PRIVATE CLOUD COMPUTING AND IT'S ADVANTAGES

AHMAD AKMAL HAZIM BIN ZULKIFLI

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN

JUDUL: [PRIVATE CLOUD COMPUTING AND IT'S ADVANTAGES]

SESI PENGAJIAN: [2020 / 2021]

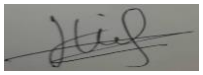
Saya: AHMAD AKMAL HAZIM BIN ZULKIFLI

mengaku membenarkan tesis Projek Sarjana Muda ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka dengan syarat-syarat kegunaan seperti berikut:

1. Tesis dan projek adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan unituk tujuan pengajian sahaja.
3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. * Sila tandakan (✓)

_____	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
_____	TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi / badan di mana penyelidikan dijalankan)
_____/___	TIDAK TERHAD	

UNIVERSITI TEKNIKAL MALAYSIA MELAKA



(TANDATANGAN PELAJAR)

Alamat tetap: BB315 JALAN BELIMBING SETIA 10, TAMAN BELIMBING SETIA, DURIAN TUNGGAL

Tarikh: 5/9/2021

(TANDATANGAN PENYELIA)

Ts. Dr. Mohd Rizuan Bin Baharon

Tarikh: 5/9/2021

CATATAN: * Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa.

PRIVATE CLOUD COMPUTING AND IT'S ADVANTAGES

[AHMAD AKMAL HAZIM BIN ZULKIFLI]

This report is submitted in partial fulfillment of the requirements for the Bachelor of [Computer Science (Computer Security)] with Honours.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FAKULTI TEKNOLOGI MAKLUMAT DAN KOMUNIKASI
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I hereby declare that this project report entitled

PRIVATE CLOUD COMPUTING AND IT'S ADVANTAGES

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT : AHMAD AKMAL HAZIM BIN ZULKIFLI Date : 29/6/2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of [Computer Science (Computer Security)] with Honours.

SUPERVISOR : Ts. Dr. Mohd Rizuan Bin Baharon Date: 5/9/2021
([NAME OF THE SUPERVISOR])

DECLARATION

DEDICATION

To my beloved family especially both of my parents for all the moral support they gave me through my hardships and ease and to my valuable friends for helping me out through this semester.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ACKNOWLEDGEMENTS

All praise to Allah because of Him, I manage to complete this Final Year Project (FYP). I would like to express my gratitude to my project supervisor, Ts. Dr. Mohd Rizuan Bin Baharon on his invaluable advice, guidance and his enormous patience throughout the development of the project and research. Without his guide, this report and project cannot be completed. Next, I would like to express my gratitude to my beloved parents who have helped and given me support, motivation and encouragement throughout my project. In addition, I would like to thank everyone, especially my friends who had contributed to the successful completion of this project. I managed to complete my report and also my project which is Benefits of Private Cloud Security.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRACT

Cloud computing is becoming more popular norm for accessing computing resources. Cloud computing security or also known as cloud security can also be defined as security measures configured to protect cloud data, support regulatory compliance and protect customers' privacy as well as setting authentication rules for individual users and devices. However, when using public cloud, the biggest threat is the potential security issues due to multiuser nature of public clouds. This is because of the users that use them over the Internet on a pay-per-use basis share resources and costs. On the contrary, private cloud security do not have these issues. Private cloud is a cloud computing environment dedicated to a single customer. This project investigates private cloud security by developing a secure private cloud using a private server. By implementing this private cloud, a secure storage space can be provided to the cloud user with an enhanced security feature.

اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRAK

Pengkomputeran awan menjadi norma yang lebih popular untuk mengakses sumber pengkomputeran. Keselamatan pengkomputeran awan atau juga dikenal sebagai keamanan awan juga dapat didefinisikan sebagai langkah-langkah keamanan yang dikonfigurasi untuk melindungi data awan, mendukung pematuhan peraturan dan melindungi privasi pelanggan serta menetapkan peraturan pengesahan untuk pengguna dan perangkat individu. Namun, ketika menggunakan awan awam, ancaman terbesar adalah masalah keselamatan yang berpotensi kerana sifat awan awam yang pelbagai. Ini kerana pengguna yang menggunakannya melalui Internet secara bayar per penggunaan berkongsi sumber dan kos. Sebaliknya, keselamatan awan peribadi tidak mempunyai masalah ini. Awan peribadi adalah persekitaran pengkomputeran awan yang didedikasikan untuk satu pelanggan. Projek ini menyiasat keselamatan awan peribadi dengan mengembangkan awan peribadi yang selamat menggunakan pelayan peribadi. Dengan menerapkan awan peribadi ini, ruang penyimpanan yang selamat dapat diberikan kepada pengguna cloud dengan fitur keamanan yang ditingkatkan.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

PAGE

DECLARATION ..... **II**

DEDICATION ..... **III**

ACKNOWLEDGEMENTS ..... **IV**

ABSTRACT ..... **V**

ABSTRAK ..... **VI**

TABLE OF CONTENTS ..... **VII**

LIST OF TABLES ..... **XI**

LIST OF FIGURES **1**

CHAPTER 1: INTRODUCTION **4**

1.1 Introduction 4

1.2 Problem Statement (PS) 5

1.3 Project Question (PQ) 6

1.4 Project Objective (PO) 7

1.5 Project Scope 7

1.6 Project Contribution (PC) 7

1.7 Report Organization 8

1.8 Conclusion 8

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY **10**

2.1 Introduction 10

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2 Keyword 10

2.3 Cloud Computing 11

2.4 History of cloud computing 13

2.5 Related work 13

2.6 Method 15

2.7 Proposed solution 17

2.8 Conclusion 18

CHAPTER 3: ANALYSIS 19

3.1 Introduction 19

3.2 Methodology 19

3.2.1 Phase 1: Literature Review 20

3.2.2 Phase 2: Requirement Analysis 20

3.2.3 Phase 3: Design 22

3.2.4 Phase 4: Implementation 22

3.2.5 Phase 5: Testing and evaluation 23

3.3 Project schedule and milestone 23

3.4 Conclusion 25

CHAPTER 4: DESIGN 26

4.1 Introduction 26

4.2 Project Requirement 26

4.2.1 Hardware Requirement 26

4.2.2 Software Requirement 27

4.3 Design 27

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.3.1 Architectural design 28
4.3.2 Physical design 28
4.4 Flowchart 29
4.4.1 Searching for a cloud server software 30
4.4.2 Creating a Tonido account 31
4.4.3 Sharing data using private cloud 32
4.4.4 Analyze information 33
4.4.5 Compare result 34
4.5 Conclusion 34

CHAPTER 5: IMPLEMENTATION 35

5.1 Introduction 35
5.2 Search and Download Cloud server software 35
5.3 Installation and setup for Tonido software 36
5.4 Running multiple instances of Tonido server from a single device 38
5.5 Accessing Tonido server with a smart device 46
5.6 Conclusion 48

CHAPTER 6: TESTING AND ANALYSIS 49

6.1 Introduction 49
6.2 Security of user authorization through the website 49
6.3 Security of user authorization through a smart device 53
6.4 Sharing files in the Tonido server 59
6.5 Sharing files in the Tonido server using smart device 70
6.6 Comparison between the three cloud models 74

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

6.7 Conclusion 76

CHAPTER 7: PROJECT CONCLUSION 77

7.1 Introduction 77

7.2 Project Summarization 77

7.3 Project contribution 77

7.4 Project limitation 78

7.5 Future work 78

7.6 Conclusion 78

REFERENCES 79

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF TABLES

PAGE

Table 1.1: Summary of Problem Statement.....6
Table 1.2: Summary of Project Questions 6
Table 1.3: Summary of Project Objective.....7
Table 3.1: Acer Aspire e15 specs e5-575g-71mnSpecifications 21
Table 3.2: Project Milestone.....23
Table 3.3: Project Gantt chart 25
Table 4.1: Acer Aspire e15 specs e5-575g-71mnSpecifications 26
Table 6.1: Comparison between the three models of cloud computing 74

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

PAGE

Figure 2.1: Cloud computing network 13
Figure 2.2: Public cloud for electronic health 15
Figure 2.3: Overview of propose solution. 17
Figure 3.1: Project Methodology 20
Figure 3.2: Private cloud model 22
Figure 4.1: Architectural design 28
Figure 4.2: Physical design 28
Figure 4.3: Search for a cloud server software 30
Figure 4.4: Creating a Tonido account 31
Figure 4.5: Sharing data 32
Figure 4.6: Analyze information 33
Figure 4.7: Compare result 34
Figure 5.1: Tonido software website 35
Figure 5.2: Tick Allow remote access to all folders 36
Figure 5.3: Disable indexing 37
Figure 5.4: Tonido private cloud server 37
Figure 5.5: Tonido file 38
Figure 5.6: Copy all the files in the folder 39
Figure 5.7: Create a folder called Tonido4 39
Figure 5.8: Paste the files in Tonido4 40
Figure 5.9: Open localconfig.xml with WordPad 40
Figure 5.10: Change the HOME value to HOME3 41
Figure 5.11: data folder 41
Figure 5.12: Open configex.xml file with WordPad 42
Figure 5.13: Change the HttpPort value 42
Figure 5.14: Change the UDPPort value 42

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 5.15: launch the server 43
Figure 5.16: Create the new Tonido server 43
Figure 5.17: Choose a specific folder 44
Figure 5.18: python folder is chosen 44
Figure 5.19: Disable indexing 45
Figure 5.20: Change the HTTP Port value to the one in the WordPad 45
Figure 5.21: The Tonido server with the specific python folder 46
Figure 5.22: Tonido application 46
Figure 5.23: Server hajim accessed through a smart phone 47
Figure 5.24: Server bucky accessed through a smart phone 47
Figure 6.1 : Login for hajim server 49
Figure 6.2 : Unauthorized access for server hajim 50
Figure 6.3 : Sign in for the guest user of server hajim.....50
Figure 6.4 : Unauthorized access for the guest sign in.....51
Figure 6.5 : Login for abutalhah server 51
Figure 6.6 : Unauthorized access for server abutalhah 52
Figure 6.7 : Login for bucky server.....52
Figure 6.8 : Unauthorized access for server bucky.....53
Figure 6.9 : Add the hajim Tonido server.....54
Figure 6.10: Invalid password entered by the user for the server hajim 54
Figure 6.11: Invalid answer entered by the user for hajim server 55
Figure 6.12: Add the abutalhah server 55
Figure 6.13: Invalid password entered by the user for the server abutalhah 56
Figure 6.14: Invalid answer entered by the user for hajim server 56
Figure 6.15: Add the bucky server 57
Figure 6.16: Invalid password entered by the user for the server bucky 57
Figure 6.17: Invalid answer entered by the user for hajim server 58
Figure 6.18: Login for the account guest1 in hajim server.....58
Figure 6.19: Invalid password entered by the user of the guest1 account 59
Figure 6.20: Create a share link 59
Figure 6.21: Choose a specific file to share 60
Figure 6.22: The share link created.....60
Figure 6.23: The file shared using the public share link is a picture 60
Figure 6.24: choosing an expire date.....61

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 6.25: Send the link via email 62
Figure 6.26: Enter the recipient's email 62
Figure 6.27: The email received by the recipient 63
Figure 6.28: The file received by the recipient 64
Figure 6.29: Creating a guest account called guest2 64
Figure 6.30: Guest account created 65
Figure 6.31: Choose a file to share privately 65
Figure 6.32: Set which guest can view and upload to the shared file 66
Figure 6.33: Send the private share link via email 66
Figure 6.34: Private share link created 67
Figure 6.35: Email received by the recipient 67
Figure 6.36: Guest login page 68
Figure 6.37: The file shared by the user 68
Figure 6.38: Guest2 is able to upload, download, view and rename the file 69
Figure 6.39: Guest1 is only able to download and view the file 70
Figure 6.40: Login to the users or guest account 71
Figure 6.41: The account for guest1 72
Figure 6.42: The shared folder 72
Figure 6.43: The picture file 73
Figure 6.44: Guest2 account 73
Figure 6.45: Shared Test folder 73
Figure 6.46: Picture file in the shared Test folder 74

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 1: INTRODUCTION

1.1 Introduction

Cloud computing was first introduced on August 9, 2006 by Google CEO Eric Schmidt. Cloud computing is the distribution of computing resources. On the Internet, which includes servers, storage, databases, networking, applications, analytics, and intelligence. Customers use cloud computer on a daily basis, sending an email, watching movies or TV, editing documents, playing games, listening to music or storing pictures and other files, is mostly done by using cloud computing. Customers also store their important data over the internet to an offsite cloud storage system that is accessible from any device and location. Cloud security is crucial as customers want to be sure that their data stored in the cloud are safe. Cloud security, also called cloud computing security, is a set of policies, controls, procedures, and technologies that work together to safeguard cloud-based applications, data, and infrastructure. These protection mechanisms are set up to protect cloud data, help regulatory enforcement, protect consumer privacy, and set up authentication rules for individual users and devices.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

There are three different types of primary cloud environments. The three different environments are public cloud services, private clouds and hybrid clouds. In public cloud services, identity management, authentication, and access control are critical since they are hosted by third-party cloud service providers and are typically accessible via web browsers. Examples are for this type of environments are Amazon Web Services (AWS), Microsoft Azure, Google Cloud. Private cloud is when the provider provides exclusive access and usage rights on the infrastructure and computational resources to its consumers. The cloud infrastructure and resources may be hosted in consumer premises or outsourced to a third-party hosting organization and so can be

managed by the consumer or by the third party by Rakesh Kumar and Rinkaj Goyal (2019). Hybrid cloud is a composition of two or more clouds (public, on-site private, on-site community, off-site private and off-site community). The individual clouds in composition remains a distinct entity but provide standard or proprietary interfaces for application and data portability between them by Rakesh Kumar and Rinkaj Goyal (2019).

Knowing this, some organizations or companies use the cloud services to store crucial data and information. With cloud computing services, organizations or companies can extremely access data easily at any location and device, maintain consistency between users, allows for remote programs, easy data backup and many more.

However, finding the most suitable and secure type of cloud computing service can be a formidable task because all the different types of cloud computing environment have great benefits. For this research the researcher will focus on private cloud computing environment.

1.2 Problem Statement (PS)

Almost every company has incorporated cloud computing into their operations to various degrees. With the introduction of the cloud, however, comes the need to ensure that the organization's cloud protection policy is capable of defending against the top cloud security threats. Cloud data breaches are often caused by misconfigured cloud security settings. Other than data breaches, unauthorized access often occurs in cloud computing system. Many companies' cloud protection posture management policies are insufficient to safeguard their cloud-based infrastructure. Cloud-based deployments, unlike on-premises networks, are outside the network perimeter and directly available from the public Internet. While external data sharing is an amazing feature, it can also be a crucial cloud security risk. Table 1.1 illustrate the summary of problem statement

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Table 1.1: Summary of Problem Statement

PS	Problem Statement
PS1	Data breaches are often caused by misconfigured cloud security settings.
PS2	Unauthorized access often occurs in cloud computing system.
PS3	External data sharing can also be a crucial cloud security risk.

1.3 Project Question (PQ)

In cloud computing, we need to study what is the differences between available models in deep learning. Next, conducting research on the available methods and techniques that can be used or enhanced to mitigate problems stated in Table 1.1. Next, implementing knowledge gained from the research that has been made to show proof of concept is achieved successfully. Table 1.2 shows the summary of project questions.

Table 1.2: Summary of Project Questions

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

PS	PQ	Project Question
PS1	PQ1	Which type of cloud computing environment is more secured?
PS2	PQ2	How to store data in cloud computing system securely?
PS3	PQ3	Does private cloud computing ensure the confidentiality, integrity and availability of the data?

1.4 Project Objective (PO)

The project will take two objectives to determine that the project done properly and accomplished to the get the required output as issued in the preceding section. The table 1.3 displays the summary of project objective.

Table 1.3: Summary of Project Objective

PS	PQ	PO	Project Objective
PS1	PQ1	PO1	To compare the security criteria of a cloud computing system that is suitable to store sensitive data.
PS2	PQ2	PO2	To store sensitive data using private cloud computing.
PS3	PQ3	PO3	To evaluate if private cloud computing security system ensures the confidentiality, integrity and availability of the data.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

1.5 Project Scope

The project focused on the security and the benefits of the private cloud security environment in protecting the information stored in the cloud. The process will include creating a private cloud security using Tonido software.

1.6 Project Contribution (PC)

Nowadays, cloud computing security is the most widely used service of this era. Organizations with a private cloud have more leverage over security procedures and problems like data residency. In general, due to their familiarity with and understanding of the entire technology solution, private cloud administrators are better able to handle compliance issues. Thus, by using the best approaches and solution it could increase the security and protection for the data and information stored in the cloud.

1.7 Report Organization

Chapter 1: Introduction

This chapter contains the introduction, problem statement, project question, project objective, project scope, and project contribution

Chapter 2: Literature Review

This chapter contains the description and the explanation of the project with supporting article, journal, books, and websites.

Chapter 3: Project Methodology

Contain workflow or method to complete the project.

Chapter 4: Analysis and Design

This chapter contains all the design of the project, including the architecture design of the private cloud computing system.

Chapter 5: Implementation

This chapter contains on how I implement the private cloud computing security system.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Chapter 6: Testing and Validation

Contain the testing of the private cloud computing security system for its confidentiality and integrity

Chapter 7: Project Conclusion

Summarize the whole project and what improvement it can do for the future.

1.8 Conclusion

To summarize, the purpose of this chapter is to describe the general background and better understanding of the project proposes, how it can help customers and organizations secure and protect important and critical data

into the cloud server and minimize the risk and threats. This research will be focusing on private cloud and its benefits.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

The comprehensive chapter will give information in detail on literature studies on cloud computing, cloud computing security and types of cloud computing services. Furthermore, the literature review expresses every single thing affiliated to the research in particulars of definition, architecture, advantages and disadvantages of each method. Moreover, this chapter will also describe the types cloud computing security and tools being used to implement this project. Therefore, this chapter needs to explain the details of the preceding work that implemented research which most alike to the research and development that is currently implementing. Lastly, this part will contrast the method that will be used to the methods of the preceding work.

اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2 Keyword

Cloud computing: Cloud computing is the transmission of computer services such as servers, storage, databases, networking, software, analytics, and intelligence over the Internet ("the cloud") in order to enable faster innovation, more flexible resources, and cost savings.

Cloud computing security: Cloud security, often referred to as cloud computing security, is a collection of rules, controls, procedures, and technologies that work together to safeguard cloud-based systems, data, and infrastructure.

Private cloud: Computing services provided to a chosen group of users rather than the broader public via the Internet or a private internal network.

Public cloud: The public cloud is described as computer services made available to anyone who wishes to use or buy them through the public Internet by third-party providers.

Hybrid cloud: A hybrid cloud system is one that mixes a private cloud with one or more public cloud services, with proprietary software allowing communication between them.

2.3 Cloud Computing

Cloud computing virtualization technology provides end users with efficient resources. Manageability, scalability, and availability are all properties of cloud computing. Furthermore, cloud computing offers cost savings, on-demand service, convenience, universality, multi-tenancy, flexibility, and stability. Three service delivery methods and three development patterns are primarily provided by cloud computing. Platform as a service (PaaS), infrastructure as a service (IaaS), and software as a service (SaaS), public cloud, private cloud, hybrid cloud. Iaas treats computer hardware (network storage, virtual server/ computer, data center, processor and memory) as a service and provides infrastructure scalability and provisioning issues without requiring significant capital and time (PanJun Sun, 2020). IaaS also focuses on security features such as firewalls, virtual machine monitoring, intrusion detection, and other areas. PaaS locates in the middleware of the service model and provides services in the form of development tools, frameworks, architectures, programs and integrated development environments (PanJun Sun, 2020). Third-party partnerships, lifecycle development, and underlying infrastructure security are just a few of the problems that PaaS faces. SaaS is a collection of remote computing services that enables thirdparty vendors to remotely deploy applications (PanJun Sun, 2020). Customers can access cloud service provider apps on the cloud infrastructure over the Internet. Private cloud is the provider provides exclusive access and usage rights on the infrastructure and computational resources to its consumers. The cloud infrastructure and resources may be hosted in consumer premises or outsourced to a third-party hosting organization and so can be managed by the consumer

UNIVERSITI TEKNIKAL MALAYSIA MELAKA