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A Probabilistic Routing Protocol with Maximum Delivery Rate in Wireless Heterogeneous Sensor Networks

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Abstract: *Wireless sensor links are often asymmetric due to heterogeneity of transmission power of devices, non-uniform environmental noise, and other signal propagation phenomenon's. Unfortunately, routing protocols for wireless sensor networks typically work well only in bidirectional networks. This project first presents a simulation study quantifying the impact of asymmetric links on network connectivity and routing performance. It then presents a framework called Bidirectional Routing Abstraction (BRA) that provides a bidirectional abstraction of the asymmetric network to the routing protocols. These routing protocols are helpful for extensive data transmission over wireless sensor network. It Improved connectivity by taking advantage of the unidirectional links, reverse route forwarding of control packets to enable off-the-shelf routing protocols, and detecting packet loss on unidirectional links. In this paper we are formulating that Bidirectional Routing Abstraction based protocols and simulation of these routing protocols.*

Keywords: *Bidirectional Routing Abstraction, Mobility Prediction, Geographic routing, Wireless sensor networks, Probabilistic routing protocol*

1. Introduction

Recent advances in wireless communication technologies and electronics have paved the way for developing low-cost wireless sensor networks (WSNs). WSNs have a wide range of military and civilian applications such as target tracking, environment monitoring, and intelligent homes disaster rescuing, and self-touring systems.

In WSNs, sensors gather information, such as temperature, humidity, light, etc. from the environment, process them locally, and then communicate with others or send the information to the sink for further processing. In various applications, different sensors may be used. Therefore, sensors may not have the same sensing capability and transmission range. Here we just take their diverse transmission ranges brought about by their heterogeneity into account. The WSN formed by heterogeneous sensors is referred to as the wireless heterogeneous sensor network (WHSN).

After the heterogeneous sensors have completed data collection, one major issue is how to route data to the destination (mostly it is the sink in WSNs) efficiently. Since these heterogeneous sensors have different transmission ranges, there will be asymmetric links in the communication graph because if node A can reach node B, but B cannot reach A, then tshe directed link from A to B is asymmetric. Thus, the common undirected graph generated after abstraction is turned into a directed graph, which makes the off-the-shelf routing protocols for general WSNs not applicable or work with higher overhead. So the routing protocols for WHSNs need to be redesigned and should meet the following requirements: (1) Reliable with assured delivery rate and low overhead, which are important for mission critical applications; (2) totally distributed and use only local information for scalability and robustness purposes.

Probabilistic routing protocol for Heterogeneous sensor networks, which can handle asymmetry links well and work in a distributed manner using local information with low overhead and assured delivery rate.

It has two parts: the preparation part which includes identifying neighbor relationships and finding a reverse path for an asymmetric link, and the routing part which includes selecting nodes, forwarding messages and sending acknowledgement.

Other important issues in WSNs such as energy consumption and hot-spot are not discussed since the focus here is the usage of asymmetric communication links and assured delivery rate in WHSNs. Previous works have extensively studied the energy consumption and hot-spot problems in sensor networks. So we want to address the issues that are neglected by them.

The Internet address forwarding algorithm is a specific implementation of routing for IP networks and gives a more directed approach in forwarding datagram's over a network. In order to achieve a successful transfer of data the algorithm uses a routing table to select a next-hop router as the next destination for a datagram. The IP address that is selected is known as the next-hop address.

1.1 Related Work

The ProHet protocol, which has two parts: the preparation part which includes identifying neighbor relationships and finding a reverse path for an asymmetric link, and the routing part which includes selecting nodes, forwarding messages and sending acknowledgement. The details are as follows:

First each node needs to identify its In-out-neighbors and In-neighbors (if there is any) by sending each other "Hello" messages (see algorithm Identifying Neighbor Relationships).

The identification of a node's Out-neighbors needs to wait until a reverse path is found and two-hop neighborhood information model is used. Information in one-hop or more than two-hop neighborhood can also be used, we will justify why we adopt two-hop information in later simulations. Our basic idea is to choose a subset of two-hop receivers of a node which have high delivery probabilities as forwarding nodes, and choose the one-hop receivers that can cover the selected two-hop receivers to relay the message.

The ProHet protocol contains three phases/algorithms: Selecting Nodes, Forwarding Messages, and Sending Acknowledgement. The Selecting Nodes algorithm chooses the subset of two-hop receivers and the corresponding one-hop receivers; the Forwarding Message algorithm forwards messages to the destination; and the Sending Acknowledgement algorithm sends back an "Acknowledgement" for a successful transmission and updates the delivery probabilities of forwarding nodes.

2. Existing System Models

In the Existing system, a novel beaconing strategy for routing algorithm called Selecting Nodes, Forwarding Messages and Sending Acknowledgement.

2.1 Network Model

We consider a single channel multi-hop infrastructure mesh network. Infrastructure WMNs are commonly used in community and neighborhood networks. In this type of network, mesh nodes are statically deployed, e.g., on the roof of houses in a neighborhood, and communicate with one another to form a multi-hop wireless backbone. One or more mesh nodes are connected to the Internet and serve as gateways to provide Internet connectivity for the entire mesh network. The mesh nodes can aggregate traffic from its end clients and forward the traffic to and from the Internet.

2.2 Selecting Nodes Model

The nature of wireless communication is broadcasting. So the easiest and most reliable way to transmit a packet to the sink is flooding. However, flooding will cause serious communication overhead known as "flooding storm". In order to reduce overhead and achieve the assured delivery rate, we only choose a number of forwarding nodes based on historical statistics. Comparing to conventional routing protocols in WSNs, which ignore the existence of large numbers of asymmetric links, ProHet takes advantage of asymmetric links to route packets with high delivery ratio assurance.

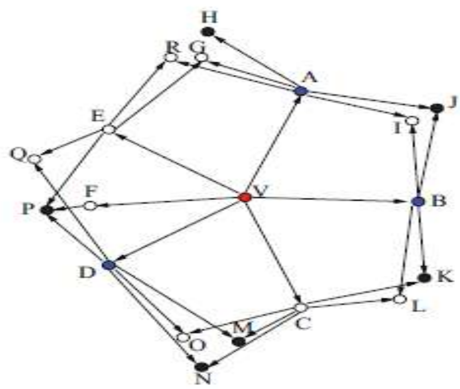

Figure1. *An Example for Selecting Nodes Algorithm*

Suppose V (marked in red) has a pocket to send. We use the algorithm to select v's two-hop (will be marked in black) and one-hop receivers (will be marked in blue). If there is a directional link A->B or a bidirectional link A<-> B, it means A covers B, First, suppose six of V's two-hop receivers H, J, K, M, N, P are selected into $SN_2(v)$

because their delivery probabilities are no less than P_{th} given *p*. Next, we select the minimal set of V's one-hop receivers to cover all of the nodes in SN_2 (v) as follows: Node H is only covered by one-hop receiver A. So, A is selected into SN_1 (v). Node A covers J. Next the one-hop receiver that covers the most of the remaining nodes in SN_2 (v) is node D. So, it is also put into SN_1 (v). Now, the only node left in SN_2 (v) is K. It is covered by both B and C. Since neither B nor C covers any other remaining node in SN_2 (v), we can choose either one of them to cover K. Suppose we choose B, so finally SN_1 (v) = { A, B, D }.

In ProHet, two-hop neighbourhood information model is used. Information in one-hop or more than two-hop neighbourhood can also be used, we will justify why we adopt two-hop information in later simulations. Our basic idea is to choose a subset of two-hop receivers of a node which have high delivery probabilities as forwarding nodes, and choose the one-hop receivers that can cover the selected two-hop receivers to relay the message.

The ProHet protocol contains three phases/algorithms: Selecting Nodes, Forwarding Messages, and Sending Acknowledgement. The Selecting Nodes algorithm chooses the subset of two-hop receivers and the corresponding one-hop receivers; the Forwarding Message algorithm forwards messages to the destination; and the Sending Acknowledgement algorithm sends back an "Acknowledgement" for a successful transmission and updates the delivery probabilities of forwarding nodes.

2.3 Proposed System

The Internet address forwarding algorithm is a specific implementation of routing for IP networks and gives a more directed approach in forwarding datagram's over a network. In order to achieve a successful transfer of data the algorithm uses a routing table to select a next-hop router as the next destination for a datagram. The IP address that is selected is known as the next- hop address when several destinations are matching, the route with the longest subnet mask is chosen (the most specific one). There can be only one default.

Given a destination IP address, D, and network prefix, N:

if (N matches a directly connected network address)

Deliver datagram to D over that network link;

else if (The routing table contains a route for N)

Send datagram to the next-hop address listed in the routing table;

else if (There exists a default route)

Send datagram to the default route;

else

Send a forwarding error message to the originator;

delivery

3. Conclusion

In this paper, we have identified the efficient way of routing that can reduce the cost can improve the performance improves reliability and scalability by choosing forwarders based on historical statistics using local information less packet drop or loss and high packet delivery rate and improved local routing at the neighbour's.

References

[1] S. Ben Alla, A. Ezzati, A. BeniHssane, and M. L. Hasnaoui, "Hierarchical adaptive balanced energy efficient routing protocol (HABRP) for heterogeneous wireless sensor networks," 2011 International Conf.MultimediaComput. Syst.

[2] I. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayicrci, "A survey on sensor networks," IEEE Commun. Mag., vol. 40, no. 8, pp. 102–116, 2002.

[3] B. Deb, S. Bhatnagar, and B. Nath, "Information assurance in sensornetworks," in Proc. 2003 ACM International Conf. Wireless Sensor Netw. Appl., pp. 160–168.

[4] D. L. Guidoni, A. Boukerche, L. A. Villas, F. S. H. Souza, R. A. F. Mini, and A. A. F. Loureiro, "A framework based on small world features to design HSNS topologies with QoS," 2012 IEEESymp. Comput.Commun.

[5] B. Karp and H. T. Kung, "GPSR: greedy perimeter stateless routing for wireless networks," in Proc. 2000 International Conf. Mobile Comput. Netw., pp. 243–254.

[6] L. Lazos, R. Poovendran, and J. A. Ritcey, "Probabilistic detection of mobile targets in heterogeneous sensor networks," in Proc. 2007 International Conf. Inf. Process. Sensor Netw., pp. 519–528.

[7] A. Manjeshware and D. P. Agrawal, “TEEN: a routing protocol for enhanced efficiency in wireless sensor networks,” in Proc. 2001 International Parallel Distributed Process. Symp., pp. 2009–2015.

[8] J. Newsome and D. X. Song, “GEM: graph embedding for routing and data-centric storage in sensor networks without geographic information,”in Proc. 2003 International Conf. Embedded Netw. Sensor Syst., pp. 76–88.

[9] V. Ramasubramanian and D. Moss´e, “BRA: a bidirectional routing abstraction for asymmetric mobile ad hoc networks,” IEEE/ACM Trans.Netw., vol. 16, no. 1, pp. 116–129, 2008.

[10] A. Rao, C. H. Papadimitrious, S. Shenker, and I. Stoica, “Geographic routing without location information,” in Proc. 2003 Annual International Conf. Mobile Comput. Netw.