WWJMRD 2017; 3(9): 313-317
www.wwjmrd.com
International Journal
Peer Reviewed Journal
Refereed Journal
Indexed Journal
UGC Approved Journal
Impact Factor MJIF: 4.25
e-ISSN: 2454-6615

Satnam Singh
M. Tech Scholar, Baba Farid College of Engg. & Technology, Bathinda, India

Ashu Bansal
Associate Professor,
Baba Farid College of Engg. & Technology, Bathinda, India

Correspondence:
Satnam Singh
M. Tech Scholar, Baba Farid College of Engg. & Technology, Bathinda, India

Beenish with Heed Protocol on Normal, Advance, Super and Ultra Super Nodes in Network: A Review

Satnam Singh, Ashu Bansal

Abstract
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. 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. Here in this paper the different researcher's research work is reviewed. Each researchers using different protocols and modifying the BEENISH protocols, but some problems that I have studied in the existing work like 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. These types of problems are resolved in the research work with the help of BS, SCH and HEED protocols.

Keywords: WSN, Network, DEEC, BS, DEEC

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 [3]. 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 [7]. 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 [6]. 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 [8], 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.
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 [1]. 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.

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, 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. 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 [2]. 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.

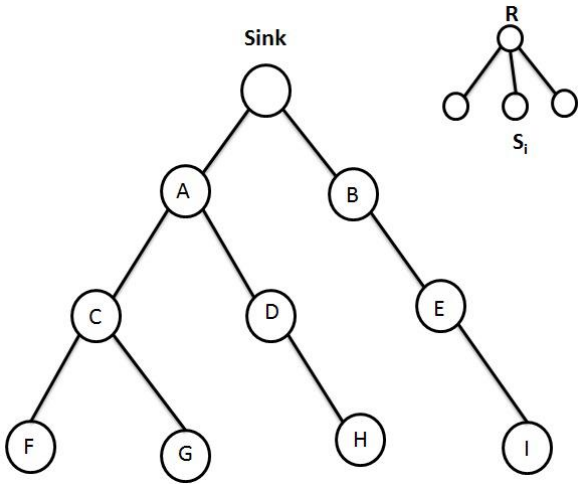

Fig.1: General Tree structure used in EERC-MAC for data gathering.

Beenish Protocol

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_{optN} CHs in each round, LEACH let every node s_i(i = 1, 2, ...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. So, if the epoch n_i is kept equal for all nodes as in LEACH then energy is not efficiently distributed and nodes having low energy die before high energy nodes. BEENISH choose different epoch n_i for different nodes with respect to their remaining energy $E_i(r)$. High energy nodes are more often elected as CH as compare to low energy nodes. So, high energy nodes have smaller epoch n_i as compare to high energy nodes. In BEENISH ultra-super nodes are largely elected as CH as compare to super, advance and normal nodes, and so, on. In this way energy consumed by all nodes is equally distributed.

Cluster heads selection process in DEEC algorithm is based on the probability in which the ratio of the average energy of the network and nodes residual energy will be considered [5]. How long different nodes would be cluster-heads, is decided according to the initial and residual energy. The authors supposed that all the nodes of the WSN contain different amount of energy, which is a source of heterogeneity. DEEC is LEACH based algorithm thus it expands the life time of network by rotating the role of CH among all nodes. At the start of processing nodes should have kept the prior knowledge of total energy and lifetime of the network. Reference energy is also known as the average energy of the network. Thus, DEEC does not require any global knowledge of energy at every election round. The routing protocol in [6] is very similar to DEEC. The difference between both lies in the expressions that define the probability for normal and advanced nodes to become a CH. A phase comes during network evolution where the advanced nodes have similar residual energies as the normal nodes. During this phase, DEEC continues to penalize the advanced nodes, which is not an optimal method because by this, the advanced nodes die much faster than the normal nodes. To avoid this unbalance, DDEEC introduces a threshold residual energy. When the energy levels of advanced and normal nodes fall below this threshold residual energy, then same probability is used by all nodes to become a CH, thereby making the CH selection process more efficient. Enhanced Distributed Energy Efficient Clustering or EDEEC [7] uses the concept of three level heterogeneous networks. It consists of three types of nodes-normal, advanced and super nodes-based on initial energies. EDEEC incorporate different probability values for normal, advanced and super nodes. EDDEEC in [8] uses the same concept as of DDEEC but in three types of heterogeneous nodes. The research work is being done in the direction of utilizing four types of heterogeneous sensor nodes in the BEENISH protocol [9]. The selection of cluster head is on the basis of residual energy level of the nodes with respect to the average energy of network as similar to DEEC. 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.

Ddeec

DDEEC uses same method for estimation of average energy in the network and CH selection algorithm based on residual energy as implemented in DEEC. Difference between DDEEC and DEEC is centered in expression that defines probability for normal and advanced nodes to be a CH [11] as given in equation. We find that nodes with more residual energy at round r are more probable to become

CH, so, in these way nodes having higher energy values or advanced nodes will become CH more often as compared to the nodes with lower energy or normal nodes. A point comes in a network where advanced nodes having same residual energy like normal nodes. Although, after this point DEEC continues to punish the advanced nodes so this is not optimal way for energy distribution because by doing so, advanced nodes are continuously a CH and they die more quickly than normal nodes. To avoid this unbalanced case, DDEEC makes some changes in equation to save advanced nodes from being punished over and again. DEEC introduces threshold residual energy as in [11] and given below:

$$Th_{REV} = E_o(1 + \frac{aE_{disNN}}{E_{disNN} - E_{disAN}})$$

When energy level of advanced and normal nodes falls down to the limit of threshold residual energy then both type of nodes use same probability to become cluster head. Therefore, CH selection is balanced and more efficient. Threshold residual energy $T\ h$ is given as in [11] and given below:

$$Th_{REV} \simeq (7/10)E_o$$

Average probability pi for CH selection used in DDEEC is as follows as in [11]:

$$p_i = \begin{cases} \frac{p_{opt}E_i(r)}{(1+am)\bar{E}(r)} & for\ Nml\ nodes,\ E_i(r) > Th_{REV} \\ \frac{(1+a)p_{opt}E_i(r)}{(1+am)\bar{E}(r)} & for\ Adv\ nodes,\ E_i(r) > Th_{REV} \\ c\frac{(1+a)p_{opt}E_i(r)}{(1+am)\bar{E}(r)} & for\ Adv,\ Nml\ nodes,\ E_i(r) \leq Th_{REV} \end{cases} \quad (21)$$

Related Work

The literature survey was studied which helped me to complete my work and enhance my knowledge. I studied so many papers and some of them are A. Preethi et.al.[2016**]** have studied a modified and improvised algorithm in electing the cluster head and an overall cluster head, which shows drastic improvement in the network lifetime. The proposed modified- BEENISH (m-BEENISH) algorithm is implemented in NS-2 (Network Simulator-2) and the simulated results are compared with the other protocols. An enhancement in the throughput ratio, along with a reduced energy consumption and end-to-end delay provides an overall efficiency of 16.3%. This differentiates and makes the proposed m-BEENISH protocol better than the existing BEENISH protocol.[1] Sanjoy Mondal et.al. [2016] have studied Wireless Sensor Network (WSN) consists of
Battery powered sensor nodes communicating to each other and to the base station (BS) in multi-hop wireless manner. The primary task of WSN is to gather field data and route it to the BS for analysis. They are generally deployed in harsh localities where battery replacement is not possible advocating the need for energy efficient data gathering to elongate network lifetime. In this paper they proposed an energy efficient load balanced data gathering protocol coined as RF-LEACH where partitioning is done using rough fuzzy c means (RFCM) and cluster head selection is based on fuzzy logic. Matlab simulation results indicate RF-LEACH performs better than LEACH, Fuzzy LEACH and FCM LEACH in terms of extending network lifetime and throughput in a load balanced way. The results are shown to be statistically significant. [2]
Azadeh Sheikhole slami et.al. [2016] have studied an efficient (in terms of energy consumption and computational complexity) routing algorithm that does not rely on any information about the locations and CSIs of the eavesdroppers. The algorithm guarantees secrecy even in disadvantaged wireless environments, where multiple eavesdroppers try to eavesdrop each message, are equipped with directional antennas, or can get arbitrarily close to the transmitter. The key is to employ additive random jamming to exploit inherent non-idealities of the eavesdropper's receiver, which makes the eavesdroppers incapable of recording the messages. [3] Akshay Sharma et.al.[2016] have studied Wireless Sensor Networks are used in collection of fields which comprises of disaster management, ecological observing, healthcare, battle arena, biotic, home, and other viable applications. With enormous evolution in the dome of entrenched sensor technology, there are tranquil of number of sensor nodes that are capable of intuiting, stimulating, and transmitting the unperturbed data, have been made astonishing influence comprehensively. Due to enormous usage of applications by WSNs, energy is prime factor which have established noteworthy responsiveness of many researchers. Clustering technique also preserve the limited energy properties of the sensors. The authors introduced the model of energy efficient clustering for heterogeneous WSNs with Sun Nodes and static clustering scheme. Furthermore, sleep awake mechanism is used for the SNs for lent hen the lifetime of the network and also the steadiness period. Simulation results shows that S-EECS performs better than BEENISH for effective transmission of data, network lifespan and stability period.[4] Sapna Gambhir et.al. [2016] have studied Wireless Sensor Networks (WSNs) are designed by hundreds or thousands of tiny, low cost and multifunctional sensor nodes. Each sensor node has very low battery life. Sensor nodes have finite storage capabilities, transmission and processing range and energy resources are also limited. There are many design issues in WSNs such as mobility, energy consumption, network topology, data aggregation, localization, production cost, security, network size and density etc. Routing protocols provide efficient working of the network, increase network lifetime, responsible for maintaining the routes in the network and perform reliable multi-hop communication under various conditions. LEACH (Low Energy Adaptive Clustering Protocol) is one of the hierarchical protocols in WSNs. LEACH uses TDMA MAC Protocol. During random data distribution, a number of TDMA slots are wasted. Because sensor nodes don't know either they have data to send or not, they continuously listen to the medium and this result in idle listening problem. [5] Cisil Baby et.al. [2016] have studied an ad-hoc network (WANET) is considered and based on certain criteria the data is forwarded dynamically. Various parameters such as Compression Ratio, Packet Delivery Rate, and Energy consumption are considered to determine the efficiency of the network. One of the primary parameters to be considered in the configuration of Wireless Sensor Networks (WSN) is the energy consumption of the nodes and the data throughput. Since the nodes are controlled by batteries with lower energy limit, it is required to minimize the energy utilization. Henceforth a proficient routing technique in light of LEACH protocol is proposed

alongside the utilization of A-LEC data compression strategy. The simulations are carried out through Network Simulator 2 (NS2). The compression code is written in GNU-C. [6]Prameela.Set.al. [2016] have studied A multiple one-way key hash chains were proposed for secure data dissemination. In this protocol, SHA-1 based hash functions and AES based encryption was utilized to provide security. However, the complexity of SHA-1 is overhead for WBAN. In this paper the complexity is reduced by introducing simple hash chain based protocol which is utilizing Chaos baker map for security. This
Chaos baker map method randomizing data before hashing. Hence, this protocol presents instant authentication and competent to tolerate node compromise. This paper also provides the experimental consequences of Chaos baker map based simple hash function protocol in a network of source restricted sensor nodes, which proves its effectiveness. [7]
Min-Te Sun et.al. [2017] have studied a partially localized topology control algorithm, namely articulation points based topology control (APTC), which effectively saves power consumption in a wireless ad hoc network with a low communication overhead. Unlike the existing topology control protocols, APTC designates articulation points to be initiators and builds a tree of minimum spanning trees to achieve power saving while maintaining network connectivity. The simulation results demonstrate the superiority of APTC over the existing topology control algorithms in terms of power consumption and communication overhead. [8]

Problem Definition

From the above study of review of literature I have studied 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.

Methodology

The BEENISH protocol implements clustering by classifying the nodes into four broad categories. They are the normal nodes, advance 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.
WSN comprising of various nodes (devices) is grouped into 4 types which are the normal, advance, super and ultra-super nodes. The architecture of the proposed m-BEENISH is shown in Fig.4.1. Clusters are formed among this wide range of the nodes following which election process takes place. Cluster heads for every cluster is selected through this election process. Finally, the overall cluster head is elected for handling the data transfer in the entire network.

Fig. 2: M-BEENISH Architecture

Proposed Algorithm 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

Conclusion & Future Work

WSN comprising of various nodes (devices) is grouped into 4 types which are the normal, advance, super and 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. These are the problems in the existing work that is studied in this review. It is further implemented with the help of BS, SCH and Energy algorithms to modify the BEENISH.

References

1. A.Preethi, E.Pravin, D.Sangeetha "Modified Balanced Energy Efficient Network Integrated Super Heterogeneous Protocol" Fifth International Conference on Recent Trends in Information

Technology, IEEE-2016.
2. Sanjoy Mondal, Pratik Dutta, Saurav Ghosh, Utpal Biswas "Energy Efficient Rough Fuzzy Set based Clustering and Cluster Head Selection for WSN" 2nd International Conference on Next Generation Computing Technologies (NGCT-2016) Dehradun, India 14-16 October 2016.
3. Azadeh Sheikholeslami, Majid Ghaderi "Energy-Efficient Secrecy in Wireless Networks Based on Random Jamming" IEEE-2016.
4. Akshay Sharma, Kunal Goel "Static Energy Efficient Clustering Scheme for Heterogeneous Wireless Sensor Networks (S EECS)" IEEE-2016.
5. Sapna Gambhir, Parul "OE-LEACH: An Optimized Energy Efficient LEACH Algorithm for WSNs" IEEE-2016.
6. Cisil Baby, S.Ranjitha, Dr.H. N. Suresh "An Efficient Energy Savings Schemes Using Adjacent Lossless Entropy Compression for WSN" International Conference on Computational Science and Computational Intelligence-2016.
7. Prameela.S, Dr.P.Ponmuthuramalingam "A Robust Energy Efficient and Secure DataDissemination Protocol for Wireless Body Area Networks" International Conference on Advances in Computer Applications (ICACA), IEEE-2016.
8. Min-Te Sun, Ching-Hsiang Chu "Distributed Topology Control for Energy-Efficientand Reliable Wireless Communications" IEEE-2017.
9. T.N. Qureshi, N. Javaid, A.H. Khan, A. Iqbal, E. Akhtar, M. Ishfaq, BEENISH: Balanced Energy Efficient Network Integrated Super Heterogenous Protocol for Wireless Sensor Networks, International Workshop on Body Area Sensor Networks (BASNet - 2013)
10. L. Qing, Q. Zhu, M. Whang, Design of a distributed energy efficient clustering algorithm for heterogeneous wireless sensor networks, ELSEVIER, Computer Communications 29, 2012.
11. T.N. Qureshi, N. Javaid, M. Malik, U. Qasim, A.Z. Khan, On Performance Evaluation of Variants of DEEC in WSNs, Broadband, Wireless Computing, Communication and Applications (BWCCA), 2012 Seventh International Conference on November 2012.