

Improvement of Aodv Routing Protocol Performance in Wireless Ad Hoc Network (WANET) Using Cross Layer Approach

Mr. Sangram S. Patil¹ and Prof. Dr. Ajitsinh N. Jadhav²

¹Student, Department of Electronics & Telecommunication Engineering

²Professor, Department of Electronics & Telecommunication Engineering

D. Y. Patil College of Engineering and Technology, Kasaba Bawada, Kolhapur

mailsangram@gmail.com¹, anj.dbee@unishivaji.ac.in²

Abstract: *Wireless Ad Hoc Networks (WANETs) are decentralized, self-configuring systems of mobile nodes that communicate over multi-hop wireless links without relying on fixed infrastructure. Their flexibility makes them vital in scenarios such as disaster management, defense operations, and emergency response. However, routing in WANETs is highly challenging due to node mobility, fluctuating topology, limited energy resources, and inconsistent link quality. The Ad hoc On-Demand Distance Vector (AODV) protocol is widely adopted for its on-demand route discovery, yet it suffers from excessive energy consumption, frequent route failures, and limited Quality of Service (QoS) support. This research enhances AODV through a cross-layer design approach that allows information sharing among the network, MAC, and physical layers. Three improved variants—ER-AODV (Energy-efficient and Residual Energy Aware AODV), E-AODV (Energy-aware AODV), and R-AODV (Residual Energy AODV)—are proposed to optimize routing decisions based on energy metrics, signal strength, and transmission conditions. Simulation results using NS-2 demonstrate that the cross-layer variants achieve superior throughput, reduced delay, higher packet delivery ratio, and lower energy consumption compared to standard AODV. The findings confirm that integrating cross-layer awareness significantly enhances routing efficiency, reliability, and network lifetime in dynamic and energy-constrained wireless environments.*

Keywords: Wireless Ad Hoc Networks, AODV, Cross-Layer Design, Energy Efficiency, Routing Protocol, Network Lifetime, Throughput, End-to-End Delay, Packet Delivery Ratio, Residual Energy

