

Optimization of Energy Consumption through Secure Cluster-Based Distributed Routing in Wsns

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Abstract: *Wireless Sensor Networks (WSNs) face critical challenges related to energy efficiency and data security. This study proposes a secure cluster-based distributed routing protocol to optimize energy consumption while ensuring secure data transmission. The proposed model employs cluster head (CH) election based on residual energy and a lightweight encryption mechanism for intra-cluster and inter-cluster communication. Simulation results demonstrate significant energy savings compared to non-clustered secure routing protocols, with up to 15% higher residual energy after 10 rounds. The integration of security and clustering mechanisms effectively balances load and protects against common attacks such as sinkhole and selective forwarding.*

Keywords: Residual Energy, Lightweight Cryptography, Network Lifetime, Intrusion Prevention