UNIVERSITI TEKNOLOGI MARA

THE NEW ENHANCEMENT OF OLSR ENERGY-SAVING SYSTEM IN ADHOC NETWORK

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ABSTRACT

In Mobile Ad Hoc Networks (MANETs), network nodes typically have short lifespans given that they are mobile, self-reconfigurable, and dependent on the battery power. To help mitigate such a problem, the Optimize Link State Routing protocol (OLSR) is considered the most appropriate routing protocol to extend nodes' lifespans. As such, this study was undertaken with the main aim to enhance the energy-saving system of MANET, with which nodes can function without failure by using a newly developed algorithm of the OLSR protocol. Specifically, the study involved the developments of three schemes, namely a new Load Balance Energy Distributed (LBED) scheme, a new enhancement energy-saving (NEES) scheme, and a New Enhanced OLSR Willingness Calculation (NEWC) scheme. Accordingly, a series of simulations was carried out to measure and quantify the performances of the LBED, NEES and NEWC schemes using the OLSR protocol. The performance criteria were based on the level of remaining battery power (measured in percentage points), energy consumption, and number of live nodes based on high data transmission rate and high mobility speed requirements. The simulations performed yielded several promising, interesting results. The new enhanced energy-saving system was able to improve the battery power consumption significantly by as much as 20%. Most promising, the mean percentage of network improvement using the new enhancement energy-saving system was 48.18%, which was significantly high compared to that of existing OSLR protocol. Such findings suggest that the new enhancement energy-saving system will be able to further improve the performance of MANETs by making such networks more stable and reliable. In addition, the new enhancement energy-saving system was applied to a number of network scenarios based on high mobility speed and high data transmission rate, the findings of which helped formulate a solution matrix. This matrix can serve as a network configuration tool to help guide practitioners (especially network administrators) in setting up appropriate mobile networks that are badly needed to establish communication in critical situations involving highly mobile nodes. Overall, the research findings suggest that the proposed new enhancement energy-saving system of the OLSR protocol can help improve the use of battery energy in MANETs through efficient distribution of energy to network nodes. Effectively, such energy-efficient distribution can help prolong the life of each node, directly improve the selection of nodes as MPR nodes, provide more alternative routes in the network, and evenly distribute data transmission tasks to all nodes. Furthermore, the findings underscore the importance of selecting appropriate levels of critical parameters (e.g., the number of nodes, size of the network space, mobility speed, and data transmission rate) that collectively will have a huge impact on the mobile network performance. In this regard, practitioners can refer to the solution matrix to select the most appropriate levels of such parameters that can help optimize the energy consumption of the battery, thus leading to a stable, reliable mobile network.

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Optimized Link State Routing Protocol (OLSR) is a table-driven proactive protocol used in Mobile Ad hoc Networks (MANETs). This protocol helps constantly maintain and update the topology of such networks. However, this constant updating requires information (which can be quantitatively immense) of all nodes in the network. Consequently, and inevitably, this protocol will experience information flooding that severely imposes a huge overhead of routing traffic, thus severely causing some initial delay in data communication. To help address information flooding, the Multipoint relay (MPR) technique was proposed to optimize the OLSR protocol.

In a MANET, all nodes rely on the power supplied by a battery to keep them running (alive), and thus optimizing energy consumption in such a network becomes an imperative (Lalitha, & Rajesh, 2014). The use of fully functional MANET is critical to managing and sustaining mobile network in life-threatening environments, which are often caused by natural disasters (such as floods and earthquakes), as the communication infrastructure of such locations may be either lacking or badly damaged (Basurra, et al., 2015; Sandeep, et al., 2015). Given this concern, many researchers have carried out a number of studies by focussing on the improvements of OLSR routing protocol to help maintain sufficient live nodes in the mobile network.

One important finding of such studies is that using OLSR will result in MPR nodes consuming more energy than the non-MPR nodes, thus rapidly depleting the available energy left in the network (Prajapati, et al., 2015). To mitigate this problem, several researchers have proposed solutions that can help such MPR nodes to consume less energy (Prajapati, et al., 2015; Patil, R.B. & Patil, A.B. , 2015 ; Belkheir, et al., 2014; Loutfi, A et al., 2014; Ouacha, et al., 2013; Guo, et al., 2011). Nonetheless, the research carried out thus far has not focussed on the level of energy use based on the willingness values that can affect the selection of nodes as MPR nodes.