

Modified Beenish Energy Efficient Network Integrated Super Heterogenous Protocol with Heed WSN

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Abstract

BEENISH implements the same concept as in DEEC, in terms of selecting CH which is based on residual energy level of the nodes with respect to average energy of network. However, DEEC is based on two types of nodes; normal and advance nodes. BEENISH uses the concept of four types of nodes; normal, advance, super and ultra-super nodes. Let n_i shows the rounds for a node s_i to become CH, we refer it as rotating epoch. CH has to consume more energy as compare to member nodes. In homogeneous networks, to ensure average $p_{opt}N$ CHs in each round, LEACH let every node $s_i (i = 1, 2, \dots, N)$ to become CH once in every $n_i = 1/p_{opt}$ rounds. During operation of WSN all the nodes does not own the same remaining energy. The more the classification of energy levels and Probability constraints the better are the outcomes and efficiency parameter. Modified-BEENISH with HEED is vitally an improvement in heterogeneous WSN, in which new mechanism is adopted to provide feasibility to the existing BEENISH protocol. In the existing work different problems are faced that are defined in the problem formulation and all these problems are resolved with the help of Modified BEENISH with HEED and getting the maximum accuracy as compared to the existing work. In the existing work the Overall efficiency is 16.3% but our overall accuracy is above 25%.

Keywords:

HEED, BEENISH, protocol, energy, Node etc.

1. Introduction

The WSN network comprising of sensor nodes sense data and pass on the information to the base station. This requires the need for sufficient energy source, wherein WSN nodes have limitations in power resource. Thus clustering these nodes together improves the scope for undeterred transmission. In reality we are not provided with nodes of evenly distributed energy [1]. Hence, we go for heterogeneity in WSN networks, where the basic protocol used for this system is based on DEEC. This protocol classifies the nodes into three energy levels and provides probability constraint to it. On the other hand, the BEENISH protocol provides four classifications to the nodes based on energy levels [2]. The more the classification of energy levels and probability constraints the better are the outcomes and efficiency parameter. M-

BEENISH is vitally an improvement in heterogeneous WSN, in which new mechanism is adopted to provide feasibility to the existing BEENISH protocol. The election of the overall Cluster-head by taking into consideration the centrality in the location of the node and its energy capability is an advancement proposed. This not only improves efficiency but also maintains reliability over an extended lifetime [3].

A wireless sensor network node has very limited battery power, tiny processors and few megabytes of memory. The nodes are placed at large distance away from the sink node. Sink node are at the head of the network in a tree based topology. Other nodes are like child node of the sink. Application areas of wireless sensor networks have been growing day by day. Many futuristic applications are developing based on wireless sensor network. Environmental hazard detection and monitoring, Traffic congestion monitoring, industrial monitoring etc. are example of wireless sensor networks in real life scenarios [4]. Different event driven networks are also present which exhibit different characteristic then usual kind of wireless sensor network. They normally run in low traffic mode where a node usually has no data or few packets to send unless there is an event in the network. In low traffic mode, nodes can send their data with less contention to the sink node. When an event is detected by the system, it changes adaptively based on incoming traffic. An event produces a large amount of data which need to deliver to the sink. All the nodes who has detected events, want to send the data to the sink node as quickly as possible [5]. The contention between nodes becomes higher to send the data. This simultaneous data transmission of a large number of nodes makes the network vulnerable to collision of data packets, which eventually decreases the throughput of the network. It becomes very hard to achieve high throughput in this situation. A hierarchical tree structure as shown in Figure 1.1, here

sink is at the top and intermediate nodes are situated below sink. Each node has a fixed parent to send data. These parents are ideally positioned at center to coordinate data packets of child. Conserving energy in the sensor nodes is one of the high priority criteria of WSN. Many protocols have been developed in this basis [6]. In most protocols, they let the nodes switch between active and sleep state. Nodes can communicate between them only in the active state. Sleep period is used basically for energy savings. If all nodes are active in high traffic mode and take periodic sleep in low traffic mode that conserves energy. When nodes are randomly placed with respect to sink, a data gathering tree is spontaneously created. Each node receives packets from multiple senders within the range and sends packets to their own parent. Parent can decrease contention between children by allowing only one child to send at a time. The fairness can be maintained by giving more medium access opportunity to the children with higher bandwidth demand [7]. This kind of technique is useful for basic parent children set but when the network increases linearly then scheduling between nodes becomes difficult. If we can define different frequency channel to different parent- children set then this problem can be solved. sensor in such a network can therefore communicate directly only with other sensors that are within a small distance. In order to communicate for a very long distance they must create an organization structure amongst these nodes. Since the fundamental advantage of wireless sensor networks is the ability to deploy them in an ad hoc manner, as it is not feasible to organize these nodes into groups pre-deployment. For this reason, there has been a large amount of research into ways of creating these organizational structures.[8]

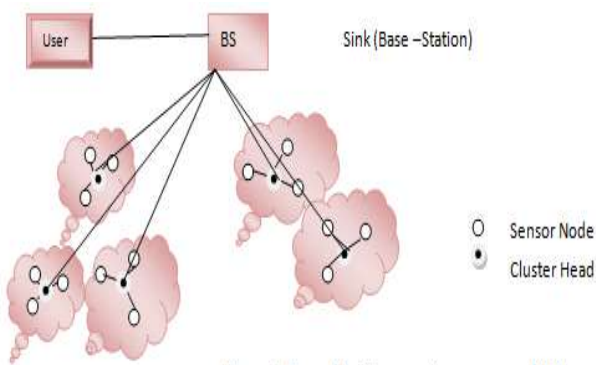


Figure 1. General Architecture of sensor network [2]

Figure.1 shows the general architecture of sensor network. The basic parameters of the sensor networks are Sensor Node, Cluster, Cluster head, Base Station and user, in the hierarchical architecture of the group the base station is at the upper level which provides communication link between the user and the clusters. The data in the sensor network are gathered for providing the answers for the queries raised by the user. An essential part of developing WSNs is being energy aware by reducing the power consumption because of the power limitation [3].

2. Heed Algorithm

HEED clustering formula could be a distributive clustering methodology that considers energy and communication cost at the same time. HEED is associate degree unvaried grouping formula that utilizes residual energy of nodes and their communication value to settle on the most effective set as cluster head nodes. Throughout clustering procedure a detector node may well be tentative cluster head, final cluster head or coated. At the start of grouping part a node with higher energy state is additional probable to be elite as tentative cluster head. It transmits a message to all or any detector nodes existing in its cluster vary and informs them concerning its new condition. For this purpose, AMRP (average power) is introduced that could be a value criterion and is exploited for breaking constraints in procedure of cluster head choice. This formula has four main goals [8]:

- Prolonging network period by distributing energy consumption
- Terminating bunch method by constant variety of iterations
- Minimizing management overload
- Providing acceptable distributed cluster heads and compressed clusters. HEED doesn't think about any assumptions concerning distribution, density or ability of nodes (such as nodes ability relative to their location). Since the formula aims to prolong network period, it decides supported residual energy of every node. Thus, cluster vary is decided by transmitted power level utilized in inhume cluster communication and through clustering [9]. Once many nodes are candidate for being cluster head, the node that has all-time low inhume cluster value are going to be elite as cluster head. This value could be a operate of:
 - Cluster characteristics, like size of a cluster.
 - Variability or non-variability of power levels utilized in intra cluster communications. If power levels for cluster nodes are an equivalent, communication value cloud be addicted to the subsequent parameters: Node degree, if

it's necessary for load to be distributed on cluster heads [10].

3. Problem Definition

From the above study of the different problems that are as follows:

- There is large scale WSN's due to the heterogeneity in the energy of sensor nodes.
- Another problem is the energy problem. Because when those high energy nodes becomes equal in energy with the normal nodes then to avoid penalizing them to stay as Cluster Head.
- There is data duplication and data redundancy problem.
- Another problem is the more bandwidth and less network life time problem.

There are following Objectives:

- To implement the base work with M-BENISH Protocol in NS2.
- To improve the m-BENISH and BENISH protocol with normal, advance, super and ultra super nodes in the network
- To modify m-BENISH with SCH and HEED protocol.
- To compare and analyse the performances of the system using various parameters such as End-to-End Delay, Network Lifetime, Throughput and Energy consumption are calculated.

4. Methodology

The BEENISH protocol implements clustering by classifying the nodes into four broad categories. They are the normal nodes, advanced nodes, super nodes and the ultra-super nodes. To efficiently transfer the data across base stations we need several cluster heads; also required for a smooth transmission. The probability of the residual energy is calculated for every node which acts as a parameter to determine the cluster head. There is a need for an overall cluster head to manage the efficient transfer of the sensed information to the base station.

Table 1. Simulation Parameter Values

Parameter Type	Parameter Value
Number of Nodes	50
Path Loss Model	Two Ray Ground
Antenna Type	Omni Antenna
Mobility Model	Random Way Point
Energy Model	Energy Model
MAC Protocol	802.11
Transmission Range	250m
Traffic Model	CBR

Proposed Steps for Efficient Overall Cluster Head Election

Input: Number of cluster K

Output: Overall cluster head OVH

Process:

'n' and 'm' be the set of all cluster heads

's' be the source cluster location

'd' be the destination cluster location

'h' be the considered cluster head at location 'l'

'RE' be the Residual energy

1. for (all n)

2. h = Find max(RE(n))

3. If (h in close proximity to (s-d)/2)

// nearing the centre of network

4. elect as OVH

5. else

6. remove h from set n

7. for (all m – {OVH})

8. inform about the OVH

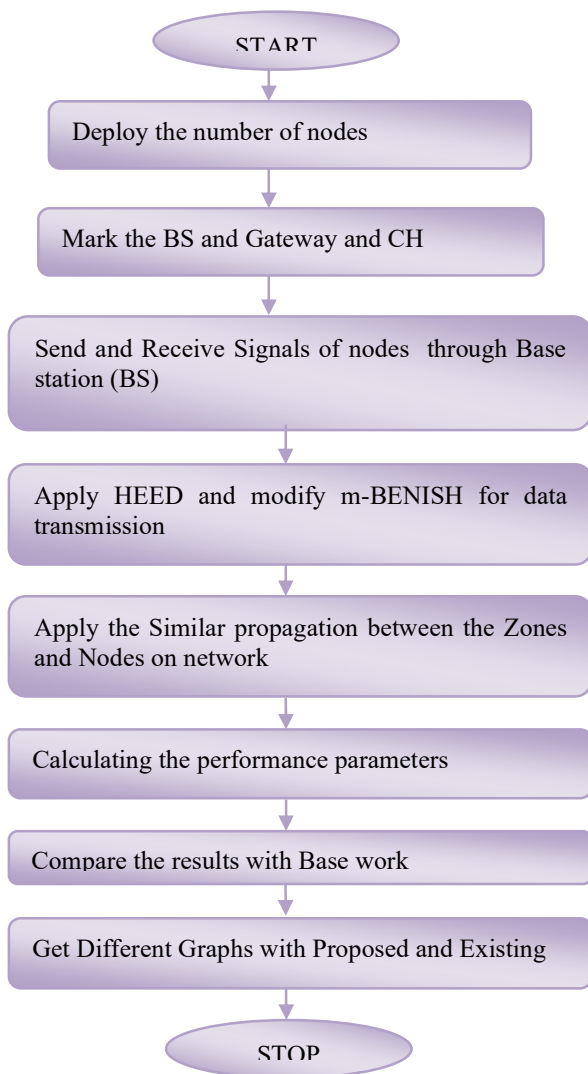


Figure 2. Efficient Overall Cluster Head Election

5. Results and Discussion

This includes the energy transfer on network with different snap shots of Proposed work. These Snap shots are given below :

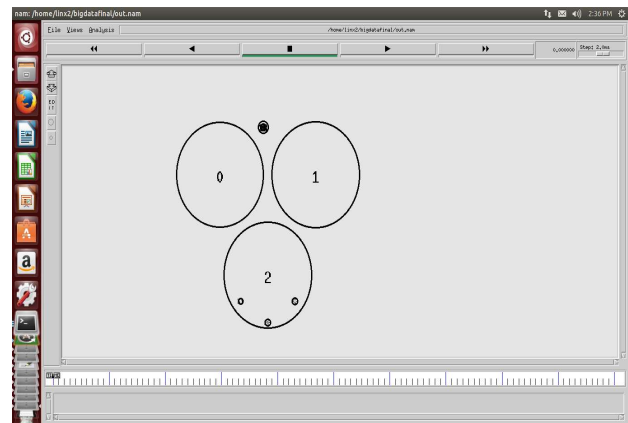


Figure 3. Initial Step

The Figure. 3 defines the initial window to process the number of nodes. In this the three different zones are displayed. Here each zones have ID 0,1 and 2. Each zone are connected with Base station.

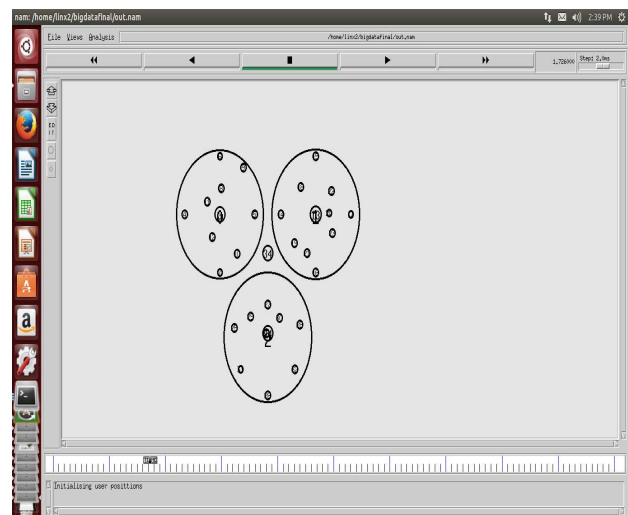


Figure 4: Initialising the User Position

The Figure 4: is the in initialization of user position in the form of different nodes. Here the third zone also includes the different nodes with different ID.



Figure 5: Node Color Labeling

The Figure 5 is the node coloring of the different Zones. Here each zone has different color. The Zone 0 includes the Green color and the zone 1 includes the blue color and the zone 2 includes the yellow color. The base station includes the Red color.

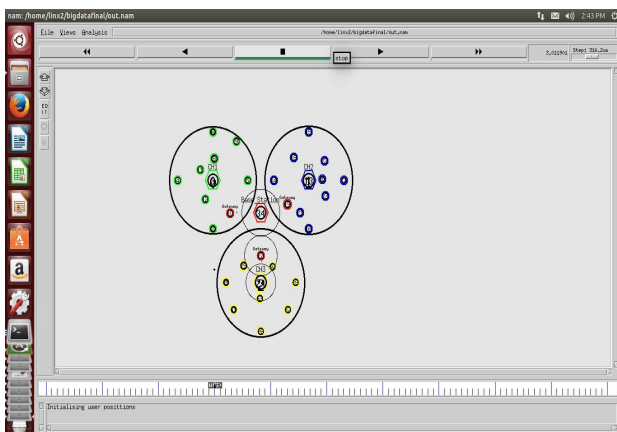


Figure 6: Packet dropping from zone 0

The Figure 6 displays the drop of packet during the transmission of the data. In this figure all the nodes are communicating between each other and when the loss of energy is occurred then the packet is dropped.



Figure 7: End to End delay Graph

The Figure 7 defines the End to end delay graph . In this Graph Two lines are represented with different values. The Red line displays the existing work and the Green line defines the Proposed Work.



Figure 8: Energy Consumption Graph

The Figure 8 defines the Energy Consumption graph. In this Graph Two lines are represented with different values. The Red line displays the existing work and the Green line defines the Proposed Work. Here the existing work energy is 80 joule and the proposed work energy is 75 joule.



Figure 9: Throughput Ratio Graph

The Figure 9 defines the Throughput graph. In this Graph Two lines are represented with different values. The Red line displays the existing work and the Green line defines the Proposed Work.

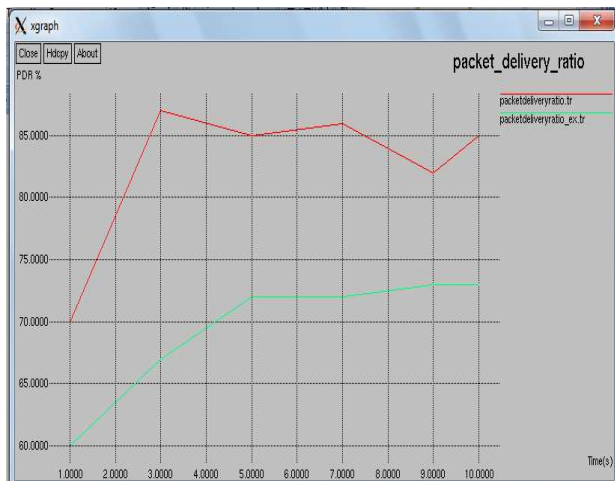


Figure 10: Packet Delivery Ratio Graph

The Figure 10 defines the Packet delivery Ratio graph. In this Graph Two lines are represented with different values. The Red line displays the existing work and the Green line defines the Proposed Work.

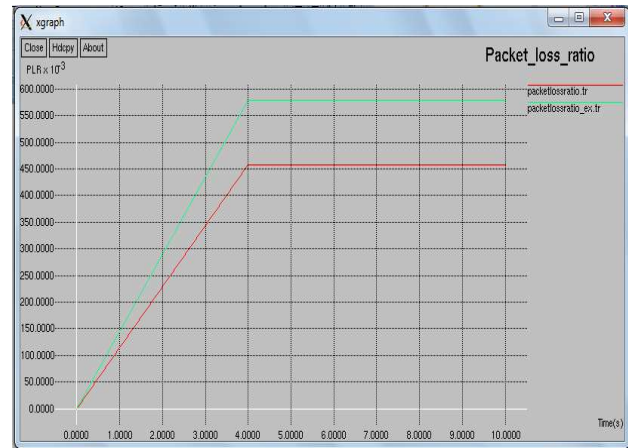


Figure 11: Packet loss Ratio Graph

The Figure 11 defines the Packet loss Ratio graph. In this Graph Two lines are represented with different values. The Red line displays the existing work and the Green line defines the Proposed Work.

Table 2: End to End Delay

Duration	Existing End to End Delay	25 Nodes	50Nodes
		Proposed End to End Delay	Proposed End to End Delay
1	25	12	22
2	24	13	23
3	23	11	21
4	28	18	25
5	27	17	26
6	29	18	27
7	23	11	21
8	23.5	12.5	21.5
9	23.5	12.5	21.5
10	22.5	10	20.5

Table 3: Energy Consumption

Duration n	Existing Energy Consumption n	25 Nodes	50 Nodes
		Proposed Energy Consumption n	Proposed Energy Consumption n
5	80	40	75
10	80	43	75
15	78.5	49.2	72.5
20	76	52.0	74
25	76	52.0	74
30	76	51.5	74

Table 4: Throughput

Duration	Existing Throughput	25 Nodes	50 Nodes
		Proposed Throughput	Proposed Throughput
2	0.23	1.5	0.5
4	0.8	2.8	1.8
6	1.0	4.0	2.0
8	1.0	4.5	2.3
10	1.0	7.0	3.0

Table 5: Packet Delivery Ratio

Duration	Existing Packet Delivery Ratio	25 Nodes	50 Nodes
		Proposed Packet Delivery Ratio	Proposed Packet Delivery Ratio
1	60.0	100.0	70.0
3	66.0	98.0	88.0
5	72.0	96.0	85.0
7	73.0	102.0	86.0
9	73.0	112.0	82.0
10	73.0	115.0	85.0

Table 6: Packet Loss Ratio

Duration	Existing Packet Loss Ratio	25 Nodes	50 Nodes
		Proposed Packet loss Ratio	Proposed Packet loss Ratio
1	150	50	100
3	422	150	350
5	560	210	450
7	560	210	450
9	560	210	450
10	560	210	450

6. Conclusion

The WSN network comprising of sensor nodes sense data and pass on the information to the base station. This requires the need for sufficient energy source, wherein WSN nodes have limitations in power resource. Thus clustering these nodes together improves the scope for undeterred transmission. Hence, we go for heterogeneity in WSN networks, where the basic protocol used for this system is based on DEEC. This protocol classifies the nodes into three energy levels and provides probability constraints to it. On the other hand, the BEENISH protocol provides four classifications to the nodes based on energy levels. The more the classification of energy levels and

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