Learning Of Laboratory Project Based Learning (Lipbl) On Subject Of Hardware Basic Computer Cloud Server Real Time Communication Video Conference Based On Bigblubutton

Abdul Rohmad Basar, Ganefri, Wakhinuddin, M.Ropianto

Abstract: to support video conferencing (vicon) services, a duplex and real time multimedia application, as supporting educational services is integrated with e-learning. The research took the object at STT-Ibnu Sina Batam using the Network Development Life Cycle method. This method is to build a real time communication server and integrate bigbluebutton into video conferencing services. The final result of this research provides the alternative designs on video conferencing services that can be accessed through a web browser integrated with Learning Management Service (Chamilo). Based on observations using Wireshark, to obtain good audio-video quality, a stable internet connection is required when performing a vicon.

Keywords: Laboratory, Project Based Learning, NDLC Cloud Computing, Video Conference, Bigbluebutton.

————————————————◆————————————————

1. INTRODUCTION

Technical college (STT) - Ibnu Sina Batam as one of the colleges located in the city of Batam, with a vision: to become a superior institution of higher education, globally competitive, based on science and technology and IMTAQ, has utilized Google classroom as a virtual class) where lecturers and students can interact anytime and anywhere. According to Gunawan and Sunarman.[1][2], the use of Google classroom actually makes it easier for the teachers to manage learning and convey information to students accurately. Unfortunately, the Google classroom has no teleconference or video conference features[3], so the students and lecturers cannot communicate face-to-face and talk directly to conduct dialogue in the learning and teaching process like in a real class[4]. So, there needs to be a real time communication server that can transmit data, sound and images at the STT-Ibnu Sina Batam[5]. According to Purnomo, et al.[6], video conferencing is a multimedia application that allows communication of data, sounds and images that are duplex and real time. The form of this application is a conversation via audio and video between users which is expected to replace the face-to-face function directly[7][8]. However, there are still many educational institutions in Indonesia which have not implemented and utilized the multimedia video conference technology so far, including STT Ibnu Sina Batam. Based on the description above, the researcher proposes a new teaching method in order to solve problems with appropriate solutions. The title of this research is "Cloud Server Real Time Communication Video Conference Based on Big Blue Button"[9].

2. Method

This research uses literature study research by finding theoretical references from various written sources, whether in the form of books, archives, articles, documents and previous journals that are related to the research. Thus, theoretical references obtained during the research of literature will be used as a basic foundation and main tool in the research. The data analysis method used in this research is qualitative analysis (a type of non-statistical data analysis), which is the data that cannot be framed but it can be processed or analyzed based on the content or substance[10]. For system design, researcher uses the NDLC (Network Development Life Cycle) method which requires planning, involves analyzing the hardware and software requirements as well as analyzing the system topology.

3. RESULT AND DISCUSSION

To obtain the data used in this research report, the researcher conducts the primary and secondary data, as follow:

Primary data

The research has begun by conducting a literature study. Through internet media, the researcher looks for information related to NDLC cloud computing, video conferencing and bigbluebutton. Then, the researcher also discusses directly with several officials at STT Ibnu Sina Batam. Furthermore, the researcher receives the permission or approval from STT Ibnu Sina Batam to continue the research. To get additional primary data, the researcher conducts the written interviews with two types of questions, namely: open and closed questions. The conclusion of the discussion and interview is that STT- Ibnu Sina Batam agrees and supports to immediately make the cloud computing-based video conference service at STT-Ibnu Sina Batam.

Secondary Data

The next step is to collect the secondary data in the form of literature from books and previous research journals. The data is used to find out and learn the concept of the work of the vicon system in cloud computing.

Analysis of System Requirements

Analysis of system requirements is also called data processing or data interpretation is the most decisive process in a research. Therefore, it needs hard work, creativity and high intellectual abilities to get satisfying results. The analysis of the system includes:

Problem Analysis

Based on the above background, it can be concluded that the problem faced by STT-Ibnu Sina Batam to improve academic quality in the teaching and learning process in virtual

1763

classrooms is that there is no real time communication server and video conferencing service application.

Hardware and Software Needs Analysis

In building the video conference server, two main components are needed: hardware and software. Hardware and software requirements used can be seen in the following table:

### Table 1. Hardware Requirements

Hardware	Information
Server Vicon	Google Cloud, Intel(R) Xeon(R) Processor 2.20GHz, RAM 5Gb, vSWAP 512Mb, SSD 30Gb, Bandwith IIX(shared) 1Gbps, Bandwith Int'l 30Gbps, Location data center: Singapore, 1 IP Public + 1 Ip Local
Server Chamilo	Google Cloud, Intel(R) Xeon(R) Processor 2.20GHz, RAM 4Gb, vSWAP 512Mb, SSD 30Gb, Bandwith IIX(shared) 1Gbps, Bandwith Int'l 30Gbps, Location data center: Singapore, 1 IP Public + 1 Ip Local
Laptop 1 (Client)	Lenovo X260, Intel(R) Core i5 Processor 2.30GHz, RAM 8 Gb, HDD 500 Gb, Camera HD 720px
Laptop 2 (Client)	MacBook Pro, Intel Core 2 Duo Processor 2.14 GHz, RAM 4 Gb, HDD 320 Gb, Camera 1,3MP

Table 2. Software Requirements

Hardware	Information
Ubuntu server 16.04 x64Bit	Vicon server operating system.
Centos 7.0 x64Bit	Chamilo LMS server operating system.
Bigbluebutton	Multimedia video conference application
Chamilo	LMS application
Domain	vicon-sttibnusina.com
Windows 8.1 x64Bit	Client operating system 1
Mac OS X	Client operating system 2
Web browser	Mozilla Firefox or Google Chrome
Adobe flash player	As a browser support application
Putty	As remote terminals against the server

Vicon System Topology Analysis

In general, the vicon system topology in cloud computing is almost the same as the star topology on UTP or STP cable networks. The choice of network topology is based on the scale of the network, costs, goals and users. The overview of the Vicon System Topology.
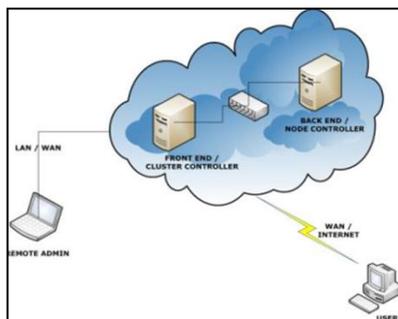
Planning

Planning is a process or step or strategy to determine a series of actions to achieve the desired results, including:

a. Determine Research Objectives

Based on section 1.2 (Introduction).

b. Selection of Cloud Computing Technology

This research uses the IaaS service model from Google Cloud, considering: goals, functions and costs. Based on its function, the service model in cloud computing consists of three models, namely:

Table 3. Software Requirements

| Service Model	Aplication	Function
Software as a Service (SaaS)	*Email, CRM, online storage, online document*	Communication, collaboration, promotion
Platform as a Service (PaaS)	*Web server, development tools, database.*	Application development
Infrastructure as a Service (IaaS)	*Virtual machine, storage, network.*	Provision of web-based computing infrastructure

Vicon Application Selection

At present, there are many vicon applications available on the internet both free and paid. In this research, the researcher chooses BigBluebutton, because it is easily integrated with other applications and there are many features including; Live or streaming video, VoIP, Meeting recording, Whiteboard, Text Chat, Polls and Surveys, Screen sharing or Desktop sharing.

System Design

System design is a method of describing a system to be built (figure 1.2). To give a complete picture of vicon system, the researcher uses unfield modeling language (UML), where there are two actors, students and lecturers. The actors can log into the system and interact with each other if they have registered according to the specified level[11].

Simulation Prototype

To create a prototype vicon system simulation image in this research, the researcher uses Microsoft Visio 2010 tool. As in Figure 3 below:
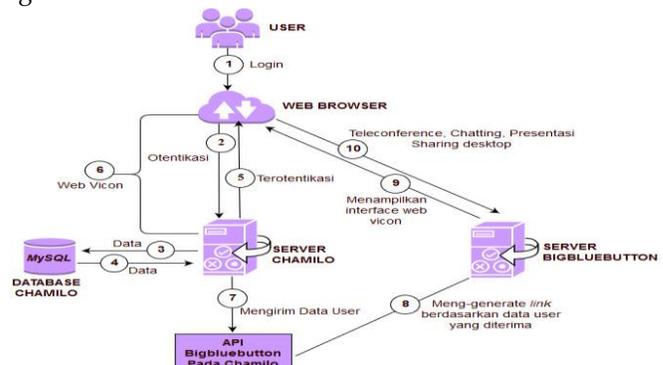

Vicon System Prototype Simulation Image

System Implementation

In implementing the bigbluebutton based real communication video conference server system, there are several stages, including:

a. Operating System Installation and Configuration in Cloud Computing Cloud Computing according to Google's definition is a data center that is outside the client application computer. One of the features of Google Cloud is the Google Compute Engine which is able to create virtual computing machines in a flexible and scalable cloud system. At this stage, the researcher conduts it with the following steps:

1. Make e-mail (https://gmail.com) as the main requirements required by Google.
2. Enter Google Cloud (https://cloud.google.com) as a developer, so the screen will appear:
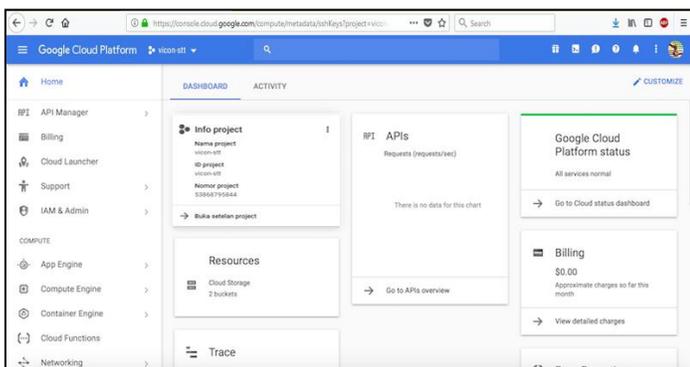

Dashboard Google Cloud image

3. Create SSH (Secure Shell) key that will be used to enter the virtual machine through the remote shell. Click compute engine => metadata => SSH keys
4. The next step is to create a virtual machine, click Compute Engine => VM Instance => Create Instance => Name (Ubuntu 16.04) => Zone (Data center location) => Machine Type => Boot Disk (System Selection operations and hard disk capacity to be used) => Create.
5. Then check Allow HTTP and HTTPS traffic to allow access to the web server. Other firewall options are in the Network VPC menu => Firewall rules.
6. Now, the virtual machine on Google Cloud is active. External IP (Internet Protocol) is a Public IP from Google Cloud and Internal IP is a Private IP from a virtual machine.
7. To make the public IP address (Internet Protocol) given by Google does not change, the researcher changes the type of IP Address from ephemeral to static.

b. BigblueButton Installation and Integration

The steps in the installation and integration of BigBluebutton are as follows:

1. Download the putty application (www.putty.org) => Double click putty.exe, enter the SSH login user & password that was created earlier.
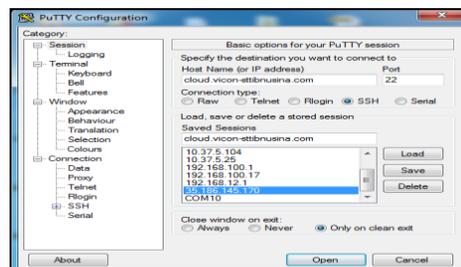
Putty Aplication appearment image

2. Update and upgrade the repository using the commands: "sudo apt-get update" and "sudo apt-get dist-upgrade".
3. Add a bigblue button repository to the server using the command: "wget http://ubuntu.bigbluebutton.org/repo/bigbluebutton.asc -O- | sudo apt-key add -".
4. Then, add the URL so the server can access the bigbluebutton repository using the command: "Echo" deb https://ubuntu.bigbluebutton.org/xenial-200/bigbluebutton-xenial play "| sudo tee /etc/apt/sources.list.d/bigbluebutton.list "
5. Install all bigbluebutton components like: tomcat, ffmpeg, libreoffice, nginx, ruby and others with the command: "sudo apt-get install bigbluebutton".
6. During installation, every time there are several questions with the option y / n, always type "y" then press "enter", then fill in the "MySQL bigbluebutton root password".
7. Wait a few minutes until the words "done" (installation process depends on internet speed). Then, restart the bigbluebutton application by using the command: "sudo bbb-conf-restart".
8. Change the hostname on the bigbluebutton server with the domain name using the command: "sudo bbb-conf - set cloud.vicon-sttibnusina.com".
9. The command: "bbb-conf –secret" is used to find out the name of the hostname and shared secret that will be used to collaborate bigbluebutton with LMS Chamilo (front-ends) later.
10. To check configuration and log files and look for possible errors that can cause problems when the bigbluebutton system is running, use the following command: "bbb-conf - check".
11. The next step, open TCP port: 1935, 9123, 7443 and UDP port: 16384 - 32768, by clicking on VPC Network => Firewall Rules => Create Firewall Rule on the cloud computing server that has been made before.
12. Make DNS record by clicking Network Services => Cloud DNS => Create Zone.

1765

4. CONCLUSION

After analyzing and implementing, the conclusions of this research are:

1. The real time communication server is successfully built on the cloud computing (Google cloud) service model IaaS (Infrastructure as a Service), with Ubuntu 16.04 operating system and the domain name https://cloud.stt-ibnusina.com.
2. Bigbluebutton based video conferencing applications can be accessed through the web browser to make video calls, chat and presentations as distance learning media at STT-Ibnu Sina Batam.

5. REFERENCES

[1] "Gunawan, F. I., & Sunarman, S. G. (2018). Pengembangan Kelas Virtual Dengan Google Classroom Dalam Ketrampilan Pemecahan Masalah (Problem Solving) Topik Vektor Pada Siswa SMK Untuk Pembelajaran. In Prosiding Seminar Nasional Pendidikan Matematika Etnomatn."

[2] J. Manuel and M. Ferreira, "Flipped classrooms : From concept to reality using Google Apps," no. February, pp. 204–208, 2014.

[3] N. Ye, X. Tao, L. Dong, Y. Li, and N. Ge, "Indicating Eye Contacts in One-to-Many Video Teleconference with One Web Camera," 2015 Asia Pacific Conf. Multimed. Broadcast., no. April, pp. 1–5, 2015.

[4] T. Chua and D. C. Pheanis, "Quantifying Improvements from Refinements in a VoIP Teleconference System," 2009 Fifth Adv. Int. Conf. Telecommun., pp. 52–57, 2009.

[5] V. Iru, X. Lvsod, U. R. I. Dqg, V. L. Sx, and D. F. Ms, ", PSOHPHQWDWLRQ RI + LJK 3UHVHQFH 9LGHR & RPPXQLFDWLRQ," pp. 494–499, 2015.

[6] "Purnomo, M. F. E., Nurdiansyah, D. C., & Dahlan, I. E. A. (2013). Implementasi Video Conference Pada Jaringan Hsupa (High Speed Uplink Packet Access) Dengan Media Ipv6 Menggunakan Simulator Opnet Modeler V. 14.5. Jurnal TEUB, 1(4)."

[7] E. D. Arca, N. M. Robertson, and J. Hopgood, "AUDIO-VIDEO SCHEME Eleonora D ' Arca , Neil M . Robertson and James Hopgood Joint Research Institute for Signal and Image Processing , Heriot-Watt University & University of Edinburgh , UK," 2013 IEEE Int. Conf. Acoust. Speech Signal Process., pp. 3622–3626, 2013.

[8] R. Pi, "The Implementation of Calendar Academic Monitoring System in University Using," vol. 11, pp. 497–500, 2019.

[9] C. Systems et al., "Implementation Competency Based Learning Model Of Learning Computer Network Courses At Vocational Education," vol. 11, no. 5, pp. 501–505, 2019.

[10] R. Krishan, A. Verma, S. Mishra, and P. R. Bijwe, "Analysis of Hopf bifurcation with forecast uncertainties in load / generation," vol. 11, pp. 1531–1538, 2017.

[11] B. zul azmi, B. H. Hayadi, "Design of Expert System to Determine Stock Investment Using Forward Chaining Method," Jour Adv Res. Dyn. Control Syst., vol. 10, pp. 1869–1873, 2018.