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Performance Evaluation of MANET Routing Protocols Using Scenario-Based Mobility Models

Abstract

Mobile Add-Hoc Network (MANET) is a multi-hop wireless network without a fixed infrastructure. Many routing protocols have been proposed for MANETs and are tested under various traffic loads and speeds. In Current simulations of MANET routing protocols, all mobile nodes can move at the speed of 1 to 30 m/s uniformly, and hence ignore the compulsions of participants in a situation where movement is in a narrower range of speed and the distinction among such situations. Typically, MANET involves humans carrying mobile devices that move in a narrow range of speeds. Human participants have upper limits on their walking and running speeds, and they cannot move faster than their possible limits. Same is the case of other MANET participants such as cars and ambulances moving on busy streets or highly populated areas in which situation the range of speed is different. Simulation results of various MANET routing protocols based on a wider range of speeds may be biased against certain protocols that may perform better in a specific speed range.

In order to comprehensively simulate a protocol for the MANET, it is important to design different models based on the limits of humans and vehicular MANET participants with their specific ranges of speeds. Such models will be helpful in classifying protocols suitable in different conditions and environments such as university campus, shopping malls, medical camps in rural areas and search/rescue operations.

In this research, four scenario-based mobility models have been designed for the simulation of MANET routing protocols by considering nomadic velocities and pause time intervals as simulation parameters. Designed models are named as; Fast Car Model (FCM), Slow Car Model (SCM), Human Run Model (HRM) and Human Walk Model (HWM). Each model considers a particular participant and its nomadic velocity within a specific range.

Two MANET routing protocols namely Destination-Sequenced Distance Vector (DSDV) and Ad-Hoc On-Demand Distance Vector (AODV) have been tested in Scenario-based Mobility Models. The Network Simulator-2 (NS-2) was used to simulate the behavior of both DSDV and AODV protocols in designed models. The simulation results indicate

that both DSDV and AODV protocols give 62% throughput for HRM and HWM models where mobile nodes move at slower speeds. Moreover, the DSDV protocol outperforms the AODV protocol for protocol overhead, whereas, the AODV protocol performed significantly better for average end-to-end delay for all models.

For the future work, it is recommended that other MANET routing protocols such as DSR, WRP and TORA should also be compared and analyzed using Scenario-Based Mobility Models for more realistic results and performance evaluation. Furthermore, the actual pause-time intervals of MANET participants should also be considered in the future simulations.