

Energy and mobility conscious multipath routing scheme for route stability and load balancing in MANETs

Waheb A. Jabbar^a, Mahamod Ismail^b, Rosdiadee Nordin^b

^aFaculty of Engineering Technology, Universiti Malaysia Pahang (UMP), Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

^bDepartment of Electrical, Electronic and Systems Engineering, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia

Abstract

Mobility and limited energy resources of nodes are the most critical attributes of Mobile Ad hoc Networks (MANETs). The mobility of the nodes changes the network's topology in an unpredictable manner, which in turn, affects the stability of connected paths. In addition, it causes an excessive overhead traffic that leads to a higher energy consumption and degrades the performance of routing protocols. Therefore, a routing scheme in MANETs should comprise techniques that cope with challenges incurred by both the energy failures and node's mobility. In this paper, we proposed Multipath Battery and Mobility-Aware routing scheme (MBMA-OLSR) based on MP-OLSRv2. Specifically, the study exploits a Multi-Criteria Node Rank (MCNR) metric that comprises the residual battery energy and the speed of nodes. It aims to rank the stability of the links using a link assessment function and to select the most efficient and stable paths to the destination. Moreover, an Energy and Mobility Aware Multi-Point Relay (EMA-MPR) selection mechanism is introduced and utilized by the MBMA-OLSR to set the willingness of nodes to contribute as MPRs, for flooding topological information. We implemented the proposed scheme as an extension to the EXata network simulator. Benefits of the innovative scheme have been demonstrated and validated under various simulation scenarios based on different mobility parameters. The simulation results provided evidence of the effectiveness of our scheme, especially during the high mobility scenarios with heavy traffic load where it outperformed the conventional MP-OLSRv2 routing protocol in terms of QoS and energy related metrics.

Keywords

MANET; Energy-Efficient; Mobility-Aware; MP-OLSRv2; MBMA-OLSR