Data aggregation schemes for maximal network lifetime: Review

RRS Molose Comp. Sc. Dept. & UDSC North-West University Mafikeng, South Africa
moloserrs@gmail.com

Bassey Isong Comp. Sc. Dept. & UDSC North-West University Mafikeng, South Africa
isong.bassey@ieee.org

Nosipho Dladlu Comp. Sc. Dept. & MaSIM North-West University Mafikeng, South Africa
nosipho.dladlu@nwu.ac.za

Adnan Abu-Mahfouz Council for Scientific and Industrial Research (CSIR) Pretoria, South Africa a.abumafouz@ieee.org

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Abstract

Energy consumption and the network lifespan of wireless sensor networks (WSNs) are greatly affected by data transmission and retransmission. The challenge follows the energy limitation of sensor nodes with replaceable batteries. Albeit several energy-efficient approaches including data aggregation (DA) algorithms have been proposed to address the challenge, an optimum solution is yet to be deployed. Therefore, this paper comprehensively reviews existing relevant energy-efficient DA schemes to bring together the different approaches utilized to maximize network lifetime and identify aspects that need improvement. Several relevant DA techniques in WSN articles were considered and the analysis revealed the existence of several schemes such as the tree-based, cluster-based, in-network and even free structure-based with the overall objective of maximizing network lifespan. The tree-based DA approach was found to be the most widely used and more energy-efficient scheme appropriate for continuous monitoring. We also suggested further advancement via software-defined network controllers to minimize energy consumption and provided some opportunities for future research.