

Performance Analysis of Cloud Computing Based E-Commerce Server Using PROXMOX Virtual Environment

Marike Kondo, Herry Langi, Yoice Putung and Varland Lengkong
Manado State Polytechnic, Indonesia

Keywords: Cloud Computing, Proxmox, E-Commerce, MSMEs.

Abstract: Cloud computing is on-demand service access to computing resources such as networks, servers, storage, applications, and services. A virtual machine is an efficient and isolated duplicate of an actual device. Nowadays, virtual machines can simulate hardware even though there is no authentic hardware. So far, the use of computers as server computers is still one server, one computer, even though the specifications of the computers used are pretty high and branded. So that many computer resources have not worked optimally to existing computer specifications. This study aims to build a cloud server for e-commerce services for Micro, Small, and Medium Enterprises (MSMEs) by optimizing the performance of available computing devices. The trial was carried out on a laboratory scale by simulating up to 750 users to get the results of the performance analysis of the installed device. The problems in this study used computer specifications that support virtual machines. The next step is to create a virtual machine server installed on the proxmox server, then run it together using existing computer resources. The results of the analysis from these trials show the server computer with proxmox continues to run well in serving requests for access to 400 – 550 users.

1 INTRODUCTION

Cloud Computing or cloud computing is a combination of the use of computer technology ('computing') and Internet-based development. Cloud Storage. Cloud Storage is a metaphor for the Internet, as storage media are often depicted on computer network diagrams. Besides being like a cloud in a computer network diagram, Cloud Storage in cloud computing is also an abstraction of the complex infrastructure it hides. Cloud Computing applies a computing method, namely, capabilities related to information technology are presented as a service so that users can access it via the Internet without knowing what is in it, an expert with it, or have to control over the technological infrastructure that helps it (Anggeriana, 2011).

Cloud computing is one of the computing models that can access anywhere. Cloud computing is on-demand service access to computing resources such as networks, servers, storage, applications, and services (Mell, 2012). Cloud Computing is emerging and overgrowing, both conceptually and in reality. Legal/contractual, economics, quality of service, interoperability, security, and privacy issues still pose significant challenges (Sen, 2015). A virtual machine

is an efficient and isolated duplicate of an actual device. At this time, virtual machines can simulate hardware even though no authentic hardware exists (Purbo, 2012). So far, the use of computers as server computers is still one server, one computer, even though the specifications of the computers used are pretty high and branded. So that many computer resources have not worked optimally following existing computer specifications.

Cloud Computing or cloud computing is a combination of the use of computer technology ('computing') and Internet-based development. Cloud Storage. Cloud Storage is a metaphor for the Internet, as storage media are often depicted on computer network diagrams. Besides being like a cloud in a computer network diagram, Cloud Storage in cloud computing is also an abstraction of the complex infrastructure it hides. Cloud Computing applies a computing method, namely, capabilities related to information technology are presented as a service so that users can access it via the Internet without knowing what is in it, an expert with it, or have to control over the technological infrastructure that helps it (Anggeriana, 2011).

In a previous study by Zheng et al., experiments were carried out using AIS data. The results show that virtualization and Elasticsearch can effectively store

and index Spatio-temporal data with high reliability and efficiency. This paper is innovative in implementing cloud virtualization (Yicheng Zheng, 2014). Furthermore, Kovari et al. researched that the Open Node Virtualization Platform is an open source CentOS-based server virtualization and management solution. Proxmox VE is a tweaked Debian distribution with a specially optimized kernel. The two platforms are identical but based on different Linux distributions, with minor differences. This study analyzed these two open-source IaaS systems as KVM & OpenVZ-based virtualization solutions (Kovari, 2012). Research conducted by Min Chen et al. proposes a new architecture, Affective Interaction through Wearable Computing and Cloud Technologies (AIWAC), which includes three components: collaborative data collection via wearables, model-enhanced sentiment analysis, and forecasting, and controlled effective interactions. Based on the proposed architecture, they present the AIWAC testbed, design a practical mechanism for computational-based emotional interaction that can be subjected to exchange, and discuss its open problem, which inspires potential research as a new direction (Chen, 2015). Furthermore, in research conducted by Suhatman, who designed a centralized virtualization system using Cloud Computing based on Virtual Machines capable of building Multi Servers (DNS, WEB, Mail, and FTP) so that lectures run smoothly and by the actual client-server network conditions. This system is applied to 3 Informatics Engineering Classes with 30 Linux nodes and 30 Windows nodes in each class. In the study, information on the use of data sources in the form of memory was up to 94.8%, who only used the CPU as much as 17.8%, and accessing a Linux server was much faster than accessing a windows server, namely the average time to access a Linux server was 1.8 minutes, while to access windows takes an average of 6.20 minutes. So we can conclude that the performance of Proxmox in terms of resource usage, especially memory, is very maximal. The research conducted by Harijanto et al. describes the design and implementation of digital library software using Slims digital library with cloud computing using Proxmox Server for system implementation in a centralized digital library; this saves infrastructure and computer server maintenance costs. On the cloud computing server, which made four digital library servers with trials running simultaneously, the result was that the server ran well on the cloud computing server using Proxmox Server (Harijanto, 2018).

This study aims to build a server by optimizing the computer's performance using the available

resources on the computer according to its specifications. The trial in this study uses computer specifications that support machine virtualization. The result of this research is to build an e-commerce service server for coconut-derived SMEs using virtual machine technology based on cloud computing using a proxmox server.

The trial in this study builds a cloud server by optimizing the performance of available computing devices. The next step is done on a laboratory scale by simulating up to 750 users to get the version of the installed device. The results show that the server can work well for access to 400 - 450 users.

2 METHODS AND SYSTEM DESIGN

2.1 Proposed Method

The research methodology carried out in the implementation of this research are:

1. Literature Study

Collect research materials or materials in the form of; Literature study by collecting various literature/references related to computer networks (networking), especially those related to cloud computing. References used are not only obtained from libraries (books, scientific journals) but also from the internet.

2. Analysis, Design, and Implementation

This stage is intended to retrieve, study and analyze the data obtained from direct observation/observation on server devices to carry out the system design process and topology design. At this stage, an analysis of the server utility used, server scalability, and execution time of an application running on a non-virtualized system is carried out with the same application running on a virtualized machine in the data center.

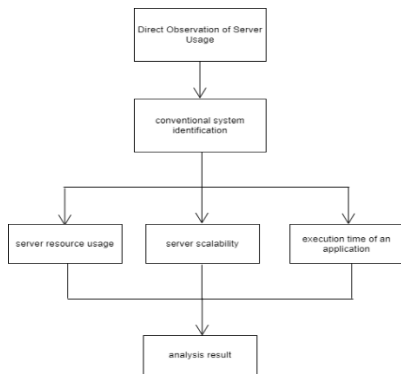


Figure 1: Cloud system design analysis.

The results of the analysis stages described in Figure 1 are used as a basis for considering the implementation of cloud computing for service optimization. The flow of the analysis stage is illustrated in Figure 1.

The system design is illustrated using the topology shown in Figure 2.

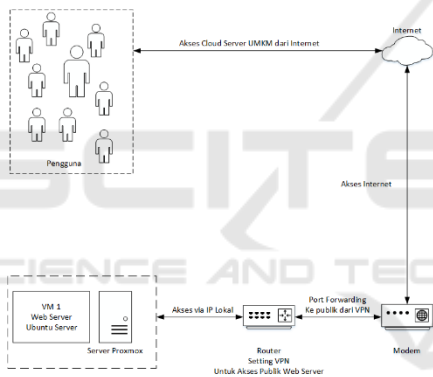


Figure 2: Cloud Computing Topology.

The Proxmox VE server uses version 7.2 with a server IP of 192.168.100.2; then, a virtual machine is installed with the Linux Ubuntu Server operating system version 22.04. On the Linux Ubuntu server, install Nginx, Mysql, and PHP. A router is set up so that proxmox and VM Ubuntu servers can access the internet. Routers are also used so that the public can access the Ubuntu server/web server using VPN and port forwarding settings. The modem is used to provide internet access which is set through the router. Users can access the web server by accessing the VPN address and the port forwarded to the web server.

2.2 System Requirements

At this stage, it will explain who must prepare system requirements in this study using hardware specifications, shown in table 1 below.

Table 1: System Requirements Specification.

No	Name	Specifications
1	Monitor	14 Inch FHD IPS Anti Glare
2	Processor	AMD Ryzen 3 3200U (2.6GHz up to 3.5GHz)
3	Graphics	Radeon Vega 3 Graphics
4	Memory	8GB DDR4
5	Storage	512GB SSD

2.3 E-Commerce Cloud Server Online

The process of making cloud servers using Proxmox Virtual Environment, open-source server management and Linux-based Proxmox VE version 7.2 was used, released on May 4, 2022. Proxmox VE is installed on a computer with AMD Ryzen 3 3200U (2.6) processor (GHz up to 3.5GHz), 8GB DDR4 RAM, and 512GB SSD storage media. After installing Proxmox VE without making any changes, you get an IP of 192.168.100.2. To access Proxmox VE requires a computer that is connected and can communicate with one another. On a computer with a Windows or Linux operating system installed, we can create a web browser such as Mozilla Firefox or Google Chrome and type <https://192.168.100.2>. If connected, it will be directed to the login page of Proxmox VE. After successfully logging in, we can create a Virtual Machine (VM) that can install various operating systems. In this experiment, we installed the Linux Ubuntu Server 22.04 Operating system, and the installation process was like installing a Linux. When the installation process is complete, you can configure the router.

The router in question is setting the router so that it can connect from the WAN (Internet Source/Modem) to the virtual machine so that the virtual machine can connect to the internet. The router used uses the Mikrotik RouterBoard 750 type, where Port 1 is a WAN (or connected to a modem) with a DHCP network source, port two is connected to the Proxmox VE server, and port three is connected to a computer that will configure the Proxmox Server and Virtual Machine.

When successfully setting up the Proxmox VE router and server and the virtual machine can be connected to the internet, the software is installed on the Ubuntu virtual machine. Software installations

include Nginx as an HTTP server and proxy, MySQL as a database, and PHP 8 as a compiler to run .php files.

After installing the software, continue uploading the MSME E-commerce web file using an FTP Client and importing a SQL database so that users can access the E-commerce web by typing the virtual machine IP on the Mozilla Firefox or Google Chrome web browser so that they can access the E-commerce web. -commerce and the web server has been successfully created.

So that the web server can not only be accessed locally, it is necessary to do a Public IP setting with VPN Tunnel, which is obtained for free from the <http://web.tunnel.my.id> website. After successfully setting OVPN/VPN Tunnel, the author makes Port Forwarding settings on the menu Firewall then NAT where IP and local port forwarding is IP virtual machine with port 80 as HTTP default port.

3 RESULTS AND DISCUSSION

At this stage, a user trial is carried out, divided into three parts: the first 250 users, 500 users, and then 500 users.

1. Trial 250 Users Online using the test application from <https://loader.io> and access VPN Tunnel with the address <http://id26.tunnel.my.id:11019>. The test was carried out at 07:06 PM, and production values as in table 2 below.

Table 2: Testing 250 User.

	O'clock		
	07:06 PM	07:07 PM	07:08 PM
Memory	1.13GiB	1.13GiB	1.13GiB
CPU	0.55%	0.61%	1.59%
Disk	6.69kb	621.23byte	12.51kb
Network - In	7.27kb	280.71byte	4.11kb
Network - Out	7.27kb	8.22kb	113.57k

From the test table above, for access to 250 users, one user is experiencing a timeout, so the real test is only 249 users for a significant difference on the network side. So the specifications of the hardware can still handle 250 users. The results of the analysis using the application for 250 users can also be seen in Figure 3.

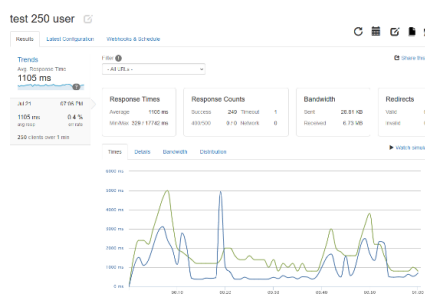


Figure 3: Test results in 250 users using the loader.

2. Trial 500 Users Online using the test application from <https://loader.io> and access using VPN Tunnel with the address <http://id26.tunnel.my.id:11019>. The test was carried out at 08:07 PM, resulting in values in table 3 below.

Table 3: Testing 500 Users.

	O'clock		
	08:06	08:07	08:08
Memory	1.16GiB	1.16GiB	1.16GiB
CPU	0.55%	0.56%	1.25%
Disk	0kb	0kb	8.55kb
Network - In	3.77byte	3.77byte	2.72kb
Network - Out	0byte	0byte	78.9kb

From the test table above, for access to 500 users, there are two users experiencing timeouts, so the real test is only 498 users, for the significant difference is on the network side. For the CPU, there is an increase, but it's around 1.5% from when no one is accessing it. So for the hardware specifications, it can still handle 500 users. The results of the analysis using the application for 250 users can also be seen in Figure 4.

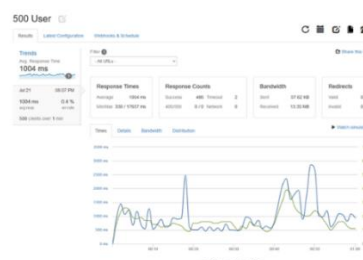


Figure 4. Test results in 500 users using a loader.

3. Trial 700 Users Online using the test application from <https://loader.io> and access VPN Tunnel with the address <http://id26.tunnel.my.id:11019>.

The test was carried out at 5.30 PM resulting in a value like in table.

Table 4: Testing 750 Users.

	O'clock		
	17:36	17:37	17:38
Memory	1.15GiB	1.16GiB	1.16GiB
CPU	1.35%	1.76%	3.53%
Disk	0kb	0kb	0kb
Network - In	2.07kb	3.4kb	7.45
Network - Out	48.42byte	75.7byte	219.1kb

From the test table above, for access to 750 users, there are 162 users experiencing timeouts, so the real test is only 400. The rest is not continued because it has reached its peak, for the significant difference is on the network side. For CPU, there is an increase, but it's around 1.5% from when no one is accessing it. So for the hardware specifications, it can still handle 750 users, but the network has reached its peak.

4 CONCLUSION

Based on the study results, it can be concluded that the cloud server built for e-commerce services for Micro, Small, and Medium Enterprises (MSMEs) using the Proxmox virtual machine can run well for up to 450 users. Based on the results of trials conducted for 700 network users, it has reached its peak, so it is no longer very effective for that many users.

REFERENCES

- A. Kovari and P. Dukan, "KVM & OpenVZ virtualization based IaaS open source cloud virtualization platforms: OpenNode, Proxmox VE," 2012 IEEE 10th Jubilee International Symposium on Intelligent Systems and Informatics, 2012, pp. 335-339, doi: 10.1109/SISY.2012.6339540.
- Anggeriana, Herwin, 2011, Cloud Computing, Jurnal Teknik Informatika, Vol 1 September 2011.
- Chen, M., Zhang, Y., Li, Y., Hassan, M.M. and Alamri, A., 2015. AIWAC: Affective interaction through wearable computing and cloud technology. IEEE Wireless Communications, 22(1), pp.20-27.
- Hariyanto, Budi., Ariyanto, Yuri.(2015): Desain Dan Implementasi Digital Library Dengan Teknologi Cloud Computing Menggunakan Server Proxmox. Seminar Nasional Komputer dan Informatika Terapan Jurusan Teknologi Informasi Politeknik Negeri Jember 2015.
- <http://www.proxmox.com>. Diakses pada tanggal 1 Juli 2022.
- Leymann, F., 2011. Cloud computing.
- Mell, P., Grance, P. (2012):The NIST Definition ofCloudComputing.<http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf> .
- Purbo, Ono. W. (2012):Membuat Sendiri CloudComputing Server Menggunakan Open Source.Yogyakarta: C.V ANDI OFFSET.
- Sen, J., 2015. Security and privacy issues in cloud computing. In Cloud technology: concepts, methodologies, tools, and applications (pp. 1585-1630). IGI global.
- Suhatman, Rahmat. "Analisa Performansi Server Cloud Berbasis Proxmox Ve untuk Multi Server dan Multi Platform pada Praktikum Administasi Jaringan Komputer." Jurnal Komputer Terapan, vol. 2, no. 1, 2016, pp. 17-26.
- Yicheng Zheng, Feng Deng, Qingmeng Zhu and Yong Deng, "Cloud storage and search for mass spatio-temporal data through Proxmox VE and Elasticsearch cluster," 2014 IEEE 3rd International Conference on Cloud Computing and Intelligence Systems, 2014, pp. 470-474, doi: 10.1109/CCIS.2014.7175781.