# Multi-hop Stable Selection with Mobile Sink in Wireless Sensor Network

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**Abstract:**
Wireless sensor networks are remote networks and works in ad-hoc manner. Sensors collect the information sensed by themselves and send it to cluster head. All such cluster heads pass on the information to the sink where it is further compiled and processed as per the need of the underlying application.

In our research, we will propose a cluster based novel multihop stable election protocol extended which does multihop communication between CHs and sensor nodes towards the sink. To increase power efficiency to utilize energy much more effectively multiple mobile sinks are used along with base station. Mobile sink nodes are used to enhance the performance metrics. Multihop communication is used to form cluster head communication with other sensor nodes and concept is based on nearest sink available. If sink is available nearer than cluster head then data will sent to sink and if cluster head is present nearer more than sink then communication will be done with cluster head. Mobile sinks will be configured manually according to the density of the nodes available for sensing purposes. For example we can place number of mobile sinks for two clusters which includes 15 nodes each. Cluster heads will based on routing protocol will send the information to the nearest mobile heads available. Further in future, mobile sinks can be used for authentication processes also.

**Keywords:** Wireless Sensor Nodes, Mobile Sink, Leach Protocol, Multi-hop Communication

## 1. Wireless Sensor Networks

The recent technological advancements in the field of micro electrical mechanical systems (MEMS) have made the manufacturing and use of small, low powered and moderate cost micro-sensors[1] both technically and economically feasible. A Wireless Sensor Network (WSN) [2] consists of hundreds to thousands of low-power multi-functioning sensor nodes, operating in an unattended environment, having capabilities of sensing, computation and communications. Wireless Sensor Networks are used for monitoring and collecting information from an unattended environment and for reporting events to the user. They monitor physical or environmental conditions such as temperature, humidity, pressure, sound, vibration etc.

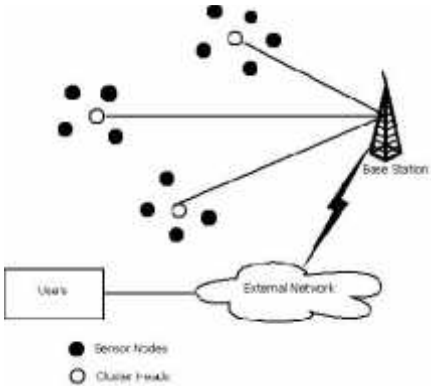


Figure 1: Wireless sensor network [4]

Since a sensor node is limited in terms of sensing and computation capacities, communication performance and power - a large number of sensor nodes can be distributed over an area of interest for collecting information. [3]The decrease in size and cost of the sensor nodes has made it possible to have a network of large number of sensor nodes, thereby increasing the reliability and accuracy of data as well as the area of coverage. Due to the low-cost deployment, the nodes are generally deployed with greater degree of connectivity. Such redundancy also increases the network fault tolerance as the failure of a single node has negligible impact on the entire network operation. [4]
LEACH assumes a simple model for the radio hardware energy dissipation where the transmitter dissipates energy to run the radio electronics and the power amplifier, and the receiver dissipates energy to run the radio electronics. For the experiments described here, both the free space and the multipath fading channel models were used, depending on the distance between the transmitter and receiver [6].

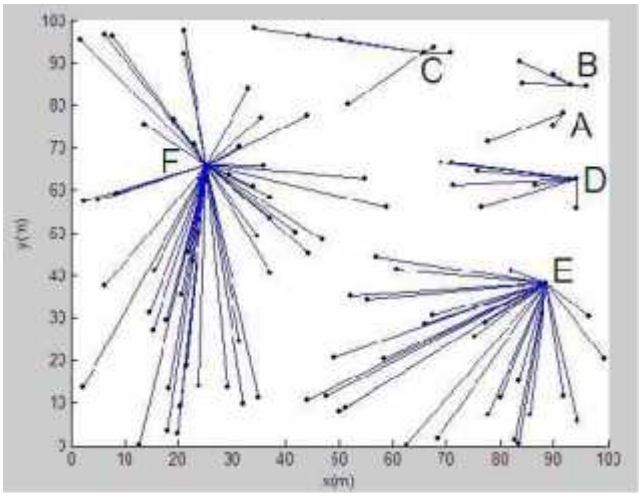

Figure 2: Cluster head formed in Leach protocol [6]

## 2. Parameters for Communication in WSN

1) **Node deployment:** Node deployment in WSNs is application-dependent and can be either manual or randomized. In manual deployment, the sensors are manually placed and data is routed through predetermined paths. However, in random node deployment, the sensor nodes are scattered randomly, creating an adhoc routing infrastructure. If the resultant distribution of nodes is not uniform, optimal clustering becomes necessary to allow connectivity and enable energy-efficient network operation. [7]
2) **Data reporting method:** Data reporting in WSNs is application-dependent and also depends on the time criticality of the data. Data reporting can be categorized as either time-driven, event driven, query-driven, or a hybrid of all these methods. The time-driven delivery method is suitable for applications that require periodic data monitoring. As such, sensor nodes will periodically switch on their sensors and transmitters, sense the environment, and transmit the data of interest at constant periodic time intervals. [3]
3) **Node/link heterogeneity:** In many studies, all sensor nodes were assumed to be homogeneous. However, depending on the application a sensor node can have a different role or capability. The existence of a heterogeneous set of sensors raises many technical issues related to data routing. For example, some applications might require a diverse mixture of sensors for monitoring temperature, pressure, and humidity of the surrounding environment, detecting motion via acoustic signatures, and capturing images or video tracking of moving objects. [6]
4) **Fault tolerance:** Some sensor nodes may fail or be blocked due to lack of power, physical damage, or environmental interference. The failure of sensor nodes should not affect the overall task of the sensor network. If many nodes fail, medium access control (MAC) and routing protocols must accommodate formation of new links and routes to the data collection BSs. [7]

## 3. Mobile Sink Communication

The consumption of energy in reception and sensing is independent from transmission distance. Energy consumption in computation is negligibly small compared to energy dissipation in other process such as sensing, transmission and reception of a bit as shown by Hoang and Motani [9]. Intra-cluster traffic can be varied if we change the size of the cluster accordingly by varying the number of nodes in a cluster. A change in a cluster size and the change in number of nodes will result in change in traffic load on a cluster head of that cluster. [10] If we increase the cluster size we can also accommodate more number of nodes. Therefore load on cluster head increases which may lead to depletion of the residual energy of the cluster head more rapidly and vice versa. Inter-cluster traffic means the data transfer between adjacent cluster heads on its way to the base station. The farthest cluster head from the base station have only its own data but the cluster head following it towards base station has to forward its own traffic and the traffic it received from its neighbor nodes. Thus, the cluster head which is nearest to BS will be dealing with maximum data traffic. Also larger the size of the cluster the cluster head requires higher energy to directly transmit or relay data to its adjacent cluster head on its path to the base station and smaller the size of the cluster , lesser will the amount of energy spent in transmitting it to the next hop cluster head or to the base station. We assume that energy spent at each node is consumed on reception and transmission only as energy spent on processing is negligible. [11]

## 4. Problem Definition

Multi-hop Stable communication is the requirement for the efficient congestion control and efficiency in power management. In our research we are proposing the concept of bringing mobile sinks to sensing field to save energy of cluster heads while sending data to mobile sinks instead of fixed sink on base station. Cluster heads will be decided on the base of residual energy and the population of the nodes available. Data will be travel from cluster heads to nearest mobile sink in associated with their grid area only.

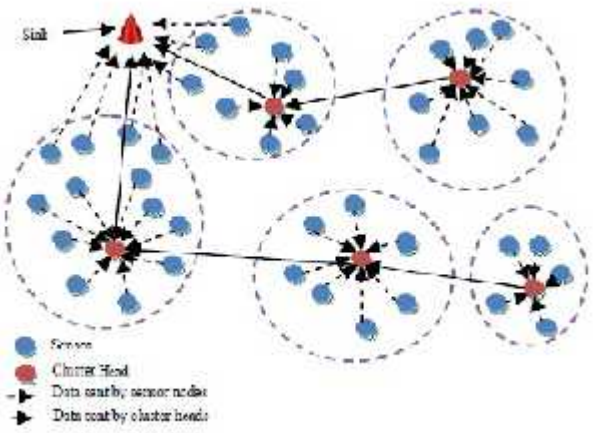


Figure 3: Multi-hop network

## 5. Objectives

To fulfill our require experimentation we will have following objectives

- To find the power efficient scheme for Multi-hop communication.
- To find the solutions for mobility of nodes with help of mobile sink.

## 6. Proposed Work

Our research will start with study of sensor network implementation and will proceed with saving energy for sensors in following steps.

**1st Phase:** This phase will contain the basic functionality and collection of information (simulator, basic sensor functions etc). Layout for comparison will be done in this phase.

**2nd Phase:** In this phase we will implement a simple scenario for sensor nodes and will divide the grid area into equal parts. Sensing process will start with computation and communication later on.

**3rd Phase:** In this phase we will implement the technique for mobile sink into grid area. Number of mobile sinks will be based on the cluster heads available.

**4th Phase:** We will implement the complete communication process for sensor network which works in different sense fields with mobile sink in very close to various cluster heads.

**5th Phase:** We will compare the base scenario with proposed scenario for finding the difference and fetching the information about energy consumption.

## 7. Conclusion

This Research will prove to be a good solution for saving resources while finding the power saving and congestion avoidance mechanism. This is our continuous experimentation for providing a stable communication. In further experimentation we will implement the concept in Network Simulator to fetch the exact results of the concept.

## References

[1] I.F. Akyildiz, W. Su, Y. Sankara subramaniam, "A Survey on Sensor Networks", in IEEE Communications Magazine, 2002, Vol. 40, Issue. 8, pp.102-114.

[2] K. Sohrabi, J. Gao, V. Ailawadhi and G. Pottie, "Protocols for Self-organization of a Wireless Sensor Network", in IEEE Personal Communications, Vol. 7, Issue. 5, 2000, pp. 16-27.

[3] Chandrakasan, Amirtharajah, Cho, Goodman, Konduri, Kulik, Rabiner and Wang, "Design Considerations for Distributed Microsensor Systems", in IEEE Custom Integrated Circuits Conference (CICC), Vol. 9, Issue. 2, May 1999, pp. 279-286..

[4] Koushik Majumder, Sudhabindu Ray,'' A Novel Power Efficient Routing Scheme for Wireless Sensor Networks''. International Journal of Instrumentation, Control & Automation (IJICA), Vol. 1, Issue. 1, 2011, pp.23-29.

[5] Rakesh Kumar, "Fault Tolerance for Chain based Hierarchical Data Gathering Protocol for WSN", International Journal of Engineering Research and Applications (IJERA),Vol. 2, Issue. 4, August 2012, pp.906-911.

[6] Lu Tao1, Zhu Qing-Xin, Zhang Luqiao, "An Improvement for LEACH Algorithm in Wireless Sensor Network", IEEE Conference on Consumer Communications and Networking, Vol. 6, Issue. 4, June 2010, pp 593 – 598.

[7] Jamal N. Al-Karaki, "Routing Techniques in Wireless Sensor Networks: A Survey", IEEE Wireless Communications, Vol. 2, No. 2, December 2004, pp.704-709.

[8] Raju Pal, Ajay K. Sharma, "MSEP-E: Enhanced Stable Election Protocol with Multihop Communication", IEEE Conference on Asia-Pacific Service Computing Conference, Vol. 2, Issue. 2, February 2011, pp 172-178.

[9] K.Suganthi, Dr.B.Vinayaga Sundaram, K.S.Vishwa Kumar, J.Syed Ashim, S.Saravana Kumar, "Improving Energy Efficiency and Reliability using multiple mobile sinks and hierarchical clustering in Wireless Sensor Networks", IEEE-International Conference on Recent Trends in Information Technology, MIT, Anna University, Chennai, Vol.5, No.4, June 3-5, 2011.

[10] Z. Maria Wang, Stefano Basagni, Emanuel Melachrinoudis and Chiara Petriol, "Exploiting Sink Mobility for Maximizing Sensor Networks Lifetime" IEEE Proceedings of the 38th Hawaii International Conference on System Sciences, pp. 1–5, March 2005.

[11] Fahed Awad, Eyad Taqieddin, Asmaa Seyam," Energy-Efficient and Coverage-Aware Clustering in Wireless Sensor Networks", Wireless Engineering and Technology, SciRes, Vol. 3, 2012, pp.142-151.