ABSTRACT

Penelitian ini mengembangkan algoritma perutean oportunistik berbasis Q-Learning yang mengintegrasikan kesadaran energi (*Energy Awareness*) ke dalam proses pengambilan keputusan *forwarding* pada jaringan *Delay Tolerant Network* (DTN). Tantangan utama terletak pada pemilihan node relay yang optimal di tengah keterbatasan konektivitas, kapasitas memori, dan kesehatan baterai. Untuk mengatasi hal ini, penelitian menyempurnakan algoritma ORQLCI (*Opportunistic Routing using Q-Learning with Context Information*) dengan menambahkan *Energy Factor* ke dalam faktor diskon dinamis Q-Learning dan juga memasang threshold, sehingga node berenergi rendah secara otomatis mendapat penalti proporsional dalam pemilihan relay. Evaluasi dilakukan menggunakan *The ONE Simulator* pada dataset Helsinki dan Haggle Infocom5, dibandingkan terhadap algoritma Epidemic dan PROPHET. Penelitian ini membuktikan bahwa integrasi *Energy Awareness* ke dalam Q-Learning merupakan solusi yang efektif untuk memperpanjang masa hidup jaringan oportunistik sekaligus meningkatkan rasio keberhasilan pengiriman pesan.

Kata Kunci : Jaringan Oportunistik, Q-Learning, *Energy Awareness*, *Delay Tolerant Network*, PROPHET, *Energy Factor*.

ABSTRACT

This study develops a Q-Learning opportunistic routing algorithm that integrates energy awareness into the forwarding decision making process in a Delay Tolerant Network (DTN). The main challenge lies in selecting the optimal relay node amid constraints on connectivity, memory capacity, and battery health. To address this, the study refines the ORQLCI (Opportunistic Routing using Q-Learning with Context Information) algorithm by adding an Energy Factor to the dynamic discount factor of Q-Learning and battery threshold, ensuring that low energy nodes automatically receive a proportional penalty in relay selection. Evaluation was conducted using The ONE Simulator on the Helsinki and Haggle Infocom5 datasets, compared against the Epidemic and PRoPHET algorithms. This research demonstrates that integrating Energy Awareness into Q-Learning is an effective solution for extending the lifespan of opportunistic networks while improving the message delivery success rate.

Keywords: Opportunistic Networks, Q-Learning, Energy Awareness, Delay Tolerant Network, PROPHET, Energy Factor.