

Universiti Teknologi MARA

**Enabling Live Video Technology for Distance
Learning Using IP Based Camera**



**Thesis submitted in fulfillment of the requirements for
Bachelor of Science (Hons)
(Data Communications and Networking)
Faculty of Information Technology and
Quantitative Sciences**

November 2007

**ENABLING LIVE VIDEO TECHNOLOGY FOR DISTANCE
LEARNING USING IP BASED CAMERA**

**NOR SYUHAILA BINTI SOBRI
(2004617936)**

A project paper submitted to
FACULTY of INFORMATION TECHNOLOGY AND
QUANTITATIVE SCIENCES

**In partial fulfillment of requirement for the
BACHELOR OF SCIENCE (Hons) IN
DATA COMMUNICATIONS AND NETWORKING**

Approved by Examining Committee:

MOHD FAISAL BIN IBRAHIM

Project Supervisor

**UNIVERSITI TEKNOLOGI MARA
SHAH ALAM**

DECLARATION

I certify that this thesis and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.

NOVEMBER 29, 2007

NOR SYUHAILA BINTI SOBRI
2004617936

ACKNOWLEDGEMENT

First of all, Alhamdulillah, with gratitude and blessed from Allah S.W.T for giving me strength, health, and enough time for me to complete my project.

And never forget for the person who always guide me from the first time I started doing this project until now, my supervisor Encik Mohd Faisal b. Ibrahim. Thank you so much.

I would like to extend my gratitude and thanks to my beloved mother Shariffah bt Abd Hamid and my brother Shahrul Azli b Sobri for their support and encourage me to settle this project.

Thank you very much to my beloved friends, who always helping and give moral support. And also for those who had involved in this thesis either directly or indirectly, thank you very much.

wassalam

TABLE OF CONTENTS

PROJECT APPROVAL.....	ii
DECLARATION.....	lii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENTS.....	v
LIST OF FIGURES.....	ix
LIST OF TABLES.....	x
LIST OF GRAPH.....	xi
ABSTRACT.....	xii

CHAPTER 1 : INTRODUCTION

1.1 INTRODUCTION.....	1
1.2 PROBLEM STATEMENT.....	2
1.3 OBJECTIVES.....	4
1.4 SIGNIFICANCE OF PROJECT.....	4
1.5 SCOPE OF PROJECT.....	5

CHAPTER 2 : LITERATURE REVIEW

2.1 Definition of Term.....	6
2.1.1 Distance Learning.....	6
2.1.2 Electronic Learning (e-Learning).....	6
2.1.3 IP Camera.....	7
2.1.4 Bandwidth.....	8
2.1.5 Streaming video.....	10

2.2	Similar of Studies.....	10
2.21	Video Streaming in Online Learning (Taralynn Hartsell and Steve Chi-Yin Yuen).....	10
2.2.2	Using Video to Record Summary Lectures to Aid Students' Revision (Janice Whatley and Amrey Ahmad, University of Salford, Manchester, UK).....	11
2.2.3	Pedagogical Use of Video Streaming (Oscar Martinez Bonastre, Antonio Penalver Benavent and Joaquin Lopez Eradez, University of Spain).....	11
2.2.4	Enabling Mobile Communication in Tourist Navigation System Through Peer to Peer Telephony (Nor Fauziah bt Abubakar, UiTM, Shah Alam).....	12

CHAPTER 3 : METHODOLOGY

3.1	Project Methodology.....	13
3.1.1	Initiation.....	13
3.1.2	Planning / Design.....	18
3.1.3	Development.....	19
3.1.4	Analysis and Data Result.....	21

CHAPTER 4 : SYSTEM ARCHITECTURE AND OVERVIEW

4.1	E-learning Architecture.....	22
4.1.1	Personal Computer (PC) or Laptop.....	23
4.1.2	IP Camera.....	24
4.1.3	Apache Web server (version 2.0).....	25

4.1.4	MYSQL Database (version 1.0).....	26
4.1.5	Web Browser (Internet Explorer).....	27
4.1.6	UltraEdit-32.....	28
4.2	Algorithm.....	29
4.2.1	Algorithm of Bandwidth Detection.....	29
4.2.1(a)	Flow of the Algorithm.....	31
4.2.1(b)	Process of the Algorithm.....	35
4.2.2	Script for IP Camera.....	38
4.2.3	Network Design for IP Camera.....	40

CHAPTER 5 : DATA RESULT

5.1	Bandwidth Detection's Evaluation.....	43
5.1.1	Result of the Testing.....	45

CHAPTER 6 : CONCLUSION

6.1	Conclusion.....	50
-----	-----------------	----

REFERENCES

LIST OF FIGURES

- FIGURE 2.1 :** CONNECTION FROM COMPUTER AT HOME TO ISP
- FIGURE 2.2 :** SKINNY DRAIN PIPE
- FIGURE 2.3 :** FAT DRAIN PIPE
- FIGURE 3.1 :** E-LEARNING WEB-BASED SYSTEM
- FIGURE 4.1 :** IP CAMERA
- FIGURE 4.2 :** APACHE BEB SERVER
- FIGURE 4.3 :** MY SQL
- FIGURE 4.4 :** INTERNET EXPLORER
- FIGURE 4.5 :** ULTRA-EDIT32
- FIGURE 4.6 :** FLOW CHART ALGORITHM BANDWIDTH
DETECTION
- FIGURE 4.7 (a) :** MOD-BANDWIDTH.TPL
- FIGURE 4.7 (b) :** MODULES
- FIGURE 4.8 :** TIKI_BANDWIDTH.PHP
- FIGURE 4.9 :** POPUP
- FIGURE 4.2.1 :** TIKI_BANDWIDTH.PHP
- FIGURE 4.2.2 (a) :** DOWNLOAD TIME
- FIGURE 4.2.2 (b) :** LINE SPEED

LIST OF TABLE

TABLE 2.1 : DIFFERENCES BETWEEN WEB CAMERA AND IP CAMERA

TABLE 3.1 : USER REQUIREMENTS.

TABLE 4.1 : COMPONENT OF THE PC

TABLE 5.1 : RESULTS FOR BANDWIDTH DETECTION

LIST OF GRAPH

**GRAPH 5.1 : THE COMPARISON BETWEEN THE ACTUAL
BANDWIDTH AND BANDWIDTHLIMIT**

ABSTRACT

Most university in Malaysia is still using the traditional learning method in order to deliver the education to their students. They does not realized by applying e-learning concept will give more benefits to both lecturer and students. Therefore, we proposed the distance learning environment to change perception about e-learning education system. The used of video in teaching and learning will play a bigger role in delivery course materials to student. In order to enable live video technology, IP camera had been chosen.

Before proposing the documentation, we have to identify the user requirement in this project. This elicitation is used the scenario-based technique to identify the requirement. We also proposed algorithm of bandwidth detection in order to detect the bandwidth of a current network. The recommendation to which video is most suitable depends on the bandwidth.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Technologies keep on evolving without us realizing it. We always hear about new thing been invented and a lot of old, traditional apparatus have been replaced with the new one to ease people in doing things in our daily life. In the new era of information technology, computers have become more and more important. Two examples of IT technology are the internet and multimedia. Everyone knows that internet is one of the most efficient means of communication.

Applying this concept in education sector would surely improve the learning process where communication between students and lecturers would become more effective. Besides that, it would also create a new learning environment where lecturer could teach without having students to be in front of him but somewhere else.

The objective of this project is to enable live video technology for distance learning by using IP based camera. Distance learning or e-learning is the new learning environment where the class is still on while the lecturer and students is not at the same places. This e-learning concept brought some convenience, mobility, effectiveness and flexibility for lecturer and students.

By using the IP camera, it has its owned IP address. All students can view the video at any place during the lecture. The students only need to have pc or laptop with internet connection. Students also can record the video and the recording will be review as much as they want.

1.2 PROBLEM STATEMENT

The formal education system in the past requires teachers and students to attend school, have the teaching and learning process in a classroom and uses chalk, blackboard, cardboard as well as overhead projectors as teaching kit. As time passes by teaching kit has become more and more advance from year to year and recently with the advent of computers and internet, learning process becomes more flexible to both teachers and students.

The advent of new technology especially in computer, multimedia and internet nowadays also give an impact to the education system around the world including Malaysia. It provides flexibility and mobility to people, teachers, lecturers and students in education context, and hence introduce new learning concept such as distance learning.

Distance learning is a field of education that focuses on the instructional systems design that aim to deliver education to students who are not physically "on site". Rather than attending courses in person, teachers and students may communicate at times of their own choosing by exchanging printed or electronic media, or through technology that allows them to communicate in real time. Distance learning has been in Malaysia for about four decades. It started with the external degree programmes offered by established universities in United Kingdom. Such programmes were popular among the working individuals who were looking for opportunities to improve themselves. This was later followed by off-campus programmes offered by a local university, namely Universiti Sains Malaysia. The mode of delivery was naturally print-based because of the absence of the internet at that time. But nowadays in the Information Technology era, computers, multimedia and internet play a very important role in supporting distance learning specifically in providing means of communication between lecturers and students efficiently.

One of the applications in distance learning that provides an efficient means of communication between lecturers and student or even among students themselves is

video conferencing where lecturer and students could communicate and have the lecture session as if they are in the same “physical” lecture hall. However, the cost to implement video conferencing is high and it requires students and lecturer to be in a conferencing room during the lecture session. Hence, this project would look into other tools that could eliminate such problems and at the same time following and even enhancing what video conferencing capable of; i.e. enabling live video conferencing for distance learning by using IP based camera because it is low cost device.

IP based camera or IP camera is a stand-alone device which allows people to view live, full motion video on a computer network, even over the Internet, using a standard web-browser. Besides that, it is also capable of recording live video to a remote location. This would allow people to make sure recorded video is safe by storing it at a location that only can be accessed by a specific person or group.

1.3 Objectives

The objectives of this project are :

- a) To identify user requirement for distance learning.
- b) Design, development and implement e-learning using ip based camera.
- c) To develop and evaluate a bandwidth detection algorithm for ip based camera.

1.4 Significance of project

This project will give some implication to the other parties such as to university, faculty and lecturer.

- **University**

Nowadays Universities in Malaysia have been growing up very fast. Students with SPM, STPM, and Matriculation holder have to choose the best university for them to further their studies. With this e-learning, it can help to promote UiTM to those students as their preferred university. It is because technology has been growing rapidly and it is very important in daily life. So university with this learning environment will get some advantages to attract local students also from abroad. And this also can help UiTM to achieve the vision to be the 'World class university'.

- **Faculty**

Faculty of Information Technology and Quantitative Sciences will be the first faculty that apply this learning system. Before this, faculty had some problem with classroom space. And with this e-learning system make much easier to manage class schedule for students.

- Lecturer

Some lecturers have other commitments such as meeting, seminar or personal matter and class has to be cancelled. Class will still on wherever and whenever they were. Lecturer also does not have to face with traffic jam and parking space anymore.

1.5 Scope of Project

The scopes of this project as mention below:

- This project will focus only on both students and lecturers in FTMSK.
- It will be accessed by using internet.

CHAPTER 2

LITERATURE REVIEW

2.3 Definition of Term

2.3.1 Distance Learning

Distance learning is most suits with education field where instructor delivers education to students that is not physically on site via system technologies. This education has been practiced since Isaac Pitman taught shorthand in Great Britain via correspondence in the 1840. Colleges provided distance education to students since the development of the postal service in the 19th century.

The first university that offer distance learning degrees is the University of London in 1858. In 1946, University of South Africa was another university that offered the correspondence education courses. In 1969, Open University in the United Kingdom was founded; this university is the largest that applying the concept of distance education.

2.3.2 Electronic Learning (e-Learning)

Electronic learning or E-learning is a general term used to refer to computer-enhanced learning. It is most suits with distance learning and flexible learning. It also can be refer as educational websites. An e-Learning approach has played a pivotal role in improving flexibility and quality of education and training by using the Internet and collaborative technologies (Schweizer 1999, Takacs et al. 1999, Gottfredson 2002). Many applications have been employed to support teaching and learning method such as Microsoft Visual Studio, and Netware. These

applications enable individual tutors to put teaching materials online, create discussion forums, organized assessments, and link with other sources (Anderson 1998, Beller and Or 1998, Shank el at. 1994, El-Tigi and Branch 1997, Horton and Horton, 2002).

2.3.3 IP Camera

IP camera is a video camera with a built in web server and can be controlled, monitored and viewed from other location via high speed internet. It has it s owned ip address that can be assigned. Ip camera technologies enable a user to have a camera at 1 location and can view live video at another location over the network/internet.

There are things needed when using the IP camera; broadband or high speed internet connection for fast download times, wired or wireless router, computer to configure the camera, and computer that will act as remote viewing station.

Web Camera	IP Camera
Must be plugged directly into a computer (via USB port) and only accessible by the host computer and cannot be shared across a network.	Has its own ip address and can be viewed from virtually any location using web browser.
1 to 1 connection	1 to many connection

Table 2.1 : differences between web camera and ip camera

2.3.4 Bandwidth

Bandwidth has two meaning which can be viewed in electronic communication and in computer networking. When it looks in computer networking, bandwidth is amount of data that can be carried from one point to another in a given time of period. It is usually expressed in bits per second (bps). Bandwidth also can be explained as the amount of traffic that allowed to occur between web site and the rest of the internet. Bandwidth from the connection of computer at home and internet service provider (ISP) was determined why it takes so long to download certain web pages. Computer at home connect to the modem to the ISP.

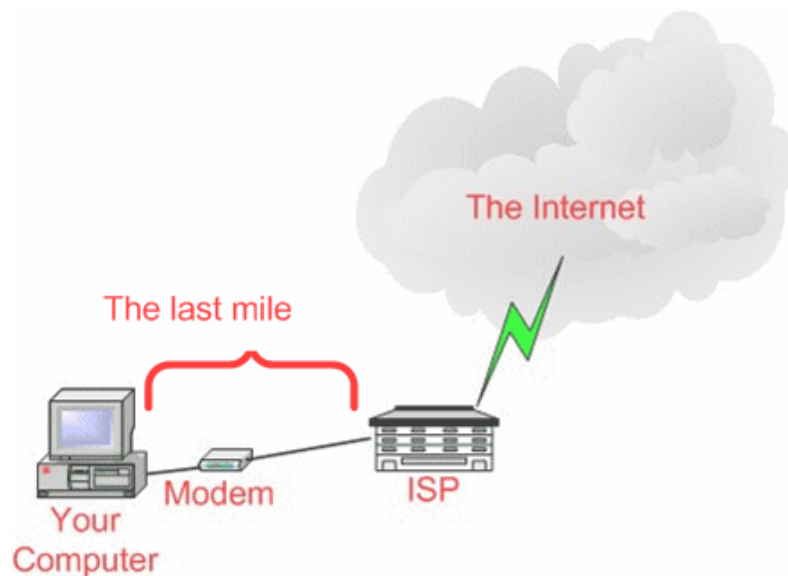


Figure 2.1 : connection from computer at home to ISP

Dial up internet account which is use a standard telephone line to connect to the ISP have a narrow bandwidth in about just 50 Kbps or 50000 bits per second. It causes things are too slow and takes a long time to download. While a broadband internet account, this can move data from 128 Kbps to 2000 Kbps or more. It only takes less time to download files or get web pages. It can be explained with analogy of daily life situation; imagine that instead of trying to get a web page or file from ISP, like trying to drain a swimming pool. The water in the pool is the web page and file. A small and skinny hose will be using to drain the water from the pool like using dial up connection; it will take quite a while to drain all the water. Compared to drain the water by using fat hose like broadband connection; it just take a second to drain all the water in the pool.



Figure 2.2 : skinny drain pipe

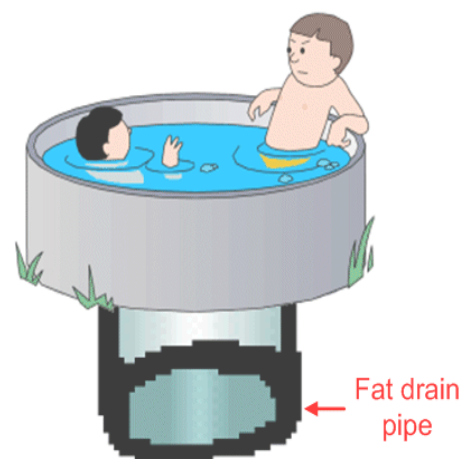


Figure 2.3 : fat drain pipe

2.3.5 Streaming video

Streaming video is a sequence of "moving images" that are sent in compressed form over the Internet and displayed by the viewer as they arrive. When video is streamed, a small buffer space is created on the user's computer and data starts downloading into it. The technology requires for streaming video are computer with access (broadband) to the internet, web browser, speakers to hear audio, microphone to contribute audio and camera (web camera or ip camera) to contribute video.

2.4 Similar of Studies.

There are some projects that have been done by other researchers is almost similar with this project. The projects focus on video conferencing or video streaming in learning method, e-learning method studies and bandwidth detection.

2.4.1 Video Streaming in Online Learning (Taralynn Hartsell and Steve Chi-Yin Yuen)

Taralynn Hartsell and Steve Chi-Yin Yuen was doing project about video streaming in online learning. This research brings the courses alive with form of technologies by allowing online learners to use their visual and auditory senses to learn complex concepts and difficult procedures. This project also offers an overview of using streaming video in the online educational environment and discusses the various formats of streaming media. In this project used the various hardware and software programs to create streaming video. Otherwise the project examined the advantages and drawbacks of using streaming video in online instruction. At the final steps, discussions

have been made of how streaming video can be used in online instruction and its curricular applications are addressed.

2.4.2 Using Video to Record Summary Lectures to Aid Students' Revision (Janice Whatley and Amrey Ahmad, University of Salford, Manchester, UK)

This project is about the use of video to record summary lectures to aid students' revision. This project had been conducted by Janice Whatley and Amrey Ahmad from University of Salford , Manchester. They did some experimental assessment using short videos to summarize the lectures and act as an aid to students for later revision. Some interpretive method had also been adapted to investigate the use of videos for those students, during lecture and when revising for assessment. This project gives preliminary evident that video can be used for supporting teaching and learning and discussion of some issues related to produced summary length videos.

Two methods that had been used to prepare summary videos of lectures are recording a live lecture and recording a summary presentation of the lecture in the office. There is no special equipment or software needed in this method.

2.4.3 Pedagogical Use of Video Streaming (Oscar Martinez Bonastre, Antonio Penalver Benavent and Joaquin Lopez Eradez, University of Spain)

A pedagogical approach of video streaming was conducted by Oscar Martinez Bonastre, Antonio Penalver Benavent and Joaquin Lopez Eradez from University of Spain. In their project, they introduce the technology innovation based on a distance learning framework. They aimed to provide a way of understating the role of pedagogical use of video streaming and as it

changes from a simple presentation tool to a focus for real-time networked learning and teaching.

They focused on both lecturers and students. From the lecturer side, the skeleton tool shows a personalized interface with matching courses in allowing real-time e-lecturers transmission or even recording of new pedagogical elements. And from students' side, tool visualizes subjects which students is enrolled presently. Student then can be subscribed in order to assist a real-time e-lecture and download past e-lecture.

The technology that have been used in this project are VideoLan Client which is on open source software, DVDs, VCDs and various streaming real-time protocols.

2.4.4 Enabling Mobile Communication in Tourist Navigation System Through Peer to Peer Telephony (Nor Fauziah bt Abubakar, UiTM, Shah Alam)

This project is to enable mobile communication in tourist navigation system through peer to peer telephony. The objective of this project is to develop a web-based system that enables the tourist to communicate with other people around the world. In this project some communication application such as skype, private message, shoutbox and forum are included. This project enables bandwidth detection for mobile tourist navigation system.

CHAPTER 3

METHODOLOGY

Introduction

This research involves identifying user requirement, design, development and implementation the distance learning. It is also developing bandwidth detection algorithm for ip based camera. Data analysis will be gathered by using network monitoring tool. There are several phases that have been used in this project.

3.2 Project Methodology

There are 4 different phases required to complete the project:

3.1.1 Initiation

In this initiation phases, user requirement will be identified by using scenario-based technique. The researcher has to identify actors, scenario in classroom method, scenario based on distance learning and identifying user requirement based on the scenarios.

Before we proceed, this is some explanation about this technique to gather the information about user requirements and reasons of using this technique. Scenario based system is a textual description or narrative of a use episode. The scenario is described from the user point of view and may include social background, resource (e.g. disk space, time) constraints and background information. By using a narrative it is possible to capture more information about the user's goals, and the context the user is operating in. The context might include details about the work place or social situation, and