Activating the Hot Spot Problem by Switching Multiple Sinks in Wireless Sensor Networks

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Abstract

In many-to-one wireless sensor networks, there exists an unbalanced power consumption problem; that is, nodes near the data sink or base station, called hot spots, have a high probability of forwarding a high amount of packets and die early. Most of previous work is dedicated to constructing a long-lived aggregation tree, while leaving the hot spot problem unsolved. When the locations of sinks are given and thus fixed, this work attempts to alleviate the hot spot problem by exploiting techniques to balance power consumption for nodes in the tree by switching multiple fixed sinks. The first balancing technique is called manipulating multiple long-lived trees (MMLT), which constructs multiple long-lived data aggregation trees for multiple sinks, and cyclically switches a data aggregation tree to another, after a sink collects information for a predefined period of time. To reduce overhead, we further propose another technique which constructs only a single tree and shares it with all sink nodes. To evaluate the performance of these two balancing techniques, we run simulations with various setup environments and compare them with the balanced tree method.

Keyword：Wireless sensor networks, the hot spot problem, routing protocols