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A Proactive Data Reporting Protocol for Wireless Sensor Networks

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Abstract

In large-scale Wireless Sensor Networks (WSNs), leveraging data sinks' mobility for data gathering has drawn substantial interests in recent years. Current researches either focus on planning a mobile sink's moving trajectory in advance to achieve optimized network performance, or target at collecting a small portion of sensed data in the network. In many application scenarios, however, a mobile sink cannot move freely in the deployed area.

In Proposed System, we propose SinkTrail, a proactive data reporting protocol that is self-adaptive to various application scenarios, and its improved version, SinkTrail-S, with further control message suppression. In SinkTrail, mobile sinks move continuously in the field in relatively low speed, and gather data on the fly.

1. INTRODUCTION

Wireless Sensor Networks (WSNs) have enabled a wide spectrum of applications through networked low cost low-power sensor nodes, e.g., habitat monitoring, precision agriculture, and forest fire detection. In these applications, the sensor network will operate under few human interventions either because of the hostile environment or high management complexity for manual maintenance. Since sensor nodes have limited battery life, energy saving is of paramount importance in the design of sensor network protocols.

Recent research on data collection reveals that, rather than reporting data through long, multi hop, and error prone routes to a static sink using tree or cluster network structure, allowing and leveraging sink mobility is more promising for energy efficient data gathering. Mobile sinks, such as animals or vehicles equipped with radio devices, are sent into a field and communicate directly with sensor nodes, resulting in shorter data transmission paths and reduced energy consumption.

Data gathering using mobile sinks introduces new challenges to sensor network applications. To better benefit from the sink's mobility, many research efforts have been focused on studying or scheduling movement patterns of a mobile sink to visit some special places in a deployed area, in order to

minimize data gathering time. In such approaches a mobile sink moves to predetermined sojourn points and query each sensor node individually. Although several Mobile Elements Scheduling (MES) protocols have been proposed to achieve efficient data collection via controlled sink mobility.

2. EXSISTING SYSTEM

The Most of the Existing System uses Geographic Forwarding Approach. The Following description shows a Dead-End Free Topology Maintenance Protocol for Geographic Forwarding in Wireless Sensor Networks.

Minimizing energy consumption is a fundamental requirement when deploying wireless sensor networks. Accordingly, various topology control protocols have been proposed, which aim to conserve energy by turning off unnecessary sensors while simultaneously preserving a constant level of routing fidelity. However, although these protocols can generally be integrated with any routing scheme, few of them take specific account of the issues which arise when they are integrated with geographic routing mechanisms. Of these issues, the dead-end situation is a particular concern. The dead-end phenomenon (also known as the "local maximum" problem) poses major difficulties when performing geographic forwarding in wireless sensor networks since whenever a packet encounters a dead end, additional overheads must be paid to forward the packet to the destination via an alternative route.

Disadvantages of Existing System:

1) Energy consumption In addition to large amount of energy consumption on flooding control messages, change of routing paths due to the sinks' movement, and energy cost on detouring large data packets
2) Required GPS devices or Predefined landmarks to find sensor devices

3. PROPOSED SYSTEM

The proposed protocols feature low-complexity and reduced control overheads. In this paper, we propose SinkTrail, a proactive data reporting protocol that is self-adaptive to various application scenarios, and its improved version, SinkTrail-S, with further control message suppression. In SinkTrail, mobile sinks move continuously in the field in relatively low speed, and gather data on the fly. Control messages are broadcasted at certain points in much lower frequency than ordinarily required in existing data gathering protocols. These sojourn positions are viewed as "footprints" of a mobile sink.

Considering each footprint as a virtual landmark, a sensor node can conveniently identify its hop count distances to these landmarks. These hop count distances combined represent the sensor node's coordinate in the logical coordinate space constructed by the mobile sink. Similarly, the coordinate of the mobile sink is its hop count distances from the current location to previous virtual landmarks. Having the destination coordinate and its own coordinate, each sensor node greedily selects next hop with the shortest logical distance to the mobile sink. As a result, SinkTrail solves the problem of movement prediction for data gathering with mobile sinks.

Our contributions in this paper are manifold.

1. We propose a unique logical coordinate representation for tracking mobile sinks without assistance of GPS devices or predefined landmarks, which is widely applicable to various network settings and scenarios.

2. We design a novel low-complexity dynamic routing protocol for data gathering with one or multiple mobile sink(s), which effectively reduces average route length and cuts down total energy consumption.

3. We propose and evaluate an enhanced SinkTrail protocol, called SinkTrail-S.

4. We conduct extensive comparison studies and simulations with popular existing solutions.

Advantages of Proposed System:

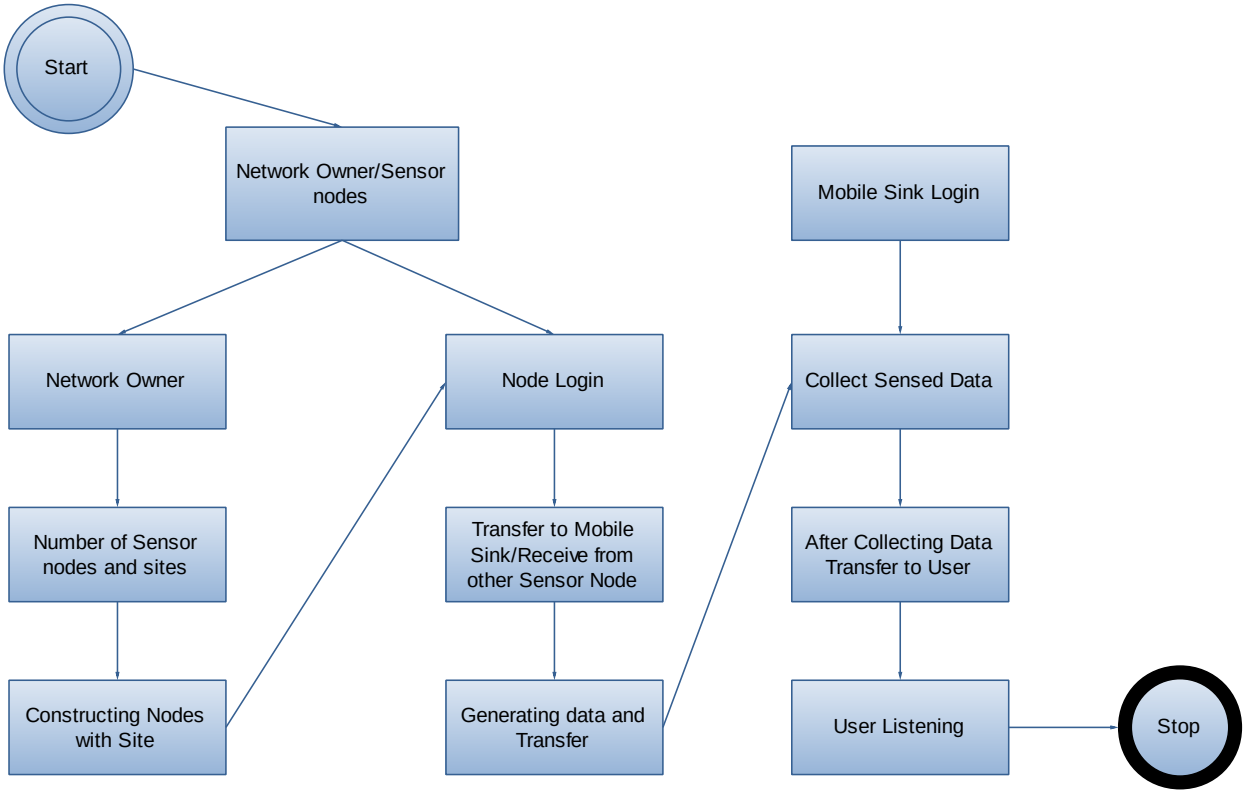
To avoid constant sink location update traffics when a sink's future locations cannot be scheduled in advance, we propose two energy efficient proactive data reporting protocols, SinkTrail and SinkTrail-S, for mobile sink-based data collection.

The proposed protocols feature low-complexity and reduced control overheads. Two unique aspects distinguish our approach from previous ones:

1) We allow sufficient flexibility in the movement of mobile sinks to dynamically adapt to various terrestrial changes

2) Without requirements of GPS devices or predefined landmarks, SinkTrail establishes a logical coordinate system for routing and forwarding data packets, making it suitable for diverse application scenarios.

4. DATAFLOW DIAGRAM



5. Modules Description

- Network Construction
- Sensor Node
- Mobile Sink

Network Construction:

The Network Owner creates the nodes depending upon number of nodes in the network. And also the network owners have to mention the number of sites in wireless sensor network. Here, the site is known as clusters. Node creation must be with the Node name, Network address for that node that is, Node Internet protocol address and the port number for that node also given when creating nodes. The network owner also gives the site that is in which site the node will present.

Sensor Node:

After the construction of nodes, the sensor nodes collect the data with respect to their site in wireless sensor network. Sensor nodes, which are stationary, keep monitoring the surrounding environment and generating data. After generating data, the sensor node opens the gateway when sink starts to run within the site or network because the sink collects those generated data. If the sink collecting data in other sites, then the sensor node transfers the generated data to other sensor nodes with multi hop routing in other sites.

Mobile Sink:

A mobile sink is used to gather sensed data by traveling around the network. We assume that only at certain locations, the sink can communicate with the outside network and then deliver cached data to users. If the sink collecting data from one site, then the sensor node from other sites, transfers the generated data to other sensor nodes with multi hop routing in other sites. After sometimes the sink moves to other sites when the data collected completely from one site. After collecting the sensed data from all the sites in a network then the sink transfers those data to users connected with the sink.

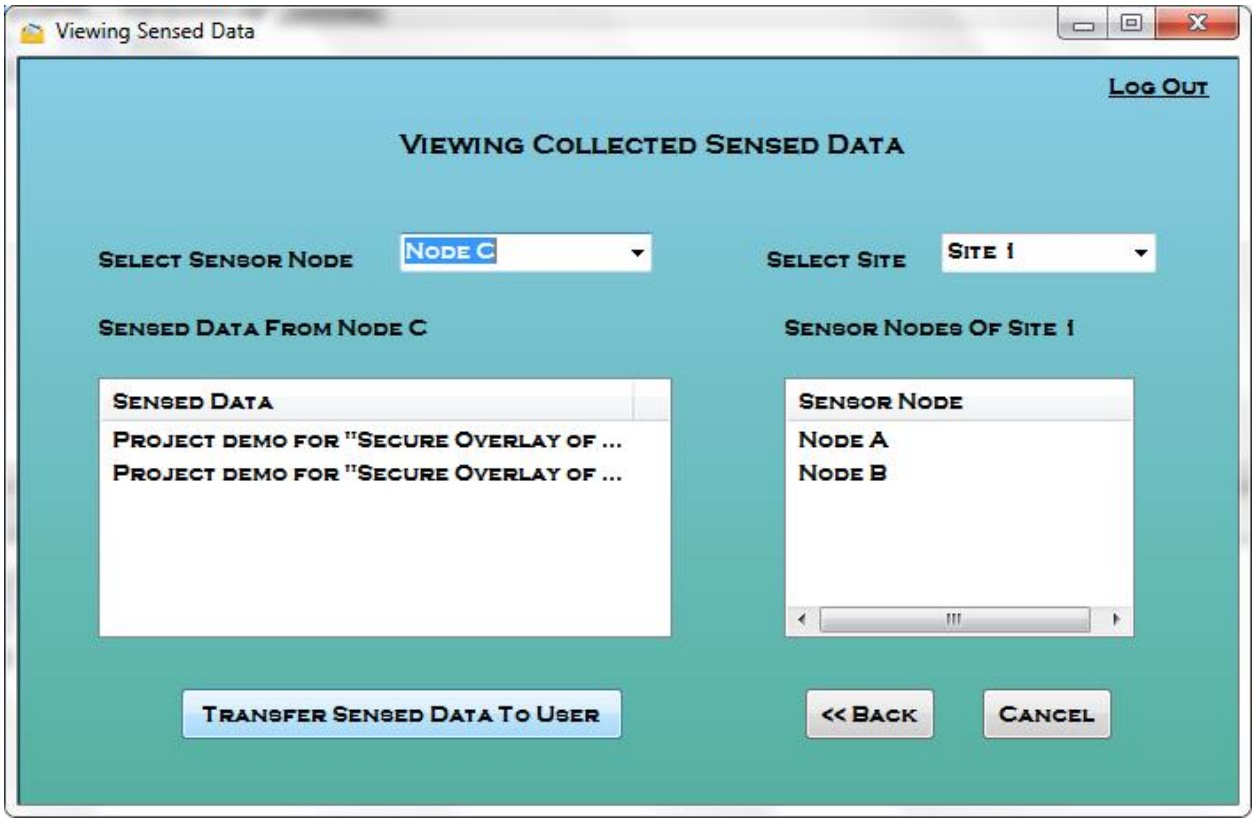
6. CONCLUSION

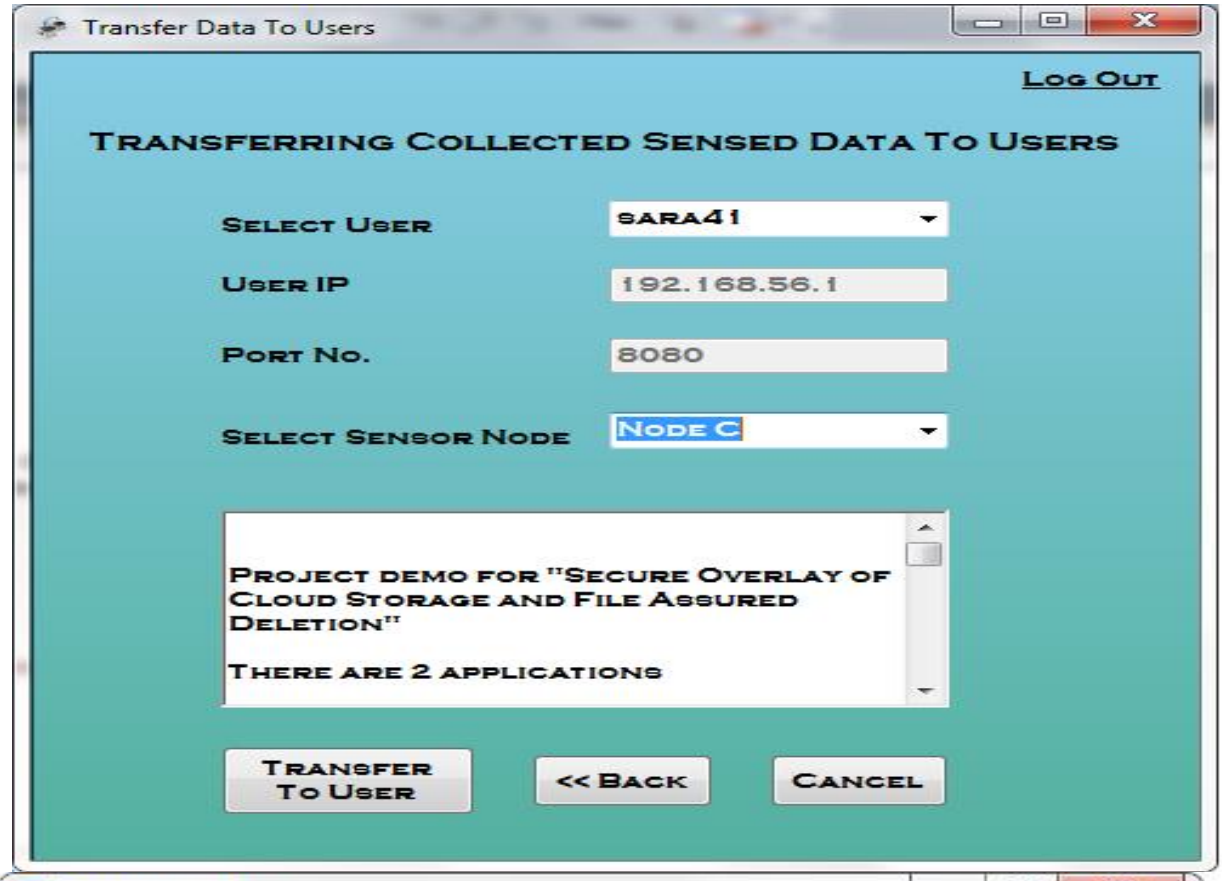
We presented the SinkTrail and its improved version, SinkTrail-S protocol, two low-complexity, proactive data reporting protocols for energy-efficient data gathering. SinkTrail uses logical coordinates to infer distances, and establishes data reporting routes by greedily selecting the shortest path to the destination reference. In addition, SinkTrail is capable of tracking multiple mobile sinks simultaneously through multiple logical coordinate spaces. It possesses desired features of geographical routing without requiring GPS devices or extra landmarks installed. SinkTrail is capable of adapting to various sensor field shapes and different moving patterns of mobile sinks. Further, it eliminates the need of special treatments for changing field situations. We systematically analyzed energy consumptions of SinkTrail and other representative approaches and validated our analysis through extensive simulations. The results demonstrate that SinkTrail finds short data reporting routes and effectively reduces energy consumption. The impact of various design parameters used in SinkTrail and SinkTrail-S are investigated to provide guidance for implementation.

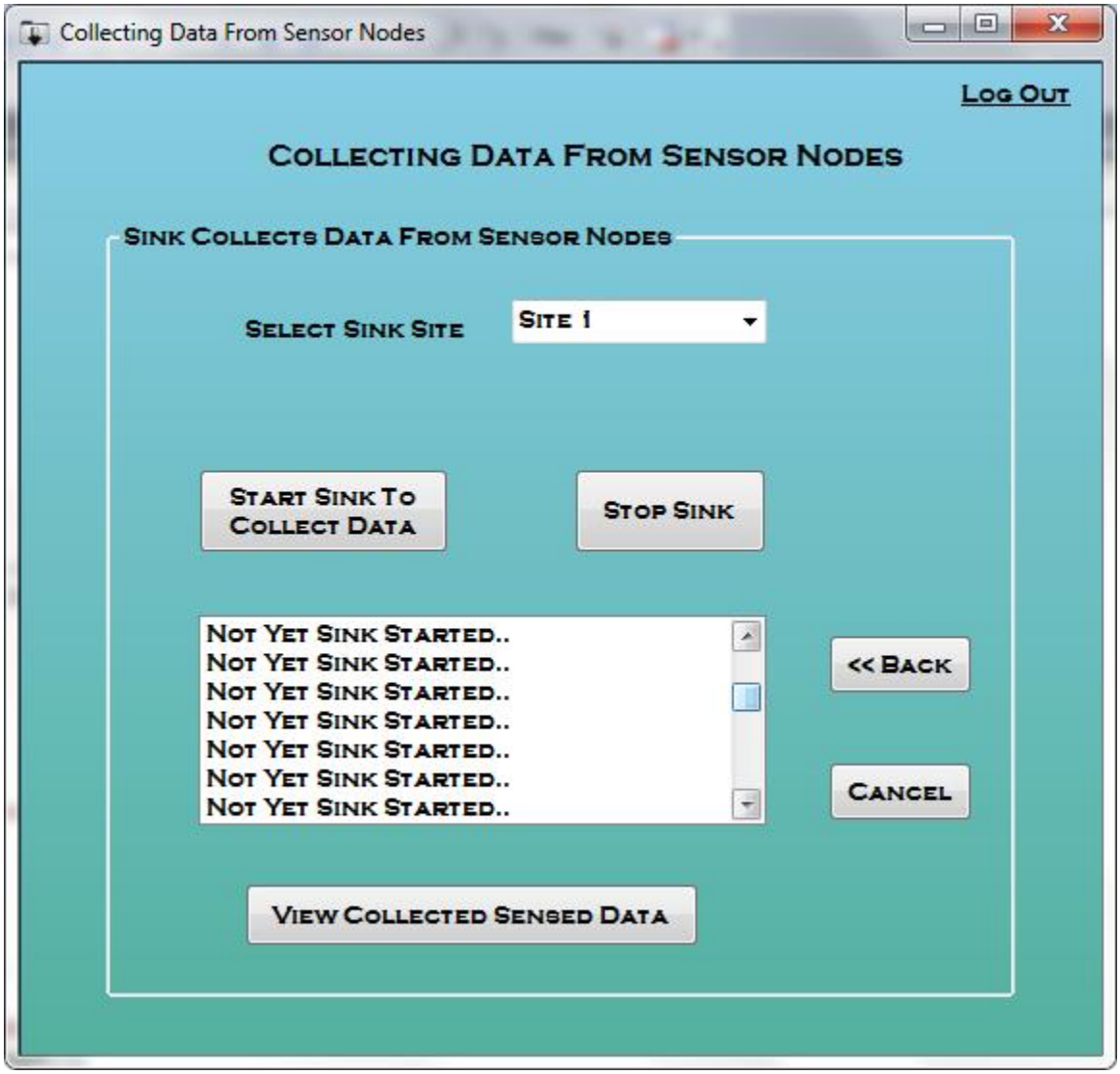
7. Future Enhancement

Further, it eliminates the need of special treatments for changing field situations. We systematically analyzed energy consumptions of Sink Trail and other representative approaches and validated our analysis through extensive simulations. The results demonstrate that Sink Trail finds short data reporting routes and effectively reduces energy consumption. The impact of various design parameters used in SinkTrail is investigated to provide guidance for implementation. We are currently working with collaborators in the GreenSeeker system. Through one-hop sensing, the Green Seeker system applies the precise amount of Nitrogen adaptive to spatial and temporal dynamics of the farmland, increasing yield and reducing Nitrogen input expense. The Sink Trail protocol can be further integrated with the GreenSeeker system to enable large-scale multihop sensing on demand and automate spray systems for optimal fertilizer and irrigation management.

8. OUTPUT SCREENSHOT







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