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Network Server Management Based on Virtualization Technology using Proxmox at Diskominfo Bengkayang Regency

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ABSTRACT

Based on research conducted by the author, two server machines at Diskominfo Bengkayang District have poor resources because they use personal computers with specifications not for servers, so they cannot serve clients properly. Besides that, there is no central data storage server for sharing data. The solution to the problem of server resources is to replace it with one unit of PC Server with high specifications and because there are two servers, the method used for this problem is Virtualization Technology. All server machines are built in virtualization technology using Proxmox. Proxmox is open-source software for running Virtual Machine. With proxmox, it can minimize the use of hardware and facilitate maintenance because it uses Web Base Management for its settings and with the construction of a data center server for value data storage and data sharing, will provide convenience in doing work. The benefits of this community service activity are to streamline time and costs in server maintenance and optimal use of resources.

Keywords: *Servers, Promox, Virtualization, Web Based Management.*

1. INTRODUCTION

Based on observations from Tony Iams, senior analyst at D.H. Brown Associates Inc, NY, servers in most organizations are only utilizing 15-20% of their capacity, of course that number is a ratio that is far from ideal. By seeing the potential of processors that have more than one core, we can utilize to run applications and services simultaneously using virtualization techniques on server computers. This server virtualization technology aims to avoid wasting expensive process power or in other words increase efficiency and optimize the use of more than one core processor (**Isa, 2020**).

Another saving is the cost of electricity because only using one or a few servers. At this time there are many methods of designing server virtualization with high availability cluster types, including using Proxmox, because Proxmox is a software open source Virtualization Platform for running Virtual Appliance and Virtual Machine (**Prasandy & Adhiwibowo, 2021**). Proxmox VE is a special distro dedicated specifically as a system virtualization host machine and contains 2 virtualization technologies, namely KVM and using OpenVZ Container

Virtualization Container Virtualization (OpenVZ) is the recommended technology for running Linux servers. OpenVZ creates multiple secure and isolated containers (also called CT, VE or VPS) (**Prismana et al., 2020**).

Each Container performs and executes exactly like a stand alone server, a container can be rebooted independently and has access to super user, IP address, memory, processes, files, applications, system libraries and configuration. To further optimize the server, the also built user management with LDAP technology (**Anjali, 2024**). LDAP in a network environment usually stores credentials in a centralized server or in a directory (**Cueva-Hurtado et al., 2018**). The system directory-based system must provide high capability by replicating credential storage. To provide To provide greater flexibility, a single sign on should provide both server centralized server and method of credential storage. Lightweight Directory Access Protocol (LDAP) is designed to update and search directories running over a TCP/IP network (**Choi, 2024**).

Many developers such as Microsoft with Active Directory, Novell with Novell® eDirectory™ and Netscape with Netscape Directory Server all provide a centralized directory access protocol with Netscape Directory Server have all adopted LDAP as a standard for directory services. Because of widespread use of LDAP directories, a single sign on product must provide built-in support for LDAP so that it can work effectively with LDAP (**Kannadhasan et al., 2024**). So that it can work effectively with today's modern infrastructure. Based on observations made author, a number of server machines at Diskominfo Bengkayang has poor resources. Some server machines still use desktop personal computers (PCs) which are utilized as servers. The hardware resources provided by these server machines have not been used optimally so that the addition of new server machines is an inefficient step (**Ajmera & Tewari, 2023**).

In the organization, it can be said that there is waste because it is spending on hardware resources that are mostly unused. Based on the facts mentioned earlier, Diskominfo Bengkayang needs a flexible server infrastructure so that the agency can rely on it. Flexibility in the context of this research is measured based on the utilization of a dedicated server machine to replace a less dedicated one. Dedicated servers to replace less dedicated ones (Garg & Deshmukh, 2006). The allocation of hardware resources in the form of processors and memory can be adjusted according to the workload so that the server resources are optimized. The infrastructure is designed and implemented with server virtualization (Khair et al., 2022).

2. METHOD

2.1 Analysis System

Search and study applications and supporting applications, such as:

- Microsoft Visio 2007
- Turnkey Domain Control
- Debian Linux

2.2 Design System

Network topology at the Department of Communication and Informatics of Bengkayang district already has a running network topology as seen in figure 1. The Network Topology used by Diskominfo Bengkayang is Star Topology. The font used is Tahoma for all styles.

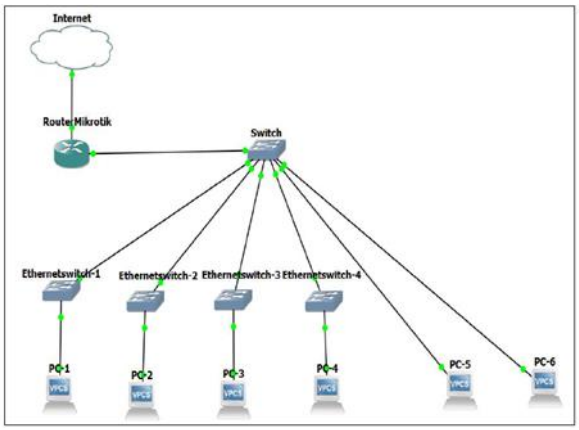

Figure 1. Running Network Topology

2.3 Testing

In this stage the author will test how the performance of two server machines after being virtualized into one unit pc server, so that the author can find out general description of how optimization on the system created by the author.

2.4 Implementation

At this stage, the system design that has been made in the design stage by the author will be implemented.The benefits felt by Diskominfo Bengkayang Regency from the Community Service on Network Server Management Based on Virtualization Technology Using Proxmox, including efficiency, cost savings, increased service reliability, security, and HR capabilities in virtualization management.

3. RESULT AND DISCUSSION

3.1 Hardware and Software Specifications

Table 1 contains the specifications of the hardware used in a network system. Each row of the table describes different hardware based on the type, technical specifications, brand, and number of units used.

Tabel 1. Hardware Specifications

Type	Head of Table Column 2	Head of Table Column 3	Head of Table Column 4
ADSL 2+	IEEE 802.3, 802.3u, ITU-T G.992.5, 4 10/100Mbps RJ45 1 Unit TP-Link (TD 8840T) Ports, 1 RJ11 Port	TP-Link (TD 8840T)	1 Unit
Switch	1610/100Mbps RJ45 Ports AUTO Negotiation/AUTO MDI/MDIX	TP-Link (TL-SF1016D)	2 Unit
Switch	24 10/100Mbps RJ45 Ports (Auto Negotiation/Auto MDI/MDIX) 10BASE-T: UTP category 3, 4, 5 cable (maximum	TP-Link (TL SF1024D)	2 Unit

	100m) 100BASE-TX: UTP category 5, 5e or above cable (maximum 100m)		
Wireless	One 10/100M Ethernet, Port(RJ45) Support Passive PoE IEEE 802.11g, IEEE 802.11b	TP-Link (TL WA5110G)	2 Unit
Wired	UTP Cat5 100Mbps	Belden USA	-
PC	Intel Pentium 4 Dualcore, 1gb Ram, 250 GB Harddisk, Monitor LCD 19 Inch Advance	-	8 Unit
PC	Intel Pentium 4 Dualcore, 512 Ram, 40Gb Harddisk, Monitor CRT 17 Inch	Dell	2 Unit
PC	Ram, 250Gb Harddisk, Monitor LED 19 Inch	Axioo	2 Unit
PC	Intel Pentium 4 Dualcore, 4Gb Ram, 500 Gb Harddisk, Monitor LCD 19 Inch Acer	-	2 Unit

Table 2 contains software specifications used in the system. Each row describes the type of software, version, and license status.

Tabel 2. Software Specifications

Type of Software	Head of Table Column 2	Remarks
Operating Systems	Windows XP Sp 2	Licensi
Operating Systems	Windows 7 Ultimate	Licensi
Operating Systems	Windows Server 2003	Licensi
Monitoring Application	VNC Server	Free
Office Applications	Microsof Office 2007	Licensi

3.2 Network Topology

The author proposes to keep use the current network topology running in the research object, namely the extended star topology and virtualize two server machines that have been built with Desktop PC into one unit of Server PC with specifications according to the needs of the server. So that it can reduce the use of desktop computers in Community service objects.

Figure 2 is the network topology proposal that upgraded the placement position Server Computer. Which previously took point from the Kabid Room hub switch to be directly from the main hub switch. This This is intended so that the process of sending data faster (**Peng & Wu, 2021**).

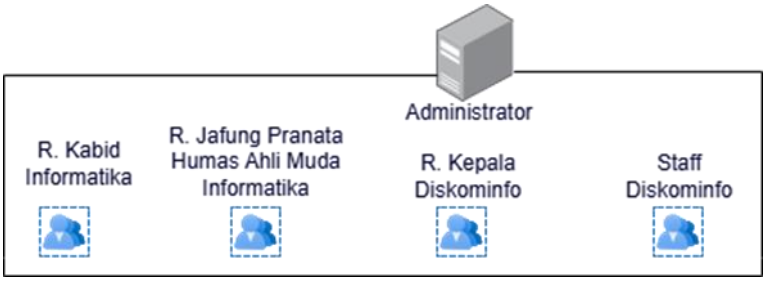

Figure 2. The Proposed Network Topology

3.3 Network Schematic

The concept of this network scheme is virtualized two server machine units into one physical server unit using Proxmox. Then add one machine server as a data center server. Where servers that already exist can run on top of Proxmox and operated through a web browser (**Andreadis et al., 2016**). Figure 3 showed schematic of the proposed nerwork.

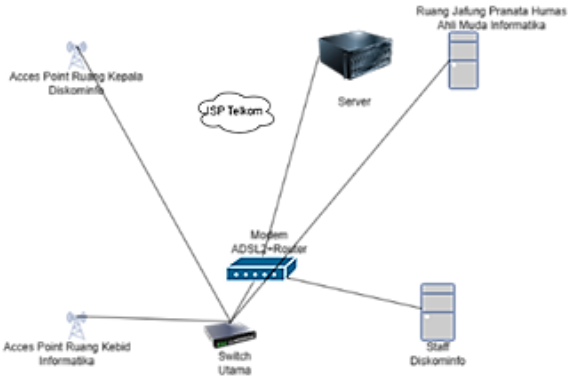

Figure 3. Schematic of the Proposed Network

3.4 Network Security

For data center security, the LDAP (Lightweight Directory Access Protocol) is implemented. Client computers authenticate through a data center server with a TurnKey Domain Controller. Users and groups are created on the server, and only registered users can log in and access the data center, ensuring controlled and secure access (**Kannadhasan et al., 2024**).

3.5 Network Testing

Network monitoring was conducted to observe the processor's working process and data traffic using the Proxmox Network Monitoring System. Figure 4 and 5 shows inbound (blue line) and outbound (red line) traffic on the Core Switch interface. This test was performed before the Proxmox server machines were activated. The figure below is the traffic graph at 01:00 to 02:00.

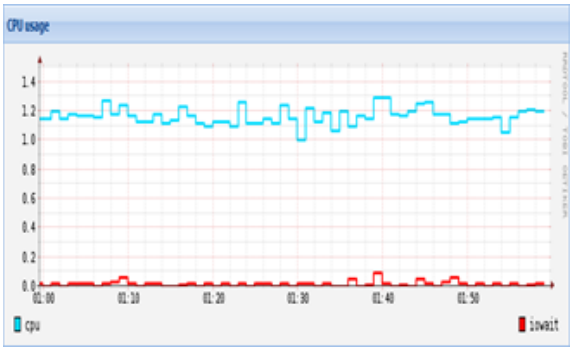

Figure 4. Processor Work Process

Figure 5. Network Traffic Proxmox

3.6 Final Network Testing

The final network test is carried out when the three servers in proxmox are activated, then ping is carried out with a load of 50000 bytes to all servers.

1. Intranet Servers
   Testing the intranet server using ping with a load of 50000 Bytes. Figure 6 and 7 show the data traffic process when testing with ping.

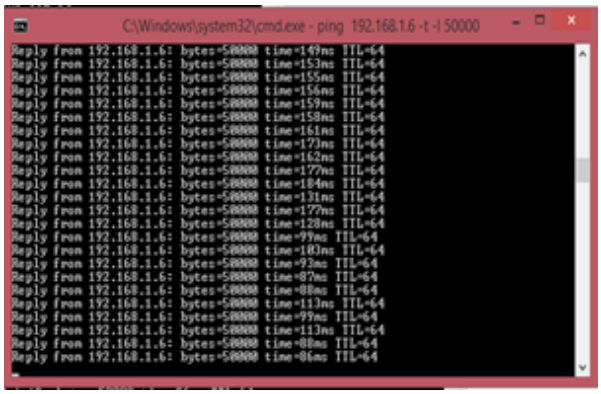

Figure 6. Intranet Server Ping Process with 50000 Bytes Load

Figure 7. Data Traffic Monitoring Process on Intranet Server

2. Data Center Servers
   Figure 8 is a test of the data center server by pinging.

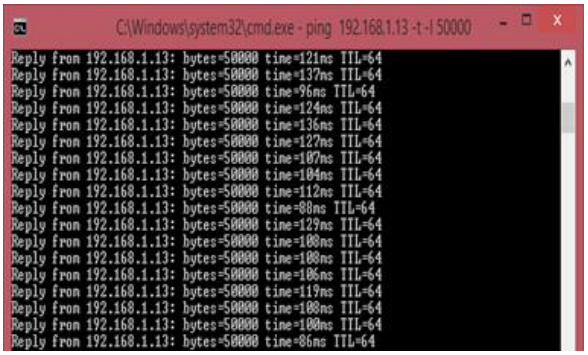

Figure 8. Ping Process of Data Center Server with 50000 Bytes Load

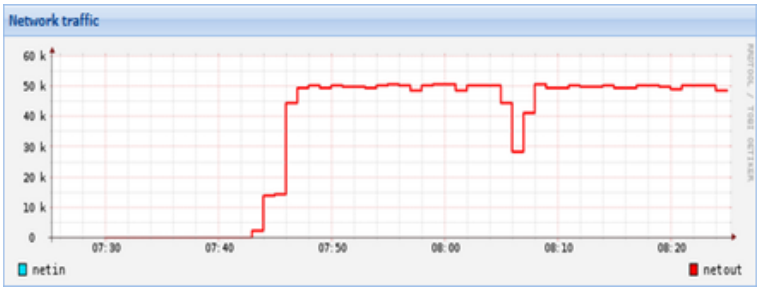

Figure 9. Data Traffic Monitoring Process on Data Center Server

Figure 9 shows the data traffic process when testing with a ping that is loaded with 50000 bytes.

3. SIM (Management Information System) Server

   Figure 10 shows testing the Management Information System server using ping with a load of 50000 Bytes.

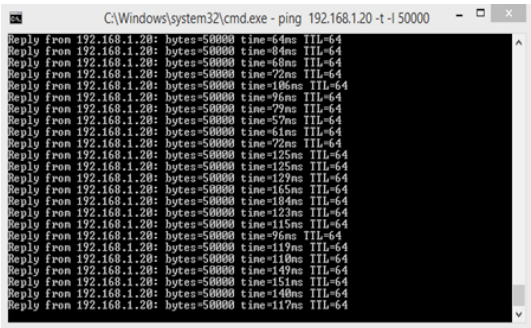

Figure 10. Ping Process of SIM Server with 50000 Bytes Load

Figure 11. Data Traffic Monitoring Process on Data Center Server

Figure 11 shows the data traffic process when testing with a ping that is given a load of 50000 bytes. When all servers are running simultaneously and then tested using Ping with a load of 50000 bytes, proxmox server activity increases. Processor performance is still stable but increased data traffic is indicated by server monitoring. The following is a monitoring graph of Processor work and data traffic on the network.

Figure 12. Processor Work Process

Figure 12 is a graph of processor performance from 07:30 to 08:00 when replying to three servers with a load of 50000 bytes each server, but processor performance remains stable between 0.2 - 0.8 Ghz.

Figure 13. Network Traffic Proxmox

While figure 13 is a graph of network data traffic when all server machines are being tested with ping. The highest graph reaches 170 kbytes.

After conduct the activity, in can be conclude that the benefits of this Community service are reduction of hardware investment costs, ease of backup & recovery, ease of deployment and ease of hardware standardization. Table 2 shows feedback from Diskominfo Bengkayang.

Table 2. Feedback on the Implementation of Network Server Management Based on Virtualization Technology Using Proxmox at Diskominfo Bengkayang

No	Feedback	
1	Improved Efficiency	Diskominfo Bengkayang a significant enhancement in server management efficiency, allowing for quicker deployment and configuration of virtual machines.
2	Cost Savings	The use of virtualization technology has led to reduced hardware costs and lower energy consumption, as fewer physical servers are needed.

4. CONCLUSIONS

By replacing the existing server computer existing server computer using a server computer that high specifications and according to the needs server makes the performance of server services more stable. Implementation of virtualization technology can reduce wasteful use of usage because one server computer unit runs three virtual server machines that running simultaneously. Implementation of server virtualization will simplify the process maintenance and recovery because it only focuses on one server hardware. This helps organizations avoid the common issue of underutilized servers, where servers are operating at only 15-20% capacity. The construction of a centralized data server makes it easier to collect grade data. The data center is also useful for sharing data with other teachers through folders that can be accessed by all users. The LDAP concept applied to the data center server is reliable enough to be used as a security system for stored data.

The suggestions for the future work can add server security that can be used for other applications. Virtualization concept can be applied to other server systems. For further Community service can developed implementation of VPS (Virtual Private Server) for the learning process and virtual virtual technology can be further optimized, in agencies that have a small budget for server development.Write the contents of the conclusions using the same letters and paragraph styles as the other sections. To avoid article writing errors, it is recommended to directly use this document as a format (template) by removing the contents of these writing instructions and saving (save as) in accordance with the requested file name.

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