Increased Lifetime Protocols for WSN

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Abstract **WSN is a network that consists of microelectronics system nodes having limited power and processing capability which record and report various physical variables related to the environment in which they are deployed. There are a number of protocols suggested for communication in the wireless sensor network just like Leach, DEEC, SEP etc. But due to limited amount of energy the sensor nodes are constrained which results the short network life in number of conventional routing protocols we will design two new algorithms and will compare their life time with the help of graphs with the earlier design leach protocol. The main problem with LEACH protocol lies in the random selection of cluster heads due to which there exists a probability that the cluster heads formed are unbalanced and may remain in one part of the network making some part of the network unreachable. In this presented work we are trying to improve the network life. Our protocols will conduct cluster head election on the basis of energy/distance in cluster with taking different energy amplification for transmission energy in intra cluster communication and cluster head to base station.**

Keywords: **WSN, Sensor nodes, GSM, Routing, Ad hoc networks**

I. INTRODUCTION

In the architecture SNs are grouped into clusters controlled by a single command node. Sensors are only capable of radio-based short-haul communication and are responsible for probing the environment to detect a target/event. Every cluster has a gateway node that manages sensors in the cluster. Clusters can be formed based on many criteria such as communication range, number and type of sensors and geographical location. Sensors receive commands from and send readings to its gateway node, which processes these readings. Gateways can track events or targets using readings from sensors in any clusters as deemed by the command node. However, sensors that belong to a particular cluster are only accessible via the gateway of that cluster. Therefore, a gateway should be able to route sensor data to other gateways. Gateway nodes interface the command node with the sensor network via long haul communication links. The gateway node sends to the command node reports generated through fusion of sensor readings, e.g. tracks of detected targets. The command node presents these reports to the user and performs system-level fusion of the collected reports for overall situation awareness.[1]

A SN also called mote is a node in WSN that is capable of performing some processing, gathering sensory information and communicating with other connected nodes. Due to recent technological advances, the manufacturing of small and low cost sensors became technically and economically feasible. The sensing electronics measure ambient condition related to the environment surrounding the sensor and transforms them into an electric signal [4]. Processing such a signal reveals some properties about objects located and/or events happening in the vicinity of the sensor. A large number of these disposable sensors can be networked in many applications that require unattended operations. A WSN contains hundreds or thousands of these SNs. the command node reports generated through fusion of sensor readings, e.g. tracks of detected targets .These sensors have the ability to communicate either among each other or directly to an external Base-Station (BS). A greater number of sensors allows for sensing over larger geographical regions with greater accuracy. Each individual node is comprised of one or more sensing devices, a processor, a communication unit, and a power supply [3, 4].It shows the communication architecture of a WSN. SNs are usually scattered in a sensor field, which is an area where the SNs are deployed. SNs coordinate among themselves to produce high-quality information about the physical environment. Each SN bases its decisions on its mission, the information it currently has, and its knowledge of its computing, communication, and energy resources. Each of these scattered SNs has the capability to collect and route data either to other sensors or back to an external BS. A BS may be a fixed node or a mobile node capable of connecting the sensor network to an existing communications infrastructure or to the Internet where a user can have access to the reported data [6,7].

II. CLASSIFICATION OF WSN

A simple classification of Wireless sensor networks based on their mode of functioning and the type of target application is given below.

Proactive Networks The nodes in this sort of network periodically switch on their sensors and transmitters, sense the environment and transmit the data of interest. Hence, they collect the data for the relevant parameters at regular intervals. They are well suited for applications requiring periodic data monitoring. Some known instances or protocols of this kind are the LEACH (Low Energy Adaptive Clustering Hierarchy) protocol [9], some improvements on

LEACH such as [6] and PEGASIS (Power-efficient gathering in sensor information systems)[11].

Reactive Networks The nodes of the networks according to this scheme react immediately to sudden and drastic changes in the value of a sensed attribute. They are well suited for time critical applications. Typical instances of this sort of networks are [8,10].

Hybrid Networks The nodes in such a network not only react to time-critical situations, but also give an overall picture of the network at periodic intervals in a very energy efficient manner. Such a network enables the user to request past, present and future data from the network in the form of historical, one-time and persistent queries respectively. Such kind of network takes advantages of Proactive and Reactive networks. Some instances of this kind of networks are [11,12,13].

III. PREVIOUS WORK

LEACH (Low-Energy Adaptive Clustering Hierarchy) W. R Heinzeolman proposed LEACH protocol, which based on cluster structure and hierarchical technology. Relative to the traditional protocol, LEACH could save a greater degree of energy. It used adaptive technology and Next Node, node rotation technology, the LEACH was more efficient than the original class network structure; the whole WSN was more balanced on load distribution, and could extend the WSN lifetime greatly. In addition, each cluster could calculate locally and remove redundant data, reduce the communication burden of Next Node, node. As the energy consumption of calculation was much less than the energy consumption of communication, so LEACH could save energy greatly. At the beginning of each round, each node advertises it probability, (depending upon its current energy level) to be the Cluster Head, to all other nodes. Nodes (k for each round) with higher probabilities are chosen as the Cluster Heads. Cluster Heads broadcasts an advertisement message (ADV) using CSMA MAC protocol. Based on the received signal strength, each non-Cluster Head node determines its Cluster Head for this round (random selection with obstacle). Each non-Cluster Head transmits a join-request message (Join-REQ) back to its chosen Cluster Head using a CSMA MAC protocol. Cluster Head node sets up a TDMA schedule for data transmission coordination within the cluster.

IV. PROPOSED ALGORITHM

This protocol will conduct cluster head election on the basis of energy (PROTOCOL-1) / distance (PROTOCOL-2) in cluster with taking different energy amplification for transmission energy in intra cluster communication and cluster head to base station. In this algorithm we are taking heterogeneous nodes with total number of nodes equal to a temporary variable temp. Temp is checked for temp>=m*No of Nodes+1 condition to get normal nodes of energy Eo else if temp<m*NoofNodes+1 then Energy Eo*(1+a). Various phase of algorithm are:

Advertisement Phase

Initially when clusters are started forming the decision whether a node become cluster head for the present round is dependent on the percentage of cluster heads for the network and how many times the node had been used for the same purpose. This decision is done on following criteria:

$$p_{normal} = \frac{p_{simple}}{1+ma}$$

$$p_{advance} = \frac{p_{simple}}{1+ma}(1+a)$$

Terminology

p_{normal} probability of normal node of becoming cluster head

$P_{advance}$ probability of advanced node of becoming cluster head

m is fraction of nodes

a is additional energy factor

p_{simple} probability of node of becoming cluster head as per leach protocol (taking energy at place of distance for election)

Each node that has elected itself a cluster-head for the current round broadcasts an advertisement message to the rest of the nodes. For this "cluster-head-advertisement" phase, the cluster-heads use a CSMA MAC protocol, and all cluster-heads transmit their advertisement using the same transmit energy. The non-cluster-head nodes must keep their receivers on during this phase of set-up to hear the advertisements of all the cluster-head nodes. After this phase is complete, each non-cluster-head node decides the cluster to which it will belong for this round. This decision is based on the received signal strength of the advertisement. Assuming symmetric propagation channels, the cluster-head advertisement heard with the largest signal strength is the cluster-head to whom the minimum amount of transmitted energy is needed for communication. In the case of ties, a random cluster-head is chosen.

Cluster Set Up Phase

As soon as decision is done by the nodes that which cluster they belong the cluster head must have to be informed about the membership in the group. Information is send back to the cluster head using a CSMA MAC protocol by the node. Also, the receivers of cluster heads must be on to receive their signals.

Schedule Creation

The cluster head after getting the messages of request from the nodes that want to get included in the cluster, it creates a TDMA schedule which will decide and tell each node that when they can transmit their data. This schedule is broadcasted over the cluster by the cluster head to the nodes.

Data Transmission

As the clusters get created the schedule of time i.e. TDMA get fixed and data transmission can be started. Let us take an assumption with nodes having always data to transmit; it will be send to the cluster head only during the time which is allocated as per the TDMA schedule. It uses least amount of energy based on strength of cluster-head advertisement. So as per our proposed methodology the energy for intra cluster communication is:

Forwarding_energy1= Forwarding_energy/10;

Energy1=Energy /10;

Amplification energy when do>=do1 or do=<do1.

The radio of nodes remains off during the time of non transmission and thereby saving a lot of energy dissipated from these cluster members. But the cluster head's radio remains all time on to receive all the data from various sensor nodes of the cluster. As soon as the data from all the clusters get received the processing is done on the basis of signal function which compress the data into single signal. For example, if the data are audio or seismic signals, the cluster-head node can beam form the individual signals to generate a composite signal. This signal is sent to the sink which is composite in nature. After a definite time, which is decided a priori, the next round starts with every node deciding if it should be a cluster-head in the present or upcoming round.

V. ANALYSIS OF WORK

From the first analysis it is found that taking scenario one i.e. LEACH V/S PROTOCOL-2 that leach protocol persist for nearby 1450 no of rounds or iteration whereas our protocol PROTOCOL-2 persist till 3650 rounds hence 150% more better than the former.

From the second analysis it is found that while taking the scenario two i.e. LEACH V/S PROTOCOL-1 that leach protocol persist for nearby 1450 no of rounds or iteration whereas our protocol PROTOCOL-1 persist till 2450 rounds hence 68% (approximately) more better than the former.

From the third analysis it is found that while taking the scenario three i.e. PROTOCOL-2 V/S PROTOCOL-1 that PROTOCOL-2 protocol persist for nearby 3650 no of rounds or iteration whereas our protocol PROTOCOL-1 persist till 2450 rounds hence 49% (approximately) more better than the former.

VI. CONCLUSION

WSN is a network that consists of microelectronics system nodes having limited power and processing capability which record and report various physical variables related to the environment in which they are deployed. In this proposed work we tried to improve the network life. Our protocol is designed taking distance/energy for election as criterion improving energy consumption by taking different transmission energy levels for communication between base station and cluster heads and in intra cluster communication. It also have heterogeneous nodes with different energy in battery. In our work we analysed the new protocol designed with leach and also with one another based on parameters like number of alive and dead nodes etc.

VII. FUTURE SCOPE

We can extend the heterogeneity of nodes by having three levels like normal node, intermediate node and advanced for deployment in our multi-level energy transmission. We can change direction of our study to GPS equipped sensor nodes which are capable of location based sensing and apply our concept to that specific domain. Multi sinks can be taken for the same idea in case application area in which network is to be deployed is having such possibility. Multi-hop concept between cluster head nodes away from sink can be paired with multiple transmission level and heterogeneous network.

VIII. REFERENCES

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