International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2018 IJSRCSEIT | Volume 3 | Issue 4 | ISSN : 2456-3307

Mobile Relay arrangement in Wireless Sensor Networks

G. Purushotham
MCA Sri Padamavathi College of Computer Scinces And Technology Tiruchanoor, Andhra Pradesh, India

ABSTRACT

Wireless sensor Networks (WSNs) are more and more used in data-intensive applications like micro-climate monitoring, exactness agriculture, and audio/video police investigation. A key challenge faced by data-intensive WSNs is to transmit all the information generated within an application's lifetime to the base station despite the actual fact that sensor nodes have restricted power supplies. We propose using low-cost disposable mobile relays to reduce the energy consumption of data-intensive WSNs. Our approach differs from previous add 2 main aspects. First, it doesn't need complicated motion planning of mobile nodes, so it can be enforced on variety of low-cost mobile sensor platforms. Second, we have a tendency to integrate the energy consumption owing to each mobility and wireless transmissions into a holistic improvement framework. Our framework consists of 3 main algorithms. The first algorithmic program computes an optimal routing tree assuming no nodes can move. The second algorithmic program improves the topology of the routing tree by greedily adding new nodes exploiting mobility of the newly extra nodes. The third algorithmic program improves the routing tree by relocating its nodes without dynamic its topology. This iterative algorithmic program converges on the optimum position for every node given the constraint that the routing tree topology doesn't change. We present efficient distributed implementations for each algorithmic program that need only restricted, localized synchronization. as a result of we have a tendency to don't necessarily compute an optimum topology, our final routing tree isn't essentially optimum. However, our simulation results show that our algorithms considerably outperform the best existing solutions.

Keywords: Wireless sensor networks, energy optimization, mobile nodes, wireless routing.

I. INTRODUCTION

Now Days, wireless sensor networks (WSNs) are increasingly used in critical applications within several fields including military, medical and industrial sectors. Given the sensitivity of these applications, sophisticated security services are required . Key management is a corner stone for many security services such as confidentiality and authentication which are required to secure communications in WSNs. The establishment of secure links between nodes is then a challenging problem in WSNs. Because of resource limitations, symmetric key establishment is one of the most suitable paradigms for securing exchanges in WSNs. On the other hand, because of the lack of infrastructure in WSNs, we have usually no trusted third party which can attribute pair wise secret keys to neighboring nodes, that is why most existing solutions are based on key pre-distribution. Approaches are timely. Wsn's have been deployed in a variety of *data intensive* applications including micro-climate and habitat monitoring, precision agriculture, and audio/video surveillance. A moderate-size WSN can gather up to 1 Gb/year from a biological habitat. Due to the limited storage capacity of sensor nodes, most data must be transmitted to the base station for archiving and analysis. However, sensor nodes must operate on limited power supplies such as batteries or small solar panels. Therefore, a key challenge faced by data-intensive WSNs is to minimize the energy consumption of sensor nodes so that all the data generated within the lifetime of the application can be transmitted to the base station. Several different approaches have been proposed to significantly reduce the energy cost of WSNs by using the mobility of nodes. A robotic unit may move around the network and collect data from static nodes through one-hop or multi-hop transmissions. The mobile node may serve as the base station or a "data mule" that transports data between static nodes and the base station . Mobile nodes may also be used as *relays* that forward data from source nodes to the base station. Several movement strategies for mobile relays. Secret key generation (SKG) from shared randomness at two remote locations and has recently been extended to unauthenticated channels. SKG techniques have also been incorporated in protocols that are resilient to spoofing, tampering and man-in the-middle active attacks. Still, such key generation techniques are not entirely robust against active adversaries, particularly during the advantage distillation phase. Denial of service attacks in the form of jamming are a known vulnerability of SKG systems; in, it was demonstrated that when increasing the jamming power, the reconciliation rate normalized to the rate of the SKG increases sharply and the SKG process can in essence be brought to a halt. As SKG techniques are currently being considered for applications such as the Internet of things (IoT) , the study of appropriate counter-jamming approaches is timely. WSN's have been deployed in a variety of *data intensive* applications including micro-climate and habitat monitoring , precision agriculture, and audio/video surveillance. A moderate-size WSN can gather up to 1 Gb/year from a biological habitat . Due to the limited storage capacity of sensor nodes, most data must be transmitted to the base station for archiving and analysis. However, sensor nodes must operate on limited power supplies such as batteries or small solar panels. Therefore, a key challenge faced by data-intensive WSNs is to minimize the energy consumption of sensor nodes so that all the data generated within the lifetime of the application can be transmitted to the base station. Several different approaches have been proposed to significantly reduce the energy cost of WSNs by using the mobility of nodes. A robotic unit may move around the network and collect data from static nodes through one-hop or multi-hop transmissions. The mobile node may serve as the base station or a "data mule" that transports data between static nodes and the base station . Mobile nodes may also be used as *relays* that forward data from source nodes to the base station.Several movement strategies for mobile relays . In this paper, we use low-cost disposable mobile relays to reduce the total energy consumption of data intensive WSNs. Different from mobile base station or data mules, mobile relays do not transport data; instead, they move to different locations and then remain stationary to forward data along the paths from the sources to the base station. Thus, the communication delays can be significantly reduced compared with using mobile sinks or data mules. Moreover, each mobile node performs a single relocation unlike other approaches which require repeated relocations. We make the following contributions in this paper. (1) We formulate the problem of Optimal Mobile Relay Configuration (OMRC) in data-intensive WSNs. Our objective of energy conservation is holistic in that the total energy consumed by both mobility of relays and wireless transmissions is minimized, which is in contrast to existing mobility approaches that only minimize the transmission energy consumption. The tradeoff in energy consumption between mobility and transmission is exploited by configuring the positions of mobile relays. (2) We study the effect of the initial configuration on the final result. We compare different initial tree building strategies and propose an optimal tree construction strategy for static nodes with no mobility. (3) We develop two algorithms that iteratively refine the configuration of mobile relays. The first improves the tree topology by adding new nodes. It is not guaranteed to find the optimal topology. The second improves the routing tree by relocating nodes without changing the tree topology. It converges to the optimal node positions for the given topology. Our algorithms have efficient distributed implementations that require only limited, localized synchronization. (4) We conduct extensive simulations based on realistic energy models obtained from existing mobile and static sensor platforms. Our results show that our algorithms can reduce energy consumption by up to 45% compared to the best existing solutions.

II. ALGORITHM

Our solutions to the three subproblems assume a centralized scheme in which one node has full knowledge of the network including which nodes are on the transmission paths to each source, the original physical position 표푗 of each node 푠푗 , and the total message length 푚 to be sent from each source. Whereas the centralized algorithm computes the optimal static tree and the optimal position of each node in the restructured tree, it incurs prohibitively high overhead in large-scale networks. We now present a distributed and decentralized version of each of our algorithms.We modify the first phase, the tree construction phase, to use a fully distributed routing algorithm. We pick greedy geographic routing since it does not require global knowledge of the network although any algorithm with such property can be used. After a routing tree is constructed, the tree restructuring phase begins. Network nodes outside the tree broadcast their availability (as NODE IN RANGE message) to tree nodes within their communication range and wait for responses for a period of time . Similarly, tree nodes enter a listening phase . During that period, tree nodes receive messages of different types (NODE IN RANGE, OFFER, . . .). Each tree node that receives one or more NODE IN RANGE message responds to the sender by giving it its location information and its parent's location information. Each non-tree node that receives location information from a tree node during computes the reduction in cost if it joins the tree as parent of and adds to a list of candidates. At the end of , the non-tree node selects from the candidate list the node that results in the largest reduction and sends it an offer. It also sends the tree node with the second largest reduction a POTENTIAL OFFER message. At the end of , each tree node that collected one or more offers and potential offers operates as follows. If 's best potential offer exceeds its best offer by a certain threshold and has not already waited rounds, waits rather than accepting its best offer in the hopes that its best potential offer will become an actual offer in another round. By waiting, it sends everyone a REJECT OFFER, restarts the listening phase, and records that it has waited another round. Otherwise, accepts its best offer by responding to its sender with an ACCEPT OFFER message and to the remaining nodes with a REJECT OFFER message. It then updates its parent in the tree to , resets and starts the listening phase again. A non-tree node that receives an ACCEPT OFFER message moves to the corresponding local optimal location and joins the tree. It becomes a tree node and enters the listening phase. On the other hand, if does not receive an ACCEPT OFFER, repeats the process by broadcasting its availability again and resetting . We note that values in 's candidate list cannot be reused to extend offers to old tree nodes since those tree nodes could have a new parent at this point in time. When the second phase ends, any remaining non-tree nodes stop processing whereas tree nodes enter the tree optimization phase the algorithm executed by each tree node. Giving tree nodes the ability to wait before accepting an offer increases the chances of using mobile relay nodes to their full potential. For example, consider a scenario where several mobile relay nodes can greatly improve the capacities of several tree links but are all closest to one specific link. They will all send offers to the same tree node while the rest of the tree nodes in their proximity will receive modest offers from more distant mobile nodes. If the tree nodes cannot wait, they will be forced to accept a modest offer and the mobile nodes will either remain unused or they will help more distant tree nodes where their impact is reduced since they use up more energy to get to their new location.

```
procedure TREERUN
  ▷ Phase I: Run routing algorithm to discover parent and children
  (parent, children) ← DISTRIBUTEDROUTING;
  ▷ Phase II: Start tree restructuring phase
  offers ← ∅; potentialoffers ← ∅; wait ← 0;
  repeat
    ▷ Listen to incoming offers or changes in structure
    repeat
      RECEIVE(sender, type, data);
      if type = MOBILE_IN_RANGE then
        SEND(sender, META_DATA, info);
      else if type = OFFER then
        offers.add(data);
      else if type = POTENTIAL_OFFER then
        potentialloffers.add(data);
      else if type = UPDATE_STRUCTURE then
        children.add(data.newchild);
        children.remove(data.oldchild);
      end if
    until timeout
    ▷ Process offers and pick best
    if offers ≠ ∅ then
      bestOffer ← offers.dequeue();
      bestPotentialOffer ← potentialoffers.dequeue();
      if bestPotentialOffer > bestOffer*B and wait < R then
        SEND(bestOffer.sender, REJECT_OFFER);
        wait++;
      else
        SEND(bestOffer.sender, ACCEPT_OFFER);
        parent ← bestOffer.sender;
      end if
    end if
    while offers ≠ ∅ do
      offer ← candidates.dequeue();
      SEND(offer.sender, REJECT_OFFER);
    end while
  until timeout
  ▷ Phase III: Iterate moving to optimal local positions
  converged ← false;
  while not converged do
    (u, converged) ← LOCALPOS(o, parent, children);
    ▷ Exchange location info with parent and children
    SEND(parent, NEW_LOCATION, u);
    for all child ∈ children do
      SEND(child, NEW_LOCATION, u);
    end for
    RECEIVE(parent, NEW_LOCATION, parent.u);
    for all child ∈ children do
      RECEIVE(child, NEW_LOCATION, child.u);
    end for
  end while
end procedure
```

III. CONCLUSION

In this paper, we tend to plan a holistic approach to minimize the full energy consumed by each mobility of relays and wireless transmissions. Most previous work neglected the energy consumed by moving mobile relays. When we model each sources of energy consumption, the optimum position of a node that receives data from one or multiple neighbors and transmits it to a single parent is not the center of its neighbors; instead, it converges to this position because the amount of data transmitted goes to infinity. Ideally, we tend to begin with the optimum initial routing tree in static surroundings where no nodes will move. However, our approachcan work with less optimum initial configurations together withone generated using only local data such as greedy geographic routing. Our approach improves the initial configuration exploitation 2 iterative schemes. The primary inserts new nodes into the tree. The second computes the optimum positions of relay nodes in the tree given a fixed topology. This rule is appropriate for a range of data-intensive wireless sensor networks. It allows some nodes to move while others don't as a result of any local improvement for a given mobile relay may be a global improvement. This allows us to potentially extend our approach to handle extra constraints on individual nodes such as low energy levels or quality restrictions due to application requirements. Our approach is implemented in a centralized or distributed fashion. Our simulations show it well reduces the energy consumption by up to 45th.

IV. REFERENCES

[1]. R. Szewczyk, A. Mainwaring, J. Polastre, J. Anderson, and D. Culler, "An analysis of a large scale habitat monitoring application," in SenSys, 2004.

[2]. L. Luo, Q. Cao, C. Huang, T. F. Abdelzaher, J. A. Stankovic, and M. Ward, "Enviromic: Towards cooperative storage and retrieval in audio sensor networks," in ICDCS, 2007, p. 34.

[3]. D. Ganesan, B. Greenstein, D. Perelyubskiy, D. Estrin, and J. Heidemann, "An evaluation of multi-resolution storage for sensor networks," in SenSys, 2003.

[4]. S. R. Gandham, M. Dawande, R. Prakash, and S. Venkatesan, "Energy efficient schemes for wireless sensor networks with multiple mobile base stations," in Globecom, 2003.

[5]. J. Luo and J.-P. Hubaux, "Joint mobility and routing for lifetime elongation in wireless sensor networks," in INFOCOM, 2005.

[6]. Z. M. Wang, S. Basagni, E. Melachrinoudis, and C. Petrioli, "Exploiting sink mobility for maximizing sensor networks lifetime," in HICSS, 2005.
[7]. A. Kansal, D. D. Jea, D. Estrin, and M. B. Srivastava, "Controllably mobile infrastructure for low energy embedded networks," IEEE Transactions on Mobile Computing, vol. 5, pp. 958– 973, 2006.
[8]. G. Xing, T. Wang, W. Jia, and M. Li, "Rendezvous design algorithms for wireless sensor networks with a mobile base station," in MobiHoc, 2008, pp. 231–240.
[9]. D. Jea, A. A. Somasundara, and M. B. Srivastava, "Multiple controlled mobile elements (data mules) for data collection in sensor networks," in DCOSS, 2005.
[10]. R. Shah, S. Roy, S. Jain, and W. Brunette, "Data mules: Modeling a three-tier architecture for sparse sensor networks," in IEEE SNPA Workshop, 2003.
[11]. S. Jain, R. Shah, W. Brunette, G. Borriello, and S. Roy, "Exploiting mobility for energy efficient data collection in wireless sensor networks," MONET, vol. 11, pp. 327–339, 2006.
[12]. W. Wang, V. Srinivasan, and K.-C. Chua, "Using mobile relays to prolong the lifetime of wireless sensor networks," in MobiCom, 2005.
[13]. D. K. Goldenberg, J. Lin, and A. S. Morse, "Towards mobility as a network control primitive," in MobiHoc, 2004, pp. 163–174.
[14]. A. A. Somasundara, A. Ramamoorthy, and M. B. Srivastava, "Mobile element scheduling with dynamic deadlines," IEEE Transactions on Mobile Computing, vol. 6, pp. 395–410, 2007.
[15]. Y. Gu, D. Bozdag, and E. Ekici, "Mobile element based differentiated message delivery in wireless sensor networks," in WoWMoM, 2006.
[16]. K. Dantu, M. Rahimi, H. Shah, S. Babel, A. Dhariwal, and G. S. Sukhatme, "Robomote: enabling mobility in sensor networks," in IPSN, 2005.
[17]. http://www.k-team.com/robots/khepera/index.html. 18J.-H. Kim, D.-H. Kim, Y.-J. Kim, and K.-T. Seow, Soccer Robotics. Springer, 2004