# Energy Efficient Error Control Technique Based on Clustering for Wireless Sensor Networks

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***Abstract***— Remote sensor systems (WSNs) may have a few quantities of consistent or diverse sorts of sensors which can gather dependable and exact data in various and shaky situations. Remote Sensor Networks are for the most part thought to be vitality impartial on the grounds that sensor hubs work with little limit DC source or might be put to such an extent that substitution of its vitality source is unrealistic. Most usually battery is utilized to supply power to all the introduced hubs, so it's imperative to way the hubs to effectively use its energy. A fundamental remote sensor organize requires almost no framework. In one such system, hubs can be put in a specially appointed manner. Be that as it may, the sensor organizes presented on get information from the earth may require an expansive number of bits, contingent upon the territory to be secured. Because of substantial quantities of bits, the administration of system winds up plainly troublesome, and complex structure is required.

***Keywords****—Sensor nodes. WSN, LEACH, Clustering, Error Model*

## I. INTRODUCTION

In the previous years, remote sensor systems have increased expanding consideration from both the exploration group and real clients. Remote Sensor Networks are utilized as a part of assortment of fields which incorporates ecological, human services, military, organic and other business applications. The basic angles to face concern "how to diminish the vitality utilization of hubs" and sensor hubs are for the most part battery-controlled gadgets so that the system lifetime can be stretched out to sensible circumstances. In any case, we led that initially separate the vitality utilization for the segments of a run of the mill sensor hub i.e. talk of the principle headings to vitality protection in WSNs. Also, we are introducing the error using Pragmatic general multicast (PGM) into the network to check how efficiently it'll utilize the energy and achieve the Quality of service. And we are comparing our final results with the existing model (LEACH) by proving our proposed model will give the better performance by utilizing the energy efficiently.

## II. RELATED WORKS

LEACH & LEACH-C: Energy is a paramount issue for wireless sensor networks because in many situations battery recharging or replenishment is not possible. Many solutions have been provided for energy conservation. Clustering protocols have been successful for solving this issue to an extent but are not perfect. In the proposed algorithm they utilize the ability of the sensor nodes to control their transmission power range. By utilizing this ability we are able to minimize their intra cluster energy. Although this is local energy saving but this leads us to minimization of overall network energy consumption. The other thing that can be considered is about the task of a cluster head in clustering algorithms where cluster-head is doing the task as transmitter and receiver simultaneously. Providing these tasks to a single node is not efficient. So introducing the notion of a special node called s-node where this s-node is working as a transmitter for a cluster and sending the aggregated data to the sink. Simulated the proposed scheme with LEACH and LEACH-C protocol and simulation results show that the proposed scheme is better in terms of network life time than both protocols.

ANALYSIS OF LEACH PROTOCOL IN WSN: Wireless Sensor Network is a network of sensor nodes without having any central controller. Its growth is expeditiously increasing and that's why there is an immense field for research in this area. Sensors depend entirely on the trust of their battery for power, which cannot be revitalized or substituted. So the design of energy aware protocol is essential in respect to enhance the network lifetime. LEACH is energy-efficient hierarchical based protocol that balances the energy expense, saves the node energy and hence prolongs the lifetime of the network. So this survey presents a detailed review and analysis of LEACH protocol. Comparison of various network parameters is done in the form of tables and graphs. The simulation work has been carried out by using own set of parameters.

P-LEACH: Reducing the energy consumption of available resources is still a problem to be solved in Wireless Sensor Networks (WSNs). Many types of existing routing protocols are developed to save power consumption. In these protocols, cluster-based routing protocols are found to be more energy efficient. A cluster head is selected to aggregate the data received from root nodes and forwards these data to the base station in cluster-based routing. The selection of cluster heads should be efficient to save energy. In P-LEACH protocol, dynamic clustering for the efficient selection of cluster heads has been used. The routing protocol works efficiently in large as well as small areas. For an optimal number of cluster head selection, it divided a large sensor field into rectangular clusters. Then these rectangular clusters are further grouped into zones for efficient communication between cluster heads and a base station. It performed NS2 simulations to observe the network stability, throughput, energy consumption, network lifetime and the number of cluster heads. In P-LEACH routing protocol out-performs in large areas in comparison with the LEACH, I-LEACH. It has been done in P-LEACH, which residual energy and distance of node from BS are used as parameters for CH selection. To save energy, start the steady state operation of a node only if the value sensed by a node is greater than the set threshold value. The threshold value will be set by the end user at the application layer. P-LEACH is then qualitatively and quantitatively analysed. It has been done that the P-LEACH in terms of network lifetime and took less energy consumed when the amount of data to transfer to BS. If maximum number of nodes is alive with time, shows the network lifetime. In P-LEACH, 90 nodes are alive for 50 sec. If maximum numbers of nodes are alive for long time, the network life time increased. It has been found that first node dies at 35 round and half of the node alive =250, last node dies at 1000, network settling time =1.9 sec and protocol overhead (bytes) =16. The result is that the network settling time is increased due to the maximum number of nodes alive and low energy consumption.

## III. PROPOSED MODEL

The proposed technique brings Error Model into the system in light of the fact that ns2 is an occasion driven recreation. At the point when mistake is presented, this diminishes the quality of the channel. Along these lines, prompts bundle misfortune in the decoder, for correction we utilize mean flag to clamour proportion to figure got and sent parcels Error display re-enacts connect level blunders or misfortune by either denoting the bundle's mistake banner or dumping the parcel to a drop target. In recreations, mistakes can be produced from a basic model, for example, the parcel blunder rate, or from more entangled factual and observational models. To bolster a wide assortment of models, the unit of blunder can be determined in term of parcel, bits, or time-based.

Blunder Model is the proposed display into this framework which advises about how to redress the mistakes in a system amid the correspondence procedure utilizing SINR. This Error model is presented utilizing blunder capacity and mistake code written in c++, Pragmatic General Multicast (PGM). Blunder Model is brought into the system it can't be acquainted with a specific group in light of the fact that ns2 is an occasion driven reproduction. At the point when blunder is presented, this lessens the quality of the channel which prompts bundle misfortune in the decoder, for amendment of this mistake we utilize mean flag to clamour proportion to figure got and sent parcels.

Mistake display reproduces connect level blunders or misfortune by either denoting the parcel's mistake banner or dumping the bundle to a drop target. In reproductions, mistakes can be produced from a basic model, for example, the bundle blunder rate, or from more muddled factual and observational models. To bolster a wide assortment of models, the unit of mistake can be indicated in term of parcel, bits, or time-based.

Mistake model is a model which presents the parcel misfortunes or bundle drop into a reproduction. The unit of blunder can be determined in term of parcel, bits, or time-based. Blunder model is presented utilizing mistake capacity and blunder code written in C++. After mistake presentation, this decreases the quality of the channel. In this way, prompts bundle misfortune in the system. This can be redressed by changing the equipment prerequisites in reception apparatus by utilizing SINR (Signal to Noise Ratio) flag to-clamour proportion, frequently composed as S/N or SNR, is a measure of flag quality in respect to foundation commotion. The proportion is normally measured in decibels (dB) utilizing a flag to-clamour proportion equation. On the off chance that the approaching sign quality in microvolts is Vs, and the clamour level, likewise in microvolts, is Vn, then the flag to-commotion proportion, S/N, in decibels is given by the equation: $S/N = 20 \log10(Vs/Vn)$

The simple function to introduce error in the packet is given below:

```
#create a loss_module and set its packet error rate to 1 percent
Set loss_module [new ErrorModel]
 \$loss_module set rate_0.01
```

In this model, consider a remote sensor arrange region where in which we can send sensors hubs by utilizing a hub organization calculation. Subsequent to sending the hubs into the system make a directing table by utilizing neighbourhood calculation. In view of the transmission go group development happens. In a specific bunch, group head(CH) ought to be chosen in view of the high leftover vitality utilizing a grouping calculation. Grouping calculations is a vitality productive approach for asset imperative remote sensor systems.

Verifiably, in the plan of group bunching calculations assume sorted out, roundabout or particular disseminations of sensor hubs, while exhibiting a steering, limitation and vitality lessening conventions. In the end, such hub dispersions can be recognized as basic Gaussian and Cluster head (CH), these CH's are situated at the mean separation from each sensor which doesn't prompts any trouble. Be that as it may, fundamentally the vast majority of the circumstances sent hubs in the detecting territory are irregular and noncircular in nature. Gathering of hubs into reasonable bunches with Cluster Heads(CHs) arranged at the mean separation from each hub which comes about with insignificant correspondence vitality for sensors is a requesting issue in Wireless Sensor Network.

Bunch head employment is to convey between the hub and the sink in a specific system, CH will gather the information from the hubs and before sending those information to the sink information accumulation happens, CH will go about as both transmitter and recipient. Bunching has two sorts of correspondence called Intra Clustering Communication and Inter Clustering Communication.

**Intra Clustering Communication**: Communication within the cluster known as Intra Clustering Communication and there is no node-node communication happens in this clustering.

**Inter Clustering Communication**: Communication outside the cluster known as Inter Clustering Communication.

**Residual Energy is calculated using the below formula**:

**RE=IE-CE**

RE= Residual Energy
IE= Initial Energy
CE= Consumed Energy

In the wake of bunching correspondence happens by directing it to the sink from the source by modifying the transmission go. In the proposed framework mistake models are additionally sent to the total system by utilizing PGM which has clarified before. While deciphering the information those conveyed blunders are redressed utilizing SINR. By this we can expect that the vitality devoured is reasonable and furthermore Qos is accomplished which is then contrast and the current model.

**Vitality Model**: Energy Model, as executed in, is a hub property. The vitality display speaks to level of vitality in a versatile host. The vitality demonstrate in a hub has an underlying quality which is the level of vitality the hub has toward the start of the reproduction. This is known as initialEnergy_. It likewise has a given vitality use for each bundle it transmits and gets. These are called txPower and rxPower_.

The vitality show just keeps up the aggregate vitality and does not keep up radio states. It is sufficiently bland for future recreations, for example, the CPU control utilization. If you don't mind take note of that the old vitality show without a doubt keeps up some radio states, and have a few techniques to control them, and they are just utilized by the versatile devotion module. This approach may bring about irregularity with remote phy. To keep versatile devotion work, we didn't expel it from the vitality show, yet it is out of date, and ought not be utilized further. Presently all entrance to the vitality model ought to experience remote phy. The energy model is used through the node-config API. An example is shown as follows:

```
$ns_ node-config -adhocRouting DumbAgent \
    -llType $opt(ll) \
    -macType Mac/SMAC \
    -ifqType $opt(ifq) \
    -ifqLen $opt(ifqlen) \
    -antType $opt(ant) \
    -propType $opt(prop) \
    -phyType $opt(netif) \
    -channelType $opt(chan) \
    -topoInstance $topo_ \
    -agentTrace ON \
    -routerTrace ON \
    -macTrace ON \
    -energyModel $opt(energymodel) \
    -idlePower 1.0 \
    -rxPower 1.0 \
    -txPower 2.0 \
    -sleepPower 0.001 \
    -transitionPower 0.2 \
    -transitionTime 0.005 \
    -initialEnergy $opt(initialenergy)
```

The following parameters are newly added

-sleepPower: power consumption (Watt) in sleep state
-transitionPower: power consumption (Watt) in state transition from sleep to idle (active).
-transitionTime: time (second) used in state transition from sleep to idle (active).

## IV. RESULT ANALYSIS

The below graphs show the comparisons between the LEACH and error model (which is the proposed one) here the energy, throughput, overhead, end-end delay and packet delivery ratio parameters have been compared. And finally, the compared parameters prove that the proposed model shows the better performance compared to existing one.

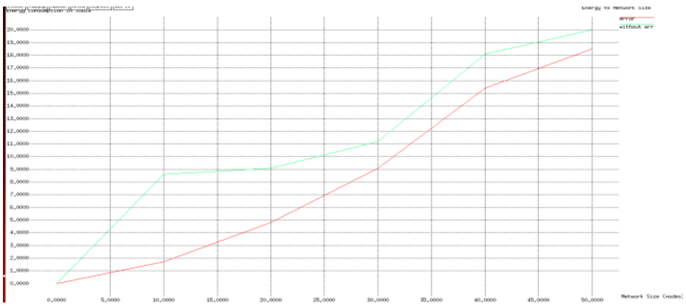

Fig 1: Energy graph compared between LEACH and Error Model

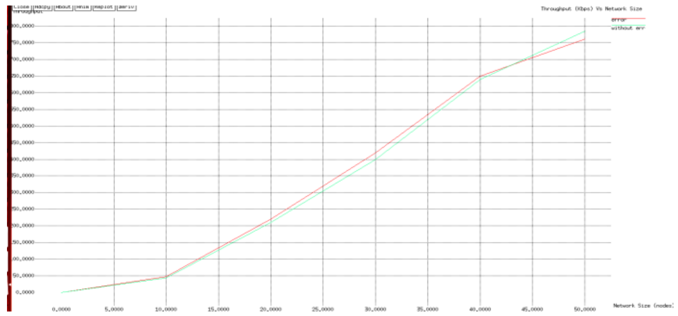

Fig 2: Throughput graph compared between LEACH and Error Model

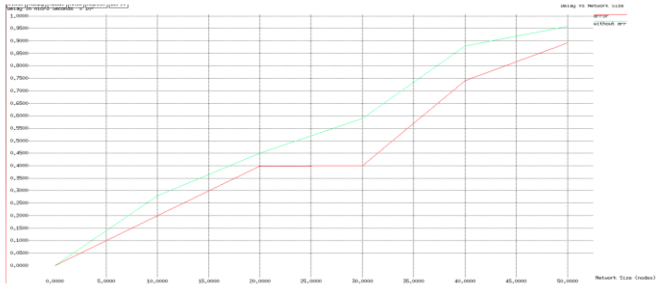

Fig 3: End-End Delay graph compared between LEACH and Error Model

## CONCLUSION

The proposed framework gets Error Model into the framework in light of the fact that ns2 is an event driven diversion. At the point when blunder is given into the framework, this exhausts the quality of the channel. Subsequently, bundle misfortune is knowledgeable about the decoder while interpreting the information, with the end goal of this mistake amendment we utilize mean flag to commotion proportion as a blunder rectifier. To assess the acknowledged and passed bundles Error show emulate the presence of connection level mistakes or drop by either mirroring the parcel's blunder banner or dumping the parcel to a drop target. At long last system parameters are contrasted and the current one by delivering the better execution of the proposed framework.

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