

**AN INVESTIGATION OF TFRC OVER MANET ROUTING
PROTOCOL**

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ABSTRAK

'Mobile ad hoc network' atau dikenali sebagai MANET adalah gabungan nod-nod tanpa wayar yang membolehkan ia berdiri sendiri dan tidak boleh diramal oleh sistem rangkaian sementara. *'Mobility'* dan keadaan infrastruktur MANET yang tidak tetap sangat baik untuk kegunaan sistem rangkaian sensor, operasi menyelamat, ketenteraan, dan kegunaan pada masa kritikal. Protokol *'MANET'* mengandungi *'table driven'* dan *'on-demand'* di mana dalam penyelidikan ini tumpuan diberikan kepada protokol *'on-demand'* iaitu *'Dynamic Source Routing (DSR)'* dan *'Ad Hoc On-Demand Distance Vector (AODV)'*. Selain itu *'TCP-Friendly Rate Control (TFRC)'* menyediakan kawalan traffic yang lebih lancar, *'throughput'* yang lancar dan pelbagai jika dibandingkan dengan *'Transmission Control Protocol (TCP)'*. Dalam penyelidikan ini, dicadangkan kajian bagi *'performance metrics'* seperti *'jitter'*, lengahan, dan *'throughput'* dengan membandingkan *'performance metrics'* bagi DSR dan AODV dan menggunakan simulasi rangkaian (ns-2). Berdasarkan keputusan yang diperolehi, DSR menunjukkan prestasi lebih baik jika dibandingkan dengan AODV terutamanya dalam *'jitter'*, lengahan, dan *'throughput'*. Protokol DSR menunjukkan prestasi sangat baik dengan *'jitter'* dikurangkan sebanyak 19.45% hingga 23.27%, *'throughput'* yang lebih baik dengan peratusan 36.43% hingga 69.65% dan lengahan masa yang rendah dengan peratusan 92.56% hingga 98.05% jika dibandingkan dengan protokol AODV.

ABSTRACT

A Mobile Ad Hoc Network or MANET is a collection of wireless nodes that are able to junction standalone and which cannot be predicted by a temporary network without any fixed backbone infrastructure. Mobility and the non-fixed infrastructure of MANET are also attractive for sensor networks applications, rescue operations, military, and time-critical applications. MANET routing protocol consist of a table driven and on-demand routing protocol and the specific focus to on-demand routing protocol such as Dynamic Source Routing (DSR) and Ad Hoc On-Demand Distance Vector (AODV). The TCP-Friendly Rate Control (TFRC) provides a smoother congestion control, smoother throughput variance compared with Transmission Control Protocol (TCP). In this paper, we propose an investigation of the performance metrics such as jitter, packet delay, and throughput. We compare the performance metrics of DSR and AODV using extensive simulation experiments Network Simulation (ns-2). Based on the research results, DSR operates better in TFRC over AODV routing protocol and it performed with better in jitter, throughput and packet delay. The DSR protocol perform better with 19.45% to 23.27% less jitter, 36.43% to 69.65% better throughput and 92.56% to 98.05% lower packet delay than the AODV protocol.

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LIST OF ABBREVIATIONS

Glossary

| | |
|---------|--|
| ABR | Associativity-Based Routing |
| ACK | Acknowledgement |
| ADV | Adaptive Distance Vector |
| AODV | Ad Hoc On Demand Distance Vector |
| AP | Access Point |
| CBR | Constant Bit Rate |
| CGSR | Cluster head-Gateway Switch Routing |
| CSMA/CA | Carrier Sense Multiple Access with Collision Avoidance |
| CTS | Clear-to-Send |
| Cwnd | Congestion Window |
| DNS | Domain Name Server |
| DREAM | Distance Routing Effect Algorithm for Mobility |
| DSDV | Destination-Sequenced Distance Vector Routing |
| DSR | Dynamic Source Routing |
| HTTP | Hyper Text Transfer Protocol |
| IEEE | Institute of Electrical and Electronics Engineers |
| IETF | Internet Engineering Task Force |
| IP | Internet Protocol |

| | |
|-------|--------------------------------|
| LAM | Lightweight Adaptive Multicast |
| LAN | Local Area Networks |
| LAR | Location Aided Routing |
| LMR | Lightweight Mobile Routing |
| MAC | Medium Access Control |
| MANET | Mobile Ad Hoc Networks |
| MSS | Maximum Size Segment |
| nam | Network Animator |
| ns-2 | Network Simulator 2 |
| OS | Operating System |
| OTCL | Object TCL |
| QoS | Quality of Service |
| RERR | Route Error |
| RFC | Request for Comments |
| RREP | Route Reply |
| RREQ | Route Request |
| RTO | Round Transmission Out |
| RTS | Request-to-Send |
| RTT | Round Trip Time |
| SSA | Signal Stability Adaptive |
| SSR | Signal Stability Routing |
| TCL | Tool Command Language |

| | |
|------|--------------------------------------|
| TCP | Transmission Control Protocol |
| TFRC | TCP-Friendly Rate Control |
| TORA | Temporally Ordered Routing Algorithm |
| UDP | User Datagram Protocol |
| WAN | Wide Area Networks |
| WMN | Wireless Mesh Network |
| WRP | Wireless Routing Protocol |

CHAPTER 1

INTRODUCTION

1.1 Introduction

Since their emergence in the 1970s, wireless networks have become increasingly popular in the computing and communication industries. This is particularly true within the past decade, which has seen wireless networks evolving in order to enable greater mobility. There are two variations of mobile wireless networks [1] the first is known as infrastructure network (i.e., a network with fixed and wired gateways) and the second is infrastructure less mobile network, known as an *ad hoc network*. Wireless mobile ad hoc networks have no fixed routers; hence all nodes are capable of movement and can be connected dynamically in an arbitrary manner. Meanwhile, nodes of these networks function as routers which discover and maintain routes to other nodes in the network.

A Mobile Ad Hoc Network or MANET is a collection of wireless nodes that are able to junction standalone and which cannot be predicted by a temporary network without any fixed backbone infrastructure [2]. MANET is a mobile network which produce free mobile nodes that organize themselves and move randomly, hence the MANET topology can change rapidly and unpredictably [3]. The MANET network enables servers and clients to communicate in a non-fixed topology area and its used in a variety of applications and fast growing networks [4]. Mobility and the non-fixed

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