WEB BASED LEARNING MANAGEMENT SYSTEM VIA INTERNET PROTOCOL TELEVISION TRANSMISSION: A CASE STUDY OF PERSONAL CAPABILITY DEVELOPMENT FOR NETWORK MANAGEMENT PROJECT

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WE B BASED LEARNING MANAGEMENT SYTEM VIA INTERNET PROTOCOL TELEVISION TRANSMISSION: A CASE STUDY OF PERSONAL CAPABILITY DEVELOPMENT FOR NETWORK MANAGEMENT PROJECT

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ABSTRACT

Thanks to the development of the high speed internet infrastructure, a new system of education has been evolved; namely distance learning. Later distance the learning system evolved into Learning Management Systems (LMS). Moodle is one of the most popular LMS open-source software tools. With this tool, a user can remotely manage learning and teaching via the internet. Furthermore, internet protocol television (IPTV) technology is also compatible with this tool.

This thesis focused on applying Moodle to the management of distance learning systems. Here Moodle acts as a web-based portal in which students can check their scores, upload their assignments, download teaching materials, interact with others, including their teachers, and fill in course evaluation forms. Moreover, teachers can share multimedia materials, in WMV form, on the portal. In this work, the application of Moodle was also tested and evaluated by sampling 100 students from different universities and schools in the provinces of Chiang Mai, Khon Kaen, Ayutthaya, and Songkhla. From the results, the average post-test score is markedly higher, than those of the pre-test examination, with a statistical significance value of 0.05.

KEY WORDS: LEARNING MANAGEMENT SYSTEM /
INTERNET PROTOCOL TELEVISION / MOODLE /
WEB BASED LEARNING / DISTANCE LEARNING

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ระบบการจัดการเรียนการสอนออนไลน์ผ่านอินเทอร์เน็ตโปรโตคอลเทเลวิชั่น: กรณีศึกษาโครงการพัฒนาบุคลากรสำหรับการบริหารจัดการเครือข่าย

WEB-BASED LEARNING MANAGEMENT SYSTEM VIA INTERNET PROTOCOL TELEVISION TRANSMISSION: A CASE STUDY OF PERSONAL CAPABILITY DEVELOPMENT FOR NETWORK MANAGEMENT PROJECT

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บทคัดย่อ

การพัฒนาโครงสร้างพื้นฐานทางด้านเครือข่ายอินเตอร์เน็ตความเร็วสูงเป็นวิธีการใหม่ที่จะช่วยพัฒนาการเรียนการสอนทางไกล อีกทั้งยัง เพิ่มศักยภาพในการพัฒนาระบบการจัดการการเรียนการสอน ซึ่งโปรแกรมมูเด้ิลเป็นโอเพ่นซอร์สที่ได้รับความนิยมในการบริหารจัดการการเรียนการสอน ในการบริหารจัดการการเรียนการสอนด้วยเครื่องมือนี้ ผู้ใช้สามารถเข้าสู่การเรียนการสอนได้จากทางไกลผ่านเครือข่ายอินเตอร์เนท อีกทั้งยังมีเทคโนโลยีอินเตอร์เน็ตโปรโตคอลเทเลวิชั่น ที่เข้ามาช่วยเพิ่มประสิทธิภาพในการบริหารจัดการระบบการศึกษาทางไกลอีกด้วย

วิทยานิพนธ์ฉบับนี้มีวัตถุประสงค์เพื่อประยุกต์ใช้มูเด้ิลสำหรับการจัดการการเรียนการสอนทางไกล โดยนำมูเด้ิลมาเป็นเว็บพอร์ทัล ที่ให้นักเรียนสามารถเข้าเรียน ทำข้อสอบ ทำแบบประเมิน ส่งงานที่ได้รับมอบหมาย หรือ ดาว์นโหลดสื่อการเรียนการสอน อีกทั้งยังสามารถติดต่อสื่อสารผ่านระบบดังกล่าวได้อีกด้วย รวมไปจนถึง อาจารย์ผู้สอนสามารถเข้าสอน เปิดรายวิชา สร้างแบบทดสอบ ตรวจคะแนน และทำแบบประเมิน และถ่ายทอดสื่อการเรียนการสอนที่เป็นวีดีโอสื่อมัลติมีเดียรูปแบบนามสกุล “WMV” ผ่านระบบดังกล่าวข้างต้น เพื่อทดสอบประสิทธิภาพของระบบ และประเมินผลการจัดการเรียนการสอน โดยการเก็บตัวอย่างนักเรียนจำนวน 100 คน จากมหาวิทยาลัย และโรงเรียนในจังหวัดเชียงใหม่ ขอนแก่น อยุธยา และสงขลา จากผลการวิเคราะห์ทางสถิติโดยใช้ทีเทส (T-test) คะแนนเฉลี่ยแบบทดสอบหลังเรียนจะมีค่าคะแนนมากกว่าและแตกต่างจากคะแนนเฉลี่ยแบบทดสอบก่อนเรียนที่ระดับนัยสำคัญทางสถิติที่ 0.05

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CHAPTER I
INTRODUCTION

1.1 Background and Problem Statements

In the development of the country towards the learning society according to the 2nd National education act, there are two policies which have importance not less than each other. The first is the development of the basic structure on information technology [1]. The project that the government gives importance for developing basic structure on information technology. It is the development of the high-speed internet network for supporting the development of the country towards learning society. [2] But it is still facing the problem of inequality in accessing the information. [3] The next policy is the personnel quality development towards learning society, which e-learning is an alternative which is appropriate for personnel development of the country [4].

In the present, there is Inter-University Network: UniNet under Office of the Higher Education Commission : OHEC, which has developed the personal capability development for network management to manage project, working for managing to develop personnel for high-speed internet network management according to the objective of the project, by having institutions which had joined the project throughout the country (from the network of Backbone Network level, to the network of Last Mile level). So it is necessary to have the learning and teaching management system for the attendants.

In addition, the research about learning and teaching via the Moodle program: a freeware. The Moodle program can manage learning and teaching via internet system [5]. The research about the internet protocal television technology present the multimedia content via high-speed internet network [6]. This research then has studied the web-based learning management system for distance learning and teaching and adapted. This research used Internet protocal television: IPTV to broadcast the learning and teaching via learning and teaching management system by

using the Moodle program to manage the online learning and teaching, by to letting the network administrator from an institute in the project to be able to access the teaching and learning media. So the introduction of web-based learning management system via internet protocol television can be regarded as a way to make the project accomplish the objective mentioned. The web-based learning management system making the user be able to study the lessons all the time. The research has the sample group: the network administrator of end-user level of the institutions in Chiangmai, Khonkaen, Ayutthaya, and Songkla province, which joined in the personal capability development for network management project for 100 persons. Those are selected from multiple steps random in Basic network security course (BNS).

1.2 Objective

The objectives of this research are as followings:

1.2.1 To develop a learning management system on web-based distance learning.

1.2.2 To apply internet protocol television technology on web-based distance learning.

1.2.3 To gather and categorize information on web-based distance learning.

1.3 Scope of Work

The scope of this research can be defined as below:

1.3.1 The students are sampled from the audience of the personal capability development for network management project.

1.3.2 The course model, selected from the personal capability development for network management project, consists of lecture and laboratory hours.

1.4 Major Contributions

The major contributions of this work are:

1.4.1 A web-based learning management system in which students can check their scores, upload their assignments, download teaching materials including multimedia, interact with others including their teachers, and fill up course evaluation forms

1.4.2 The application of internet protocol television on learning management system

1.4.3 The database, specifically for multimedia materials, on distance learning system

1.5 Chapter Outlines

Chapter 2 literature review: This chapter involves the literature reviews on learning theory, learning management system, sharable content object reference model (SCROM), web-base learning management, Internet protocol television technology and related research

Chapter 3 methodologies and materials: This research shows methods web-based learning management system via IPTV transmission. The methodologies have 6 process of the system development life cycle with the waterfall model.

Chapter 4 results: The methodologies in chapter 3 reflects the results in this chapter. The results of an experiment shows the function of web-based learning management system via IPTV transmission, the integrity of the system, the capability of the system, and examination

Chapter 5 discussion, conclusion, and recommendations: This chapter addresses the discussion of this research. The conclusion and recommendations shows the detailed summary in this chapter.

CHAPTER II
LITERATURE REVIEW

This chapter involves the literature reviews on learning theory, learning management system, sharable content object reference model (SCROM), web-base learning management, Internet protocol television and related research**.** This chapter is classified as following:

2.1 The Basic of The Learning Theories

2.1.1 The Basic of Behaviorism

Behaviorism, as a learning theory, can be traced back to Aristotle, whose essay "Memory" focused on associations being made between events such as lightning and thunder. The theory of behaviorism concentrates on the study of overt behaviors that can be observed and measured. It- views the mind as a "black box" in the sense that response to stimulus can be observed quantitatively, totally ignoring the possibility of thought processes occurring in the mind. [7]

2.1.2 The Basic of Cognitivism

Cognitive theorists recognize that much learning involves associations established through contiguity and repetition. The acknowledge of reinforcement, although stress its role in providing feedback about the correctness of responses over its role as a motivator. However, even while accepting such behavioristic concepts, cognitive theorists view learning as involving the acquisition or reorganization of the cognitive structures through which humans process and store information. [7]

2.1.3 Key Concepts of Cognitive Theory

2.1.3.1 Schema an internal knowledge structure. New information is compared to existing cognitive structures called "schema". Schema may be combined, extended or altered to accommodate new information. [7]

2.1.3.2 Three stage information processing model. The model input first enters a sensory register, then is processed in short-term memory, and then is transferred to long-term memory for storage and retrieval. [7]

- Sensory Register receives input from senses which lasts from less than a second to four seconds and then disappears through decay or replacement. Much of the information never reaches short term memory but all information is monitored at some level and acted upon if necessary.

- Short-Term Memory (STM) sensory input that is important or interesting is transferred from the sensory register to the STM. Memory can be retained here for up to 20 seconds or more if rehearsed repeatedly. Short-term memory can hold up to 7 plus or minus 2 items. STM capacity can be increased if material is chunked into meaningful parts.

- Long-Term Memory and Storage (LTM) - stores information from STM for long term use. Long-term memory has unlimited capacity. Some materials are "forced" into LTM by rote memorization and over learning. Deeper levels of processing such as generating linkages between old and new information are much better for successful retention of material.

2.1.3.3 Meaningful Effects. Meaningful information is easier to learn and remember. If a learner links relatively meaningless information with prior schema it would easier to retain. [7]

2.1.3.4 Serial Position Effects. Serial position is easier to remember items from the beginning or end of a list rather than those in the middle of the list, unless that item is distinctly different. [7]

2.1.3.5 Practice Effects. Practicing or rehearsing improves retention especially when it is distributed practice. By distributing practices the learner associates the material with many different contexts rather than the one context afforded by mass practice. [7]

2.1.3.6 Transfer Effects. The effects of prior learning on learning new tasks or material. [7]

2.1.3.7 Interference Effects. Interference occurs when prior learning interferes with the learning of new material. [7]

2.1.3.8 Organization Effects. When a learner categorizes input such as a grocery list, it is easier to remember. [7]

2.1.3.9 Levels of Processing Effects. The words may be processed at a low-level sensory analysis of their physical characteristics to high-level semantic analysis of their meaning. The more deeply a word is process the easier it would to remember. [7]

2.1.3.10 State Dependent Effects. If learning takes place within a certain context it was easier to remember within that context rather than in a new context. [7]

2.1.3.11 Mnemonic Effects. Mnemonics are strategies used by learners to organize relatively meaningless input into more meaningful images or semantic contexts. For example, the notes of a musical scale can be remembered by the rhyme: Every Good Boy Deserves Fruit. [7]

2.1.3.12 Schema Effects. If information does not fit a person's schema it may be more difficult for them to remember and what to remember or how to conceive of it may also be affected by the prior schema. [7]

2.1.3.13 Advance Organizers. The advance organizers prepare the learner for the material are about to learn. The organizers are not simply outlines of the material, but are material that would enable the student to make sense out of the lesson. [7]

2.2 Learning Management System (LMS)

Learning Management Systems (LMS) is changing the character of the on-campus learning experience. The trend towards LMS as an adjunct to traditional learning modes has been the subject of little research beyond technical analyses of alternative software systems. [8]

Learning Management System (LMS) is a collection of E-learning tools available through a shared administrative interface. A learning management system can be thought of as the platform in which online courses or online components of courses are assembled. [9]

Learning Management Systems (LMS) are specialized learning technology systems, based on the state-of-the-art internet and WWW technologies in order to provide education and training following the open and distance learning paradigm. The design and implementation of such systems is not an easy task, since All user are complex systems that incorporate a variety of organizational, administrative, instructional and technological components. [10]

2.2.1 Definition

Learning Management System (LMS) is an environment where developers can create, store, reuse, manage and deliver learning content from a central object repository, usually a database. Learning management systems offer a central database and format for a consistent learning experience. [10]

2.2.2 Integration

Education institutions and corporations expect their learning management systems be fully integrated with content, services, and the technology platform for managing and delivering the learning process. As a result, learning management systems describe a wide range of applications that track student training and may or may not include functions such as:

- Authoring of courses and training modules
- Classroom management
- Competency & knowledge management
- Certification or compliance training
- Mentoring and discussion boards
- Competency testing and recordkeeping

Features of these systems often include search engines, access to private learning networks, secured managed chat rooms, discussion groups, and e-commerce capabilities. [10]

2.2.3 Selection

Selecting an LMS can be an enormous task. It could be the biggest decision a corporation, education institution, or e-learning professional ever makes. LMS applications are large, complex software programs that change rapidly. The LMS purchase becomes a visible decision to everyone who logs in and takes a course. [10]

2.3 Sharable Content Object reference Model (SCROM)

Fundamental objectives of the SCORM standard are the easy portability of learning content from one Learning Management System (LMS) to another as well as the reusability of learning objects. The easy portability of WBTs creates an additional benefit for vendors of learning content and LMS because the high costs for portation are reduced. WBT can exchange data with the LMS via standardized interfaces. Above all, the metadata model of the LOM standard integrated in the SCORM supports the retrieval of learning objects in varying constellations. SCORM denominates the smallest unit which can be administered by a Sharable Content Object (SCO). A Sharable Content Object (SCO) represents one or more assets which use the SCORM runtime environment to communicate with different LMS. [11]

The SCORM system is produced and maintained by the Advanced Distributed Learning (ADL) initiative. An important goal of SCORM is to separate the "content" from the "system" that delivers the content in order to increase compatibility. The challenge is to make it so that neither the content nor the delivery system relies on the other's special properties to create learning experiences that are adaptive and that follow accepted instructional design principles S-C-O-R-M stands for: [11]

- Sharable the goal is to make learning content readily available to virtually all members of the learning community. That means the content should run on multiple platforms and be launch able from any number of SCORM-conformant learning management systems. It also means the content should carry information that enables identification and search of the content (meta-data).

- Content the choice of the word "content" rather than course is important. A piece of content can be as small as a single page, a single image, a single audio file, or a word or character. This granularity provides great flexibility for learning developers.

- Object this term, from the world of information technology, implies that the existence of learning chunks or objects containing data and behaviors would make it easier to develop reusable content.

- Reference Model this term refers to SCORM's role as a roadmap to standards work, similar to a bookshelf of reference materials. SCORM-based standards model the learning content so that everyone needing to combine that content into larger composites can understand it thanks to the SCORM framework. The SCORM system promises to bring together the best of current standards and to provide a common ground for future e-learning

- Standards the e-learning standards community is creating standard properties that can be used by all content and by any learning platform. That is, SCORM addresses the problem of creating content that users can play on most any learning platform. In November of 1997, the U.S. Government launched the advanced distributed learning initiative to promote high-quality education and training materials that are easily tailored to individual learner needs and are available whenever.

- Efficiency SCORM promotes online learning efficiency. The initiative is aimed at improving online education by enabling reuse of teaching materials. E-learning content and LMS vendors can get their products stamped as compliant with the SCORM standard from the department of defense's Advanced Distributed Learning (ADL) initiative. While not an interoperability guarantee, SCORM advises buyers that compliant content and systems should work together.

2.4 Web-based Learning Management Systems

“A build it and they would come” approach would not necessarily ensure success in distance or hybrid classes. Despite the technologies, motivating and engaging the students in a web-based virtual environment remains a major challenge. Brower suggested that one solution lies in creating virtual learning communities where

the instructor takes the role of learning facilitator and students become engaged in the virtual discussion forums without the pressure of personality differences. This allows students and instructors to freely express their opinion sand ideas. Also suggests that inter- activity with technologies enhances the learning experience. For example, on-demand whiteboards between online participants facilitates the exploration of concepts. A user-friendly interface to web-based tools that engage students in collaboration, problem-solving activities, and exploration can support virtual communities and is one effective solution for distance learning The above constitute examples of communities of practice (or CoP's) at work. In its broad definition, communities of practice are structured social networks constituted by individuals or organizations in pursuit of specific goals. All item can thus be viewed as a subcategory of the broader term "social networks", which refers to the vast array of relationships formed between individuals and/or organizations. Most classrooms today use a combination of Polycom for video-conferencing plus web based applications including Skype, WebCT/Blackboard, NetMeeting, among other similar tools for one-way or two-way audio or video communications between the in-class professor. [12]

2.5 IPTV Technology

In an academic environment is possible to be in two places at the same time through the power of distance learning facilities. In fact, this author has used distant learning to teach a data communications course in Macon, Georgia, that was simultaneously broadcast onto video monitors located in Millegeville, Georgia, the home of Georgia College & State University, and the learning center at Robbins Air Force Base. [13]

Although distance learning can be accomplished through the use of conventional teleconferencing equipment, when performed through the use of IPTV the efficiency associated with reaching students at distant locations can significantly increase. This is because conventional distance learning that is based on the use of teleconferencing equipment results in a central monitor at distant locations. Not only do all students have to focus their attention on a single monitor, but in addition, a microphone has to be passed around by a proctor at each distant location to the

students who wish to talk to the instructor giving the lecture. In comparison, the use of IPTV can significantly improve distance learning because the image of the distant instructor can be directed onto the PC monitor of each student workstation while a microphone connected to each computer enables students to converse with the instructor without having to wait for a microphone to be passed through the classroom. [13]

Another significant advantage of IPTV within a distance learning environment is the fact that, similar to the previous discussion about business TV to the desktop, it can be scaled on a PC screen. This would allow distance learning courses on programming and other topics to haven students both view and hear the instructor while the all user perform different exercises. Because software can be developed to enable an instructor to view student activities, it's possible for a student's work to be viewed by the instructor. Similarly, with appropriate programming, the instructor could display the efforts of one student on a designated portion of each student's PC screen, which would significantly enhance instructor–student interaction. [13]

2.5.1 The Concept of IPTV

The IPTV system as representing "digital video content, including television, that is delivered via the use of the Internet Protocol (IP)." This definition of IPTV not only is very simple but also stresses that the Internet does not need to play a role in the delivery of television or any othertype of video content. Instead, IPTV refers to the use of the IP as a delivery mechanism that can use the Internet, which represents a public IP-based network. or IPTV can be used to deliver video content over a private IP-based network. [13]

Because IPTV requires the use of the IP only as a delivery mechanism, IP can be used to deliver various types of content over both the Internet and private IP-based networks. Examples of IPTV content can range in scope from music videos to television shows, full feature movies, rock concerts, and a variety of special events, such as boxing matches, football games, or even Broadway musicals. This means that our brief definition of IPTV covers a wide range of both existing and potential activities. Some of those activities could include downloading a movie or music video

via the Internet for viewing now or at a later date or subscribing to a television service that would delivery to a homeowner via the installation of a private network that would provide the delivery of television content through the use of the IP. Thus, the term IPTV does not restrict content to that provided by broadcast television nor does it imply that delivery of content has to occur over the Internet. The IPTV represents a broad term used to reference the delivery of a wide variety of video content using the IP as a mechanism for transporting content. Prior to discussing in more detail a few examples of the delivery of video content via IP-based networks, a few words are in order concerning the mnemonic “IPTV” that mnemonic should not be confused with IP/TV, which is an active, registered U.S. trademark owned by Cisco, the company best known for its routers. Cisco uses IP/TV to reference a series of products developed to transport television content over the Internet or via private IP-based networks. [13]

2.5.2 IPTV Architecture

IPTV Definition the IPTV is a transmission and control technique to deliver broadcast and VoD video streams to an STB. The use of IP as a video delivery mechanism is omnipotent. What is novel is the use of pure IP signaling to change channels and control other functions. This dogmatic definition of IPTV implies the use of a point-to-point networking infrastructure that supports broadcast video using multicasting techniques. The FiOS project at Verizon is, therefore, not an IPTV implementation. The access network is still a bottleneck, and telcos have two options1 to address the twisted-pair (TP) engorgement: either improve the copper infrastructure or abandon the TP for fiber-to-the home. [13]

Most telcos, with the exception of Verizon and NTT, have decided to keep the copper infrastructure for the last few hundred feet, with fiber-to-the-home being only considered for new builds. Verizon, on the other hand, has engaged in an aggressive fiber-to-the-premises overlay network and plans to retire all TPs. The FiOS architecture shares many similarities with a hybrid fiber coax (HFC) system with a passive optical network (PON) instead of a coax cable. [13]

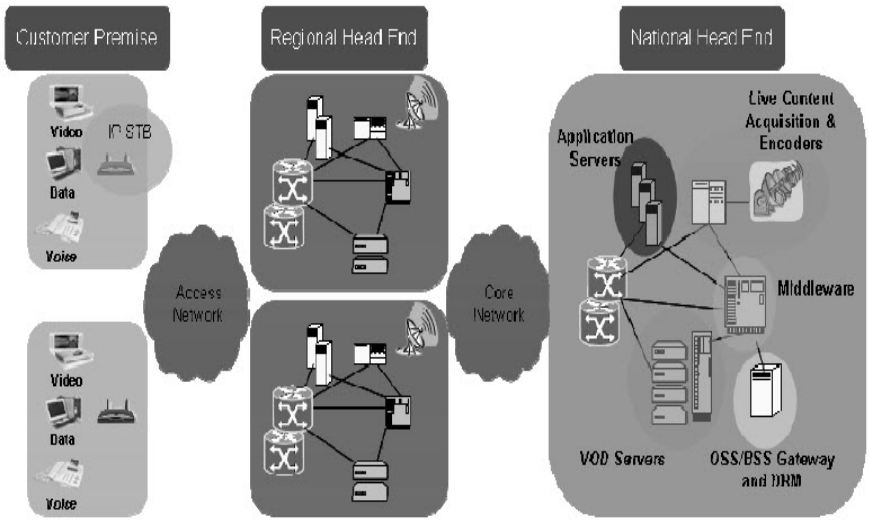

Figure 2.1 IPTV Generic Infrastructure. [13]

Regardless of the access network, an IPTV network follows an N-tier architecture: national head end, regional head end, and customer premise. The centralization of back-office functions and content with a nationwide audience reduces the number of tiers, while the need to bring one-on-one content or content with a small number of viewers increases the number of tiers. Very large operators use two national head ends to provide redundancy and to avoid long-hauling video feeds. [13]

2.5.3 IPTV Components

The video encoders are responsible for transforming an input stream that can be of various formats into a digital compressed stream. The video output is either in MPEG–2, MPEG–4 AVC, or WM VC–1. Video encoders can also be responsible to encapsulate the video streams into a transport format that can be an ATM adaptation layer or IP packets. Real-time video encoders that encode live TV feeds used to be very expensive. This process have decreased in price dramatically and therefore the process no longer represent a large portion of the capital investment of a video head end, but the investment per digital channel is still at least $75,000. Most video encoders for live TV are in the national head end; however, the process present in regional head ends for local programming. The key technical attributes of video

encoders are quality of the encoding, compression rate, variety of encoding algorithms, and support for statistical multiplexing. Some video encoder suppliers are Harmonic, Tandberg, Thales, and Tut Systems. [14]

- Video Server are computer-based devices connected to large storage systems. Video content, previously encoded, is stored either on disk or in large banks of RAM. Video servers stream video and audio content via unicast or multicast to STBs. A 1 RU2 video server can support about 200 video streams at 3 Mbps. Typical storage systems range from 5 terabit (Tb) to 20 Tb. Video servers are mostly used for VoD; however, Video server also used for NPVR, which allows subscribers to record shows remotely on a device at the operator site. The key technical attributes of video servers are scalability in terms of storage and number of streams, management software, and variety of interfaces. Some video server suppliers are Bitband, Broadbus, C-COR, Entone, and Kasenna. [14]

- Middleware is the software and hardware infrastructure that connects the components of an IPTV solution. It is a distributed operating system that runs both on servers at the telco location and on the STBs. Among other things, it performs end-to-end configuration, provisions the video servers, links the electronic program guide (EPG) with the content, acts as a boot server for the STB and ensures that all STBs run compatible software. The key technical attributes of a middleware are reliability, scalability, and ability to interface with other systems. Some middleware suppliers are Microsoft, Myrio/Siemens, Minerva, Orca, and Thales. [14]

- Conditional Access System/Digital Rights Management (CAS) allows for the protection of content. Historically, a switched digital video network did not require CAS, since the network would perform content entitlement. In theory, it could still be the case if the device that performs the multicasting function could also determine whether the user is entitled to view the content. In several early IPTV trials, the content was not protected; however, this content was not very “fresh.” As IPTV becomes more mainstream, content providers are mandating CAS and digital rights management (DRM), which not only controls the real-time viewing, but also what happens to the content after it has been viewed once. Generically, most CAS/DRMs are a combination of scrambling and encryption. The video feed is scrambled using a control word. The control word is sent over an encrypted message to the decoding

device. The CAS/DRM module on the decoding device decrypts the control word that is fed to the descrambler. The key technical attributes of CAS/DRM are: smart card versus soft client; security; server scalability; and integration with encoder, video server, and STB. Some CAS/DRM suppliers are Irdeto, Microsoft, Verimatrix, and Widewine. [14]

- STB/Terminal is a piece of customer-premises equipment (CPE) that is responsible for interface with the user, its television and the network. For live TV and VoD, the STB supports an EPG that allows the users to navigate through the programming. The STB transforms a scrambled digital compressed signal into a signal that is sent to the television. The STB hosts the middleware and is poised to become the center of the communications infrastructure within the home. The first generation of STB offers minimal features (EPG, decoding and, optionally, some PVR) to keep the price down (around $100). The key technical attributes of a STB are reliability, decoder support, size of internal drive, and variety of external interface for add-ons. The cost of the STB is potentially the most important factor for any IPTV operator. MPEG–4 system on the chip (SoC), with its high level of integration, should push the cost of an STB down. [14]

2.6 The TCP/IP Protocol Suite

The TCP/IP protocol suite and IPTV it is important to note that there are two types of video that can be delivered through the use of the TCP/IP protocol suite. Those types of video can be categorized as realtime and stored for replay. The first type of video, real-time, requires the use of a jitter buffer to smooth out delay variations experienced by packets as the flow through an IP network. In comparison, video that would store and later viewed on a PC, video iPod, or other device does not require the use of a jitter buffer. The TCP/IP protocol suite represents a layered protocol similar to the. [14]

International Standards Organization (ISO) Open System Interconnection (OSI) seven-layer reference model, but it predates that model and consists of five layers. Figure 4.1 illustrates the five layers of the TCP/IP protocol suite during the

formation of a LAN frame as well as the relationship between the layers in the ISO reference model and the TCP/IP protocol suite. [14]

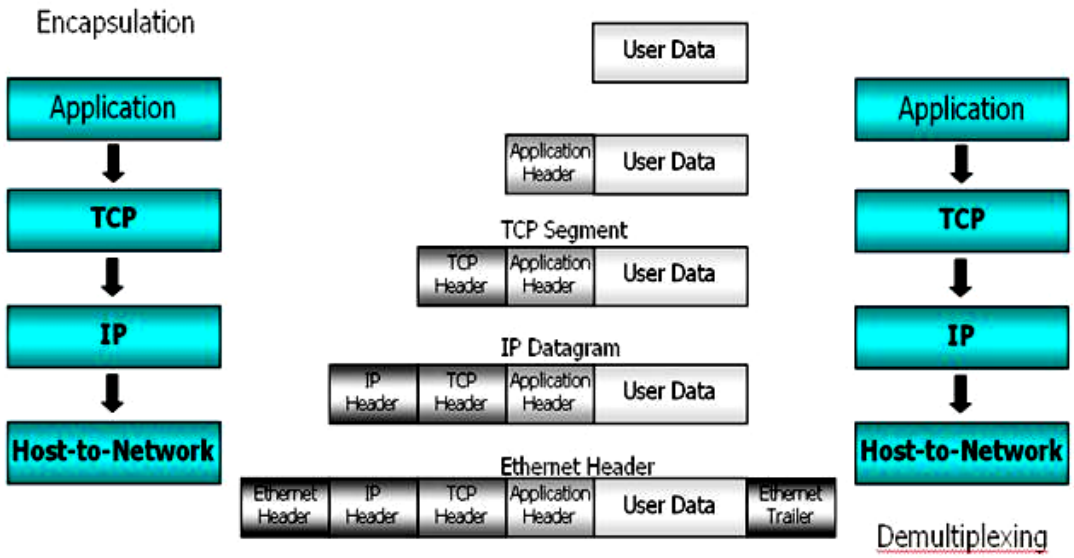

Figure 2.2 TCP/IP encapsulated in a LAN header [16]

In examining figure 2.2, the TCP/IP protocol suite does not define a physical layer (layer 1). Instead, the TCP/IP protocol suite defines a series of address resolution protocols (ARPs) that enable the network layer's addressing to be adapted to operate on the Media Access Control layer (MAC layer) supported by a particular LAN. In addition, layers 5 through 7, which represent the session, presentation, and application layers in the ISO reference model, are a single application layer in the TCP/IP protocol suite. [14]

As a LAN frame is formed in the TCP/IP protocol suite, a transport layer header, typically either a TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) header, is prefixed to application data. Both TCP and UDP headers include a source and destination numeric port number identifier, which indicates the type of application data being transported. In actuality, the destination port number indicates the application because a receiving device would "listen" on predefined port numbers to support one or more predefined applications associated with certain port numbers. In comparison, the source port is normally set to either a value of 0 or a randomly selected value. [14]

2.6.1 Source and Destination Port Fields

For both TCP and UDP, the source and destination fields are each 16 bits in length. The source port field number is supposed to denote the application associated with the data generated by the originating station. However, most source port field values are either set to 0 if the sourceport is not used or represent a random number generated by the originator. In comparison, the destination port field contains a value that identifiesa user process or application for the receiving station whose IP addressis denoted by the destination IP address field value in the IP header. [14]

Because a pair of origination and destination address data flows can occur on multiple destination port numbers, the use of the port field enables multiple applications to flow to a common destination. For example, when a station initiates an HTTP session, it would place port number 80 in the destination port field. Later, the HTTP session could be followed by a telnet session, with the originating station placing port number 23 in the destination port field. Because there are three types of port numbers that can be used in the TCP and UDP port fields, let’s examine port numbers in more detail. [14]

2.6.2 Port Numbers

Both TCP and UDP headers, as illustrated, contain 16-bit source and destination port fields, enabling port numbers to range in value from 0 to 65535. This results in a “universe” of 65536 port numbers, which are subdivided into three ranges referred to as well-known ports, registered ports, and dynamic or private ports. [14]

2.6.3 Well-Known Ports

Well-known ports are also referred to as assigned ports because their assignment is controlled by the Internet Assigned Numbers Authority (IANA). Well-known or assigned ports are in the range of 0 to 1023, providing 1024 possible assignments. Such ports are used to indicate the transportation of standardized process and for the most part have the same assignments for both TCP and UDP. Ports used by TCP typically provide connections that transport relatively long-term connections requiring error detection and correction, such as file transfers (FTP) and remote access (Telnet). [14]

2.6.4 Registered Ports

Port numbers beyond 1023 can be used by any process or application. However, doing so in a haphazard manner could result in incompatibilities between vendor products. To alleviate this potential problem, th the IANA allows vendors to register their use of port numbers, resulting in port number values from 1024 to 49151 allocated for registered ports. Although a vendor can register an application or process with the IANA and obtain a port number for the use of the process or application, the registration does not carry the weight of law. That is, registered ports primarily allow other vendors to develop compatible products and end users can configure equipment to use such products. For example, when a new application uses a registered port number, it becomes a relatively easy task to both adjust a router access list or firewall configuration to enable the flow of datagrams used by the new application as well as purchase and use other vendor products that perform a similar function through the use of the same registered port. [14]

2.6.5 Dynamic Ports

Dynamic ports begin where registered ports end, resulting in their use of ports 49152 through 65535. Port numbers in this range are commonly used by vendors implementing proprietary network applications. A second common use of dynamic port numbers is for NAT, which The discussion about next section because it can adversely affect certain IPTV operations. [14]

Although some services and applications may be familiar to readers, a few deserve a bit of explanation. Bit Torrent represents an application and peer-to-peer File Transfer Protocol (FTP) that sends portions of files from one client to another. A central server, referred to as a tracker, coordinates the actions of peers. Because Bit Torrent enables uploads and downloads to occur simultaneously, it makes more efficient use of bandwidth. In addition, because large files, such as videos, are broken into smaller pieces, the use of Bit Torrent enhances the availability of popular files; instead of an “all or nothing” approach to downloading a file may be split into hundreds of pieces that can be obtained from many sites. A second protocol worth noting is the RTP, which provides end-to-end network transport functions suitable for

applications transmitting realtime data, such as audio and video, over multicast and unicast network. [14]

2.6.6 Delivery Methods

There are three basic methods by which video can be delivered via an IP network. Those methods include delivery as a file transfer, which precludes real-time viewing, broadcast, and video on demand (VOD). The latter two methods are used for the real-time viewing of a movie, television show, concert, or other type of visual performance. Because the file transfer of video, although representing a transfer of data over an IP network, is used for playback and not immediate viewing, the propose would simply state that the transfer can occur via FTP or through the use of the previously described Bit Torrent application. Thus, in the remainder of this section focus our attention on the use of broadcast and video-on-demand technologies to provide an IPTV capability. [14]

2.6.7 Broadcast

When video is broadcast, each feed is provided a unique channel number to enable a set-top box to select the feed the person controlling the box wishes to view. In actuality, when a person uses the set-top box to select a channel the box was establish a multicast connection to the broadcasted channel, eliminating the need for all digitized channels to flow into the subscriber's home. The top portion of figure 2.3 IPTV can be delivered via broadcast and unicast video on demand (VOD) transmission. The broadcast source can be movies previously stored on a server as well as a live feed from an on-air television station showing the summer olympic basketball finals, a soap opera, or another show. Each source is input into a broadcast encoder, which packetizes the video stream, including setting a channel number and multicast address group to which set-top boxes would join whenever a viewer selects a channel using the box. [14]

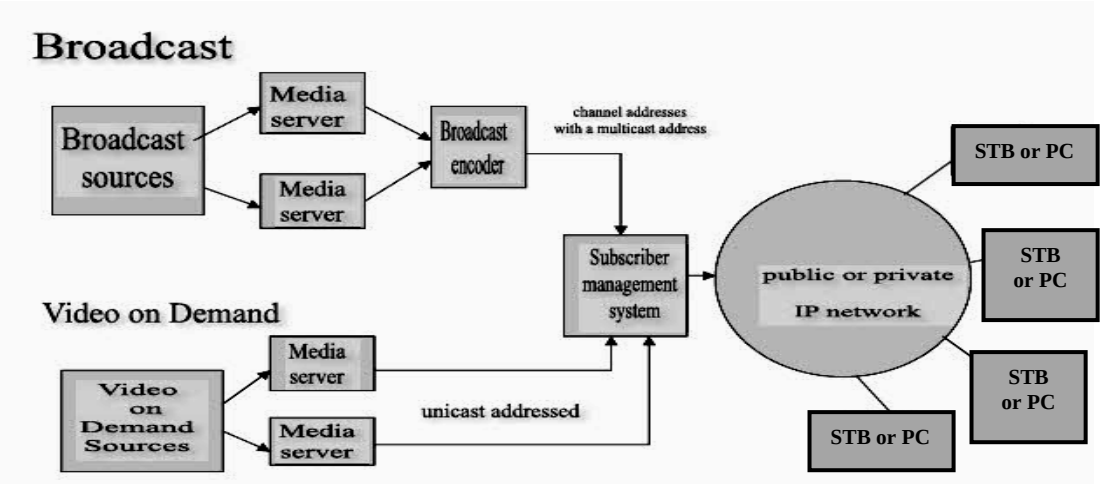

Figure 2.3 The IPTV delivering via broadcast and unicast VOD transmission [14].

The broadcast system can be thought of as a series of media servers that host a number of broadcast streams. The media servers support the delivery of both multicast and unicast, with the latter used for VOD operations. Because billing for services represents an important aspect of any IPTV operation, a subscriber management system is used to perform that function. In addition to billing subscribers, the subscriber management system was normally provide such additional functions as broadcasting an electronic programming guide and supporting interactive set-top box features, such as providing selected content to subscribers as a VOD product. [14]

2.6.8 Video on Demand

The lower portion of illustrates the integration of VOD into an IPTV communications system. Because VOD responds to a query generated by a subscriber through the set-top box or PC, the response flows as a sequence of unicast datagrams to the IP address of the set-top box or personal computer. Typically, the subscriber management station would display a list of VOD events from which a subscriber can select a program. However, it’s also possible for an IPTV operator to insert a card with the subscriber’s monthly bill, which can list hundreds of events, their viewing cost, and an access code to retrieve selected events. For either method, the flow of IP datagrams wouldl represent a unicast transmission to the subscriber’s set-top box or personal computer. [14]

2.7 Relates Research

Dusit (2003) explained about the context of multimedia and hypermedia which including the ways how to integrating multimedia and hypermedia for teaching and learning. As the advance towards a digital age, today's technologies allow educators and students to integrate, combine, and interact with media far beyond what would previous possible. As the computer and the internet are very strongly integrated into every life and in education especially as well as in school education. A new method to teach for example teachers facilitate learning by encouraging active learning, guide learners to question their tacit assumptions, enhance learning environment, support student center, and coach them in the construction process. Therefore, The idea about "integrating educational technology" which refers to the process of determining which electronic tools such as multimedia and hypermedia or which methods for implementing them are appropriate for given classroom situations and problems. The concept of multimedia refers to a combination of multiple media combined into a single whole. Indeed multimedia today is synonymous with a computer-based format that combines text, graphics, audio, and even video into single conferent, digital presentation. Hypermedia refers to linked media. Furthermore multimedia software is typically arranged in a hypermedia format that follows the learner to jump among these elements to follow his or her own learning style and personal curiosity. Multimedia and hypermedia differ from multimedia/hypermedia makes one's experience as realistic as possible without actually being there. Multimedia/hypermedia encourages students to take responsibility for their own learning and support them to learn at their own pace. Multimedia/hypermedia provides for students participation in the learning experience, and allow the teacher to play more of a coaching role, moving around the classroom and supporting individual help to students. In this article would explore the following types of multimedia/hypermedia: multimedia kits, interactive media, and virtual reality. Because of some advantages as mentioned above the approach which integrating multimedia/hypermedia for teaching and learning was applied into efficient instruction. [14]

Kelli and Kevin (2006) separated their criteria into two main components, content and technical aspects. Both areas are the foundation for the nine criteria for aid

teachers in evaluating educational web sites for personal resource use as well as classroom use. The nine criteria should help educators distinguish between the informative, accurate, and well designed educational web site and the uninformative, inaccurate, and poorly designed educational web site, as show in Table 2.1 [15]

Table 2.1 The nine criterias for evaluating educational web site.

NINE CRITERIAS FOR EVALUATING EDUCATIONAL WEB SITES	
1. AUDIENCE	• Clearly states the academic level of target audience. • Contains content and activities that match the academic level of the web site's target audience. • Recognizes that students learn in different ways.
2. CREDIBILITY	• Author has appropriate credentials to author the content of the web site. • Author's name, email/contact info, or address/phone number is provided. • The educational credentials or expertise of the author is stated on web site. • The web master/web designer is credible and provides contact information. • Author responds to queries about the web site's content.
3. ACCURACY	• Web site should state the educational background of the author. • Web site should distinguish between the author of the content and the designer of the web site because lack of accurate information can be masked by the 'print' of an expert web designer or web master. • The web site's information clearly matches the web site's intended purpose. • Web site is free from grammatical and typographical errors.
4. OBJECTIVITY	• Content is free from commercial, political, gender, or racial bias. • The web site's stated curricular goals, objectives, and motives should match its content. • If the content is based upon personal opinion, the author should make it known to the reader. • The content contains a neutral or positive tone. • Affiliations with other educational organizations/companies are stated. • Check the web site address or URL/domain to locate the organizational source of the web site.
5. COVERAGE	• The scope of information is stated. • Evaluated links complement the web site's content. • The information is cited properly to allow access to a larger information base.
6. CURRENCY	• Web site clearly indicates the publishing date as well as when the content was last updated.
7. AESTHETIC OR VISUAL APPEAL	• The use of graphics and colors enhance the web site's information. • There is a balance of text and graphics corresponding to the ability of the audience.
8. NAVIGATION	• Home page contains direct links to all other parts of the web site. • Useful content is no more than 3 clicks away from home page. • All links are kept current and active and the links take user to valid and appropriate content. • Each page or section on the web site is clearly.
9. ACCESSIBILITY	• Any special software requirements to view web site's content is stated clearly. • Web site has text-only option to accommodate visually impaired users. • Web site loading time is minimal/web designer informs the user of length of download time. • Access to content should be free user should not have to pay a fee or provide personal information (name, e-mail address) to gain access to educational content.

Since the inception of the internet as well know, a great deal of time and effort has been spent in the authoring and the design of web sites. Internet access is becoming easier as the cost of internet-ready computer systems and internet service provision becomes affordable to more people throughout the world. With the ease in which people are able to publish content on the internet, the number of web sites available to users have been growing at an exponential rate. But, not a lot of work has been done in the area of website evaluation. Content that is published in more traditional formats, such as books, magazines, and newspapers, is subject to strong filtering systems with set rules before being considered publishable. But, there are no widely accepted formal rules that oversee the authoring and design of web sites on the internet. With this lack of control, web site authors and web designers have been left with free reign to the content and the technical aspects of web site production.

CHAPTER III
METHODOLOGIES AND MATERIALS

3.1 Methodologies

This chapter describes methods in web-based learning management project via internet protocol television (IPTV) transmission and the Moodle used in management education. However, the six stages of the system development life cycle with the waterfall model of software engineering, as shown in Figure 3.1.

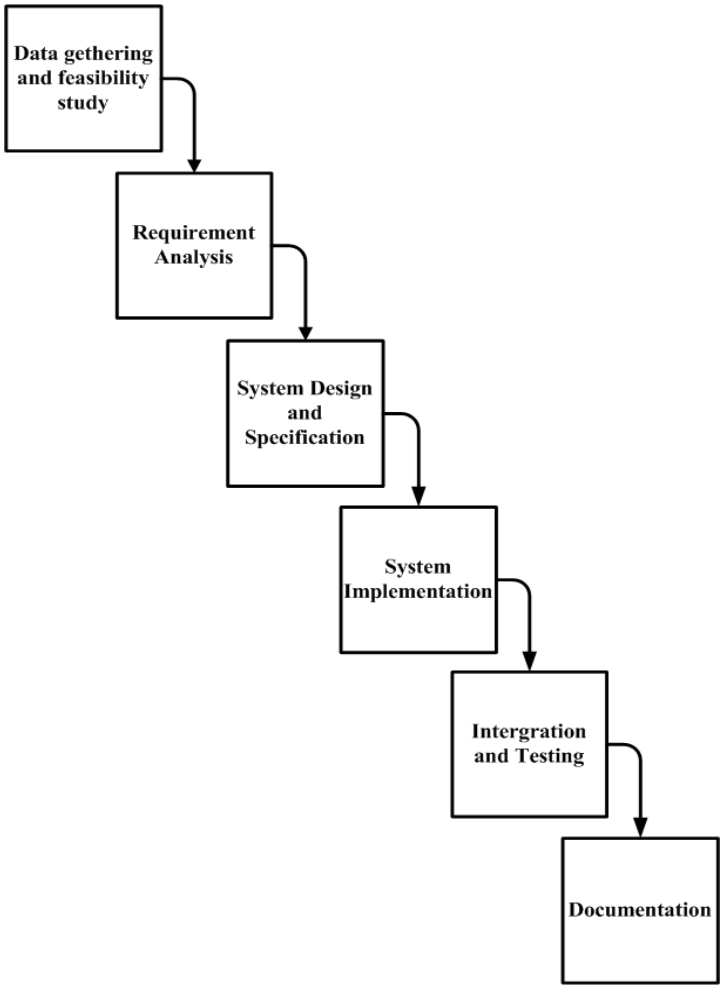

Figure 3.1 The system development life cycle and SDLC Waterfall Model

3.1.1 Data gathering and feasibility study

Data gathering methods used in this study using the information of basic network security course would be collected, analyzed, and designed by:

- Interviewing the instructor and trainee for defining requirement.
- Studying theories and researching for learning management system.
- Studying web pages to provide the service about learning management system.
- Gathering all activities from the training of basic network security course.

3.1.2 Requirement analysis

The study of the relevant information, as well as the problems in development projects; the analysis; technology, management, teaching, and learning using the Moodle program which can facilitate both the administrators and instructors.

3.1.3 System design and specification

This research is for basic network security course. The functional modeling using the Data Flow Diagram (DFD) provides a mechanism. The diagram shows the flow of data into the system and between processes and data stores. The context diagram shows the system overview in figure 3.2.

The Data Flow Diagram (DFD) level 0 of the web based learning management system via IPTV transmission shows not only the entity of user groups in the system but also the process between the entity and the system. The user groups were divided into 3 groups as follows: as instructor, trainee, and administrator. The Data Flow Diagram (DFD) level 0 is shown in figure 3.3.

The Data Flow Diagram (DFD) level 1 shows the five-processes subsystems of the web based learning management system via IPTV transmission as follows:

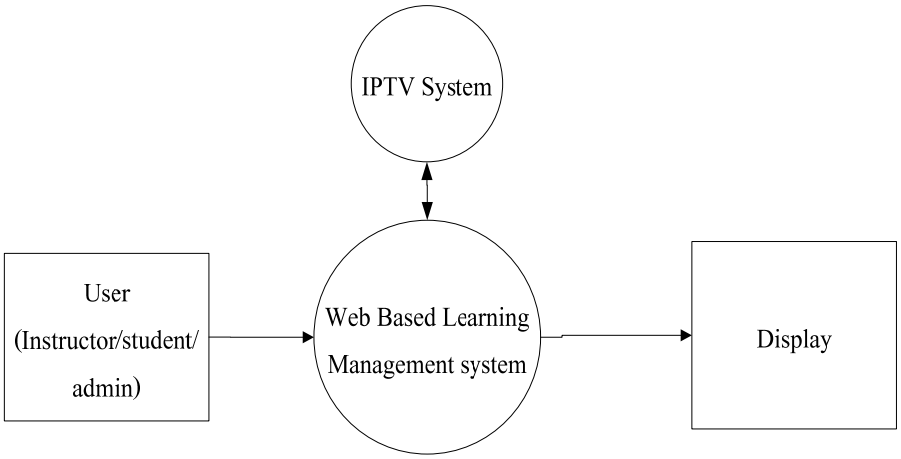

Figure 3.2 The system overview

- The process number 1 shows the “managing user” process.
- The process number 2 shows the “create content” process.
- The process number 3 shows the “test and evaluate” process.
- The process number 4 shows “intercommunication tools” process.
- The process number 5 shows in “file management” process.

The DFD level 1 is shown in figure 3.4.

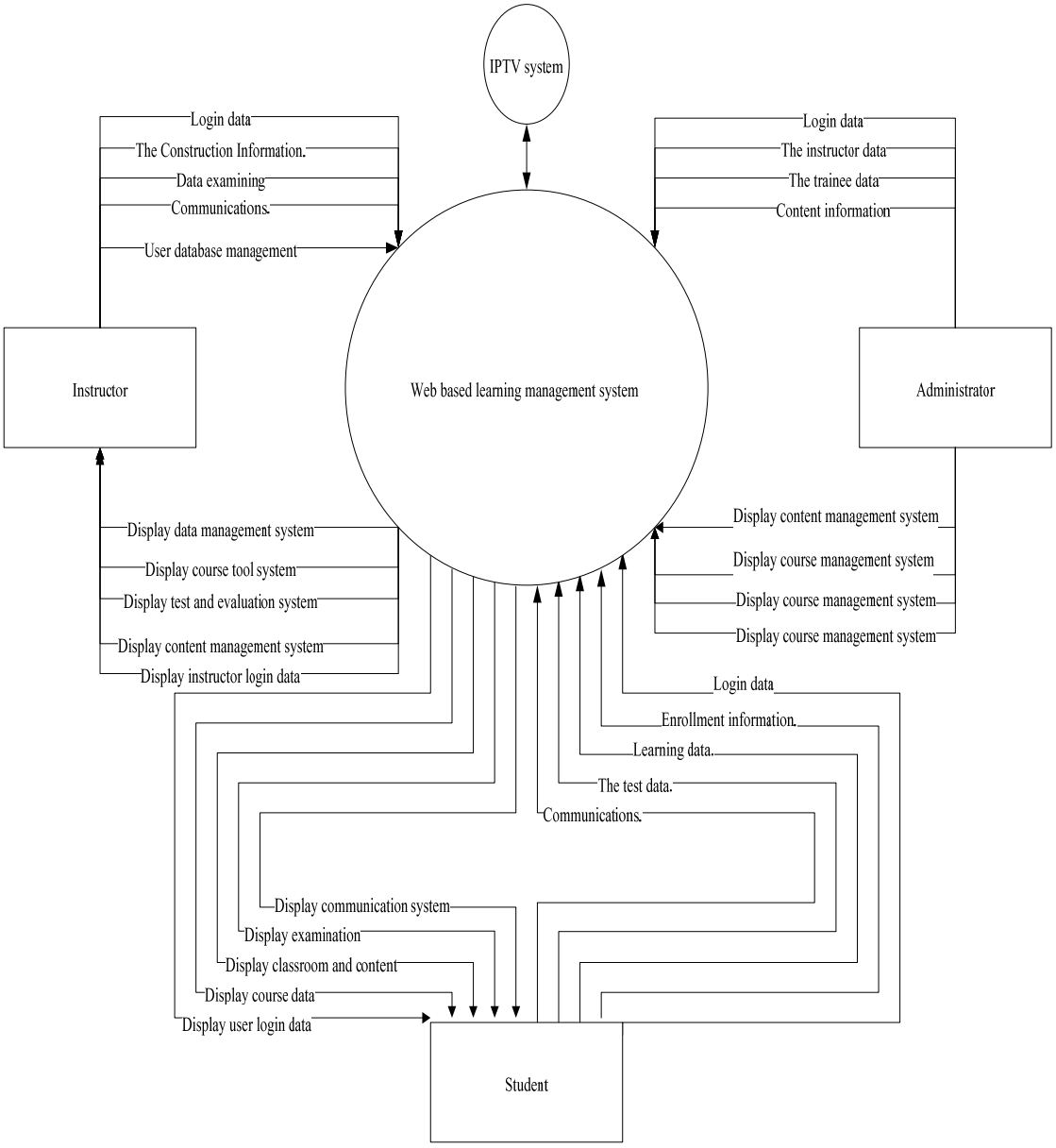

Figure 3.3 The data flow diagram level 0 of the web-based learning management system via IPTV transmission.

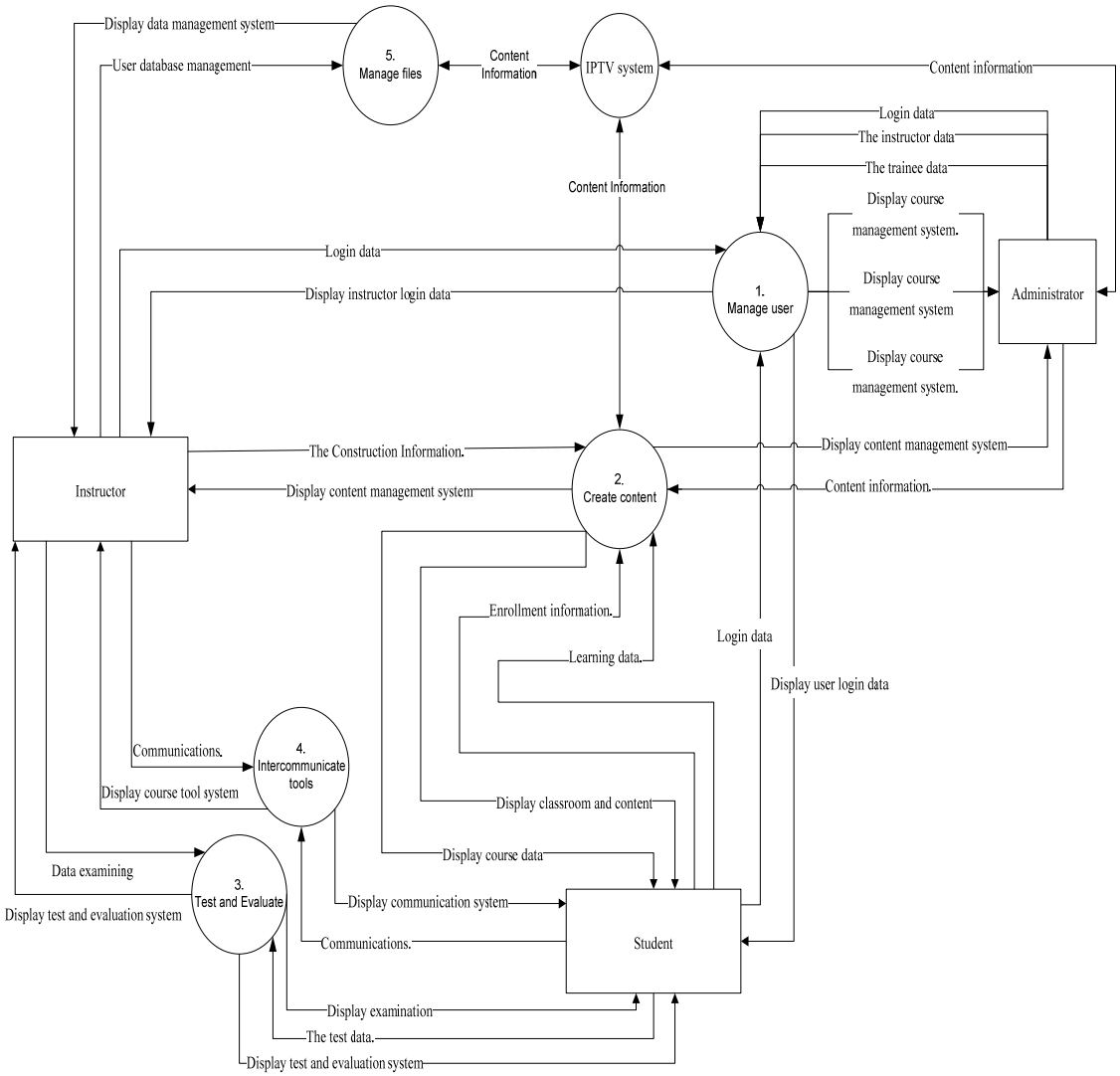

Figure 3.4 The data flow diagram level 1 of the web-based learning management system via IPTV

3.1.4 System implementation

The system implementation methods are divided into different steps as the following:

3.1.4.1 Installing Moodle program

- Download the Moodle program form moodle web site.
- Create a database of Moodle and the username and password.

- Open internet explorer on the client machine and type the name or IP Address.
- Create a data directory in the programs listed.
- Enter the username and password by the user and password that can be added to the database Moodle.
- Create file config.php.
- The system would display all of Moodle program.
- The system would be built. Moodle database tables, then scroll down to the bottom, then to continue.
- Select the language to Thai (th) and then save the changes.
- Give the full name of the website, your name, profile page, then save the changes.
- Set the administrator password, email address and other details to complete your profile.
- The system shown the Moodle login page of the application in the name of the system looks after.

3.1.4.2 Multimedia for e-learning

Preparation of teaching materials for using in Adobe Premiere Pro CS3. Data used to create instructional materials for this are as follows.

- Video of the lecturer teaching.
- Teaching of the instructor.
- Sound files, video of the lecturer teaching.
- The preparation of teaching materials used in the following steps.
- Install the Adobe Premiere Pro CS3.
- Find the speaker of the compressed video teaching.
- Convert video files to the teaching of the lecturer. avi format or. mp4 format.
- Export documents for all schools to a file. Jpg format.
- Use the audio super mp3 record program from the speaker phone and then save the file extension. mp3 format.
- Open Adobe Premiere Pro Cs3.

- Under project menu, create New project, choose select load present as DV-NTSC standard 48 kHz and choose the project to BNS (as project name).
- In media file editing instruction from the import menu, choose file, then Import video files, teaching, teaching audio files, image files, documentation and teaching.
- Import all in the project: BNS (project name).
- Drag the file to the timeline: sequence 01 is divided into the picture and sound.
- Choose instructional video files and image files from all in the timeline in layer 2 and layer 1, respectively, in the light sound in the audio timeline in layer 1.
- Select the title of the learning and teaching of the new title as a base on template and then create a title by completing all required information and save the title.
- Drag the title onto the timeline by a separated layer 3.
- Edit all the lessons in the course of the chapter.
- Perform file and edit it by selecting the play button of the program: sequence 01.
- When finish editing the sequence menu, then render. Under File menu, choose render work area.
- When rendering file from the file menu, choose the export menu, then select the movie.
- The media of instruction from the adobe Premiere Pro CS3 extension avi format is then available.

3.1.4.3 Install IPTV server

Step 1: install operating system as following:

- Install operating system with windows server 2008 R2 (Enterprise edition)
- Update windows 2008 and update patch from Microsoft website by windows update.
- Setup IP to number 202.28.194.23

- Set user for remote desktop connection.
- Enable remote desktop function.

Step 2: install software Windows Media Service. This software is an optional supplement to Windows Server 2008. In Windows Server 2008, the Streaming Media Services role (which includes the latest version of Windows Media Services) and remote administration tools are not included in Server Manager as following:

- Download Windows Media Service for window 2008 from website Microsoft.
- Install Windows Media Service to data platform.
- Open server manager program.
- Choose add role function from role summary menu.
- Go into the add role wizard for install windows 2008 server roles.
- Click next until server roles step.
- Choose streaming media service function.
- Click next until roles service step.
- Choose add required roles service for enable web based administration.
- Choose logging agent.
- Choose add required roles for enable logging agent.
- Click next until data transfer protocol.
- Choose real time streaming protocol (RTSP) for enable real time streaming protocol.
- The system would installation until installation succeeded.
- Install the desktop experience feature before testing media server.
- Choose the function from slide menu and the feature from menu feature
- Choose desktop experience and add required to start installation button.

- The system would restart the machine, then choose the yes button.
- After restart, the machine open again the desktop experience feature would installation succeeded.
- When finish Windows Media Service, this server have already stream any video.
- Upload video.
- Create playlist and manage schedule from windows media service.
- Then test from another computer.

3.1.5 Integration and testing

The Integration and testing methods divided into different steps as the following:

3.1.5.1 Preparing Multimedia file

Before Upload multimedia files with Windows Media Service on the Server IPTV program to convert the file extension in WMV format.

3.1.5.2 Creating playlist

- Open windows media service.
- Select the publishing point, then add publishing point.
- Name, playlist the encoder live stream.
- Select broadcast publishing point.
- Input encoder URL (in the C:\WMpub\ wmroot\bns.wsx).
- Select create a wrapper playlist and announcement file (.wsx), announcement file (.asx) and web page (.htm).
- Select the file and select add media to broadcast and record the playlist.
- Connected to the playlist by access the content.
- Announcement file system and storage parth.
- Make a start playlist.
- The playlist can be solved at the broadcast source.

3.1.5.3 Editing Template of playlist

- Select local disk (C:), then select the interpub folder and the wwwroot folder.
- Change the file extension. Htm (bns.htm).

3.1.5.4 Connecting Moodle with IPTV system

- Login on the state administrator or Instructor.
- Select the course.
- Select button "to edit this page" to create the broadcast. According to a playlist in windows media service.
- Select add resources process. Input The file name and the url of the playlist from the IPTV system and the display size.

3.1.6 Documentation

The documentation of web-based learning management system via IPTV transmission method provides the manual for trainee and instructor in the personal capability development for network management project. The manual upload on website of training.

3.2 Materials

The researcher has classified materials used in the research as the following:

3.2.1 Hardware

- Server : HP Proliant ML350 G5
- Chip : Intel Xeon CPU 5000Z Chipset x 2 CPU
- Memory : PC2 53000 DDR2 667 x4 Slot (16 Gbps)
- Storage controllers : Hp smart Array E200i
- Network controllers : embedded NC373i Gigabit Network Adapter
- Internal drive : Harddisk SAS 500Gb x2 (Raid Mirror)
- Power supply : Power Redundancy x2 (Hot Swap)
- Operating system : Windows Server 2008 R2 (Enterprise edition)

- Peripherals: keyboard, mouse, printer, and CD-ROM drive

3.2.2 Software

- Operating System: Microsoft Window 7 Ultimate
- Database Server: PHP MyAdmin with MySQL
- Web Server: Apache version 2.2.3
- Development tools: Adobe Dreamweaver CS3, Adobe Premiere Pro CS3, Moodle version 1.7, PHPMyadmin Version 2.5.3, MySQL, PHP version 5.1.6, and Appserv.

CHAPTER IV
RESULTS

The web-based learning management system via internet protocol television proved the methodologies. As for chapter 3, the Moodle is used to manage. Using the program is the basic network security course for the capability for network management project. The results of an experiment would be shown as following topic:

4.1 The function of web-based learning management system

The web-based learning management system for training in the personal capability development for network management project consists of two parts providing front-end for trainee and back-end for administrator or instructor.

4.1.1 Administrator view

The administrator has the two main functions: to manage the users and to open the types of courses.

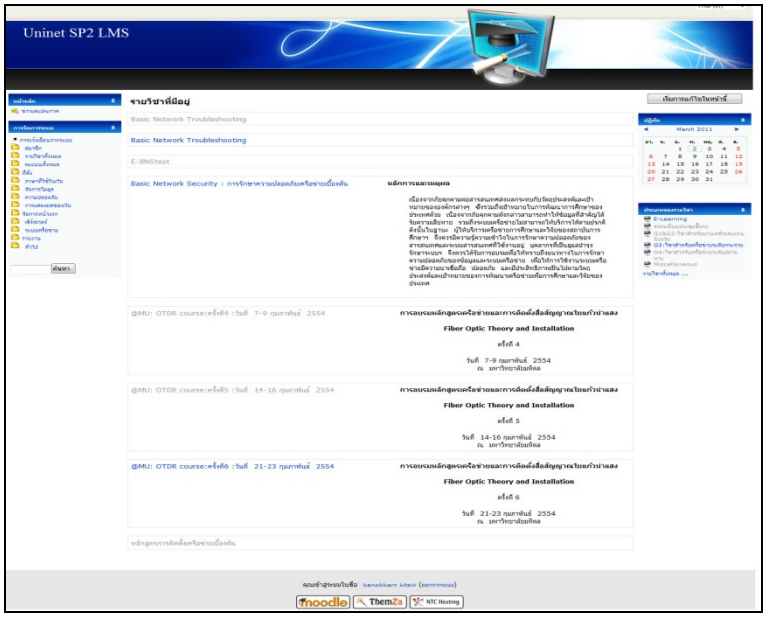

Figure 4.1 The administrator view

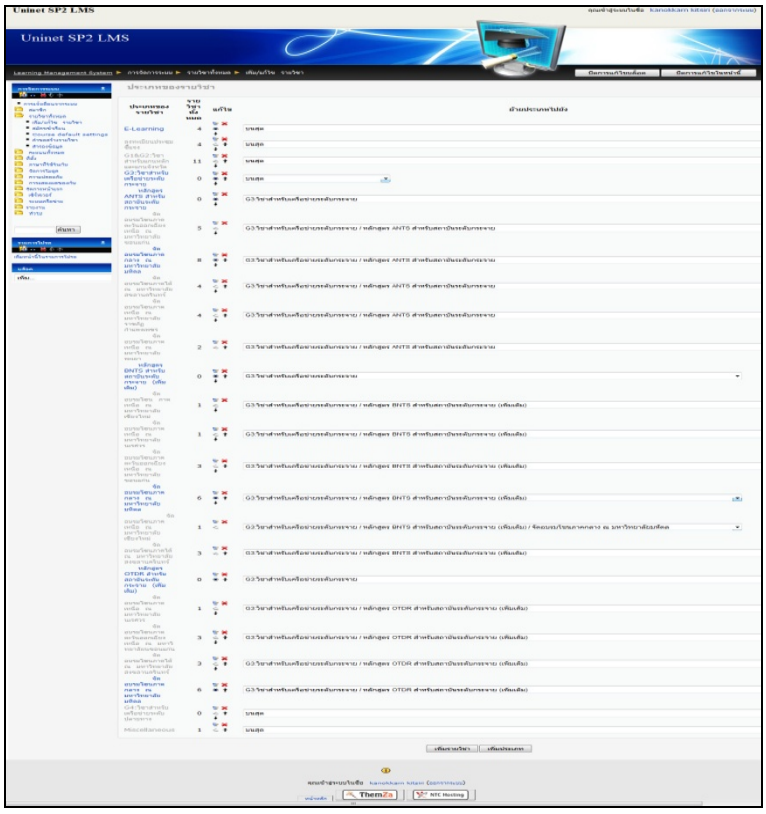

Figure 4.2 The screen for management course

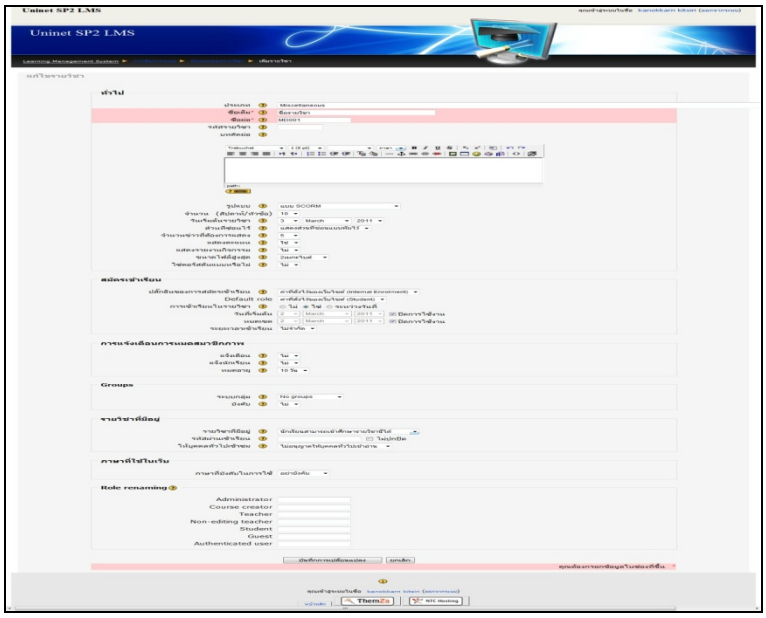

Figure 4.3 The screen for administrator to create course

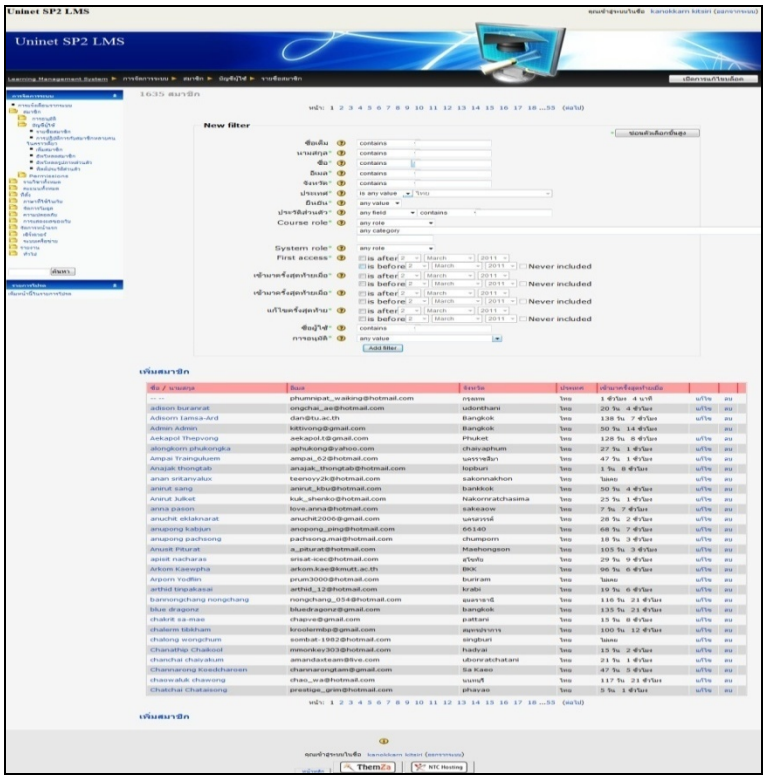

Figure 4.4 The administrator's user management

4.1.2 Instructor view

The instructor has 4 processes: the content management of course, examination, reporting, and communication as shown in Figure 4.5 – 4.9.

Figure 4.5 Adding the content by the instructor

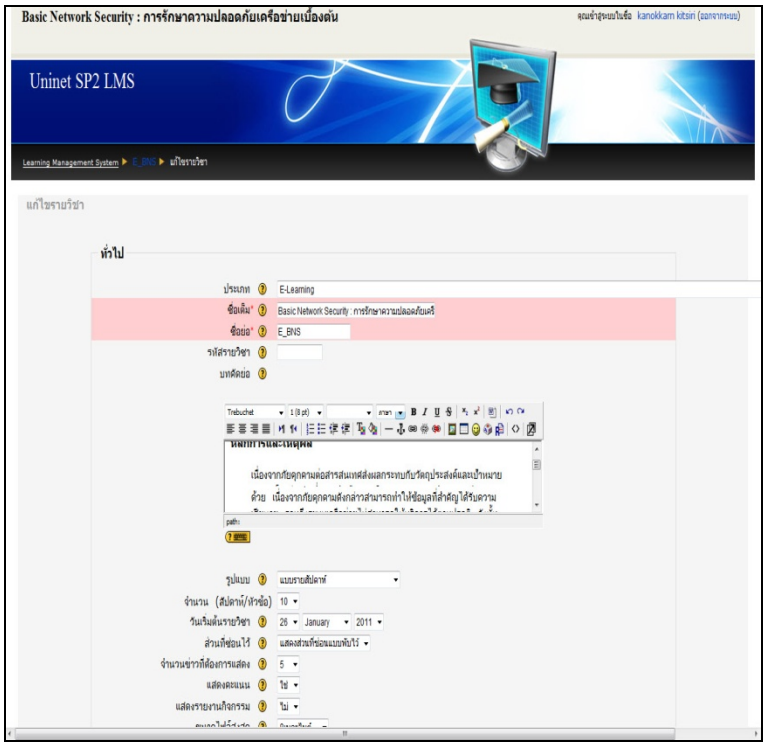

Figure 4.6 Course editing

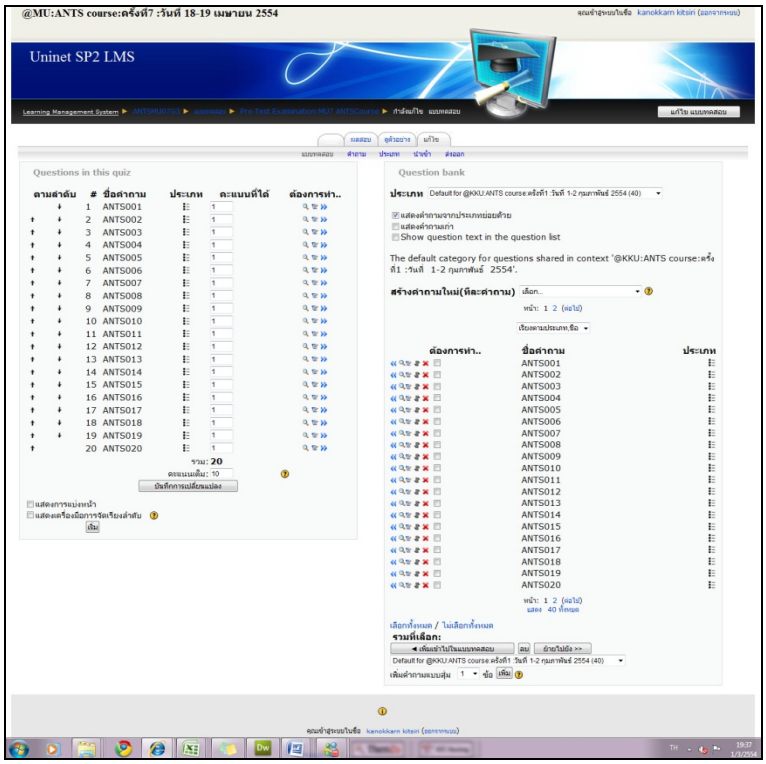

Figure 4.7 The instructor test

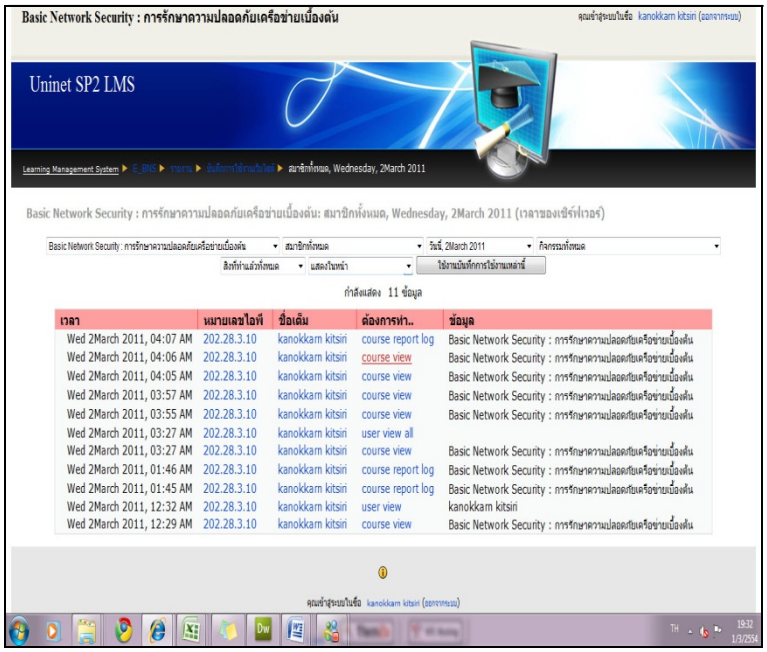

Figure 4.8 Report for instructor

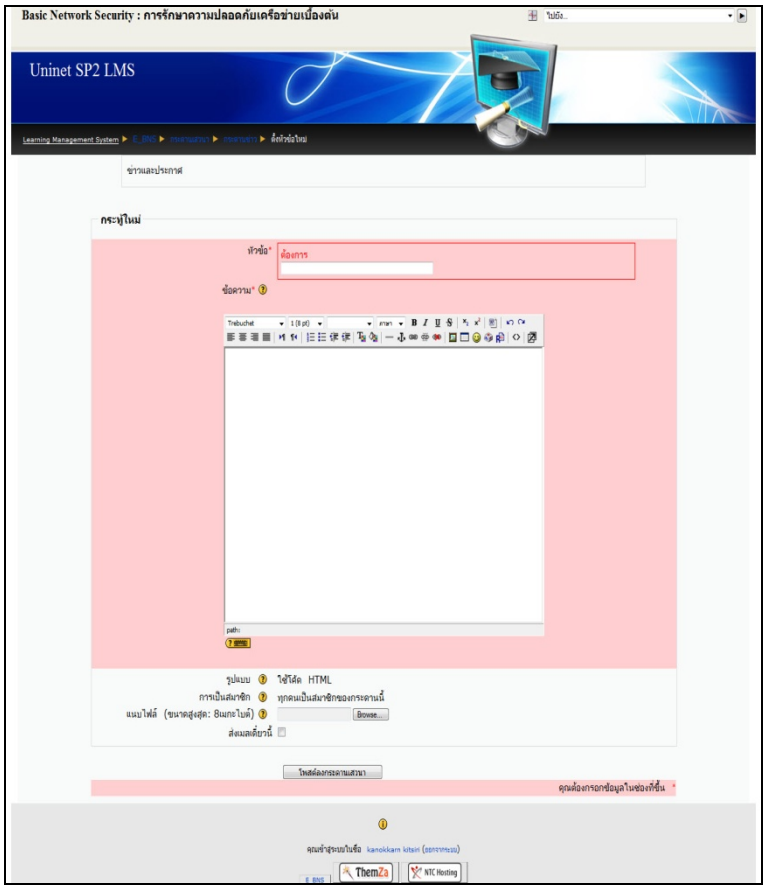

Figure 4.9 The communication path

4.1.3 Trainee view

The trainee logins to web-based learning management system for basic network security course, which has functions as follow;

- Login to web-based learning management system.
- Registration, for register basic network security course.
- Learning, for the content presentation and instructional media.
- Exam, for display examination with learner testing.
- Webboard and chatroom, for trainee to communicate.

These functions are shown in Figure 4.10 – 4.14.

Figure 4.10 The web-page showing the registration of basic network security course

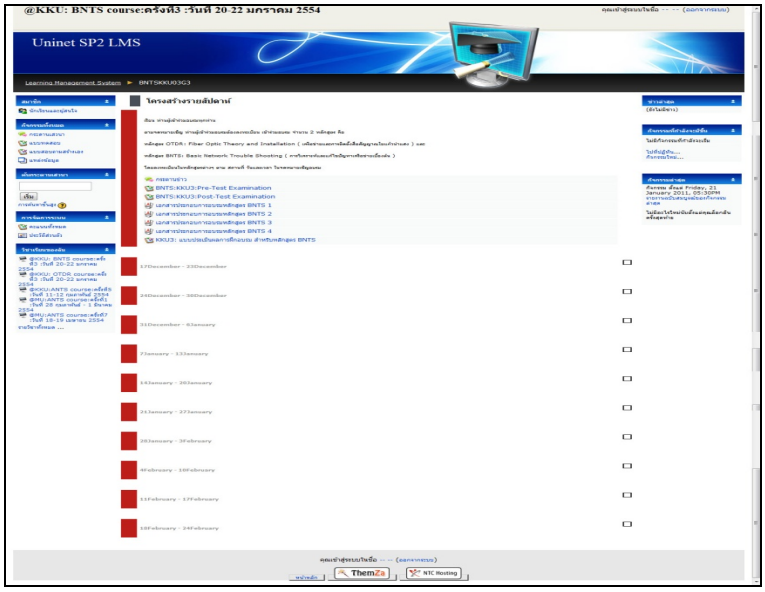

Figure 4.11 Trainee view in classroom

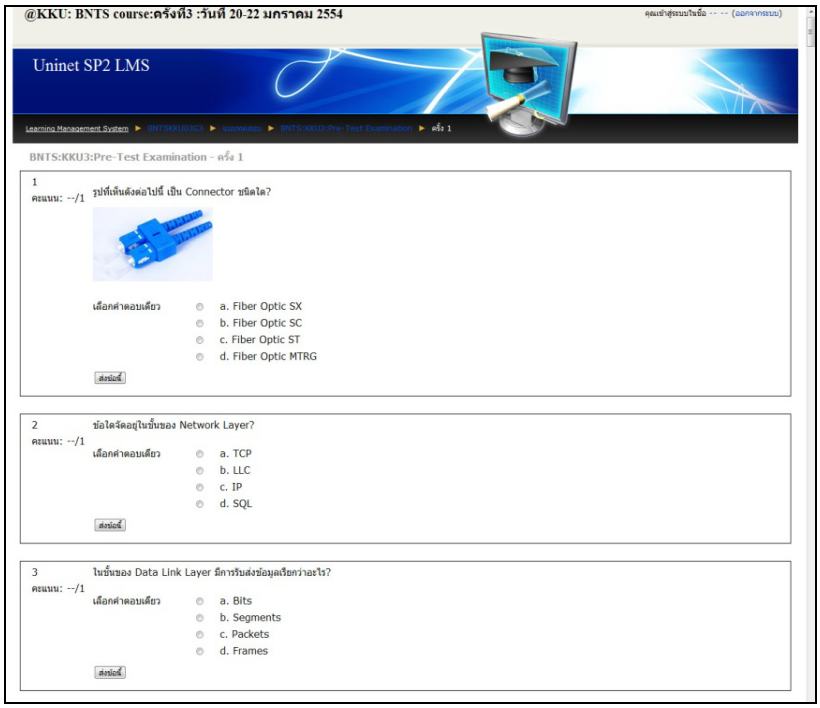

Figure 4.12 The tests for trainee

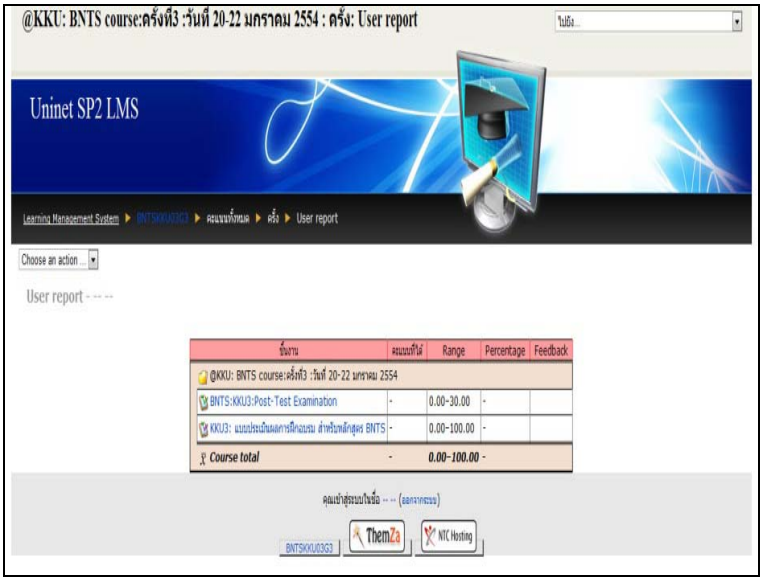

Figure 4.13 The result of testing

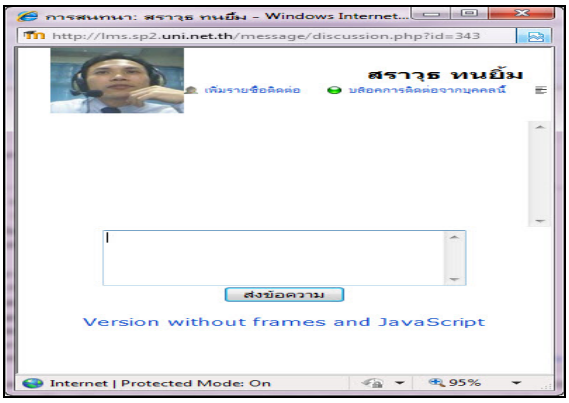

Figure 4.14 Chatroom communication

4.2 The Integrity of the system

The integrity of the web-based learningmanagement system are testedg the accuracy of the information. The client machine is to be tested from Chiang Mai and Khon Kaen. The Server of web-based learning management system is located in Bangkok, Commission on Higher Education. The result of the integrity by login testing and the time schedule testing are shows in the table 4.1.

The table 4.1 The result of integrity test

Login by user from	Ip address	Login	Time Schedule
Chiang Mai	202.28.27.6	/	/
Khon Kaen	202.12.97.117	/	/

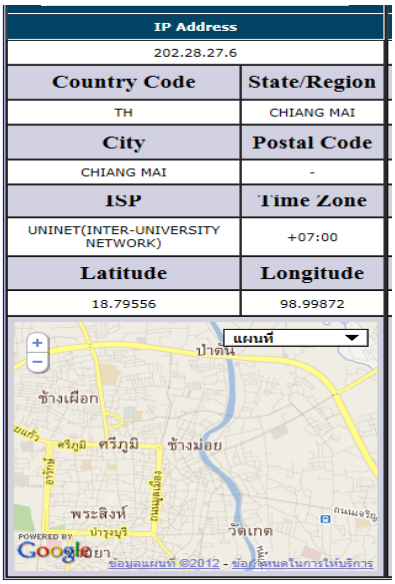

Figure 4.15 The IP address of the login from Chiang Mai province

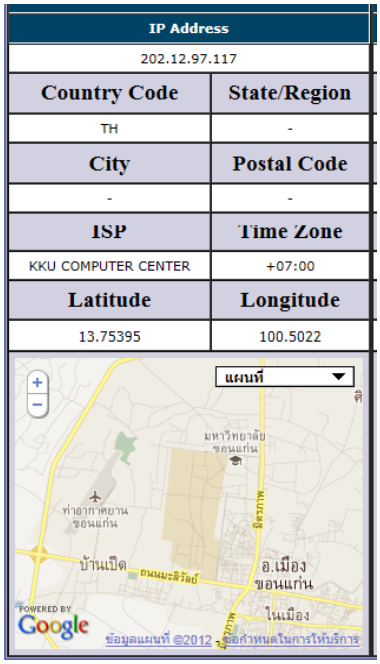

Figure 4.16 The IP address of the login from Khon Kaen province

The integrity result of the time schedule management showing the multimedia played by the time schedule are shown in figure 4.17 and figure 4.18 as follows:

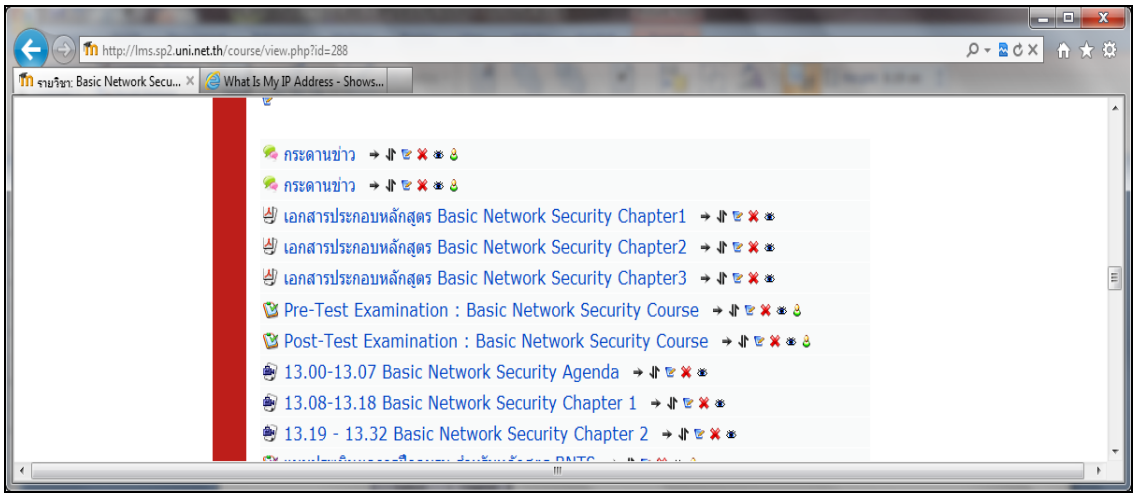

Figure 4.17 The time schedule

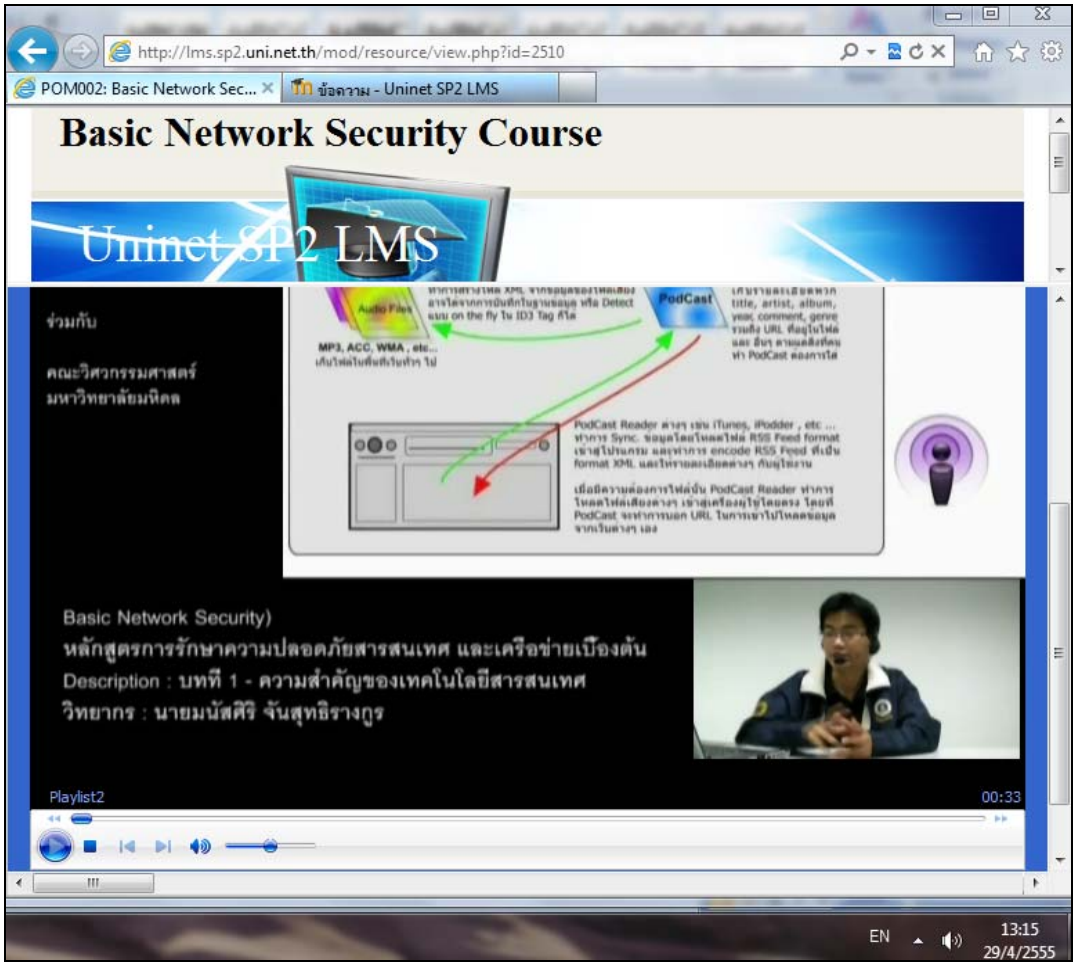

Figure 4.18 The multimedia being played by the time schedule

4.3 The capability of the system

The results of the timer to download multimedia data from a sample in Chiang Mai province is described. Also, the comparison of the original system and the web-based learning management system via IPTV is shown. The URL of the media file is automatically displayed on the Moodle system. The IPTV system is to display video files on Moodle, which has the length of 32.3 MB and 12:00 minutes. Cool timer from the URL as mentioned above is used. The results were presented in table 4.2:

Table 4.2 The downloading time of multimedia from website.

Province of Client	IP Address	URL file server (minutes)			URL IPTV server (minutes)		
Chiang Mai	202.28.27.6	00.00	05.39	17.12	00.00	00.18	12.22
Khon Kaen	202.12.97.117	00.00	05.24	16.23	00.00	00.16	12.26

The display of the timer to download multimedia data are shown in the figure 4.19 - figure 4.27 as follows:

Figure 4.19 The display of URL file server at time 0.4 seconds.

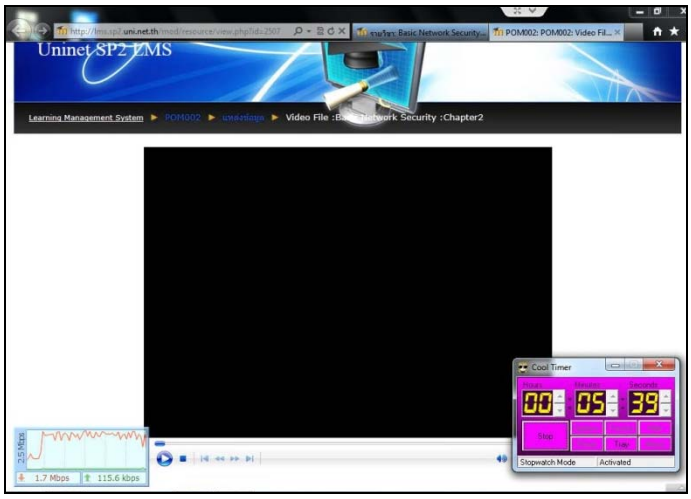

Figure 4.20 The display of URL file server at time 5.39 minutes.

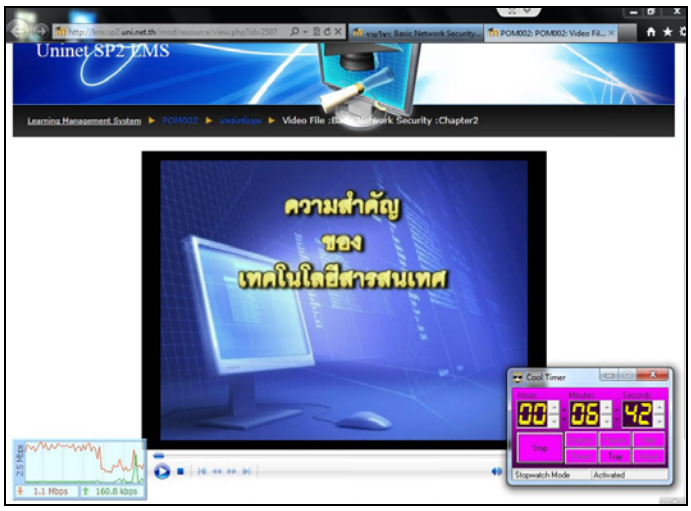

Figure 4.21 The display of URL file server at time 6.42 minutes.

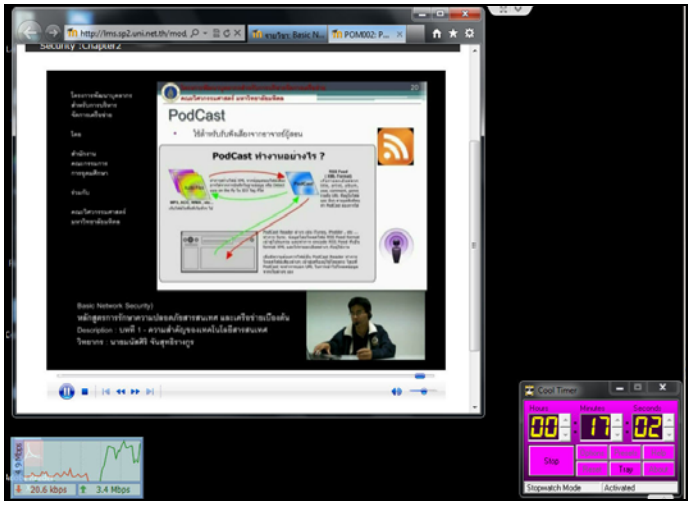

Figure 4.22 The display of URL file server at time 17.02 minutes.

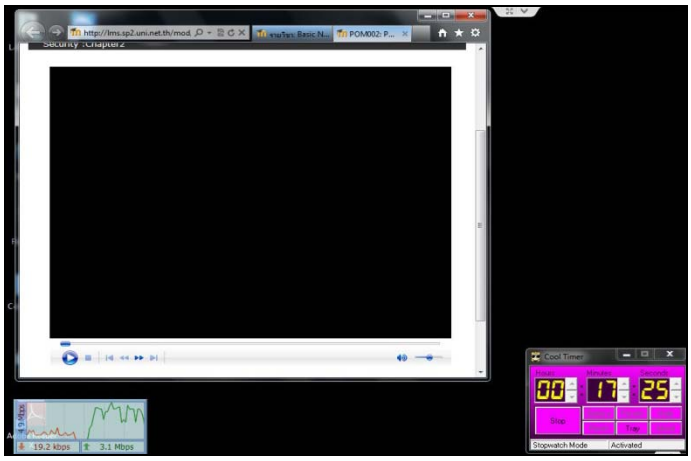

Figure 4.23 The display of URL file server at time 17.25 minutes.

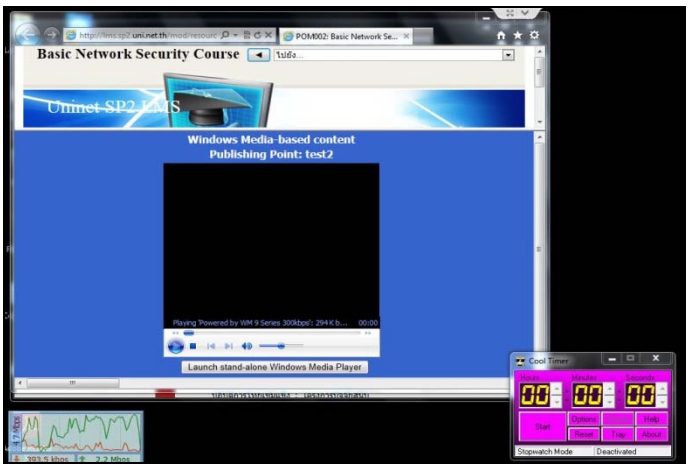

Figure 4.24 The display of URL IPTV server at time 0.00 seconds.

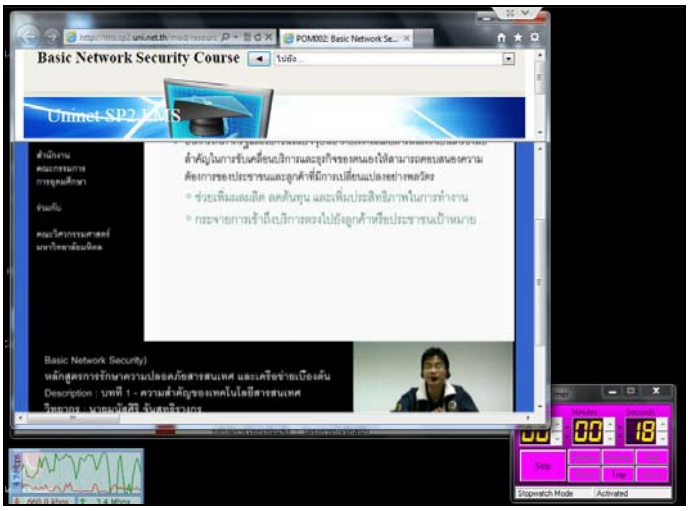

Figure 4.25 The display of URL IPTV server at time 0.18 seconds.

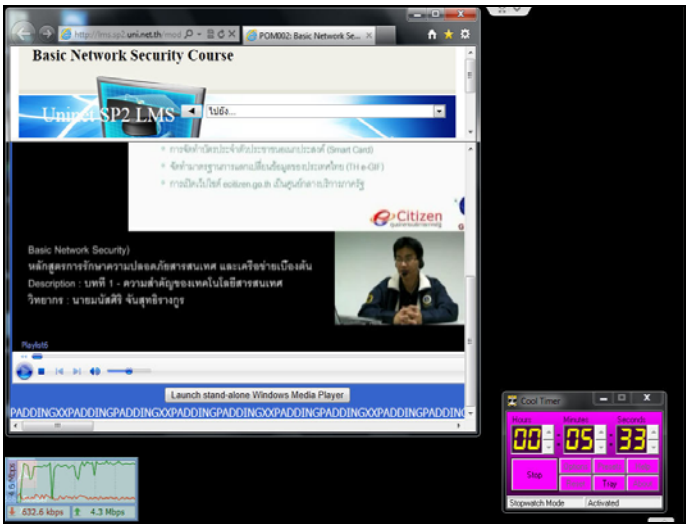

Figure 4.26 The display of URL IPTV server at time 5.33 minutes.

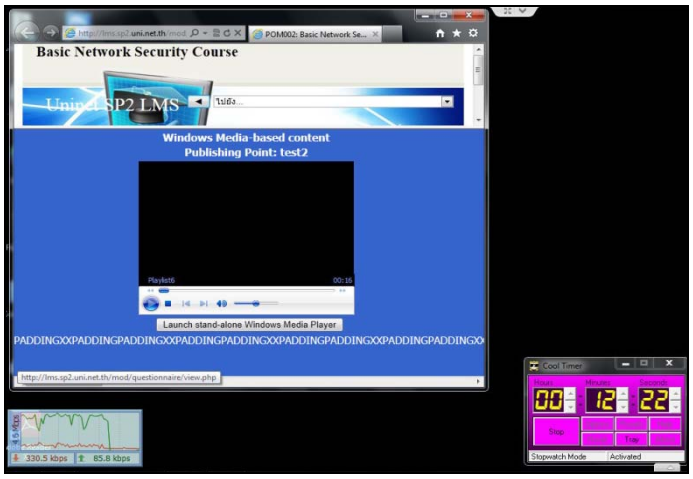

Figure 4.27 The display of URL IPTV server at time 12.22 minutes.

4.4 Examination

The results are evaluated. A sample group of 100 people is used in pre-test examination and post-test examination. It is found that the average pre-test examination is 6.0940 and the average post-test examination is 7.5420 points from the benchmark average. T-Test analysis is applied to the scores of the two group. The T-Test is equal to 6.0143 and DF is equal to 15. It has the significance at 0.0001 which is less than 0.05 (Sig <0.05), indicating that there is a level of difference of statistical significance test at 0.05. Pre-test and post-test have different values. The test of post-test examination is higher than the pre-test examination.

CHAPTER V
DISCUSSION, LIMITATION, CONCLUSION, AND RECOMMENDATION

5.1 Discussion

The development of Web-based learning management system can manage distance learning and teaching and can adapt IPTV technology to transcend multimedia information by using Moodle to manage online learning and teaching, which is conformed to the research by Prapas Thepthong [17]. It can perform activities in learning and performing and can access the lessons from distance i.e. from the testing result in Chapter 4, illustrating system access from Chiangmai and Khonkaen province. Furthermore, transcending multimedia information via IPTV helps in reducing time to download compared to the existing system.

Also the effective education result measurement in learning via the system by using statistical analysis t-test from score result of the testing before and after the learning. The result of the test is conformed to the research result of Dr. Chompunat [18]. The testing results of the learner before learning and after learning are compared. The average score of the test after learning is higher than the average score of the test before learning. It is shown that the effective result of the learning is increased. From the statistical analysis t-test, it is found that the score of both groups have difference at the 0.05 significance level.

5.2 Limitations

In the making of IPTV server in this research, there is limitation on resource which is to be encoder, so there is only 1 channel in learning and teaching.

Web-based learning management system via IPTV has limitation on efficiency of information transcending, which may have a reduced efficiency when there is increased usage in the network.

5.3 Conclusion

This research has presented the development of Web-based learning management system via internet protocol television (IPTV) for managing distance learning and teaching and has adapted IPTV technology to transcend learning and teaching media, which can perform distance learning and teaching via internet network. The sample group of 100 people is used, by the sample group or the developed system user. The sample group have performed learning and teaching via Basic Network Security: BNS course.

In chapter 2, this research have studied learning theory, learning management system, and IPTV technology. With our study, the process developed a learning management system based on the waterfall model of software engineering which can be itemized into 6 processes as follows;

- Starting from data gathering and feasibility study by interviewing from training attendants and officers in the project.
- Then bring the results of interviews to perform requirement analysis.
- Then perform system design and specification by using data flow diagram to help in designing.
- The process of system implementation, the installation of learning management web server is performed by using Moodle to help in managing learning and teaching. And then the making the learning and teaching media by Adobe premiere program in BNS course, and the installation of IPTV server in transcending learning and teaching media.
- After that uploading multimedia media onto IPTV server and display the result via web-based learning management system. In the process of Integration and testing, the system testing is performed.
- Then the user manual is made for the part of documentation.

By the result of the research in developing web-based learning management system via IPTV can be displayed into four parts as follows:

- The system performance result: The system can separate users into 3 groups, that is administrator, instructor, and student (the training attendant). The system user can use tools on management, improvement, controling, reserving and supporting the information, saving and result evaluation. From user management,

subjects and media used in subjects are added in to make learner who comes in perform distance learning activities via internet network. Furthermore, result evaluation of the study including the communication between learners and teachers or learners to learners can be done.

- System accuracy test result: The learners from Chiangmai and Khonkaen province enter the system and check the activity result report available from the system and attend according to broadcasting time schedule. It is found that there is accuracy of the information in the system.

- The efficiency measurement result of the system implementation: The timer is used. When compared to the existing system, it is found that learning and teaching media transcending via IPTV Server used the time for downloading the lessons which is multimedia lesson less that the that of the existing system.

- The result of measuring knowledge: The sample group of 100 persons was used. The sample group did the test before learning, attended the course according to time schedule, and then did the test after learning. It is found that the averages of both tests are different by using t-test analysis.

From the study, performing, and testing it is found that Web-based learning management system via internet protocol television has the correctness of the information, and it reduces the time in accessing the information. And furthermore it is the source of information for the learner to have more knowledge.

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APPENDIX

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ระบบการจัดการเรียนการสอนออนไลน์ผ่านอินเทอร์เน็ตโปรโตคอลเทเลวิชั่น: กรณีศึกษา

Web based learning management system via internet protocol television transmission: A case study of personal capability developer for network management project

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บทคัดย่อ

การพัฒนาการเรียนการสอนผ่านเครือข่ายอินเทอร์เน็ตความเร็วสูงทำให้เกิดความสะดวกในการเข้าถึงบทเรียนได้ทุกที่ทุกเวลา ด้วยเหตุผลดังกล่าว การวิจัยนี้จึงมีวัตถุประสงค์เพื่อ (1) พัฒนาระบบการจัดการเรียนการสอนบนฐานของเทคโนโลยีเว็บสำหรับการเรียนการสอนทางไกล (2) เพื่อประยุกต์ใช้เทคโนโลยีอินเทอร์เน็ตโปรโตคอลเทเลวิชั่น (Internet protocol television: IPTV) เพื่อการแพร่ภาพสื่อการเรียนการสอน ผ่านระบบการจัดการเรียนการสอน โดยใช้โปรแกรมมูเดิ้ล (Moodle) มาจัดการการเรียนการสอนออนไลน์ โดยมีกลุ่มเป้าหมายและกลุ่มตัวอย่าง คือ เจ้าหน้าที่ดูแลระบบเครือข่ายของสถาบันที่เข้าร่วมในโครงการพัฒนาบุคลากรสำหรับการบริหารจัดการเครือข่าย จำนวน 100 คน ซึ่งมาจากการสุ่มแบบง่าย จากหลักสูตรการรักษาความปลอดภัยเครือข่ายเบื้องต้น (Basic network security course)

ผลจากการศึกษาพบว่านอกจากจะช่วยลดเวลาและค่าใช้จ่ายในการเรียนการสอนแล้ว ยังลดปัญหาการปฏิสัมพันธ์ระหว่างผู้เรียนและผู้สอน และระหว่างผู้เรียนด้วยกันเองอีกด้วยการเข้าถึงแบบออนไลน์ได้ในเวลาเดียวกัน

คำสำคัญ: ระบบการจัดการการเรียนการสอน, อินเทอร์เน็ตโปรโตคอลเทเลวิชั่น, มูเดิ้ล, การเรียนรู้บนฐานเทคโนโลยีเว็บ, การเรียนการสอนทางไกล

Abstract

Because of the educational development by high-speed internet, the users can access the lesson from anywhere, anytime. From such reason, the purposes of this research were: (1) to develop the web-based learning management system for distance learning, (2) to apply internet protocol television transmisson media of instruction. The system based on moodle program to manage the on-line instruction system. The simple group in this research consisted of 100 network administrator of institutions participating in the personal capability developer for network management project form Basic Network Security course.

The results showed that the web based learning management system via internet protocol television transmission not only decrease the time and expense in training but also the interaction problem for students and teacher, with online access at the same time too.

Keywords: Learning Management System, Internet Protocol Television, Moodle, Web-based Learning, Distance Learning

บทนำ

เครือข่ายอินเทอร์เน็ตความเร็วสูงในปัจุบันพัฒนาไปอย่างรวดเร็วและต่อเนื่อง ส่งผลให้เกิดการนำเทคโนโลยีต่างๆ เข้ามาประยุกต์ใช้การจัดการศึกษา เพื่อให้การศึกษาสามารถเข้าถึงได้ในการเรียนการสอนทางไกล มีคุณภาพและประสิทธิภาพมากขึ้น เพื่อรองรับการพัฒนาเป็นสังคมแห่งการเรียนรู้ การจัดการเรียนการสอนออนไลน์เป็นวิธีการหนึ่งที่จะเพิ่มศักยภาพในการจัดการการเรียนการสอนได้อย่างมีประสิทธิภาพ

โครงการพัฒนาบุคลากรสำหรับการบริหารจัดการเครือข่าย ทำหน้าที่จัดการพัฒนาบุคลากรเพื่อบริหารจัดการเครือข่ายอินเตอร์เน็ตความเร็วสูงตามเป้าหมายของโครงการ โดยมีสถาบันที่เข้าร่วมโครงการทั่วประเทศ จึงจำเป็นต้องมีระบบจัดการการเรียนการสอนเพื่อให้ผู้เข้าเรียน ซึ่งเป็นเจ้าหน้าที่ดูแลระบบเครือข่ายจากสถาบันในโครงการสามารถเข้าสื่อการเรียนการสอน ดังนั้นการเผยแพร่การจัดการเรียนการสอนผ่านเทคโนโลยีอินเทอร์เน็ตโปโตคอลเทเลวิชั่น ถือว่าเป็นช่องทางที่จะทำให้โครงการบรรลุเป้าหมายตามวัตถุประสงค์ข้างต้น ซึ่งทำให้ผู้ใช้สามารถเข้าศึกษาบทเรียนได้ตลอดเวลา

วัตถุประสงค์ของการวิจัย

การวิจัยครั้งนี้ มีวัตถุประสงค์หลักในการดำเนินงานวิจัย 2 ข้อ ดังต่อไปนี้

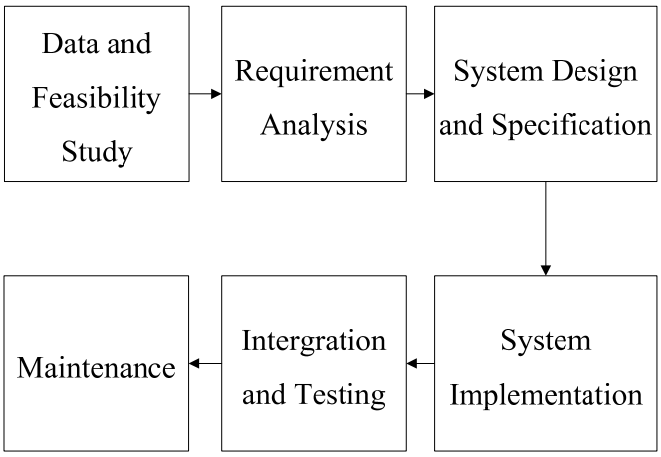
1. เพื่อพัฒนาระบบการจัดการเรียนการสอนบนฐานของเทคโนโลยีเว็บสำหรับการเรียนการสอนทางไกล

2. เพื่อประยุกต์ใช้เทคโนโลยีอินเทอร์เน็ตโปรโตคอลเทเลวิชั่น เพื่อแพร่ภาพสื่อการเรียนการสอน

วิธีการวิจัย

วิธีการวิจัยในการดำเนินงานการพัฒนาระบบจัดการเรียนการสอนออนไลน์ผ่านอินเทอร์เน็ตโปรโตคอลเทเลวิชั่น (IPTV) ได้นำโปรแกรม Moodle มาใช้ในการวิเคราะห์และออกแบบระบบการจัดการการเรียนการสอน โดยแบ่งวิธีการดำเนินงานออกเป็น 6 ขั้นตอน โดยพัฒนาระบบตามหลักของวงจรการพัฒนาระบบ Software Engineering แบบ Waterfall Model มาประกอบด้วย ดังแสดงในรูปที่ 1

1. การเก็บรวบรวมข้อมูลและศึกษาความเป็นไปได้ (Data gathering and feasibility study) ในส่วนข้อมูลเกี่ยวกับปัจจัยและเทคโนโลยีต่างๆที่ใช้ในการทำงาน เพื่อนำไปวิเคราะห์ระบบงาน

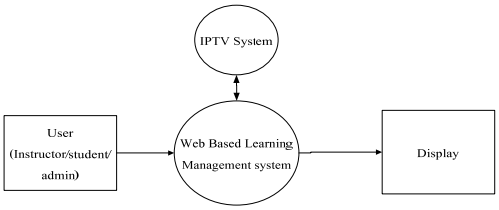


รูปที่ 1 รูปแสดงการพัฒนาระบบตามหลัก SDLC แบบ Waterfall Model

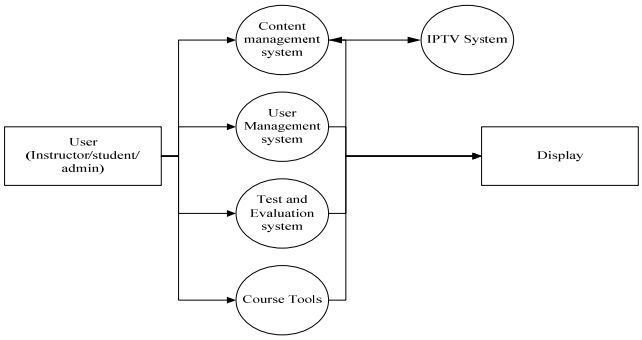
2. การวิเคราะห์ความต้องการของผู้ใช้งาน (Requirement analysis) จากการสอบถามและรวบรวมข้อมูลที่เกี่ยวข้อง รวมถึงการกำหนดปัญหาในระหว่างการพัฒนาโครงการ การวิเคราะห์ระบบครั้งนี้นำเสนอ เทคโนโลยีระบบการบริหารจัดการการเรียนการสอนโดยใช้โปรแกรม Moodle ซึ่งเป็นระบบที่มีผู้ใช้และผู้พัฒนาต่ออย่างแพร่หลาย และมีการปรับปรุงเวอร์ชั่นใหม่อยู่เสมอ ซึ่งสามารถอำนวยความสะดวกได้ทั้ง ผู้ดูแลระบบ ผู้สอน และ ผู้เรียน
3. การออกแบบระบบจากการวิเคราะห์ระบบ (System design and specification) ในขั้นที่แล้ว ได้นำ ผลการวิเคราะห์มาออกแบบระบบ ดังต่อไปนี้
   3.1 การออกแบบส่วนประกอบต่างๆของเว็บเพจ ในส่วนข้อมูลนำเข้า (Input data) ในส่วนการออกแบบจอภาพ (Output design) และการพัฒนาเนื้อหารายวิชา การวิจัยครั้งนี้ผู้วิจัยทำการพัฒนารายวิชา การรักษาความปลอดภัยเครือข่ายเบื้องต้น (Basic network security)
   3.2 การนำเทคโนโลยีอื่นมาร่วม เป็นการนำสื่อมัลติมีเดียที่ทำการสร้างโดย Adobe Premiere Pro CS3 นำเข้าระบบแพร่ภาพสัญญาณผ่านระบบ IPTV ในลักษณะจัดเก็บรายการไว้รับชมเมื่อต้องการ (Video On Demand) และเชื่อมต่อเข้ากับ Moodle ในห้องเรียน
4. การพัฒนาโปรแกรม (System implementation) ตามการออกแบบจากการวิเคราะห์ระบบ
5. การเชื่อมต่อระบบและการทดสอบ (Integration and testing) ทำการเชื่อมต่อสื่อมัลติมีเดียเข้ากับระบบการจัดการการเรียนการสอน พร้อมทำการทดสอบระบบ
6. การติดตั้งและดูแลรักษาระบบ (Maintenance)

โดยมีผู้ใช้ระบบ 3 กลุ่ม คือ ผู้สอน ผู้เรียน และ ผู้ดูแลระบบ ที่ใช้บริการ Web-based learning management system โดยมีการเชื่อมต่อกับระบบ IPTV และทำการแสดงผลทางจอภาพดังแสดงในรูปที่ 2 และ มีระบบงานย่อยของระบบจัดการการเรียนการสอนออนไลน์ผ่านอินเทอร์เน็ตโปรโตคอลเทเลวิชั่น ได้แก่ ระบบการจัดการหลักสูตร ระบบการจัดการสร้างบทเรียน ระบบการทดสอบประเมินผล ระบบส่งเสริมการเรียน และ ระบบจัดการข้อมูล โดยในส่วนของระบบการจัดการหลักสูตรนั้นได้ทำการเชื่อมต่อกับระบบอินเทอร์เน็ตโปรโตคอลเทเลวิชั่นดังแสดงใน รูปที่ 3

ขั้นตอนการทำงานของระบบ คือ เริ่มต้นจากผู้ใช้ขอใช้บริการผ่านทางเว็บบราวเซอร์ โดยส่งข้อมูลบัญชีผู้ใช้และรหัสผ่านไปยัง Server เพื่อดึงฐานข้อมูลผู้ใช้และรหัสผ่านเพื่อเข้าสู่ Web Based Learning Management System เมื่อผู้ใช้เข้าสู่ระบบ และทำเลือกเข้าห้องเรียนเพื่อทำการเรียนผ่านสื่อมัลติมีเดีย Web Based Learning Management System จะทำหน้าที่ส่งข้อมูลที่อยู่ในรูปแบบ URL มาจากระบบ IPTV System และแสดงข้อมูลที่ผู้ใช้ขอบริการ



รูปที่ 2 รูปแสดง System Overview



รูปที่ 3 รูปแสดงระบบย่อยของระบบการจัดการเรียนการสอนออนไลน์ผ่านไอพีทีวี

ผล/ สรุปผลการวิจัย

ระบบการจัดการการเรียนการสอนออนไลน์ผ่านอินเทอร์เน็ตโปรโตคอลเทเลวิชั่น โดยใช้โปรแกรม Moodle นั้น ได้คัดเลือกหลักสูตรต้นแบบ คือ หลักสูตรการรักษาความปลอดภัยเครือข่ายเบื้องต้น ผู้ใช้ระบบจาก 100 ตัวอย่าง เป็นผู้ดูแลระบบเครือข่ายจากสถาบันในโครงการ โดยมีผลการวิจัยดังต่อไปนี้

1. การออกแบบระบบการจัดการเรียนการสอนออนไลน์ผ่านอินเทอร์เน็ตโปรโตคอเทเลวิชั่น โดยการนำ Moodle มาบริหารจัดการระบบการจัดการการเรียนการสอนดังกล่าวข้างต้น

1.1 การนำเข้าข้อมูล และแสดงผลส่วนต่างๆของระบบ

1.1.1 ระบบจัดการหลักสูตร)Course Management System) กลุ่มผู้ใช้งานแบ่งเป็น 3 ระดับ คือ ผู้เรียน ผู้สอน และผู้ดูแลระบบ โดยสามารถเข้าสู่ระบบจากที่ไหน เวลาใดก็ได้ โดยผ่านเครือข่ายอินเทอร์เน็ตความเร็วสูง

1.1.2 ระบบการสร้างบทเรียน)Content Management System) ระบบประกอบด้วย เครื่องมือในการช่วยสร้างเนื้อหาต่างๆได้ ดังแสดงในรูปที่ 4

1.1.3 ระบบการทดสอบและประเมินผล)Test and Evaluation System) มีแบบทดสอบก่อนและหลังเรียน โดยสามารถกำหนดเวลาให้เข้าทำแบบทดสอบได้ และยังทำการสุ่มข้อสอบ และการตรวจข้อสอบอัตโนมัติ พร้อมเฉลย รายงานสถิติ คะแนน และสถิติการเข้าเรียนของนักเรียน ดังแสดงในรูปที่ 5

1.1.4 ระบบส่งเสริมการเรียน)Course Tools System) สามารถถาม-ตอบปัญหาในขณะที่ผู้สอนออนไลน์ หรือ ออฟไลน์ ได้ในห้องสนทนา)Chatroom) หรือ เว็บบอร์ด)Webboard) ทำให้สะดวกในการสื่อสารระหว่าง ผู้เรียนกับผู้สอน และ ผู้เรียนกับผู้เรียน ด้วยกัน ดังแสดงในรูปที่ 6

1.1.5 ระบบจัดการข้อมูล)Data Management System) ประกอบด้วยระบบจัดการไฟล์และโฟลเดอร์ ผู้สอนมีเนื้อที่เก็บข้อมูลบทเรียนเป็นของตนเอง โดยได้เนื้อที่ตามที่ผู้ดูแลระบบกำหนดให้

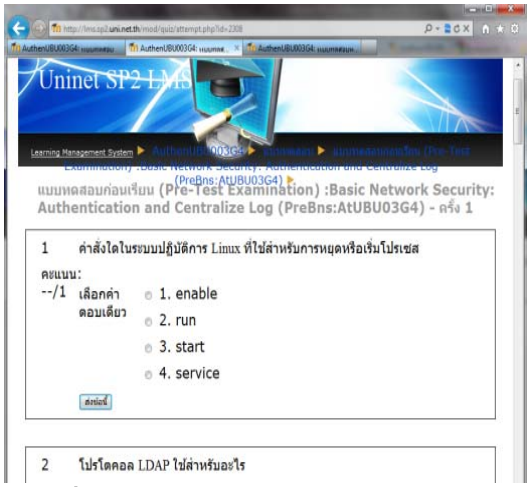
2. การนำเทคโนโลยีอื่นมาร่วม เป็นการนำสื่อมัลติมีเดียที่ทำการสร้างโดย Adobe Premiere Pro CS3 นำเข้าระบบแพร่ภาพสัญญาณผ่านระบบ IPTV ในลักษณะจัดเก็บรายการไว้รับชมเมื่อต้องการ (Video On Demand) และเชื่อมต่อเข้ากับ Moodle ในห้องเรียน ดังรูปที่ 7

3. การประเมินผลคะแนน การทดสอบก่อนเรียน (Pre-Test) และผลการทดสอบหลังเรียน (Post-Test) ของกลุ่มตัวอย่างจำนวน 100 คน พบว่าคะแนนเฉลี่ย Pre-Test ได้ 6.0940 และคะแนนเฉลี่ย Post-Test ได้ 7.5420 คะแนน จากการทดสอบเปรียบเทียบค่าเฉลี่ยของคะแนนทั้ง 2 กลุ่ม โดยใช้ T-Test Analysis แล้ว ค่า T-Test มีค่าเท่ากับ 6.0143 และค่า df มีค่าเท่ากับ 15 มีนัยสำคัญทางสถิติที่ 0.0001 ซึ่งมีค่าน้อยกว่า 0.05 (Sig<0.05) แสดงว่ามีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติระดับ 0.05 นั้นคือ คะแนนสอบ Pre-Test และ Post-Test มีค่าแตกต่างกัน โดยผลการทดสอบหลังเรียน (Post-Test) มีค่าเฉลี่ยสูงกว่าผลการทดสอบก่อนเรียน (Pre-Test)

อภิปรายผล

การพัฒนาระบบการจัดการการเรียนการสอนออนไลน์ผ่านอินเทอร์เน็ตโปรโตคอลเทเลวิชั่นนั้น เป็นระบบที่พัฒนาขึ้นเพื่อช่วยให้เจ้าหน้าที่ดูแลรักษาระบบเครือข่ายจากสถาบันในโครงการ หรือผู้ที่ต้องการศึกษาหลักสูตรที่เกี่ยวข้องกับระบบเครือข่ายเข้าถึงหลักสูตรได้ทำให้ประหยัดเวลาและลดค่าใช้จ่ายในการเดินทาง

รูปที่ 4 รูปแสดงระบบการสร้างบทเรียน



รูปที่ 5 รูปแสดงแบบทดสอบก่อนเรียน-หลังเรียน

รูปที่ 6 รูปแสดงระบบส่งเสริมการเรียนกระดานสนทนา และ เว็บบอร์ด

รูปที่ 7 รูปแสดงสื่อการเรียนการสอนที่เชื่อมต่อผ่านเทคโนโลยี IPTV

ข้อเสนอแนะ

แนวทางและข้อเสนอแนะนำในการประยุกต์ใช้และพัฒนาระบบเพิ่มเติมในอนาคต มีดังนี้

- พัฒนาระบบสื่อสารด้วยภาพและเสียงแบบ Interactive ในขณะที่ผู้เรียนและผู้สอน ออนไลน์

- พัฒนาระบบInteractive ที่สามารถวัดระดับความรู้ของผู้เรียนและสามารถช่วยสนับสนุนการตัดสินใจเลือกแบบเรียนที่เหมาะสมให้ผู้ใช้ได้

- พัฒนาการจัดการข้อมูล ในส่วนของเนื้อที่การเก็บข้อมูลของผู้เรียน ให้สามารถจัดตารางเรียนได้ด้วยตนเอง

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