

Research Article

Design and Implementation of an E-Learning Live Streaming Application With Audio Chat

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Abstract: In recent years, increased computing power, improved wireless and user-friendly technology and reduced telecommunication costs have contributed to lowering barriers to information access and exchange. The potential for using more innovative, cost-efficient and user-friendly ICT solutions in education and for reaching all groups of society: including the under privileged, those in remote areas and other disadvantaged groups has become increasingly feasible in less advanced countries and in more advanced ones. Some of the schools in Nigeria have sub-standard levels of education without basic educational amenities such as: laboratories, competent teachers and libraries while other schools with those amenities are too expensive for the poor and other groups in the society. With the aid of this software we can broadcast live lectures from the school with adequate educational amenities to other schools that are deficient. Thus with the implementation of this software in schools, it will help bridge the gap.

Keywords: educational amenities, E-Learning, Nigeria.

INTRODUCTION

The spread of the internet triggered the development of e-learning. From the invention of the first emails, pioneers used the medium for exchange of knowledge. The first higher education institute to offer an online curriculum was CALCAMPUS, created in 1994. Shortly after, the university of virginia beach issued its first Ph.D through courses delivery entirely via email[1]. With this application the possibilities of teaching and research when students can experience remote places first hand and encounter faraway experts without leaving the school premises. Invite guest speakers(professors, doctors, teacher etc) to speak to a class.

Questions asked by students in the schools with deficient amenities are answered with the use of the audio chat feature on the application.

Everyday, the database of the application is the updated with books and other relevant data from the teachers and is then sent to the administrator to be uploaded to the database.

BRIEF REVIEW OF THE INSTALLATION PROCESS

This e-learning software can be easily incorporated into any school with a pre-existing network structure just by installing it on their server, schools without a network will have to build one but this will increase cost.

I.P camera's are installed in the class rooms where their lecture's are to be broadcasted, the I.P camera must be placed in such a way as to capture the teacher and the white or black board, it is then connected to a computer to broadcast the stream.

Now over at the other school where the stream is intended to be displayed, the school is required to have a white board, a project, speakers and computer connected to their local area network (LAN) network. The teacher in each class will be trained on how to operate the computer and other equipment, training will only take a few minutes.

Due to these fact that these schools are poor and lack basic educational amenities, the only cost of implementation they will incur is the cost for the initial installation of a network for those schools that don't have, then installation of the software and other equipment required. In the preceding pages we will look into the actual software design.

FLOWCHART OF WEB-BASED APPLICATION

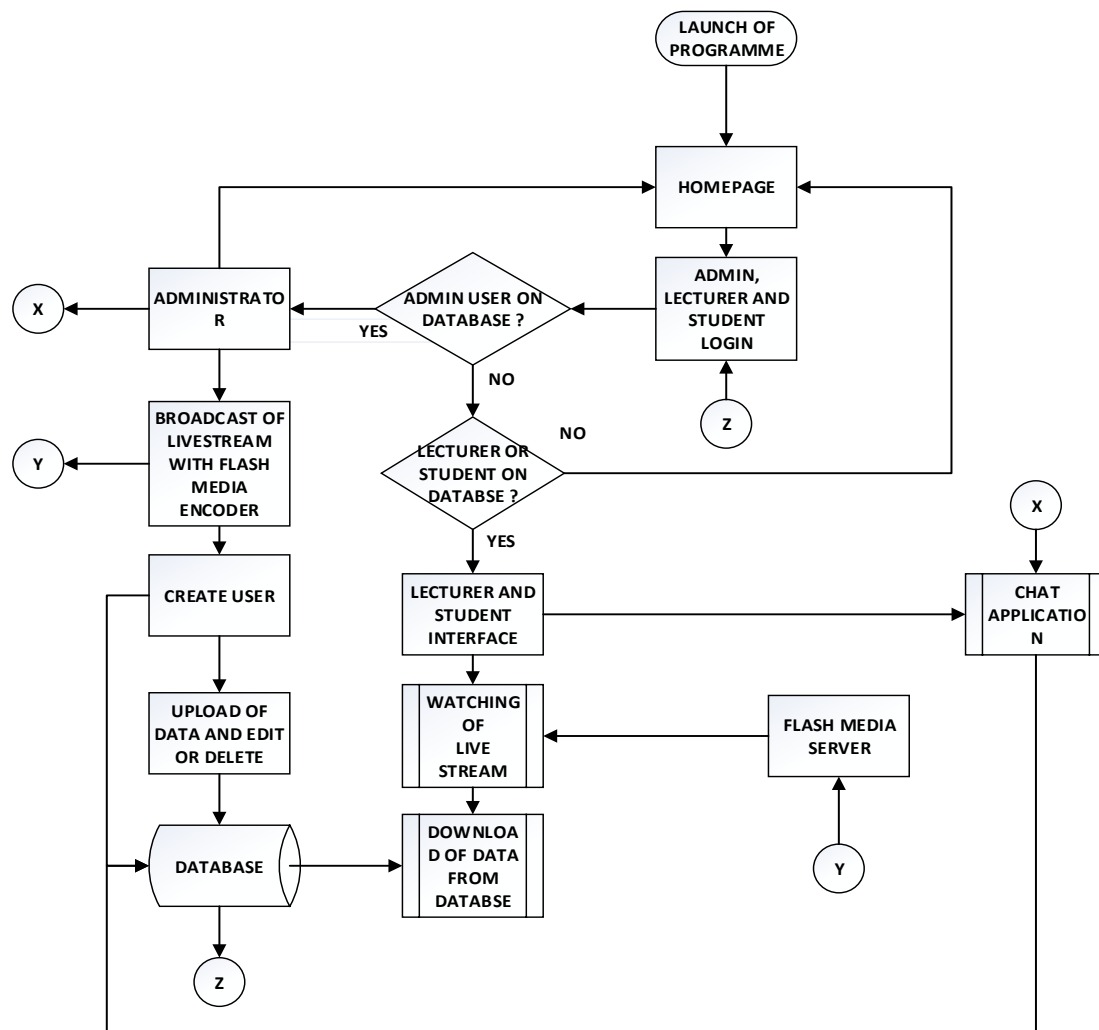


Figure 1: Flow Chart of E-learning Application Design

DESIGN OF WEB-BASED APPLICATION

The term “Virtual Classroom” is a descriptive name for the application. The web application comprises of a lecturer interface, administrator interface and a free software for the database administration. It depends on a back end database hosted on MySQL Server. The details of the design are as follows[6].

The Web-Based Application

The design phase of the web applications involves creating web pages using basic Hypertext Mark-up Language (HTML). Application logic is then added to these HTML pages via Scripting languages namely: “Client side scripting languages” and “Server side scripting languages”. The former runs within the client browser and can respond instantly to the client without express communication with the server hosting the application. Examples include JavaScript, Visual Basic Script and the Hybrid Ecma Script. Server side scripting on the other hand are more powerful since they are executed on the server hosting the application.

Web Application Server, usually execute such scripts and thereafter return pure HTML codes to the requesting client. Examples include Java Server Page (JSP) Script, PHP Script, Cold Fusion Mark-up Language (CFML), Active Server Page (ASP) script, etc.

In designing the web-based application, we combined both kinds of scripting to create a near rich interface and a “thin client”. A thin client implies that all possible processing are done on the client browser before submitting requests to the server thereby reducing server traffic.

The web-based application comprises of various components that interact with each other to produce the full application [5]. They are:

1. Web Pages: These are designed using HTML and PHP scripting technology.

2. The Database Component: The database is implemented on the MySQL platform which is free and very nice for these kinds of applications.
3. The Live Streaming Component: This was implemented using flash media server and flash media encoder.

Database Design

The e-learning web-based application is hosted on a MySQL server database. The database contains 9 columns, Schools B, C, D and E represent the different schools.

- **Admin:** This column contains the username, email and the passwords of all the administrators.
- **School B:** This column contains the username, email and the passwords of all the lecturers in school b.

- **School C:** This column contains the username, email and the passwords of all the lecturers in school c.
- **School D:** This column contains the username, email and the passwords of all the lecturers in school d.
- **School E:** This column contains the username, email and the passwords of all the lecturers in school e.
- **Chat:** This is where all conversations between the administrator and lecturer are stored.
- **Audios:** This is where all the uploaded audio files are stored.
- **Videos:** This is where all the uploaded video files are stored.
- **Documents:** This is where all the uploaded document files are stored.

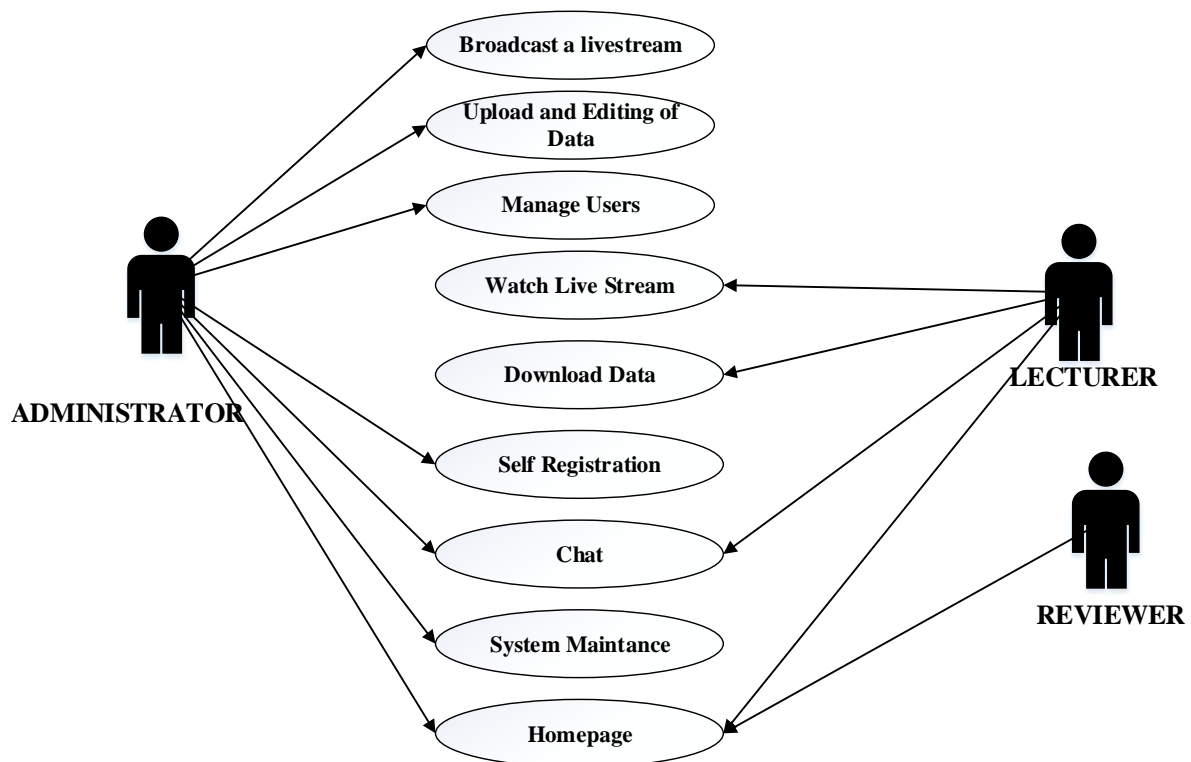


Figure 2: E-learning software use case diagram

The use case diagram above displays the privileges of each user

CHOICE OF PROGRAMMING LANGUAGES

PHP is a choice because it is a powerful programming language that lets you build dynamic websites. It works well on a variety of platforms, and it is reasonably easy to understand. MySQL is an impressive relational data management system used to build commercial quality databases. PHP and MySQL are such powerful and easy-to-use platforms that they make web programming accessible even for beginners. Also, WAMP supports PHP and HTML.

The following software's were used in developing the application:

WAMP (Windows Apache MySQL PHP) Server, Notepad++, Flash Media Encoder and Flash Media Server.

WAMP (Windows Apache MySQL and PHP) Server: Is a Windows web development environment. It allows you to create web applications with Apache, PHP and a MySQL database. Alongside, PhpMyAdmin allows you to manage easily your databases [2].

DEVELOPMENT TOOLS USED

ADOBE FLASH MEDIA LIVE ENCODER: Adobe Flash Media Live Encoder is a software program for capturing, encoding, and streaming audio and video to Adobe Flash Media Server or the Adobe Flash Video Streaming Service.

Flash Media Live Encoder is designed for technical audio/video producers who seek a convenient and simplified workflow. It provides a unified interface to audio and video capture devices, basic editing tools, fine control over encoding parameters, and live broadcast using Flash Media Server or Flash Video Streaming Service providers. Flash Media Live Encoder can also be run from a command-line interface, making it possible to set up continuously running encoding sessions and integrate them with existing automated systems [3].

ADOBE FLASH MEDIA SERVER EXTENDED 5 : It's a real time messaging protocol (rtmp) server that delivers live stream on http dynamic stream (HDS) and http live stream (HLS). It streams on multiple bit rates [4].

Notepad++:It's a text editor and source code editor for windows. It opens large files significantly faster than windows notepad.

SYSTEM SPECIFICATIONS AND REQUIREMENTS

The minimal system requirements for successful implementation of the e-learning website are as follows:

Hardware Requirements:

- A minimum of 4GB RAM
- Not less than 3GB Hard disk capacity
- Webcam or I.P camera
- A standard keyboard and mouse

Software Requirements:

- A WAMP server
- A Java Script enabled web browser
- Flash Media Encoder
- Flash media server
- Note that these are just the minimal recommendations for running the application.

IMPLEMENTATION

The first page the user sees is the homepage which is the login page as well for the lecturer only. Using email and password, the user is required to provide these details in order to login; administrator has a separate login page from the lecturer. No lecturer can sign up or register all registrations are done by the administrator.

ADMINISTRATOR INTERFACE

BROADCAST OF LIVE STREAM ADMINISTRATOR'S END

Start a Live Broadcast: On launch of the desktop application flash media encoder the interface will appear, in figure 3 is a screenshot of the interface.

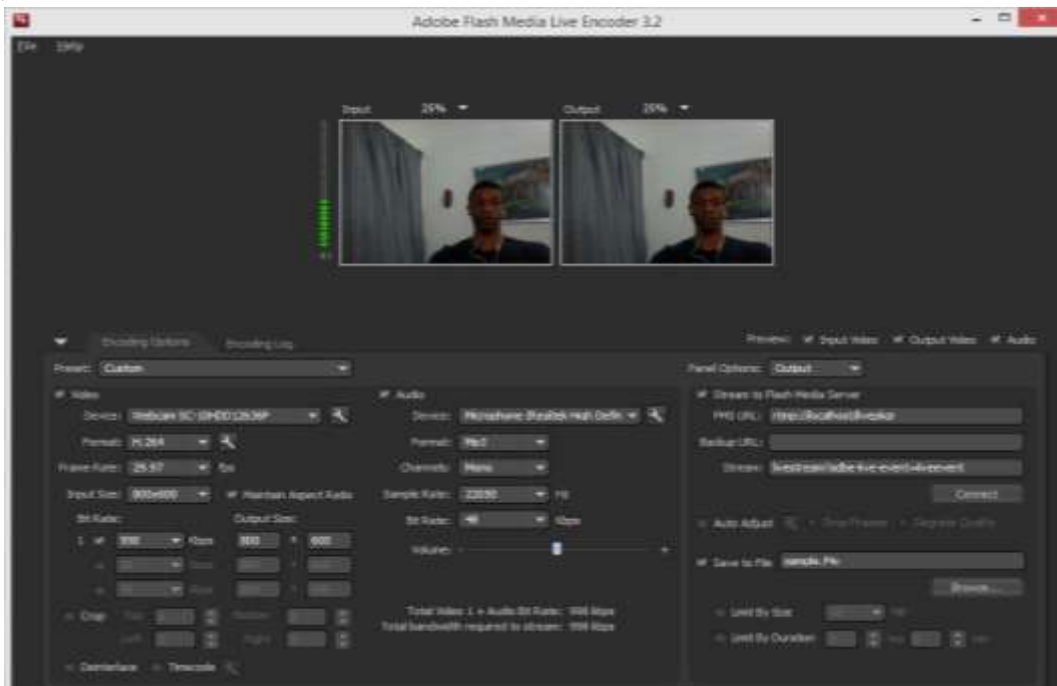


Figure 3: Screenshot of Flash media encoder interface

The administrator is required to do the following just for the first ever broadcast

- Change the FMS url to: <rtmp://localhost/livekpg> and stream to:

livestream?adbe-live-event=liveevent then click on connect.

- This the only application that streams over http to other domains apart from the localhost it is called http dynamic stream (HDS).
- When you click on format you can change it from flv (H.264) to mp4 (VP6) whichever is preferred.
- Then click on connect and then start to broadcast.
- The two boxes shows the input and output display's.

- This broadcast is sent from the flash media encoder to the server (flash media server) now the broadcast can be viewed by clicking on channels tab on the lecturer interface.

WEB-BASED APPLICATION

Launch of Windows Apache MySQLPhp (WAMP) click on learn as shown in figure 4 under your projects, to do this we goto: <http://localhost:8080/in> your web browser. For the homepage of the web application goto: <http://kobi:8080/learn/> which redirects you to the homepage shown in figure 5, the username (email) and password input boxes are located on the top right of the window.

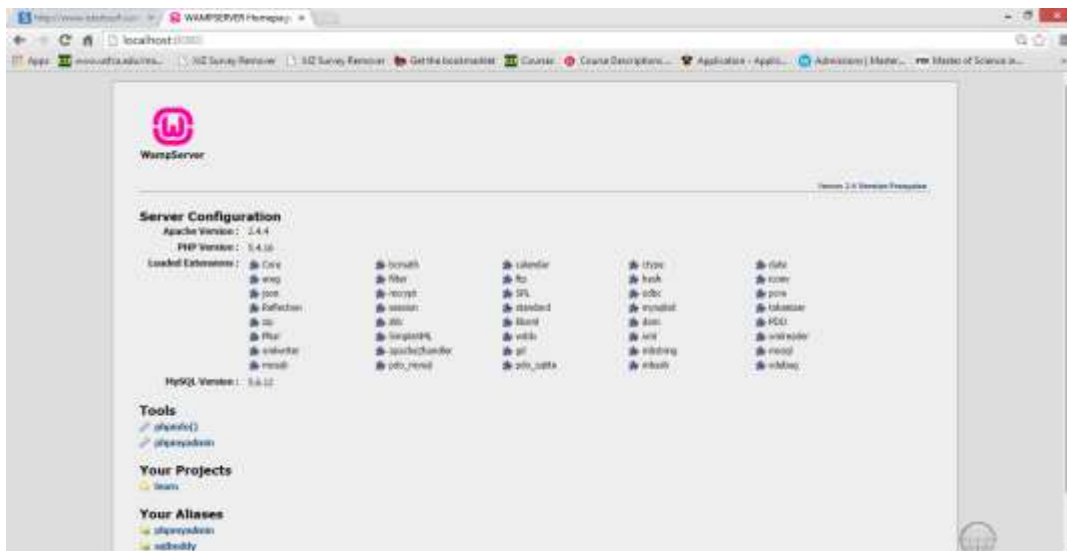


Figure 4: Screenshot of Windows Apache MySQL Php (WAMP)

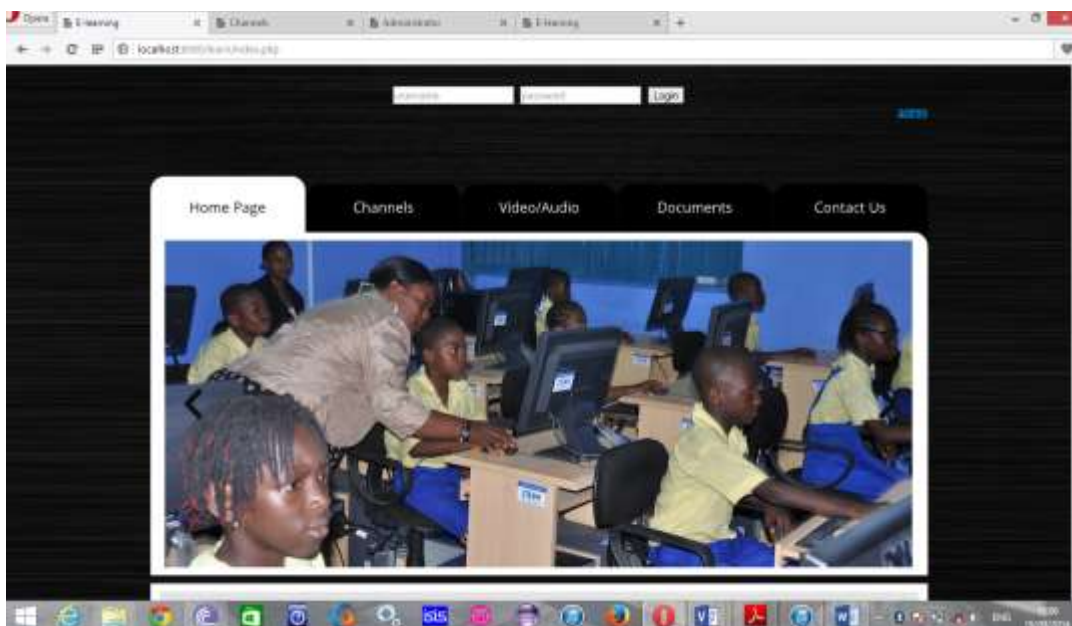


Figure 5: Screenshot of Homepage

If you have an admin account, click on admin link and the admin login page

Input your username (email) and password and you will be redirected to administrator interface once logged in you will see the

following: Create user, edit user, upload files and edit

files as shown in figure 6.

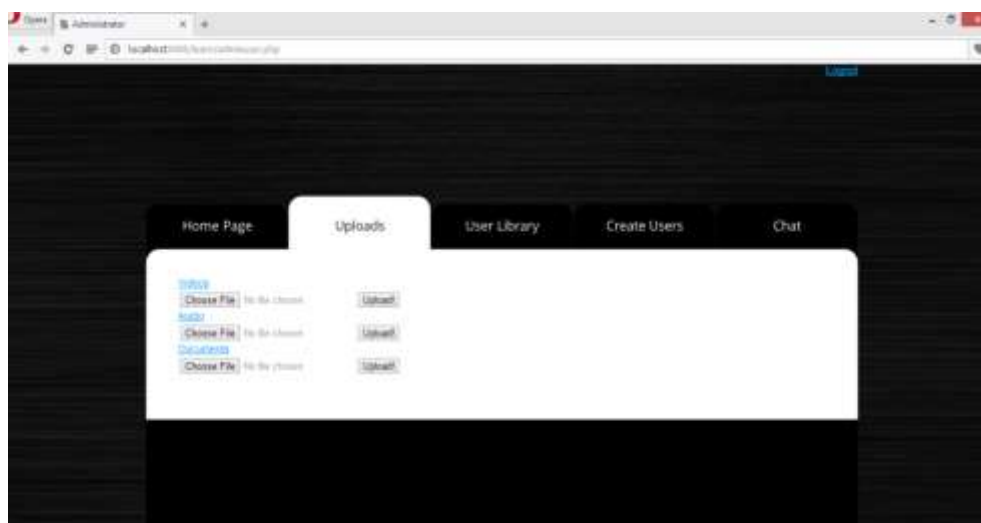


Figure 6: Admin interface

- **Create User:** This is where the administrator creates a new user account on the database with username and password details. Lecturers are given their username and password by the administrator no lecturer is allowed to register.
- **Edit User: Only** the administrator is allowed to edit the user account details such as username and password.
- **Upload Files:** Only the administrator is allowed to upload files
- **Edit Files:** Editing, deleting of uploaded files is done or handled by the administrator.
- **Chat:** This is where the administrator responds to user questions as the live stream is going on.

LECTURER INTERFACE

This interface contains the home, channels, videos/audios, documents and contact pages.

Channels:

Top Rectangular box : This is where the live stream will be displayed, after 20seconds of buffering an image(live stream) will be displayed.

Bottom Rectangular box: This is the interface where the teachers in each class room can ask questions which where asked by a student it's a texted based web chat.

Videos/Audios: Two links will be displayed on the click of Videos/audios tab the videos link, and audios link. Audios link will take you to the audios area and videos link to the videos area. Videos are in .mp4 and .flv file format while the audio is in .mp3.

Documents: This is the download page of the documents in pdf and doc formats.

Contact Us: This is the area where the users (lecturers) and ask further questions or emergence questions about the software system.

Logout: Because security is important in every area of our lives, our web-based application has incorporated a feature that will allow you to close your session when leaving the computer. As a measure to ensure that no one hijack an account, the user should always logout of the system. To logout, click Logout and the window will reload with the login page.

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