Performance Evaluation of AODV in MASNETs: Study on Different Simulators

M. N. Jambli*, W. B. Wan Mohd Shuhaimi *, H. Lenando*, J. Abdullah*, S. Mohamad Suhaili†
*Faculty of Computer Science & Information Technology, Universiti Malaysia Sarawak, 94300 Sarawak, Malaysia
jmnazim@fit.unimas.my, wan.balkis@gmail.com, cool@fit.unimas.my, ajohari@fit.unimas.my

† Centre for Pre-University Studies, Universiti Malaysia Sarawak, 94300 Sarawak, Malaysia
mssinarwati@preuni.unimas.my

***Abstract*—Nowadays, most of researchers working on Wireless Sensor Networks (WSNs) focus on Mobile Ad-hoc and Sensor Networks (MASNETs) due to their wide range of potential applications ranging from underwater monitoring to search and rescue mobile robotics applications. Most of these applications are deployed in remote and unattended areas. Since MASNETs are energy-constrained networks which have a low radio frequency coverage, their network topologies are frequently change due to mobile sensor nodes. In this paper, through extensive simulation of two different simulators namely Avrora and Castalia, we evaluated the capability of Ad-hoc On Demand Distance Vector (AODV) routing protocol on how far it can react to different speed and density of mobile nodes in MASNETs. We investigated the performance of AODV in terms of the average percentage of packet loss with the various speed and density of mobile nodes. Our performance study demonstrates that both simulators show the performance of AODV is significantly decreased in mobile environment due to the frequent topology change in MASNETs.**

***Index Terms*—MASNETs, MANETs, WSNs, Ad-hoc On-Demand Distance Vector, Performance Evaluation, Simulation.**

I. Introduction

The rapid development of wireless communication technologies and portable mobile devices such as laptops, PDAs, smartphones and wireless sensors brings the best out of mobile computing particularly mobile ad-hoc and sensor networks. Mobile computing can be defined as the use of portable mobile devices in conjunction with mobile communications technologies that allows transmission of data, via mobile devices, without having to be connected to a fixed physical link [1] as in Mobile Ad-hoc Networks (MANETs) [2] and Wireless Sensor Networks (WSNs) [3]. The design of routing protocols for both types of networks, which can be called as Mobile Ad-hoc Sensor Networks (MASNETs), is a complex issue because of the diversity of their potential applications, ranging from small, static networks that are constrained by power sources, to large scale highly dynamic mobile networks. MASNETs also have certain characteristic, which imposes new demands on the routing protocol. The most important characteristic is the dynamic topology, which is a consequence of the mobile nodes. A mobile node can change position quite frequently, which means that we need a routing protocol that quickly adapts to topology changes. In designing such routing protocol we have to consider the constraints of the nodes in MASNETs that are often very limited in resources such as processing capacity, storage, battery power and bandwidth power, processing ability, short transmission range and limited storage space [4]. Since the nodes are forwarding packets for each other towards sink, some sort of efficient routing protocol is necessary to make better routing decisions with less energy consumption in mobile environment. Before designing a better routing protocol for MASNETs, there is a need to identify the effects of node mobility on a routing protocol for such mobile networks.

In order to evaluate the performance of the proposed routing protocols that have been designed, the researchers need to simulate such routing protocols using different simulators. But, some of the simulators not be able to simulate all the performance metrics that required for different evaluation of routing protocols due to their constraint and limitations as discussed in [5]. Therefore, in this paper we study two different simulators namely Avrora and Castalia simulators to evaluate the capability of an Ad-hoc On-Demand Distance Vector (AODV) [6] routing protocol on how far it can react to network topology change in MASNETs. We present the analysis of the impact of mobile nodes on the average percentage of packet loss with different speed and density of mobile nodes through these two simulators. The rest of the paper is organized as follows: Section II includes the recent related work on the performance evaluation of AODV. The AODV routing protocol description is summarized in section III. The simulation environment and set-up are described in Section IV. We present the simulation results in section V. Section VI concludes the paper and outlines the future work.

II. Related Work

This section reviews the recent related work which directly or indirectly aims at evaluating performance of the existing AODV routing protocol with different simulators as in [7], [8], [4], [9], [10]. Most of this work simulate different routing protocols using one simulator only but not many papers in literature evaluate the performance of AODV with two different simulators.

Performance evaluation of AODV in MASNETs has gained an important part of the interest of researchers. As one of the popular simulators for Wireless Sensor Networks (WSN),

978-1-4799-5765-1/14/$31.00 ©2014 IEEE