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ENHANCE CLOUDLET SCHEDULING POLICY (ECSP) USING CLOUDSIM TOOLKIT WITH RESUBMISSION FAULT TOLERANCE MECHANISM

JULIZA BINTI AUZIR

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By

JULIZA BINTI AUZIR

Thesis Submitted to the School of Graduate Studies,

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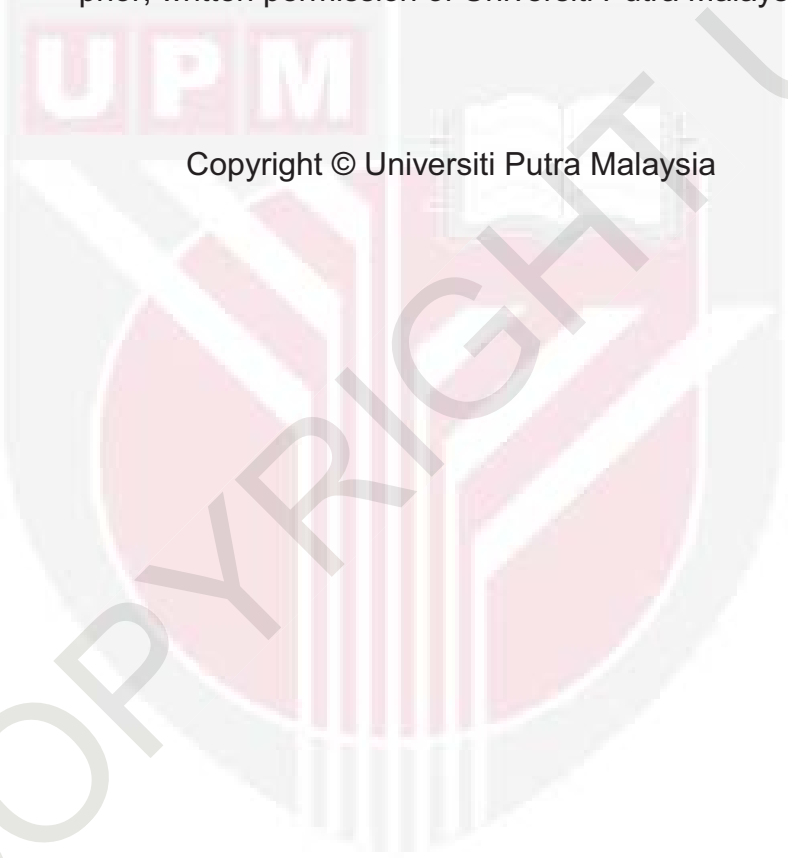

DEDICATIONS

This thesis is dedicated to:

My parents and lovely family

Whose affection, love, encouragement and prays make me able to get such success and honour.

Along with all hardworking, guardian and respected

My Supervisor, lectures and friends.

ABSTRACT

Abstract of thesis presented to the Universiti Putra Malaysia in fulfilment of the requirement for the Master of Computer Science

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By

JULIZA BINTI AUZIR

JANUARY 2018

Supervisor : En Ahmad Alauddin Bin Ariffin

Faculty : Faculty of Computer Science and Information Technology

Abstract:

Several research works are still going on in the domain of cloud computing and many traditional methods are used to highlight the parameters involved in QoS (Quality of Services) of cloud. QoS is associated with several parameters used to guarantee a service level such as performance, availability, and reliability. In cloud computing, to ensure cloud services proficient in environment, one of the challenges is to provide efficient cloudlet scheduling policy. The cloudlet scheduling policy plays key role as a lead to improve overall system performance such as minimizing the turnaround time,

waiting time and context switching. This project emphasizes and evaluates the QoS parameter by performed result comparison with previous work – Improved Round Robin Cloudlet Scheduling Algorithm (IRRCSA) and Round Robin Algorithm (RRA). CloudSim Toolkit will be used to improved cloudlet scheduling algorithm as well as Qualtiy of Sevice (QoS) performance by providing better execution time and turnaround time. In addition, this project also will include fault tolerance function as extended from previous work.

ABSTRAK

Abstrak tesis yang dikemukakan kepada Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah sarjana Sains Komputer

ENHANCE CLOUDLET SCHEDULING POLICY (ECSP) USING CLOUDSIM TOOLKIT WITH RESUBMISSION FAULT TOLERANCE MECHANISM

Oleh

JULIZA BINTI AUZIR

JANUARY 2018

Penyelia : En Ahmad Alauddin Bin Ariffin

Fakulti : Fakulti Sains Komputer dan Teknologi Maklumat

Abstrak:

Beberapa karya penyelidikan masih diteruskan dalam domain pengkomputeran awan dan banyak kaedah tradisional digunakan untuk menyerlahkan parameter yang terlibat dalam *Qualtiy of Sevice (QOS)*. QoS dikaitkan dengan beberapa parameter yang digunakan untuk menjamin tahap perkhidmatan seperti prestasi, ketersediaan, dan kebolehpercayaan. Dalam *cloud computing*, untuk memastikan perkhidmatan *cloud* mahir dalam persekitaran, salah satu cabaran adalah untuk menyediakan dasar penjadualan *cloud* yang cekap. Dasar polisi penjadualan *cloudlet* memainkan peranan penting sebagai pendorong untuk meningkatkan prestasi

keseluruhan sistem seperti meminimumkan masa pemulihan, masa tunggu dan peralihan konteks. Maka ini memberi penekanan dan menilai parameter QoS dengan perbandingan hasil yang dilakukan dengan kerja sebelumnya - *Improved Round Robin Cloudlet Scheduling Algorithm (IRRCSA)* dan *Round Robin Algorithm (RRA)*. CloudSim Toolkit akan digunakan untuk meningkatkan algoritma penjadualan *cloud* serta prestasi QoS dengan menyediakan masa pelaksanaan yang lebih baik dan masa pusing balik. Di samping itu, projek ini juga memasukkan fungsi *Fault Tolerance* sebagai penambahan kerja dari sebelumnya.

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&

My Supervisor, lectures, and friends.

APPROVAL

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master Computer Science (Distributed Computing). The members of the Supervisory Committee were as follows:

En Ahmad Alauddin Bin Ariffin
Faculty of Computer Science and Information Technology
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Date: January 2018

DECLARATION

I declare that the thesis is my original work except for the quotations and citations which have been duly acknowledged. I also declare that it has not been previously submitted for any other degree at Universiti Putra Malaysia or at any other institutions.

Signature : _____

Name and Matric No : **JULIZA BINTI AUZIR**

(GS45899)

Date : _____

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LIST OF ABBREVIATIONS

ECSP	:	Enhance Cloudlet Scheduling Policy
IRRCSA	:	Improved Round Robin Cloudlet Scheduling Algorithm
RRA	:	Round Robin Algorithm
QOS	:	Quality of Service
FCFS	:	First Come First Serve
TQ	:	Time Quantum
ET	:	Execution Time
RET	:	Remaining Execution Time
VM	:	Virtual Machine
LQ	:	Local Queue
GQ	:	Global Queue

CHAPTER 1

INTRODUCTION

1.1 Background

Cloud Computing has the potential to transform a large part of the IT industry, making software even more attractive as a service and shaping the way IT hardware is designed and purchased. Companies offering these computing services are called cloud providers and typically charge for cloud computing services based on usage, similar to how you are billed for water or electricity at home. Cloud computing [7] also refers to the delivery of computing as a service rather than product such as servers, storage, databases, networking, software, analytics, and many more over the cloud whereby shared resources and information are provided to users and other devices as a utility.

Cloud computing offer the flexibility, elasticity, and scalability to release resources with varying configuration to follow the requirement of applications. It also focuses on the development of scheduling technique to ensure distributed resources are efficiently utilized. It provides dynamically scalable integration of software and resources. This dynamic nature cause unprecedented failure in the cloud. Fault tolerance is the capacity of the system to detect and rectify the occurred fault fluidly. Several research works are still going on in the domain of cloud computing and many traditional methods are used to highlight the parameters involved in Quality of Services

(QoS) of cloud. QoS is associated with several parameters used to guarantee a service level such as performance, availability, and reliability.

Quantifying the performance of provisioning policies in a cloud computing environment for different applications models is extremely challenging in cloud computing. To ensure cloud services proficient in environment, one of the challenges is to provide efficient cloudlet scheduling policy. The cloudlet scheduling policy [5,6] play a key role as a lead to improve overall system performance such as minimizing the turnaround time, waiting time and context switching. Hence, a proper scheduling policy may lead to enhance the QoS of the overall system.

In this paper, we emphasize and evaluate the QoS parameter by performed result comparison with previous work – Improved Round Robin Cloudlet Scheduling Algorithm (IRRCSA) and Round Robin Algorithm (RRA). CloudSim Toolkit will be used to improved cloudlet scheduling algorithm as well as QoS performance by providing better turnaround time and waiting time. In addition, this paper also will include reactive fault tolerance technique called resubmission as extended from previous work.

1.2 Problem Statement

In the domain of cloud computing [4], several research works are still going on focus on cloud computing performance. Based on the literature survey [1], it is found that little amount of research work has been done to emphasize

the QoS parameter evaluation. Cloud computing is a type of parallel and distributed system. It consists of collection of large-scale heterogeneous interconnected presented as one or more unified computing resources established through negotiation between the service providers and customers. It is an adoptable technology which provides integration of software and resources which are dynamically scalable. The dynamic environment of cloud will have caused various unexpected faults and failures.

In this domain, the background activities are completely abstracted from the user's concerns. Here, the end users can access the cloud based applications [7,8] as well as infrastructure through logging into a cloud interface. To ensure cloud services more proficient in cloud computing environment, challenging issues facing by engineer is to provide an efficient cloudlet scheduling policy as well as binding or allocating cloudlet to Virtual Machine (VM) in a heterogeneous cloud environment. The cloudlet allocation policy plays a very important role to improve the overall system performance and a proper allocation policy may lead to a good process of cloudlets to achieve robustness and dependability in cloud computing where failure should be accessed and handled effectively.

Refer to Round Robin Algorithm (RRA) [4], the Time Quantum (TQ) has been defined as 5 milliseconds and its give bigger effect to execution time (ET) for each cloudlet where the execution time will be decreased by the TQ. Means here, If ET is bigger than TQ, the cloudlets is pre-empted and added to the

tail of the LQ. This specification rule will caused cloudlets having long waiting time and turnaround time.

Refer to Improved Round Robin Cloudlet Scheduling Algorithm (IRRCSA) [4], this algorithm set the TQ for each cloudlet and using remaining execution time (RET) to give impact into cloudlets process. In this algorithm, RET is calculate using differences between ET and TQ. If RET is bigger than TQ, cloudlet will context switch and next cloudlet will continue process. Its mean cloudlet will drop and none fault tolerance is applied.

A solution to this problem is the use of simulation tools in purpose of evaluating and testing the cloud-computing model in a controlled and scalable environment, therefore generating specific results based on specific measurements. Hence, by taking two disadvantage mentioned in RRA algorithm and IRRCSA algorithm, this study analyse and improve cloudlet scheduling algorithm using CloudSim toolkit by providing better turnaround time, waiting time and adding fault tolerance function called resubmission as extended work.

1.3 Research Objectives

The primary objective of this project is to focus on the performance analysis by improve cloudlet allocation strategy and data center broker policy by providing better turnaround time and waiting time. The aim target and

objective to ensure the problem has been highlight can be investigated by proposed simple and efficient approach as follows:

1) To develop and enhance cloudlet allocation strategy and Data Center Broker policies in CloudSim Toolkit in order to submit cloudlets and VMs accordingly to the specific rules of the simulated scenario.
2) To emphasize and evaluate the QoS performance by performed result comparison with previous work algorithm, Improve Round Robin Cloudlet Scheduling Algorithm (IRRCSA) and Round Robin Algorithm (RRA). We considered turnaround time and waiting time as comparison.
3) To include fault tolerance function called resubmission by allowed data center broker to re-submit failure cloudlets either to the same or different virtual machine for execution as extended from previous work.

1.4 Research Scope

This research focuses on how to improve cloudlets scheduling using CloudSim by extend the cloudlet allocation strategy and implement Data Center Broker policies with suitable fault tolerance technique. We will setup the CloudSim frameworks which allow users to analyse the scheduling and conduct related performance testing by expanding few interfaces. Cloudlets are design and assigned to virtual machine by following the circular first come first serve (FCFS) manner. There are many different type of cloudlet scheduling [3, 9] algorithms present and two of them has been chosen in this

study from previous work, Improved Round Robin Cloudlet Scheduling Algorithm (IRRCSA) and Round Robin Algorithm (RRA). Besides, these studies choose reactive fault tolerance mechanism called resubmission technique as extended work.

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