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RESEARCH ARTICLE

COMPARATIVE ANALYSIS OF GSTEB PROTOCOL FOR WSNs

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Abstract- ***The quick escalations in network multimedia devices have permitted extra concurrent digital services: video conferencing, online playoffs as well as remote learning to nurture for conform e-net jobs. WSNs have become major area of research in computational theory due to its wide-ranging applications. But due to limited battery power the energy expenditure has become key drawback of WSNs protocols. Although several protocols has been proposed so far to improve the energy efficiency more however still a lot enhancement can be done. GSTEB has shown fairly significant results over the on hand WSN protocols. The general purpose of this work is to find the problems of the former techniques for WSNs. At the end of this paper appropriate future guidelines are given to further improve this work.***

Keywords- WSNs, energy, GSTEB, clustering, Protocols.

I. INTRODUCTION

Wireless sensor network is a network capable of wireless communication usually includes spatially distributed thousands or millions of autonomous sensors nodes having micro progression ability and restricted authority, which are arbitrarily and broadly set. These small nodes arrange in a little to hundreds vary from refined metropolitan areas to tremendously unfriendly, isolated regions. These nodes cooperate with each other to be able to deal with the environment in which:

- sensors work absolutely wireless,
- on impulse can create an extemporized network,
- bring together all the network (self-configuring),
- vigorously adjust with device collapse and ruin (self-healing),
- each node sense and then process the data,
- And respond to alteration in task and network prerequisite.

Below Fig.1 shows the basic architecture of wireless sensor network. Transmissions of data is one of the most vital purpose of WSN, it's liable for transmit sensed information of original nodes to sink nodes.

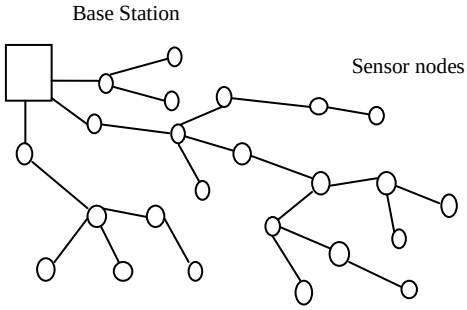

Fig. 1 Basic architecture of WSN

Applications- Wireless Sensor Networks (WSN) becoming trendy these days in many regions:

- armed surveillance,
- ecological relevance,
- forest fire detection,
- operating indoors for intrusion detection,
- health monitoring and so on,

Sensor nodes in WSN sense any substantial, automatic or compound change in the environment and then send it to the sink. The fundamental intention of a WSN is to gather the measurement of physical values (e.g., barometric pressure, temperature, vibrations, positioning, animal position, a patient's vital health signs, etc.), aggregate this information and transmit it to a base station (a.k.a. the *sink*) for further analysis. Wireless sensor network systems have been broadly accepted for monitoring substantial or environmental properties over a large area, such WSNs for volcano monitoring, habitat monitoring and permafrost monitoring.

Imperative issues in sensor networks are as follows:

- The most imperative concern in wireless sensor networks (WSNs) is which way should be used to collect information in proficient manner among slightest of power expenditure.
- Low energy cost.
- Accuracy of information

Sensor nodes are power-driven through battery that is unfeasible to revitalize after expenditure. Since routing eat up so much of power, an proficient routing plan in sensor networks is important as well (LEACH). To extend the lifetime of WSNs, energy supervision under given recital necessities becomes the chief facet in the system. As it is able of achieving unchanged interaction between individual and computer, it is believed that WSN are the key of synthetic brainpower.

II. DATA AGGREGATION

Data aggregation is as a necessary standard for wireless route selection in sensor networks. The initiative is to merge the data impending from unlike resources, remove superfluously, diminish the numerous broadcastings and hence keep the power. Data aggregation merge dissimilar data from unlike nodes by the functions like min (), max (), average (), and containment. As the network power mostly scatters on data broadcast, the power keeping algorithm has to lessen the quantity of spread data. D*ata aggregation* is one of the effectual power keeping system that merges the data gathered via the unlike sensors by passing through a filter in which the superfluous data could lessen the quantity of spread data. In other words, data aggregation is able to improve the data exactness of network. Following are the several data aggregation techniques.

A. SDAOC

For WSNs, highly Secured Data Aggregation method using tree structured Orthogonal Codes (SDAOC). With tree based data aggregation shown in fig. 2, the imitation is completed in a situation among evenly supply of nodes. According to Walsh

Hadamards [1] algorithm, to make twenty chip codes, selects the least power of 2. Remind that this digit ought to be larger than twenty. Hence produces 32 bit chip code, each one of them has 32 bits, except barely 20 bits of those bits are utilized. This standardized and homogenous arrangement inflicts a reduced amount of intricacy in scheming sensor networks. Consequently, the surroundings find extra anxious the projected process have further rewards than any other processes. The nodes and the broadcasting ends that can be generated among the diverse sensor nodes then the graphs made by sensors and their relationship with graph cost of the edge signify the detachment among the nodes. When graph crafting is done among the nodes, create a straddling tree above the graph. The motive behind by means of LEACH to craft the aggregator tree is to poise the power utilization in WSN. As LEACH pseudo-code selects the identical amount of the nodes as *CH*, each *CH* assign the similar chip code towards their child nodes at that time the chip codes will be stable at each pace of the imitation.

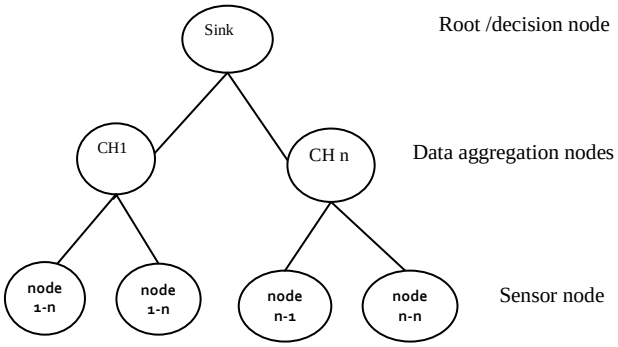

Fig. 2 Tree structure based on data aggregation

B. GSTEB

General Self-Organized Tree-based Energy Balance routing protocol (GSTEB) shown in fig. 3 where network gathers information from time to time since a territory where every node frequently senses the location and throws the data return to Base station . The major goal of GSTE B is to attain a longer network lifetime for dissimilar applications. The simulation results show that when the data collected by sensor nodes is intensely correlative, GSTEB can modify the root and recreate the routing tree with little delay and small energy utilization. Thus a better balanced load is attained compared with the protocols such as LEACH, HEED, PEGASIS, PEDAP, TBC. Because GSTEB is a self-organized protocol, it only consumes a little extent of energy in every round to change the topography for balancing the energy consumption. Entirely, leaf nodes can transmit data in the same TDMA time slot due to the short transmitting delay. GSTEB protract the lifetime by 100% to 300% [2] compared with PEGASIS. In some cases, the duration of the final node in the network is extra interested. A little minor transformation are made to build the performance of GSTEB similar with the purpose of PEDAP.

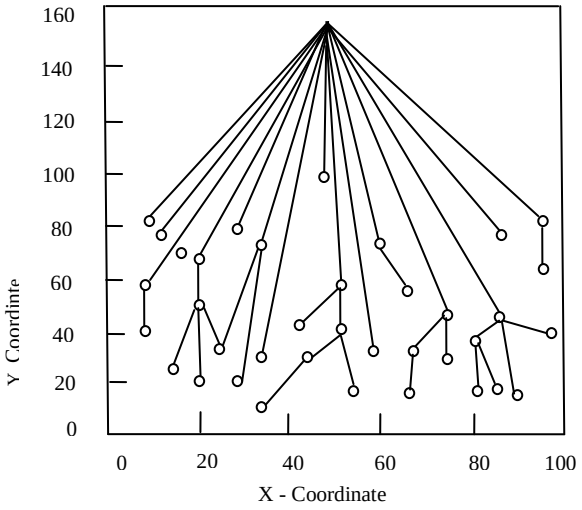

Fig. 3 GSTEB Working

So GSTEB is approximately the best result in Case1. As the data composed by sensors cannot be amalgamated, GSTEB presents one more easily way to balancing the network consignment. In actuality, it is not easy to distribute the load uniformly on all nodes in such a case. However GSTEB needs base station to calculate the topography that increases in energy waste as well as longer delay and are acceptable when compared among the energy consumption and the time delay for data transmitting. Simulation results show that GSTEB extend the network lifetime more than 100% compared with HEED.

C. GDSDA

In wireless sensor networks, cluster based data aggregation technique uses extra energy and the protected data transmissions are imperative in favor of augmenting the data validation and privacy. To avoid these problems**,** Genetically Derived Secure cluster based Data Aggregation **(**GDSDA) has been proposed in WSN. Genetic algorithm, an adaptive procedure which facilitates in deciphers study and an optimization trouble match to Gas (Genetic algorithm). Primarily, the selection of the CHs are depends upon the node connectivity that perform as a DAG (data aggregator). After this, clustering procedure is performed by means of the inherited algorithm. This procedure extremely lessens power expenditure and in that way augmenting the network duration. While the cluster component wishes to broadcast data to whom aggregate the data, a data encryption procedure, power proficient encryption technique, is used. The key to encryption plan differ like a operation of remaining power of the nodes, thus avoiding the rekeying necessities. This method needs every cluster component and data packet to lay up some information within cache that involves recent implicit power and node ID. [3] The Cyma (crypto module) utilized presents privacy to the DP, thus guarantees the genuineness and reliability of the sensed data. The imitation fallouts based on rates and nodes, shown that the projected method diminishes the power utilizations, guarantees information protection as well as decreases the broadcast operating cost.

D. ADCP

Approximate Data Collection in sensor network using Probabilistic models (ADCP). The ideas of database query processing can play a vital job in sensor networks. Though, the early adopters of sensor net query engines illustrates that the classic consignment are not fine supply by the power finest developed in the initial stage of study. Then a robust estimated technique called Ken [4] has been proposed that uses imitation active probabilistic models to diminish communication from sensor nodes to the sink of the network's PC, is based on a kind of firmness using imitation active probabilistic models. The elementary proposal of Ken is easy: both *source* and *sink* preserve an active probabilistic model of how data progress, and models is all the time set aside in sync. The model predicts the data value(s) and the *sink* uses these data values as the estimation to the factual data and the *source* knows the expected value that satisfy the required bounded-loss approximation guarantees by desirable quality of running a replica of the model by commune a little necessary information to the user [4] . This preserves a couple of active probabilistic models over the sensor network characteristic having one replica dispersed in the sensor network and the other at a PC. Generally, this is a prosperous region for database investigation, and is primarily appropriate to sensor networks.
The striking facet of the Ken architecture is: it logically has a room for purpose which stands on incident coverage or variance recognition; this involves ignition-vigilant-reply also automobile trailing.

E. EERDAT

Energy Efficient Reliable Data Aggregation technique (EERDAT) has been provided which considered together power and trustworthiness. Primarily, the network is the group of cluster. Cluster with three sensor nodes is assumed in this technique. The coordinator node, say CN, throws a request to the cluster nodes. The price of the sensor nodes namely I, II, and III thrown reverse to the CN. The node has greater coordinator node would be the Cluster head. At this point the node I have 7 as CV value, selected as the CH while CN throws this information to further clusters. Every cluster chooses CN arbitrarily in the network that is nearer towards the cluster and examines the functioning of the sensor nodes and instructions them for explicit function. Inside each cluster, the selection of the CH is depends on the costs. The nodes keep up a neighbor information table (NIT) containing Node id, Distance and expenditure. Grounded on the thrashing ratio, the size of the cluster can be customized and the onward node calculates every node is able to be rise or fall. Formerly modified cluster size, again, the CN collects the information from the CH reduces it and then throw it in the direction of the base station. Power is compact efficiently and dependability keep up while the cluster size is changed depends on the loss ratio and method is proficient in power utilization

and trustworthiness. Also, compared the new protocol with Low Energy Adaptive Clustering Hierarchy (LEACH) using NS-2 [5], calculate the code of behavior, and the simulation results shown that EERDAT do better than the LEACH.

F. NEEMRP

Novel Energy Efficient Multi-path Routing Protocol (NEEMRP) in WSNs has been discovered several pathway among elevated power competence. Two major benefits can be: one, as the broadcasting load is impartial with several pathways, the e node power is blazed extra impartially. Two, several pathway offers superfluous broadcast, which amplify the trustworthiness of release. This protocol is made up of three segments: building double routing trees, route detection and data broadcasting. First segment create two trees; *query tree*: fixed at base node and *search tree:* fixed at source node and the procedure of *search tree* building is akin to *query tree* apart from that *query is* surrogated by *search*. Source nodes transmit the *search messages* at the same flash when sink node broadcasts the *query messages*. The building of both trees initiates and finish at the identical time. In route discovery segment, the *find message* is send hop by hop by the side of the overturn way of *search message* broadcast. In *Data broadcasting segment, after* source node has together sensing data, it sends the data among several pathway exposed in the route detection segment to base node. Arithmetical study [6] and imitation consequences shown the far superior presentation, network lifetime by means of this protocol is much longer than that of the existing ones.

G. DAWN

This technique shows how to best plan the (compiled) packet routing and travel group of portable base station to bring together data in wireless sensor networks to capitalize on the network duration. For this, an arrangement policy is given for the immobile sensor network; propose numeral movement policies for portable sinks to lessen the power utilization along with dissimilar data gathering necessities. The information from all the sensors wishes to be gathered at each instant of time, and then sent to the base station. Here, data compilation involves determines a likely most favorable permissible stream network and Interference-free Link Scheduling. The data assembling arrangement given by DAWN (Data Aggregation in WSNs with mobile sink) algorithms compared with that acquired from a chain based hierarchical protocol. In each experiment, the network lifetime *is measured.* To guess the eminence of estimation, calculate OPT [7] for these data gathering problems. The time-span underneath the arrangement of DAWN is for all time notably superior to Random Waypoint arrangement. Examine the relationship among the system duration and dissimilar constraints in network scheduling.

H. LEAP

Localized Energy Aware Prediction for data collection (LEAP) in WSNs is described towards the energy-aware data aggregation. Cluster head maintains the agent data values for very sensor nodes. LEAP is clustering based where sensor nodes form clusters and CH bring together and preserve data values, and prophecy-based where energy awake prophecy is used to determine the slight tradeoff among the communication and prophecy cost. Local Prediction Models and Algorithms involves considering a cluster of awaken or sleeping sensor nodes. In case of inactive nodes, the prophecy complexity is compact to approximation data provision stricture via the past data. But if they are awake, they constantly observe feature and produce a data value at each period of time. Energy-Efficient Algorithm Selection described that exclusive of local prophecy ability at the CH, a sensor node knows how to throw whole data to the CH, which will approximate data allocation accordingly. With local prophecy, a node can careful choose and send the data values to the CH. [8] If the pseudo-code selects "without local prediction", it purely broadcasts the data values and if it gives the local prophecy, the cluster member will accomplish prophecy upon every data value.

I. NPDAS

Lofty communication prices because of pointless data-traffic in the network for the duration of data transmissions and the utilization of costly methods to modify sensor data. To defeat these two limitations of the Cluster-based Private Data Aggregation (CPDA) and Slice-Mix-AggRegaTe (SMART) techniques [9].a new private data aggregation scheme (NPDAS) has been projected for responsive data from WSNs. This plan makes use of additive goods of complex numbers -an algebraic expression that makes use of arithmetic functions to collect as well as conceal data of sensor node from another sensor nodes at the time of aggregation and then broadcast to the base station i.e. property uses sampled data which initially, changed into a complex integer prior to broadcasting to the superior point of the aggregation tree. Therefore, plan could guard the tendency of

confidential sensing node data from adjacent nodes and data collectors in a WSN. Furthermore, with this secret guard practice, still hard for contender to pick up responsive information despite the fact that data are eavesdropping and decrypted.

J. ASAP

An adaptive sampling approach to data gathering has been introduced for power proficient intervallic data gathered in sensor networks, called ASAP. This has shown that it can boost the network lifetime as well as keeping the eminence of the gathered data elevated. The tri-mechanisms described that shape the base of ASAP. Foremost, the sensing-driven cluster creation is used to figure a network association that can smooth the progress of adaptive sampling in the course of confined to a small area algorithms while attaining the worldwide purpose of power perception also first-class data gathering. Second one is the relationship-based sampler choice and model derivation which is known to find out the sample nodes and for the evaluation of constraints of the multivariate normal (MVN) [10] models, which is performed by a cluster head that initially notify the nodes regarding the rank as samplers or non samplers afterward the CH throws the abstract knowledge to main node that further utilized to draw the constraint of the probabilistic models used to expect the values of non sampler nodes, hence arrest the relationship along with the evaluations of sensor inside identical sub-clusters. Third, adaptive data collection and model-based prediction is used to diminish the numeral posts used to bring together data from the network, the values of the non sampler nodes are expected at the main node by using the MVN models and merely a abstract of the constraint are offered to the main node following apiece association-based model derivation step.

K. TEEN

Here, a formal categorization of sensor networks has been presented: proactive networks and reactive network. TEEN (**T**hreshold sensitive **E**nergy **E**fficient sensor **N**etwork protocol), a novel networks protocol for reactive networks. TEEN targeted on reactive networks and the initial protocol developed in favor of reactive networks. In this method, whenever cluster change time arises, as well as the features, the cluster-head transmit toward its members. The nodes always sense their surroundings constantly. Initially, constraint from the feature set reaches its hard threshold value, then the node toggle the source and send the sensed data. A value of this data kept in a domestic variable, known as the sensed value (SV). The nodes then after that spread data in the existing cluster time have to follows defined conditions [11]. The chief negative aspect of this plan is when threshold are not attained, the nodes do not exchange a few words at all, and after that the client do not obtain a few data from the network even if each and every node dies. Consequently, this plan is not good for which client wants to acquire data on an ordinary basis. One more likely trouble is that a realistic execution must make sure for no collisions in the cluster. It is suitable for time decisive applications like intrusion detection, explosion detection and moreover pretty well-organized in terms of energy expenditure as well as instant response. Also, it gives consent to the user in the direction of manage the energy expenditure and accurateness appropriate to the application.

L. GCEDA

Data aggregation (DA) process brings together the valuable information by eliminating repeated readings of sensor. Data aggregation at the sink through individual node grounds overflows of the data that fallout in utmost energy expenditure. To minimize this dilemma, group or alliance based data collection method is evaluate, where nodes alliance is based on accessible data and association in the intra-cluster and alliance of cluster heads at the network plane assist to lessen the power expenditure**.** Grouping of Clusters for Efficient Data Aggregation (GCEDA) algorithm works in three segments- Cluster formation, intra-cluster and inter-cluster aggregation. In the preliminary segment, the uniformly distributed node organizes into the numeral clusters (n). It opt for cluster head according to the uppermost energy, least distance to sink calculated using Euclidean distance and the chief amount of neighbor nodes [12].Grouping of nodes in intra-cluster as well as grouping of CH at inter cluster reduces the data packet count at the sink. It diminish the efficient energy required, which prolongs the network life span. Cluster based data aggregation perk up the scalability and reduces the energy consumption during aggregation of data. Simulation result shows, grouping of the numeral clusters together in the second stage of aggregation reduces energy consumption to 14.94 % (with a group of three clusters heads) [12]. Furthermore, if the network distance increases, then energy consumption increases roughly by 1%. Finest quantity of cluster head has straight effect on energy expenditure. Abridged energy expenditure in broadcast of collected data specifies the advantage of the raise in a life span of the network.

M. IC-ACO

Discover optimal path within active changing environment of WSN is a exigent concern. The chief objective of theater-Cluster Ant Colony Optimization algorithm (IC-ACO) is to extend the network life time in an impenetrable environment, since in a heavily deployed network, it's very likely that the sensor nodes in close proximity broadcast superfluous data to the sink plus energy is wasted. Consequently, in general life time of the network gets reduced. Inside the projected structure, the application of Ant Colony, Ant Colony Optimization (ACO), Swarm acumen based optimization method [13], is motivated from the ant behavior, metaheuristic approach to recognize the optimal path among sensor node and the base station, in a densely deployed network, has been presented. This mechanism has been proved to be the finest way to spot those paths which guide other ants and produce optimum paths from the whole behavior of the ant colony. The optimal path has been calculated based on phenomenal awareness in homogeneous environment. The experimental results shown that regardless of the extra overhead of selecting middle nodes, projected algorithm is proficient to give superior results in terms of elevated amount of packet transmitted, extended network life span, improved stability period, and higher energy effectiveness in densely deployed network.

N. ILSM

Four innovative hierarchical clustering topology architectures has been proposed in Improving Low-energy adaptive clustering hierarchy architecture with Sleep Mode (ILSM), namely, random cluster head and sub-cluster head (RCHSCH), random cluster head and max energy sub-cluster head (RCHMESCH), [14] random cluster head and sub-cluster head with sleep mode (RCHSCHSM) and random cluster head and max energy sub-cluster head with sleep mode (RCHMESCHSM).Chief objective of these four architecture is to get better the power proficiency for the sake of network lifetime, while sensor nodes are nominated as the CHs arbitrarily without knowing the remaining energy of the sensor nodes, the CHs have a tendency to quickly burn out; if the CHs gather too many packets, energy is exhausted too quickly. All these architectures that are based on low-energy adaptive clustering hierarchy (LEACH) architecture involved three-layers: cluster phase, sub-cluster phase and stable phase. RCHSCH used the sub-cluster configuration of hierarchical clustering topology architectures to get better outcomes related to the problem wherever cluster heads expire rapidly in LEACH. RCHMESCH or improved RCHMESCH in which SCHs and RSCHs are nominated based on the energy of the sensor nodes and in which energy utilization can be balanced. At the end, a sleep mode has been added to RCHSCH and RCHMESCH architectures to get the RCHSCHSM and RCHMESCHSM based on association of sensor data inside sub-clusters. The sleep mode reduced the energy utilization such that the life span of a WSN extended. The simulation fallout has been shown that the performances of the projected architectures are better than LEACH in term of live sensor nodes and energy utilization [14] .Moreover, the performances of the RCHMESCHSM are superior to those of RCHSCHSM where the SCHs are nominated without assuming the remaining power of the sensor nodes [14].

O. HEER

Hybrid Energy Efficient Reactive (HEER) protocol: improves the steady province for cluster ladder process for a reactive [15] network in both identical and diverse surroundings. Also, a hybrid reactive protocol of TEEN and DEEC have been presented for homogenous environment. HEER, in which cluster Head (CH) choice is combination of the proportion of remaining energy of node in addition to standard power of network and not necessitate any worldwide awareness of power at any selection round. While cluster configuration is done, the cluster head broadcast two threshold values, HT [15] (hard threshold) and ST (soft threshold). The nodes sense their surroundings frequently and if a parameter as of the attribute set arrived at its HT value, the node toggle its spreader and broadcast data. HEER distributes the load from high to low energy level nodes. Vital peculiarity of HEER follows best performance for time critical applications in homogeneous as well as in heterogeneous environment similar to TEEN, reduces the numeral broadcast ensuing the lessening of energy consumption, and add to the stability period and network duration. Comparative analysis have shown that, in homogeneous environment, the stability time of HEER (hard along with soft) is a lot lengthy than that of TEEN and DEEC. HT values decline the numeral broadcasts to the sink. HEER do better than DEEC by factor of 1.78 & 1.60 also than TEEN by factor of 2.0 both in terms of stability period and network life-span [15].Consequently, HEER is more efficient than TEEN and DEEC.

P. DUAL SINK

As the nodes close to the sink are more energy consuming, along with the mobile sink, nodes in the region of the base station all the time modifies, therefore balances the energy expenditure in the network and improves the duration of network. Though, at every point the mobile sink moves, it has to notify the entire node of the locality vary so that the data to be fruitfully routed to the base station. However, preceding study assumes that few worldwide information of the network is by now obtainable or permits the mobile sink to pass on the worldwide information through frequent network-wide transmission**.** Due to this repeated network-wide diffusion or dispersed that guide to spare lofty power failure mainly in large scale in WSNs, an "offset" problem [16] comes up in sink mobility. Therefore, Dual-Sink protocol, a power proficient and fully dispersed protocol for data gathering has been proposed in Swanskin this protocol, the static sink broadcasts in whole network just one time location alert to every node before the network activities starts. The nodes connected to two sinks are able to send the data to their closer sink. Simulation consequences have shown that Dual-Sink offers stable lifetime improvement.

Q. PNL-CSN

Mobile sink based protocol for Prolonging Network Lifetime in Clustered WSN (PNL-CSN).The dilemma of extended network duration with mobile sink has been presented. Numerous restrictions comprise the entire visit distance, the utmost distance among its two subsequent progresses, and the least sojourn time [17] at each sojourn location. As the network size increases, it becomes computationally not viable to resolve the assorted integer agenda [17].The remoteness constrained mobile sink dilemma in a WSN presented for an most favorable sojourn visit for the mobile sink such so as to the sum of sojourn times in the visit is exploit, subject to the on top of described constraints**.** A mixed integer linear programming (MILP) is the answer to this several-restricted, mutual optimization dilemma. Because of its lofty convolution and deprived scalability, a scalable heuristic for the remoteness constrained mobile sink dilemma consists of three phase [17], *first*: The sojourn time of the sink at the location of every sensor, *second*: *recognize* the sojourn visit of the mobile sink, *third:* Calculation of the sojourn time at each sojourn location. An extensive experiment carried out by imitations to estimate the show of this heuristic pseudo-code in contrast among the best key by cracking the MILP. The investigational fallout verified that the key given by the pseudo-code is almost best, and analogous with the MILP evaluations except with a lot smaller execution instant.

R. DMSR

The existing distributed mobile sink routing (DMSR) protocol has been presented. Distributed approaches did not rely on a central entity [18] to supervise routes and decisions; so, they were valid to pure WSN applications where the network involves mono-type sensor devices. Among the various approaches to the routing protocols problems with mobile sink, the very important and the most broadly adopted one is the hierarchical [18] mobile sink routing protocols. Hierarchical approaches plan to diminish the load of advertising the sink's location to the network by establishing a virtual hierarchy of nodes which inflict dissimilar dynamic roles on the sensors. The nodes in the spread over the surface virtual structure (high-tier nodes) obtain the sink's position while the residual nodes (first-tier nodes) query the high-tier nodes to acquire the sink position information whenever necessary [18].The hierarchical approach has been further classified with respect to the virtual structures imposed: grid, clusters, tree, backbone or merely a specified region. The non-hierarchical mobile sink routing protocols did not consume a high-tier structure. A hierarchy did not imposed on the sensor nodes. This approach eliminated the overhead of building a virtual structure and eliminate the opportunity of hotspots on such a structure; however, these protocols not have the benefits of the hierarchical routing protocols such as the simple acquire of sink position as of the high-tier nodes. Flooding, a non hierarchical approach, had an elevated overhead, and the protocols employed this mechanism were aware of this overhead, hence they took actions to either decrease the frequency or else the propagation region of the floods. The approaches that exploited geometric properties generally want the position-aware sensors opposing to the additional classes of then on-hierarchical protocols. They were fairly efficient; however the geometric mechanisms might need complex calculations or direct to packet transmission redundancies which delay the effectiveness of these protocols. Mobile sinks have significant advantages to enhance the performance of the existing WSN architectures; therefore, developing efficient distributed routing solutions is a promising research effort [18].

II. COMPARATIVE ANALYSIS

Below table I show the comparative analysis based on different scenarios between much energy efficient protocols for wireless sensor networks. Recent protocols have been selected for better classification.

TABLE I
Comparative analysis of recent protocols with GSTEB

Ref. no	Protocols	Clustering	Tree based	Energy efficiency	Reactive	Mobile sink
1	SDAOC	YES	YES	YES	NO	NO
2	GSTEB	YES	YES	YES	NO	NO
3	GDSDA	YES	NO	YES	NO	NO
4	ADCP	NO	NO	No	NO	NO
5	EERDAT	YES	NO	YES	NO	NO
6	NEEMRP	NO	YES	YES	NO	NO
7	DAWN	NO	NO	YES	NO	YES
8	LEAP	YES	NO	YES	NO	NO
9	NPDAS	YES	NO	YES	NO	NO
10	ASAP	YES	YES	YES	NO	NO
11	TEEN	YES	NO	YES	YES	NO
12	GCEDA	YES	NO	YES	NO	NO
13	IC-ACO	YES	NO	YES	YES	NO
14	ILSM	YES	NO	YES	NO	NO
15	HEER	YES	NO	YES	YES	NO
16	Dual sink	NO	NO	YES	NO	YES
17	PNL-CSN	NO	NO	YES	NO	YES
18	DMSR	YES	YES	YES	NO	YES

III. CONCLUSION AND FUTURE DIRECTIONS

This paper has presents comparative analysis of the various WSNs protocols. As many protocols has been proposed already to improve the energy efficiency supplementary but still more improvement can be done. GSTEB has shown quite significant results over the available WSNs protocols. But it has ignored the use of the three things:-

(a) The effect of the mobile sink has also been neglected by the most of the existing researchers,

(b) The clustering has also been neglected one can after level wise clustering to enhance the results further,

(c) The effects of the reactivity have also been neglected as the GSTEB is proactive routing protocol.

In order to overcome these constraints of the previous work a new improved technique will be proposed in near future. The proposed technique will have the ability to overcome the drawbacks of the GSTEB routing protocol.

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