

- Word Count: 2737

Plagiarism Percentage

3%

sources:

- 1 1% match (Internet from 12-Dec-2015)
http://ceur-ws.org/Vol-1498/HAICTA_2015_paper32.pdf
- 2 1% match (Internet from 22-Aug-2018)
<http://www.mediaentertainmentinfo.com/category/media-concepts/feed/>
- 3 1% match (Internet from 23-Nov-2018)
<http://iabmglossary.com/glossary/session-initiation-protocol-sip/>
- 4 1% match (Internet from 03-Dec-2015)
<http://www.mediaentertainmentinfo.com/2015/04/6-concept-series-what-is-the-difference-between-progressive-download-rtmp-streaming-and-adaptive-streaming.html/>

paper text:

Streaming Media Implementation in Moodle-based E-learning Application Agustinus Noertjahyana, Gregorius Maria Surjo, Henry Novianus Palit Informatics Department Petra Christian University Surabaya, Indonesia agust@petra.ac.id Abstract—Teaching and learning processes develop over time, and the technology behind it are growing too fast, which makes the process of learning with online media (or often referred to as e-learning). This phenomenon is interesting to examine because some e-learning systems that exist today are not yet fully secure, in the sense that it is still easy to disseminate without any copyright and they are not used wisely. The purpose of this research is to produce an application that can be used as a media for e-learning of streaming audio and video without storing the file on local cache device so that the file residing in e-learning media cannot disseminated. As a research methodology using deductive qualitative method, data collective process done by literature study, interview and observation. After the data collected, the result is e-learning software based on website and mobile that can be used to stream media files without downloaded. The result of this research and analysis shows that streaming with RTSP protocol can be used in e-learning software with a limited number of users. Keywords—Darwin Streaming Server, e-learning, Moodle I. INTRODUCTION The evolution of information technology today has an impact on many things, such as the learning process. The use of information technology during the learning process is often encountered and easily accessible today. One of the impacts of evolution on learning process is e-learning method. Learning process using e-learning media enables the teachers and students to do the learning process anywhere and anytime. E-learning involves searching for methods to reduce the problems caused by the distance between the teachers and the students [1]. Performing the learning process with the help of e-learning media means that teachers and learners are not required to meet each other, so the learning process can still go on. By that means, learning materials are sent by the teacher to learners via electronic

media, such as computers and smartphones. The materials can be in form of a slide presentation, audio or video files, or a combination of those three examples. In order for learning materials to be accessible to the users, they need to be stored. Examples of such storage are Google Drive and Dropbox, which are public storage places. The disadvantage of using public storage is that the user needs to pay for a storage subscription. Moreover, the data or files stored on online storages are mixed with others, meaning that kind of public storage security is classified as a weak level. Other than that, it is necessary to pay attention to the method of accessing the learning materials. There are several ways to access a file from online storage, such as downloading and streaming methods. The difference between those two is how the file is transferred to users' devices. The download method requires the user to download the whole file first, then save it to their device, in order to see or play the file; in contrast, the streaming method allows user directly see or play the file while the file is still downloading. This can happen because while streaming a file, users will get some chunks (part) of the file that can be played directly from user's device. The streaming method can also be applied when accessing any file, so the file is not stored on the user's device. This is important so that that the user cannot disseminate the file illegally. With the use of private storage and streaming method to access files, files can have a higher protection level.

II. LITERATURE REVIEW

A. E-Learning

E-learning can be defined as a learning activity based on computer or electronic media and tends to be educational [2]. These electronic media can be computers, smartphones, and tablets owned by users and have access to e-learning media. Contents on e-learning media are usually based on multimedia files, such as slide presentation, audio files, audiovisual files or combination of the three. Learning materials that use such media are called multimedia learning [3].

B. Moodle

Moodle is one of the e-learning portals developed using the Learning Management Systems (LMS). LMS means, using the Moodle platform, that e-learning portals can be modified according to the school or agency's preferences or required features. In addition, Moodle is also an open-source application, so developers can develop the Moodle platform in accordance with their needs [3]. According to Sukari [4], LMS characteristic can be developed into the following features:

- ? Sharing Material. Provides a platform for teachers to provide learning content to learners.
- ? Forum and chat. Provide interactive communication services such as chat or non-interactive forums.
- ? Exercises. Provides features that enable learners to know their level of understanding of what have been learned.
- ? Recording grades. Provides feature to be able to record, manage and track students' scores according to the learner's needs.
- ? Recording logs. Provides features that allow recording of students or faculty's activities.

The advantages of using Moodle are as follows [5]:

- ? Lessons can be acquired by the students in Moodle. Students can do their learning activity wherever and whenever they want.
- ? Moodle features are beneficial for teachers to manage their lessons provided by them for their students.

C. Streaming

Technology

Streaming is a technology used to send data content in a computer to another computer through a local network or the internet. The data transmitted can be anything, but usually audio or video [6]. The difference between download and streaming technology lies in how to access the files. For the download method, files are required to be downloaded completely onto the user's device before the user can access it. Meanwhile with the streaming method, a snippet of the file that has been downloaded can be directly accessed by the user. According to Narang [7], there are three streaming methods: Progressive Download. The progressive download method is the simplest and most common method of delivering audio or video content. This method works by sending contents from an audio or video file via the HTTP protocol from the server to user's device. On the user's device, it will download some part of the content. Then the downloaded section will play on the user's device. That way, users do not have to wait too long to download the entire file on their device.

Real-time Streaming.

This content delivery method typically uses the RTMP or RTP protocol as the transport file. As the name implies, this method will send a snippet of the audio or video content to the user in real-time. This means that users can only see snippets of content sent by the server.

Adaptive Streaming.

The adaptive streaming method is the most common method nowadays. This is

because this method has the ability to adapt to the condition and speed of the user's internet – so that the audio or video files will continue to be received by the user in accordance with the conditions and speed of the user. If the speed of the user slows down, then the delivered pieces will be downgraded. On the other hand, if the speed of the internet is back to normal, then the quality of pieces that are delivered will be adjusted as good as the user's internet conditions. D.

Real-Time Transport Protocol (RTP) Real-time Transport Protocol (RTP)

3

is a standard protocol that is used as a hub for

data transmission, such as audio and video, in real-time. The meaning of the real-time word is RTP allows users to get chunks of audio or video data content directly when audio or video is played. The advantage is that chunks which are transferred to the client are not stored on the local cache client device, because these chunks will be directly erased after the client receives and sees the chunks [8-10]. E. Real-Time Streaming Protocol (RTSP) Real-time Streaming Protocol (RTSP) is a protocol that resides on an application layer that is useful for controlling the delivery of data that is done in real-time. The RTSP protocol allows clients to request servers on the play, stop, pause and seek [8-10]. F. Darwin Streaming Server Darwin Streaming Server is a software used to serve as streaming server with RTP and RTSP protocol. It was developed by Apple and is open source [11]. Before the video file can be played through Darwin Streaming Server the file needs to be added hint track to the file. Hint track is useful for the media player to recognize streaming files and can be played on the media player. The Darwin Streaming Server software also provides features for authentication and authorization of video files to be played. That way, only users who have rights can view the video file. III. SYSTEM DESIGN AND IMPLEMENTATION In system design, there are 2 servers, namely web server and streaming server. Both servers have a data storage application on NAS storage. Clients can access web servers on the local network with various devices, such as computers, laptops and smart phones. System design can be seen in Figure 1. Fig. 1. System Architectural The limitation of this system is to only focus on the protection of audio and video files that can be seen by the user. Thus, users can only see and listen to audio and video files but cannot download. On the web server, Moodle will be installed to be able to provide e-learning services. Meanwhile, on the streaming server computer, Darwin Streaming Server application will be installed to provide a streaming service. A. Use Case Diagram There are three actors in the system to be created, such as administrator, teachers and students. 1) Use Case Diagram Administrator In Figure 2, it can be seen that the administrator can manage users, the subject of learning and user registration. Previously administrators need to login first before they can manage the system. Fig. 2. Use case diagram of Administrator 2) Use Case Diagram Teacher In Figure 3, it can be seen that the teacher can add the materials in the subjects other than just looking at the content of the subject. In addition, learning materials that are protected can be added and viewed by the teacher after login on the system has been created. Fig. 3. Use case diagram of teacher 3) Use Case Diagram Students In Figure 4, students can only see subjects and materials files when they have logged in. Fig. 4. Use case diagram of Students B. Streaming Mechanism The flowchart for the protected Media Streaming Application can be seen in Figure 5. Fig. 5. Flowchart of Application Project After teacher uploading files, the conversion process will be carried out for audio and video, then it will be stored on the storage media. Files that have been uploaded are then adjusted to the desired quality. In this application, there are 3 media qualities namely: Low, Medium and High. During the conversion process, the protocol adjustment process is also carried out so that the file can be run with the RTSP protocol. The video file quality specifications that become the references for converting the uploaded video file can be seen in Table 1. TABLE I. VIDEO QUALITY TYPE Video Quality Video Size Video bit rate (Kbps) Audio bit rate (Kbps) Total bit rate (Kbps) CIF (low) 384x216 268 - 468 32

300 - 500 D1 (medium) 852x480 736 - 1136 32 800 - 1200 HD (high) 1280x720 1672 - 2272 64 1800 - 2400
 Three kinds of audio file quality can be seen in Table 2. TABLE II. AUDIO QUALITY TYPE new resource
 Protected Audio Video can be seen in Figure 7. Audio Quality Audio bit rate Audio Codec File Format Low
 32 kbps MP3 .mp3 Medium 64 kbps MP3 .mp3 High 128 kbps MP3 .mp3 IV. RESULT AND TESTING
 System testing is done by added functions of the Moodle app and testing the streaming of files on the
 streaming server. The test results are as follows. A. View Testing on Moodle Application based on Mobile
 This test is done by experimenting on every new page created in the Moodle Mobile app. Devices used in
 testing were Xiaomi Redmi Note 3 and iPhone 5s smartphones. B. Main Page All the courses that are being
 followed will be displayed on the main page. If the user is a teacher on the course, a button will be displayed
 to add Protected Audio Video resources to the course. If the user is a student on the course, then the
 Protected Audio Video resource is displayed only on the course. The comparison of the main display page
 of Protected Audio Video can be seen in Figure 6. Fig. 7. Adding Page for Audio and Video Files On this
 page, users who have a teacher status on the course can change the description of the Protected Audio
 Video resource that has been added. Comparison of page views change resource Protected Audio Video
 can be seen in Figure 8. Fig. 8. Edit Page for Files D. Streaming Testing Fig. 6. Main page of Protected
 Audio Video This test is done by playing video and audio files to know how much bandwidth is needed when
 accessed by more than C. New Added Page one user. Add form, which is used for adding resource
 Protected Audio Packet loss experienced is quite large when the user who Video, is displayed on the new
 added page. Users with the passed through the connection reached 100 can be seen in student status can
 choose which section will be given resource Table 3. in Protected Audio Video. Comparison of display page
 add TABLE III. MEASUREMENT OF HIGH QUALITY VIDEO Number of Users CPU Process (Server)
 Throughput (Kbps) (Server) Sum of Packets Bit Rate (Kbps) Packet Loss 1 6% 2019 18878 1678.661 0 %
 10 8% 14531 18411 1633.332 1.39% 20 21% 55239 17302 1525.885 5.03% 50 13% 60977 15067
 1319.283 14.02% 100 21% 80890 10043 857.189 40.4% Packet loss only shows the number below 2%,
 even though the connected user reaches 500 can be seen in Table 4. It can be concluded that when a file
 with small bitrate is streamed, the server can provide service to the user without any obstacles. TABLE IV.
 MEASUREMENT OF HIGH QUALITY AUDIO Number of Users CPU Process (Server) Throughput (Kbps)
 (Server) Sum of Packets Bit Rate (Kpbs) Packet Loss 1 2% 128 7656 128 0 % 100 10% 13008 7656 128 0
 % 200 9% 26048 7656 128 0 % 300 14% 39006 7592 127 0.8% 400 15% 52097 7544 126 1.4% 500 12%
 64914 7517 126 1.8% [6] [7] [8] [9]

Ghirardini, B. 2011. E-learning methodologies: A guide for designing and developing e-learning course. Rome: Food and Argiculture Organization of the United Nations. Narang, N.

1

2015.

#6 concept series: what is the difference between progressive download, rtmp streaming and adaptive streaming. Media

4

Entertainment Info. URI=

□

Epignosis LLC. 2014, January. San Fransisco, California: Epignosis LLC. Harpence, B. 2013. Chapter 4 – RTP and RTSP. Youtube. URI= <https://www.youtube.com/watch?v=bHTcoq7n7E> [10] Scaini, S. 2014. RTSP (real time streaming protocol). Youtube. URI= <https://www.youtube.com/watch?v=L168ndJZW4g> [11] Darwin Streaming Server, 2017, Darwin Streaming Server Site. URI= <https://macosforge.github.io/dss>. V. CONCLUSION In Accessing Protected Audio Video on Moodle, it requires a stable connection and enough bandwidth to be able to play files without any obstacles. The local Ethernet network connection is a solution to play files with the RTSP protocol. Darwin Streaming Server application optimizing service can be done by changing the configuration of the maximum throughput and maximum connections in the Darwin Streaming Server configuration file. ACKNOWLEDGMENT This Research project was funded by an Applied Product Research Grant, received in 2018, from the Ministry of Research, Technology, and Higher Education of The Republic of Indonesia. We thank the Center of Research at Petra Christian University, for the support and guidance. REFERENCES [1] Rodrigues, M.W., Isotani, S. & Zarate, L. E. 2018. Educational data mining: a review of evaluation process in the e-learning. *Telematics and Informatics* 35 (2018) 1701-1717 [2] Costello, S. 2017. Internet streaming: what it is and how it works. Lifewire. URI = <https://www.lifewire.com/internet-streaming-how-it-works-1999513>. [3] [4] [5] Mayer, R. E. 2009. *Multimedia learning* (p. 3). United States of America: Cambridge University Press. Sukari. 2014. Mengembangkan e-learning sekolah: Step by step implementasi moodle (pp. 2-3). (Ratri Medya. Eds.). Jakarta: Esensi. Suppasetserree, S. & Dennis, N. K. 2010. The use of moodle for teaching and learning english at tertiary level in thailand. *International Journal of the Humanities* 8(6):29-46