



**Faculty Information and Communication Technology**

**PERFORMANCE EVALUATION OF THROUGHPUT AND PACKET  
LOSS IN DIFFERENT ROUTING PROTOCOL ON MANET  
SCENARIOS**

**ELIZA SURAIYA BINTI TAHIR**

**MASTER OF COMPUTER SCIENCE IN  
INTERNETWORKING TECHNOLOGY**

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**PERFORMANCE EVALUATION OF THROUGHPUT AND PACKET LOSS IN  
DIFFERENT ROUTING PROTOCOL ON MANET SCENARIOS**

**ELIZA SURAIYA BINTI TAHIR**

**A thesis submitted  
in fulfillment of the requirements for the degree of Master of Computer Science In  
Internetworking Technology**


**Faculty of Information and Communication Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2016**

## DECLARATION

I declare that this thesis entitled “Performance Evaluation Of Throughput And Packet Loss In Different Routing Protocol On MANET Scenarios” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.


Signature :  .....

Name : .....Eliza Suraiya Binti Tahir.....

Date : .....12/8/16.....

## APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in term of scope and quality for the award of Master of Computer Science in Internetworking Technology.

Signature :   
Supervisor Name : ABD SAMAD BIN HASSAN BASARI  
Date : 23/1/2017

## APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in term of scope and quality for the award of Master of Computer Science in Internetworking Technology.

Signature :   
Supervisor Name : ABD SAMAD BIN HASAN BASARI  
Date : 29/1/2017

## **DEDICATION**

This thesis work is dedicated to my husband, Mohd Raya Dan Faisal Bin Mastuki, who has been a constant source of support and encouragement during the challenges of postgraduate school and life. I am truly thankful for having you in my life. This work is also dedicated to my parents, Hj Tahir Bin Hj Ahmad and Hjh Hasnah Binti Hj Mudek, who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve.

## ABSTRACT

A mobile ad hoc network is a collection of mobile nodes communicating without wired network and infrastructure or centralized control. Due to limited transmission range of wireless network, more than single hops may be required to transfer data across the network. In order to reliable communication within the network, a routing protocol is used which are call MANET routing protocol. The major function of such an MANET routing protocol is to establishment short and real route between a pair of nodes so that messages may be delivered in a timely manner. This research examines two routing protocols for mobile ad hoc networks– the Destination Sequenced Distance Vector (DSDV), the pro-active routing protocol, and the Ad hoc On- Demand Distance Vector routing (AODV), a re-active routing protocol. The authors conduct a simulation to evaluate both protocols based on basic important performance metrics; Packet Lost Ratio and Throughput. The simulation was conducted using NS2.35.

## ABSTRAK

*Sebuah rangkaian ad hoc mudah alih adalah koleksi beberapa nod mudah alih berkomunikasi tanpa rangkaian berwayar di dalam sesuatu infrastruktur atau kawalan berpusat. Oleh kerana penghantaran rangkaian wayarles yang terhad, lebih daripada satu hop mungkin diperlukan untuk memindahkan data di dalam rangkaian. Dalam usaha untuk menyediakan komunikasi yang efisien di dalam rangkaian, satu protokol laluan digunakan yang dinamakan sebagai protokol laluan MANET. Fungsi utama protokol laluan dalam rangkaian Manet ini adalah untuk penetapan laluan pendek di antara sepasang nod supaya mesej boleh dihantar tepat pada masanya. Kajian ini mengkaji dua protokol laluan untuk rangkaian ad hoc mudah alih iaitu Destinasi Tersusun Jarak Vector (DSDV), sejenis protokol laluan proaktif, dan Ad hoc Atas-Permintaan Jarak Vector (AODV), sejenis protokol laluan reaktif. Para pengkaji kajian ini menjalankan simulasi untuk menilai kedua-dua protokol berdasarkan asas metrik prestasi yang penting; Nisbah Packet Hilang dan Kendalian. Simulasi ini dijalankan menggunakan NS2.35.*



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## TABLE OF CONTENTS

	PAGE
<b>DECLARATION</b>	
<b>APPROVAL</b>	
<b>DEDICATION</b>	
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	ii
<b>ACKNOWLEDGEMENTS</b>	iii
<b>TABLE OF CONTENTS</b>	iv
<b>LIST OF TABLES</b>	vii
<b>LIST OF FIGURES</b>	x
<b>CHAPTER</b>	
<b>1. INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Research Background	2
1.3 Problem Statement	3
1.4 Research Objectives	4
1.5 Research Methodology	4
1.5.1 Target Environment	
1.5.2 Nodes Mobility	5
1.5.3 Routing Protocols	6
1.6 Expected Outcome	6
1.7 Conclusion	7
<b>2. LITERATURE REVIEW</b>	<b>8</b>
2.1 Introduction	8
2.2 Network layer issues in MANET	8
2.3 Overview of Routing Protocols in MANET	
2.3.1 Routing protocols	8
2.4 Performance Metrics in MANET	9
2.5 Related Works	14
2.6 Proposed Solution	18
2.7 Conclusion	19
<b>3. METHODOLOGY</b>	<b>20</b>
3.1 Introduction	20
3.2 Research Requirements	20
3.2.1 Software and Tools	20
3.2.1.1 Simulation Support Software	20
3.2.1.2 Network Modelling and Simulation Scripting	21
3.2.1.3 Network Performance Analysis	22
3.2.2 Network Environment	22
3.2.3 Nodes Mobility	22
3.2.4 Simulation Configurations	23
3.3 Research Process	23
3.3.1 Install Software	25
3.3.2 Create MANET Scenarios	25

3.3.3	Initiate Simulation Process	28
3.3.4	Execute Network Performance Monitoring	29
3.3.5	Collect Data	30
3.3.6	Analysis Data	30
3.4	Conclusion	30
<b>4.</b>	<b>IMPLEMENTATION AND TESTING</b>	<b>31</b>
4.1	Introduction	31
4.2	Simulation Tools and Patches	31
4.3	Simulation Environment	32
4.3.1	Simulation with AODV protocol	33
4.3.1.1	Scenario 1	33
4.3.1.1.1	Test 1	33
4.3.1.1.2	Test 2	35
4.3.1.1.3	Test 3	36
4.3.1.1.4	Test 4	38
4.3.1.1.5	Test 5	39
4.3.1.2	Scenario 2	40
4.3.1.2.1	Test 1	41
4.3.1.2.2	Test 2	42
4.3.1.2.3	Test 3	43
4.3.1.2.4	Test 4	44
4.3.1.2.5	Test 5	45
4.3.1.3	Scenario 3	45
4.3.1.3.1	Test 1	46
4.3.1.3.2	Test 2	47
4.3.1.3.3	Test 3	48
4.3.1.3.4	Test 4	49
4.3.1.3.5	Test 5	50
4.3.2	Simulation with DSDV protocol	50
4.3.2.1	Scenario 1	51
4.3.2.1.1	Test 1	51
4.3.2.1.2	Test 2	53
4.3.2.1.3	Test 3	54
4.3.2.1.4	Test 4	56
4.3.2.1.5	Test 5	57
4.3.2.2	Scenario 2	58
4.3.2.2.1	Test 1	59
4.3.2.2.2	Test 2	60
4.3.2.2.3	Test 3	61
4.3.2.2.4	Test 4	62
4.3.2.2.5	Test 5	63
4.3.2.3	Scenario 3	64
4.3.2.3.1	Test 1	64
4.3.2.3.2	Test 2	65
4.3.2.3.3	Test 3	66
4.3.2.3.4	Test 4	67
4.3.2.3.5	Test 5	68
4.4	Simulation Parameters	69

4.4.1	Traffic Connections	69
4.5	Simulation Execution	70
4.6	Conclusion	74
<b>5.</b>	<b>SIMULATION RESULTS AND ANALYSIS</b>	<b>75</b>
5.1	Introduction	75
5.2	Tracegraph 202	75
5.3	Simulation Information	75
5.4	Performance Metrics measured in the Analysis	97
5.5	Performance Analysis	98
5.5	Result Analysis	104
5.6	Conclusion	104
<b>6.</b>	<b>CONCLUSION AND FUTURE WORK</b>	<b>106</b>
6.1	Introduction	106
6.2	Summary	106
6.3	The differences between AODV and DSDV protocol	107
6.4	Future Works	108
	<b>REFERENCES</b>	<b>111</b>

## LIST OF TABLES

TABLE	TITLE	PAGE
1.1	Movement of Nodes	5
3.1	Nodes Mobility	22
3.2	Name of Trace File Every Network Scenarios With Different Routing Protocol	28
4.1	Network Scenarios	32
4.2	Node movements in Test 1 of Scenario 1 with AODV protocol.	34
4.3	Node movements in Test 2 of Scenario 1 with AODV protocol.	36
4.4	Node movements in Test 3 of Scenario 1 with AODV protocol.	37
4.5	Node movements in Test 4 of Scenario 1 with AODV protocol.	39
4.6	Node movements in Test 5 of Scenario 1 with AODV protocol.	40
4.7	Node movements in Test 1 of Scenario 2 with AODV protocol.	41
4.8	Node movements in Test 2 of Scenario 2 with AODV protocol.	42
4.9	Node movements in Test 3 of Scenario 2 with AODV protocol.	43
4.10	Node movements in Test 4 of Scenario 2 with AODV protocol.	44
4.11	Node movements in Test 5 of Scenario 2 with AODV protocol.	45
4.12	Node movements in Test 1 of Scenario 3 with AODV protocol.	46
4.13	Node movements in Test 2 of Scenario 3 with AODV protocol.	47
4.14	Node movements in Test 3 of Scenario 3 with AODV protocol.	48



4.15	Node movements in Test 4 of Scenario 3 with AODV protocol.	49
4.16	Node movements in Test 5 of Scenario 3 with AODV protocol.	50
4.17	Node movements in Test 1 of Scenario 1 with DSDV protocol.	52
4.18	Node movements in Test 2 of Scenario 1 with DSDV protocol.	54
4.19	Node movements in Test 3 of Scenario 1 with DSDV protocol.	55
4.20	Node movements in Test 4 of Scenario 1 with DSDV protocol.	57
4.21	Node movements in Test 5 of Scenario 1 with DSDV protocol.	58
4.22	Node movements in Test 1 of Scenario 2 with DSDV protocol.	59
4.23	Node movements in Test 2 of Scenario 2 with DSDV protocol.	60
4.24	Node movements in Test 3 of Scenario 2 with DSDV protocol.	61
4.25	Node movements in Test 4 of Scenario 2 with DSDV protocol.	62
4.26	Node movements in Test 5 of Scenario 2 with DSDV protocol.	63
4.27	Node movements in Test 1 of Scenario 3 with DSDV protocol.	64
4.28	Node movements in Test 2 of Scenario 3 with DSDV protocol.	65
4.29	Node movements in Test 3 of Scenario 3 with DSDV protocol.	66
4.30	Node movements in Test 4 of Scenario 3 with DSDV protocol.	67
4.31	Node movements in Test 5 of Scenario 3 with DSDV protocol.	68
4.32	Simulation parameters	69
5.1	No. of sent packet in Scenario 1 with AODV protocol.	79
5.2	No. of dropped packet in Scenario 1 with AODV protocol.	79
5.3	No. of lost packet in Scenario 1 with AODV protocol.	79
5.4	No. of sent packet in Scenario 2 with AODV protocol.	83
5.5	No. of dropped packet in Scenario 2 with AODV protocol.	83
5.6	No. of lost packet in Scenario 2 with AODV protocol.	83

5.7	No. of sent packet in Scenario 3 with AODV protocol.	87
5.8	No. of dropped packet in Scenario 3 with AODV protocol.	87
5.9	No. of lost packet in Scenario 3 with AODV protocol.	87
5.10	The Throughput and PLR for Scenario 1 with AODV protocol	98
5.11	The Throughput and PLR for Scenario 2 with AODV protocol	99
5.12	The Throughput and PLR for Scenario 3 with AODV protocol	101
5.13	The Throughput in Different Nodes Mobility with AODV protocol	102
5.14	The PLR in Different Nodes Mobility with AODV protocol	103
6.1	The differences between AODV and DSDV protocol	108

## LIST OF FIGURES

FIGURE	TITLE	PAGE
3.1	Research Process Flow Diagram	24
3.2	NSG2 Work Space	25
3.3	Set Nodes Location and Movement	26
3.4	Set Source Nodes, Destination Nodes and Network Data Type to Be Transmitted	27
3.5	Select Application Protocol	27
3.6	Select Simulation Parameters	28
3.7	Tracegraph User Interface	29
4.1	Test 1 for Scenario 1	33
4.2	Test 2 for Scenario 1	35
4.3	Test 3 for Scenario 1	36
4.4	Test 4 for Scenario 1	38
4.5	Test 5 for Scenario 1	39
4.6	Test 1 for Scenario 2	41
4.7	Test 2 for Scenario 2	42
4.8	Test 3 for Scenario 2	43
4.9	Test 4 for Scenario 2	44
4.10	Test 5 for Scenario 2	45



4.11	Test 1 for Scenario 3	46
4.12	Test 2 for Scenario 3	47
4.13	Test 3 for Scenario 3	48
4.14	Test 4 for Scenario 3	49
4.15	Test 5 for Scenario 3	50
4.16	Test 1 for Scenario 1 with DSDV protocol.	51
4.17	Test 2 for Scenario 1 with DSDV protocol.	53
4.18	Test 3 for Scenario 1 with DSDV protocol.	54
4.19	Test 4 for Scenario 1 with DSDV protocol.	56
4.20	Test 5 for Scenario 1 with DSDV protocol.	57
4.21	Test 1 for Scenario 2 with DSDV protocol.	59
4.22	Test 2 for Scenario 2 with DSDV protocol.	60
4.23	Test 3 for Scenario 2 with DSDV protocol.	61
4.24	Test 4 for Scenario 2 with DSDV protocol.	62
4.25	Test 5 for Scenario 2 with DSDV protocol.	63
4.26	Test 1 for Scenario 3 with DSDV protocol.	64
4.27	Test 2 for Scenario 3 with DSDV protocol.	65
4.28	Test 3 for Scenario 3 with DSDV protocol.	66
4.29	Test 4 for Scenario 3 with DSDV protocol.	67
4.30	Test 5 for Scenario 3 with DSDV protocol.	68
4.31	The initial position of nodes in Scenario 1, 2 and 3.	70
4.32	The position of nodes during execution in Scenario 1	71
4.33	The position of nodes after execution in Scenario 1	71
4.34	The position of nodes during execution in Scenario 1	72

5.11	The network and current node information for Test 1 in Scenario 2 with AODV protocol.	84
5.12	The network and current node information for Test 2 in Scenario 3 with AODV protocol.	85
5.13	The network and current node information for Test 3 in Scenario 3 with AODV protocol.	85
5.14	The network and current node information for Test 4 in Scenario 3 with AODV protocol.	86
5.15	The network and current node information for Test 5 in Scenario 3 with AODV protocol.	86
5.16	The network and current node information for Test 1 in Scenario 1 with DSDV protocol.	88
5.17	The network and current node information for Test 2 in Scenario 1 with DSDV protocol.	89
5.18	The network and current node information for Test 3 in Scenario 1 with DSDV protocol.	89
5.19	The network and current node information for Test 4 in Scenario 1 with DSDV protocol.	90
5.20	The network and current node information for Test 5 in Scenario 1 with DSDV protocol.	90
5.21	The network and current node information for Test 1 in Scenario 2 with DSDV protocol.	91
5.22	The network and current node information for Test 2 in Scenario 2 with DSDV protocol.	92

5.23	The network and current node information for Test 3 in Scenario 2 with DSDV protocol.	92
5.24	The network and current node information for Test 4 in Scenario 2 with DSDV protocol.	93
5.25	The network and current node information for Test 5 in Scenario 2 with DSDV protocol.	93
5.26	The network and current node information for Test 1 in Scenario 2 with DSDV protocol.	94
5.27	The network and current node information for Test 2 in Scenario 2 with DSDV protocol.	95
5.28	The network and current node information for Test 3 in Scenario 2 with DSDV protocol.	95
5.29	The network and current node information for Test 4 in Scenario 2 with DSDV protocol.	96
5.30	The network and current node information for Test 5 in Scenario 2 with DSDV protocol.	96
5.31	The PLR for each tests in Scenario 1 with AODV protocol	98
5.32	The throughput for each tests in Scenario 1 with AODV protocol	99
5.33	The PLR for each tests in Scenario 2 with AODV protocol	100
5.34	The throughput for each tests in Scenario 2 with AODV protocol	100
5.35	The PLR for each tests in Scenario 3 with AODV protocol	101
5.36	The throughput for each tests in Scenario 3 with AODV protocol	101
5.37	The Throughput in Different Nodes Mobility with AODV protocol	103
5.38	The PLR in Different Nodes Mobility with AODV protocol	103



# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Portable devices and wireless technologies have become recent essential to people's daily routine. The rapid development of mobile devices technologies increase alongside with the number of mobile devices users. The need of exchanging information easily among users especially when they are on-the-go and not in a fixed network environment. For example, participants may need to exchange contact information during a conference, students may want to download the presentation slides during a lecture, people in a disaster recovery team may need to retrieve and exchange information in order to manage the search and rescue operations, and travelers may wish to exchange data about the weather, and departure and arrival schedules in an airport. In such situations, a mobile ad hoc network (MANET) provides a means to set up a mode of communication easily and quickly.

Mobile ad hoc networks (MANET) have been a point of attention lately as a means of providing continuous network connectivity to mobile computing devices regardless of physical location. An ad-hoc network can be defined as a local area network (LAN) that is spontaneously built when a mobile device, connected by wireless link, to another mobile device. Instead of relying on a base station to coordinate the flow of messages to each node in the network, there are no infrastructures exists in MANET and the individual network nodes are mobile. Since the nodes are free to move, the network topology may change dynamically and unpredictably over time.

The MANET mode of operation is basically peer-to-peer multi-hop mobile wireless networks where information packets are sent in a store-and-forward manner from a source to an arbitrary destination. The network is has no centralized environment where all network activity including discovering the topology and delivering messages must be executed by the nodes themselves, i.e., routing functionality will be incorporated into mobile nodes.

## **1.2 Research Background**

The difference between the traditional wired network and mobile ad-hoc networks are the mobility of nodes and the wireless medium. Therefore, the routing protocol for MANETs is one of the most critical factor to measure its performance. The routing protocols for wired networks are designed to support a large number of static nodes and packets are transmitted over reliable links. On the contrary, the size of a MANET may be small with a few nodes, but the network topology may be very dynamic and changes constantly, and packets are transmitted over unreliable wireless links.

In a MANET, the nodes mobility and the unreliable links between nodes may prone to route breaks. As the route breaks, the packet loss rate increases and throughput decrease. Such packet losses and performance degradation occur continuously due to the inefficiency of the wireless medium and the weakness of the routing and transport protocols. Establishing the most suitable routing protocol in MANETs may reduce packet loss and improve in performance with higher amount of throughput.

Generally, ad-hoc routing protocols can be categorized as Proactive or Reactive. Proactive protocols mandates that nodes in a MANET should keep track of routes to all possible destinations so that when a packet needs to be forwarded, the route is already known and can be immediately used. It has the advantage that a node experiences minimal delay whenever a route is needed as a route is immediately selecting from the routing table. However, proactive protocols may not always be appropriate as they continuously use a



substantial fraction of the network capacity to maintain the routing information current. . In this simulation, the Destination-Sequence Distance Vector (DSDV) will be used. This protocol builds up a route for data transmission by maintaining a routing table inside every node of the network.

On the other hand, reactive protocols employ a lazy approach whereby nodes only discover routes to destinations on demand. A node does not need a route to a destination until that destination is to be sink of data packets sent by the node. Reactive protocols often consume much less bandwidth than proactive protocols, but a long delay to determine a route can be significantly high and they will typically experience a long delay for discovering a route to a destination prior to the actual communication. In this simulation, the Ad-Hoc On-Demand Distance Vector (AODV) will be used. This protocol minimize the number of required broadcasts by creating routes on an on-demand basis.

### **1.3 Problem Statement**

It is sometimes impossible to know what environment the protocol will discover itself in because the environment especially in different levels in a building may change unexpectedly and rapidly. Therefore, the routing protocol must be able to adapt to route changes quickly in order to provide continuous transmission. Several simulation-based performance evaluations have been done for ad hoc routing protocols in the recent years but most MANET performance research were done in a single level area. However, only limited MANET performance experiments conducted in a staircase environment. Moreover, the experiment were done only to evaluate MANET performance metrics in proactive routing protocol but not in reactive routing protocol. Thus, this research need to be conducted to identify the performance of MANET in different levels in a building based on different routing protocols.

In this research, a simulation network model will be developed based on a staircase area simulating the environment of Kolej Poly-Tech MARA Batu Pahat with different types of routing protocol to overcome the following problems:

- Increased packet loss and low throughput due to route breaks.
- Delayed packet transmission due to poor establishment of suitable routing protocol with nodes mobility.

#### **1.4 Research Objectives**

In this paper, the objectives is to conduct an experiment as follows:

- i. To identify network performance metrics in MANET.
- ii. To implement a simulation MANET scenarios with different routing protocol.
- iii. To analyze and evaluate the MANET performance metrics in a staircase environment with Ad-Hoc On-Demand Distance Vector (AODV) and Destination-Sequence Distance Vector (DSDV) protocol.

#### **1.5 Research Methodology**

The simulation works will use a number of software and tools for different purposes such as simulation support software, network modelling, and monitoring network performance through packet tracing. The software used for simulation support is Linux Ubuntu 14.04 which will be the operating system for the machine, and the Network Simulator 2 (NS2) for network simulation tool. For network modelling, the Network Simulator 2 Scenarios Generator 2 (NSG2) will be used to create network model with selected parameters and help to generate the TCL scripts file to run in the NS2. The monitoring network performance will be done by tracing the network performance in Tracegraph software. The analysis also will be carried out by using Tracegraph.

### 1.5.1 Target Environment

The experiment will be simulate as an indoor staircase environment at Kolej Poly-Tech MARA Batu Pahat.

### 1.5.2 Nodes Mobility

The network topology will have 12 nodes which consists of 1 source node, 1 destination node, and 10 intermediate nodes. There will be three experimental network scenarios will be created, as stated in Table 1.1.

<b>Network Scenarios</b>	<b>Movement of Nodes</b>
<b>Scenario 1</b>	The source and destination node are in stationary mode, all intermediate nodes are moving.
<b>Scenario 2</b>	1 source node is moving, other nodes are all static.
<b>Scenario 3</b>	1 destination is moving, other nodes are all static.

Table 1.1: Movement of Nodes

The experiments will be conducted in two sets based on the routing protocol. During the first set, data transmission in all scenarios are sent by using the Ad-Hoc On-Demand Distance Vector (AODV), an on-demand based, reactive routing protocol. During the second set, data transmission in all scenarios are sent by using the Destination-Sequence Distance Vector (DSDV) a table-oriented, proactive routing protocol.