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ESTIMATING THE PERFORMANCE OF LOAD BALANCING AND DELAY ESTIMATION IN CLUSTERING SCHEME OF DATA IN WSN

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Abstract- The choice on efficient clustering algorithm can enhance the nodes energy of Wireless Sensor Networks. The basic components involved in cluster formation were the best choice of cluster head selection, node assignment within the cluster and construction of the clusters. Thus the clustering algorithm plays vital role for grouping sensor nodes to maximize the energy efficiency of WSNs. In this paper, we proposed an efficient algorithm named, "REACH- IN- Regional Energy Aware Clustering with Isolated Nodes. Here the Cluster Head (CH) is selected based on the weight dependency. The residual energy and average energy of the sensors in each cluster is determined. To prolong network lifetime, the regional average energy and the distance between sensors and the sink are used to determine whether the isolated node sends its data to a CH node in the earlier round or to the sink. The expected outcomes of the present research exposed that REAC-IN outperforms other clustering methods.

Keywords: Clustering algorithms, Cluster Head Selection, Isolated nodes, Residual energy of nodes and network lifetime.

I. INTRODUCTION

In real time applications, energy is the mysterious substance that truly makes the things happens. Presently, the interest of dependable communication drives the Wireless sensor systems (WSNs) towards an effective utilization of its constrained energy sources. The sensors are made up of using Micro Electro Mechanical Systems (MEMS). It is also capable of processing the physical variables related to their environment. Every node in the sensor system comprised of three segments: Sensor subsystem, Processing subsystem and Communication subsystem. The data gathered by sensors are forwarded to the special node equipped with higher energy and processing capabilities. The role of the Processing node is to distill and process the data send by the sensor nodes. The transmission range of wireless sensor networks is limited for its energy conservations.

In WSNs the sensor hubs are frequently assembled into disjoint sets called a group, clustering is utilized as a part of WSNs, as it gives system adaptability, asset sharing and productive utilization of compelled assets that gives system topology security and energy conserving attributes. Grouping plans offer diminished correspondence overheads, and productive asset distributions along these lines diminishing the energy utilization and also diminishing the impedances among sensor hubs. A substantial number of clusters will stuff the zone with smaller cluster size and a little number of groups will deplete the cluster head with expansive measure of messages transmitted from the clustered individuals. The rest of the paper is organized as follows: Section I discussed about the basic terms in wireless sensor networks. Section II discussed about the existing techniques carried out by other researchers. Section III proposed the novel technique employed. Section IV depicts the performance validation of the proposed systems. Atlast concluded in Section V.

II. LITERATURE SURVEY

In this section, we presented the overview of various clustering algorithm studied by various researchers. In the paper [1], a centralized cluster based protocols is proposed for WSN's. A harmony search algorithm was proposed to solve the energy constrained in Wireless Sensor Networks. It is expected to minimize the intra cluster distances between the cluster members and their cluster heads (CHs) and optimize the energy distribution of the WSNs. The study of HSA cluster-based protocol is carried out in a real case where the WSNs equipped with the proposed protocol are deployed in an indoor environment to monitor the ambient temperature for fire detection. A comparison is made with the well-known cluster based protocols developed for WSNs such as low energy adaptive clustering hierarchy-centralized (LEACH-C) and a cluster-based protocol using Fuzzy C-Means (FCM) clustering algorithm. Experimental results demonstrate that the proposed protocol using HAS can be realized in centralized cluster-based WSNs for safety and surveillance applications in building environments. The proposed protocol has been successfully developed and executed on a WSN test-bed for real-time fire detection in an indoor building environment. The experimental results show that, by using HSACP, the network lifetime is extended significantly when compared with LEACH-C and FCMCP. It is clear from the result that HSA can provide fast convergence with the best fitness value and a computational time of less than 10 ms is comparable with

FCM. Thereby, it enables HSA to be applied for real-time configuration of the network. Additionally, the proposed framework for designing clustering protocols can also be used as a tool for real-time operation to investigate other optimization algorithms for WSNs.

In this research paper [2] it is discussed that object tracking and battlefield intrusion detection—require full coverage at any time. With the limited energy of sensor nodes, organizing these nodes into a maximal number of subgroups (or called set cover) capable of monitoring all discrete points of interest and then alternately activating them is a prevalent way to provide better quality of surveillance. In addition to maximizing the number of subgroups, how to guarantee the connectivity of sensor nodes (i.e., there exist links between the base station (BS) and sensor nodes) is also critically important while achieving full coverage. In this paper, thus, we develop a novel maximum connected load-balancing cover tree (MCLCT) algorithm to achieve full coverage as well as BS-connectivity of each sensing node by dynamically forming load-balanced routing cover trees. Such a task is particularly formulated as a maximum cover tree problem, which has been proved to be nondeterministic polynomial complete.

The goal of the MCT problem is to sustain full sensing coverage and connectivity of WSNs for a long time. In the proposed MCLCT, two algorithms are employed, and they are a COR heuristic and a PLB strategy. The COR heuristic is able to rapidly find a maximum number of cover sets according to the global information of WSNs. Each cover set comprises a small number of sensing nodes. Afterwards, the PLB strategy dynamically determines the best parent node to relay sensed data using local information among neighbor nodes while achieving even energy consumption of nodes. By doing so, energy-efficient operation can be achieved by the MCLCT. Our experimental findings confirm that the combination of the cover set generation algorithm and the load-balancing algorithm is feasible in maintaining full coverage and connectivity of WSNs.

This paper [3] tries to achieve reliable wireless communications within WSNs, it is essential to have a reliable routing protocol and to have a means to evaluate the reliability performance of different routing protocols. In this paper, we first model the reliability of two different types of sensor nodes: 1) energy harvesting sensor nodes and 2) battery-powered sensor nodes. We then present wireless link reliability models for each type of sensor nodes, where effects of different parameters, such as battery life-time, shadowing, noise, and location uncertainty, are considered for analyzing the wireless link reliability. Based on the sensor node and wireless link reliability models, we compare the performance of different routing algorithms in terms of end-to-end path reliability and number of hops. In this work, we modeled the reliability of two different types of sensor nodes: energy harvesting sensor nodes (EHSNs) and battery-powered sensor nodes (BPSNs). We also presented wireless link failure models for each type of sensor nodes. In these models, we consider different parameters, such as battery life-time, shadowing, noise and location uncertainty on wireless link reliability. Based on the node and link reliability models, we compared performance of different routing protocols including D, H, R, RH, and WH in terms of the average end-to-end path reliability. A dynamic routing approach that integrates the two best performance routing algorithms R and RH was further proposed. A new cost function was also defined to facilitate a fair and comprehensive comparison among these routing algorithms. In the future, we plan to investigate reliability analysis and design of hybrid WSNs which include both EHSN and BPSN within the same network.

III. PROPOSED WORK

3.1 Objectives:

The objectives of the proposed work were:

- A novel network model is developed.
- Updating the neighboring nodes and non-neighboring nodes to make it available for intended nodes.
- A proper resource allocation is developed.
- Detection of malicious nodes.

3.2 Problem Definition:

All nodes in the cluster are required to participate in each voting, the communications overhead used to exchange voting information is quite high, and it increases the revocation time. Since participation of all nodes in the cluster results in high energy consumption of nodes in the network. However, certificates of both the accused node and accusing node have to be revoked simultaneously. In other words, the accusing node has to sacrifice itself to remove an attacker from the network. Although this approach dramatically reduces both the time required to evict a node and communications overhead of the certificate revocation procedure due to its suicidal strategy, the application of this strategy is limited.

3.3. Proposed Work

In the proposed system, recommended that to classify the nodes into clusters, the proposed scheme allows each Cluster Head (CH) to detect false accusation by a Cluster Member (CM) within the cluster. Node clustering provides a means to mitigate false accusations. CHs always monitor their CMs and watch for false accusations by means of the node position or EECHs algorithm. The cluster head is selected based on the high reliability value of FRD (fuzzy relevance degree). By constructing such clusters, each CH can be aware of false accusations against any CMs since each CH knows which CM executes attacks or not, because all of the attacks by a CM can be detected by any node, of course including the CH, within the transmission range of the CM. Each cluster members are provided with C_ID (cluster id) and N_ID (node id) for an efficient detection of which cluster members belongs to which cluster. By this process the cluster head CH easily verify and revoke the certificates for attack nodes. The energy level for each node is calculated during false accusation. The node which has the peak energy level apart from the normal nodes are considered as malicious, by observing the properties cluster head truncate the node, and updates the certificate revocation. The implementation of proposed system leads to improvement of throughput enhancement, which results in increased packet delivery ratio (PDR), reduces time delay and reduces the packet loss, which shows an improved network performance.

The modules were described as follows:

a) Wireless network configure settings
b) Topology Design
c) Node creating
d) Cluster head selection
e) Malicious observation on adversary attack
f) Malicious node determination through proposed cluster id and node id verification

Wireless Network Configure Settings:

Wireless Networks to create the no of nodes. The packets to send and receiving through the source to destination. It's based the scheme of packets delivered for ACK packet drop on the nodes. In this network to creating the source and destination node of the network and transmit the data to processing on their whole networking.

Topology Design

This module is developed to Topology design all node place particular distance. Without using any cables then fully wireless mobile equipment based transmission and received packet data. Node and wireless between calculate sending and receiving packets. The cluster head is at the center of the circular sensing area. Intermediate the sender and receiver of this networking performance on this topology.

Node Creating

This module is developed to node creation and more than 30 nodes placed particular distance. Wireless node placed intermediate area. Each node knows its location relative to the sink. The access point has to receive transmit packets then send acknowledge to transmitter.

Cluster Head Selection

The clustering Head selection algorithm protocol, consider both the residual energy and the current speed of each mobile node in cluster head election in order to avoid that low-energy nodes are selected as cluster heads and balance the energy consumption among all nodes. After a cluster head is selected, it broadcasts an advertisement message as well as its location, velocity to the mobile nodes within its transmission range using a carrier sense multiple access with collision avoidance media access control (MAC) protocol. Each node in the cluster has a cluster id and node id for its authentication process.

Malicious Observation on Adversary Attack:

If any malicious node in the cluster or any new malicious node enters the cluster the particular neighbor nodes sends accusing information to cluster head on its malicious observation. The respective cluster head passes the accusing information to CA certificate authority. The certificate authority has the full responsibility to ensure certificate verification.

Malicious Node Determination through Proposed Cluster Id and Node Id Verification

All nodes in the cluster have particular cluster id and unique node id in the random manner. If any malicious node enters the network cluster head or neighbor node request for its cluster_id and node_id. If the malicious node deemed to claim a wrong id then the cluster head itself revoke the certificate and eliminate from the cluster.

Then the Energy Efficient Cluster Head Algorithm is presented as follows:

Step-1: Distribute N nodes on XY-Plane randomly by using rand () function
Step-2: Elect Cluster-Head initially
Step-3: Find the distance of each node to CH
Step-4: Form the cluster of each CH depending up on the distance
Step-5: Assign initial energy to each node of cluster
Step-6: Data transmission takes place cluster member of each cluster to respective CH
Step-7: Elect CH maximum residual energy.

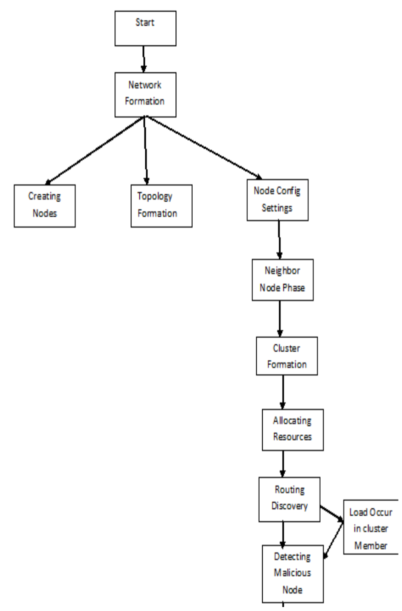

Fig.1. Proposed System Architecture

IV. PERFORMANCE VALIDATION

Energy is the most auspicious parameter in the formation of clusters. The energy is measured for initial energy for the whole network and network energy after scheduling the process. The performance evaluation is done in terms of estimating the load, End- to- End delay and False Alarm Rate.

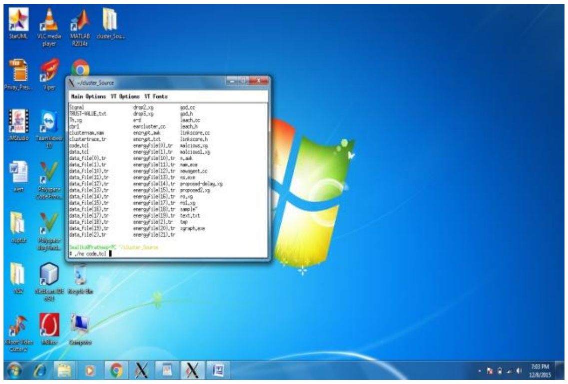

Fig. Initialization of the nodes

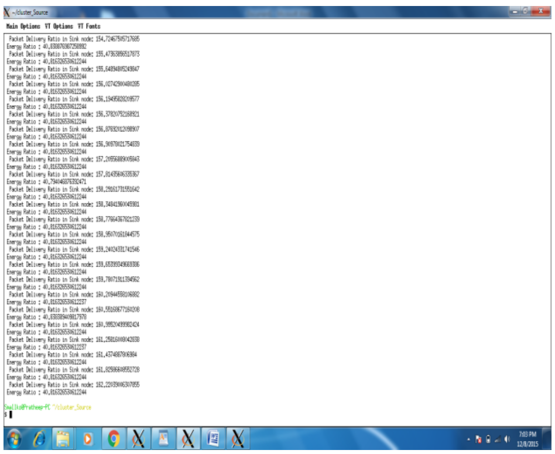

Fig. Configuring the energy of processing nodes

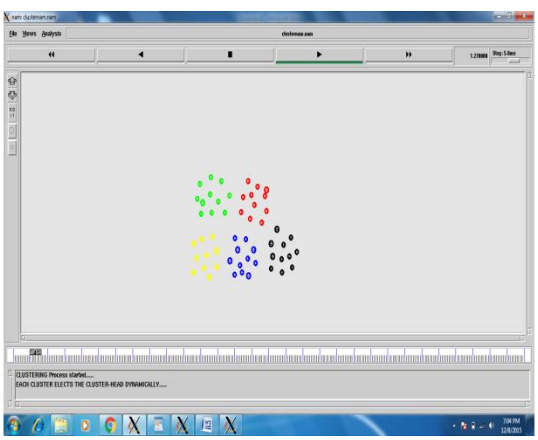

Fig. Formation of networks

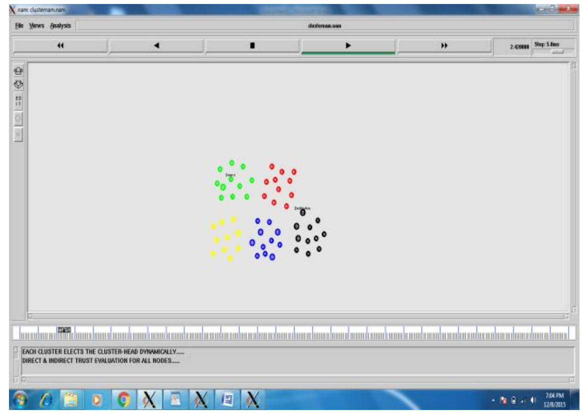

Fig. Formation of the clusters

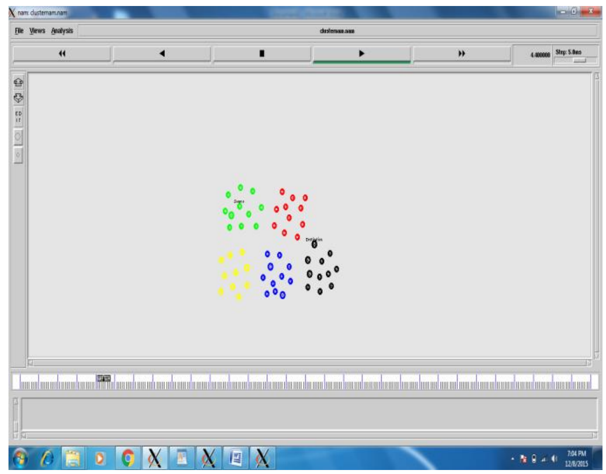

Fig. Data routing process

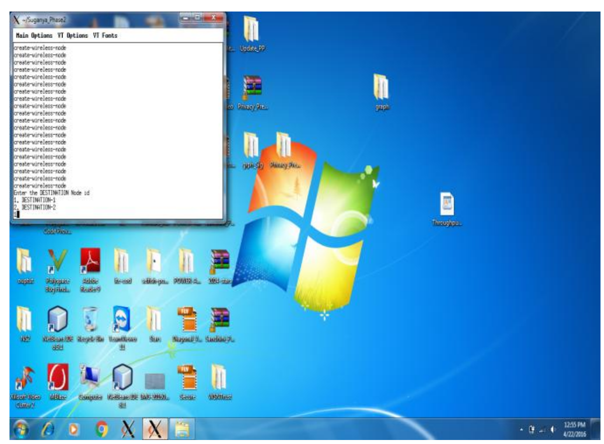

Fig. Initialization of load balancing algorithms

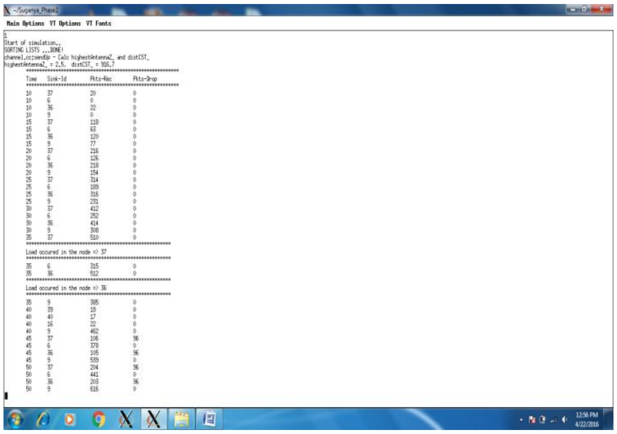

Fig. Estimation of packets received, packet drop and load occurred node.

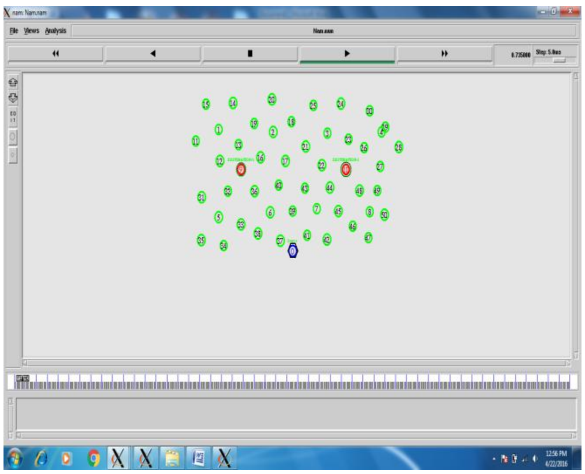

Fig. Discovery of data routing in load balancing systems

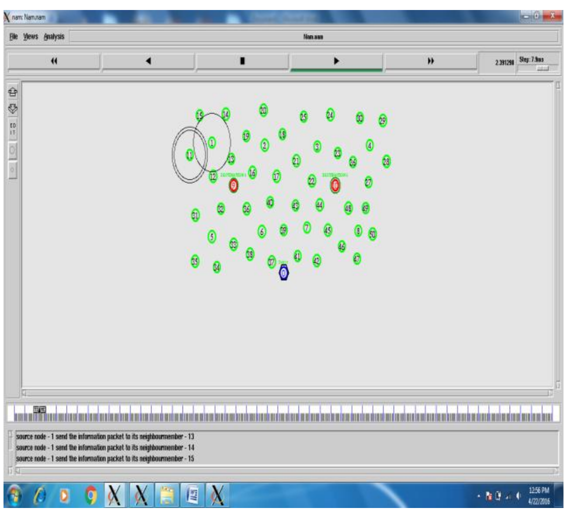

Fig. Sending information packets to its neighbor member

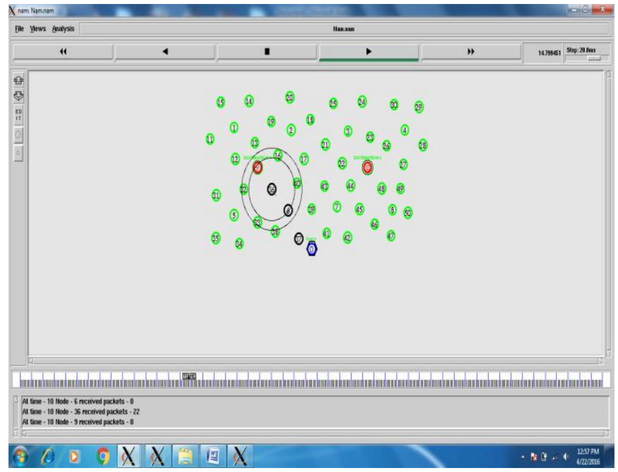

Fig. Formation of data routing to transfer the packets

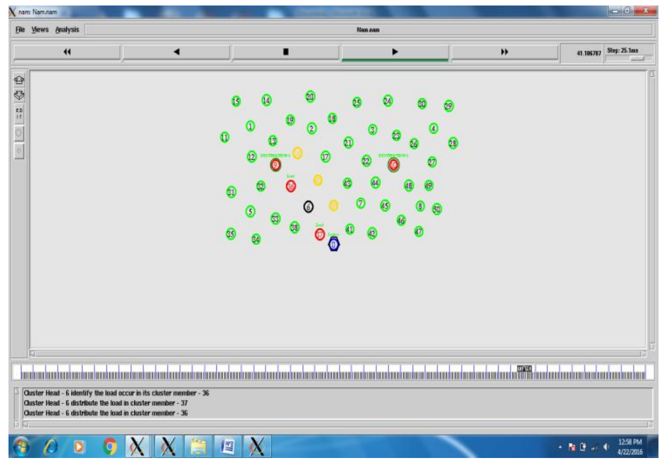

Fig. Existence of load to its cluster member

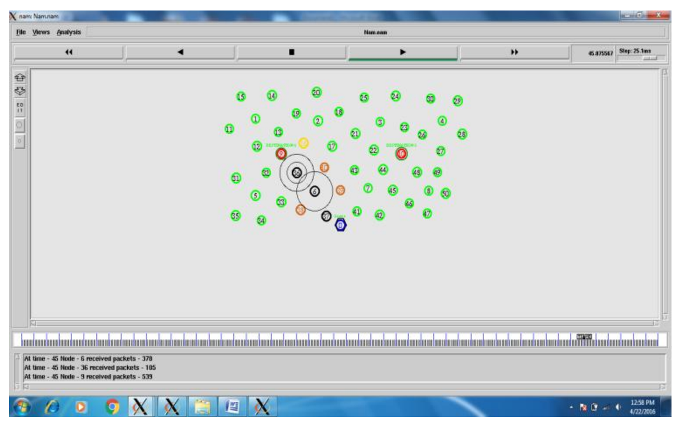

Fig. Distributing the loads to its clusters

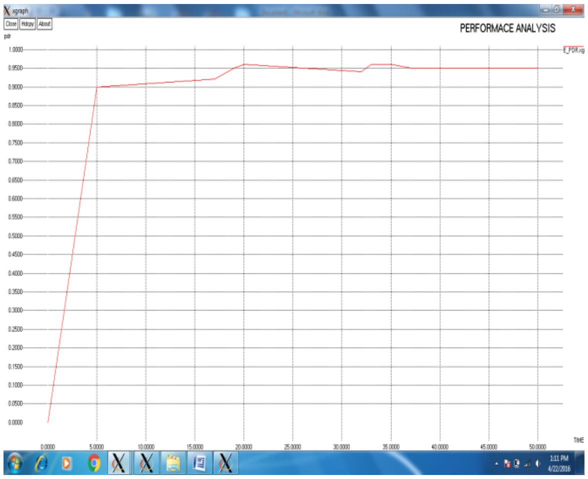

Fig. Packet Delivery Ratio

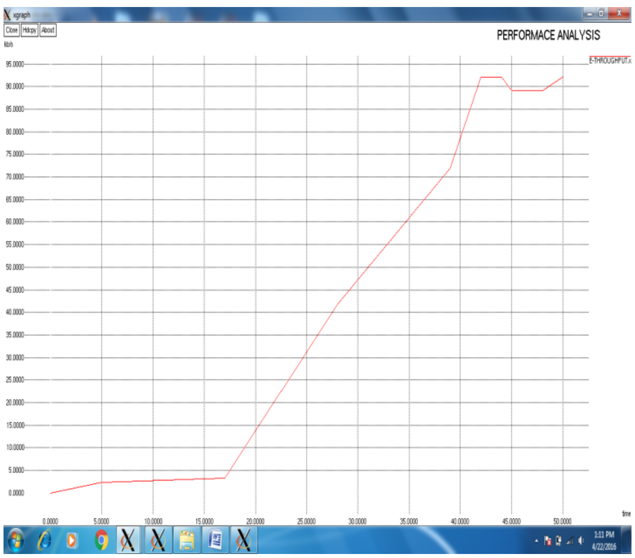

Fig. Throughput

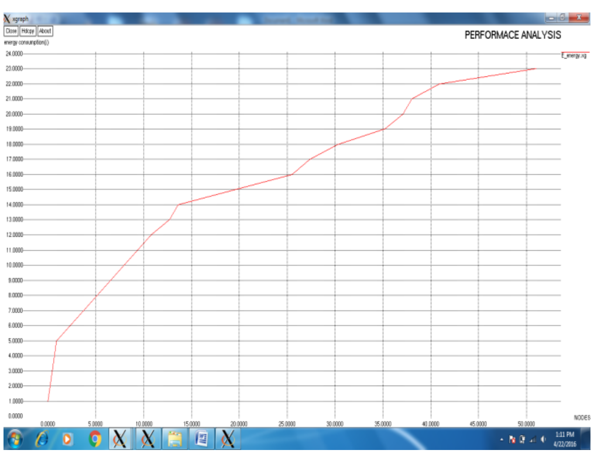

Fig. Energy Efficiency

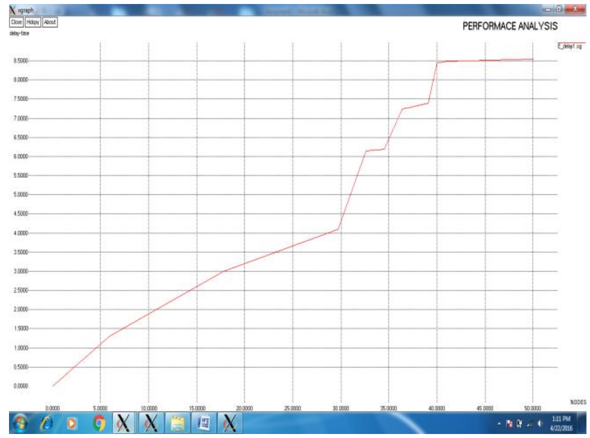

Fig. End-to-End delay

i) Estimation of load:

Load is defined as exceed number of packets present in the node with respect to total number of packets.

Load = no of packets released / total number of packets

ii) End-to- End Delay:

The delay time is calculated using optimal delay broadcasting algorithm which means each node sends the neighbor discovery phase to neighbors, from the time taken by source node for broadcasting HELLO packets to its neighbor the delay is calculated and nodes are arranged in ascending order in terms of low delay node as first neighbor. This is defined as the average time taken by the data packets to reach the intended destinations. This include delay occurred due to different reasons like queuing delay, propagation delay, processing delay etc.

$$\text{AED} = \frac{\Sigma\,(\text{time received} - \text{time sent})}{\text{Total data packets received}}$$

iii) False Alarm Rate:

The false alarm will be differentiated from the overall selfishness alarm. If any alarm generated means we should verify the reason of the alarm. We should calculate the degree of selfishness again and to confirm the behavior of selfish nodes at the network. If the number of selfish nodes exceeds the threshold value means it will get confirm as overall selfishness alarm else the alarm has been raised because of the network disconnections. We should diagnose the network disconnections by use of false detection algorithm. If it became true we should neglect the alarm with of less concern. The detection of this false alarm leads to better performance in the overall network.

FAR= (Number of honest Node misidentified)/ (Number of actually identified attackers)

V. CONCLUSION

The Wireless Sensor Network is a combination of wireless communication and sensor nodes. These networks are energy efficient and stable, which is having a long lifetime. This clustering technique plays an vital role for grouping sensor nodes will maximize the energy efficiency of WSNs and which involves additional overhead, such as cluster head selection and assignment, and cluster construction. This research suggests that the new regional energy aware clustering method using isolated nodes for WSNs, called Regional Energy Aware Clustering with Isolated Nodes (REAC-IN). The REAC-IN protocol enhanced the better cluster head selection process and rectified the problem of isolated nodes. The simulation results revealed that the performance of the algorithms used in REACIN to improve the lifetime and stability of a network is more favorable than that of the algorithms used in other protocols.

REFERENCES

[1] Jenq-Shiou Leu, Tung-Hung Chiang, Min-Chieh Yu, and Kuan-Wu Su. “Energy Efficient Clustering Scheme for Prolonging the Lifetime of Wireless Sensor Network With Isolated Nodes ”. 2015. IEEE Communications Letters.

[2] Chu Du, zhangbing Zhou and Lei Shu. “ An Efficient Technique of Scheduling Mobile Sinks in Hybrid WSN ”. 2014.

[3] M. Mehdi Afsar. “Maximizing the Reliability of Clustered Sensor Networks by a Fault-Tolerant Service ”. 2014

[4] Abderrahim Benslimane, Ferdews Tlili and Abderrezak Rachedi. “ Time-bounded Localization Algorithm based on Distributed Multidimensional Scaling for Wireless Sensor Networks ”. 2014. Ad-hoc and Sensor Networking Symposium.

[5] Sk Kajal Arefin Imon, Adnan Khan, Mario Di Francesco, and Sajal K. Das. “Energy-Efficient Randomized Switching for Maximizing Lifetime in Tree-Based Wireless Sensor Networks ”. IEEE/ACM TRANSACTIONS ON NETWORKING.

[6] Ashfaq Ahmad, Nadeem Javaid, Member, IEEE, Zahoor Ali Khan, Umar Qasim, and Turki Ali Alghamdi. “ Routing Scheme to Maximize Lifetime and Throughput of Wireless Sensor Networks ”. 2014. IEEE SENSORS JOURNAL.

[7] Petros Spachos , Dimitris Toumpakaris and Dimitrios Hatzinakos. “ Angle-based Dynamic Routing Scheme for Source Location Privacy in Wireless Sensor Networks ”. 2014.

[8] Ahmad El Assaf, Slim Zaidi, Sofiene Affes , and Nahi Kandil. “ Range-free Localization Algorithm for Anisotropic Wireless Sensor Networks ”. 2014.

[9] Jie Wu, Liyi Zhang, Yu Bai, and Yunshan Sun. “ Cluster-Based Consensus Time Synchronization for Wireless Sensor Networks ”. 2015. IEEE SENSORS JOURNAL.

[10] Amir Ehsani Zonouz and Vinod M. Vokkarane. “ Reliability-Oriented Single-Path Routing Protocols in Wireless Sensor Networks ”. 2014. IEEE SENSORS JOURNAL.

[11] Sandra Sendra, Jaime Lloret, Miguel García” Power saving and energy optimization techniques for Wireless Sensor Networks”JOURNALOF COMMUNICATIONS, VOL. 6, NO. 6, SEPTEMBER 2011.

[12] Vipin Pal1,*, Girdhari Singh2, R P Yadav3, Pavitar Pal4”Energy Efficient Clustering Scheme for Wireless Sensor Networks: A Survey” Journal of Wireless Networking and Communications 2012, 2(6): 168-174 DOI: 10.5923/j.jwnc.20120206.02.