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Build Data Backup with Nextcloud Based Infrastructure as A Service (IAAS) Concept on Budi Darma University

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Abstract—Data or important documents for each lecturer are often neglected in terms of storage and several other cases that cause important document files, for example, rank files, inpassing, certificates, teaching modules, practicum modules that are damaged due to viruses and ransomware when users use the internet using their own laptop. Some other problems include theft, fire, flooding, suddenly damaged laptop, illegible external storage or laptop hard drive, forgetting to backup to Google Drive, forgetting Google Drive password, missing internet package, not being accessed locally and having many problems when the data is somewhere when it's needed. By implementing a centralized data backup in each university with the nextcloud-based Infrastructure As A Service (IAAS) concept, it can provide an alternative to the above problems with the result that 90% of the data will be safe and confidential. Then data access is faster because the server is located in the college area and the data is also held by the respective owner of the lecturer account concerned.

Keywords: Cloud; Datacenter; Virtualization; Nextcloud; Network

1. INTRODUCTION

Data or important documents for each lecturer are often neglected in terms of storage and several other cases that cause important document files, for example, rank files, inpassing, certificates, teaching modules, practicum modules that are damaged due to viruses and ransomware. when users use the internet using their own laptop. Some other problems include theft, fire, flooding, suddenly damaged laptop, illegible external storage or laptop hard drive, forgetting to backup to Google Drive, forgetting Google Drive password, missing internet package, not being accessed locally and there are many problems when the data is somewhere when it's needed.

Technological advances in the era of the 21st century have seen many changes and improvements in data accessibility and security. Several providers are free to provide users who want to use it as a data center container. Each tertiary institution collects data from its lecturers by placing the data centrally which can be accessed online and offline where the server is located in the campus area.

By implementing a centralized data backup in each university with the nextcloud-based Infrastructure As A Service (IaaS) concept, it can provide an alternative to the above problems with the result that 90% of the data will be safe and confidential. Then data access is faster because the server is located in the college area and the data is also held by the respective owner of the lecturer account concerned. Therefore, the existence of a data center in each university will make it easier for campus managers to collect information data for each lecturer.

Previous research with the topic "Designing Hybrid Cloud Storage Based on Infrastructure As A Service (IAAS)" concluded that Owncloud virtual machines can be used as storage service providers in Cloud Computing, by implementing RAID0 in Disk Infrastructure as a Service (IAAS), on testing. Ethernet0, a maximum of 90.75Mbps, 9.65% memory used, and a maximum CPU loading of up to 36.6% when uploading 559MB of data files with 11 users almost simultaneously [1].

In previous research with the topic "Implementation of Cloud Computing Using the Infrastructure As A Service Model for Optimizing Data Center Services (Case Study: Upt Stmik Amikom Yogyakarta)" concluded that from the tests carried out, the results of the servers owned by UPT STMIK AMIKOM Yogyakarta were able to be implemented as cloud computing server. With this implementation, other servers can be used for other applications so that the service of UPT STMIK AMIKOM Yogyakarta can be improved [2].

In previous research on "Implementation of Data Center for Host Server Placement Based on Private Cloud Computing" concluded that it shows that IAAS-based data centers can save resources, optimize, and manage resources from the information system service needs that must be provided by the UIKA campus. Based on the usability test, it shows that the Proxmox application is in accordance with the existing management needs of the UIKA campus IT administrator, which meets the aspects of Learnability, Efficiency, Memorability, Errors, and Satisfaction [3].

2. RESEARCH METHODOLOGY

2.1 Research Stages

The stages to be carried out in this research are starting from looking for literature studies, collecting data, designing topology, implementation concept of infrastructure as a service (IaaS) and using the system or testing the system.

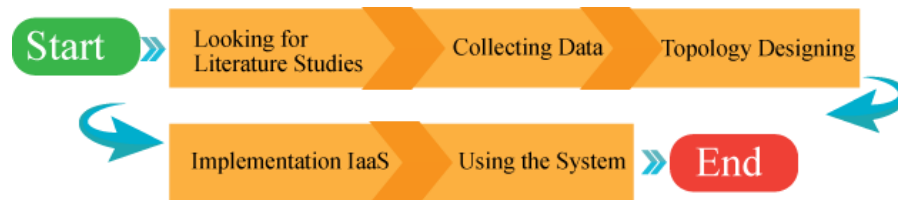


Figure 1. The stages to be carried out in this research

2.2 Virtualization

Virtualization is: "a way of making a physical computer function as if it were two or more computers, each nonphysical or" virtualized "computer is provided with the same basic architecture as that of a generic physical computer". Which when interpreted is a way to make a physical computer function like two or more computers, where each virtual computer uses the same basic architecture as the physical computer [4]. The term hardware virtualization refers to the attempt to create a virtual machine that works like a complete computer with an operating system. The term host machine (host) refers to the machine on which virtualization resides while the term guest machine (guest) refers to the virtual machine itself. The term hypervisor refers to the software or firmware that creates virtual machines [5].

2.3 Infrastruktur as a Service (IaaS)

IaaS is a part of the system in cloud computing that provides all infrastructure needs starting from storage, hardware and all of the infrastructure has been provided by the cloud provider [6]. Infrastructure as a Service is a cloud computing service that provides IT infrastructure in the form of CPU, RAM, storage, bandwidth and other configurations. All of these components are used to build virtual computers. Virtual computers can be installed operating systems and applications as needed. The advantage of this IaaS service is that there is no need to buy a physical computer, thus saving costs. The virtual computer configuration can also be changed as needed. For example, when storage is almost full, storage can be added immediately. Companies that provide IaaS are Amazon EC2, Telkom Cloud and BizNetCloud [7].

2.4 Proxmox

Proxmox VE is an open source server management platform for your enterprise virtualization. It is tightly integrated with KVM and LXC hypervisors, software defined storage, and networking functionality on a single platform. With the integrated web-based user interface, you can easily manage VMs and containers, highly available clusters or integrated disaster recovery tools with ease [8]. Proxmox VE is a complete open-source platform for enterprise virtualization. With the built-in web interface you can easily manage VMs and containers, software-defined storage and networking, high-availability clustering, and multiple out-of-the-box tools on a single solution [9].

2.5 Debian

A computer operating system composed of software packages that are released as free and open software under the majority license of the GNU General Public License and other free software licenses. Debian GNU / Linux contains the GNU operating system tools and the Linux kernel is a popular and influential Linux distribution. Debian is distributed with access to a repository of thousands of software packages ready for installation and use [10]. Debian was begun in August 1993 by Ian Murdock, as a new distribution which would be made openly, in the spirit of Linux and GNU. Debian was meant to be carefully and conscientiously put together, and to be maintained and supported with similar care. It started as a small, tightly-knit group of Free Software hackers, and gradually grew to become a large, well-organized community of developers and users. Debian is produced by almost a thousand active developers spread around the world who volunteer in their spare time. Few of the developers have actually met in person. Although no precise statistics are available (since Debian does not require users to register), evidence is quite strong that Debian is used by a wide range of organizations, large and small, as well as many thousands of individuals [11].

2.6 Nextcloud

Nextcloud is a cloud storage software that can create and use file host services. It is functionally similar to Dropbox, although Nextcloud is free and open source, but it does not rule out for anyone to install and operate it on a private server. Unlike Dropbox, Nextcloud does not offer on-premises file storage hosting [12]. Nextcloud Hub 21 brings a wide range of improvements in file handling performance with Files High Performance Back-end and important new collaboration features in Text, Talk, Groupware and Files. The biggest improvements Nextcloud Hub 21 introduces are High Performance Back-end for Nextcloud Files: reduces server load from desktop clients and web interface polling by 90% while delivering instant notifications to users, And a wide range of performance improvements all over on top, decreasing loading times of pages and reducing load on the server, Collaborative features: new Whiteboard, author colours in Text and Document Templates to increase team productivity, Nextcloud Talk: debuts message status indicators, a raise hand feature, a group conversation description and more [13].

3. RESULT AND DISCUSSION

3.1 Topology Designing

At this stage what will be done is to design a topology to easily determine the location of the infrastructure media that will be used as data backups and data centers in the research environment.

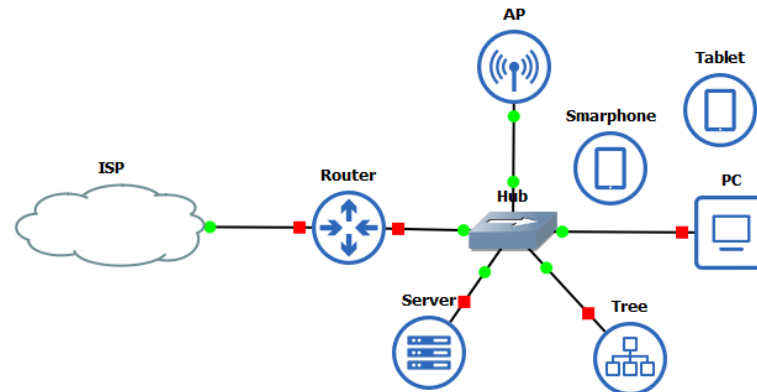


Figure 2. Topology design

3.2 Implementation IAAS

To apply the IaaS concept in this study, several steps will be taken as follows.

a. Configuration router

The routerboard configuration on the infrastructure media provided in this section changes the proxy name to Datacenter and prints the interface name as shown below.

```

[admin@mikrotik] > system identity set name=Datacenter
[admin@Datacenter] > interface print
Flags: D - dynamic, X - disabled, R - running, S - slave
#   NAME      TYPE      ACTUAL-MTU  L2MTU  MAX-L2MTU
0   R ether1    ether      1500      1600    4076
1   R ether2    ether      1500      1598    2028
2   ether3    ether      1500      1598    2028
3   ether4    ether      1500      1598    2028
4   ether5    ether      1500      1598    2028
[admin@Datacenter] >

```

Figure 3. Router configuration at the start

In Figure 3, part of the initial configuration of several other configurations, the system identity set name = Datacenter command is to enter the router identity name name command, then the print interface command to display the running interface and display TYPE, ACTUAL-MTU, L2MTU AND MAX-L2MTU.

```

[admin@Datacenter] > interface set name=public numbers=0
[admin@Datacenter] > interface print
Flags: D - dynamic, X - disabled, R - running, S - slave
#   NAME      TYPE      ACTUAL-MTU  L2MTU  MAX-L2MTU  MAC-ADDRESS
0   R ether2    ether      1500      1598    2028  D4:CA:6D:16:4C:B9
1   ether3    ether      1500      1598    2028  D4:CA:6D:16:4C:BA
2   ether4    ether      1500      1598    2028  D4:CA:6D:16:4C:BB
3   ether5    ether      1500      1598    2028  D4:CA:6D:16:4C:BC
4   R public    ether      1500      1600    4076  D4:CA:6D:16:4C:B8

[admin@Datacenter] > interface set name=local numbers=0
[admin@Datacenter] > interface print
Flags: D - dynamic, X - disabled, R - running, S - slave
#   NAME      TYPE      ACTUAL-MTU  L2MTU  MAX-L2MTU  MAC-ADDRESS
0   ether3    ether      1500      1598    2028  D4:CA:6D:16:4C:BA
1   ether4    ether      1500      1598    2028  D4:CA:6D:16:4C:BB
2   ether5    ether      1500      1598    2028  D4:CA:6D:16:4C:BC
3   R local    ether      1500      1598    2028  D4:CA:6D:16:4C:B9
4   R public    ether      1500      1600    4076  D4:CA:6D:16:4C:B8

[admin@Datacenter] > ip dhcp-server network add address=199.199.199.0/24 \
... gateway=199.199.199.1 dns-server=199.199.199.1

```

Fig 4. router configuration at the end

In Figure 4, part of the final configuration of several other previous configurations, the system interface command set name = public number = 0 is to change the interface name ether1 to public while the interface command set name = local number = 0 is to change the interface name ether2 to local, and the last command ip-dhcp-server network add address 199.199.199.0/24 gateway = 199.199.199.1 dns-server = 199.199.199.1 is a command to broadcast ip dhcp to server computers and client computers. then the print interface command to display the running interface and display TYPE, ACTUAL-MTU, L2MTU AND MAX-L2MTU and MAC-ADDRESS.

b. Installing a virtualized operating system using Proxmox based on the existing Debian infrastructure

Proxmox VE 6.3 (iso release 1) - <https://www.proxmox.com/>

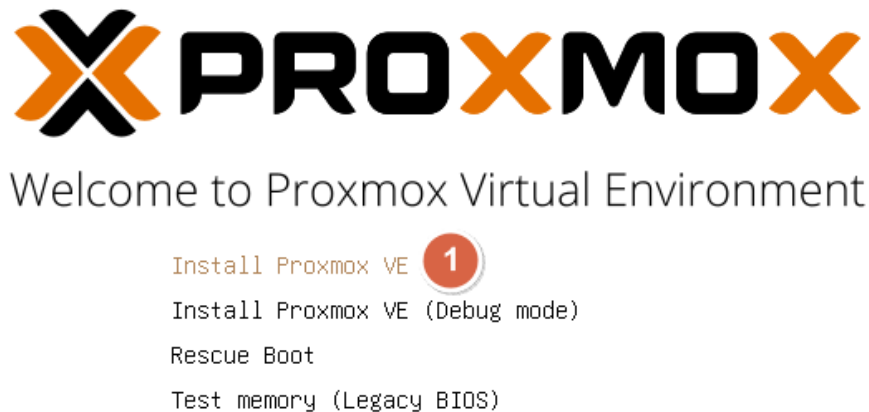


Figure 5. Proxmox installation at the start

In Figure 5 above, one of the captures from several parts afterward in the process of the Proxmox installation stage. This section is shown selecting Install Proxmox VE to continue the installation on the server used as the virtualization system software



Figure 6. Proxmox installation at the end

In Figure 6 above, one of the captures from several parts afterward in the process of the Proxmox installation stage. This section shows the progress of completing Install Proxmox VE, which means that the file transfer from the ISO image has been successfully transferred to the server hard drive

c. Installing the Debian Buster operating system by adding a virtual machine to the main OS (operation system)

To install the debian buster desktop operating system is done in the proxmox operating system by accessing the address <https://199.199.199.207:8006> after successfully logging in, then create a virtual machine called CloudUBD as shown below

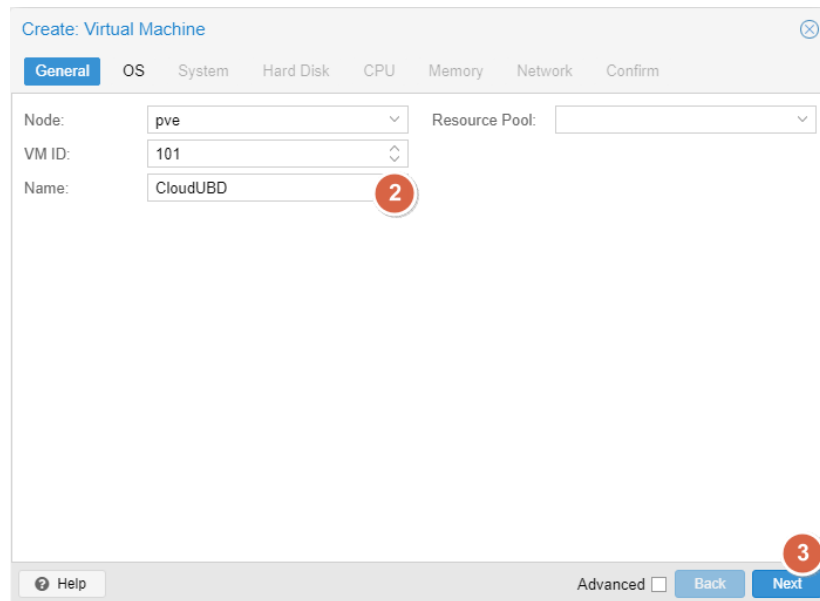


Figure 7. Debian installation at the start

In Figure 7 above, one of the captures from several parts afterwards is in the process of creating a debian virtual machine on the Proxmox main server which consists of selecting Node and VM ID, VM name, selecting OS, system, hard disk, CPU, Memory, Network then then confirm.

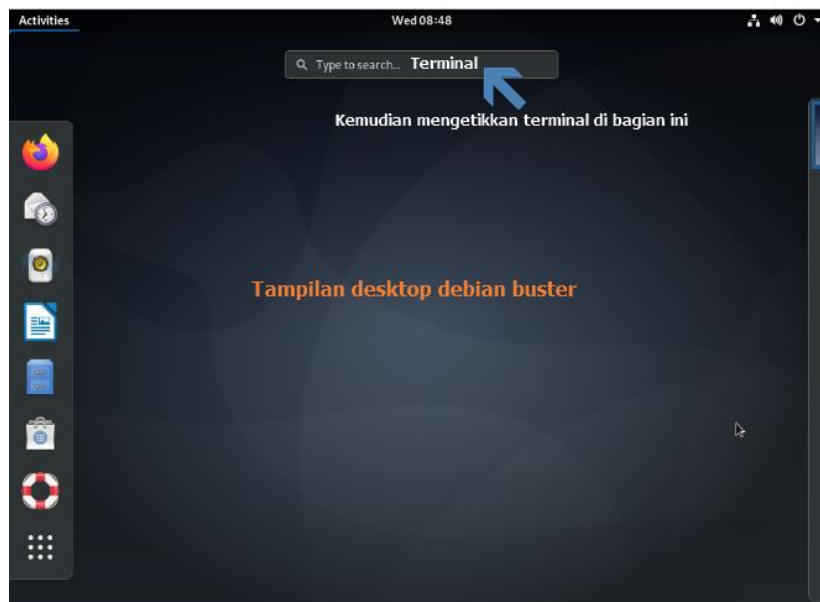


Figure 8. Debian installation at the end

In figure 8 above, one of the captures from several parts afterwards in the process of making a debian desktop virtual machine was successfully installed into a virtual hard disk on proxmox.

d. Nextcloud installation on the debian buster operating system

At the Nextcloud installation stage, there are several steps that must be taken starting from the update repository, installing the Nginx web server, Install and Configure PHP, Install and Configure MySQL Server, Download Nextcloud, Configure Nginx Virtual Host for Nextcloud.

e. Use the System

After the successful installation of Nextcloud in the Debian Buster terminal, the next step is to use the system which starts by accessing the address 199.199.199.223:89 on the Google Chrome page and entering the string according to the number in the following display.

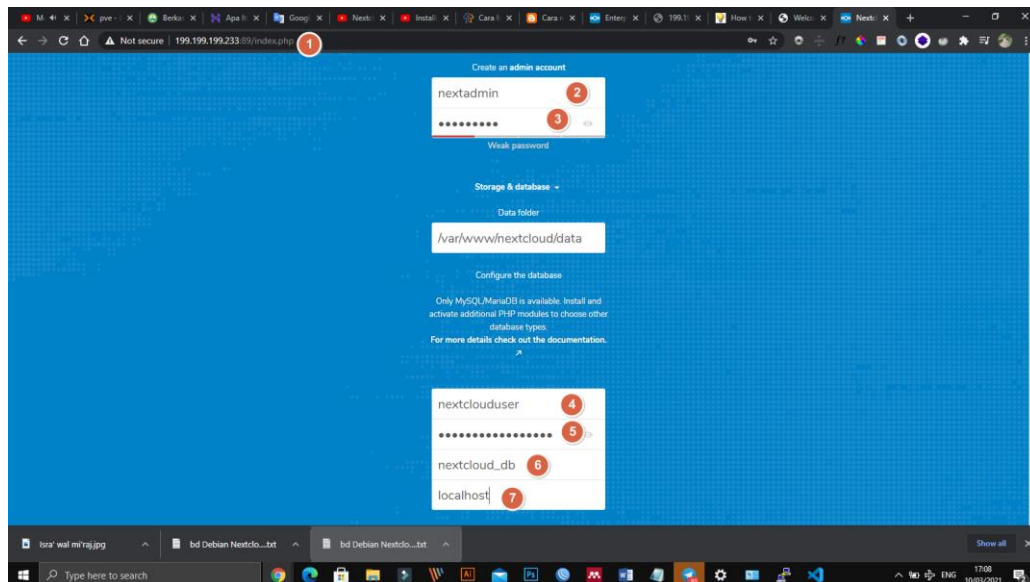


Figure 9. Nextcloud configuration at the start

In figure 9 above shows how to fill in the admin account form and fill in the database name, user database, password, localhost which will be saved into a file in the `/var/www/nextcloud/config/config.php` directory.

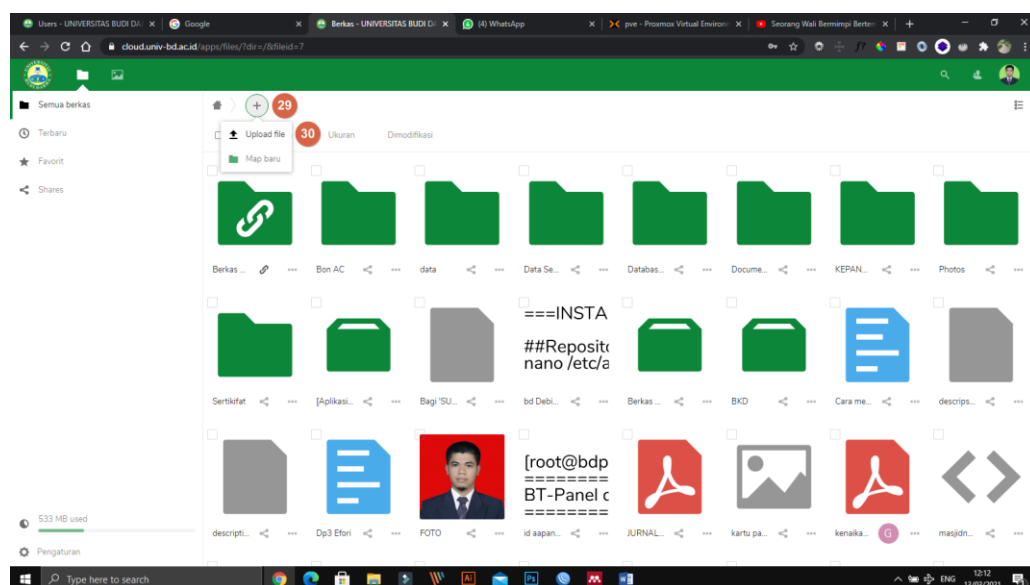


Figure 12. Nextcloud successfully used

In figure 12 shows the successful entry to the nextcloud dashboard after successful login. This section shows the data upload button which is used to enter data into the Nextcloud application so that the data is stored on the server with a user friendly display interface. This application can also be run via a smartphone which can be downloaded from the Playstore and Appstore under the name Nextcloud software.

4. CONCLUSION

The conclusions in this study are by applying the Infrastructure as a Service (IaaS) model in making data backup services using the OpenSource system starting from the network topology design stage, network configuration using a proxy router, installing the Proxmox operating system, creating a virtual machine, installing an operating system. debian, and then the nextcloud installation process stage to the stage of using the Nextcloud system as a data backup service application at the University of Buidarma where the results of the screenshot were not put in full. In the early to late stages, the process of creating data backup services at Budi Dharma University was 100 percent successful. This service can be accessed online and offline with the link <https://cloud.univ-bd.ac.id>.

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