

Jitsi meet integration analysis with moodle for synchronous distance learning

Kadek Virgan Ardiat¹, I Nyoman Buda Hartawan^{2*}, Ni Wayan Suardiati Putri³

^{1,2}Department of Computer System Engineering, Insitute of Bussiness & Technology Indonesia, Indonesia

³Department of Informatics Engineering, Insitute of Bussiness & Technology Indonesia, Indonesia

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ABSTRACT

After the Covid-19 pandemic, learning activities were used to being carried out online. Utilization of the Learning Management System is starting to be widely used for asynchronous learning, while synchronous learning is carried out using different applications. In this study, a video conferencing server design was created to integrate Jitsi Meet with Moodle. On the Moodle server, install and configure the NginX, MariaDB, php, Moodle packages and install the Jitsi Meet plugin on Moodle. On the Cacti server, install and configure Cacti, manufacture devices, create graph trees, add graphs and monitor data on graphs. Black Box Testing is carried out to test the Jitsi Meet feature and to monitor the average use of CPU and memory during meetings. The results of the Black Box test on the Jitsi Meet feature get a percentage of 89.7% completion. In testing the average CPU usage in the Cacti application, a percentage of 3.21 was obtained. In testing the average memory usage in the Cacti application, a percentage was obtained of 33.56%.

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Corresponding Author:

I Nyoman Buda Hartawan,
Department of Computer System Engineering
Insitute of Bussiness & Technology Indonesia,
Tukad Pakerisan No.97Street, Denpasar, 80225, Indonesia.
Email: buda.hartawan@instiki.ac.id

1. INTRODUCTION

The Covid-19 pandemic has made many changes in various fields, one of which is Education. Learning activities that are usually carried out face-to-face in class are replaced with remote classes through the use of e-learning applications. This has continued until now, where Covid-19 has been declared endemic and education has begun to carry out teaching activities offline. Even so, the distance learning model is still used because it is considered capable of carrying out education from anywhere and at any time.

Education during the Covid-19 pandemic has increased learning loss among students (Pratiwi, 2021)(Cerelia et al., 2021)(Widyasari et al., 2022) Besides that, the era of the industrial revolution 4.0 brought rapid development, especially in the technology sector. Technology has experienced many developments in the education sector, one of which is online learning or E-learning. E-learning is a learning system that utilizes computer technology and internet networks in conducting teaching and learning activities. The use of online learning systems or E-learning is a necessity, especially for an educational institution. The condition of the COVID-19 pandemic has led

to an increase in the use of video conferencing applications and LMS (Learning Management System) applications in educational institutions. The spread of the COVID-19 virus in Indonesia forced the government to close schools and colleges. The learning system that previously used face-to-face conventional methods was changed to a Distance Learning (PJJ) system. Schools and colleges require students to study from home. Teachers or lecturers finally carry out teaching remotely via the internet so that learning activities that should be carried out at schools or campuses can still run (Government Regulation Number 21 of 2020, 2020)(Kemendikbud, 2020). The learning system has changed from previously using face-to-face methods, but due to the COVID-19 pandemic,

Some studies explain that the learning system has changed to face-to-face learning online Achuthan et al., 2021)(Andrean & Abroto, 2021)(Chattaraj & Vijayaraghavan, 2021). the learning system has changed to face-to-face learning online (Achuthan et al., 2021)(Andrean & Abroto, 2021)(Chattaraj & Vijayaraghavan, 2021). In research by (Pradnyana & Pradnyana, 2015)(Fatmawati, 2019) explained the Universities in distance learning activities use Moodle, because Moodle has reliability in conducting distance learning (Rizal & Walidain, 2019)(Hartawan & Subawa, 2021). In distance learning using e-learning, it is important to do a combination of synchronous and asynchronous learning(Yulianti & Kusmarni, 2021)(Ramadhan et al., 2022)(Firginia et al., 2020)(Susanti & Estherina, 2022). In this research, the integration of Jitsi meeting-based video conferencing is carried out by integration into the Moodle Learning Management System.

Further analysis is needed to determine the performance and ability of the server to handle the entire online learning process. In conducting server analysis using two testing methods, namely the Black Box Testing method and monitoring hardware resources using Cacti and htop. The black box testing method is generally used by researchers to test the functionality of the system being built (Pradnyana & Pradnyana, 2015)(Ningrum et al., 2019)(Febriyanti et al., 2021)(Wijaya & Astuti, 2021). The Black Box Testing method is carried out to test the functionality of the Jitsi Meet application which is integrated with Moodle which includes joining video conferencing, audio, facecam, share screen, chats, raise your hand, invite, video quality, security, recording, livestream, share video, and virtual backgrounds. In addition, monitoring is carried out to monitor the performance and capabilities of the processor and memory through the Cacti application and the htop application installed on the server computer. Cacti has the reliability of monitoring servers in real time, which is displayed in graphical form (Rasyiidin et al., 2021)(Rasyiidin et al., 2021)(. & Mi'rajul Rifqi, 2019)(Sari et al., 2020)(Bayunadi et al., 2013).

2. RESEARCH METHOD

The method used in this research is research & development. In this research, research and development of Jitsi meet-based video conferencing was carried out with integration into the Moodle Learning Management System. Jitsi Meet can be integrated with the Learning Management System (LMS) to combine synchronous and asynchronous learning(Walilu et al., 2021)(Al - Haque & Sari, 2019)(Priyambudi et al., 2022)(Astriani & Ismah, 2021). This study uses a server with a Xeon processor. Implementation is guided by the system design that has been designed previously. The Learning Management System used on the server is Moodle. Moodle is used to carry out asynchronous learning or asynchronous learning by uploading material to the e-learning system. Students can access anytime and anywhere. The e-learning system that has been built is then integrated with Jitsi Meet to be able to carry out synchronous learning or synchronous learning. This synchronous learning model allows lecturers and students to be able to interact directly at the same time. This designed system can be accessed via an internet connection or a local network (LAN) so that it allows students to access anytime and anywhere via an internet connection. Students are registered directly in lecture classes and can use the Jitsi Meet application directly. The Jitsi Meet application has been integrated into the Moodle LMS.

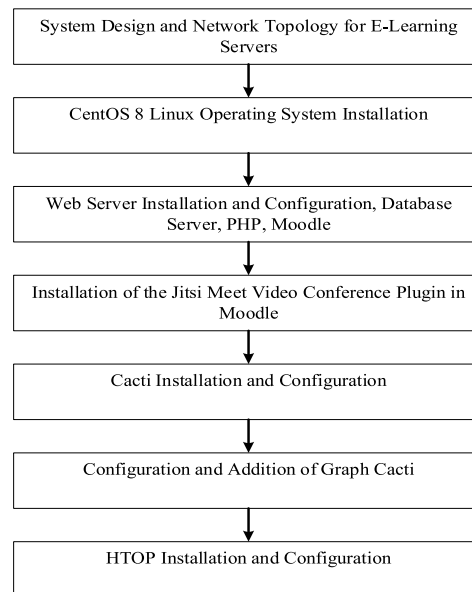


Figure 1. Block diagram of system design and software installation

The block diagram of how the system works on the Jitsi Meet integration video conference server with Moodle. In Figure 1 is a block diagram of system design and software installation on the Jitsi Meet integrated video conferencing server with Moodle. In this diagram, the installation of the software needed to install Moodle is carried out, namely Nginx server as a web server, MariaDB as a database server, PHP as the programming language used and Moodle as an E-learning application. Moodle already provides additional program features called plugins to facilitate software installation, including the Jitsi Meet video conferencing plugin. Then install Cacti and htop and add a Graph configuration to make it easier to monitor CPU and memory usage on the server.

The following is a block diagram of system design on the server in figure 2 below.

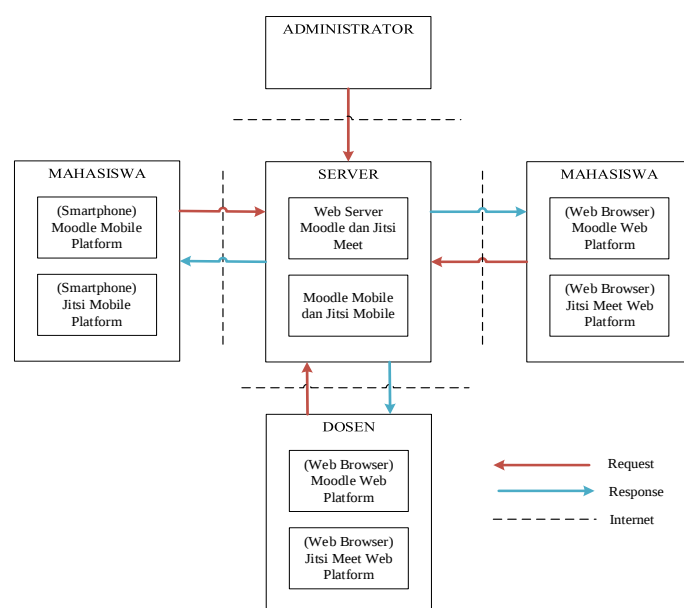


Figure 2. System block diagram

In Figure 2 is a block diagram of the Jitsi Meet Integration Video conferencing Server Design system with Moodle. In the block diagram, the administrator is in charge of managing and managing the system such as setting access rights, creating courses, determining teaching lecturers, and determining student students. Lecturers who are given permission can upload material by accessing Moodle via a web browser. If the teaching lecturer wants to do face-to-face with Jitsi Meet video conferencing, you can add an activity to the topic created. Lecturers can also download files in the form of assignments or quizzes after students have finished uploading the files to Moodle. Students can access Moodle in two ways, namely through a web browser and through an application called Moodle Mobile which is available on a smartphone. Students can download material provided by lecturers and upload files in the form of assignments or quizzes. For video conferencing purposes, students can conduct video conferences using a computer via a web browser and smartphone via the Jitsi Meet application.

In Figure 3 is the system network topology of the Jitsi Meet integration video conference server with Moodle. The server provides Moodle e-learning services and Jitsi Meet video conferencing which can be accessed by lecturers and students via the internet network. Moodle and Jitsi Meet also provide mobile versions for students to access via smartphones. The server administrator is in charge of managing access rights to authenticated users who log in according to the user level.

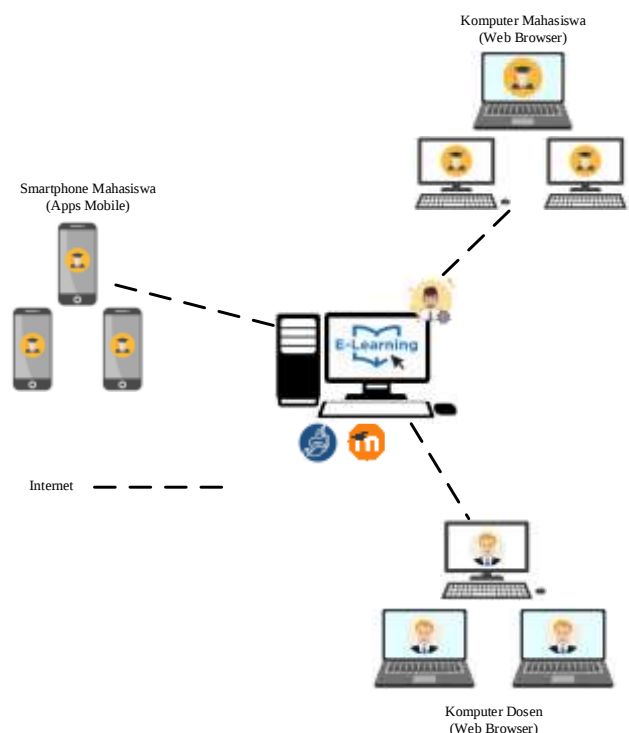


Figure 3. Topology of the e-learning system

2.1 Analisis of Server Needs

Analysis of system requirements is an activity that is carried out by observing and describing the requirements needed from servers that are built in a study. In conducting server needs analysis, an evaluation of the problems that exist in designing a server can be carried out. In analyzing a server, it is divided into two, namely analyzing server requirements functionally and non-functionally.

a. Functional Needs Analysis

Functional requirements analysis is an activity carried out to analyze server needs. The functional analysis carried out in this study consisted of:

- 1) Using a desktop PC that functions as a server virtualization for installing media for e-learning applications and video conferencing as well as monitoring applications.
- 2) Linux CentOS version 7 as the operating system used to install the required software.
- 3) The Moodle application as a media platform used for online learning media (e-learning).
- 4) The Jitsi Meet application is a teleconference medium used for online face-to-face needs.
- 5) Cacti and htop applications as monitoring software to monitor the resources used from server hardware.
- 6) Computers / smartphones as devices for testing applications through website and mobile platforms.

a. Analysis of Non-Functional Needs

Non-functional requirements analysis is an activity carried out based on system specifications outside of the system function itself. Analysis of non-functional requirements is generally carried out on hardware, software, and brainware needs analysis.

The software is in the form of an application that is used to build and design a video conferencing server that integrates Jitsi Meet with Moodle. The following are the specifications of the software used:

Table 1. Server software components

No	Applications	Function
1	Moodle v3.10	As a website-based e-learning learning media
2	Moodle Mobile	As a mobile-based e-learning learning media
3	Jitsi Meet	As a website-based teleconference media
4	Jitsi Mobile	As a mobile-based teleconference media
5	Cacti	As a monitoring application to monitor the hardware resources of the server
6	Linux CentOS v7	As the server virtualization operating system used
7	Nginx Server (Server Moodle)	As a web service based application using HTTP
8	Apache Server (Server Cacti)	As a web service based application using HTTP
9	PHP v7.4	As a website programming language needed in the Moodle installation
10	MariaDB	As a database to store user data
11	HTOP	As a monitoring application to monitor the hardware resources of the server

System implementation can be interpreted as the implementation or operationalization of an activity carried out in this study which aims to be an illustration of a system that is made. In this study, system implementation is described in a flowchart.

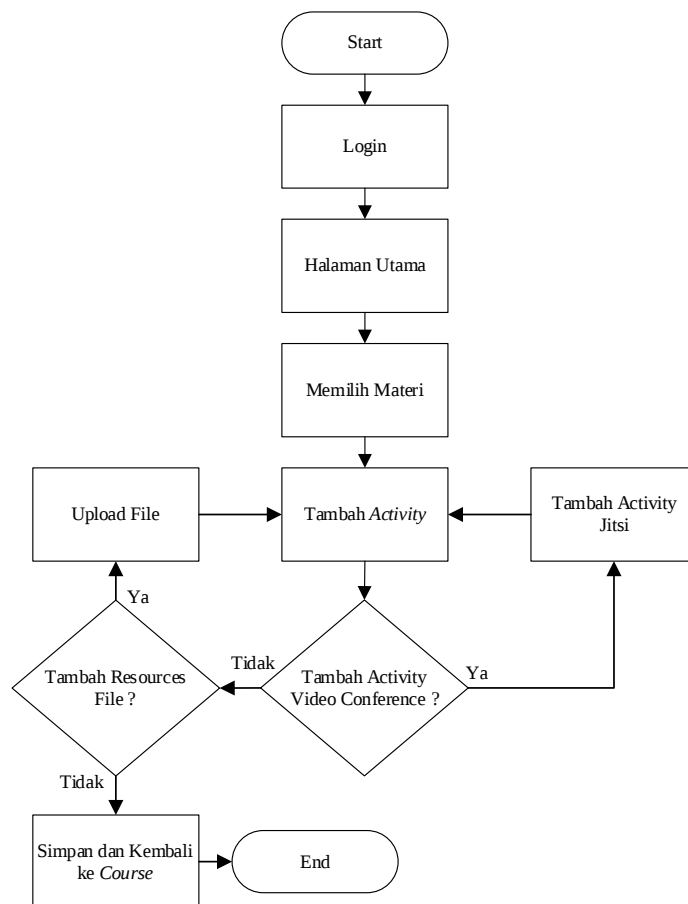


Figure 4. Flowchart of adding activities and resources by lecturers

In the flowchart figure 4 is a flowchart of the flow of adding activities and resources by lecturers in Moodle. The flowchart starts from the first start then the lecturer logs in and enters the main page. On the main page, lecturers can choose the material they want by adding activities. After selecting an activity, if the lecturer wants an online face-to-face meeting using the Jitsi Meet video conference, you can add a Jitsi activity. If the lecturer wants to include the required material files, the lecturer can add file resources and upload files, then save and return to the course page.

3. RESULTS AND DISCUSSIONS

At this stage system testing is carried out to determine the functionality of the system that is made whether it is functioning properly. Testing was carried out using the Black Box Testing method to test the functionality of the features on the Jitsi Meet video conference. The second test was carried out using the Cacti application to monitor server performance when clients access Moodle and conduct Jitsi Meet video conferencing meetings. Black Box Testing testing is carried out to test the features contained in the Jitsi Meet application such as audio, facecam, share screen, chat, raise your hand, meeting participants, invite someone, toggle tile view, video quality, security options, recording, livestream, share videos, and virtual backgrounds. This test is carried out to ensure the system used is functioning properly and correctly or vice versa.

a. Testing Jitsi Meet Join Video conference



Figure 5. Display of participants joining via a web browser

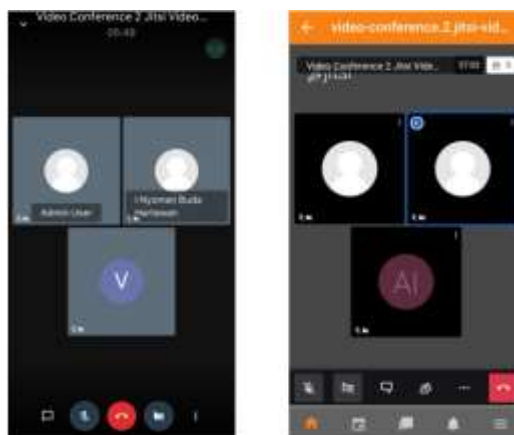


Figure 6. Display of participants joining via jitsi mobile and moodle mobile

a. Testing Facecam on Jitsi Meet Video conferencing

The second feature being tested is facecam, to use the facecam feature you can click the arrow on the camera icon to set the source of the camera device used.

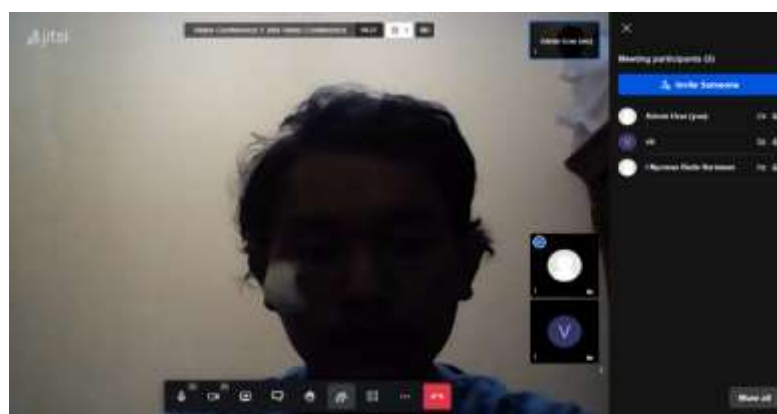


Figure 7. Facecam display on moodle web

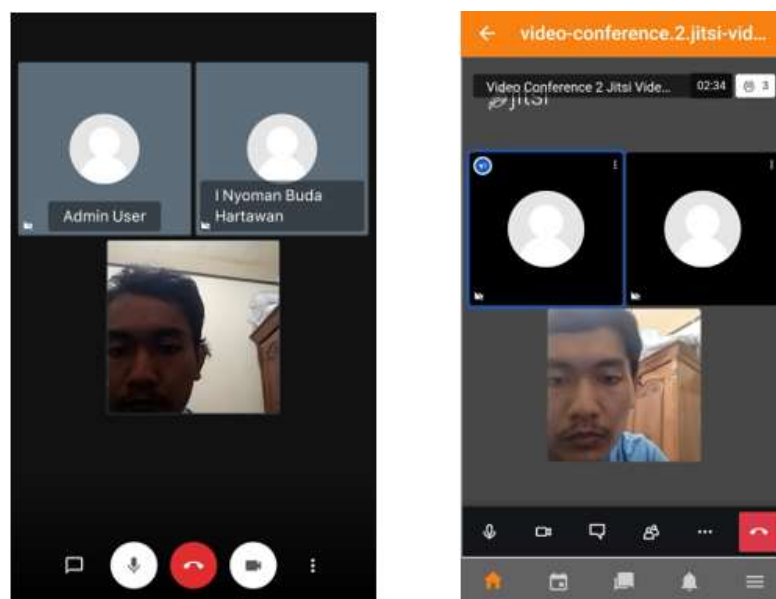


Figure 8. Facecam display on jitsi mobile and moodle mobile

Table 2. Test results of black boxd testing

No	Testing Scenario	Expected results	System Results
1	As administrators, lecturers and students join video conferences	Administrator users, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can join video conferences	Valid
2	As administrators, lecturers and students access audio	Administrator users, lecturers and students on Moodle Web, Jitsi Mobile and Moodle Mobile devices can access audio	Valid
3	As administrators, lecturers and students access facecam	Administrator users, lecturers and students on Moodle Web, Jitsi Mobile and Moodle Mobile devices can access FaceCam	Valid
4	As administrators, lecturers and students share screens	Administrator users, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can share screens	Valid
5	As administrators, lecturers and students send messages (chat)	User administrators, lecturers and students on Moodle Web, Jitsi Mobile and Moodle Mobile devices can chat	Valid
6	As administrators, lecturers and students raise your hand	User administrators, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can raise your hand	Valid
7	As administrators, lecturers and students invite	Administrator users, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can invite	Valid
8	As administrators, lecturers and students manage video quality	User administrators, lecturers and students on Moodle Web, Jitsi Mobile and Moodle Mobile devices can adjust video quality	Valid
9	As administrators, lecturers and students manage security	Administrator users, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can manage security	Valid
10	As administrators, lecturers and students do the recording	User administrators, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can record	Valid
11	As administrators, lecturers and students do livestream	User administrators, lecturers and students on Moodle Web, Jitsi Mobile and Moodle Mobile devices can live stream	Valid
12	As administrators, lecturers and students share videos	Administrator users, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can share videos.	Valid
13	As administrators, lecturers and students manage the virtual background	Administrator users, lecturers and students on Moodle web, Jitsi mobile and Moodle mobile devices can set virtual backgrounds.	Valid

4. CONCLUSION

Jitsi Meet is an open source application for online meetings that has features including audio, facecam, share screen, chat, raise hand, invite, video quality, security, recording, livestream, share video, and virtual background. Overall the system can work well. Black Box Testing of Jitsi Meet

Video conference Server Integration with Moodle has a success rate of 89.7% and a mismatch of 10.3% on the video share feature and Jitsi mobile virtual background. Then the results of testing the average CPU usage in the cacti application obtained results of 3.21%. The average result of memory usage in the cacti application is obtained at 33.56%, so that the research implication is that the integration of Jitsi Meet on Moodle can be an alternative in supporting distance learning. further research can take measurements in terms of ease of using the LMS integrated with Jitsi meet.

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