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A STUDY ON ENERGY EFFICIENT MULTI-HOP CLUSTERING IN WIRELESS SENSOR NETWORK

V.Perumal,
Ph.D Research Scholar,
Department of Computer Science,
Erode Arts & Science College(Autonomous),
Erode, Tamilnadu, India.

Dr.K.Meenakshi Sundram,
Associate professor,
Department of Computer Science,
Erode Arts & Science College (Autonomous),
Erode, Tamilnadu, India.

Abstract: In real world network need for most challenging task in WSN. The network need for energy efficient and data transmit protocol is large –scale. So, that WSN is most important applications in network. WSN have a large number of nodes of sensing, computing and transmit the data. There is a lot of existing system for WSN related to energy consumption, and sensor nodes. Furthermore, clustering is useful for reply based sensor network that require scalability to hundreds even large number of nodes. However clustering algorithm has lot of advantages and disadvantages .In clustering most of the protocols compared on LEACH protocol have saving, data aggregation and the first dead node to find in wireless sensor network.

Keywords: Sensor node,cluster ,Energy consumption process, dead node.

I.INTRODUCTION

Wireless Sensor Network is the collection of thousands of low-battery powered and low cost and sensor devices that are communicating to each other in order to perform collaborative task. In WSN each sensor node collects the information from its nearby environment within its range. The collected information is further processed in its processing model, and then sent to the Base station. Every sensor node duplicates its energy while transmitting, receiving and processing. As sensor nodes have non reachable and limited energy resources, it is very scarce resource and hence need to be managed carefully in order to extend the life time sensor network[1]. Sensor node can be used in numerous industrial, military and agricultural applications, such as transportations, traffic monitoring, environmental monitoring, smart offices, and battlefield[].Since the sensor node is energy constrained and its valid communication distance is limited, it is infeasible for all the sensors to transmit data directly to the base station (or sink node).

The sink mobility nowadays due to its varied applications in diverse fields that require surveillance and monitoring that have become inevitable in our daily life. But the main drawback of such sensors are their resource constrained nature mainly in the power backup capabilities of sensor nodes and as a result a number of issues have emerged out of which energy efficiency is an important matter of concern[2].

Main challenges of wireless sensor network faced by researcher is battery life .Battery life matter s a lot to keep node alive ,where large capacity batteries cannot be deployed. Energy utilization is due to computational operation performed and data transmission reaction[3].To guarantee a good balanced distribution of the energy load between sensor nodes, clustering communication protocols have been designed and implemented.

Wireless Sensor Network

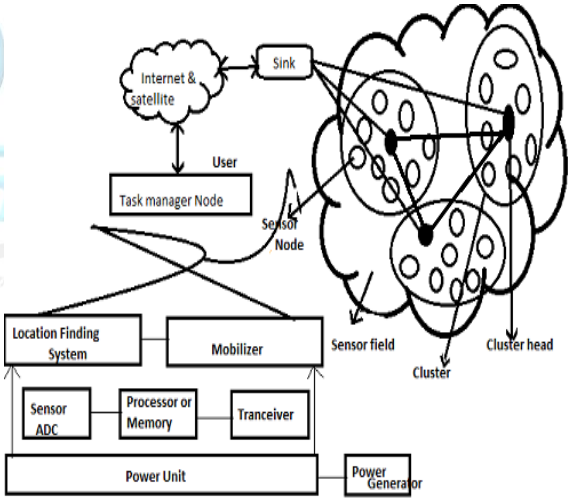

Fig 1: Block Diagram of Wireless Sensor Network

Clustering Progress: Clustering is a process to subdivided the sensing field of sensor network into the number of clusters. Clusters are organizational unit for WSNs. The dense nature of these set of connections requires the need for them to be broken down into clusters to simplify tasks such a communication.

Cluster Heads: Cluster heads are the organization leader of a cluster. they often are required to organized activities in the cluster. These tasks include but are not limited to data aggregation and organization the communication schedule of a cluster.

Base Station: The base station is at the upper level of the hierarchical WSN. It provides the Communication link between the sensor network and the end-user.

End User: The data in a sensor network can be used for a wide range of applications. Therefore, a particular application may make use of the network data over the internet, using a PDA, or even a desktop computer. In a queried sensor network (where the required data is gathered from a query

sent through the network). This query is generated by the end user.

Sensor Node: A sensor network consists of several detection station called sensor node. All sensor nodes are operational with a transducer, microcomputer, transceiver and power source. Transducer generates electrical signals on based physical effect and phenomena. The microcomputers processes and stored sensor output. Transceivers, which can be hard-wired or wireless, receives instructions from a central computer and transmit data to that computer. Power for every one sensor node is derived from the electric utility or from a battery. The main characteristics of a WSN include Power utilization constraints for nodes using batteries or energy harvesting. Ability to handle with node failures, Mobility of nodes, Communication failures, Heterogeneity of nodes, Scalability to great scale of network, such as uncomplicated sensing, data storage space, routing and data processing. Clusters are the organizational part for WSN.

II. CLUSTERING TECHNIQUES

The clustering has been well received as an effective way to reduced energy consumption of a WSN. clustering is designed as the process of choosing a set of wireless sensor nodes to be cluster heads for a given WSN. Therefore, data traffic generated at each sensor node can be sent via cluster heads to be the base station. Clustering is also used for data aggregation, where the cluster heads aggregate the information collected at the cluster member.

Intra clustering: Data collection by each node is the cluster is delivered directly to the CH in a single-hop manner if it is the coverage area of sensor node. The multi-hop packet transmission is used emerging from the sensor node is forwarded to one of the neighbors belonging to the same cluster which is closet to the CH. The another method of next-hop selection for the intra clustering packet transmission.

Inter clustering: Data aggregated at each cluster is delivered by the CHs directly to closet sink ,if the sink is in coverage area. otherwise ,the aggregated packet is forwarded to the node that closet to the target sink.

Hierarchical clustering: The hierarchical clustering scheme produced for higher level and lower level. The higher level is formed by nodes that are responsible for aggregating and fusing the received data from sensor node in sensing area and then transmit it to a central processor, such nodes are called the cluster head. The lower level of the hierarchy is formed by the nodes that are responsible for detecting the required data from the sensing region and then sending it to the corresponding cluster head. Each cluster includes number of sensor nodes and one cluster head. Cluster head selection can be centralized performed by the base station.

III. ENERGY CONSUMPTION

Energy is the most crucial resources for wireless sensor, particularly in environments in which replacing for recharging a sensor's batteries are impossible. Energy efficiency in WSNs is a hot research area where lot of methods to improve the energy efficiency is researched. There are different methods or techniques adopted to reduce the energy consumption or to effectively use the available energy to the maximum extent possible. Some of them are adopting different node deployment strategies, applying duty cycling concepts, including sensor nodes which can act as data collector and router, changing the role of nodes accordingly etc. each method will be appropriate for a specific application. According to the literature the majority of the energy is consumed for communication rather than that of processing and sensing. After So the need of an energy efficient routing protocol is very important to extend the network lifetime. Some Effective Formula's are used to calculated for the distance Energy metric given below

The Wireless Sensor Network is Calculate the cluster head Radius with distance from the base station. LEACH cluster head algorithm is divided into several rounds. At Each round, each cluster node decided if it would became a cluster head based on the threshold value on whole network.

$$T(n) = \frac{p}{1-P(r \bmod 1/p)}, \quad n \in G$$

N is given the no of node, P is a priority for probability of a node being selected cluster. R is the current round and G is the set of node that have not yet become head set. Members for the last 1/p rounds. Each node clustering the cluster head selection will generate round between 0, 1. If the number is a reduced amount of than the threshold (T (n) the node will become a cluster head. The base station broadcasts a message to whole network and each node calculated as the distance to base station d_{bs} based on received signal power. Each node calculated its CH radius with respect to its distance from the BS using.

$$R_{siz}=_{min}1+\frac{dBS-dBSmin}{dBS\ max-dBSmin}*speed_{changr\_rate}$$

R_{min} is the minimum cluster size and speed $_{change\ rate}$ is radius variation speed rate. They are protocol parameter .d_{BSmin} is the distance of closet node to the main station and d_{BSmax} is the distance of the furthest node to the BS.

The messaging transmitting and receiving Energy is defined as transmission Energy denoted by $E_{Telec\ and}$ receiving Energy denoted by $E_{Rx.\ To}$ transmit s bit packet length within distance d ,a node consumes on Energy E_{Tx} given by

$$E_{Tx}(s,d)=E_{Txelec}(s)+E_{Txamp}(s,d)$$
$$=E_{elec}*s+E_{amp}*s*d^2$$

To receive an s packet length within a distance d , a sensor node consumes an Energy E_{Rxelec} given by

$$E_{Rx}(s)=E_{Rxelec}(s)$$
$$=E_{elec}*s$$

The sensor nodes residual energy can be calculated during single frame /epoch as

$$E_{res}(i)=Ei-E_{diss}$$ where

E_i is the sensor node energy for the current round and E_{diss} is energy dissipated in n^{th} sensor node.

IV.COMPARISON OF VARIOUS ALGORITHM

We consider Energy Saving Progress for the various clustering algorithm and routing protocols are used in wireless sensor network. Sensors are randomly deployed in a region with sink located at the center using MATLAB and NS2 Environment. Based on our research these methods (Layered, Hierarchical, Inter and Intra Clustering ,etc.,) or

useful. Using 100 nodes, sensor nodes distributed dimension of 100m*100m , The energy cost of transmitter electronics E_{elec}-50NJ/bit ,The energy cost of transmit amplifier E_{amp}-10PJ/bit, message size-4000 these are common for in my comparative study papered Simulation parameters. This simulation parameter some results are given below.

TABLE 1

Methods	Advantages	Disadvantages
LEACH (Low Energy Adaptive Cluster Head**)**	LEACH is Rotate the cluster head in a randomized. So Energy saving is medium level.	It is not applicable to Network deployed in large regions. The LEACH is consider able to Local aggregation of data.
DEEC (Distributed Energy Efficient Clustering**)**	DEEC is the overhead involved in processing the average energy of the Network. In this algorithm improves the network life time.	DEEC cannot Accurately represents the State of regional network.
SPAEEP (Self Power Analyzing Energy Efficient protocol**)**	This method suggested will reduced energy consumption of the CH and Increased life span of network.	It consider less number of rounds and less packet transmission.
DCHS (Distributed luster head scheduling**)**	To achieves the lower dissipation of energy, higher data delivery rate and network longevity.	DCHS method is consider for only half of the alive node , so data aggregation process is low.
PAGSIS (Power Efficient Gathering in Sensor Information System**)**	PAGSIS avoids cluster formation and uses only one node in a chain to transmit to the base station instead of multiple node. This method increases the life time of each node by using mutual	PAGSIS assumes that all sensor nodes have the same level of energy and likely to die at the same time.
	techniques.	
CBERP (Cluster based Energy Efficient protocol**)**	The header selection process mechanism by Utilizing a number of candidate nodes to reduce the overhead and energy saving.	Energy saving is high but data aggregation medium level, because the round calculation of first dead node is quickly.
DSBCA (Distributed Self-organisation balanced clustering**)**	Life time of network are improved .	The value of suddenly changing energy and network energy consumption is lower
GMLEECS **(**Geographical multi-layered Energy Efficient clustering Scheme**)**	Energy saving is high at the same time large amount data's are transfer.	Only consider for Small scale of network.

TABLE 2

Methods	Result	
	First dead node accurance	**Energy saving**
LEACH	Most of the methods are compared to LEACH protocol, each and every time first dead node is changed and also percentage energy saving is high.	
DEEC	60	37%
SPAEEP	180	40%
DCHS	554	39.7%
PAGSIS	815	40%
CBERP	727	48%
DSBCA	983	47%
GMLEECS	1088	47%

We compare the above Table 2 is given results of GMLEECS (Geographical multi-layered Energy Efficient clustering Scheme) protocol's performance is much better than for the

percentage of energy saving is 47% at the same time first dead node accurance is 1088 in Various methods.

V.CONCLUSION

Wireless sensor network is applicable for specific network especially energy saving process. In this paper analyzing large number of papers related to knowledge in Wireless Sensor Network using Energy Efficient Algorithm. The Energy Efficient algorithm is very helpful for the large data aggregation and energy saving. Increasing the application of WSN inspired many researchers to explore the energy consumption algorithm that implemented. Generally each and every approach has one main problem that is high energy saving due to the long distance from the cluster head node to the base station. In this paper we referred large number of protocol, but most of the protocols are compared based on LEACH protocol. According to GMLEECS **(**Geographical multi-layered Energy Efficient clustering Scheme) protocol's performance is much better than the existing methods because the first node of GMLEECS is dead as delay than the existing methods, and also saving the network energy.

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