

Internet Protocol Television (IPTV) Implication for Education

Panee Suanpang

Information Technology Department, Faculty of Science & Technology, Suan Dusit Rajabhat University, Bangkok, Thailand.
E-mail: dtechpannee@yahoo.com

Received 2012

ABSTRACT

This paper illustrates the development of Internet Protocol Television (IPTV) and its implication for education. IPTV is a new type of educational technology that provides digital content (text, graphic, audio and video) which users watch as television broadcasting on the Internet. With the capabilities of IPTV that could be used for educational purpose. Therefore, the IPTV project's (Suan Dusit Internet Broadcasting: SDIB) aim has been to develop into a platform that increase educational opportunities that support distant education. The IPTV system was designed to broadcast in four channels (kids, video on demand, variety and radio). More than seven hundred program are being transmitted both through live and video on demand streams via computer, set top boxes and mobile devices. The IPTV system has been implemented and used in 80 pilot schools. The data of an evaluation of the IPTV system was collected from questionnaires and interviews. The results indicated that IPTV users were highly satisfied with the contents, set top boxes, LCD television, and overall IPTV systems.

Keywords: IPTV; Internet Broadcasting; Educational Technology

1. Introduction

Internet protocol television (IPTV) is a collection of modern technologies in computing, networking, and storage integrated to deliver digital content through an Internet Protocol (IP) network [1]. This system broadcasts various types of digital content including text, graphic, audio and video files over an IP network in order to reach a large number of users [2]. IPTV uses digital broadcast network such as ADSL and satellite to broadcast the data and provide user interface, which can be either a television monitor or web page with a menu organized in several categories such as movies, video games and radio [3]. The IPTV occurrence is being continuously enhanced with improvements in its underlying networking and computing. The successful deployment of IPTV on a large scale is essentially dependent on a wide range of supporting technologies [1,4].

IPTV has changed the way of users' access information, knowledge and entertainment. It has been utilized in multiple sectors such as business, entertainment, communication, healthcare and education. The implication of IPTV for education are becoming admired, especially in supporting distant education. IPTV can provide more collaborative content than traditional television applica-

tions and it encourages existing passive television learners to become more actively involved in their learning activities [5]. However, there has been limited research and a few articles on IPTV's implications for education.

This study breaks new ground and addresses key questions about the development of IPTV system implications for teaching and learning. The aim of this paper is to study the development and deployment of IPTV (Suan Dusit Internet Broadcasting: SDIB) and its implications for education.

1.1 IPTV Trends

Currently, the IPTV industry has grown enormously both in term of number of subscribers and investments by service providers. The world's leading markets for IPTV are Germany, France (2.7 million users end of 2009), South Korea (1.8 million users), and other [1]. Multimedia Research Group is forecasting that the number of global IPTV users in 2013 will grow to 81 million and the service revenue is expected to grow to \$19.9 billion [6,1].

IPTV trends create a new model for service provisioning and a transition from traditional broadcaster-centric television services to a user-centric television

model. The IP TV user’s behavior is changing from active to passive and content digitization allows for easier distribution [1]. The advances in IPTV technology will blend aspects of communication, social media, interactivity, and search information in new ways. In the future, IPTV is expected to change the user experience by enhancing user’s interactivity, service personalization (such as content personalization, recommendations, targeted advertisements, and personalize channels [8], mobility and multi devices/screen usage.

1.2. IPTV System Capabilities

The IPTV system capabilities [5,9] shown in **Table 1**

1.3. IPTV Architectures

The basic IPTV architecture shown in **Figure 1**.

Table 1. IPTV system capabilities.

Issues	IPTV Capabilities
Users	worldwide that have known IP addresses and known locations
Video quality	Controlled QoS, broadcast TV quality
Connection bandwidth	Between 1 and 4 Mbit/s
Video format	MPEG-2 MPEG-4 Part 2 MPEG-4 Part (AVC) Microsoft VC1
Receiver device	Set top box with a television display
Resolution	Full TV display
Reliability	Stable
Security	Users authentication and protected
Complementarily with cable, terrestrial and satellite broadcasting	Potential common STB, complementary coverage, common metadata
Copyright	Media is protected

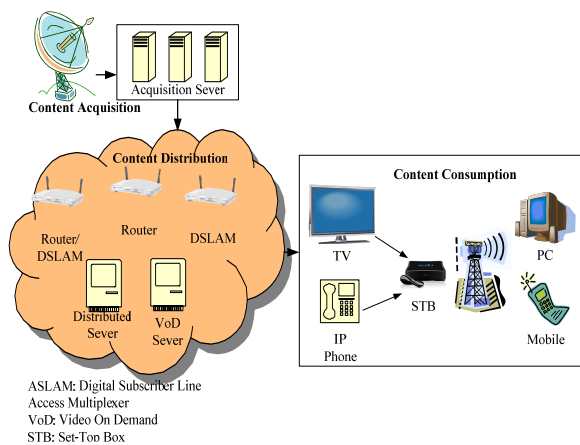


Figure 1. Basic IPTV architectures.

The basic IPTV architecture components include [1]:

- 1) Acquisition servers (A-servers): for encoding video and DRM metadata.
- 2) Distributed servers (D-Server): provide caching and QoS control.
- 3) VoD creators and servers: retain a library of encoded VoD content to provide VoD services.
- 4) IP routers: route IP packets and provide fast re-route in case of routing failures.
- 5) Residential gateways: IP routers for bundled service at home.
- 6) STBs: a STB (Set top box) is a device on the user side that interfaces with the user terminal (e.g. TV, PC, laptop, and others) with DSL or cable wiring.

2. IPTV Implication for Education

The IPTV implications for education project was implemented at Suan Dusit Rajbhat University, Thailand since 2008. The IPTV was called Suan Dusit Internet Broadcasting (SDIB).

2.1. Aims of IPTV

The aims of IPTV are to develop new educational innovations for supporting distance and life-long learning for students of Suan Dusit Rajabhat University and to increase learning channels for the delivery of information and knowledge to local communities [11].

2.2. Concepts

IPTV was designed to support education. **Figure 2** shows the IPTV system design for support distance learning.

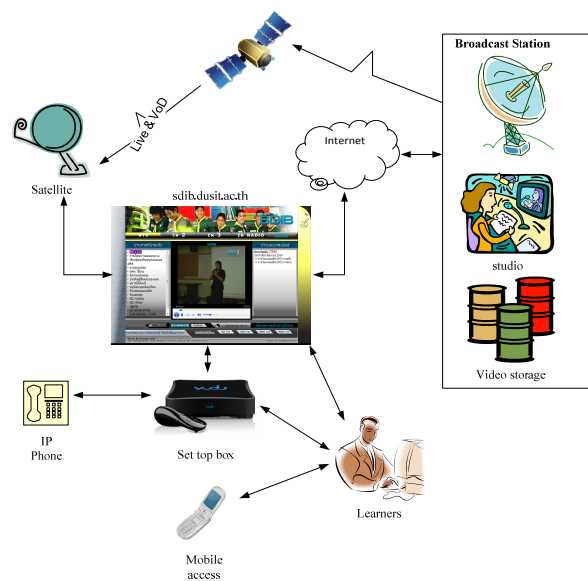


Figure 2. IPTV designed concept.

2.3. Channels, Contents and Users

IPTV was designed to broadcast in four channels and provided the following contents [2,3,10,11]:

- Channel 1 (kid program): broadcasts teaching and learning at Sa-Tid-La-O r-U-Tid primary schools. Most of the contents are useful for distance students who are studying in the Bachelor of Education Program in Pre-school Education. Currently, the university has more than 20,000 distance students who are studying in this program. Most of them are teachers who are working in the early childhood care centers in Thailand, and therefore the contents of this channel are useful for them. This channel broadcast more than 372 programs that focus on early childhood education. There are many interesting program such as brain-based learning (BBL), toys for children, and food and nutrition for children. Moreover, there are some live programs such as Kindergarten Fantasia which broadcasts children's activities in their classroom; parents can watch these programs from the Intranet. Users who are distance students currently number more than 20,000. Furthermore, the audience includes parents, kindergarten school teachers, and researchers who are interested in studying early childhood education.
- Channel 2 (video on demand of university teaching): broadcasts video on demand for bachelor's and master's degree students. This channel broadcasts more than 95 programs. Users will be students who are studying at Suan Dusit Rajabhat University, of which there are currently around 30,000.
- Channel 3 (variety): broadcasts variety programs with a focus on the university's strengths. This channel broadcasts more than 240 programs. There are many interesting program such as Food and Thai Cuisine, Thai Handicrafts, Tourism in Thailand, Thai Food and Beverages, and others. Users will be students, teachers, university staff, and people who are interested in these programs.
- Channel 4 (radio): broadcast radio programs for users who have low internet access. This channel broadcasts 11 programs. There are many interesting programs such as Art of children, Knowledge Management for Fun, and others. Users will be people who have low speeds of internet access.

2.4. IPTV Architecture

The IPTV architecture design shows in **Figure 3**. It consisted of

- Studio rooms for live broadcasting which have high definition video cameras.
- A multimedia server (MMS) which separated one

channel from one server. Server numbers 1-3 were located in the control room at Suan Dusit Rajabhat University, Thailand. Server numbers 4-5 were located at CAT Telecommunication as a co-location.

- SAN storage for 6 terabytes for storing multimedia content.
- F5 as the load balance for distributing traffic to the Intranet.
- Website (s.dib.dusit.ac.th) for broadcasting content through users. **Figure 4** shows website of the IPTV.

2.5. Devices

Users can access IPTV by using PCs, tablets (iPad, Galaxy Tab, HP Touchpad), smart phones and smart TVs (iPhone, Samsung, BlackBerry, Nokia, HTC, Sony Internet TV). The browser supported both browsers on PCs (Internet Explorer, Firefox, Safari, Chrome) and browsers on mobiles (Safari on iOS, Android, Internet Explorer Mobile).

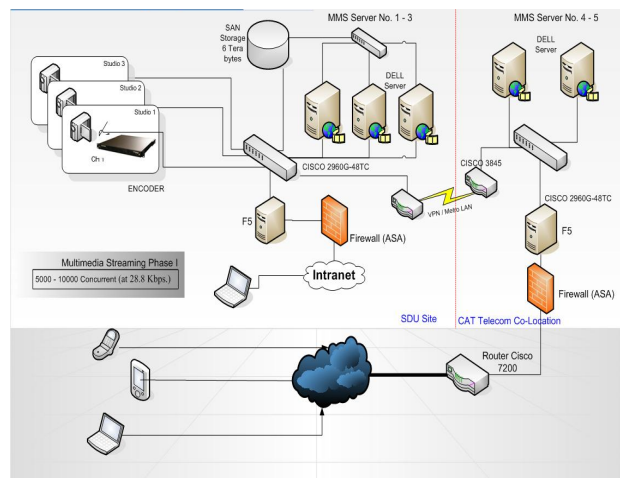


Figure 3. IPTV hardware architecture.



Figure 4. IPTV website.

The questionnaire was divided into three parts: demographics information, IPTV system evaluation, and user satisfaction. The questionnaire trials and had a highly reliability (Alpha Coefficient by Cronbach) of 0.988.

2. Result

The demographics profile of IPTV's users is given in **Table 2**.

2.6. The Study

The IPTV study was implemented in 80 pilot schools around Thailand. Suan Dusit Rajabhat University provided free LCD television, set top boxes, and ADSL to the pilot schools. The IPTV system was used by teachers and students in the pilot schools for six months. The research was compiled through both quantitative (a questionnaire using 322 samples) and qualitative methods (interviews).

Table 2. Demographic profile of IPTV users.

Items	Frequency	Percent
Area	Central 157	47.29
	Southern 49	14.76
	North 45	13.55
	North-Eastern 71	21.39
	N/A 10	3.01
Gender	Femal 293	88.25
	Male 37	11.14
	N/A 2	0.60
Age	>25 yrs.	9 2.71
	26-35 yrs.	133 40.06
	36-45 yrs.	116 34.94
	<45 yrs.	72 21.69
	N/A 2	0.60
Education	Undergraduate 9	2.71
	Bachelor degree	280 84.34
	Master degree/ Ph.D.	41 12.35
	N/A 2	0.60
	>1 yr.	6 1.81
Work experience	1-5 yrs.	98 29.52
	< 5 yrs.	224 67.47
	No experience	2 0.60
	N/A 2	0.60
IT experience	>1 yr.	27 8.13
	1-5 yrs.	149 44.88
	< 5 yrs.	141 42.47
	No experience	13 3.92
Internet experience	N/A 2	0.60
	>1 yr.	37 11.14
	1-5 yrs.	138 41.57
	< 5 yrs.	144 43.37
Computer at school	No experience	11 3.31
	N/A 2	0.60
	Yes 314	94.58
	No 15	4.52
N/A 3	0.90	

The result of IPTV system evaluation found that most of users used IPTV via a set top box (84.34%) and used IPTV at school 3-4 days per week on average.

The result of user's satisfaction with the IPTV system is shown in **Table 3**.

The result of the IPTV system evaluation showed that the highest scores (mean = 4.32) were achieved by the television LCD, the overall IPTV system (mean = 4.24), benefits of using content from IPTV (mean = 4.16), content in IPTV (mean = 4.16) and set up box (mean = 4.04) respectively. Here are some comments which illustrate the usefulness of the IPTV system as follows:

"I really like IPTV system because it help use to prepare teaching material easier for example I developments program it teach me how to make toys by using plants and natures resources that we can find in our local community. This is very useful for us."

"We can use TV LCD for other purpose as well, such as watching news, connect to the Internet and use for watch IPTV programs."

"I think, content in IPTV is really useful both for teacher and students. Students can learn outside the classroom by using IPTV system. It 's good for education"

The result of IPTV program evaluation show that the highest score were achieved by Toys developments (means = 4.00), Novels for children (mean = 3.98), Study tours outside the classroom (means = 3.93), Teaching and learning at Sa-Tid-La-U-Tid (mean = 3.93) and English for fun (mean = 3.91), respectively. Here are some comments illustrate the usefulness of IPTV programs as follows:

Table 3. User's satisfaction using IPTV system.

Issues	Mean	SD
<i>IPTV system</i>		
Television LCD	4.32	0.84
Overall IPTV system	4.24	0.72
Benefit of using content from IPTV	4.16	0.77
Content in IPTV	4.16	0.79
Set top box	4.04	0.87
Total	4.17	0.65
<i>IPTV program</i>		
Toys developments	4.00	0.75
Novels for children	3.98	0.79
Study tours outside the class room	3.93	0.80
Teaching and learning at Sa-Tid-La-U-Tid	3.93	0.80
English for fun	3.91	0.84
Total	3.83	0.70

“Kids in our school like to watch IPTV program very much especially ‘Study tour outside the classroom’ program because it help them to explore the world outside the classroom. Children can learn by watching those programs and discuss with their classmates. I think, the IPTV system is very useful especially for teacher and students in the rural areas that can access new knowledge and information for support lifelong learning.”

“Kids like to watch English for fun program because our school doesn’t have foreigner teachers to teach English. So, I open this program and use for my teaching. Students are really like it.”

3. Conclusion

The implication of IPTV ‘s use in education was illustrated in this paper. The IPTV project background was demonstrated and explained through IPTV concepts, channels contents and users, architecture and devices. The IPTV concepts were design to support distant learning. It consisted of four channels (kids, video on demand, variety and radio) and provided information regarding bandwidth availability and it supported a variety of output devices (television monitors, PCs and smart phones). Users can watch IPTV programs both in the live and video on demand format. An IPTV study was implemented in pilot schools around Thailand. The result found that the IPTV users have a high score of system satisfaction and IPTV programs.

4. Future Work

The future study should develop IPTV to mobile IPTV system because the technological trend of mobile IPTV is becoming popular and advance. Mobile IPTV technology is an application that allows users to transmit and receive multimedia content through an IPTV based network with the support of security, mobility and interactivity [2]. Also, the research should focus on how to develop learning pedagogy by using IPTV integrated with social networking to support distance learning.

5. Acknowledgement

The author would like to thank you the Office of Aca-

dem Resource and Information Technology (ARIT) at Suan Dusit Rajabhat University for providing IPTV systems to the pilot schools, and providing network infrastructure for supporting IPTV operation.

REFERENCES

- [1] S. Zeadally, and H. Moustafa, “Internet Protocol Television (IPTV): Architecture, Trends, and Challenges”, *IEEE Systems Journal*. Vol.5, No. 4, 2011, pp. 518-527.
- [2] P. Suanpang, “The development IPTV to mobile IPTV implications for teaching and learning”, *Proceeding of the ICTC 2012 International Conference on ICT Convergence*, Korea, 15-17 October 2012, to be published in IEEE Xplore Digital Library.
- [3] A. Al-Hezmi, R. Rebaïhi, T. Magedanz and S. Arbanowaski, “Towards an Interactive IPTV for Mobile Subscribers”, *Proceeding of International Conference on Digital Telecommunications*, IEEE Computer Society Press, 2006. doi:10.1109/ICDT.2006.74
- [4] Z. Liu, B. Wei, and H. Yu., “IPTV, towards sameness infotainment”, *Proceeding of 6th IEEE Consumer, Communication, Network Conference*, Japan, 10-13 January 2009, pp.1-5.
- [5] T. V. Yuzer and G. Kuruback, “Integrating internet protocol television (IPTV) in distance education: a constructivist framework for social networking”, *Turkish Online Journal of Distance Education*, Vol. 12, No.3, 2011, pp. 259-276.
- [6] Multimedai Research Group, Inc., “IPTV Global Forecast: 2009 to 2013 Semi-Annual IPTV Global Forecast Report”. http://www.international-television.org/tv_market_data/global-iptv-forecast-2009-2013.html
- [7] Budde Co m, “Thailand - Internet, Broadband Services, Broadcasting and Forecasts” <http://www.budde.com.au/Research/Thailand-Internet-Broadband-Services-Broadcasting-and-Forecasts.html>
- [8] J. Chang, C. Lai, Y. Huang, and H. Chao, “3RS: A personalized and popular program recommend system of digital TV for P2P social network”, *Multimedia Tools Applcate*, Vol. 10, No. 1, 2010, pp. 31-48.
- [9] E. Martisson, “IPTV the future of television”, Report: Computer Communication and Distributed Systems, Chalmers University of Technology. <http://www.cse.chalmers.se/~tsigas/Courses/DCDSeminar/Files/IPTVrapport.pdf>
- [10] P. Suanpang. “Suan Dusit Internet TV (SDI B)- Educational Innovation in Knowledge-Based Society”. *Special Issue of the International Journal of the Computer, the Internet and Management*, Vol. 17, No. SP3, pp. pp. 31.1-31.5.
- [11] P. Suanpang, T. ermboonpasert, J. Kantamnoon, P. and Rengittinun. S. “Internet TV: An Educational Innovation for Developing Teacher in Early Childhood Care Center all over Thailand: Phase 1”. *SDU Research Journal*, Vol. 3, No. 1, 2010, pp. 87-104.