Improving End To End Reliability And Latency Through Eqgor In Wsn

1Dr. R.Saminathan and 2S. Indhumathi

1Assistant Professor, Annamalai University, Chidambaram, Tamil Nada, INDIA.
2PG Student, Annamalai University, Chidambaram, Tamil Nada, INDIA.

ARTICLE INFO
Article history: Received 12 October 2014 Received in revised form 26 December 2014 Accepted 1 January 2015 Available online 17 February 2015

ABSTRACT
A Routing mechanism is proposed for wireless sensor networks to deliver the data packets in a reliable and timely manner. Most existing routing protocol exploits the multipath routing to guarantee both reliability and delay QoS constraints in WSNs. However, the multipath routing approach suffers from an energy cost and computation delay at each hop. The main objective of the project is to maximize the network lifetime and improve the Qos routing for both reliability and delay in WSNs. To achieve the QoS routing by this project proposes an opportunistic data transfer at per hop communication. This scheme is called Efficient QoS-aware GOR (EQGOR) protocol. It uses only hop requirements to acquire and maintain at a low overhead cost. If the hop requirement can be achieved at each hop, the end-to-end QoS requirement can also be met with a higher probability. This project contributes the mechanism is applicable for mobile sensor network. Performance of the proposed technique is conducted using NS2 to evaluate delay, throughput and energy efficiency.

© 2015 AENSJ Publisher All rights reserved.
To Cite This Article: Dr. R. Saminathan, S. Indhumathi., Improving end to end reliability and latency EQGOR in WSN. Adv. in Nat. Appl. Sci., 9(6): 701-707, 2015

INTRODUCTION

Wireless Sensor Networks (WSNs) have been designed and developed for a wide variety of applications, such as environment or habitat monitoring, smart battlefield, home automation, and traffic control etc. A sensor network consists of spatially distributed autonomous sensor nodes, to cooperatively monitor physical or environmental conditions. These sensor nodes usually operate on limited non-rechargeable battery power, and are expected to last over several months or years. Therefore, a major concern is to maximize the network lifetime, i.e., to improve the energy efficiency for WSNs. Since the sensor node normally has limited processing speed and memory space, it is also required that the algorithm running on sensor devices has a low computational cost. Providing reliable and timely communication in WSNs is a challenging problem. This is because; the varying wireless channel conditions and sensor node failures may cause network topology and connectivity changing over time. Under such conditions, to forward a packet reliably at each hop, it may need multiple retransmissions, resulting in undesirable long delay as well as waste of energy. Therefore, many existing works have been proposed to improve the routing reliability and latency in WSNs with unreliable links.

QoS (Quality of Service) provisioning in network level refers to its ability to deliver a guaranteed level of service to applications. The QoS requirements can be specified in the form of routing performance metrics, such as delay, throughput or jitter. For periodic environment reporting applications, delivery delay is not critically significant as long as the sensory data arrives at the sink node. While for other mission-critical applications, e.g., target tracking and emergency alarm, reliable and timely delivery of sensory data is crucial in the success of the mission. In this case, QoS routing for both the end to end reliability and delay guarantees becomes one of the important research issues in WSNs (Xia, F., 2008). However, due to the seemingly contradictory multiple constraints (Kuipers, F. and P. Van Mieghem., 2005) (e.g., reliability, latency and energy efficiency) and dynamics in WSNs, only soft QoS provisioning is attainable. The soft QoS refers to meeting the QoS requirements with probability, it is also considered to be “good enough” regardless of the fact that it is not possible to guarantee a particular level of service (Cheng, L., J. Cao., C. Chen., J. Ma., and S. Das., 2010). QoS provisioning in this work means the soft QoS provisioning unless otherwise specified (Biswas, S., and R. Morris., 2005).

Corresponding Author: Dr.R.Saminathan, Department of Computer Science and Engineering, Annamalai University, Annamalai Nagar – 608 002, Tamil Nadu, India
E-mail: samiaucse@yahoo.com, Mobile:9443435653
Related Works:
Jianwei Niu et al., proposed R3E to enhance existing reactive routing protocols to provide reliable and energy-efficient packet delivery against the unreliable wireless links by utilizing the local path diversity. Specifically, a biased backoff scheme is introduced during the route discovery phase to find a robust guide path, which can provide more cooperative forwarding opportunities.

Saeed Rasouli Heikalabad et al., proposed a new multi path routing algorithm is proposed for real time applications in wireless sensor networks namely QEMPAR which is QoS aware and can increase the network lifetime. QEMPAR protocol uses four main metrics of QoS with special relation in path discovery mechanism.

Young-Jin Kim et al., proposed a Geographic routing(Karp, B., and H. T. Kung., 2000) has been widely hailed as the most promising approach to generally scalable wireless routing. However, the correctness of all currently proposed geographic routing algorithms relies on idealized assumptions about radios and their resulting connectivity graphs.

Michele Zorzi et al., proposed Geographic Random Forwarding(Zorzi, M., and R, Rao 2003). It is based on the assumption that sensor nodes have a means to determine their location and that the positions of the final destination and of the transmitting node are explicitly included in each message. In this scheme, a node which hears a message is able to assess its own priority in acting as a relay for that message. All nodes who received a message may volunteer to act as relays and do so according to their own priority.

T Shiva Prakash et al., proposed a Link Reliability based Two-Hop Routing protocol (Teerawat Issariyakul, Ekram Hossain, 2009) for wireless sensor networks (WSNs). The protocol achieves to reduce packet deadline miss ratio while considering link reliability, two-hop velocity and power efficiency and utilizes memory and computational effective methods for estimating the link metrics. This system explores the idea of incorporating QoS parameters in making routing decisions i.e., (i) reliability (ii) latency and (iii) energy efficiency. Traffic should be delivered with reliability and within a deadline. The proposed protocol is devised using a modular design, separate modules are dedicated to each QoS requirement.

Paolo Casari et al., proposed a Geographic forwarding in Wireless Sensor Networks (WSN). It has long suffered from the problem of bypassing “dead ends” (Casari, P., M, Nati., C, Petrioli and M, Zorzi , 2007). In this paper, we approach the problem of dealing with dead ends in a novel way that allows us to guarantee the delivery of packets to the sink without requiring the overhead and the inaccuracies incurred by “planar” methods.

Methodology:
In this paper, The proposed protocol - Efficient QoS-aware GOR (EQGOR) algorithm is to ensure better performance of the network. The proposed QoS requirement is to guarantee both reliability and delay QoS constraints in WSNs.

The proposed system is divided into five modules.
2.1 Greedy Perimeter Stateless Routing (GPSR)
2.2 EQGOR: Selection of Forwarding Candidates
2.3 EQGOR: Selection of next hop by Prioritization of Forwarding Candidates
2.4 Mobility based Forwarding node selection
2.5 Performance Evaluation

![Fig. 1: GPSR data packet transfer](image-url)
Fig. 1 shows that GPSR is a protocol that takes the input as a data from source and transfers the data packet to the EQGOR. It produces the output in transmission through least distance next hop. EQGOR selects the neighbour node as a source and also as a forwarding candidate by the transmission range of EQGOR selection of forwarding candidates. Then it transfers the data packet to the next hop which is examined by the EQGOR selection of next hop by prioritization of forwarding candidates in priority manner. If the next hop is in mobility then it remove that next hop and select the other neighbour node as a next hop by the mobility based forwarding node selection. After the selection of next hop without fail, it transfers the data packet to the destination node by the use of data transmission. In performance evaluation, the data transmission from source to destination is further divided into end-to-end delay, throughput and energy consumption.

2.1 Greedy Perimeter Stateless Routing (GPSR):

Greedy Perimeter Stateless Routing (GPSR), a novel routing protocol for wireless datagram networks that uses the positions of routers and a packet’s destination to make packet forwarding decisions (Karp, B., and H. T. Kung., 2000). GPSR makes greedy forwarding decisions using only information about a router’s immediate neighbors in the network topology. When a packet reaches a region where greedy forwarding is impossible, the algorithm recovers by routing around the perimeter of the region. By keeping state only about the local topology, GPSR scales better in per-router state than shortest-path and ad-hoc routing protocols as the number of network destinations increases. Under mobility’s frequent topology changes, GPSR can use local topology information to find correct new routes quickly. Under GPSR, packets are marked by their originator with their destinations’ locations. As a result, a forwarding node can make a locally optimal, greedy choice in choosing a packet’s next hop. Specifically, if a node knows its radio neighbors positions, the locally optimal choice of next hop is the neighbor geographically closest to the packet’s destination.

2.2 Selection Of Forwarding Candidates:

Only the nodes located in the forwarding area would get the chance to be backup nodes. The forwarding area is determined by the sender and the next hop node. A node located in the forwarding area satisfies the following two conditions: i) It makes positive progress toward the destination; and ii) Its distance to the next hop node should not exceed half of the transmission range of a wireless node (i.e., R=2) so that ideally all the forwarding candidates can hear from one another. Forwarding candidate should achieve QoS requirements such as reliability and delay.

2.3 Selection of Nexthop By prioritization of Forwarding Candidates:

The priority of a forwarding candidate is decided by its packet speed. Packet speed is based on single hop packet progress. Single hop packet progress is based on the difference between the distance to the destination from forwarding candidate and distance to the source node from forwarding candidate. If the difference is less then it will get higher priority.
Higher priority forwarding candidate is selected as next hop and data is transmitted through it. EQGOR selects and prioritizes the forwarding candidate according to certain QoS requirements that are expressed in terms of reliability and delay of single-hop packet progress and achieves the soft QoS provisioning. If a packet is successfully received by some of the selected nodes, only the highest priority node among them is chosen as the next-hop forwarder is shown in fig. 3. Subsequently, this forwarding candidate becomes the actual next-hop sender in an opportunistic manner. The forwarding process repeats until the packet reaches the sink node.

2.4 Mobility Based Forwarding Node Selection:

Proposed solution is applied only for static sensor network which is not applicable for mobile sensor network. Even though Distance based selection of next hop and forwarding nodes selection yields less delay, it has high probability of link disconnection that leads to packet loss. To overcome this problem stability based next hop and forwarding nodes selection is contributed in which node having high stability (low mobility) is selected for forwarding candidates and next hop is shown in fig.4. It ensures the reliability of data delivery under the mobile nature of wireless sensor network and reducing the packet loss and increasing the throughput.

2.5 Performance Evaluation:

Energy Consumption:

It is the amount of energy consumed by the sensors for the data transmission over the network

Energy Consumption = Sum of energy consumed by each sensor

End-to-End Delay:

End-to-End delay is the time taken for a packet to reach the destination from the source node.

End to End delay(s) = \( \frac{\sum \text{Delay for each data packet}}{\text{Total number of delivered data packet}} \)

Throughput:

Throughput is the amount of data successfully received at the destination

Throughput(bits/s) = \( \frac{\text{Received Data}}{\text{Duration of Transmission}} \)

RESULTS AND DISCUSSION

For evaluation of the system, We have chosen simulation as a technique. NS-2 (Teerawat Issariyakul, Ekram Hossain, 2009) is a simulation tool built by South-California University and regenerated by ISI and some others. The NS2 was built using three languages: TCL script, C++, C. Here, TCL used for control, C++ for data and most of the header files were created by C. In NS2 scripting, we can simulate a wired, wireless and satellite...
networks using NS script. And the NS scripted files are saved with the extension of *.tcl (TCL: Tool Command Language).

A Wireless Sensor Network is communicated by sending and receiving a data from each node. Node is used to transmit the data. During transmission both nodes are selected as a source node which is a sender and a destination node which is a receiver. In EQGOR protocol, the source node selects both nodes as a next hop and backup node within the transmission range of 250. In the both selected next hop and backup node which node is nearer to the destination node is selected as a new source node. Again the new source node selects the next hop and the backup node within the transmission range. This routing process continues till it reaches the destination. EQGOR protocol, reduce the energy cost, delivery delay and transmission failures. The performance of existing and proposed algorithm is compared in terms of throughput and delay.

The purpose of our simulation is to improve the Lifetime of the Network and improve the Qos routing for both reliability and delay in WSNs.

**Fig. 5: GPSR Architecture**

Source 0 finds the next hop and back up nodes is shown in fig. 5. Source sends data to both next hop and backup nodes. Node 11 is next hop node and node 2 is back up node.

**Fig. 6: Selecting next hop and backup nodes by EQGOR**

Fig. 6 shows the routing process, this continues till it reaches the destination.
Fig. 7: No. of Nodes vs Throughput

Fig. 7 shows that x-axis represents the nodes involved during transmission and y-axis represents the throughput. Red line plot denotes the throughput which is the amount of data successfully received at the destination. When the number of nodes is increased throughput is maintained in same range and decreases for large number of nodes.

Fig. 8: No. of Nodes vs Delay

Fig. 8 shows that x-axis represents the nodes involved during transmission and y-axis represents the delay of nodes. Red line plot denotes the delay which is the time taken for a packet to reach the destination from the source node. When the number of nodes is increased delay is increased.

Conclusion:

Proposed protocol exploits the geographic opportunistic routing (GOR) for multiconstrained QoS provisioning in WSNs, which is more suitable than the multipath routing approach. Existing GOR protocol cannot be directly applied to the QoS provisioning in WSNs. Because the computations delay of a GOR protocol should be also considered in WSNs. The problem of efficient GOR for multiconstrained QoS provisioning (EGQP) is solved in WSNs. The EGQP problem is formulated as a multiobjective multiconstraint optimization problem and the properties of EGQP’s multiple objectives are analyzed.

Based on the analysis and observations, an Efficient QoS-aware GOR (EQGOR) algorithm is proposed for QoS provisioning in WSNs. EQGOR achieves a good balance between these multiple objectives, and has a very low time complexity, which is specifically tailored for WSNs considering the resource limitation of sensor devices. Extensive evaluations are conducted to study the performance of the proposed EQGOR. Evaluation results demonstrated its efficacy for QoS provisioning in WSNs. By contributing mobility based forwarding node selection, proposed protocol is strengthened to apply in mobile sensor network also.
REFERENCES


Teerawat Issariyakul, Ekram Hossain, 2009. Introduction to Network Simulator NS2, Springer. (mention the year)
