

AN ALTERNATIVE ROUTING MECHANISMS FOR MOBILE  
AD-HOC NETWORKS

AWOS KHAZAL ALI

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## **ABSTRACT**

Routing is the essential task of transferring packets from source node to destination, or can be described as the process of path finding. A lot of routing mechanisms have been proposed for wired and wireless networks and some of them have been widely used. In Mobile Ad Hoc Network (MANET), every node in the network acts as a router, forwarding packet from one node to another. Since Ad Hoc networks are wireless and the nodes often battery driven, it is very important that the routing protocol in use can handle a large degree of node mobility and at the same time be very energy efficient. The goal of this study is to propose a hybrid routing protocol for MANET based upon existing protocols. NS2 was used to perform the simulation and evaluate the performance of proposed protocol and compare it with existing protocols.

## ABSTRAK

*Routing* adalah proses asas dalam penghantaran paket-paket dari nod asal ke destinasi, atau boleh digambarkan sebagai suatu proses pencarian jalan atau *route*. Terdapat pelbagai mekanisma *routing* yang telah dicadangkan bagi rangkaian berwayar dan tanpa wayar dan kebanyakannya daripadanya telah pun digunakan secara meluas. Di dalam rangkaian *Mobile Ad Hoc Network (MANET)*, setiap nod di dalam rangkaian bertindak sebagai penentu arah laluan (*router*), menghantar paket dari satu nod ke nod yang lain. Disebabkan rangkaian-rangkaian *ad hoc* adalah tanpa wayar dan nod-nod kebanyakannya digerakkan menggunakan bateri, adalah penting protokol *routing* yang digunakan dapat menangani kadar pergerakan yang tinggi dan pada masa yang sama mempunyai penggunaan tenaga yang cekap. Matlamat bagi kajian ini ialah untuk mencadangkan mekanisma penukaran (*switching*) bagi protokol *routing* secara *hybrid* bagi rangkaian-rangkaian *MANET* berdasarkan protokol-protokol yang sedia ada. *NS2* telah digunakan untuk menjalankan simulasi dan mengukur tahap pelaksanaan protokol yang telah dicadangkan dan membandingkannya dengan protokol-protokol yang sedia ada.

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## CHAPTER 1

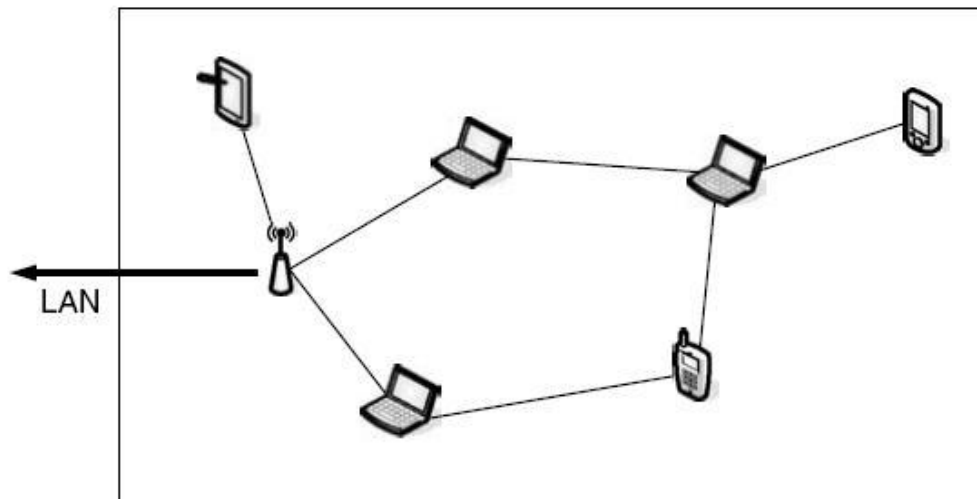
### Project Overview

#### 1.1. Introduction:

In Latin, ad hoc literally means “for this”, and is often applied in terms of network where devices may be added and integrated using wireless technology [2]. Wireless networks have become popular in the past few years, when they are being adapted to enable mobility and wireless devices became popular such as Mobile hand phone and laptop computers

There are two kinds of mobile wireless networks. The first is known as infrastructure network, with mobile nodes and base station. The base station is responsible for routing, security and all issues in this kind of network. Typical applications for this type of wireless network include wireless local area networks (WLANs). Figure 1.1 shows an example of infrastructure wireless network. The second type of mobile wireless network is the infrastructure-less mobile network, commonly known as the ad hoc network [3].



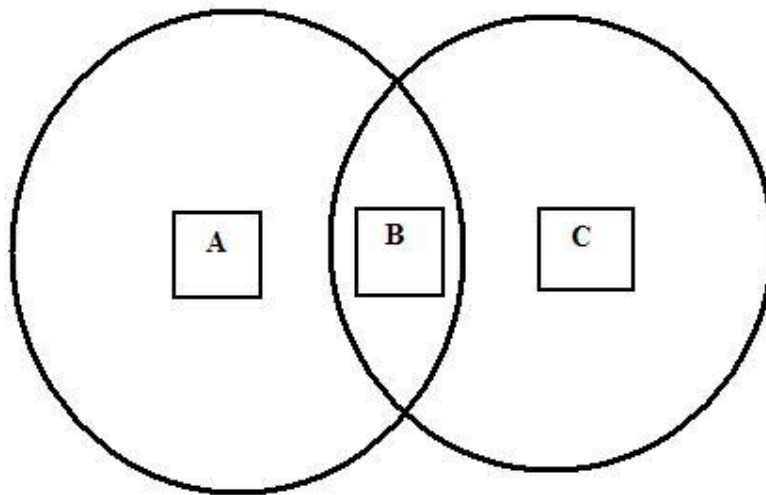


**Figure 1.1:** Example of an infrastructure wireless network.

Mobile ad hoc networks (MANETs) are collections of mobile nodes, dynamically forming a temporary network without pre-existing network infrastructure or centralized base station. These nodes can be arbitrarily located and are free to move randomly at any given time, thus allowing network topology and interconnections between nodes to change rapidly. Node mobility can vary between network to other depending on the particular network's structure and purpose.

As a general rule, high mobility usually results in low link capacity, whereas low mobility leads to high capacity links. An ad hoc network is usually a self-organizing and self-configuring "multi-hop" network which does not require any fixed infrastructure such as transceiver base stations or even cables. Mobile devices (e.g. notebook computers, PDAs, and cell phones) with wireless radio equipment are supposed to communicate with each other, without the help of any fixed devices [1]. In an ad hoc network, all nodes are dynamically and arbitrarily located, and are required to relay packets for other nodes in order to deliver data across the network. There is no router like in wired network, thus the node it self operate the router job.

Ad hoc networks are suited for use in situations where infrastructure is either not available, not trusted, or should not be relied on in times of emergency. A few examples include: military soldiers and equipments in the battlefield ("open environment"), sensor networks for various research purposes, emergency rescue after an earthquake or flood, and temporary offices, conference or meeting in such company ("close or limited environment"). Figure 1.2 illustrates an example of ad-hoc network with three nodes.



**Figure 1.2:** Example of a mobile ad hoc network with three participating nodes.

## 1.2. Problem background

In any network communication there is a need for a suitable routing mechanism to deliver packets from source to destination nodes. The concept of routing can be described as the process of path finding. In case of mobile ad hoc networks (MANETs) the main problem in routing mechanism, is how to send a packet from one node to another when there is no direct link exist between source and destination nodes.

Routing in ad hoc networks has always been a challenging task. The major reason for this is because of the characteristics of MANET itself that consists of high degree of node mobility, limited bandwidth, variable capacity links, energy-constrained operation, limited physical security, and no stationary infrastructure or base station for communication. Such characteristics make routing mechanism a challenging issue in MANET environment.

There are several techniques that have been proposed so far and all of them have their own advantages and limitations [9][17][19]. Each technique tries to determine the optimal path for packets delivery from source to destination nodes. The proposed routing mechanisms also should enable nodes to send and receive packets in reliable and fast manner. Some of the proposed routing mechanisms are suitable to be used in various MANET environments (i.e. open, localized, and organized environments), while some others are only suitable to be deployed in a specific environment.

### **1.3. Problem Statement:**

Despite of long history of mobile ad-hoc networking (MANET's), there are still quite a number of problems that are open for discussion. Routing is one of the most important open issues in MANET research. The problem of routing can be divided into two areas: route discovery and route maintenance. When nodes want to communicate with each other, they must initially discover a suitable route to be used for the communication.

The high mobility, low bandwidth, and limited computing capability characteristics of mobile hosts make the design of routing protocols very challenging. The protocols must be able to keep up with unpredictable changes in network topology with as minimal message exchanges as possible and in the most efficient way.

This project proposes an alternative solution for ad-hoc network routing mechanism which aims to improve the reliability of the path chosen between source and destination nodes.

### **1.4. Project Objectives**

This project aims to propose an alternative routing mechanism that could improve the reliability of packets sent between source and destination nodes in MANET environment. In order to achieve the aforementioned aim, the following objectives need to be accomplished.

1. To investigate existing routing mechanisms in MANET environment.
2. To propose an alternative routing mechanism based upon existing schemes
3. To analyze the performance of the proposed mechanism compared to the existing schemes.

### **1.5. Project scopes**

The scope of this project is as follow.

1. The investigation of existing MANET's routing mechanisms is focusing upon open environment.
2. The proposed routing mechanism will focus upon the route discovery performance not on the security issues.
3. The analyses of the proposed routing mechanism will be conducted in simulation experiments.

## **1.6. Project organization**

The organization of this report is as follow

Chapter 1 gives an introduction to the mobile ad-hoc wireless networks, the problem background, problem statement, project objectives, and project scopes.

In Chapter 2, sufficient reviews of previous works that have been done by researches in this area are presented, which covers the classification of mobile ad-hoc networks (MANET) routing protocols, their advantages and also the limitations.

Chapter 3 will be about the methodology of this study. Chapter 4, present the finding which be done in simulation experiments, Chapter 5, will be the summary of this project.

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