



# **Analysis of Routing Protocols for Mobile Sink in Wireless Sensor Networks: A Survey**

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**Abstract:** – *Computation, capability of communication and distributed computing is essential feature of wireless sensor field. The main strategy of designing a wireless sensor network is minimum utilization of energy in each node. Mobility of sinks has been recognized as an efficient approach of improving network lifetime and performance in wireless sensor network. This article is survey data dissemination protocol supporting mobile sinks to deploy mobile base station to increase the life time of wireless sensor network. In this article, we discuss the advantage of using mobile sink and survey and classify the state of the art of data dissemination protocol.*

**Keywords:** - *Routing protocol, Wireless sensor network, sink nodes and wireless communication.*

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## **I. INTRODUCTION**

Wireless sensor network is consist of finite large number of autonomous sensor with sensing, routing and communication advancement[1]. There are sufficient number of application of wireless sensor network in area of home automation, environmental monitoring, military operations and health issues. The sensor node sense information from object of the physical world and route to the nearest hop node. In the multiple mobile base station, there are at least two mobile sinks, have the responsibility to receiving the information sense by the sensor for further processing or making decision based on the observation and performing appropriate action. The main challenging issue of wireless sensor network are minimization of node energy consumption for increasing the network lifetime.

In this paper we discuss some mobility based data dissemination protocol for energy conservation in wireless networks. If few sensor nodes are movable, the traffic flow of data can be changed if mobile sinks are responsible for data collection from sensor nodes[2]. Stationary nodes wait for the passage of mobile sink and route message towards it, so that communication occurs. So stationary nodes can save energy because path length and forwarding overhead are minimize as well. Mobility of sinks nodes are also helpful for reducing energy consumption. In such scenario, the problem for sensor node is to efficient track the mobile sink to routing. This problem is resolve by using the protocol like Two-tier data dissemination(TTDD), Geographic Hash table(GHT), Line based data dissemination(LBDD) and so on. All

these protocols use the concept of virtual infrastructure, which work as a rendezvous area for storing and retrieval of the collected measurement. This virtual infrastructure can be built using a backbone based or rendezvous based approach. Energy efficient issue is the main challenge for designing the wireless sensor network. For this issue, research has been going in the past few years to give the energy efficient approach for wireless sensor network. In this paper we focus on cluster based and grid based protocols in wireless sensor network scenarios.

## II. Advantage of employing mobile sink over static-

Experimental results show that the sensor nodes which are near or one hop away from the base station drain their energy level faster than the other nodes of the network. Nodes which are one hop away from the base station need to forward their own message as well as forward messages originating from other nodes. In doing so, sensor nodes drain their energy level and become inactive or dead. As a result, many sensor nodes will be dead and unable to forward the message to the base station and network communication becomes dead. To increase the life time of the sensor network, there is a need to deploy multiple base stations and periodically change their locations.

## III. Types of wireless sensor network—

In this section we categorized wireless sensor networks according to their application. Wireless sensor networks are used in home automation, environmental monitoring, military services, health issues and commercial purposes. Sensor nodes can be deployed in land (forest, military area), under water and underground (mining firms). Wireless sensor networks can be differentiated as static WSN, mobile WSN, geographical WSN, multimedia WSN, underwater and underground wireless sensor networks.

In static WSN, sensor nodes once deployed remain static.

Mobile WSN consists of sensor nodes that can move and interact with the physical environment.

Geographical WSN consists of hundreds to thousands of cheap sensor nodes deployed in a fixed territory, either in a planned manner or in a random manner.

Underground WSN consists of sensor nodes covered in a mine used to monitor underground conditions.

Underwater WSN consists of sensor nodes deployed under water. Nodes are more expensive and fewer sensor nodes are deployed.

Multi-media WSN [3] has been proposed to perform monitoring and tracking of events in the form of multimedia data such as video & image.

## IV. A survey on different data dissemination protocols used in different types of wireless sensor networks

**1—LEACH (Low Energy Adaptive Clustering Hierarchy):** Leach [4] is an adaptive clustering routing protocol that minimizes energy drain in wireless sensor networks. Leach is a clustering based protocol that defines a whole WSN in form of different clusters. Leach divides a network into a finite number of clusters. In each cluster there are some members and one cluster head or coordinator exists. The cluster head collects the data from source nodes and sends it to the sink. Leach protocol has several rounds and each round contains two phases. The first phase is cluster formation and head selection phase and in the second phase data dissemination occurs between source nodes to cluster head and cluster head to mobile sink. Leach uses randomization approach to balance the load on sensor nodes.

**2-TTDD:** TTDD [5] is an event driven mechanism. In TTDD, after occurrence of a new event, the initiator node forms a virtual grid circuit. Source nodes become starting points and notifications to their adjacent nodes. This mechanism is over when the grid is completely formed. The data are forwarded directly to the sink. In the mobile sink scenario, the number of source nodes and grids increases and network lifetime also increases.

**3—LBDD:** LBDD [6] divides a network into two equal parts and dividing criteria is called vertical line or strip. Vertical strips behave as rendezvous fields for data communication and look up. LBDD is an event driven process. When an event occurs, sensor nodes sense the object and send the data to the rendezvous field. After that, the sink sends a query message to the rendezvous field. This query propagates through the rendezvous area until it arrives at the node that owns the requested data. At last, the data are sent to the sink.

**4—DDB:** Dynamic Directed [7] protocol is based on the low energy self organization scheme (LEGOS) which provides a way with low data cost, where each sensor node can act as a member, a leader, or a gateway. The leader node behaves as a head node and communicates directly to another leader using a gateway node, this architecture known as dynamic backbone. When the sink communicates with the network, it attaches itself to the backbone and sends a message to the leader node. After receiving the query message, the leader easily sends the data to the sink.

5— In this paper [8], a multiple mobile sinks moves randomly in a network field to optimize packet delay and energy consumption. In this paper author analyzed mobile sinks speed, the transmission range and number of sink node decreases end to end delay and improve the energy conservation. The simulation result shows that k- hop transmission improve the performance of another rather than using 1- hop transmission for forwarding data from one node to sink node. It also resolve the hot-spot problem.

6—In this paper[9] author suggested the framework where cluster mobility strategy are proposed. A wireless sensor network field is divided into equal number of cluster. Node having a higher residual energy chosen as cluster head which move node to node and collects the data.

7—In this paper[10] author proposed algorithm to increase the network life time and optimum utilization of energy as compared to the single and multiple sink node scenario. Author suggested three new algorithm for the feasibility site of mobile base station. First algorithm proposed, TOP Kmax, the base station are placed in few of feasibility site such that nearest sensor node having higher residual energy. To balance the energy level evenly among all the node two algorithm are proposed, maximizing the minimum residual energy and minimum difference residual energy.

8- This paper[11] show the co0ordinality between increasing number of sink and network life time. In wireless sensor network, author suggested that increasing number of mobile sinks increase the performance and network life time at certain point. After the certain point, there is no effect on network life time because by that time all the sensor node will be 1- hop away from sink node.

9- In this paper [12] author proposed a energy aware grid based routing scheme protocol (EAGER). EAGER protocol based on time-scheduling method (round robin scheduling) to allow all equal grid head or coordinator to sleep for specific period of time. In each grid, there is a grid head. Node send the data to head node. if sinks moves from one node to other node path is updated. Paper result show that EAGER perform better than the existing grid algorithm in term of both energy efficiency and delivery delay.

**10-GBDD:-** The author proposed a dual radio based grid formation method which deploy dual radio mode of a sensor node to design a grid architecture across wireless sensor network. At starting there is no valid grid present, grid formation is started by the sink in the sensor field. Depend on their transmission range of radio node, cell size is decide and all nodes of these cell form cluster and one of node at corner behave as a cluster head. Source dissemination node set up the path by sending path setup message and also handle the occurring of multiple events in sensor field. Mobility and excess of sinks and events is properly managed through message passing and path sharing information between the nodes.

**11-VGDD:-** In the virtual grid data dissemination scheme, network dynamically portioned into equal size of cell to maintain the trade off between network lifetime and data delivery performance in the sensor field. The selection of cell header process give the priority to the node which is close to the centre or mid point of the cell. Cell header keep the update location of the mobile sink and forward the packet to mobile sink through gateway node. Sink moves counter clockwise direction in the sensor field and periodically broadcast their current location to all nodes.

**12-EEDD:-** EEDD [14]is a two level architecture virtual grid based protocol adopted to enhance the lifetime of wireless sensor network. The two level architecture is define are: Coarse and Fine level. In the coarse level, some nodes are one for detecting the event and rest nodes are in sleep mode. In the fine level, grid is divided into many sub grid and nodes of each sub grid is alternative going on and off mode according to their schedule. In the EEDD, there are three approach for data dessimination. i.e Target location aware, Target area aware and Target location unaware. In Target location aware approach, Target is known so query is directly send using Diagonal-first routing approach. In Target area aware approach, query is forwarded to all sub grid where the source resides. In Target location unaware, query forwarding is done throughout the sub grid and it reaches all grid heads in the field and the nodes which have event in their sensing field sends the relevant data.

## V. A COMPARATIVE STUDY OF PROTOCOLS:

Survey protocol	No of mobile sink	Virtual infrastructure	Mobility pattern
Leach	1	Cluster	Controller
GHT	1	Hashed location	Random
TTDD	1	Grid	Controlled
LBDD	Multiple	Grid	Controlled
DDB	1	Cluster	Random
8	Multiple	Cluster	Controlled
9	Single	Cluster	Controlled
10	Single or Multiple	Cluster	Controlled
11	Multiple	---	Random
12	Single	Grid	Controlled
GBDD	single or multiple	GRID	controlled
VGDD	Single	Grid	Controlled

Table (1) show the comparative study of the protocols

## VI. CONCLUSION

In this paper we have reviewed the different energy efficient protocol in wireless sensor field. Movement of sink can be imposed to increase network lifetime as well as the network efficiency. In this paper we classified the wireless network based on their application and list out the different protocol based on the different virtual architecture. Through this survey , we find out that are sufficient issues which the protocol failed to resolve. one protocol does not consider the mobility of node but other one did but can't enhance the network lifetime effectively. So its expected that upcoming protocol cover all this issue.

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