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Editorial

QoS-Aware Data Collection in Wireless Sensor Networks

Anfeng Liu,[1] Lin X. Cai,[2] Tom H. Luan,[3] and Ajith Ranabahu[4]

[1]*School of Information Science and Engineering, Central South University, Changsha 410083, China*
[2]*Illinois Institute of Technology, Chicago, IL 60616, USA*
[3]*Deakin University, Melbourne, VIC 3125 360, Australia*
[4]*Wright State University, Dayton, OH 45435, USA*

Correspondence should be addressed to Anfeng Liu; afengliu@mail.csu.edu.cn

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Wireless Sensor Networks (WSNs) have been recognized as a key technology to enable data collections in unattended environment for a wide range of applications, such as habitat monitoring, surveillance, and military tracking. WSNs usually consist of a large number of low-cost and low-power sensor nodes, which collaborate with each other to collect data and disseminate them to the sink through an established routing path. The data gathering architecture, principle, and scheme constitute the infrastructure of WSNs. Due to the limited computation capability and battery capacity of sensor nodes and unreliable wireless connections, it is fundamentally challenging to ensure quality of service (QoS) data gathering for applications. With different deployment environment and applications on top, different QoS metrics may apply in different aspects, such as energy efficiency, network lifetime, delay, reliability, convergecast time, security, and privacy aggregation.

We have received many high-quality submissions, and six papers have been selected for publication after a rigorous review process due to the space limit. The purpose of this special issue is to publish high-quality research papers as well as review articles addressing recent advances in QoS-aware data collection in WSNs. The topics included in this special issue are mainly divided into four major categories, including QoS-aware data gathering, multichannel scheduling for data gathering, data gathering and scheduling on aggregation information, and data collection schemes with integrated consideration of WSNs performances.

A set of three papers studies novel design methods of QoS-aware data gathering for WSNs, aiming to minimize the delay and/or maximize the energy efficiency. In paper "Latency Improvement Strategies for Reliability-Aware Scheduling in Industrial Wireless Sensor Networks" by F. Dobslaw et al., the authors proposed a novel strategy called SchedEx for the end-to-end reliability-aware scheduling in industrial Wireless Sensor Networks. In "Improving Performance of QoS Applications for Wireless Networks" by P. Dong et al., the authors developed a new method to obtain the appropriate access parameters, which can significantly improve the performance of QoS applications over wireless networks. A new algorithm AQEDCA was also proposed to achieve improving the downlink throughout and decreasing the latency by adjusting traffic-aware minimum contention window. In "QoS Routing RPL for Low Power and Lossy Networks" by B. Mohamed and F. Mohamed, the authors used the residual energy and the transmission delay as routing metric in the next hop selection process for the RPL protocol to improve the performance in terms of energy usage, network lifetime network, and energy uniform consumption.

One paper investigates multichannel scheduling for data gathering in WSNs. The paper "MIDAS: A Data Aggregation Scheduling Scheme for Variable Aggregation Rate WSNs" by J. Long et al. proposed a Makeup Integer based Data Aggregation Scheduling (MIDAS) to minimize the energy consumption and designed an efficient aggregation algorithm to reduce the number of aggregated packets for better scheduling performance.

Another paper mainly aims at methods for data gathering and scheduling for aggregation information. The paper "Network Lifetime Maximization in Wireless Sensor Networks

Table 1: The main content of QoS-aware data collection in WSNs.

The main research fields	The main contents and features
QoS-aware data gathering	Analysis on WSNs transport delay of NAK-based SR-ARQ [1], a new contention-free TDMA-based integrated MAC and routing protocol named DGRAM [2], investigates multichannel transmissions with dynamic channel assignment to reduce interference [3], CW (contention window) [4], AAP (Asymmetric Access Point) [5], dynamical updating technology [6], and routing protocol for low consumption lossy networks [7, 8]
Multichannel scheduling for data gathering	A scheduling algorithm called Peony-Tree based Data Aggregation (PDA) [9], a distributed network estimation and decentralized aggregation scheduling algorithm [10]
Data gathering and scheduling on aggregation information	Hop-based approach [11, 12], QoS based approach [13, 14], and relay-based approaches [15–17]
Data collection scheme with integrated consideration of WSNs performances	Routing protocol for low energy consumption lossy networks [7, 8]

with a Path-Constrained Mobile Sink" by T. Huynh and W.-J. Hwang proposed an efficient data gathering policy and a policy to cope with the overlapped connection time of the sink and sensor node.

The last paper mainly pays close attention to the design of data collection schemes with integrated consideration of energy efficiency, security, and latency as well as methods for analysis and optimization. "Minimized Delay with Reliability Guaranteed by Using Variable Width Tiered Structure Routing in WSNs" by J. Zhang et al. proposed a VWTSR protocol which can minimize the delay under reliability constraint by controlling the system parameters.

In Table 1, we list the main content of QoS-aware data collection in Wireless Sensor Networks (WSNs).

Acknowledgments

Finally, the guest editors thank all the authors who have contributed their time and effort submitting their outstanding works in response to the call for papers, regardless of whether their works have been published in this special issue or not on account of the space limitations. The guest editors are also grateful to all the reviewers for their valuable suggestions to the authors on improving the issues and presentation of their papers.

Anfeng Liu
Lin X. Cai
Tom H. Luan
Ajith Ranabahu

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