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SURVEY ARTICLE

A Survey on Energy- Efficient Multi-Sink Clustering Based Weighted Rendezvous Planning Method (EE-MSCWRP) for Wireless Sensor Networks

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Abstract: Wireless sensor networks (WSNs) are composed of a large number of sensor nodes which has the capability to collect and process data. Sink mobility is an important technique to improve sensor network performance; Selecting the most suitable RPs is an important problem that minimize energy consumption in multihop communications. So, in the existing method weighted rendezvous planning (WRP) is used which is a novel algorithm for controlling the movement of a mobile sink in a WSN. But the problem is this method focuses on a single mobile sink or source. This leads to inefficient communication, reducing the network lifetime. To deal with this problem, the proposed system uses enhanced by using energy efficient multi-sink clustering based weighted rendezvous planning method which uses multiple mobile sink.

Index Terms: Data collection, mobile sink, scheduling, wireless sensor networks (WSNs)

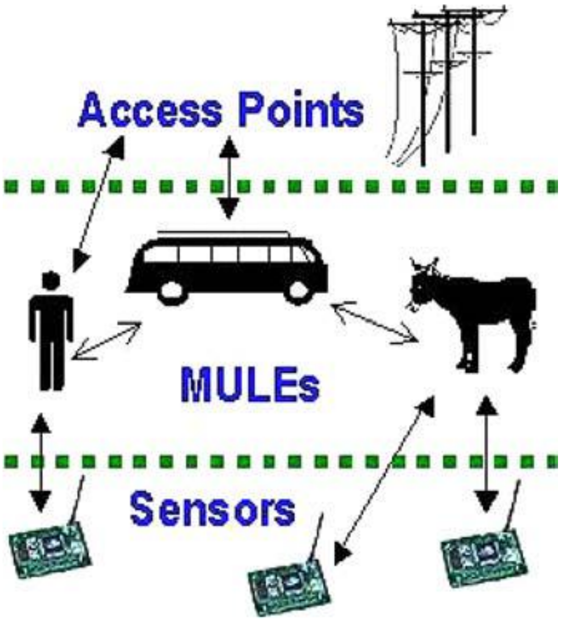
1. INTRODUCTION

WIRELESS sensor networks (WSNs) are composed of a large number of sensor nodes deployed in a field. They have wide-ranging applications, some of which include military, environment monitoring , agriculture, home automation , smart transportation, and health. Each sensor node has the capability to collect and process data, and to forward any sensed data back to one or more sink nodes via their wireless transceiver in a multihop manner. In addition, it is equipped with a battery, which may be difficult or impractical to replace, given the number of sensor nodes and deployed environment. These constraints have led to intensive research efforts on designing energy-efficient protocols. In multihop communications, nodes that are near a sink tend to become congested as they are responsible for forwarding data from nodes that are farther away. Thus, the closer a sensor node is to a sink, the faster its battery runs out.

A. Exploiting Mobility for Energy Efficient Data Collection

Energy Efficient Data Collection in Wireless Sensor Networks is an important challenge. In this work, analyze an alternative model for energy efficient data collection in sparse wireless sensor networks. The key idea in this model is to exploit mobile entities present in an application scenario. These entities are called as MULEs (Mobile Ubiquitous LAN Extensions) because they "carry" data from sensor to access point. MULEs are assumed to be capable of short-range wireless communication and can exchange data as they pass by sensors and access points as a result of their motion. Thus MULEs pick up data from sensors, buffer it and later on drop off the data at an access-point. In the **MULE architecture** sensors transmit data only over a short range that requires less transmission power. However, latency is increased because a sensor has to wait for a MULE before its data can be delivered. Nevertheless, for many sensor network applications in which data is collected for future scientific analysis such high latency is acceptable. The main contributions of this work are:

An analytical model based upon queuing theory is presented to understand the relationship between performance metrics and system parameters. Performance is characterized along three dimensions: data transfer rate, latency, and energy requirements at the sensors. This model incorporates system parameters such as sensor data generation rate, buffer size, sensor duty cycle, radio characteristics such as range and capacity, MULE velocity, MULE mobility model, etc.



To argue the benefits of the MULE architecture over ad-hoc networks both qualitatively and quantitatively using simulation.

Issue of efficient discover of sensors is addressed by using a low duty cycle at the sensor and this is incorporated in the analysis. A novel discovery mechanism is discussed that permits significantly lower duty cycles while at the same time has very little impact on performance.

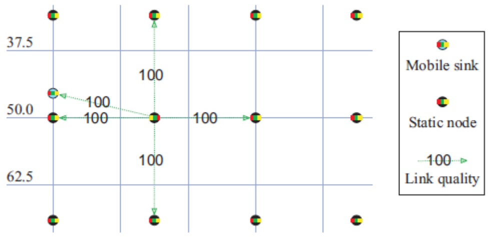
B. Maximizing the Lifetime with Tolerant Applications

This work proposes a framework to maximize the lifetime of a WSN by taking advantage of sink mobility. Compared with other mobile-sink proposals, the main novelty is that to consider the case where the underlying applications tolerate delayed information delivery to the sink. This work proposes a framework to maximize the lifetime of the wireless sensor networks (WSN) by using a mobile sink when the underlying applications tolerate delayed information delivery to the sink. Within a prescribed delay tolerance level, each node does not need to send the data immediately as it becomes available. Instead, the node can store the data temporarily and transmit it when the mobile sink is at the most favorable location for achieving the longest WSN lifetime. To find the best solution within the proposed framework, optimization problems are formulated that maximize the lifetime of the WSN subject to the delay bound constraints, node energy constraints, and flow conservation constraints.

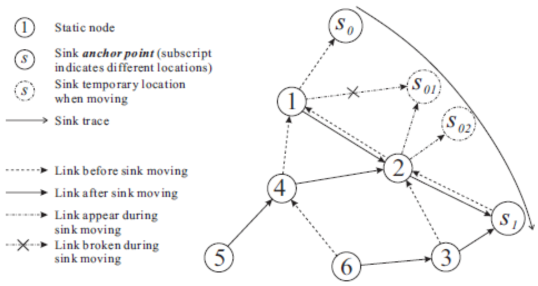
In this proposal, within a prescribed delay tolerance level, each node does not need to send the data immediately as it becomes available. Instead, the node can store the data temporarily and transmit it when the mobile sink is at the location most favorable for achieving the longest network lifetime. To find the best solution within the proposed framework, optimization problems are formulated that maximize the lifetime of the WSN subject to the delay bound constraints, node energy constraints and flow conservation constraints. Another one of the contributions is that compare this proposal with several other lifetime-maximization proposals and quantify the performance differences among them.

C. Routing towards a Mobile Sink

Improving network lifetime is an important issue involved in every aspect of the design and deployment of wireless sensor networks. There is a recent research trend of studying the application of a mobile sink to transport (rather than let the sensor nodes transmit) data back. Whereas this approach trades data delivery latency for reduced (node) energy consumption (and thus an improved lifetime), the experience tells us that sacrificing latency to extend lifetime is not necessary. In this work, in line with the previous work, investigate the approach that makes use of a mobile sink for balancing the traffic load and in turn improving network lifetime.



In this work, a routing protocol is presented, Mobi Route, to support wireless sensor networks (WSNs) with a mobile sink. This is a follow-up of the previous work where theoretically prove that moving the sink can improve network lifetime without sacrificing data delivery latency. By inventively simulating MobiRoute with



TOSSIM (in which real implementation codes are running), have demonstrated the benefit of using a mobile sink rather than a static one.

D. Rendezvous Planning with Mobile Elements

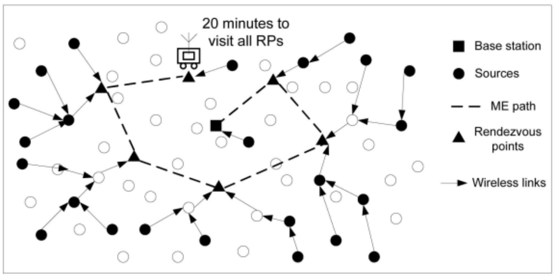
Significant energy saving can be achieved in wireless sensor networks is an important problem. In this work, a rendezvous-based approach is presented for collecting high-bandwidth data with delay requirements. In this approach, a few nodes in a large sensing field serve as rendezvous points (RPs) that buffer data sent (possibly through multiple hops) from source nodes. MEs periodically visit the RPs, pick up the cached data, and carry them back to the BS within the required deadline. The use of RPs enables MEs to collect a large volume of data at a time without traveling a long distance, which achieves high data bandwidth and low communication delay at the same time. This work makes the following contributions:

Formulate the minimum-energy rendezvous planning (MERP) problem which aims to find a set of RPs that can be visited by MEs within a required delay while the network energy consumed in transmitting data from sources to RPs is minimized.

Develop two rendezvous planning algorithms: RP-CP and RP-UG. RP-CP finds the optimal RPs when MEs move along the data routing tree. RP-UG is a utility-based greedy heuristic that can find RPs with good ratios of network energy saving to ME travel distance.

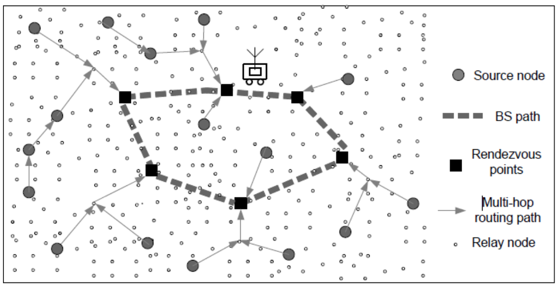
Performance Metrics	Multi-hop WSNs	Mobile Elements
Delay	Low (seconds)	High (minutes to hours)
Energy Consumption	High (nonreplenishable)	High (replenishable)
Average Bandwidth	Medium (a few Kbps)	Medium to high (a few Kbps $\sim$ Mbps)

Design the Rendezvous-based Data Collection (RDC) protocol that facilitates reliable data transfers at RPs by efficiently coordinating MEs' movement and data transmission/caching in the network.



E. **Rendezvous Design Algorithms for Mobile Base Station**

Energy is a paramount concern to wireless sensor networks (WSNs) that must operate for an extended period of time on limited power supplies such as batteries. In this work, a rendezvous-based data collection approach is presented that explores the controlled mobility of BS and the capability of in-network data caching. Specifically, a subset of static nodes in the network will serve as the *rendezvous points (RPs)* and aggregate data originated from sources. The BS periodically visits each RP and picks up the cached data. This approach has several key advantages. First, a broad range of desirable tradeoffs between energy consumption and communication delay can be achieved by jointly optimizing the choices of RPs, motion path of BS and data transmission routes. Second, the use of RPs enables the BS to collect a large volume of data at a time without traveling a long distance, which mitigates the negative impact of slow speed of BS on overall network throughput. Third, mobile nodes communicate with the rest of the network through RPs at scheduled times, which minimizes the disruption to the network topology caused by mobility.



This work makes the following contributions. 1) Formulate the rendezvous design problem for WSNs with a mobile BS, which aims to find a set of RPs that can be visited by the BS within a required delay while the network cost incurred in transmitting data from sources to RPs is minimized. 2) Develop two efficient rendezvous design algorithms with constant approximation ratios. The first algorithm places RPs on an approximate Steiner Minimum Tree (SMT) of source nodes, which allows the data to be efficiently aggregated at RPs while shortening the data collection tour of BS. The second algorithm is designed for mobile BSs that must move along fixed tracks. Based on the analysis on the optimal structure of connection between sources and a fixed track and find efficient RPs within bounded BS tour on the track.

Performance Evaluation

The performance is evaluated for the existing weighted rendezvous planning method and the proposed energy efficient multi-sink clustering based weighted rendezvous planning method. In the existing method the sensor node is chosen as a rendezvous point by considering the hop count and number of data forwarding. But only single mobile sink is considered. In the proposed system, multiple mobile sinks are deployed for gathering the data with a deadline. When compared to the existing method there is less energy consumption and less delay in the proposed system.

CONCLUSION

The paper describes the comparison and analysis between various methods involved in the energy efficient system. It also illustrates that there are many techniques that can be followed for increasing lifetime efficiency. This kind of comparison reflects that the efficiency differs from each method. This means a mobile
sink is required to visit some sensor nodes or parts of a WSN more frequently than others while ensuring that energy usage is minimized, and all data are collected within a given deadline.This paper shows the usage of multi sink mobile system to increase efficiency.

REFERENCES

[1] S. Jain, R. Shah, W. Brunette, G. Borriello, and S. Roy, "Exploiting mobility for energy efficient data collection in wireless sensor networks," *Mobile Netw. Appl.*, vol. 11, no. 3, pp. 327–339, Jun. 2006.

[2] Y. Yun and Y. Xia, "Maximizing the lifetime of wireless sensor networks with mobile sink in delay-tolerant applications," *IEEE Trans. Mobile Comput.*, vol. 9, no. 9, pp. 1308–1318, Sep. 2010.

[3] J. Luo, J. Panchard, M. Pirkowski, M. Grossglauser, and J.-P. Hubaux, "Mobiroute: Routing towards a mobile sink for improving lifetime in sensor networks," in *Distributed Computing in Sensor Systems*, P. Gibbons, T. Abdelzaher, J. Aspnes, and R. Rao, Eds. Berlin, Germany: Springer- Verlag, 2006, pp. 480–497.

[4] G. Xing, T. Wang, Z. Xie, and W. Jia, "Rendezvous planning in wireless sensor networks with mobile elements," *IEEE Trans. Mobile Comput.*, vol. 7, no. 12, pp. 1430–1443, Dec. 2008.

[5] G. Xing, T. Wang, W. Jia, and M. Li, "Rendezvous design algorithms for wireless sensor networks with a mobile base station," in *Proc. 9th ACM Int. Symp. Mobile ad hoc Netw. Comput.*, Hong Kong, China, May 2008, pp. 231–240.

[6] Y. Bi, L. Sun, J. Ma, N. Li, I. A. Khan, and C. Chen, "Hums: An autonomous moving strategy for mobile sinks in data-gathering sensor networks," *EURASIP J.Wireless Commun. Netw.*, vol. 2007, pp. 64574-1– 64574-15, 2007.

[7] M. Gatzianas and L. Georgiadis, "A distributed algorithm for maximum lifetime routing in sensor networks with mobile sink," *IEEE Trans. Wireless Commun.*, vol. 7, no. 3, pp. 984–994, Mar. 2008.

[8] R. Sugihara and R. Gupta, "Improving the data delivery latency in sensor networks with controlled mobility," in *Distributed Computing in Sensor Systems*, S. Nikoletseas, B. Chlebus, D. Johnson, and B. Krishnamachari, Eds. Berlin, Germany: Springer-Verlag, 2008, pp. 386–399.

