VIDEO STREAMING QUALITY IN WIRELESS MESH NETWORK

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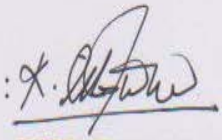
Signature : 

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This project and research work is dedicated to my beloved parents for their devoted caring throughout my life, my loving brothers and sister, also my friends for their encouragement and love.

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ABSTRACT

This Final Year Project (FYP) report traverses the Video Streaming Quality in Wireless Mesh Network. Wireless Mesh Network (WMN)is a type of wireless network and emerging technology that is on rise as it carries the potential to deliver Internet broadband services in supporting real time applications. such as the multimedia and video streaming. In this project it comprises of WMN, server and client where video streaming is done from server to client. The WMN network comprises of mesh routers and mesh clients, and video streaming is done on laptop form server to client. There are chosen imperative elements that are analyzed to determine the quality level of video streaming such as the jitter, delay, packet loss and distance. These are the parameters that is about to be analyzed for the QoS(quality of service). The video streaming results will be analyzed and a final report on the quality of video streaming in wireless mesh network is given.

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ABSTRAK

Projeck Sarjana Muda (PSM) adalah satu usaha dalam menanaman dan pembagunan sifat professional yang berasaakan kerja-kerja teknikal dan softskill secara menyeluruh. Salah satu syarat untuk melengkapkan penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Telekomunikasi), Universiti Teknikal Malaysia Melaka, seseorang mahasiswa perlu melengkapkan secara menyeluruh berkaitan Projek Sarjana Muda dengan sempurna. Berasaskan tujuan dan matlamat itu, Projeck Sarjana Muda (PSM) saya bertajuk "Kualiti Aliran Video Dalam Rangkaian Mesh Wayarles. Rangkaian Mesh Wayarles adalah salah satu rangkaian wayarles yang semakin banyak diaplikasikan terutamanya dalam applikasi multimedia dan video. Dalam projek ini, tajuk yang dipilih adalah kualiti video dalam rangakain mesh wayarless di mana aliran video dilaksanakan dalam wayarless mesh. Rangkaian mesh terdiri daripada jaringan router mesh dan jaringan mesh pelanggan dan aliran video dilaksanakan dalam video daripada pelayan kepada pelanggan. Dalam projek beberapa parameter penting telah dianalisis seperti ketar(jitter), 'delay', kehilangan paket dan jarak router. Ini adalah parameter yang dianalisis untuk menentukan kualiti servis aliran video dalam rangkaian mesh. Akhir sekalai data yang diperoleh dikumpul dan analisis dibuat. Ini diikuti dengan penyelesaian lapora akhir di mana semau data dimasukkan dan kesimpulan diberi mengenai kualiti aliran video dalam rangkaian wayarles mesh.

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LIST OF ABBREVIATIONS

WMN	-	Wireless Mesh Network
UTeM	-	Universiti Teknikal Malaysia Melaka
FYP	-	Final Year Project
IEEE	-	Institute of Electrical and Electronics Engineers
QoS	-	Quality of Service
IP	-	Internet Protocol
LAN	-	Local Area Network
WLAN	-	Wireless Local Area Network
P2P	-	Peer to Peer
RF	-	Radio Frequency
PSNR	-	Peak Signal-to-Noise Ratio
HWMP	-	Hybrid Wireless Mesh Protocol
AP	-	Access Point
RTP	-	Real Time Protocol
UDP	-	User Datagram Protocol
MLR	-	Media loss rate

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CHAPTER 1

INTRODUCTION

Chapter one focuses on the project's overview, project's objective and problem statement, scope of work, methodology and thesis structure. It will explain the basics of the project that is the Wireless Mesh Network (WMN) and the video streaming that is done and the quality assessment in WMN. These will be explained in this chapter to give guidance to what the project is about.

1.1 Overview of the Project

Wireless Mesh Network (WMNs) is one of the key technologies that will dominate wireless networking in the nearest future [1]. Wireless mesh network

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comprises of mesh routers and mesh clients. The function-ability of each nodes are depicted in the way where nodes resemble router and not only a host. The primary function of router is to forwards packets , acting in behalf of other nodes which might not be within direct wireless transmission range of their destinations [1]. There are many advantages of wireless mesh network.

WMNs provides ease at many elements such the installation part, owns a deployment that is cost effective, scalability that is very good, wide coverage area and capacity, network flexibility and self-configuration capability [2]. WMN also boosts stable connectivity and capacity, and through the different mesh routers it is able to possess efficient transmission. Wireless mesh network are dynamically self organized and self-configured networks where the nodes in network establish themselves and sustains connectivity among them.

These mesh routers are also known as access points through equipping mesh access points [11]. Multiple radios are often used to execute routing with mesh routers and clients respectively. Hence wireless mesh network is a good platform to support all sorts of real time application. It has the ability to support many applications including video streaming. Mesh routers has the minimal ability and form the backbone of WMN, which provide network access for the clients and connect other sorts of networks through routers with bridge function [3]. The methods to conduct this project need lots of literature review based on past studies and experimental which have been conducted, and required a well understanding and knowledge in both mesh network and video streaming.

Video streaming is a assuring multimedia application and emerging out to be the choice over the wireless/mobile communications. Video streaming happens to be a growing technology that allows transport of video over data networks[4]. Video streaming over IP network is indeed in demand for choices of wide range of network application. Conventionally the parameters of quality of service (QoS) for instance channel bandwidth, packet loss ratio, and transmission delay is used to identify the data transmission performance over wireless mesh network in video streaming [8].

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There are two type of parameters that are usually analyzed in video streaming quality, known as network connection level and application level parameters where the application level parameters are the resolution, frame rate, color, video codec type, audio coded type etc [9]. Network connection level parameters are defined as the network status for packet delivery where it is basically about the transmission of general packets [8]. The ultimate objectives of video streaming in any sort of platform is to provide the best video presentation quality at the receiver end, under the certain constraints of network condition.

In this project analysis of quality will be done on video streaming that uses wireless mesh network as its platform. To my best knowledge there are very few research have been about video streaming performance on wireless mesh network. In this project the quality of video streaming will be analyzed based on the network connection level comprising of data loss, jitter, delay or latency and media loss rate.

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1.2 Objectives

The objectives of this project are:

a. To deploy Wireless Mesh Network (WMN) using routerboard 433UAH.

b. To execute video streaming in the deployed WMN by sending video script.

c. To analyse the video streaming quality based on the chosen parameters.

1.3 Problem Statement

Wireless mesh network is being used in many real time applications as it consist many advantages. And many technologies have been used in data transmission especially video streaming. Video streaming in wireless mesh network would be a better choice as it would boost a better performance. In this project the problem statements comprised of deployment of wireless mesh network and a successful internet connection. Basically the problems that are usually analyzed are the performance of video streaming based on its parameters. The problem that is often faced is the data loss and delay when the client moves around from one access point to another. The important problem statement here is the inspection of video streaming quality in terms of network level parameters and the effect of the distance of mesh nodes. The connection has to be another problem statement that needs to be highlighted as the connectivity of the client has to be monitored when the signal drops and increases. Another element that is included is the codec and the protocol that is used in analyzing the QoS.

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1.4 Scope

The scope of this project covers mainly on two parts; the first is the establishment of wireless mesh network using Mikrotik Routerboard 433UAH. Three boards are used to establish mesh network each with the same channel as WMN demands it. This is followed by the successful internet connection to enable internet access for mesh clients. Another primary scope of this project is the analysis of video streaming quality in WMN from server to client by sending video script. Analysis is done using software IXChariot tool that checks the network level quality of service parameters. Those parameters that will be analyzed are delay, jitter, data loss, and throughput and media loss rate. The secondary scope of this project is based on the analysis summarizing the quality if video streaming and the element that affects the quality of video streaming.

1.5 Project Outcomes

It is expected that by the end of this project, a single radio based wireless mesh network is established with successful internet connection. The video streaming quality analysis is expected to yield out result within the tolerable level for each parameters evaluated.

1.6 Methodology

This project was initialized withe garnering information related to Wireless Mesh Network(WMN) and video streaming that can be executed in the network. The sources and information are obtained from journals, reference books, e-Books, magazines and also the internet. That information collected are

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about the setting up wireless mesh network using single radio and the steps need to be taken to ensure successful WMN with internet access. This was then followed by emulating those steps using the router, to establish WMN, once it has been established few methods were used to ensure the connectivity. Subsequently, video streaming was done using a network tool by the name IXChariot, the video streaming quality was analyzed based on the parameters such as data loss, throughput, jitter, delay and media loss rate. After acquiring all the information needed it was then analyzed and finalized in the report.

1.7 Thesis Structure

The thesis structure is the brief detail of the report ingredients or the layout on the chapters that have been divided in completing this report. In this reports, there are six chapter comprising of introduction, literature review, methodology, results, discussion and conclusion chapters.

The first chapter is about the introduction where it consists of brief description about the project background and overview of project. It also includes the problem statement, objectives and the scope of project and report structure in designating the report.

This is followed by the second chapter named literature review. In this part review and research regarding this project is written about. Many sources can be looked upon to garner information on these related topics for instance journals, books, electronic sources, internet and etc. Information, facts and methods used are found from the resources which will used as reference and informative data in this project. These information will be utilized by doing a comparison of info and methods or techniques and implementing those relevant information into this project.

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