained to receive the packets transferred through nodes. Using priority queue reduces the packet drop ratio. Hence more packets are transferred from nodes to CH and from CH to BS. Rather dense network is considered in which Intra-cluster correspondences are performed at lower power level and just those cluster heads are permitted to seek cluster head determination, which have remaining energy over an edge level.

III. ENHANCED DEEC

The proposed system consists of advance, normal and super nodes. Distance handling mechanism is associated with the system to reduce energy consumption. The structure of the proposed model is shown in Figure 1 and Figure 2:

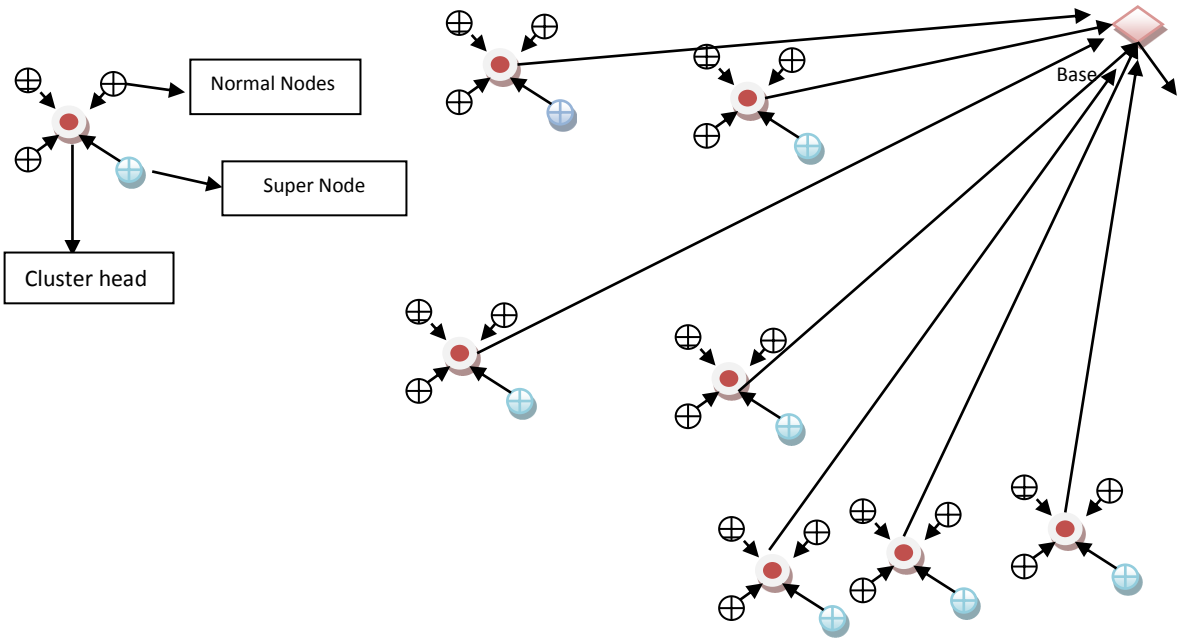

Figure 1. Structure of Proposed Model

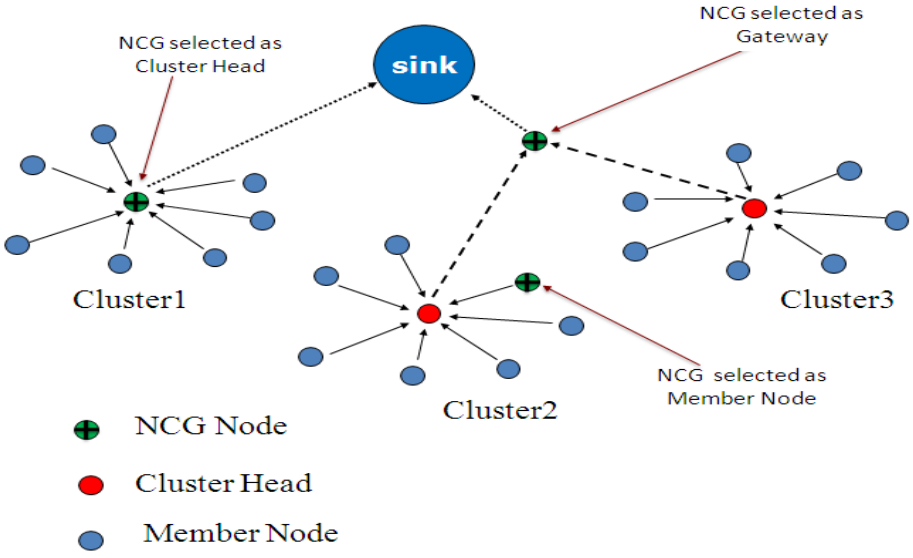

Figure 2. Structure of Proposed Model

Flow Chart

The flow of the system using modified DEEC and priority queue is given below in Figure 3:

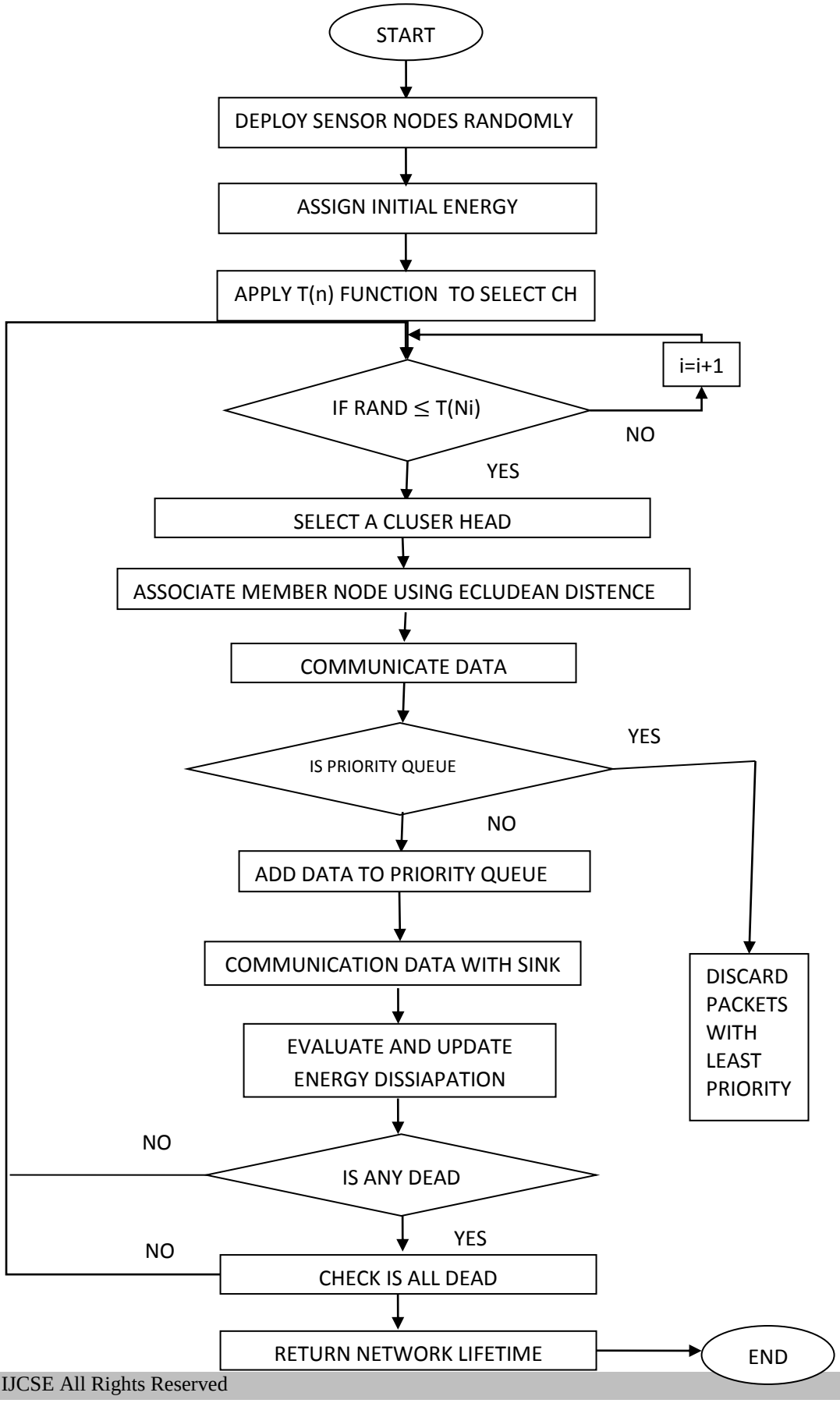

Figure 3. Flow Chart of proposed System

IV. EXPERIMENTAL RESULTS

Setup environment is created within MATLAB. Total area considered for evaluation is 50x50 cm^2. Total number of nodes within the simulation is 100. Initial energy consumed is 0.1joules. cluster head selection initial probability is 0.1. This probability can be increased or decreased at each round. Total of two thousand rounds are considered for evaluation. The performance analysis is conducted with DEEC and EDEEC are compared in this approach as shown in Table 1,2,3 and 4.

Table 1. Number of Dead Nodes

Number of rounds	Existing(DEEC)	Proposed(EDEEC)
500	50	25
1000	63	47
1500	79	53
2000	97	75

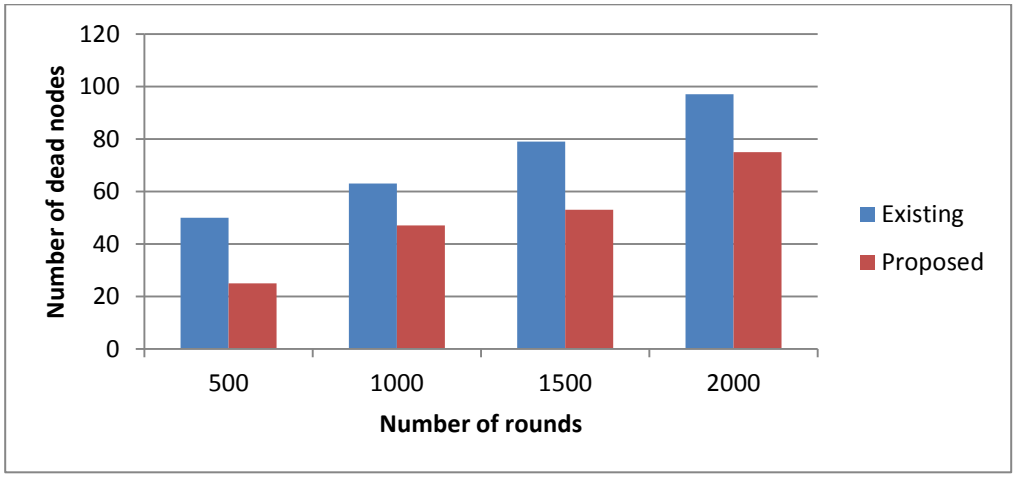

Figure 4. Number of Dead Nodes

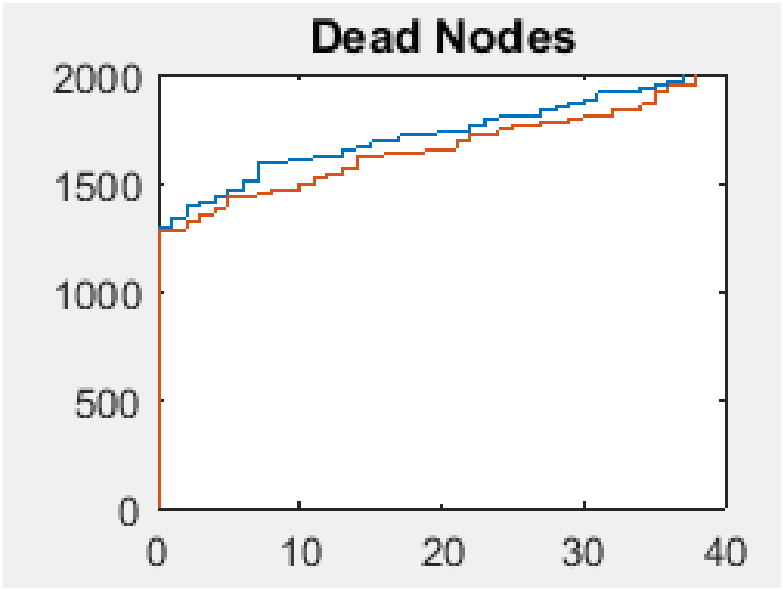

Figure 5. Dead Nodes

Table 2. Number of Alive Nodes

Number of rounds	Existing(DEEC)	Proposed(EDEEC)
500	50	75
1000	37	53
1500	21	47
2000	3	25

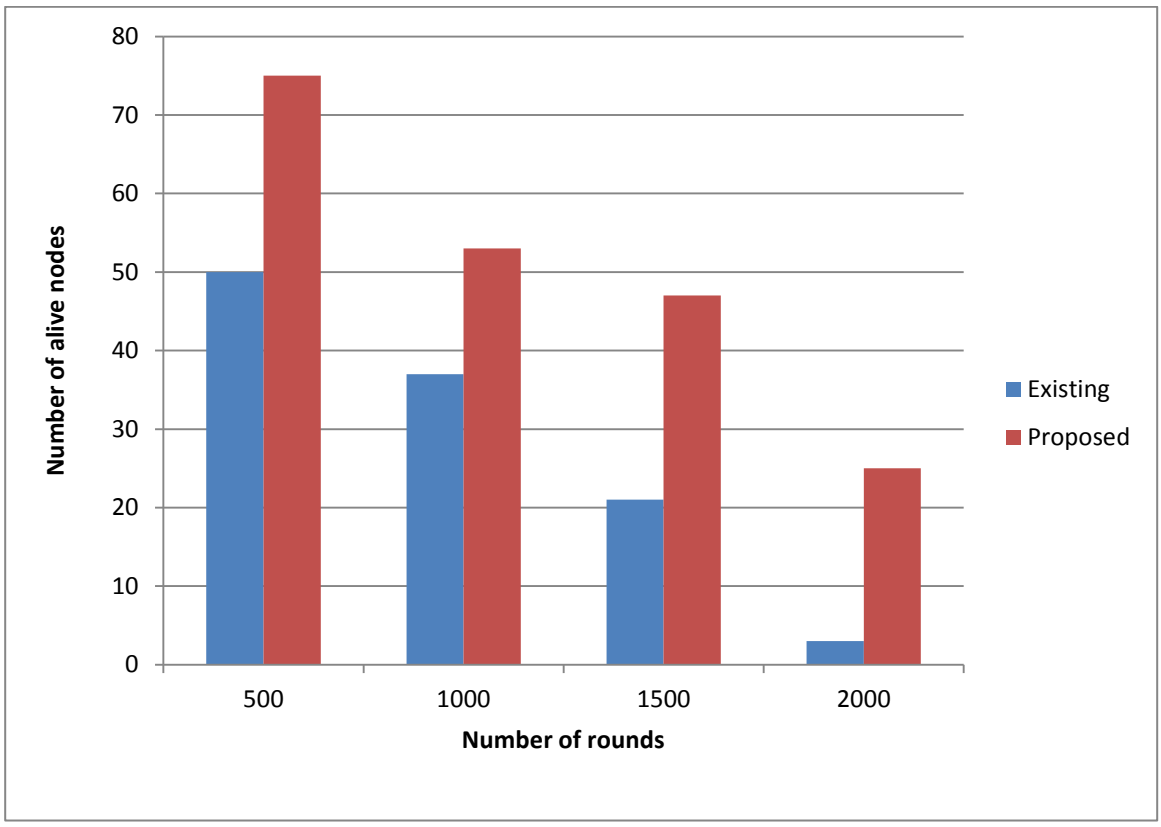

Figure 6. Number of Alive Nodes

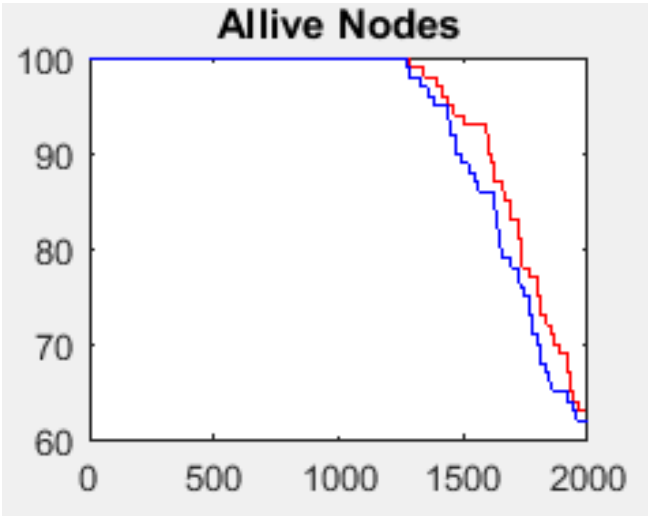

Figure 7. Alive Nodes

Table 3. Packets sent to BS

Number of rounds	Existing(DEEC)	Proposed(EDEEC)
500	10000	10789
1000	18098	20192
1500	21098	22098
2000	23098	24509

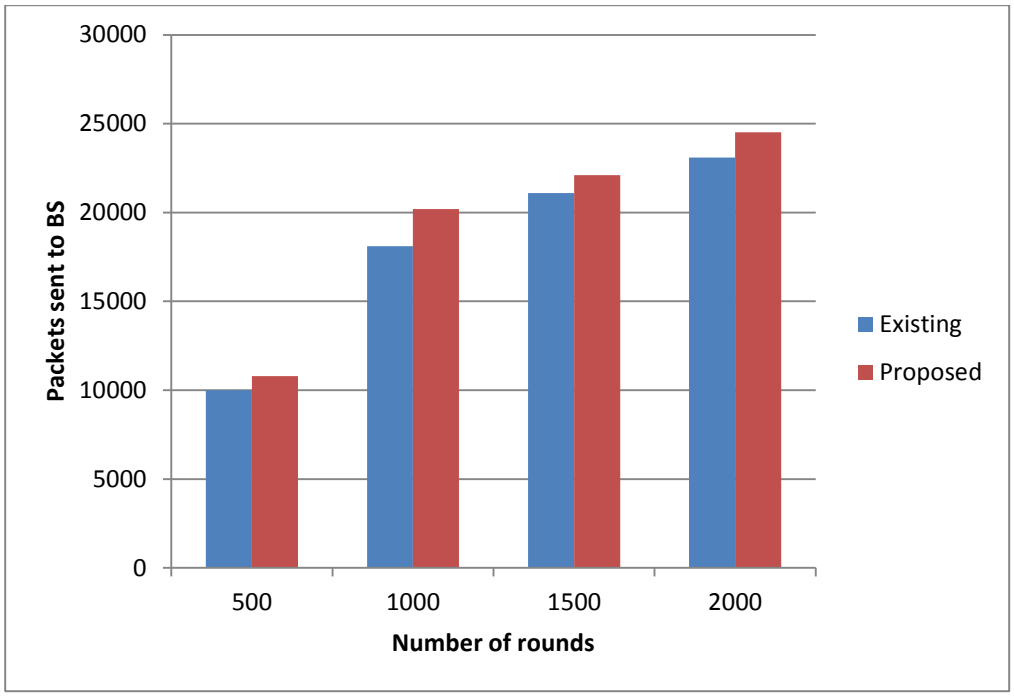

Figure 8. Packets sent to BS

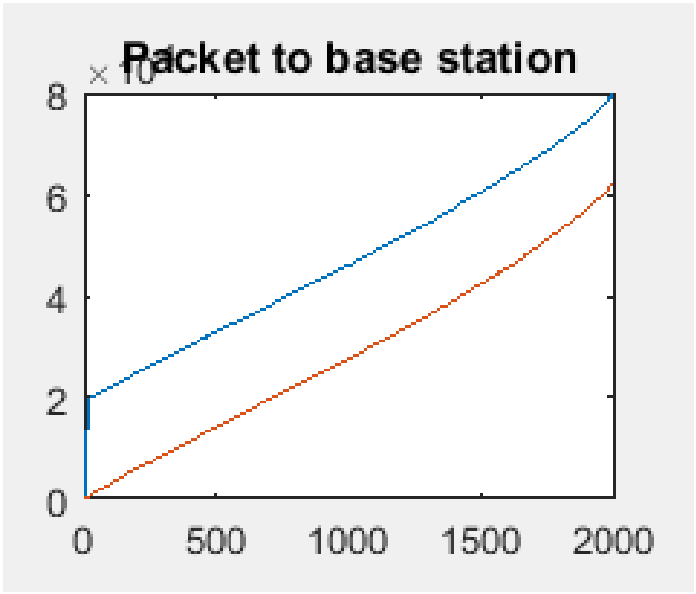

Figure 9. Packet to Base station

Table 4. Total Cluster Heads

Number of rounds	Existing(DEEC)	Proposed(EDEEC)
500	20	26
1000	30	35
1500	45	55
2000	47	58

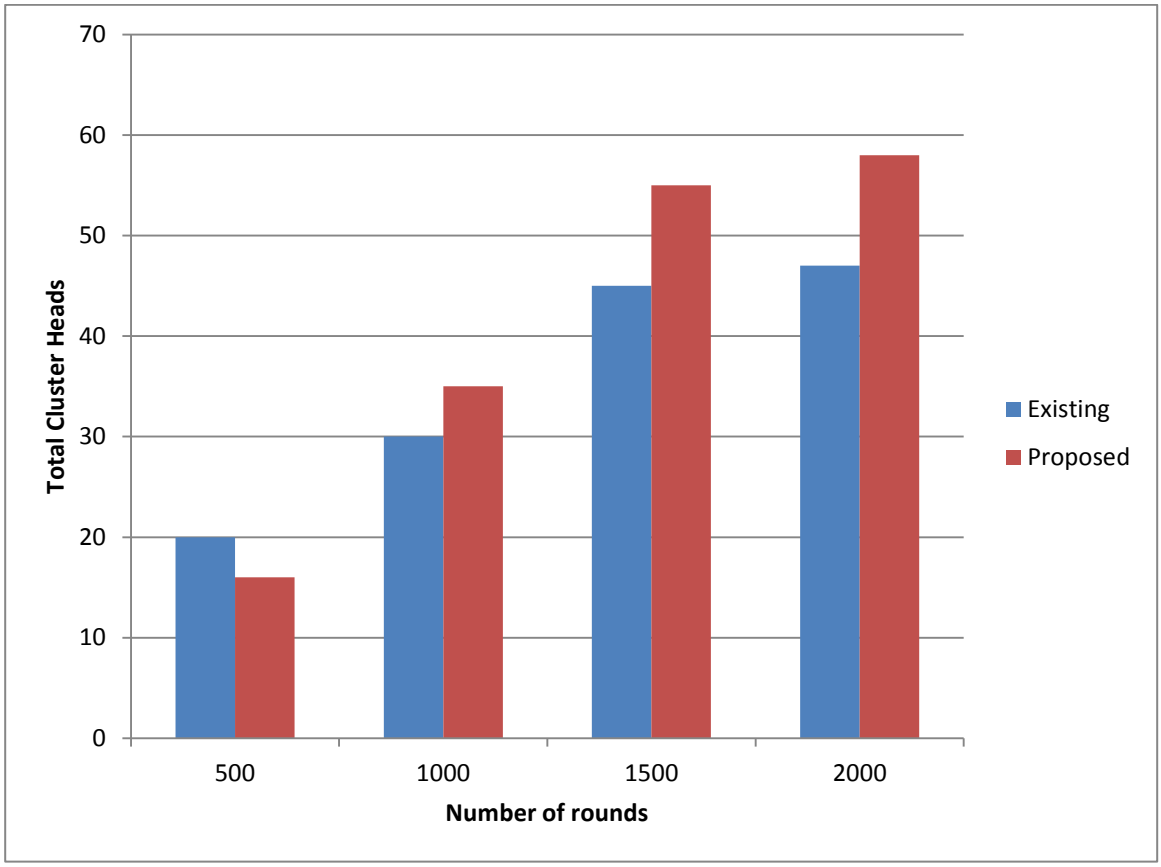

Figure 10. Total Cluster Heads

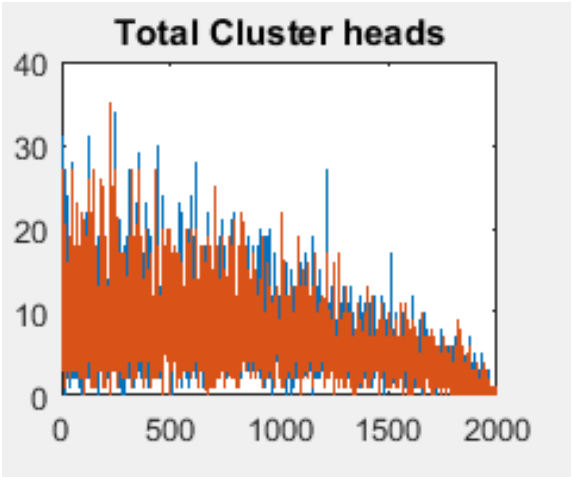

Figure 11. Cluster Heads

In this section, comparison of result in terms of energy consumption and packet drop ratio is made. The energy consumption when 100x100 area is considered is maximum in LEACH and minimum in modified DEEC where priority queue is used. Cluster head is shifted or changed at the end of each round. Cluster head is selected on the basis of probability and energy which is left or associated with each wireless node.
Packet drop ratio is considerably reduced along with energy consumption proving optimality of protocol formed.

V. CONCLUSION

In Proposed paper the analysis performance of optimal energy aware routing protocols is considered. DEEC is found to optimal but requires improvement to match the performance with other algorithms. In order to accomplish that task priority queues are used and result has been improved and performance is enhanced by the factor of 20%. In this paper, we have suggested modified DEEC protocol with the priority queue in which number of data transmitted to the base station is more as compared to the existing DEEC. In the existing DEEC, priority queue is not taken so packet drop ratio is high and fewer messages transmitted. In future, same dense network can be implied upon SEP, EDEEC and other cluster based protocols.

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