 ISSN: 2321-8169
1662 – 1668

Evaluating The Shortcomings Of DEEC Variants

Vikramjit Singh[1], Er.Rishma Chawla[2]
[1]M.TechScholar ,Dept. of Computer Science and Engineering ,RIET Phagwara Punjab
[2]Professor ,Dept. of Computer Science and Engineering ,RIET Phagwara Punjab

Abstract--Because of restricted battery of sensor nodes, power effectiveness found to be the keycheck of restricted life of Wireless sensor networks. So the keyattention of the current work is to discover the numerous protocols which have concentrated on reducing the power utilization problem and how anyone can improve the stability period and life time of network. Numerous researchers have presented distinctkind of the protocols to improve the network lifetime on the other hand still abundantperfection can be done further to boost the network lifetime. The complete aim of this paper is to estimate the gaps in present clustering techniques of WSNsparticularly DEEC variants. This paper has valued the matters which have been ignoreduntil nowin the arena of the Wireless sensor networks.

Keywords—*WSN, DEEC, Clustering, Lifetime.*

*****

1. INTRODUCTION

Recent progresses in wireless communications [2], digital electronics and micro-electro-mechanical system have empowered the development of sensor nodes that have small size and also have low energy, low cost and that are multifunctional. These sensor nodes are capable of sensing and communicating. Consisting of hundreds to thousands of sensor nodes that are densely deployed either within the region or very close to it, wireless sensor network[1] is power constrained. Power conservation is the major issue in WSN. Fig1.1 shows the working of wireless sensor network. Restricted energy nodes that cannot be replaced can be carried by sensor nodes.

2. DATA AGGREGATION IN WSN

In WSN, sensor nodes sense data from the sensing region and pass it to the base station or sink. As information from neighboring sensor nodes[3] may be redundant and correlated, it is very difficult for the base station to process or compute large amount of information. In addition, sensor nodes have their own power because of redundant transmissions and power loss, lifetime of sensor nodes can decline. In order to prolong the lifetime, a practical solution was introduced which is referred to as Data Aggregation [3,4]. The main objective of data aggregation to accumulate and aggregate the information [3,5] from various sensors in order to eliminate redundancy and save power.

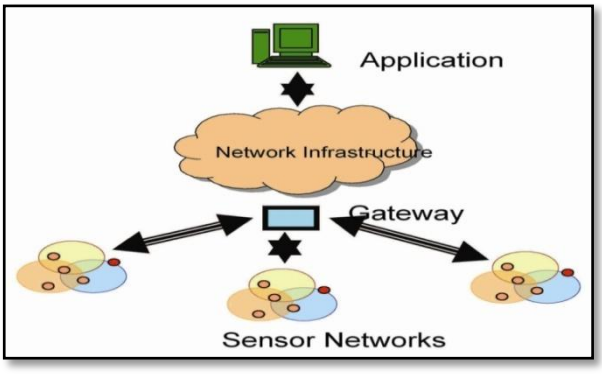

Fig 1: Working of Wireless Sensor Network

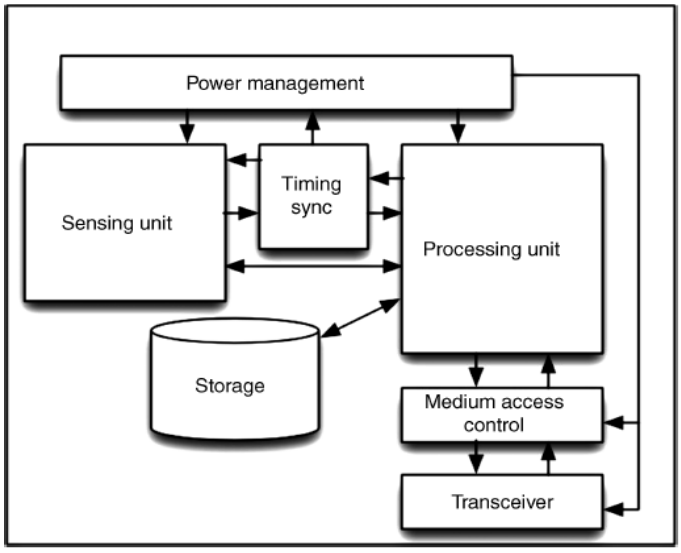

Fig 2: Simple Schematic of a sensor node

Figure 2 has shown that the each sensor node have several units like, a sensing unit (which can sense physical parameters like temperature, sound, vibration and humidity), a processing Unit (one or more microcontrollers, CPUs where processing of sensed data is done), have a RF transceiver (which consists of a transmitter for sending data and a receiver for receiving data from its 1 hop neighbours.),a storage unit which may contain multiple types of memory (program, data and flash memories), have a power Management Unit (e.g., batteries and solar cells)-for maintaining low power consumption.

Wireless sensor networks serve a broad range of applications in various areas likehealth, military and security[2].Such as,the physiological information about a patient can be monitored remotely by a doctor.The doctor can understand the present condition of the patient's health.By using wireless sensor network,it will become easy to detect the presence of

foreign chemical agents in air and water.It is also easy to identify to type, amount and location of the pollutant.

Routing protocols [6] help to achieve power efficiency in wireless sensor networks.In order to minimise power consumption,clustering is used.In clustering,the sensor nodes elect a cluster head and the nodes which belong to the cluster transmit their information to the cluster head and data is aggregated at the cluster head and then transmitted to the base station.

Two types of networks exist which are homogeneous and heterogeneous [6] in nature.The networks in which all the sensor nodes have same amount of energy are called homogeneous wireless sensor networks. The examples of the protocols that are cluster based and are of homogeneous networks include hybrid energy-efficient distributed clustering(HEED)[8], low-energy adaptive clustering hierarchy(LEACH)[9] and power efficient gathering in sensor information system(PEGASIS)[10]. The performance of these protocols is poor in case of heterogeneous networks. The sensor nodes which have less power will die faster than the nodes having more power because the homogeneous protocols are not capable of treating each and every node in terms of power. The networks in which some of the sensor nodes have extra power as compared to other nodes in the network are called heterogeneous wireless sensor networks. In case of these networks, the deployment of nodes is done with distinct initial energy. The examples of heterogeneous network protocols include SEP(Stable Election Protocol)[17], DEEC(distributed energy efficient clustering)[18], DDEEC(Developed DEEC)[19] and EDEEC(Enhanced DEEC)[20].

3. HETEROGENEOUS WSNs TYPES

Consider an area of $M \times M$ square metres and the number of sensor nodes be denoted by$N$. There are 3 types of nodes in heterogeneous networks [21]: two, three and multi level regarding their power levels and that is why they are known as two, three and multi-level heterogeneous networks.

A. Two level Heterogeneous networks

There are two power levels of sensor nodes, normal and advanced nodes in these networks. The power level of each normal node is E_o and the power level of each advanced node is $E_o(1+\alpha)$. Given the total number of nodes is N so the number of advanced nodes is Nm where m is the fraction of advanced nodes and the number of normal nodes is $N(1-m$. So, the total power of the entire network is given by:

$E_T = N(1-m)E_o + Nm(1+\alpha)E_o = NE_o(1+\alpha m)$ (1)

Thus it can be said that the two level heterogeneous networks have αm times more power than homogeneous networks.

B. Three level heterogeneous networks

There are three power levels of sensor nodes, normal, advanced and super nodes in these networks. The power of each normal node is E_o, the power of each advanced node of fraction m with α times more power than normal nodes is $E_o(1+\alpha)$ and the power of each super node of fraction m_o with b times more power than normal nodes is $E_o(1+b)$.Given the total number of nodes is N so the number of super nodes is Nmm_o and the number of advanced nodes is$Nm(1-m_o)$.So, the total power of the entire network is given by:

$$E_T = N(1-m)E_o + Nm(1-m_o)(1+\alpha)E_o + Nm_oE_o(1+b)$$

$E_T = NE_o(1+m(\alpha+m_ob))$(2)

Thus, the three level heterogeneous networks have $(\alpha + m_ob)$ times more power than homogeneous networks.

C. Multilevel heterogeneous networks

There are three power levels of sensor nodes. The initial power of sensor nodes is distributed over the close set$[E_o . E_o(1+\alpha_m)]$, where the lower bound is denoted by E_o and the maximal power value is α_m. The sensor node u_i is equipped with power of$E_o(1+\alpha_i)$, that is α_i times more power than E_o. So, the total power of the entire network is given by:

$E_T = \sum_{i=1}^{N} E_o(1+\alpha_i) = E_o(N+\sum_{i=1}^{N}\alpha_i)$(3)

More power is utilized by cluster heads than cluster members therefore the power level of nodes becomes different from each other during some of the rounds. So, the networks having heterogeneity are essential than homogeneous ones.

4. HETEROGENEOUS PROTOCOLS

A. Distributed Energy-Efficient Clustering(DEEC):

For dealing with sensor nodes of heterogeneous networks, DEEC is proposed by [18]. The initial and residual power levels of sensor nodes are used to select cluster head. Let the number of rounds for a sensor node u_i to be a cluster head be n_i. In the network, the optimum number of cluster heads during each and every round is $k_{op} * N$. Nodes having more power will become cluster head more often than the nodes having low power. Consider the probability of a sensor node u_i of becoming a cluster head be p_i, so high power nodes have larger p_i value in comparison with k_{op}.

Let the average power of network during t^{th} round is as follows [18]:

$\bar{E}(t) = \frac{1}{N}\sum_{i=1}^{N} E_i(t)$(4)

Probability will be given by:

$p_i = k_{op}[1 - \frac{\bar{E}(t)-E_i(t)}{\bar{E}(t)}] = k_{op}\frac{E_i(t)}{\bar{E}(t)}$ (5)

During each and every round, the average number of cluster heads is as[18]:

$\sum_{i=1}^{N} p_i = \sum_{i=1}^{N} k_{op}\frac{E_i(t)}{\bar{E}(t)} = k_{op}\sum_{i=1}^{N}\frac{E_i(t)}{\bar{E}(t)} = N * k_{op}$(6)

Assume G be a set of sensor nodes that are eligible to become cluster head at round t. Each sensor node selects a random number in [0,1]. If this number is less than the threshold value[18], then this node becomes cluster head in the present round.

$$T(u_i) = \begin{cases} \frac{p_i}{1-p_i(t \bmod \frac{1}{p_i})}, if\ u_i \in G \\ 0, otherwise \end{cases} \quad (7)$$

In two level heterogeneous networks the value of k_{op} is given by[18]:

$$p_n = \frac{k_{op}}{1+\alpha m}, p_a = \frac{k_{op}(1+\alpha)}{1+\alpha m} (8)$$

In equation (5), p_n and p_a will be used for two level heterogeneous networks:

$$p_i = \begin{cases} \frac{k_{op} E_i(t)}{(1+\alpha m)\bar{E}(t)}, if\ u_i\ is\ a\ normal\ node \\ \frac{k_{op}(1+\alpha)E_i(t)}{(1+\alpha m)\bar{E}(t)}, if\ u_i\ is\ an\ advanced\ node \end{cases} \quad (9)$$

This can be extended to multi-level network which is given as:

$$p_m = \frac{k_{op} N(1+\alpha)}{(N+\sum_{i=1}^{N}\alpha_i)} (10)$$

In equation (5), p_m will be used for two level heterogeneous networks:

$$p_i = \frac{k_{op} N(1+\alpha)E_i(t)}{(N+\sum_{i=1}^{N}\alpha_i)\bar{E}(t)} (11)$$

The average power for the round t of the network is given by:

$$\bar{E}(t) = \frac{1}{N} E_T\ (1 - \frac{t}{R}) (12)$$

Where R represents the total number of rounds of the lifetime of the network and is given by:

$$R = \frac{E_T}{E_r} (13)$$

Where E_r = total power dissipated in the entire network during a round[18].

B. Developed Distributed Energy-Efficient Clustering (DDEEC):

DDEEC is proposed by [19]. The same strategy as that of DEEC is implemented by DDEEC in order to estimate average power of the network and the algorithm for selecting cluster head that is based on residual power.

The total power dissipated in the network during a round is given by[19]:

$$E_r = l(2NE_{elec} + NE_{DA} + k \in_{mp} d_{toBS}^4 + N \in_{fs} d_{toCH}^2) (14)$$

Where k = number of clusters,

l = number of bits,

E_{elec} = power dissipated per bit in order to run the transmitterE_{TX} or receiverE_{RX},

E_{DA} = cost of data aggregation per bit per signal,

d_{toBS}^4 = distance between the cluster head and base station.

d_{toCH}^2 = distance between cluster head and cluster members, and

$\in_{mp}$ and $\in_{fs}$ depend on the model used on the basis of distance between sender and receiver.

If $d < d_o$, where $d_o = \sqrt{\frac{\in_{fs}}{\in_{mp}}}$, then the free space ($d^2$ energy loss) model is used.

If $d \geq d_o$, then the multi path (d^4 energy loss) model is used.

Assume that all the sensor nodes are uniformly distributed, then

$$d_{toCH} = \frac{M}{\sqrt{2k\pi}}, d_{toCH} = 0.765\frac{M}{2} \quad (15)$$

Now the optimum number of clusters is given by:

$$k_{op} = \frac{M}{d_{toBS}^2}\frac{\sqrt{N}}{\sqrt{2\pi}}\frac{\sqrt{\in_{fs}}}{\sqrt{\in_{mp}}} (16)$$

Since in DEEC, the advanced nodes having high power will become cluster head more often as compared to normal nodes with low energy, so advanced nodes die more quickly than other ones. So, at each and every iteration the residual power is decreased by[19]:

$$E_{disAN} = l(E_{TX} + E_{mp}(d_{toBS}^4) + (E_{RX} + E_{DA})n/k_{op}) (17)$$

Where E_{disAN} = the power dissipated by an advanced node during round.

Possible number of iterations for a cluster head with an initial power $(1+\alpha)E_o$ will be given by:

$$Nb_{CH} = (1+\alpha)E_o/E_{disAN} (18)$$

In each round the power dissipated by a normal node E_{disNN} is[19]:

$$E_{disNN} = l(E_{TX} + \in_{fs} (d_{toCH}^2)) (19)$$

Possible number of iterations for a normal node with an initial power E_o will be given by:

$$Nb_{NN} = E_o/E_{disNN} (20)$$

Some changes are made in equation (9) by DDEEC for saving advanced nodes. Threshold residual power is introduced by DEEC [19] that is given by:

$$Th_R = E_o\left(1 + \frac{\alpha E_{disNN}}{E_{disNN} - E_{disAN}}\right) (21)$$

The probability in this case will be given by:

$$p_i = \begin{cases} \frac{k_{op} E_i(t)}{(1+\alpha m)\bar{E}(t)}\ for\ normal\ nodes, E_i(t) > Th_R \\ \frac{k_{op}(1+\alpha)E_i(t)}{(1+\alpha m)\bar{E}(t)}\ for\ advanced\ nodes, E_i(t) > Th_R \\ c\frac{k_{op}(1+\alpha)E_i(t)}{(1+\alpha m)\bar{E}(t)}\ for\ advanced, normal\ nodes, E_i(t) \leq Th_R \end{cases}$$

(22)

C. Enhanced Distributed Energy-Efficient Clustering (EDEEC):

EDEEC is proposed by [20]. The concept of three level heterogeneous network is used. The value of probability p_i to select cluster head is given by:

$$p_i = \begin{cases} \frac{k_{op} E_i(t)}{(1+m(\alpha+m_0 b))\bar{E}(t)}\ if\ u_i\ is\ the\ normal\ node \\ \frac{k_{op}(1+\alpha)E_i(t)}{(1+m(\alpha+m_0 b))\bar{E}(t)}\ if\ u_i\ is\ the\ advanced\ node \\ \frac{k_{op}(1+b)E_i(t)}{(1+m(\alpha+m_0 b))\bar{E}(t)}\ if\ u_i\ is\ the\ super\ node \end{cases} (23)$$

The threshold to select cluster head for all types of sensor nodes will be given by[20]:

$$T(u_i) = \begin{cases} \frac{p_i}{1-p_i(t \bmod \frac{1}{p_i})}, if\ p_i \in G' \\ \frac{p_i}{1-p_i(t \bmod \frac{1}{p_i})}, if\ p_i \in G'' \\ \frac{p_i}{1-p_i\left(t \bmod \frac{1}{p_i}\right)}, if\ p_i \in G''' \\ 0\ , otherwise \end{cases} \quad (24)$$

Where G' = set of normal nodes which have not been cluster heads in the last $1/p_i$ rounds of the epoch.

G''=set of advanced nodes which have not been cluster heads in the last $1/p_i$ rounds of the epoch.

G'''=set of super nodes which have not been cluster heads in the last $1/p_i$ rounds of the epoch.

The same idea as that of DEEC is implemented by EDEEC in order to estimate average power of the network and the algorithm for selecting cluster head that is based on residual power.

D. Enhanced Developed Distributed Energy-Efficient Clustering (EDDEEC):

EDDEEC is proposed by [6]. The concept of three level heterogeneous network is used like EDEEC. It uses the same strategy like DEEC to compute the residual power of nodes, average power of network and the cluster head selection algorithm. The value of probability p_i to select cluster head is given by[6]:

$$p_i = \begin{cases} \frac{k_{op}\, E_i(t)}{(1+m(\alpha+m_0 b))\bar{E}(t)}\ for\ normal\ \ if\ E_i(t) > T(u_i) \\ \frac{k_{op}\,(1+\alpha)E_i(t)}{(1+m(\alpha+m_0 b))\bar{E}(t)}\ for\ advanced\ \ if\ E_i(t) > T(u_i) \\ \frac{k_{op}\,(1+b)E_i(t)}{(1+m(\alpha+m_0 b))\bar{E}(t)}\ for\ super\ \ if\ E_i(t) > T(u_i) \\ c\,\frac{k_{op}\,(1+b)E_i(t)}{(1+m(\alpha+m_0 b))\bar{E}(t)}\ for\ ALL\ nodes\ if\ E_i(t) \le T(u_i) \end{cases} \quad (25)$$

The threshold $T(u_i)$ is given by:

$$T(u_i) = zE_o \quad (26)$$

Where z belongs to (0,1). If the value of z=0, then there will be EDEEC. The advanced and super nodes may have not been a cluster head in rounds t actually, it is also probable that some nodes some nodes become cluster head and same is the case with the normal nodes. So the accurate value of z is in doubt. On the other hand, the closest value of z is estimated through various simulations by varying it for best result on first dead node in the network and best result for z equal to 0.7 is found. Thus, $T(u_i)$=$(0.7)E_o$.

5. LITERATURE REVIEW

G. Smaragdakis, I. Matta, Bestavros:[17]This paper presented a new protocol heterogeneous aware SEP. In the whole network, the initial energy of a node in comparison to that of other sensor nodes weighted the probabilities of electing nodes for becoming a cluster head. Before the death of the first node which is known as stability period, the interval of time has been maximized. Longer stability period and higher average throughput has been provided by this protocol as compared to existing heterogeneous-unaware clustering protocols. The sensitivity of this protocol to heterogeneity parameters capturing power imbalance has been explored. In consuming the extra power of advanced nodes sensibly, SEP is more durable than low-energy adaptive clustering hierarchy.R.Rajagopalan and P.Varshney:[3] In this paper, different data aggregation algorithms has been presented which focus on the performance measures like power efficiency, data accuracy, latency and network lifetime. Security and source coding are the compulsory issues in data aggregation which have been studied. Comparison of dissimilar hierarchical data aggregation protocols like LEACH, HEED, PEGASIS, hierarchical chain based protocol, energy aware distributed heuristic, power efficient data gathering and aggregation protocol on the basis of their organization type (cluster, chain or tree), objectives and characteristics has been presented.The focus is also on the network flow-based data-aggregation algorithms thatare CMLDA, Maxconcurrent flow algorithm, restricted flow problem with edge capacities algorithm, shortest path tree algorithm and these are differentiated according to objectives and constraints, approach, limitations. Different approaches that characterize the trade-offs involved in data aggregation have been shown.Woo-Sung Jung, keun-Woo Lim, Young-BaeKo, Sang-Joon Park:[22]This paper proposed a hybrid approach for cluster based aggregation of data in wireless sensor network that has improved the effectiveness of aggregating data in applications to track several mobile targets. A suitable clustering technique has been adaptively selected by the proposed approach which depends on the position of the whole network. This has helped in raising the efficiency of aggregating data, power consumption and successful data sending proportion.BrahimElbhir, RachidSaadane ,Sanaa El Fkihi , DrissAboutajdine:[19] This paper proposed a clustering technique known as a developed distributed energy-efficient clustering scheme for heterogeneous wireless sensor networks. This protocol is an adaptive power aware clustering protocol. On the basis of initial and remaining power of sensor node, each and every sensor node elects itself independent as a CH without knowledge of power during each round. The probability of sensor nodes for becoming a cluster head in an efficient manner has been altered dynamically in order to distribute same amount of power between sensor nodes. From the results, it has been demonstrated that this protocol has better performance as compared to SEP, DEEC in terms of lifetime of the network and stability period.ParulSaini, Ajay.K.Sharma:[20] In this paper, enhanced distributed energy efficient clustering scheme has been proposed for heterogeneous networks containing three types of sensor nodes in order to improve the stability of the whole network and to prolong the network

lifetime. Sensor nodes are introduced that have more power as compared to normal and advanced nodes. Thus, the heterogeneity and power level of the entire network is increased. From the results it can be illustrated that the performance of EDEEC is better as compared to SEP having more stability.B. A. Said, E. Abdellah, A. B. Hussane and M. L. Hasnaoui:[23] This paper presented a heterogeneous-aware protocol named an Improved and Balanced LEACH(IB-LEACH). This has proposed a new technique for declining the probability of failure nodes and incrementing the interval of time before the death of the first node (this period is referred to as stability period) and prolonging the lifetime in heterogeneous wireless sensor networks. The impact of nodes heterogeneity has been studied, with respect to their power in wireless sensor networks that have been hierarchically clustered. In such kind of networks, nodes with more energy which are called normal nodes, cluster heads and gateways, became cluster heads for aggregating data of the cluster nodes and then send it to the selected gateways which needs the less power to communicate for minimizing the power utilization of CH and decreasing the failure nodes probability. From the results, it has been demonstrated that this protocol is power efficient and has helped in enhancing the lifetime of network and stability period in comparison with LEACH and SEP.D kumar, T.C. Aseri and R B Patel:[24] This paper proposed an energy efficient clustering and data aggregation(EECDA) protocol for heterogeneous wireless sensor networks. This protocol has helped in joining the ideas of power efficient cluster based routing and data aggregation for attaining a better performance in terms oflifetime and stability. In this protocol, a novel technique for the election of cluster head has been included and for the transmission of data, a path has been chosen with maximum amount of power residues instead of the way with minimum power utilization. From the results, it has been explored that this protocol has helped in balancing the power utilization and extending the lifetime of network. A comparison between this protocol, LEACH, energy efficient hierarchical clustering algorithm and effective data gathering algorithm has been established. T.N. Qureshi, N. Javid, M. Malik, U. Qasim, Z.A. Khan:[21] In this paper, various protocols like distributed energy-efficient clustering(DEEC), developed(D-DEEC), enhanced(E-DEEC) and threshold(T-DEEC) have been examined for heterogeneous networks that contain various different levels of heterogeneity: high to low. The performance on the basis of stability period, lifetime and throughput has been observed. The performance of EDEEC and TDEEC is better in all heterogeneous scenarios that contain variable heterogeneity in terms of lifetime. In terms of stability period, TDEEC is the best among all. But EDEEC and TDEEC have large instability period. On the other hand, by changing the heterogeneity parameters of the network, the performance of DEEC and DDEEC is greatly affected.DnyaneshwarMantri, Neeli R Prasad andRamjee Prasad:[25] In this paper, bandwidth efficient heterogeneity aware cluster based data aggregation algorithm has been proposed. Utilization of existing bandwidth effectively in terms of reduced data packet delivery proportion and throughput has been the major design objective. For efficient congregation of data with in-network aggregation, this algorithm has presented the solution. The complete network along with heterogeneous sensor nodes in terms of power and sink which is mobile for the aggregation of the data packets has been considered. On the arbitrarily distributed sensor nodes , the most favourable method by Intra and inter-cluster aggregation with changeable data creation rate while routing to base station has been embodied. For applying the aggregation function on data generated by sensor nodes, the correlation of data inside the data packet has been used. Comparison of results with two tier cluster based data aggregation and energy efficient cluster based data aggregation has been done.N. Javaid, T.N. Qureshi, A.H. khan, A.Iqbal, E. Akhtar, M.Ishfaq:[6] In this paper, enhanced developed distributed energy efficient clustering scheme(EDDEEC) for heterogeneous networks has been proposed. This protocol is adaptive power aware. The probability of sensor nodes for becoming a cluster head in an efficient manner has been altered dynamically in order to distribute same amount of power between sensor nodes. Simulations have been performed for checking the efficiency of new protocol. For this analysis, the selected performance parameters are lifetime, stability period and data transmitted to the base station. From the results, it has been shown that EDDEEC is more efficient and reliable as compared to DEEC, DDEEC and EDEEC.DnyaneshwarMantri, Neeli R Prasad andRamjee Prasad:[26] In this paper, the mobility and heterogeneous aware bandwidth efficient cluster based data aggregation(MHBCDA) approach has been presented. The nodes have been distributed randomly. The mobile sink based aggregation of data packets has been considered for heterogeneous WSN. For aggregating data at cluster head, a predefined area has been used for minimizing the cost of communication and computation. This approach is bandwidth and power efficient. By varying the generation rate of data packets, the correlation of packets of data generated has been exploited. For improving power consumption and prolonging the lifetime, the transmission of duplicate data packets has been presented. From the results, it has been demonstrated that this algorithm has saved power, prolonged the lifetime of network and has maximum remaining power in comparison to energy efficient clustering and data aggregation protocol.

6. GAPS IN EARLIER WORK

To evaluate the gaps in existing research; latest published papers of some well-known journals have been evaluated.

1. The survey has shown that the most of the existing data aggregation techniques are for homogeneous WSNs. But in real time applications WSNs comes up with heterogeneous sensor nodes.
2. In EDDEEC and DEEC variants data aggregation at the base station by individual nodes causes flooding of the data which consequences in maximum energy consumption.
3. Also most of data aggregation methods are either based upon the clustering or tree based approach but the use of hybrid data aggregation has been ignored by the most of the researchers.

So using the hybrid data aggregation in EDDEEC heterogeneous WSNs is the main motivation of this research work.

7. CONCLUSION & FUTURE WORK

Though EDDEEC has revealedfairlysubstantialoutcomes over current wireless sensor network protocols but it has ignored the usage of inter-cluster data aggregation to minimize communication overheads and also avoiding the flooding at the base station.

Thus for overcoming this difficulty in close future we will practice inter-cluster data aggregation on Cluster heads. It will overcome the matter of flooding at thebase station and also communication is done in confident way thus will offer more correctoutcomes. No implementation is considered in this paper so in nearby future we will utilize appropriate simulation tool to contrivance the modified EDDEEC protocol.

REFERENCES:

[1] P.N.Renjith and E.Baburaj, "An Analysis on Data Aggregation in Wireless Sensor Networks," International Conference on Radar, Communication and Computing(ICRCC), SKP Engineering College, Tiruvannamalai,TN.,India. pp. 62-71, Dec. [2012].

[2] I.Akyldiz, W.Su, Y.Sankarasubramanian and E. Cayirci, "Wireless Sensor networks: a survey," IEEE Computer, vol. 38, no. 4, pp. 393-422, [2002].

[3] R.Rajagopalan and P.Varshney, "Data-Aggregation Techniques in Sensor Networks: A Survey," IEEE Comm. Surveys Tutorials, vol. 8, no. 4, pp. 48-63, Oct.-Nov. [2006].

[4] S.Madden, M.J.Franklin, J.M.Hellerstein, and W.Hong, "TAG: A Tiny Aggregation Service for Ad-Hoc Sensor Networks," Proc. Fifth Symp. Operating Systems Design and Implementation, [2002].

[5] S.Tilak, N.Abhu-Gazhaleh, W.R.Heinzelman, "A taxonomy of wireless micro-sensor network models," ACM SIGMOBILE Mobile Comp. Commun. Rev. , vol. 6, no. 2, pp. 28-36, Apr. [2002].

[6] N. Javaid, T.N. Qureshi, A.H. khan, A.Iqbal, E. Akhtar, M.Ishfaq, "EDDEEC: Enhanced Developed Distributed Energy-Efficient Clustering for Heterogeneous Wireless Sensor Networks", International Workshop on Body Area Sensor Networks (BASNet-2013) in conjunction with 4th International Conference on Ambient Systems, Networks and Technologies, Halifax, Nova Scotia, Canada, [2013].

[7] I. Akyldiz, W.Su, Y. Sankarasubramanian and E. Cayirci, "A survey on sensor networks," IEEE CommunicationMag., vol. 40, no. 8, pp. 102-114, Aug. [2002].

[8] O. Younis and S. Fahmy, "HEED: a Hybrid, Energy-Efficient Distributed Clustering Approach for Ad Hoc Sensor Networks", IEEE Trans. Mobile Computing, vol. 3, no. 4, pp. 366-79, Dec. [2004].

[9] W.Heinzelman, A.Chandrakasan, H.Balakrishan, "An application-specific protocol architecture for wireless microsensor networks", IEEE Transaction on Wireless Communication, vol. 1, no. 4, pp. 660-670, [2002].

[10] S.Lindsey, C.S.Raghavenda, "PEGASIS: power efficient gathering in sensor information systems",in: Proceedings of the IEEE Aerospace Conference, Big Sky, Montana, March [2002].

[11] Olivier Dousse, PetteriMannersalo, Patrick Thiran, "Latency of Wireless Sensor Networks with Uncoordinated Power Saving Mechanisms," MobiHoc'04,Roppongi, Japan.May 24–26, [2004].

[12] HuseyinOzgur Tan and Ibrahim Korpeoglu, "Power Efficient Data Gathering and Aggregation in Wireless Sensor Networks".

[13] S. Cho, andA. Chandrakasan, "Energy-efficient protocols for low duty cycle wireless microsensor networks", Proceedings of the 33rd Annual Hawaii International Conference on SystemSciences, Maui, HI Vol. 2 (2000), p. 10.

[14] N. Bulusu, D. Estrin, L. Girod, J. Heidemann, "Scalable coordination for wireless sensor networks: self-configuring localization systems", International Symposium on Communication Theory and Applications (ISCTA 2001), Ambleside, UK, July [2001].

[15] C. Intanagonwiwat, R. Govindan, D. Estrin, "Directed diffusion: a scalable and robust communication paradigm for sensor networks" Proceedings of the ACM Mobi-Com'00, Boston, MA, pp. 56–67, [2000].

[16] S. Meguerdichian, F. Koushanfar, G. Qu, M. Potkonjak, "Exposure in wireless ad-hoc sensor networks", Proceedings of ACM MobiCom'01, Rome, Italy, pp. 139–150 [2001].

[17] G. Smaragdakis, I. Matta, Bestavros, "SEP: A Stable Election Protocol for clustered heterogeneous wireless sensor network", in: Second international Workshop on sensor and Actor Network Protocols and Applications ,[2004].

[18] L.Qing, Q.Zhu, M. Wang, "Design of a distributed energy-efficient clustering algorithm for heterogeneous wireless sensor network", ELSEVIER, Computer Communications 29, pp 2230-2237, [2006].

[19] BrahimElbhir, RachidSaadane , Sanaa El Fkihi , DrissAboutajdine, "Developed distributed energy-efficient clustering (DDEEC) for heterogeneous wireless sensor networks", in: 5th International Symposium on I/V Communications and Mobile Network (ISVC), [2010].

[20] ParulSaini, Ajay.K.Sharma, "E-DEEC- Enhanced Distributed Energy Efficient Clustering Scheme for heterogeneous WSN", in: 2010 1st International Conference on Parallel, Distributed and Grid Computing (PDGC-2010).

[21] T.N. Qureshi, N. Javid, M. Malik, U. Qasim, Z.A. Khan, "On performance evaluation of variants of DEEC in WSNs" Broadband, Wireless Computing, Communication and Applications (BWCCA), 2012 Seventh International Conference on , vol. no., pp. 162-169, 12-14 Nov. [2012].

[22] Woo-Sung Jung, keun-Woo Lim, Young-BaeKo, Sang-Joon Park, "A hybrid approach for clustering-based Data Aggregation in Wireless Sensor Networks", IEEE, 3rd International Conference on Digital Society, pp. 112-117, [2009].

[23] B. A. Said, E. Abdellah, A. B. Hussane and M. L. Hasnaoui, "Improved and Balanced LEACH for heterogeneous wireless sensor networks", International Journalon Computer Science and Engineering, Vol 02, No. 08, 2633-2640,[2010].

[24] D kumar, T.C. Aseri and R B Patel, "EECDA: Energy Efficient Clustering and Data Aggregation Protocol for Heterogeneous Wireless Sensor Networks", International Journal of Computers Communications & Control, ISSN 1841-9836, Vol. 6(1), pp. 113-124, March [2011].

[25] DnyaneshwarMantri, Neeli R Prasad andRamjee Prasad, "BHCDA:Bandwidth Efficient heterogeneity aware cluster based data aggregation for wireless sensor network", IEEE, International Conference on Advances in Computing, Communications and Informatics, pp. 1064-1069, [2013].

[26] DnyaneshwarMantri, Neeli R Prasad andRamjee Prasad, "MHBCDA: Mobility and Heterogeneity aware Bandwidth Efficient Cluster based Data Aggregation for Wireless Sensor Network", IEEE, [2013].