

Traffic Load-Based Analysis of MBQA-OLSR Routing Protocol in Wireless Ad Hoc Networks

Waheb A. Jabbar
Faculty of Engineering
Technology,
Universiti Malaysia
Pahang, 26300 Gambang,
Kuantan, Pahang,
Malaysia
waheb@ump.edu.my

Mahamod Ismail
Dept. of Electrical,
Electronic and Systems
Engineering
Universiti Kebangsaan
Malaysia, 43600 Bangi,
Selangor, Malaysia
mahamod@ukm.edu.my

Rosdiadee Nordin
Dept. of Electrical,
Electronic and Systems
Engineering
Universiti Kebangsaan
Malaysia, 43600 Bangi,
Selangor, Malaysia
adee@ukm.edu.my

Roshahliza M. Ramli
Faculty of Engineering
Technology,
Universiti Malaysia
Pahang, 26300 Gambang,
Kuantan, Pahang,
Malaysia
roshahliza@ump.edu.my

Abstract— In wireless Ad hoc networks, congestion occurs frequently at intermediate nodes when forwarding data packets between source-destination pairs. This traffic incurs higher packet loss, longer transmission delay, and faster energy resources depletion, thus degrades the performance of the network. This paper analyzes the performance of our hybrid *Multipath Battery and Queue-Aware OLSR* routing protocol (*MBQA-OLSR*), which is an adaptation of MP-OLSRv2, for congestion avoidance, load balancing and energy-efficient routing in wireless ad hoc networks. The *MBQA-OLSR* considers multiple metrics, namely, residual energy, node's lifetime, node's idle time, and length of traffic queue for route computation and also selects Multipoint Relays (MPR) using an enhanced mechanism, *Energy-Aware MPR (EA-MPR)*, thereby prolonging network lifetime, reducing the overhead involved and improving the QoS while maintaining connectivity of the network. The proposed scheme avoids the selection of congested and low battery level nodes for forwarding data packets and/or flooding topological information. The performance characteristics of the *MBQA-OLSR* protocol are evaluated through simulations by comparing it to the conventional routing protocols, namely the: MP-OLSRv2 and MPQ-OLSRv2. It emerges that *MBQA-OLSR* performs well under various traffic load scenarios and it significantly improves QoS metrics, reduces energy cost per packet, and extends the network lifetime.

Keywords— *Ad hoc Networks; MP-OLSRv2; MBQA-OLSR; Energy-Efficient; EA-MPR; MCNR*