Energy Efficient Clustering with Reliable and Load-Balanced Multipath Routing for Wireless Sensor Networks

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Abstract : Unlike conventional networks, it is particularly challenging to manage resources efficiently in Wireless Sensor Networks (WSNs) due to their inherent characteristics, such as dynamic network topology and limited bandwidth and battery power. To ensure energy efficiency, this paper presents a routing protocol for WSNs, namely, Enhanced Hybrid Multipath Routing (EHMR), which employs hierarchical clustering and proposes a next hop selection mechanism between nodes according to a maximum residual energy metric together with a minimum hop count. Load-balancing of data traffic over multiple paths is achieved for a better packet delivery ratio and low latency rate. Reliability is ensured in terms of higher data rate and lower end-to-end delay. EHMR also enhances the fast-failure recovery mechanism to recover a failed path. Simulation results demonstrate that EHMR achieves a higher packet delivery ratio, reduced energy consumption per-packet delivery, lower end-to-end latency, and reduced effect of data rate on packet delivery ratio when compared with eminent WSN routing protocols.

Keywords : energy efficiency, load-balancing, hierarchical clustering, multipath routing, wireless sensor networks
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