NETWORK PERFORMANCE OF OUTDOOR TEST-BED
DEPLOYMENT FOR WIRELESS MESH NETWORK USING LINKSYS
ROUTER (610N)

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ABSTRACT

A Wireless Mesh Network (WMN) is a communications network made up of radio nodes in a mesh topology. Mesh Software Stack is software that designed to setup a mesh network by using wireless routers. The objectives of this project are to deploy the outdoor Wireless Mesh Network test-bed using Linksys Router (610N) and to evaluate the performance of Wireless Mesh Network.This project need to setup the test-bed with 3 flashed 2.4 GHz wireless Linksys 610n routers with different location. The location of Router A at FKEKK building, Router B at FKEKK shed and Router C at student's café between FKEKK and FKE faculty. Every router need to be measure using 1 wired LAN server connected to wireless router and 1 wireless client has 10 points in range about 1 to 10 meter of distance from router. At every point the throughput need to be measured by using the IxChariot software and the RSSI by using WirelessMon software. The measurement purpose for evaluate the performance of Wireless Mesh Network (WMN) using Linksys router. The performance must consider the location of the wireless routers. Location of every wireless router must be stable and less interferences before the measurement can be run. Location in this project is the best of stability connection of routers and less interference. After done this project finding of the performance of the Wireless Mesh Network using Linksys Router WRT610N can be drop and weak because of the interferences in the outdoor test bed area.

ABSTRAK

Rangkaian *Mesh* Wayarles adalah sebuah rangkaian komunikasi yang terdiri dari titik radio di dalam topologi *mesh*. *Mesh Software Stack*adalah software yang direka untuk menghasilkan rangkaian *Mesh* dengan menggunakan wayarles penghala. Tujuan projekini adalah untuk mengatur kedudukan pengujian Rangkaian *Mesh* Wayarles di rekreasi luar dengan menggunakan penghala *Linksys* (610N) dan untuk menilai prestasi Rangkaian *Mesh* Wayarles. Projekini perlu persediaan rekreasi luar dengan 3 pengubahsuaian 2.4 GHz penghala wayarles *Linksys* (610N) dengan lokasi yang berbeza. Lokasi penghala A di bangunan FKEKK, penghala B di pondok FKEKK dan penghala C di kafe pelajar, terletak diantara fakulti FKEKK dan FKE. Setiap penghala perlu diambil bacaan dengan menggunkan 1 pelayan disambug LAN ke penghala wayarles dan 1 pelanggan wayarles yang mempunyai 10 titik di dalam jarak 1 hingga 10 meter dari penghala. Pada setiap titik, *throughput* akan diukur dengan menggunakan perisian *IxChariot* dan RSSI dengan perisian *WirelessMon*. Tujuan pengukuran ini adalah untuk menilai prestasi Rangkain Mesh Wayarles menggunakan penghala Linksys. Di dalam projek ini kita mempelajari prestasi Rangkaian Mesh Wayarles. Prestasi harus mempertimbangkan lokasi penghala wayarles. Lokasi setiap penghala wayarles perlu stabil dan kurang dari gangguan sebelum pengukuran dapat dijalankan. Lokasi projek ini adalah lokasi terbaik dari segi kestabilan sambungan penghala dan kurang gangguan. Setelah projek ini dijalankan, di dapati prestasi Rangkaian Mesh Wayarles menggunkan penghala Linksys WRT610N boleh menjadi lemah dan jatuh disebabkan oleh gangguan di kawasan pengujian rekreasi luar.

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AODV   -   Ad hoc On-demand Distance Vector

ARP   -   Address Resolution Protocol

BSSID   -   Basic Service Set Identification

DHCP -   Dynamic Host Configuration Protocol

DNS   -   Domain Name System

DSSS   -   Direct-Sequence Spread Spectrum

ESSID -   Extended Service Set ID

FTP   -   File Transfer Protocol
HTTP   -   Hypertext Transfer Protocol
IP   -   Internet Protocol
LAN   -   Local Area Network

LELA   -   Linksys EasyLink Advisor

MAC   -   Media Access Control

MAN   -   Metropolitan Area Network

MANET   -   Mobile Ad Hoc Networks

MPR   -   Multipoint Relaying

OFDM   -   Orthogonal Frequency-Division Multiplexing

OLSR   -   Optimize Link State Routing

PC   -   Personal Computer

QoS   -   Quality of Service

SNR   -   Signal toNoise Ratio

SSID   -   Service Set Identifier

TBRPF   -   Topology Dissemination Based on Reverse-Path
Forwarding
TC   -   Topology control

TCP   -   Transmission Control Protocol
TFTP   -   Trivial File Transfer Protocol

TORA	-	Temporally-Ordered Routing Algorithm
UDP	-	Datagram Protocol
QoS	-	Quality of Service
SNR	-	Signal toNoise Ratio
SSID	-	Service Set Identifier
VoIP	-	Voice over IP
WLAN	-	Wireless Local Area Network
WMN	-	Wireless Mesh Network

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CHAPTER I

INTRODUCTION

This chapter presents an overview of the project. This chapter will explain about the project, objectives of the project, problems statements, and scope of project, methodology and the outline report.

1.1   Mesh Network and Wireless Mesh Network

Mesh networking is a type of networking where in each node in the network may act as an independent router, regardless of whether it is connected to another network or not. It allows for continuous connections and reconfiguration around broken or blocked paths by "hopping" from node to node until the destination is reached. A mesh network whose nodes are all connected to each other is a fully connected network. Mesh networks differ from other networks in that the component parts can all connect to each other via multiple hops, and they generally are not mobile.

Mesh networks can be seen as one type of ad hoc network. Mobile ad hoc networks (MANET) and mesh networks are therefore closely related, but MANET also have to deal with the problems introduced by the mobility of the nodes. Mesh networks are self-healing: the network can still operate when one node breaks down

or a connection goes bad. As a result, the network may typically be very reliable, as there is often more than one path between a source and a destination in the network. Although mostly used in wireless scenarios, this concept is also applicable to wired networks and software interaction. The animation at the right illustrates how wireless mesh networks can self form and self heal [1].

Wireless mesh networks were originally developed for military applications and are typical of mesh architectures. Over the past decade the size, cost, and power requirements of radios has declined, enabling more radios to be included within each device acting as a mesh node. The additional radios within each node enable it to support multiple functions such as client access, backhaul service, and scanning (required for high speed handover in mobile applications). Additionally, the reduction in radio size, cost, and power has enabled the mesh nodes to become more modular—one node or device now can contain multiple radio cards or modules, allowing the nodes to be customized to handle a unique set of functions and frequency bands.

1.2   Background Project

Over the last past years, Wireless Mesh Networks (WMNs) are gaining more attention and considered as a convincing solution for providing better Internet access services for end users. The attention comes according to the unique features of WMNs including reliability, scalability and self-configuring wireless network technology. These features offer a suitable wireless network technology for next-generation networks.

WMNs consist of a collection of wireless nodes. Each node operates not only as a host, but also as a router forwarding packets for other nodes. The main goal of WMNs is to allow neighbours in residential and business areas to connect their home networks together forming a "Community Mesh Network". Providing such kind of connectivity allows neighbours to share single Internet access and accordingly reduce the cost of individually install it in each home network.

1.3   Objective of Project

The objectives of this project are to deploy the outdoor test-bed of Wireless Mesh Network using Linksys routers and DD-WRT firmware. Next objectives are to evaluate the performance of Linksys router and understand how the Wireless Mesh Network works.

1.4   Problem Statement

The problem statements of this project are the stability of the connection on the routers and the interference in the test-bed locations. In Wireless Mesh Network the stability of the connections of routers is the main factor in the process of deploys the test-bed either outdoor or indoor. The interference is the other factors in measurements the performance of the Wireless Mesh Network. This problem statements need to take a consideration to success this project.

1.5   Scope of Project

The scope of this project is focusing on flashing the DD-WRT firmware into specified router, (Linksys WRT610N) and deploys the test- bed WMN and measure the performance of Linksys router. Besides, the performance evaluation will be done using DD-WRT flashed.

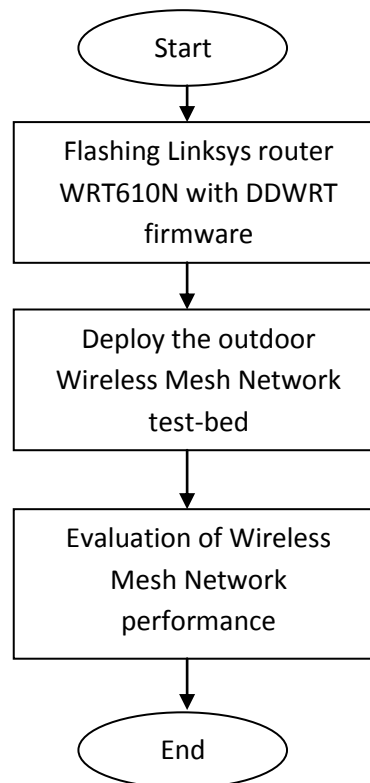## 1.6   Project Methodology

Figure 1.1: Methodology of Project

The methodology of this project are to make sure the flashing of DD-WRT firmware can be used and success on the three Linksys routers WRT610N. Then deploy the outdoor Wireless Mesh Network test-bed at the location that already plans. And the last is evaluating the performance of the Wireless Mesh Network at the outdoor test-bed areas.

1.7   Report Outline

This report discusses overall the network performance of outdoor test-bed deploy for Wireless Mesh Network using Linksys router (WRT610N). It is consisting of five chapters, which will cover all the matter that should be discussed in developing this project.

Chapter I give out the information of the introduction to this project. It is including the project background, objectives to achieve from this project, the project problem statement, scope of work, and project methodology.

Chapter II contains literature review. It discusses the literature review of the background that is needed in this project. It is about all the study that has been made for this project. It will explain the techniques used in gathering the information and the theory. The literature review will produce a work concept to show the connection between the project with theory and concept.

Chapter III is about project methodology. It will explain the implementation and solution in doing this project. It consist the overall system and the structure needed in the system. Methods used in this project are clearly pointed out such as data collection, data process and analysis, system model and flowchart. Factors that were weighed out in selecting the methods and the advantages are also pointed out.

Chapter IV presents the result of this project. This chapter also includes the analysis of this system development. This chapter will discuss the result accordingly to the objective stated earlier in this project.

Chapter V, is the final chapter which summaries the research findings. This chapter also identifies problems and obstacles throughout this research. Some suggestions for future work is discussed which might be useful for further development and improvement to the system and also the implementation of the system.

CHAPTER II

LITERATURE REVIEW

This chapter presents an overview of Wireless Mesh Networks (WMNs) and explain their main features, architectures, characteristics, and some of the current challenges facing WMNs. In this chapter also discuss the major families of the routing protocols used in wireless networks. This chapter will present one protocol from each family to show the routing behaviour of the family. Finally, researcher conclude the chapter with the related works.

2.1   Introduction

With the ever increasing number of wireless devices, the popularity of wireless networks has been rapidly increased to provide better wireless services and to achieve good user satisfaction. Traditionally, wireless networks are either point-to-point network, where each wireless device (wireless node) needs its own dedicated connection, or point-to-multipoint network, where all wireless nodes are within range of a multi-point node which considered as a master node to ensure connectivity among nodes.

Recently, another topology called Wireless Mesh Network has emerged to provide reliable and scalable wireless network. Wireless Mesh Network (WMN)