AN ENERGY EFFICIENT LOAD BALANCING FOR WIRELESS SENSOR NETWORKS USING EE-TORA AND K-MEANS ALGORITHM

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Abstract— Wireless Sensor Network (WSN) is the widest developing technology in wireless domain. The sensor nodes are usually lightweight and with limited battery power they are failure-prone too. Wireless sensor network needs network lifetime maximization for real-time applications. Numerous clustering approaches have been recommended for this issue but the load of the network is unbalanced due to uneven clusters. To resolve this problem Energy Efficient-Temporally Ordered Routing Algorithm (EE-TORA) and K-means algorithms are used which consists of two staged approach for load balance efficiently. Residual energy, inter, intra cluster cost, communication distance are the parameters to be considered to evaluate the performance of the network. The algorithm proposed attains improved load balance, network lifetime is increased with balanced energy clusters and node death rate is decreased.

1. INTRODUCTION

A wireless sensor network (WSNs) has been seen as a fundamental technology. A classic WSN composed of a broad number, insignificant cost sensor hub which labor on limited battery power and occupied with the inaccessible and unsafe condition. Sensor nodes can detect fringe occasions, combine the sense data and communicate it. WSNs are used with a wide scope of applications, for example, natural issue checking, military reconnaissance, sea observing, the inward untamed life of ocean checking, submerged mineral mining, tolerant checking and so forth. As referenced before sensor hub works with restricted battery power and is occupied with an unreachable and risky condition. That is the reason they are exceptionally hard to change or refreshed. Therefore, energy efficiency to expanding the network life expectancy is one of the basic challenges.

For augmenting the existence time of WSNs lots of hierarchy-based clustering protocol has been proposed by the scholars. Each of them utilizes various protocols for cluster formation and information transmission [4]. These protocols segment the WSN into various logical gatherings which named clusters. CH is mindful towards communicate through the base station (BS). Steering overhead of regular nodes are compact just because they communicate their information to CH. The fundamental awareness of LEACH is to rotating the CH over the entire NW for efficient burden propagation. CH is selected haphazardly with probabilistic way. If the low energy sensor node is selected for CH, at that point it will lapse quickly. In LEACH-C the base station creates all decisions like CH selection, cluster formation & flow of data in the network. CH selection relies upon energy & location information.

OBJECTIVE

The objective of this project is to maximize the NW lifetime, to overcome uneven cluster formation, to increase Energy Efficiency (EE), to achieve better load balancing, to give low node death rate for WSNs. For this purpose, EE-Temporally Ordered Routing Algorithm (EE-TORA) &K-means algorithm is used.

II. RELATED WORK

In EESCA [8], Remaining energy and location relies on cross breed for CH selection. For load balance and increase the network life-time the given method is decent. The entire network is partition into a fixed number of clusters. At central situation of the cluster, low normal communication distance chose a hub as CH. CH jellies the succeeding gathers together to lose half of the total energy allotted in the initial time frame. A while later another hub is selected with low normal communication distance. At the point when all hub of the cluster loses their half energy, at that point the CH selection is relying upon outstanding energy. On the off chance chose the hub which is at the corner of the network. The hub in the network needs to communicate the statistics over a protracted distance.

In [9] proposed another method advanced leach, OLEACH principle reason for the algorithm is to improve LEACH and LEACH-C protocols. Chose CH which has energy 10% more energy than the remaining energy. At the point when the energy is not as much as its level in second stage if the energy is not as much as its level customary LEACHES protocol will be running. In EBCAG [10], in this a partition is created between BS and CH for cluster formation of cluster with calibrates cluster size. In this method each sensor hub protects an incline regard which describe its most minimal advance count to the BS. Nonetheless, safeguarding a slope an

incentive for each sensor hub produces extra energy overhead inside the network.

However, upper round has the less remaining energy of hub. Therefore, postpone time is extremely short. CH is chosen from provisional arrangement of CH logic will need more time and energy is needed for logic fluffy. [12] k-means procedure is used in CH-Leach. Notwithstanding, according to [16] k-means procedure experiences void cluster and inconsistent cluster size issue. [13] k-means algorithm is used for clustering. Gauss disposal algorithm is used for selection of CH. This approach likewise experiences inconsistent cluster size. Because of inconsistent cluster size, lopsided burden conveyance follows in the network. Energy is chomped more when CH has more member nodes, and passes on quicker in relate to CH holding less Member Nodes [14].

III. PROPOSED PROTOCOL

The proposed system (PS) uses an EE-TORA & K-means Algorithm. This algorithm presents a two staged approach for load balance efficiently.

- First stage composed of cluster formation which is done by K-means algorithm.
- Second stage deals with load balancing for which it studies intra, inter cluster cost, communication distance among CH & the BS using EE-TORA.

A. METHODOLOGY

- **WSN Node Creation**

This is the first module is used to create the nodes which perform the actions like assign This is the primary module is utilized to make the hubs which perform the activities like dole out qualities, hub detail, show the performance delay. K-means algorithm is utilized for making bunches. WSN checks the confirmation of the client. It well improves the security & keeping from unapproved information proprietor goes into the network. Here it approves the login client & WSN worker validation. WSN includes one WSN regulators, which controls a number of NW elements inside its domain.

- **Loop Free Forwarding**

In the second module, the Sender sends files to the destinations with the help of the nodes which are available in the NW. For that purpose, first select the file then initialize the nodes which are available in the NW & then selects the destination node for sending the file successfully & have to choose the nodes dynamically for providing security. When data is transferred from one node to another it will be transferred it without any loops by using EE-TORA.

- **Link Redundancy**

In this module, the information regarding to nodes selection can be determined. The Sender can choose the file for sending it to the destination. For sending purpose it have to choose the routing path dynamically based on EE-TORA, available nodes in the NW & have to choose the destination node(receiver) all this will be done with any link redundancy. It can be done by grouping multiple links into one virtual link, A Link Aggregation Group (or LAG), viewed as a single link

- **Energy Efficient Load Balancing**

In this module, for EELB it determines and analyzes the traffic load & energy consumption of the sensor nodes. Load balance is determined by measuring the inter-cluster, intra cluster cost & communication distance.
In this module, for sending purpose we have to choose the routing path dynamically based on the available nodes in the network and have to choose the destination node (receiver) all this will be done without any link redundancy, Energy Efficient & Load Balancing. It determined & analyzed the traffic load and energy consumption of the sensor nodes, which is complicated because network routing paths change dynamically.

- **Scalability**

In this module, the module shows the complete picture of the network. In this the WSN can access the node details & the actions performed by them. It can assign values to the nodes. It displays the path details such as the nodes used to route the data.

ADVANTAGES OF PROPOSEDSYSTEM

- It gives more EE
- It gives more load balancing
- NW lifetime is increasing.
- Less node death rate
- Reduce end-to-end delay.

B. SYSTEM ARCHITECTURE

The system architecture beneath characterizes the basic sketch of the proposed system. The needed entities in the system are user, WSN, data base, router wireless sensor nodes & server. The nodes in the NW can send the data to the other nodes when the file size is less than the energy of the node. Server will create the clusters & find the best route by using EE-TORA. The energy of the nodes can be viewed & end to end delay can be viewed. The workflow of the structure is shown in the figure.

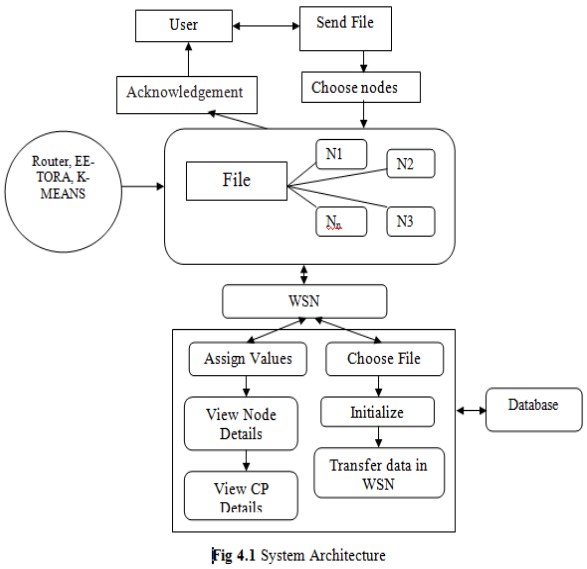

Fig: 1. System Model

C. EE-TEMPORALLY ORDERED ROUTING ALGORITHM (EE-TORA)

- EE-TORA is a source started on demand steering convention.
- It was created by Vincent Park and M. Scott Corson from college of Maryland in 1997 for remote impromptu organization.
- EE-TORA is an exceptionally versatile, effective, circle free and adaptable steering convention dependent on connect inversion algorithm.

- **Route creation:** Route creation from source to destination.
- **Cluster:** Cluster with non-cluster sensor nodes is formed using several multiple access techniques. It provides better performance because it reduces routing overhead using cluster heads.
- **Route maintenance**: Maintenance of the route.
- **Route erasure:** Erasing of the route when the route is no longer valid.
  - **Step 1:** Initialize mac for all nodes
  - **Step 2:** Sending Data
  - **Step 3:** Find Path based on the distance (Small Distance)
  - **Step 4:** Check the energy of sensors (fsize<sensor energy)
  - **Step 5:** select CH rendering to residual energy of each cluster.
  - **Step 6:** set node threshold th_{node} = no.Of alive node/no. Of cluster
  - **Step 7:** Set D_{th}= Network size*.70 // Where D_{th} is the communication distance threshold from BS to CH
  - **Step 8:** Set Th_{min}. = m percent of Th_{node} // where m is variable.
  - **Step 9:** Find all empty cluster and remove those cluster.
  - **Step 10:** if number of nodes of any cluster is < Th_{min}. Then join those nodes to the nearest cluster and remove that empty cluster.
  - **Step 11:** Find all heavy loaded and lightly loaded cluster according to node threshold level.
  - **Step 12:** for each heavy loaded cluster
  - **Step 13:** Check the mac of the sensor
  - **Step 14:** Measure Time delay and energy
  - **Step 15:** Capture the all nodes information
  - **Step 16:** View nodes, distance, and energy.

IV. RESULT

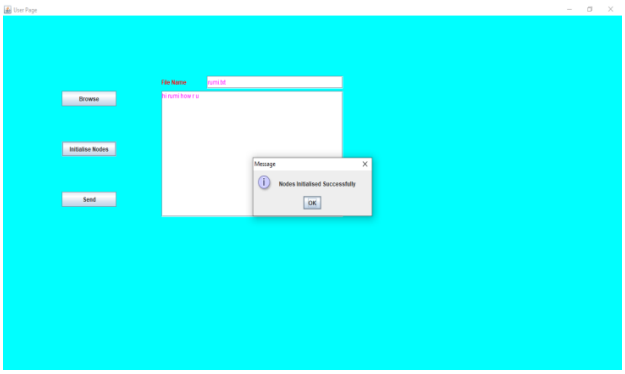

Fig: 2. Initialized Node

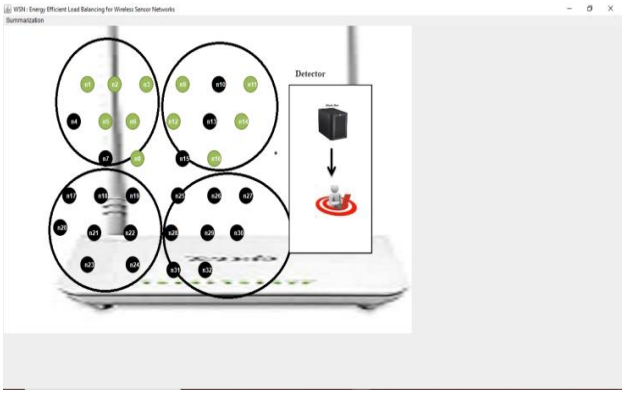

Fig: 3 Routing Data

Fig: 4. Lower Energy node found

Scalability & Link Redundancy ::

File Name	Destination	Upload Time	Time Delay	Link Redundancy
file1.txt	C	9/2/20 4:02 PM	125000000	Node1->Node3->Nod...
rumi.txt	E	9/2/20 5:35 PM	46875000	Node1->Node3->Nod...
Ben.java	C	9/2/20 5:49 PM	125000000	Node1->Node2->Nod...
rumi.txt	C	9/2/20 9:58 PM	109375000	Node1->Node2->Nod...
Ben.java	D	9/2/20 10:05 PM	203125000	Node1->Node2->Nod...
rumi.txt	E	9/28/20 10:08 PM	62500000	Node1->Node2->Nod...
Ben.java	E	9/28/20 11:08 PM	78125000	Node1->Node2->Nod...
Attacker.java	C	9/28/20 11:11 PM	187500000	Node1->Node2->Nod...

Fig: 5. Result

V. CONCLUSION

Energy efficiency is the significant problem for the performance of several Wireless Sensor Network applications. An Energy Efficiency-TORA is used to decrease the energy consumption of the node. The energy is consumed when the data is to be routed otherwise the node is in rest stage by which the Energy efficiency is achieved. This offers an energy capable load-balancing protocol to make even load spreading evenly in the network. The results show that the protocol used gives virtuous balanced load in the network and network life-time improves considerably.

In future, the study would focus on multiple resource networks of heterogeneous wireless sensors for the implementation of energy consumption tasks. The study also emphasizes the development of new entropy-based techniques so that the integrity of shared content is enhanced and a time constraint in computing efficiency is maintained. We can give the information protection and security to the Wireless Sensor Network. We will do likewise a more profound examination to apply this way to deal with this present reality climate.

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