

# Performance Evaluation of AODV Routing Protocol for Mobile Wireless Sensor Network

Mohamad Nazim Jambli, Kartinah Zen, Halikul

Lenando

Faculty of Computer Science and Information Technology  
Universiti Malaysia Sarawak  
94300 Kota Samarahan  
Sarawak, Malaysia  
{jmnazim, kartinah, cool}@fit.unimas.my

Alan Tully

School of Computing Science  
Newcastle University  
Newcastle upon Tyne  
NE1 7RU  
United Kingdom  
Alan.tully@ncl.ac.uk

**Abstract**— Topology change is the main factor that affects the network life time of Wireless Sensor Network (WSN) applications. In static WSN, the topology change is often caused by node failure which is due to energy depletion. However, in the Mobile WSN (MWSN), the main reason of the topology change is caused by the node movement. Since the mobile sensor nodes are limited in power supply and have a low radio frequency coverage, they are easily losing their connection with neighbours, and have difficulties updating their routing tables. The switching process from one coverage area to another consumes more energy that related to transmitting and receiving association packets. Using Ad hoc On-Demand Distance Vector (AODV) routing protocol in MWSN application shows degradation in network performance due to high density and speed of mobile nodes. In this paper, through extensive simulation we evaluated the capability of AODV on how far it can react to network topology change in MWSN. We investigated the performance metrics namely packet loss and energy consumption of mobile nodes with various speed, density and route update interval (RUI). Our performance study demonstrates that by applying the existing AODV in MWSN, the results show a high percentage of packet loss and the reduction in total network energy consumption of mobile nodes if RUI is getting longer due to serious broken link caused by nodes movement. We also identify some key research problems that need to be addressed for successful implementation of AODV in MWSN.

**Keywords**-AODV; MANET; WSN; MWSN; Performance Evaluation; Simulation

## I. INTRODUCTION

In recent years, extensive research has been conducted on Wireless Sensor Networks (WSNs) due to their wide range of potential applications. The enormous potential of this technology can be seen ranging from environmental monitoring to critical military surveillance and healthcare applications [1]. In these networks a large number of small sensor nodes are deployed, each capable of collecting, storing, processing observations and communicating over short-range wireless interfaces and multiple hops to central locations called sinks. However, the nodes in WSNs have severe resource constraints due to their lack of processing power, limited memory, bandwidth and energy [2]. Since these networks are usually deployed in remote places and left

unattended, they should be equipped with energy-constraint routing protocol to increase the network lifetime.

The researchers in WSNs have proposed various routing protocols which are optimized for these networks with resource constraints. A number of efficient routing protocols has been proposed by several researchers in WSNs [3, 4]. When describing the existing routing protocols, normally they assumed that sensor nodes and sinks are stationary in the deployment. But for some WSN applications, a mobile node is also present because a mobile Wireless Sensor Network (MWSN) owes its name to the presence of mobile sink or sensor nodes within the network [5]. For example in ocean temperature monitoring application, the sensors are deploy on the surface of the ocean to monitor the water temperature and we can expect that they are carried around by ocean flows [6]. As for a real-time target tracking in battle situations, mobile nodes can be used to avoid holes in the coverage and to generate information to be transmitted through the network [7]. In some other applications, sensors are mounted on robots, animals or other moving objects, which can sense and collect relevant information. If this information is not managed properly, energy can be wasted due to unpredictable changes in network topology in mobility environment.

Using the existing Ad hoc On-Demand Distance Vector (AODV) [8] routing protocol in MWSN degrades the net-work performance although this protocol is designed for use in mobile ad-hoc network (MANET) due to high density and speed of mobile nodes. Since the sensors are limited in power supply, they have a low radio frequency coverage. This can be disadvantageous to mobile sensor nodes because they easily lose their connection with neighbours as indicated in [9], and as a consequence, they have difficulties in updating their routing tables. The switching process from one area to another consumes more energy that related to transmitting and receiving association packets. These are the primary problems that need to be addressed in MWSN routing protocol.

In this paper, through extensive simulation we evaluated the capability of AODV routing protocol on how far it can react to network topology change in MWSN in order to show that AODV is not suitable for MWSN. The evaluation is