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PERFORMANCE ANALYSIS OF VIDEO STREAMING OVER LOCAL AREA NETWORK

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This report is submitted in partial fulfillment of the requirement for the Bachelor of Computer Science (Computer Networking)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA
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DEDICATION

To my beloved parents, Abdullah Bin Jaafar and Sebariah Binti Darus

To my sister, Mornizawati Abdullah, my brothers Mohammed Suhaidi Bin Abdullah and Mohamad Saifol Bin Abdullah.

To Mohd Afiq Hj. Ahmad and all my friends for this steadfast support

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ABSTRACT

Performance Analysis of Video Streaming over Local Area Network is a project that focuses the performance of Video Streaming over Wired and Ad Hoc Wireless LAN. The main objective of this project is carried out to differentiate and to make analysis during video streaming at Wired and Ad Hoc Wireless. This project is to identify and analyze the bandwith and delay performance during transmission packet by using some compatible analyzing tools. This project will implement over Wired and Ad Hoc Wireless connection and it is use client-server architecture without internet connection. The project implementation is using different services technology like Microsoft's Windows Media Server for Microsoft Technology and QuickTime streaming server that called Darwin Streaming Server. After project being implemented, the performances are measured by using different type of analyzing software like Ethereal and Distinct Network Monitor.

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ABSTRAK

Projek ini menfokuskan analisis berkenaan taraf peningkatan semasa proses video streaming melalui sambungan berwayar dan sambungan komputer ke komputer tanpa wayar. Objektif utama projek ini adalah untuk melakukan analisis dan membandingkan proses streaming di antara sambungan berwayar dan sambungan komputer ke komputer tanpa wayar. Projek adalah untuk mengenalpasti dan menganalisa kelewatan proses semasa penghantaran paket dengan menggunakan beberapa perisian yang bersesuaian untuk menganalisa taraf peningkatan semasa proses streaming. Projek ini akan dibangunkan melalui sambungan berwayar dan sambungan komputer ke komputer tanpa wayar dan menggunakan rekabentuk pelayan dan komputer pelanggan tanpa sambungan internet. Pembangunan projek dilakukan dengan menggunakan pelbagai teknologi seperti Microsoft's Windows Media Server untuk Microsoft Technology dan QuickTime yang mengandungi pelayan streaming iaitu Darwin Streaming Server. Selepas membangunkan project, proses peningkatan diukur dengan menggunakan pelbagai jenis perisiaan analysis seperti Ethereal dan Distinct Network Monitor.

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CHAPTER I

INTRODUCTION

1.1 Project Background

Video files are usually really big and a majority of users still have slow computer running when to download a big video file. This means that a big video files will take a long time to download and saved in hard drive. So, nowadays there was other way to view a video without download from internet that called media streaming. There are two ways to deliver video through streaming, on demand and real time. There is an increasing demand for video streaming applications over WLAN networks. However, the dynamic nature of wireless networks in terms of fluctuating bandwidth and time-varying delays make is difficult to provide good quality streaming. In wired network environment also faced the same problem.

For this project, both Wired and Ad-Hoc Wireless network will implement at local area networks. This thesis intends to analyze the performance of video streaming in terms of delay and bandwidth due to excessive delay since these are the primary factors that affect the perceived video quality at the receiver.

Streaming tools will use to delivery the video content and to send the video being played at the users. There are tools that will use to analyze the performance during streaming the video.

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Streaming tools will use to delivery the video content and to send the video being played at the users. There are tools that will use to analyze the performance during streaming the video.

For this project, video streaming will implement at two different networks, wired network and ad-hoc wireless. It will use a client-server technology where a video server stores compressed video for delivery to clients connected by a local area network. The server can deliver multiple streams to multiple users at the same time, but some architecture permit multiple users to access the same video file, yet each user maintains total control over the playback environment. A video is streamed to a viewer when they request the video from the server. The server will send the media to a player upon request. Then after implementation, one application will use to analyze delay and bandwidth of the stream over wired network and ad-hoc wireless.

1.2 Problem Statement

Today, not many people familiar with the streaming video content over ad-hoc wireless. There was not much fact convinces that streaming video can be implementing over ad-hoc wireless or not. Normally people are talked about streaming video over wired or wireless infrastructure. There are many challenges for supporting video traffic over ad hoc networks. Thus the established connection route between a source and a destination is likely to be broken during the period of the transmission, which may cause interruption, pause, or packet loss in the received video signal.

When the streaming path involves both wired and wireless links, some additional challenges evolve. Since any end-to-end measurements contain aggregate statistics across both the wired and wireless links, it is difficult to identify the proper cause and therefore perform the proper reaction. A dynamic nature of wireless networks in terms of time-varying delays makes it difficult to provide good quality streaming under such

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constraints. Multimedia streaming applications are a demanding and challenging service to deliver over wireless networks. There is a trade-off between the capacity of the wireless network and the quality of the multimedia streaming application.

There are many tools that can use to stream the video contents like Windows Media Service at windows platform and Darwin Streaming Server for QuickTime. Even though these two softwares are using the same technology but they also have a different features like video quality, files support and Operating System compatibility.

1.3 Objective

There are several objectives that will achieve throughout this project. There are:

i. To implement a video streaming application and running the streaming services at different network environment within Local Area Network over wired and ad-hoc wireless.

ii. To analyze the performance of delay and bandwidth during video streaming over wired and ad-hoc wireless.

iii. To compare the performance of video streaming by applying different streaming tools especially for wireless networks that become increasingly important service and also to use analyzing tools that can show the result about delay and bandwidth performance during streaming.

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1.4 Scopes

The scope is boundary of the project that will implement. Below are the scopes of this project:

i. Type of media for streaming

The project that will implement and analyze will focus for video streaming only. It will discuss how streaming tools and analyzing tools are used as a mechanism to know delay and bandwidth when deliver a video stream over wired and wireless environment.

ii. Type of network

The project will implement at Local Area Network (LAN), both wired and ad-doc wireless without Internet connection. The video streaming applications are demanding and challenging service to deliver over wired and wireless networks because there is a trade-off between the capacity of the wireless network and the quality of the multimedia streaming application.

iii. Platform of Operating System

This project will begin with analysis and implementation on PSM 1 and will analyze the performance on PSM 2. The project that implement will configure and test at windows platform which is the operating system that will use are Microsoft Windows 2003 Server for server and Microsoft Windows XP Professional Service Pack 2 for client computer.

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1.5 Project Significance

Even though the project was not done yet, the performance analysis will have some diagrams, tables and graph based on the understanding on the function of the scenario implementation.

The project will benefit for all user with streaming technology where is user will able to view the media clip as it is downloaded, thus there is no waiting for an entire file to download. After a few seconds of buffering the media clip begins playing. In addition, there is no hard disk space required.

Benefits analysis for this video streaming in several evaluation criteria can be applied. In order, these are quality of delivery, quality of communication, interaction and accessibility. Then, the result of analyze the performance of video streaming between two different network can be use to research about delay and buffer time during video streaming for each user. From this project also, what type of high availability of video streams will identified for making necessary mechanisms during streaming.

Analysis of performance in delay and bandwidth is to provide a better identification of the entire video streaming. Each video streaming is play through any software and also through different networks, so that a different resulting of performance can be know by using different type of tools.

1.6 Expected Output

Performance Analysis of Video Streaming over Wired and Ad-Hoc Wireless Project consists of two levels. The first levels is implementation a server and client for different network which is wired and ad-hoc wireless and configure a server that can

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stream a video to client. The second level is analyze the performance parameters of delay and bandwidth.

The expected output are delay and bandwidth of video streaming over wireless can be trace because this network have a challenge fluctuating channel quality during user session and can also compare the performance in terms of the delay and bandwidth for wired network which is network delay averaged for every second varies over time for streaming can be analyze.

In this paper, after analyze the performance of video streaming applications in terms of delay and bandwidth since these are the primary factors that affect the perceived video quality at the receiver. The paper will show how these parameters vary when using a wired and wireless video streaming. Furthermore by an analysis, the results will demonstrate by using graph that can show a detail performance about delay and bandwidth.

1.7 Conclusion

As the technologies are very useful and to investigate with effort, this protect will try to achieve the objective that have been state above. As a conclusion, by this project, it will compare the performance of wired and wireless video streaming in terms of bandwidth and packet delay. For applications, packet loss and packets dropped due to excessive delay can be known after the implementation and analyze the video streaming. Nevertheless, this project is useful for anybody because by the results, we can plan how to reduce delay and bandwidth performance during streaming whether over wired or ad-hoc wireless.

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Henceforward, literature review and project methodology will be continued as a next stage. This part will review the project that has been proposed. Besides, this chapter explains about methodology that will use in this project.

Streaming tools will use to delivery the video content and to send the video being played at the users. There are tools that will use to analyze the performance during streaming the video.

For this project, video streaming will implement at two different networks, wired network and ad-hoc wireless. It will use a client-server technology where a video server stores compressed video for delivery to clients connected by a local area network. The server can deliver multiple streams to multiple users at the same time, but some architecture permit multiple users to access the same video file, yet each user maintains total control over the playback environment. A video is streamed to a viewer when they request the video from the server. The server will send the media to a player upon request. Then after implementation, one application will use to analyze delay and bandwidth of the stream over wired network and ad-hoc wireless.

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CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

A literature review conducted at the start of the project will identify the most relevant research findings relating to qualitative issues being investigated in this research. Furthermore, a literature review will provide needed context to the research topic, assist in the selection of optimal strategy and guide execution.

In order to analyze performance of video streaming over wired and ad-hoc wireless, a research has been conducted in order to help a better understanding about this project. The research was mainly conducted through the Internet, journal and reference from books also done.

Literature review for this project based on the previous study related to the topic of my project. The topics that will be studied for this project are about video streaming, ad-hoc wireless, software or tools for implementation and used of streaming. The literature review will be conducted by searching, collecting, studying and analyzing relevant sources from books, journal, technical reports, anonymous reference as well as web pages. Beside that, there were some extraction and drawing conclusion from the information and research that had gathered.

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This project will apply a system methodology to networking. The methodology used for this project is derived from the Top Down Approach.

2.2 Fact and finding

2.2.1 Video Streaming

Video streaming is a server client technology that allows multimedia data to be transmitted and consumed. Streaming applications include e-learning, video conferencing and video on demand. The main goal of streaming is that the stream should arrive and play out continuously without interruption. However, this is constrained by fluctuations in network conditions. An adaptive streaming server keeps track of the network conditions and adapts the quality of the stream to minimize interruptions and stalling. For this project implementation, the streaming services will implement both over on demand and real time streaming.

(Cranley, N., Davis, M., 2005) has stated his opinion about:

"Real-time streaming can be delivered by either peer-to-peer (unicast) or broadcast (multicast). There are two types of real-time streaming services on-demand or live streaming."

Streaming works as the data and it is buffered for a few seconds and then playback begins. As the video is playing, more data is constantly arriving or streaming, and as long as users are receiving a constant stream of data, user should see and hear constant video. Think of a bucket (the buffer) with a hole in the bottom, being topped up with water (the data). As long as there is water in the bucket, it will continue to pour out of the hole, and will do this as long as there is water in the bucket. Similarly, as long as there is data in the buffer, user will continue to watch video.

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(John G. Apostolopoulos, Wai- tian Tan, Susie J. Wee, 2002) noted that:

'The fundamental problem that afflicts video communication is losses. Losses can have a very destructive effect on the reconstructed video quality, and if there was system is not designed to handle losses, even a single bit error can have a catastrophic effect. A number of different types of losses may occur, depending on the particular network under consideration. For example, wired packets are afflicted by packet loss, where congestion may cause an entire packet to be discarded (lost)."

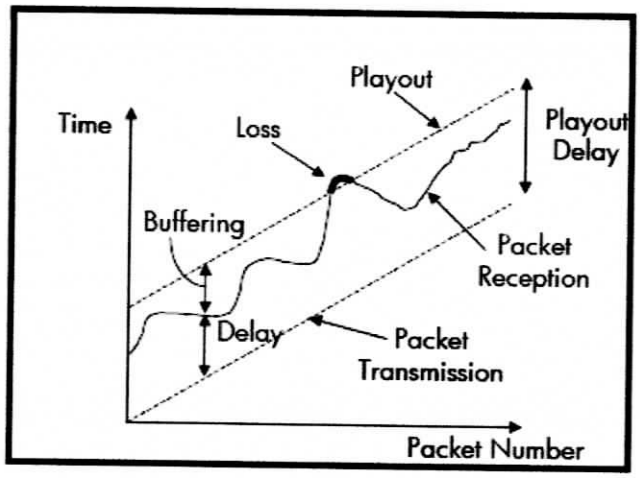

Figure 2.1: Effect of play out buffer on reducing the number of late packets.

2.2.2 Client-Server Architecture

Client server describes the relationship between two computer programs in which one program; the client makes a service request from another program, the server which fulfils the request. Although the client server idea can be used by programs within a single computer, it is more important idea in a network. In a network, the client server model provides a convenient way to interconnect programs that are distributed efficiently across different locations. The client server architecture reduced network traffic by providing a query response rather than total file transfer.

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