# QoS support for data transportation in Wireless Sensor Networks

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The rapid development in low power wireless communication, microsensor, and small-scale energy supplies has made wireless sensor networks (WSNs) a new technological vision. It has become one of the most important wireless networks for ubiquitous society which has many potential applications such as environmental monitoring, industrial control, home automation and security, health monitoring and traffic monitoring. Although a lot of research has been done on some important aspects of WSNs such as architecture and protocol design, energy conservation, and locationing, supporting Quality of Service (QoS) in WSNs is still a largely unexplored research field. Thus, how to provide QoS support in WSNs has become a hot issue in recent research.

Unlike traditional networks and wireless ad hoc networks, WSNs have many unique characteristics such as extremely resource-constrained sensors, large-scale random deployment and novel data-centric communication protocols. All these have posed unprecedented changes in the area of QoS support in WSNs. In WSNs, the main function is to deliver sensor data to the central control node (also called sink). Therefore, the QoS parameters should be desired for the measurement of the delivery of the sensor data in an efficient and effective way. It is well known that wireless communication is error-prone. Packets may be lost during transmission. To ensure high

packet delivery reliability, lost data must be retransmitted. However, frequent retransmission may incur significant delay for packet transmission. Therefore, reliability and delay have become the most important factors in designing the QoS support in WSNs. Although, a lot of work has been done to solve this problem. Most of them focus on only one property, i.e., either reliability of delay. But for many applications, reliability and delay are both important in fact. The problem how to provide reliable packet delivery with short delay has become an important problem that needed to be solved in wireless sensor networks.

In our research, we consider both reliability and latency factors when designing our routing protocols. Our objective is to provide a good tradeoff between these two metrics. As we all know that a protocol that can provide good QoS service should satisfy the following conditions.

- Each packet can be delivered to the sink with short delay.
- Each packet can be delivered to the sink with high reliability.
- Each packet can be delivered to the sink with samll hop counts.

Based on these conditions, we design a new algorithm – L-R algorithm which considers both factors for making routing decisions. In WSNs, sensor node may become dead due to the exhaustion of energy or the breakdown of some equipment, which may lead to some links fail. To solve this problem, we propose a new algorithm which using multi-path to rebuild the links that can provide equivalent service.

We have conducted extensive simulations to evaluate our algorithms. We have compared the performance of our algorithm with those of the minimum latency path algorithm and the maximum reliability path algorithm. The simulation results show that our algorithm has provide a good tradeoff between reliability and latency. It can always find a path that has a higher end-to-end reliability than the minimum latency path algorithm while has a shorter delay than the maximum reliability algorithm. We also give a discussion on the extension of our algorithm and implementation in real sensor networks.

Wireless sensor networks are important networks for ubiquitous society. But the existing researches about QoS support for data transportation are not enough and efficient in WSNs. In this paper, we consider both reliabil-

ity and latency and propose an algorithm which can provide a good tradeoff between reliability and latency. We have evaluated our algorithm through simulations and the simulation results demonstrate that our algorithm has a good performance.