

Abstract

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Fuzzy-based Adaptive Cross Layer Routing Protocol for Mobile Ad hoc Networks

The performance of mobile ad hoc networks depends on the adaptability of its underlying routing protocol to current network conditions. Mobility, traffic load, and traffic type (Delay-Sensitive application Delay-Tolerant application) are factors affecting the performance of routing protocols in mobile network environment. We carry out an extensive simulation study to investigate the traffic and mobility conditions required to get the paramount performance of popular routing protocols belonging to reactive and proactive routing. Then, we develop a routing protocol that enables each mobile node to switches between reactive routing mode and proactive routing mode based on the current node status. It utilizes a fuzzy-based routing mode whose inputs are the number of link breaks (LB), the interface queue length (IFQL), and the type of application for each node (whether Delay-Tolerant "DT" Delay-Sensitive "DS"). Since the suggested routing protocol (which belongs to Layer 3) is determined based on Layer 1 information (LB), Layer 2 information (IFQL) and Layer 7 information (type of application), it is called Adaptive Cross-layer Routing Protocol (ACRP). Using the well-known network simulation package ns-2, it has been shown that the newly proposed ACRP protocol outperforms conventional mobile ad hoc network routing protocols such as AODV (pure reactive), DSDV (pure proactive), and IRA (mixed proactive and reactive). Numerical results indicate up to 19.5% improvement in packet-delivery ratio (PDR), up to 78.5% improvement in average end-to-end delay (ETED), up to 78.5% improvement in route-discovery latency, and up to 22.8% improvement in average discovery path length.