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Efficient Energy Utilization in Fog Computing Based Wireless Sensor Networks

Abstract

Recent technology trends in proficient utilization of resources and powerful computing as well as storage requirements of cloud networks inject new vitality into wireless sensor networks (WSNs). In its basic form, a wireless sensor network includes a large number of sensing nodes that are deployed at some remote locations in order to collect useful data by continuously monitoring the surrounding environment. Since each node is equipped with a fixed battery source that have limited lifetime, the network needs to use its energy requirement in an efficient way in order to maximize its lifetime. Development of energy efficient protocol is an important challenge in WSNs for which different techniques have been proposed in the literature. Among these, the classical low-energy adaptive clustering hierarchy (LEACH) protocol is well used in various applications along with its variants. Recently it is observed that the LEACH protocol can be combined with the Dijkstra's algorithm so that the nodes transmit data from node to node in an optimal way until it reaches the cluster head, which then transmit it to the base station. In this paper, we proposed a modified form of the combined settings, LEACH protocol with Dijkstra's algorithm, in order to reduce the energy requirements of the network. In addition, the proposed settings can improve the packet latency of some application specific data travelling between nodes and cloud end. The idea is to introduce a model of edge or fog computing that act as an intermediate network between sensor nodes and the cloud network. Strengthening the stability of the fog-supported wireless sensor network while conserving energy consumption of the underlying nodes increases the lifetime of the overall network. Different functionality tests have been carried out and results of the proposed framework are compared with the performance of the classic LEACH implementation. The results show that the proposed framework improves the network lifetime by efficiently utilizing the energy of the network.

KEYWORDS: Wireless Sensor Networks, LEACH protocol, Dijkstra's Algorithm, Fog computing

Primary author: Mr RAFI, Arslan (Student)

Co-authors: Mr REHMAN, Adeel (Co-Supervisor); Mr AHMAD, Ilyas (Supervisor)

Presenter: Mr RAFI, Arslan (Student)

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