# ENERGY EFFICIENT MECHANISMS FOR CLUSTER HEAD SELECTION IN WSN

Manjeet kaur and Sandeep kaur Research scholar and Assistant Professor Dept of computer science and engineering, Sri sai institute of engg and technology, Amritsar (Pb.), India.

#### ABSTRACT

The evaluation and up gradation of wireless sensor Network(WSN) requires transfer of data from source to destination. Nodes within wireless network are sensors having limited energy associated with them. Nodes collaborating together form clusters. Data transmission takes place from distinct clusters towards base station. Energy of sensors needs to be preserved in order to enhance lifetime of network. This paper presents various techniques used to enhance lifetime of network. Lifetime of network ensures degradation in terms of packet drop ratio. Comparative analysis of techniques is also presented to determine approach that can be used for future enhancements.

#### Keywords

WSN, Clusters, Lifetime, Packet drop ratio

#### 1. INTRODUCTION

[1]Wireless sensor network consist of spatially distributed devices used to maintain physical or environmental conditions. Nodes used within WSN could be of distinct configuration. These nodes form heterogeneous environment. [2], [3]Heterogeneous environment requires protocols in order to establish communication among distinctly configured nodes. IEEE 802.11 standards established for Wi-Fi connectivity is commonly used protocol for transmission within WSN. Nodes following common protocols form clusters.

[4]Clustering in WSN is formed so that minimum energy is consumed during transmission of data. Formed clusters consist of large number of nodes which may have same or distinct configuration. The nodes within the clusters if belongs to same configuration then homogeneous clusters are formed. In case nodes are of distinct configuration then heterogeneous clusters are formed.[5] Nodes selection from clusters is critical that leads to selection of cluster head. Cluster head from particular cluster is node having maximum energy. [6]All the nodes from a distinct clusters transfer the data towards selected cluster head from their cluster. Data then is transmitted from one cluster head to another cluster head until destination node i.e base station is reached. Packet drop ratio is considerably reduced as maximum energy node is selected for transmission of information. [7]As energy decays, sensors unable to hold the packet and hence packet is dropped. As more and more packets arrive at the sensor having minimum energy, packets are dropped. This enhances packet drop ratio considerably. Within clustered environment techniques were researched over to enhance performance in terms of packet drop ratio during degradation of sensor energy. This paper presents comprehensive analysis of techniques used to enhance lifetime and decrease packet drop ratio. Highlights of this paper is listed as under

- Energy efficient protocols in WSN for enhancing lifetime of networks are discussed.
- Techniques used to minimize packet drop ratio are identified.
- Cluster head formation techniques are discussed in detail.

- Comparative analysis of various protocols is presented for determining best possible protocols out of available protocols.
- 2. ENERGY EFFICIENT CLUSTERING TECHNIQUES IN WSN

Large number of protocols researched over a decade to enhance lifetime associated with the network. This section discusses various protocols falls under energy efficient category.

#### 2.1 LEACH

[4], [8]Low Energy Adaptive Clustering hierarchical protocol is used to enhance energy efficiency associated with transfer process. Time division multiple access protocol is integrated within LEACH. Cluster head selection is a problem within LEACH. In fact cluster head selection does not take place and data is transmitted from transmitter towards random selection of node selected as head. Aggregation is performed at cluster head and when threshold value is reached, packets are transmitted forward. In case cluster head energy dissipated completed, all the packets aggregated at node will be lost. Properties associated with LEACH are listed as under

- Hierarchical in nature
- Random Cluster Head Selection is involved
- Adaptive membership of cluster
- Aggregation of data at cluster head
- Communication involves nodes and cluster head
- Threshold values involve during transmission
   2.2 DEEC

This protocol is advancement associated with LEACH. [9], [10]Cluster head selection is complex in case of DEEC. Maximum energy nodes are elected among available nodes. The node with the highest probability of conserving energy is selected as cluster head. A distributed multilevel clustering algorithm for heterogeneous wireless sensor networks is considered with following characteristics

- The cluster head is elected by a probability based on the ratio between the amount residual energy present at each node and the average energy of the network.
- The lifetime of a cluster head is decided according to its initial energy and residual energy. So always

the nodes with high initial and residual energy have a better chance to become a CH.

- DEEC is implemented based on the concepts of LEACH algorithm. The role of cluster head is rotated among all nodes of the network to make energy dissipation uniform.
- Two levels of heterogeneous nodes are considered in this algorithm to achieve longer network lifetime and more effective messages than other classical clustering algorithms.
- It also works better for multilevel heterogeneous networks.

In DEEC, all the nodes must have the idea about total energy and lifetime of the network. Average energy of the network is used as the reference energy.

2.3 SEP

[10]SEP concentrate the effect of heterogeneity of Clusters, as far as their vitality, in remote sensor arranges that are progressively bunched. Following properties are considered

- In these systems a portion of the nodes progressed toward becoming bunch heads, total the information of their group individuals what's more, transmit it to the sink.
- It accept that a rate of the populace of sensor hubs is outfitted with extra vitality assets which is a wellspring of heterogeneity which may come about from the underlying setting or as the operation of the system advances.
- It additionally consider the sensors are arbitrarily (consistently) appropriated and are not versatile, the directions of the sink and the measurements of the sensor field are known.
- It is assumed in SEP that nodes cannot take full favorable position of the nearness of hub heterogeneity.
- SEP, a heterogeneous-mindful convention to draw out the time interim before the passing of the principal hub (we allude to as strength period), which is pivotal for some applications where the criticism from the sensor organize must be solid.
- SEP depends on weighted race probabilities of every hub to end up bunch go to the rest of the vitality in every hub.

[11], [12]SEP is advancement associate with DEEC. Energy is conserved and lifetime of network is improved considerably by the use of this protocol.

2.4 EDEEC

[13]–[15] Remote Sensor Networks (WSNs) comprises of across the board arbitrary sending of vitality obliged sensor hubs. Following properties exists of EDEEC.

- Sensor hubs have distinctive capacity to detect and send detected information to Base Station (BS) or Sink.
- Detecting and in addition transmitting information towards sink requires substantial measure of vitality.
- In WSNs, save vitality and delaying the lifetime of system are incredible difficulties. Many directing conventions have been proposed with a specific end goal to accomplish vitality productivity in heterogeneous condition.
- EDEEC for the most part comprises of three sorts of hubs in amplifying the lifetime and solidness of system.

Enhanced distributed energy efficient clustering protocol is advancement of DEEC that conserve energy and reduce packet drop ratio considerably. Further enhancement in DEEC can be made to enhance performance DEEC by reducing distance between nodes in which data is being transmitted.

Today's world needs some technologies to fulfil their routine work. [16]WSN is that technology which fulfills the routine work of the society. Wireless sensor network senses the physical world whether it is temperature, pressure, humidity and some other environment activities. WSN is used in an environment where the wires or cable are not possible to reach. It is easy to install compared with the other cables network. Now, these day's WSN are using mainly for the data transfer purpose. [17]Sensor nodes in the wireless network transfer the data packets from source to destination. Wireless sensor network includes sensors nodes and a base station (sink) and there are so many sensors which create a network. All the sensor nodes in a network communicate with each other and transfer the data packet from source node to the sink. Sensor nodes can communicate directly with the base station. Sensor nodes consume a lot of energy while data transfer. On the other hand, sensor nodes also consume energy after transferring the data packets. Due to this consumption, the lifetime of the network also gets reduced. This is the major issue of the sensor network. [18]There are more issues of the network

but energy consumption and improve the lifetime of the network. Taking these issues in concern, there is one method which is very much useful to resolve these problems called clustering. Clustering, the technique in which large network region is divided into smaller one. With this technique, sensor nodes do not require direct communication with the base station. In every cluster, there is a cluster head which collects the data from all the network nodes and then transmits that data to the base station. The cluster head is elected on the basis of maximum energy of the node. The node which has highest energy is selected for cluster head. Basically only cluster head is responsible for the communication in the network. Cluster head needs more energy for the data aggregation and transmitting the data. So after transmission of the data, its energy reduces and the node which has second highest energy is selected for cluster head. There is so many clustering protocols which not only reduces the energy consumption but also enhance the network lifetime. These protocols are LEACH, HEED, DEEC, EDEEC, SEP etc. These protocols are cluster-based protocol and a lot of work has been done with these protocols. LEACH is the first protocol which came into the existence in the clustering protocol. DEEC is also a cluster-based protocol in which cluster head is selected based on the residual energy of the sensor nodes and the average energy of the network. EDEEC is the enhanced version of the DEEC protocol and requires a heterogeneous network. LEACH is the homogeneous network.

Next section describes background analysis or literature survey to determine best possible protocol for future enhancement.

#### 3. LITERATURE SURVEY

Techniques have been devised for improvement of performance in WSN. The WSN performance is critically analysed using this paper. The worth of study is proved using this literature survey. [19] proposed distance and energy aware LEACH. The cluster head selection in this approach was adaptive and allow packet drop ratio to reduce considerably. The aggregation mechanism was the drawback associated with this approach. In case cluster head go down,

every packet aggregated at source could be lost. [20]proposed EAP for conserving energy during transmission of data from source to destination. Inter cluster coverage was introduced in this approach. Data gathered at particular cluster was according to probability distribution factor that reduces energy consumption and enhances lifetime of network. [8] discussed energy efficiency achieved through LEACH protocol. Time division MAC was integrated to achieve energy efficiency and lifetime within the WSN. [21]proposed a mechanism to analyse energy dissipation through Multi-Chain PEGASIS. This protocol constructs a chain of routing path. Multi hop routing was used under PEGASIS. Overall protocol was energy and power efficient but complex. In other words time and space complexity was enhanced using PEGASIS. Future modifications required in order to enhance performance of examined system. [22] proposed LEACH, a hierarchical protocol for achieving energy efficiency within WSN. Adaptive cluster head selection allow performance enhancement however aggregation mechanism used within WSN has merits and demerits associated with it. Energy conservation was achieved with the risk of enhancement of packet drop ration in case of cluster head failure.

[23] Proposed energy efficient DEEC protocol. DEEC protocol uses probability distribution function to determine cluster head out of number of nodes available within WSN. Probability assigned with each node within WSN was analysed for selection of cluster head. Probability associated with nodes varies during each round. Higher the probability more will be chance of node being selected as cluster head. DEEC performance decreases by the application of aggregation mechanism leading to increase in packet drop ratio. [13]proposed enhancement in DEEC protocol to achieve more energy efficiency. Lifetime of network significantly improved by the application of E-DEEC. As packets moved from one node to another, energy associated with nodes will be analysed. Node having highest energy will be selected as cluster head. Packet being received by node having highest energy. Lifetime of network was considerably enhanced but packet drop ratio increases hence requires improvement. [9]proposed a sleep awake protocol for WSN data transmission. Node being idle was set to sleep and energy conservation was

achieved. The problem of topology breakage occurred as node was made to sleep. In order to wake the node sufficient amount of energy was required to be dispensed with. [15]discussed a super energy aware protocol by accomplishing modifications to the existing DEEC protocol. Modified mechanism of electing cluster head was proposed. Node selected as cluster head was evaluated against several criteria's before electing it as cluster head. Complexity in terms of cluster head was extremely high.

[24]Proposed a priority based application specific congestion control algorithm. Packets can be initiated through any node and hence traffic could be a problem. To handle traffic, congestion control mechanism was proposed by maintaining priority queue. Packets from distinct nodes were maintained within queue. As congestion becomes high, enqueue operation takes place. As traffic becomes moderate dequeue operation takes place. This mechanism results in decreasing packet drop ratio. But energy consumption in this mechanism still requires improvement. [25]advised gateway based energy routing protocol (M-GEAR) for WSN. Depending on their location in the sensing area, they divided the nodes into four zones. In this protocol, they placed the base station out of the sensing zone and placed a gateway at the middle of the sensing area. The node uses the direct communication if the distance of the sensing node from the base station or gateway is less than the prescribed distance. They also divided the remaining nodes into equal zones. Selected cluster heads in each zone are independent of each other. They compared the performance of proposed protocol with LEACH. Analysis results show that their assigned protocol perform greatly basis on the consumption of energy and lifespan of the network. [26]said that in the upcoming time, WSNs require a great need of spreading the nodes and also enhance its applications in all fields because in the future most of the devices will be connected to each and everything. So spreading of these nodes is the greatest challenge, keeping this in mind a new protocol is given called TDEEC used for the heterogeneous network. TDEEC protocols use three levels of heterogeneity. It is a reactive protocol and used basically for reactive

needs extra

energy to

rebuild

clusters

It is limited

assumptions

that CHs are

predetermin

ed as well as

network is

by

not

Commonly

protocol in

environmen

unequal cluster

used

sized

t

Very low

Medium

Bad

and

CH selection.

uniform

Achieve high

energy

efficiency and

scalability by

communic

ating in multi-hop

Unequal

clusters

Nodes in

are formed

cluster can

be variable

way.

size

networks. Reactive networks are those which react quickly to any change arise in any parameter.

The comprehensive literature survey conducted in this paper suggest, considerable improvement in terms of energy efficiency and packet drop ratio within WSN is required. Some techniques suggested such as DEEC provides efficient low complexity mechanism to accomplish the same but distance based criteria's are absent within DEEC. To improve the performance of DEEC, distance between nodes must be considered. This could be the future course of action.

4. COMPARISON OF ENERGY AWARE SCHEMES WITHIN WSN

S.       S.       Residual energy of notified transmission.       Protoc     Merits     Paramet       ol     Merits     Demerits     Paramet     Remarks       Energy Load     Algorith m     Energy Load     Stafficient for large range     and not sufficient for large range       Leach     •     Each node has equal     •     Leach use single hop communicati on so so thing the basis of subsequent protocol and the basis of substribution and	Comparison of energy aware schemes presented in										homogeneou		
Intersection       Note of the section of the sectin the sectin the sectin the section of the sectin the section of	this section provides clear and concise view of optimal										S.		
Protoc ol         Merits         Demerits         Paramet er         Remarks er         Remarks er         Ander in the considered and not sufficient for large range networks.         Medium and not sufficient for large range networks.         Medium Medium to more balancing to mode is not considered and not sufficient for large range networks.         Medium Medium to for         Medium to filt to fil	this section provides clear and concise view of optimar									•	Residual		
Protoc ol       Merits       Demerits       Paramet er       Paramet er       Remaiks       Considered and not sufficient for large range networks.       Considered and not sufficient for large range networks.       Paramet and not sufficient for protocil associated communicati cluster       Constructs energy communicati large range networks.       Demetris protocil associated communicati large range networks.       EECS constructs energy on no no consumpti consumpti consumpti consumpti consumpti consumpti no no consumet lat alink large range networks.       Medium Medium lat link large range network in terein single hop communicati lat alink large range network in terein single hop communicati lat alink large range network in terein single hop communicati lat alink large range network in terein single hop communicati lat alink large range network in terein single hop communicati lat alink large range network in terein single hop communicati lat alink large range network in terein single hop communicati lat alink large range network in terein single hop communicati lat alink lat alink lan	te	echnique within wa	SN during data trans	mission.							node is not		
or     and not sufficient of large range networks.     and not sufficient of protocil on constructs     and not sufficient of protocil on subsequent selected a     and not sufficient of protocil on not subsequent nodes     and not sufficient of protocil on on subsequent nodes     and not sufficient of protocil on on subsequent nodes     and not subsequent protocil on not subsequent nodes     and not subsequent treation of protocil on on subsequent nodes     and not subsequent not protocil on on subsequent nodes     and not subsequent treation of protocil on subsequent nodes     and not subsequent not protocil on subsequent not protocil on subsequent nodes     and not selected on the basis protocil on subsequent not protocil on subsequent not protocil on sensing and sensing     between energy consumpti on sensing and sensing     between energy consumpti on sensing     and not sensing and sensing     and not subsequent not protocil on sensing     and not sensing and sensing	Protoc	Merits	Demerits	Paramet	Remar	ks					considered		
Leach     •     Each node has equal chance become     •     Leach use single hop commonicati chance to communicati chance to communicati chance to communicati chance to communicati chance to communicati chance to communicati chance to communicati chance to chance to communicati chance to chance to communicati chance to chance to chance to the chance to chance to chance to the chance to chan	01			er							and not		
Leach     •     Each node     •     Leach use Single hop Complexi Ty     •     EECS Balancing Complexi Ty     •     EECS Constructs metriciency Balancing Complexi Ty     •     EECS Constructs more balanced notwork in term of communication on communication on associated with energy complexi term of consumption on associated with energy complexi term of consumption on associated with energy communication on associated with energy communication on associated with energy communication on associated with energy communication on associated with energy communication on associated with energy communication on associated with energy communication on associated with energy communication on consumption on associated with energy communication on consumption consumption cons				Energy							sufficient for		
Leach     •     Each node has equal chance to cluster     •     Leach use single hop chance to cluster     •     Earliest protocol associated with cluster     •     Earliest protocol associated with cluster     •     •     Communicati on and communicati on consume associated with cluster     •     •     Earliest protocol associated with cluster     • <t< td=""><td></td><td></td><td></td><td>Load</td><td></td><td></td><td></td><td></td><td></td><td></td><td>large range</td><td></td><td></td></t<>				Load							large range		
LeachEach node has equal chance to become communicati cluster head in tromotos from clusterLeach use single hop communicati LowEarliest protocol associated with clusteringEarliest protocol associated with clusteringConstructs more balanced network in term of communicati on and communicati on and communicati on and communicati cluster head in tromotosEarliest protocol associated with clusteringEarliest protocol associated with communicati communicati communicati clusteringMedium used on communicati on and communicati on and communicati on and communicati clusteringMedium term of energy consumpti on and communicati on consume it or for clusteringMedium media access control is sing of clusteringMedium media access control is sing of clusteringMedium media acces clusteringArea acces aclusteringHEED••••Poor energy efficiency<				Algorith		FECS			FECS		Lot of		Energy
Leach•Each node•Leach use single hop communicati in tryEarliest protocol associated with edustermore balancing energy comsunticati on and associated with edustermore balancing information comsunticati on and associated with edusterdue to global information communicati on single hop communicati on and associated with edusterMedium term of energy comsunticati on and associated with edusteringMedium term of energy on and comsunticati on and associated dynamic comsunticati single hop to or on so it comto a solected as tround so is distributedMedium term of associated with distributedMedium more balancing term of associated dynamic comsuntic comsuntic dynamic comsuntic single hop to or onsoure lot of energyMedium media access control layer within data link layerLeach use between collisions•CCMCCMCes energy consumpti on compared with leach•Very more on control layerMedium Medium herarchical and location basedHEED•Fully distributed•The random selection ofBetter connectivity••Poor energy efficiency efficiency area with on out put to the markMedium media access combinedHEED•Fully distributed••The random selection ofBetter connectivity•••••••HEED•				m		1105			constructs	, , , , , , , , , , , , , , , , , , ,	overhead		efficient
Leach•Each node has equal chance to become cluster cluster•Leach use single hop communicati modesEarliest protocol associated with cluster clusterEarliest on and communicati on and cluster on and cluster ation loadMedium wery High at media access control layer within data link layerLeach•Leach use single hop communicati on on so•Earliest protocol on and cluster on and cluster cluster cluster cluster elected on badin througs to any to the subsequen shared between collisions•Leach use sigle hop communicati distribution distribution shared between collisions•Earliest protocol associated with cluster•Single hop communicati on consume ation loadMedium wery High access control layer within distribution on communicati on consume i load is shared tround so to as ouniform to adis tround so is balancing keeps CHS from unnecessa ry collisions•Earliest provide load tround so to and tround so to adis to adiancing keeps CHS from unnecessa ry collisions•Nedium to adiancing keeps CHS from to adiancing keeps CHS from to adiancing keeps CHS from unnecessa ry collisions••Earliest provide load to adiancing keeps CHS from to adiancing keeps CHS from distributed••Very holeMedium hole <td></td> <td></td> <td></td> <td>Efficiency</td> <td></td> <td></td> <td></td> <td></td> <td>more</td> <td></td> <td>due to global</td> <td>Medium</td> <td>protocol</td>				Efficiency					more		due to global	Medium	protocol
Leach• Each node has equal chance to become duster duster communicati become duster cluster cannot be selected as cluster cluster trond bain selected as cluster cluster trond bain cluster• Leach use cluster cluster cluster cluster• Medium cluster cluster cluster clusterMixture of thick cluster clusterHEED• Fully distributed• The random selection ofBetter commutivity• Solve the problem of area with overlappe d sensing coverage and• Poor energy efficiency the archical and ceis and distributed• The random selection ofBetter conmettivity• Poor energy efficiency the archical sensing coverage and sensing• Poor energy efficiency the archical and ceis and the archical and ceis and ceis and commutivity• Poor energy efficiency the archical sensing coverappe• Poor energy efficiency the archical and ceis and teis and teis and teis and teis• Poor energy efficiency the archical the archical and teis teis 				Complexi					balanced		information	Medium	used
Leach       • Each node       • Leach use       • Each node       • Each node       • Single hop communicati protocol associated with clustering       • Single hop communicati on consume lot of energy       • Single hop communicati on consume lot of energy       • Single hop communicati on consume lot of energy       • Single hop communicati on consume lot of energy       • Single hop communicati on consume lot of energy       • Single hop communicati on consume lot of energy       • Single hop communicati on consume lot of energy       • Single hop communicati on consume lot of energy       • Use       • Use       • Use       • Other energy       <				tv					network in		for	Very High	commonly
Leach       • Each node has equal chance to become cluster       • Leach use single hop communicati on so it cluster       • Leach use single hop communicati on so it cluster       • Single hop communicati on and cluster       • Single hop communicati on consumeti ation load       • Chis data link layer       Jaccess control layer within data link layer         Leach use cluster       • Chis are cluster       • Chis are elected as       • Chis are elected on head in subsequen probability       • Chis are elected on head is subsequen between ensured and nodes       • Chis distribution shared       • Chis distribution cannot be between unnecessa       • Chis distribution shared       • Chis distribution shared       • Chis distribution cannot be between rowide load balancing trom unnecessa       • Chis distribution shared       • Cess dynamic cluster       • Chain head energy consumpti on compared with leach       • Chain head energy consumpti on compared with leach       • Poor energy efficiency • Leach       • Medium Medium Medium       Medium headin location based routing is combined         • LEACH- vf       • Solve the problem of are with overlappe d sensing coverage and sensing       • Poor energy efficiency • Load       • Medium Medium       Area independen ce is achieved				.,					term of		communicati		at media
has equal chance to become cluster cannot be cannot be cannot be clustersingle hop communicati on so it unterscienceprotocol associated associated clusteringon and communic associated sociated on and communic ation load usith clusteringSingle hop communicati on and communicati on consume to feasibleSingle hop communicati on and communic associated with clusteringSingle hop communicati on and communicati on and communic ation load usith dynamic sizing ofSingle hop communicati on consume to feasible dynamic sizing ofSingle hop communicati on consume to feasibleCommunicati data link data link layer within data link layerassociated dustribution subsequen t round so between modesCCMUse dynamic sizing ofVery useMixture of flat, mediumi cluster between modesCHs are elected and nodesCCMLess energy consumpti on on compared with leachCCMVery useWery with heleVery MediumMixture of flat, heir heirLeach uses TDMA so it between collisionsprovide load balancing t rowLEACH- vFVery with earea with overlappe d sensing coverage andPoor energy efficiency markArea independen c eis achievedHEEDFullyThe random selection ofBetter connectivitySelection formNedium sensing beleArea and achievedArea and achieved	Leach	Each node	Leach use		Earlies	t	1		energy		on Ciasta has		access
chance to become cluster head but cluster head but cannot usedcommunicati Medium LowVery low Medium with clusteringassociated with communic ation loadCommunicati ation load sizing of clustersCommunicati ation load lot of energydata link layerdetermine head but cannot be head in t round so subsequenin large scale networks, selected asCHs are elected on t to basis of subsequenCCMUse dynamic sizing of clustersCAin head selection clustersVery head metworks, selectionMixture of flat, metworks, selection criterionMixture of flat, metworks, selection criterionMixture of flat, metworks, selection criterionMixture of flat, metworks, selection criterionMixture of flat, metworks, selection criterionMixture of flat, metworks, selection criterionicannot be betweenensured and nodeson distribution balancingEEACH- VFSolve the problem of area with overlappe d sensing and sensingPoor energy efficiency markMedium data link layerHEED•Fully distributed•The random selection ofBetter connectivitySolve the sensing and sensing••Poor energy efficiency markMedium distributedidependen c coursage achieved••Fully and•The random selection ofBetter connectivity••••idependen c cour		has equal	single hop		pr <mark>otoc</mark>	ol			consumpti on and	•	Single nop		laver within
becomeon so itMediumwithation loadlot of energylayerclusterclusterin large scaleclusteringUseUselot of energylot of energylot of energylayerselected as• CHs areelected onelected onclustering• Less• Chain headVeryMixture ofsubsequenprobabilitythe basis of• CCM• Less• Chain headVeryMixture ofsubsequenprobabilitydistributionsameconsumpticriterionWediumMediumbetweenensured andit cannot beensured andit cannotVFMediumMedium• Leach usesprovide loadbalancingVFVFPoor energy• LoadMediumit cannotbalancingfromVFVFSolve the• Poor energyMediumit cannotprovide loadVFVFarea withoverlappeMediumindependenconsumptioverlappenot up to theindependenif fromrorot up to thedistributedselection ofBetterandrycollisionsselection ofBetterandsensingnot up to theHEEDFullyThe randomBetterandsensingnot up to thedistributedselection ofselection ofbalancing is ensingandindependenselection ofselection ofensingandindependenseles		chance to	communicati	Very low	as <mark>socia</mark>	ited			communic				data link
cluster head but cannot be clusterLow in large scale n large scale elected on head in tround so so uniform load is shared between between ensured and nodesLow in large scale elected on the basis of so uniform distribution clusterUse dynamic sizing of clustersVery low flat, hierarchical and location based routing is compared with leachMixture of flat, hierarchical and location based routing is compared with leachMixture of selection criterionMixture of flat, hierarchical and location based routing is combinedHEED•Fully distributed•The random selection ofBetter connectivity•Solve the gensing and sensing••Poor energy efficiency markMedium MediumHEED•Fully distributed•The random selection ofBetter connectivityBetter connectivityNot up to the sensing balae		become	on so it	Medium	with				ation load		lot of energy		layer
In large scale (cannot be selected as (luster head in head in basequenOther networks, elected on the basis of soussequenOther networks, elected on probability tround so so uniform load is shared to ensured and nodes it cannot between nodes it cannot the balancing y collisionsCCMdynamic sizing of clustersVery low flat, hierarchical and location based provide load to compared with leachVery low flat, hierarchical and location based routing is compared with leachMedium selection criterionMixture of flat, hierarchical and location based routing is compared with leachMedium selection criterionMixture of flat, hierarchical and location based routing is combined compared with leachMedium m distributedMedium m and location based routing is combined compared with leachMedium m and selection criterionMedium m and location based routing is combined ce is and and selectionMedium m and location based combined ce is achievedMedium and location based combined ce is achievedHEED••The random selection ofBetter conceptivity•Solve the sensing d sensing coverage and sensing bale••Poor energy efficiency markArea independen ce is achieved		cluster	cannot used	Low	cluster	ing	Ť	•	Use				
Image: Selected as selected as cluster       • CHs are elected on the basis of elected on the basis of subsequen probability tround so so uniform load is distribution load is distribution shared       • CCM       • Less energy consumption on compared with leach       • Chain head in subsequen probability criterion on compared with leach       • Chain head in subsequen probability trouged and is distribution load is distribution load is distribution shared       • CAmount of the compared with leach       • Chain head in subsequen probability criterion on compared with leach       • Compared with leach       • Chain head in subsequen probability criterion on compared with leach       • Medium Medium Medium Medium hierarchical and location based is combined compared with leach         • Leach uses TDMA so it balancing keeps CHs from unnecessa       • The random selection of selection of selection of selection of sensing convertage and selection of sensing convertage and selection of sensing hole       • Poor energy efficiency mark       Medium Medium hierarchical and location based is combined is combined is combined independen ce is achieved         HEED       • Fully       • The random selection of selection of selection of is connectivity       Better connectivity       and sensing hole       • Fully       • The random selection of selection		nead but	in large scale						dynamic				
cluster clusterelected on head in subsequenelected on the basis of subsequenelected on the basis of so uniform load is sharedCCMLess energy consumpti consumpti on on compared with leachChain head selection on consumpti criterionWery low Medium Medium Medium hierarchical and location based routing is combined• Leach uses TDMA so it keeps CHs from unnecessa TP Collisions• The random selection of• Chain head energy consumpti consumpti on consumpti consumpt		selected as	CHs are						sizing of				
head in subsequen t round sothe basis of probability t round soCCMLess• Chain head selection selectionVery flat, medium and location based routing is combinedload is shared between nodesdistribution shared t cannot be between t cannot betweendistribution sit cannot balancing- Less energy consumpti on compared with leach• Chain head selection on criterionVery flat, Medium Medium Medium hierarchical and location based routing is combined• Leach uses TDMA so it keeps CHs from unnecesa Try collisions• Deor energy balancing• Deor energy ensured with leach• Poor energy efficiency 		cluster	elected on						clusters				
subsequen t round soprobability so uniform load isprobability so uniform distributionon consumpti consumpti on compared with leachow criterionnitat, Medium hierarchical and location based routing is combinedbetween between nodesensured and it cannot betweenit cannot balancingIt cannot betweenIt cannot balancingIt cannot betweenIt cannot balancingIt cannot betweenIt cannot balancingIt cannot balancingArea independen ce is area with overlappeMedium balancing is not up to the markArea independen ce is achievedHEEDFully distributedThe random selection ofBetter connectivitysensing sensing sensingoverlappe and and sensingMedium markArea independen ce is achieved		head in	the basis of			ССМ		•	Less	•	Chain head	Very	Mixture of
t round soso uniformMediumMediumMediumMediumMediumMediumMediumMediumMediumMediumMediumMediumandload isdistributioncannot beensured andwith leachwith leachwith leachwith leachwith leachbasedrouting isbetweenensured andit cannottit cannottit cannottit cannotwith leachwith		subsequen	probability						energy		selection	IOW Modium	flat,
load is shareddistribution cannot be between 		t round so	so uniform						on		CITEMON	Medium	and
heter       Shared       Cannot be       ensured and       with leach       with leach       based       routing is         between       ensured and       it cannot       it		load is	distribution						compared			meanan	location
holdween       it cannot       it cannot       routing is combined         nodes       it cannot       it cannot       it cannot       routing is combined         • Leach uses       provide load       EEACH-       • Solve the       • Poor energy       Area         TDMA so it       balancing       balancing       VF       problem of area with       • Load       Medium       independen         from       unnecessa       ry       v       efficiency       Medium       achieved         ry       collisions       v       efficiency       medium       achieved         HEED       • Fully       • The random       Better       connectivity       and       independen         and       sensing       not up to the       sensing       independen         distributed       selection of       connectivity       bole       independen		snared	cannot be						with leach				based
Heach uses       provide load       provide load       Area         TDMA so it       balancing       VF       Solve the       Poor energy       Area         keeps CHs       from       VF       problem of       area with       Load       Medium       achieved         unnecessa       ry       collisions       Nedium       Better       coverage       mark       Medium       achieved         HEED       Fully       The random       Better       connectivity       balanci       and       Image: Sensing       and       Image: Sensing		nodes	it cannot										routing is
HEED       • Fully       • The random distributed       • Better connectivity       • Solve the problem of area with overlappe       • Poor energy efficiency       Medium independen independen independen independen independen independen independen independen independen area with overlappe       • Load       Medium area with overlappe       • Medium		Leach uses	provide load										combined
keeps CHs     from     vF     problem of     efficiency     Medium     independen       unnecessa     ry     collisions     v     v     v     v     v       HEED     Fully     The random     Better     connectivity     and     v     v     v       hole     balancing is     sensing     and     v     v     v     v		TDMA so it	balancing			LEACH	4-	•	Solve the	•	Poor energy		Area
from unnecessa ry collisions     • The random selection of     Better connectivity     • Load     Medium • Load     Coldinic Cers Medium balancing is not up to the coverage     Medium balancing is     Medium achieved		keeps CHs				VF			problem of		efficiency	Medium	independen
HEED     •     Fully     •     The random distributed     Better connectivity     and better     sensing     inclusion     inclusion		from							overlanne	•	LUdu balancing is	Medium	achieved
ry     ry     non-prime       collisions     collisions     coverage     mark       HEED     • Fully     • The random distributed     Better connectivity     and sensing		unnecessa							d sensing		not up to the	cului	donnered
HEED • Fully • The random Better connectivity bole		ry							coverage		mark		
distributed selection of connectivity hole	HEED	Eully	The random		Better				and				
hole		distributed	selection of		connee	tivity			sensing				
routing the cluster Medium of cluster his LACH		routing	the cluster	Medium	of clus	ter		_	hole				
scheme heads, may Medium heads • In LEACH-		scheme	heads, may	Medium	heads			•	IN LEACH-				
Requires cause higher Low nodes can		Requires	cause higher	Low					vr suille nodes can				
only local communicati be moved		only local	communicati						be moved				
communic on overhead. to		communic	on overhead.						to				
ation   I he periodic  coverage		ation	Ine periodic						coverage				
Achieves     Cluster field     inside the		<ul> <li>Achieves</li> <li>load</li> </ul>	rotation or						inside the				
balancing election cluster are		balancing	election						cluster are				

Ucs

### © 2019 JETIR February 2019, Volume 6, Issue 2

## www.jetir.org (ISSN-2349-5162)

TEEN	•	Data	Whenever	Very	Hierarchical				formation		varying		
		transmissi	thresholds	High	routing			•	Decrease		topologies		
		on can be	are not meet	Good	protocol				number of				
		controlled	, the node	High	that is used				data				
		by varying	will not	0	to minimize				transmissi				
		two	communicat		energy				on				
		thresholds	е		consumption	;		•	Energy	•	Unbalanced	Low	It is
	•	Well	Data may be		n of				consumpti		energy	Very bad	network
		suited for	lost if CHs		clustering				on is		consumption	Medium	coding
		time	are not able		algorithm				reduced	•	Large delay		based
		critical	to		Ū			•	Reduced	-	due to long		protocol for
		application	communicat					•	data flow		chain		energy
		5	e with each						from BS in		chain		efficiency
		0	other										emolency
PΔNFI	•	Panel is	Clusters are	Medium	This is TSC		-			-	Nodo	Modium	Modularity
174422	•	energy	predetermin	Good	efficient			•	roducos	•	distribution	Modium	is provided
		efficient	ed	High	node				rodundant		ic	Medium	by dividing
		that	To determine		selection				data		unbalancod	wiediam	the network
		ensure	geographic		algorithm				transmissi		unbalanceu		into
		load	position		for handling	,			on in				concentric
		halancing	information		cluster	·			network				circles
		and long	special						hy				hence
		network	conditions						breaking				hetter
		lifetime	are needed						long chains				energy
	•	Sunnorts	which is not						into				consumptio
	•	asynchron	always						smaller				n is
			available						chains				achieved
		application	available		DE	c			Dunamia in		Complayin	High	Bottor ac
		c				i.C	-		Dynamic in	•	Complex in	High	Better as
GAE			Largo traffic injection		It is a				nature		nature	High	to
GAF	•	GAF	and dolay is not	Modium	location				Better	•	Lifetime can	High	to LEECH
		Increase	and delay is not	Medium	based least				than Leach		be further		
		ne	predictable	Medium	Dased least				in terms of		Improved		
		lifetime by		weulum	concurrentia				energy				
		infetime by			consumptio				consumpti				
		saving			in protocor		_		on				-
	-	Douting			SEP			•	It is better	•	More	Medium	Energy
	•	Routing							in terms of		complex as	High	consumptio
		fidelity is							packet		compared to	Low	n is less as
		maintaine							drop ratio		leach		compared
<b>TTO 0</b>		a											to previous
TTDD	•	Resolve	Large latency	Very low	It is a two								algorithm
		the	Low energy	Good	tier energing	SCC		•	Priority	•	Energy	High	Priority is
		numerous	efficiency	LOW	consumptio				based data		consumption	Low	assigned
		mobile	TTDD require		n				transforma		is high	Low	but
		sinks and	sensor nodes		minimizatio				tion				starvation
		moving	tobe		n protocol			•	Packet				problem
		problem of	stationary						drop ratio				can be
		SINK IN	and location						is low				present
		large scale	aware		TDE	EC		•	Modified	•	Slotting is	Low	DEEC with
		W SINS							DEEC		used hence it	Low	time
	•	Suitable to							Clustering		is more	High	division is
		event							protocol		complex		considered
		aetecting							provides				hence
		VV SINS							better				overall
		annong							performan				operation is
		data traffic							ce in terms				faster
SI CC					Itic				ot energy				
SLGC	•	Lower	Large	Mad	IT IS				consumpti				
		energy	overhead	Nealum	aistributed				on then				
		consumpti	aue to	Medium	enicient				DEEC				
		on in SGLC	complex data	weatum	energy		Tab		omnorico	n of Tor	hainwas of C	Justoring	usad
		compared	communicati		consumptio		Idu	ne I. C	ompariso	norrec	iniques of C	lustering	useu
		to LEACH	on		n and		wit	hin WS	N				
					uistribution								
250.401		_			protocol.		Fro	m com	narison ta	hlo it is	concluded th	hat techni	
PEGASI	•	Energy	Long delays	1.000	Load		.10						4403
2		load is distributed	cause a node to become	Low Medium	balancing is		associated with clustering algorithm within WSN						
					nandled	roquiros considerable improvement in terms of							
		unitormly	bottleneck	нıgh	efficiently in	1	requires considerable improvement in terms of						
	•	Reduce	Network is		this	energy conservation and packet drop ratio. Distance							
		overhead	not very		protocol as		handling among WSN is critical for this purpose.						
		due to	scalable		compared								
		dynamic	Not suitable		TO LEACH			_					
		cluster	for time					5. CC	ONCLUSIO	N AND	FUTURE SCO	PE	

This paper present comprehensive survey of techniques used within WSN to achieve increase in lifetime of sensor within WSN. Enhancement in lifetime involves mechanism such as sleep and wake up protocol but has demerits associated with it. The idle nodes are made to sleep but topology breakage is the result. In order to restore the nodes to their initial state sufficient energy is required leading to loss of packets. From analysis of existing techniques it is identified that there exist a trade off between energy and packet drop ratio.

In future this tradeoff between energy and packet drop ratio is to be eliminated by considering distance between nodes before selection of cluster head. Use of priority queue can also be merged within existing approach for enhancing performance of WSN.

- 6. REFERENCES
- A. Kaur and H. Kaur, "A REVIEW ON A HYBRID APPROACH USING MOBILE SINK AND FUZZY LOGIC FOR REGION BASED CLUSTERING IN WSN," vol. 16, no. 2, pp. 7586–7590, 2017.
- [2] M. A. Perillo and W. B. Heinzelman, "Wireless Sensor Network Protocols."
- [3] B. Krishnamachari and A. Networks, "An Introduction to," no. January, pp. 1–101, 2005.
- F. Awad, E. Taqieddin, and A. Seyam, "Energy-Efficient and Coverage-Aware Clustering in Wireless Sensor Networks," vol. 2012, no. July, pp. 142–151, 2012.
- [5] T. Of, "A C OMPARATIVE S TUDY OF C LUSTERHEAD S ELECTION A LGORITHMS IN W IRELESS S ENSOR," vol. 2, no. 4, pp. 153–164, 2011.
- K. Maraiya, "Efficient Cluster Head Selection Scheme for Data Aggregation in Wireless Sensor Network," vol. 23, no. 9, pp. 10–18, 2011.
- S. Mahajan, "An energy balanced QoS based cluster head selection strategy for WSN," *Egypt. Informatics J.*, vol. 15, no. 3, pp. 189– 199, 2014.
- [8] Q. Nadeem, "A New Energy Efficient Protocol for Wireless Body Area Networks," 2013.
- T. Shah, N. Javaid, and T. N. Qureshi, "Energy Efficient Sleep Awake Aware (EESAA) Intelligent Sensor Network Routing Protocol," pp. 1–6.

- B. Elbhiri, S. Rachid, S. El Fkihi, and D.
   Aboutajdine, "Developed Distributed Energy-Efficient Clustering (DDEEC) for heterogeneous wireless sensor networks," 2010 5th Int. Symp. I/V Commun. Mob. Networks, ISIVC 2010, pp. 1–4, 2010.
- S. A. Weil, S. A. Brandt, and E. L. Miller,
   "CRUSH: Controlled, Scalable, Decentralized
   Placement of Replicated Data," SC 2006 Conf.
   Proc. ACM/IEEE, vol. 1, no. November, p. 31,
   2006.
- [12] J. Robinson and E. W. Knightly, "A Performance Study of Deployment Factors in Wireless Mesh Networks," IEEE INFOCOM 2007 - 26th IEEE Int. Conf. Comput. Commun., pp. 2054–2062, 2007.
- [13] P. Saini and A. K. Sharma, "E-DEEC Enhanced distributed energy efficient clustering scheme for heterogeneous WSN," 2010 1st Int. Conf. Parallel, Distrib. Grid Comput. PDGC - 2010, pp. 205–210, 2010.
- [14] L. Landge and C. Science, "AC," vol. 2, no. 9, 2014.
- [15] A. Preethi, E. Pravin, and D. Sangeetha,
   "Modified balanced energy efficient network integrated super heterogeneous protocol,"
   2016 Int. Conf. Recent Trends Inf. Technol. ICRTIT 2016, 2016.
- [16] H. Chaouchi and J. Marie, "Wireless sensor networks : a survey on recent developments and potential synergies."
- [17] S. Hasan, Z. Hussain, and R. K. Singh, "A Survey of Wireless Sensor Network," vol. 3, no. 3, pp. 1–6, 2013.
- [18] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "Wireless sensor networks : a survey," vol. 38, pp. 393–422, 2002.
- [19] S. Kumar, "DE-LEACH : Distance and Energy Aware LEACH," vol. 88, no. 9, pp. 36–42, 2014.
- [20] M. Liu, J. Cao, G. Chen, and X. Wang, "An Energy-Aware Routing Protocol in Wireless Sensor Networks," pp. 445–462, 2009.
- [21] M. Prajapat and N. C. Barwar, "Performance Analysis of Energy Dissipation in WSNs Using Multi-Chain PEGASIS," vol. 5, no. 6, pp. 8033– 8036, 2014.
- [22] W. R. Heinzelman, A. Chandrakasan, and H. Balakrishnan, "Energy-Efficient Communication Protocol for Wireless

Microsensor Networks P & SeQVUfRgX G5C7CSTQVUWRYXE  $\sim$  G587 9 i x£¥ i § STQaXcbd G587A9 G587hSeQVUfRgXI  $\sim$  i x£¥ i B ¦ pi Qqbr 6i Q i R & G @ 7 e S QaXI  $\sim$  F G @ 7A9 i x£¥ i B ¦ sSeQaX G @ 7 STQaXI  $\sim$  F 6 i x£¥ i § ¦ i Q," 2000.

- [23] R. Kumar, "Evaluating the Performance of DEEC Variants," vol. 97, no. 7, pp. 9–16, 2014.
- [24] M. A. Jan, P. Nanda, X. He, and R. P. Liu,
   "PASCCC: Priority-based application-specific congestion control clustering protocol,"
   *Comput. Networks*, vol. 74, no. PB, pp. 92–102, 2014.
- [25] Q. Nadeem, M. B. Rasheed, N. Javaid, Z. A. Khan, Y. Maqsood, and A. Din, "Multi-Hop Routing Protocol for WSNs."
- [26] E. Cheikh, C. Saad, B. Mostafa, and H.
   Abderrahmane, "Energy Efficient Enhancement of TDEEC Wireless Sensors Network Protocol Based on Passive RFID Implementation," vol. 3, no. 5, pp. 6647–6653, 2014.