

INTERNET MEDIA MANAGEMENT SYSTEM
FOR UNIVERSITY CAMPUS INTERACTIVE TV (UTHM)

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requirements for the award of the degree of
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To my beloved wife, parents and family members

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ABSTRACT

Video On Demand technology is rapidly becoming one of the most crucial tool aspects of teaching and learning for higher education. Video on demand is used by students in learning their subject matters. It help student to manage their time and place in studies style. Universiti Tun Hussein Onn Malaysia (UTHM) has initiated and decided to create his own platform of providing video-on-demand, e-learning video on demand and live telecasts via internet famously known as University Campus Interactive TV (UCiTV). UCiTV has provided numbers of streaming server to support the digital contents. The servers are categorized into video on demand and e-learning video on demand. There are also others server that located at different places which is belongs to other department and faculties. With multiple servers and multiple video on demand, it is quite difficult to manage the media in proper manner. This where a centralized management system is needs to help them to managing and indexing all the digital media into single platform. System also cans effectiveness in searching specific media from various servers within the campus.

ABSTRAK

Teknologi video atas permintaan merupakan salah satu alat yang penting di dalam bidang pengajaran dan pembelajaran di peringkat pengajian tinggi. Video atas permintaan boleh digunakan oleh pelajar di dalam bidang pengajian mereka. Ini dapat membantu pelajar untuk menguruskan masa dan tempat mengikut gaya pembelajaran mereka. Universiti Tun Hussein Onn Malaysia (UTHM) telah bersedia untuk menyediakan platform video atas permintaan, e-pembelajaran atas permintaan dan video siaran langsung melalui internet dikenali dan diberi nama sebagai *University Campus Interactive TV* (UCiTV). UCiTV telah menyediakan sejumlah pelayan *streaming* untuk menyokong kandungan video digital sedia ada. Pelayan dikategorikan kepada video atas permintaan dan e-pembelajaran atas permintaan. Terdapat berberapa pelayan *streaming* yang dimiliki oleh jabatan dan fakulti lain yang terletak di lokasi yang berbeza. Kepelbagaian jenis media dan bilangan pelayan, menimbulkan kesukaran oleh pengguna untuk menguruskan media dalam cara yang lebih sistematik. Oleh itu amatlah perlu sebuah sistem pengurusan yang berpusat untuk membantu pengguna untuk mengurus semua koleksi media digital di dalam satu platform. Sistem juga dapat mencari media tertentu dari pelbagai pelayan di dalam kampus dengan lebih berkesan.

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CHAPTER 1

PROJECT OVERVIEW

1.1 Introduction

Video streaming is one method to present moving image in sequence with voice which is sent out through the network in compressed form and displayed by the end user's media player as they arrive. With video streaming, a Web's user do not have to wait to download complete a large file before see the video. On the other hand, the media actually is sent continuously (streaming) and played as it arrives.

The media player is a special program that uncompressed and receives video data for display. Video Streaming can be sent of prerecorded video files (Video on demand), or can be send a real time video as part of a live broadcast. In live broadcast, the video signal is being compressed into digital signal and transmits continuously from streaming server through viewer's player.

Therefore it is important for any educational project to take into consideration on video streaming. This greatly enhances user experience, helps to better transmit knowledge and gives a more personal touch to distance education and e-learning.

Both students and lecturers can take advantage of this kind of technology during the learning stage, as well as for complementing socialization purposes [1].

University Tun Hussein Onn Malaysia has taken initiative to develop Internet Protocol Television (IPTV) infrastructure for campus citizen usages. One unit has been established known as University Campus Interactive TV (UCiTV) to lead on IPTV development.

Video on demand in UTHM is more consist on campus events, documentary and learning video. E-learning video on demand is video that combine with the interactive element. This video is deals on the lecturers, seminars, workshops and presentation. Live telecasts is a live video feeds to the network and broadcast to the end user. This live telecasts is captured live events within the campus and also provide the campus citizen with the local broadcasts radio station and television.

UCiTV has fully utilized their network infrastructure to apply the IPTV technology for university benefit. This IPTV technology is developed to increase and enhance the quality of teaching and learning in the campus. UCiTV also aim to provide the best service to the university community through quality video on demand streaming.

The main goals of IPTV development are to provide knowledge-sharing and enhancing knowledge dissemination via video online. With this system, students are able to access and watch online video lectures in interactive form and it can be utilized 24 hours. Viewer can also use video on demand and the concept of video streaming enable viewers to watch live telecast on any event in the university and they can be accessed continuously. These enable more interactive utilizations by the users/viewers. The quality of UCiTV depends on the content provider, networking service maintenance, infrastructure, data presenting and user's interests.

Presently, UCiTV have been produce about 767 of video on demand, 10 of live broadcast media and 700 e-learning video on demand. This value is keep increasing during demanding on recording the lecture, campus event, seminar and workshop inside and outside the campus.

UCiTV has provided numbers of streaming server to support the digital contents. The servers are categorized into video on demand and e-learning video on demand. There are also others server that located at different places which is belongs to other department and faculties. With the multiple servers and multiple video on demand, it is quite difficult to manage the media in proper manner. This where a centralized management system is needs to help them to managing and indexing all the digital media into single platform. System also can search specific media from various servers within the campus.

1.2 The Background of the Study

The figure 1.1 shows, the digital media stored in different category of streaming server and it also belong to the different users. All the media need through the same process before it stored in the streaming server. The process is shown in figure 1.2.

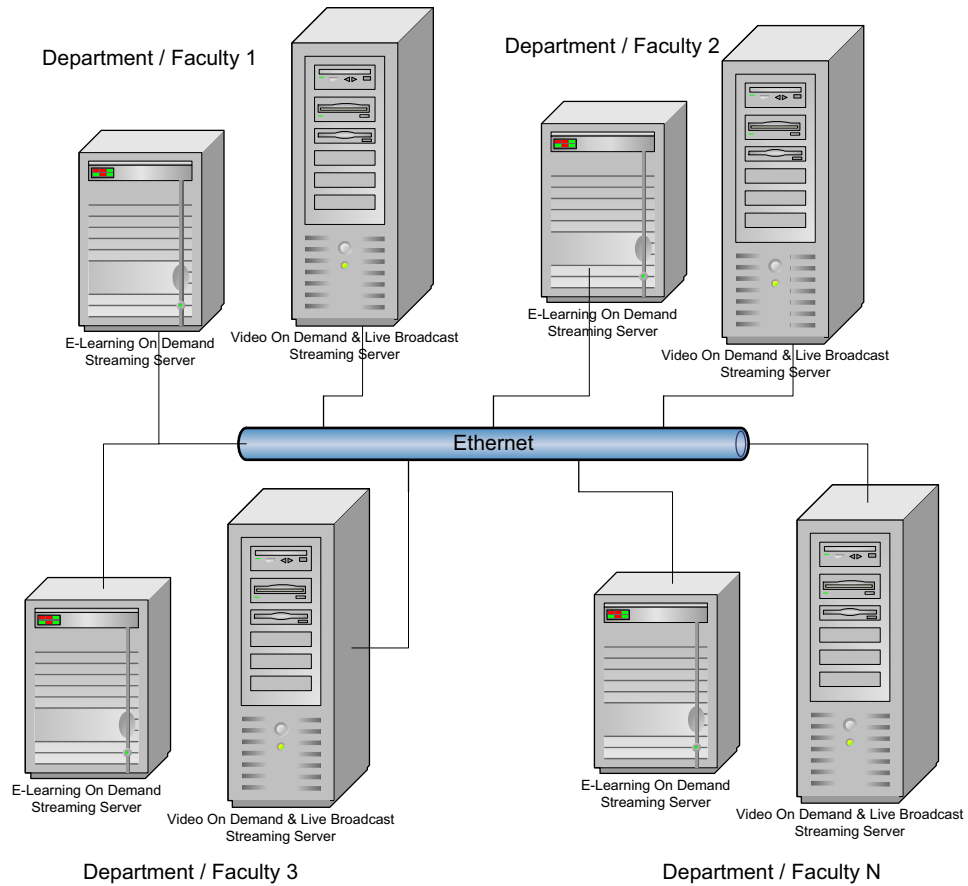


Figure 1.1: Video archiving stored in multiple dedicated streaming server

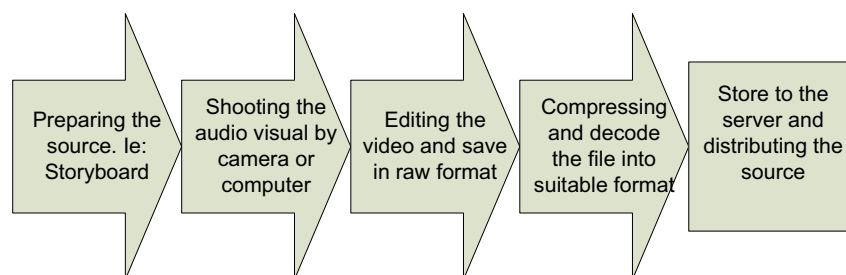


Figure 1.2: Process in distributing multimedia sources through streaming server

Each departments or faculties have their credibility at making their own teaching and learning video productions. They are free to record and do editing. Edited video need to upload into the streaming server according to media title, media type and media owner. The uploading process is using the FTP method or windows sharing (windows based server). To make sure the video can be achieved by user, admin need to create a publishing point for each video uploaded. Then the hyperlinks of the publishing point need to be distributing on the web page for user to get accessed.

Caused of need server more than one, is difficult on behalf of admin in UCiTV to regulate supervise all video material added another with diversity from aspect types video. Concerning on how to manage media contents, this study will develop a web base system which is centralized managing, maintaining, delivering, reporting and tracking process for all media contents

Due to server requirement more than one, there are very complicated for UCiTV's admin to supervise all the video contents with the diversity of video type. Concerning on how to manage the media, this study will develop a web base system which are centralized the managing, maintaining, delivering, reporting and tracking process for all the media contents.

1.3 Problem Statement

The problem statements of this project are

- a) “How to develop a web based system that can manage digital media contents from multiple streaming servers in web based environment”.
- b) “How to categorize and index the digital media”.

1.4 Objective of The Project

The objectives of the project are:

1. To provide categorize option of the digital media.
2. To study and analyze the suitable metadata and parameters for searching approach.
3. To develop a prototype of web based system that can manage the digital media contents and distributing the media through the web.

1.5 Scope of The Project

This study will be done for University Campus Interactive TV (UCiTV), Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, Johor, Malaysia.

From the research, this project will be focused on the following area:

1. Identify parameters from the digital media and streaming server.
2. Text based searching method.
3. Media ranking.
4. Media sorting.
5. Media information.
6. Media comment and discussion.
7. Sharing media with friend
8. Covers on windows version applications.
9. Test the application

1.6 Importance of The Project

By implementing the Video On Demand Management System For E-Learning, researcher hope that it can support faster video distributing for the organization. It will help the administrator for creating, managing, maintaining, delivering and tracking the web-base media contents. Some benefits of the system for administrator, registered user and guest are:

1. Administrator (Super Admin)
 - i. Manage user.
 - ii. Generate reports.
 - iii. Manage media contents.
 - iv. Manage media categories.
2. Registered User (Admin)
 - i. Generate specific reports.
 - ii. Manage media categories.
 - iii. Manage media contents on dedicated server.
3. Client
 - i. Easy to navigate digital media contents.
 - ii. Searching media contents with specific criteria.
 - iii. Discussion on published media.
 - iv. Quality improvement in teaching & learning.

In overall, hopefully this project will give big impact on university ranking in providing free knowledge information especially in to fulfill the standards requirement of Webomatic.

1.7 Chapter Summary

In this first chapter, a brief introduction and background of the project has been given. From the background of the project, we can see why this project should be implemented and benefit gained by the project not also for the administrator but also for the end users. By developing the project hopefully can achieve the objectives aimed.

REFERENCES

1. Rusan A., Onita, M., Guidelines for a [future] multimedia educational platform. *Proceedings of the International Conference "Networking Entities" NETTIES 2006*, Timisoara, Romania, 6-9 September, 2006, ISBN 973-638-262-1. 211-215
2. Su, T. C., Huang, S. Y., Chan, C. L. and Wang, J. S. (2005). Optimal chaining scheme for video on demand applications on collaborative networks. *IEEE Trans. On multimedia*. 7(5). 972-980
3. Luke Welling, Laura Thomson. *PHP and MySQL Web Development*. 3rd Edition. United State of America: Developer's Library. 2004
4. Connally, T. and Begg, C. *Database Systems: a practical approach to desing, implementation and management*. 4th Edition. Addison Wesley. 2005
5. Farhan, H. *Aplikasi Video On Demand Berbasis Web*. Master Thesis. Universitas Widyatama Bandung (Unpublished). 2007
6. Onita, M., Bucos, M., Iasmina, E., Ternauciuc, A. *Streaming in UPT Environment. Multimedia Centre of Politehnica University of Timisoara, Romania*. Master Thesis. University of Timisoara 2006.
7. Jani, L. *Internet Streaming Media Platform*. Master Thesis. Tampere University of Technology. (Unpublished) .2001.
8. Time Streaming Protocol
http://en.wikipedia.org/wiki/Real_Time_Streaming_Protocol
9. Austerberry, D. *The Technology of Video & Audio Streaming* Elsevier USA. 2005
10. Follansbee, J. *Get Streaming; Quick Steps to Delivering Audio and Video Online* Elsevier USA. 2004

11. Kunkel, T. *Streaming Media: Technologies, Standards, Applications*. Wiley. England. 2003
12. Demetriades, G. *Steaming Media: Building and Implementing a Complete Streaming System*. Wiley. England. 2003
13. Topic, M. *Streaming Media Demystified*. McGraw-Hill Telecom. New York. 2002
14. Andersen, S., Batterberry, T., Birney, B. *Inside Windows Media*. Que. 1999
15. O'Driscoll, G. *Next Generation IPTV services and technologies*. Wiley. Canada. 2008
16. Streaming Statistics. <http://news.netcraft.com/>
17. Dennis, A., Haley Wixom, B., Tegarden, D. *System Analysis and Design with UML version 2.0*. Wiley. USA. 2005
18. Mediasite Machine. <http://www.sonicfoundry.com/>
19. EDU Web TV of Ministry of Education. <http://www.eduwebtv.com>
20. University Campus Interactive TV E-learning media collections. <http://ucity2.uthm.edu.my/mediasiteucity42/catalog>