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**Mobile Data Gathering with Bounded Relay in Wireless Sensor Networks**

**Abstract**

Recent study reveals that great benefit can be achieved for data gathering in wireless sensor networks by employing mobile collectors that gather data via short-range communications. To pursue maximum energy saving at sensor nodes, intuitively, a mobile collector should traverse the transmission range of each sensor in the field such that each data packet can be directly transmitted to the mobile collector without any relay. However, this approach may lead to significantly increased data gathering latency due to the low moving velocity of the mobile collector. Fortunately, it is observed that data gathering latency can be effectively shortened by performing proper local aggregation via multihop transmissions and then uploading the aggregated data to the mobile collector. In such a scheme, the number of local transmission hops should not be arbitrarily large as it may increase the energy consumption on packet relays, which would adversely affect the overall efficiency of mobile data gathering. Based on these observations, in this paper, we study the tradeoff between energy saving and data gathering latency in mobile data gathering by exploring a balance between the relay hop count of local data aggregation and the moving tour length of the mobile collector. We first propose a polling-based mobile gathering approach and formulate it into an optimization problem, named bounded relay hop mobile data gathering (BRH-MDG). Specifically, a subset of sensors will be selected as polling points that buffer locally aggregated data and upload the data to the mobile collector when it arrives. In the meanwhile, when sensors are affiliated with these polling points, it is guaranteed that any packet relay is bounded within a given number of hops. We then give two efficient algorithms for selecting polling points among sensors. The effectiveness of our approach is validated through extensive simulations.