Mobility and Transmission Power of AODV Routing Protocol in MANET

Raneen I. Al-Essa
Department of Computer Engineering
University of Basrah
Basrah, Iraq
engpg.raneen.imad@uobasrah.edu.iq

Ghaida A. Al-Suhail
Department of Computer Engineering
University of Basrah
Basrah, Iraq
ghaida.suhail@uobasrah.edu.iq

***Abstract*— A Mobile Ad hoc Network (MANET) is made up of multiple nodes connected by routing protocols that do not require any infrastructure or centralized access point. Mobility and transmission power are two important parameters that influence the activity of MANET routing protocols. This study investigates the network performance of the reactive protocol AODV under different transmission power conditions in three mobility models of Random waypoint, Mass mobility and Linear mobility. Also, this study evaluates the impact of network size, mobility speed and simulation area on the network performance in terms of different QoS parameters. The simulation results are obtained using OMNeT++ and INET framework for AODV routing protocol. The findings indicate a good and helpful baseline for the researchers in evaluating some of the QoS metrics such as the packet delivery ratio, end to end delay and throughput under various scenarios in MANET environment.**

Keywords*— *Ad hoc, MANET, AODV, QoS, Mobility, Transmission Power, OMNeT.

I. INTRODUCTION

MANET stands for Mobile Ad hoc Network is a kind of Ad hoc networks that consists of a collection of self-configuring, self-recovering, and self-repairing wireless mobile nodes. It is also called a wireless Ad hoc network that is usually created when nodes communicate with each other directly without infrastructure. Specifically, they are established where infrastructure is non-existent or damaged like military, medical applications, environmental application as monitoring climate conditions, personal area networks and natural disaster like earthquake and floods [1-3]. The status of communication links between nodes is determined by a variety of factors, including node positions, velocities, and transmission power values. Transmission power is the most effective factor because it determines the node's transmission range. To ensure network link quality, each node has a unique transmission power that is determined by node type, environmental parameters, and battery status.

In general, the active nodes in these Ad hoc networks can communicate using different data routing protocols. Such protocols adapt to the network's dynamic and unpredictable changes in topology, so packets can be forwarded from the source to the destination via intermediate nodes [4]. However, the researchers are still focusing on the development of the routing protocol to achieve good performance in various extreme conditions. In fact, the communication mechanism between nodes has a large impact on the overall performance of MANET network scenarios. Accordingly, mobility models are generally considered in MANET simulations to realize the network performance where the mobility of the nodes can be in any direction and speed. Nodes can move without stopping or can pause at regular interval time during the movement. To study MANET performance, the parameters of these different mobility models should be considered. Therefore, the goal of this paper is to investigate the impact of transmission power on MANET performance for various mobility models using various scenarios. The impact of node density, speed, and environment area on QoS parameters was assessed. The rest of paper is organized as follows: Section 2 introduces related work. The background on ad hoc networks is presented in Section 3, and the mobility models are also defined in Section 4. In Section 5, the simulation method and performance metrics are addressed and its results analysis in Section 6. Finally Section 7 summarizes the conclusions and future work.

II. RELATERD WORK

Many researchers investigated the impact of transmission power and mobility models on the behavior of various MANET routing protocols. In [5], the authors compared AODV, OLSR, and GPR routing protocols under four mobility models of Slow Car Model, Fast Car Model, Random Waypoint, and Human Walking Model by varying the pause time during mobility. OPNET 14.5 was used for simulation in this study. In contrast, [6] have analyzed the impact of the transmission power on the Manet's performance and energy consumption by setting different transmission power and configuring three situations. First, fixed nodes are implemented, then the RWP model is used, and finally, transmission power is dynamically altered during simulation using NetAnim (Network Animator) version 3.108 simulator. Moreover, studying the performance evaluation of designed MANET scenario was addressed for different transmission power by using Ad hoc on-demand multipath distance vector (AOMDV) routing protocol with variable node configuration. Several performance metrics were considered in this study and the scenario has been simulated by using QualNet simulator [7]. However, an optimized algorithm in [8], Chronological Earth Worm Optimization Algorithm (C-EWA) was designed for managing power and energy. The analysis of the this algorithm was established for existing DISPOW, OPC and LTRT taking various number of nodes 50 and 100 nodes with different number of rounds. In [9] the authors developed a low energy consumption-based system in MANET by using NS-2 simulator and compare it with 802.11 AODV MANET protocol the proposed system for node energy consumption by maintaining distance from the low number of nodes. In [10], the effect of UDP traffic pattern was also studied on mobility models in MANET by taking different parameters values of pause time, simulation time, environment areas, traffic source, traffic rates and velocities. AODV routing protocol was used in this study with different mobility models of Gauss Markov Model, Manhattan Grid Model, Reference Point Group Model and