PERFORMANCE EVALUATION OF THE LAR-1P ROUTE DISCOVERY ALGORITHM

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ABSTRACT

The location-aided routing scheme 1 (LAR-1) and probabilistic algorithms were combined together into a new algorithm for route discovery in mobile ad hoc networks (MANETs) called (LAR-1P) [1]. Simulation results demonstrated that, on network scale, for a uniform random node distribution and for a specific simulation setup (time); the LAR-1P algorithm reduces the number of retransmissions as compared to LAR-1 at a cost of insignificant reduction in the average network reachability. However, on zone scale, the algorithm provides an excellent performance in high-density zones, while in low-density zones; it almost preserves the performance of LAR-1. This paper provides a detail analysis of the performance of the LAR-1P algorithm through various simulations, where the actual numerical values for the number of retransmissions and reachability in high- and low-density zones are estimated to demonstrate the effectiveness and significance of the algorithm and how it provides better performance than LAR-1 in high-density zones. Furthermore, the effect of the total number of nodes on the average network performance is also investigated.

KEYWORDS

LAR-1P, LAR-1, probabilistic algorithm, broadcast MANET, pure flooding, flooding optimization algorithms, routing protocols, route discovery algorithms.

1. INTRODUCTION

In a mobile ad hoc network (MANET), data packets are forwarded to other mobile nodes on the network through reliable and efficient dynamic routing protocols [1], which are part of the network layer software that is responsible for deciding which output route a packet should be transmitted on. Dynamic routing protocols (e.g., the dynamic source routing (DSR) [2], ad hoc on-demand distance vector (AODV) [3], zone routing protocol (ZRP) [4]) consist of two main phases; these are: route discovery and route maintenance. Route discovery is used when a source node desires to send a packet to some destination node and does not already have a valid route to that destination; in which the source initiates a route discovery process to locate the destination. It broadcasts a route request (RREQ) packet to its neighbours, which then forward the request to their neighbours, and so on until the expiration of the packet. During the forwarding process, the intermediate nodes record in their route tables the address of the node from which the first copy of the broadcast packet is received. Once the RREQ reaches the destination, the destination responds with a route reply (RREP) packet back to the source through the route from which it first received the RREQ. Otherwise, if the RREQ packet expired before reaching its destination, then the node at which it expires, sends a route error (RERR) packet back to the source to initiate a new route discovery process [3].

Pure flooding is the earliest, simplest, and reliable mechanism proposed in the literature for route discovery in MANETs [5, 6]. In pure flooding, each node rebroadcasts the message to its neighbours upon receiving it for the first time, starting at the source node. Although it is simple

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5. CONCLUSIONS

This paper provides a detail description of the main concept of a new route discovery algorithm in MANET, namely, the LAR-1P algorithm, which combines two well-known route discovery algorithms: The location-aided routing scheme 1 (LAR-1) and dynamic probabilistic algorithms. The simulation results demonstrated that the performance of the LAR-1P over the LAR-1 is improving with increasing nodes densities, i.e., more reduction in the number of retransmissions can be achieved against insignificant reduction in network reachability. Moreover, the performance of the LAR-1P algorithm overwhelmed the performance of LAR-1 in high-zones densities, while almost provides the performance of LAR-1 in low-zones densities.

As recommendations for future work, we recommend to investigate the effects of nodes speeds on the performance of the LAR-1P algorithm. In addition, it will be very useful to perform performance evaluation of the algorithm using different distribution functions for calculating intermediate nodes retransmission probabilities. Furthermore, we recommend evaluating the performance of the new algorithm in terms of load, through, and delay using well-known network simulators, such OPNET, NS2, NS3, or GloMoSim.

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