

A Survey on Leach Routing Protocol for Wireless Sensor Network

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Abstract--- *The wireless sensor network is a collection of sensor nodes, which are small energy constrained devices. The efficient use of energy source in a sensor node is most worth for long time of wireless sensor network. So reducing energy consumption is the important factor in efficient routing. The low energy adaptive clustering hierarchy (LEACH) is a well known hierarchical routing protocol in WSN. The LEACH is a clustered based routing protocol which improves the lifetime of wireless sensor network. This paper also gives the some of the versions of leach protocol along with its comparison of fundamental leach protocol. At last this paper concludes which one of leach protocol is best.*

Keywords- *WSN, Hierarchical Routing, LEACH*

I. INTRODUCTION

A wireless sensor network consists of large number of smaller sensor nodes. A sensor which consists of sensor, actuators, memory, a processor used to communicate. The sensor are organised in a ad-hoc manner in the area of interest to monitor events and gather data about the environment [1]. If the node is not able to communicate with other through direct link, that is they are out of coverage area of each other. By using the in between nodes the data can be sent to the other node. This called as multihoping. a network with clustering is divided into several clusters within each cluster. One of the sensor nodes selected as a cluster head (CH) with the cluster member (CM). All sensor nodes works together to serve the request. Cluster head collects the data locally from the cluster member and transmit the data directly or via multi-hop transmission to the sink. Since the cluster heads spend more energy than the non-cluster heads, so deliver the workload of cluster heads among the wireless sensor nodes in order the equalize energy consumption[2].

In wireless sensor network, the sensor nodes are very small in size therefore energy is a limited resource. Apart from energy these nodes are low on battery power, memory, processing capabilities, security features and available bandwidth. These sensor nodes are used to deliver the captured information to the base station via multi-hop or single hop link. The fundamental goal of a WSN is to produce information from raw local data obtained by individual sensor node by prolonging the life time of WSN as much as possible. The limited power of sensor nodes mandates the design of energy efficient communication protocol in WSN [3][4].

II. CLUSTER BASED HIERARCHICAL ROUTING PROTOCOL – LEACH

Low Energy Adaptive Clustering Hierarchy (LEACH) is a clustering based protocol that uses a randomized rotation of cluster base station [5]. LEACH is the one of the most popular distributed cluster-based routing protocol in WSN [6]. LEACH is the one of the most popular energy efficient hierarchical clustering algorithm for WSNs that was used to reduce the power consumption and also increase the lifetime of the network [2][7].

LEACH performs self-organizing and re-clustering functions for energy round. Sensor nodes organize themselves into cluster in LEACH routing protocol [8]. In this way LEACH maximize lifetime of network node and reduce the energy consumption by compressing the data before transmitting to cluster head [7]. The leach operation is classified into different round and each of these rounds having mainly two phases and are called [2][7][9].

a) Setup phase

The process of organizing the whole network into different intra-cluster.

Advertisements of the cluster members to its different individual cluster members.

Transmission of the schedule that has been translated during the setup phase.

b) Steady phase

This is the process of data aggregation within the different clusters of the network.

Compression of the sensed information that is being sensed by the sensor node into its different cluster head within the cluster only.

Transmission of the compressed data to the sink via different cluster heads.

III. IMPROVEMENT OF LEACH

There are many protocols that have been proposed by many authors that described the improvement of the efficient protocol called LEACH in many factors to overcome from the disadvantages which are there in the LEACH clustering protocol. Some of the improvement of leach protocol is

3.1 A-LEACH (Angled Low Energy Adaptive Clustering Hierarchy)

The main purpose of developing the A-LEACH is to reduce the amount of traffic that is generated at the base station. Here the first phase is cluster formation and head selection as same as leach protocol. Some of the node in the network that is not belong to any of the cluster and transfer their data to the sink directly. Because of this situation the high amount of traffic is caused at sink node and also affects the energy efficient factor. The A-LEACH protocol calculate the angles among these nodes and reduce the network traffic and energy efficiency is very effective [6][9][10][11].

3.2 LEACH-B (Balanced Low Energy Adaptive Clustering Hierarchy)

In LEACH-B for the cluster formation purpose it will use the de-centralized algorithm, based on this each sensor node knows only its own

position and destination node. Position where the information is going to receive, and it does not know about any other node position. LEACH-B calculates the path between destination node and originating node, based on this path the cluster head will be chosen. Compared with leach efficiency of LEACH-B is much higher [6][9][10][11].

3.3 LEACH-C (Centralized Low Energy Adaptive Clustering Hierarchy)

It is differ from LEACH-B, because it will use the centralized clustering algorithm and steady-state protocol as LEACH. In the set-up phase of LEACH-C, each node would send its current location position and energy level information to the sink node. The base station will determine the different cluster along with CH and non-CH of each and every cluster based on the information of sensor nodes. Utilizing the global information of the whole network the base station would be able to produce better cluster and less energy consumption for data transmission. In LEACH-C the number of CHs in each round is equal to pre determined optimal value, where as in LEACH the number of cluster head is varies from round to round because of lack of global coordination between different nodes in the network[1][6][7][9][10][11][12].

3.4 LEACH-E (Energy Low Energy Adaptive Clustering Hierarchy)

LEACH-E protocol would improve the CH selection process compared to LEACH. The LEACH-E is divided into different round that is same as LEACH protocol. In the first round all the sensor nodes would having the same probability to be CH of the cluster. After the first round choose the high energy node as the CH and other node as the cluster members (CM)[6][9][10][11].

3.5 LEACH-F (Fixed No. Of Cluster Low Energy Adaptive Clustering Hierarchy)

In LEACH-F, the network formed the cluster at the beginning and after that is being fixed. The cluster head position rotates among the nodes same as LEACH. The advantage of this process is no set-up overhead at the beginning of each node. It will use the centralized cluster formation algorithm as same as LEACH-C. The disadvantage of LEACH-F is do not allow new

node to be added to the network when any node dies in the network [4][6][9][10].

3.6 M-LEACH (Multi-Hop Low Energy Adaptive Clustering Hierarchy)

When the network distance is increased beyond a certain level, the distance between CHs and Sink node would get increased. This is disadvantage of LEACH protocol. This can be overcome by the help of M-LEACH in which the CH sends the data to the sink using other CHs as relay stations. M-LEACH is a complete distributed cluster based routing protocol [1][6][7][10][11][12].

3.7 V-LEACH (Vice Cluster Level Low Energy Adaptive Clustering Hierarchy)

When a cluster head dies the cluster would become useless, because the information collected by the cluster members will not be able to transmit to the sink. To overcome this V-LEACH protocol is used. In V-LEACH protocol, along with CH in the cluster, there is a vice-CH that comes to act as a CH when the CH dies. The other working of this protocol is same as LEACH protocol [1][6][10][11].

IV. COMPARISON OF IMPROVED LEACH PROTOCOL WITH NORMAL LEACH

The above seven protocols are compared with normal LEACH protocol is shown in the table. All these hierarchical routing protocols have better performance than the normal LEACH routing protocol.

V. CONCLUSION

In wireless sensor network the main purpose of using energy efficient routing protocol is to increase the lifetime of network. It consist of number of energy efficient routing protocol. One of the most efficient routing protocols is LEACH. In our survey period we studied about LEACH protocol and we also able to distinguish cluster-based protocol and its phases. Here we also studied various improved version of LEACH. Protocol which we do the comparative study of various improved version of LEACH with the fundamental one. at last, it can be calculated from given survey that for an energy efficient wireless sensor network, still it is needed to find more and more efficient, scalable and robust clustering scheme for better result.

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