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Designing a Cloud-Based Web Server Infrastructure at the Pematang Serai Village office

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Abstract

The cloud is a metaphor for computer networks/the internet, where the cloud represents them, abstracted from complex, hidden infrastructure. Using cloud technology, we can combine several computer devices into a single unit (cluster) and create multiple servers on a single computer device through virtualization. The Pematang Serai Village Office is one of the villages without a server network infrastructure. Currently, the village office has several computers located in each room, and they are not connected. This decentralizes the village office's data storage, sometimes making it difficult for employees to obtain the data they need for their work. For this reason, the village office needs a means to support centralized storage on a server. Therefore, the purpose of this study is to build a web server based on a cloud infrastructure. This study uses an experimental method, with experiments conducted on the Ubuntu operating system across the following research stages: literature review, network topology design, system design analysis, server network configuration, and testing. The results of this study show that a cloud-based web server can be used for centralized data storage and that the data stored on it can be accessed properly. The conclusion from this study is that it can overcome problems with centralized data storage, ensuring that data management systems in the Pematang Serai village office are better organized and that every village office employee who needs data can access it correctly, specifically for shared data.

Keywords: *Design; Infrastructure; Web; Server; As a Cloud.*

I. INTRODUCTION

The rapid growth of the digital era today encourages every organization to store data on a storage medium, which is then processed into information data, making it easier for the organization to find out what information it needs. Advances in computer networks today can provide increasingly effective and efficient communication services (Kurniawan et al., 2023) .

The development of computer technology in developed countries has made researchers increasingly "hungry" for computing power that can answer the challenges and problems they face (Kamdan et al., 2023). Even though they already have supercomputers with very high capacity and speed, what they have is still considered insufficient, because they are trying to solve even bigger problems, and then cloud technology emerged (Abdi Reinanda et al., 2024).

The cloud is a metaphor for computer networks/the internet, where the cloud represents computer networks/the internet abstracted from complex infrastructure that is hidden (Ramsari & Ginanjar, 2022). In the cloud, resources such as processors/computing power, storage, networks, and software become abstract (virtual) and are provided as services on the network/internet. By using cloud technology, we can combine several computer devices into a single unit (cluster) and create multiple servers on a single computer device through virtualization. So, it can be said that the cloud is a combination of computer network technology, virtualization, and clustering (Insanudin et al., 2024).

The Pematang Serai Village Office is one of the villages that does not yet have server network infrastructure. Currently, the village office has several computers located in each room, but they are not connected to each other (Putra et al., 2020). This results in the decentralization of the village office's data storage, which sometimes makes it difficult for village office employees to obtain the data they need for their work (Tantowi & Wijayanti, 2023).

The Pematang Serai Village Office needs a server that can be used as a medium for data storage by utilizing cloud-based infrastructure that takes advantage of available internet facilities, which does not require the village office to provide a physical computer to serve as a server (Subandri & Hanadwiputra, 2018). Of course, providing a physical computer to serve as a server will require costs and will certainly burden the village office, which will have to allocate funds to build a physical

computer to serve as a server (Ernes Cahyo Nugroho et al., 2022).

This research was conducted to assist village offices in implementing digitalization technology, which in this technological age should not only be owned and implemented in cities, but we also need to develop villages to be more advanced and introduce technology in villages. The design of this As Cloud-based server network infrastructure will broaden the knowledge of village office employees that server systems can be built without using physical computers as servers (Pribadi Fitrian et al., 2025).

This study aims to develop an As Cloud-based network infrastructure web server that functions as a media server that can be used as a repository for storing general village data that can be used or needed by village office employees who need each other's data in order to improve employee performance and avoid work disruptions due to the unavailability of needed data (’Abidah et al., 2020).

II. RESEARCH METHODOLOGY

The research stages referred to are the processes that will be carried out in order to resolve the issues discussed. The research method used is the experimental method, in which experiments are conducted using the Ubuntu operating system [10]. The research stages used in this study are as follows (Hendrawan et al., 2023).

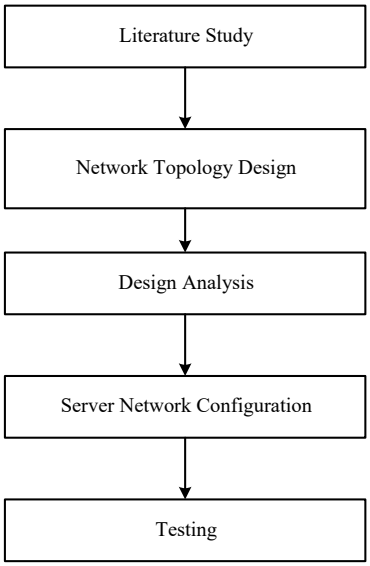

Figure 1. Research Stages

Based on the research stages, each step can be described as follows:

1. Literature Study
   By collecting data in the form of theories from both the supervising lecturer and people who are competent in this case, as well as supporting literature found in books and journals.
2. Network Topology Design
   The network topology design is intended to be suitable for the system being developed, so that the following topology description can provide a clear picture of the system to be built.
3. System Design Analysis
   The system design will be used to design a server system that can use cloud-based storage media to store data on the server computer. The design of a cloud server system requires several tools or components to build the system, which will then work together to achieve maximum results.
4. Server Network Configuration
   At this stage, the author performs the initial configuration of the server operating system. The installed server will be equipped with several other network applications to support the system. The author also assigns an IP address to the server's network interface in accordance with the designed topology. The next configuration is to install config.yaml. Before installing the program, the author has prepared several dependencies required for the installation. After config.yaml is successfully installed, the next thing to do is to install supporting applications for the server to run properly, namely apache2, mysql-server, php, phpmyadmin, and owncloud.
5. Testing
   The testing in this study aims to determine whether the Ubuntu server computer system is running properly by creating a folder or file on the server through the ownCloud desktop and checking it on the browser display to compare the contents on the desktop display with those on the browser page.

III. RESULTS AND DISCUSSION

This section will explain the process of completing the Design of a Cloud-Based Web Server Infrastructure, which includes several steps in completing the construction of a cloud-based server, namely installing Ubuntu Server, installing Apache2, installing MySQL Server, installing PHP, installing phpMyAdmin, and installing OwnCloud.

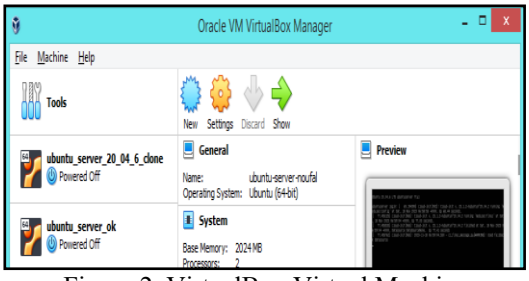

Figure 2. VirtualBox Virtual Machine

The initial step required to build a Cloud-Based Infrastructure Web Server is to have a server. The server used in this study is a server using Virtual Box, which is used as a server medium that can be installed on a computer located in one of the

rooms in the Pematang Serai Village office and uses Ubuntu 20.04.6 server.

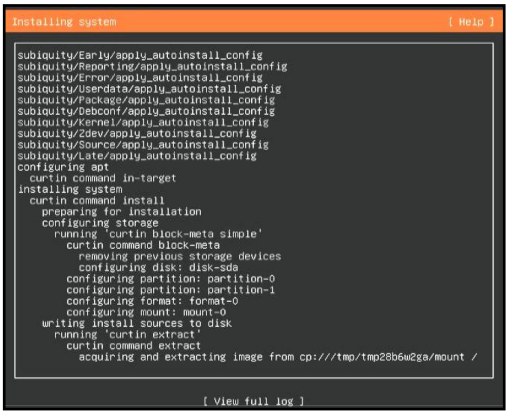

Figure 3. Ubuntu Server Installation Process

The image above illustrates the process of installing Ubuntu Server in Virtual Box, which will later be run as a server. The installation process can be done by completing several steps, namely the initial settings that must be done based on the steps required to perform the installation until the final stage of the installation process.

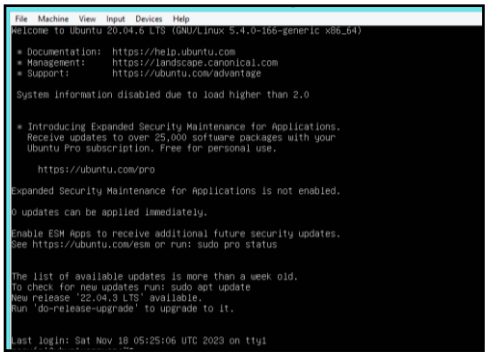

Figure 4. Ubuntu Server Display Already Running

The image above shows the Ubuntu server after installation is complete and ready to run. Additional applications will be installed to turn it into a cloud-based server, which requires several additional applications or supporting applications to function as a server for data storage.

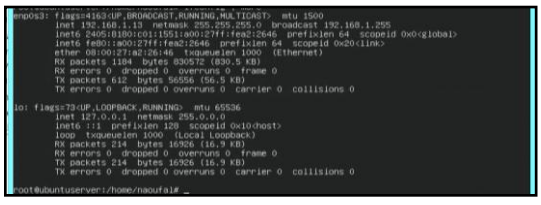

Figure 5. IP address display on Ubuntu Server

The image above shows the IP address on the Ubuntu server. This IP address will be used as the server IP so that As Cloud can connect to it and use it as a media server for storing data.

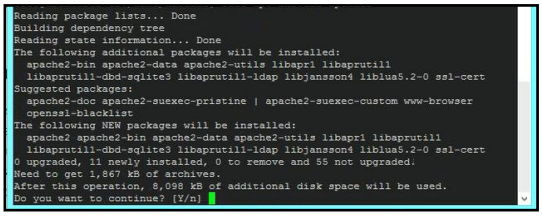

Figure 6. IP address display

The image above shows the installation of apache2 in Ubuntu, where Apache2 is one of the supporting applications used on server computers that functions as a connection between the server and the browser by typing the command sudo apt install apache2.

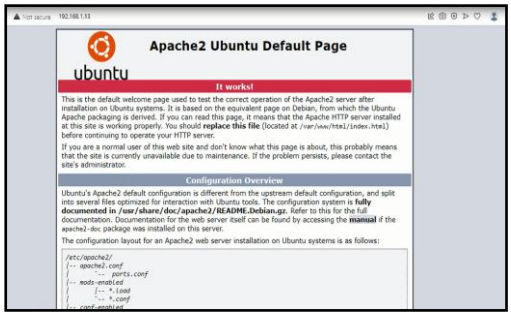

Figure 7. Apache2 display

The image above shows Apache2 successfully installed on an Ubuntu server. You can test whether it is running or not by opening a browser application on a computer running Ubuntu server using Virtual Box. Type the IP address found on the Ubuntu server, and the browser will display the image above, indicating that the application is running properly and the server is connected and can be used as a data storage server.

IV. CONCLUSION

From the results of the research that has been conducted, it can be concluded that to build a Cloud-Based Infrastructure Web Server, several supporting applications can be used, namely Virtual Box, which is used as a virtual machine that will be used as a server running the Ubuntu system. The Ubuntu server requires several additional applications to support its function as a server, namely the Apache2 application. The Apache2 application can be used as a medium to connect the server computer in Virtual Box with the computer running Virtual Box using a browser application and entering the IP address of the Ubuntu server in the browser address bar.

V. RECOMMENDATIONS

This study has weaknesses that can be improved. The suggestion for improving this study is to use a static IP for the server on Ubuntu because the generated IP sometimes changes and when accessed on the cloud service, there is no

target IP and you have to reconfigure so that the IP address can be accessed, especially on the cloud IP address that is used as the server address for data storage.

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