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Resource Allocation Using Particle Swarm Optimization Algorithm in Cloud Computing

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Abstract: Cloud computing is now widely used in organisations and business firms because of its on-demand accessibility of framework assets, web innovation, and pay-as-you-go principle. Despite of numerous advantages of cloud computing, such as availability and accessibility, it also has few significant drawbacks. The most fundamental issue is the resource management, where Cloud computing provides IT assets such as memory, network, storage, and so on based on a virtualization concept and a pay-as-you-go model. Much research has gone into the administration of these assets. The suggested framework employs the particle swarm optimization algorithm method for assigning and performing the tasks of an application. The proposed algorithm will likely reduce task completion time, cost by utilizing the maximum resources. The proposed system is evaluated using the cloudsims toolkit.

Keywords: Particle swarm optimization algorithm, Resource allocation, Cloud computing.

I. INTRODUCTION

Cloud computing, because of the advancement of virtualization and Internet advances, Cloud processing has arisen as another figuring stage. Cloud computing can be characterized as a sort of conveyed framework comprising of an assortment of interconnected and virtualized PCs that are progressively provisioned. It gives at least one solidified processing resource dependent on help level arrangements (SLA) between the specialist organizations and administration buyers. Cloud figuring has a few difficulties (e.g., security, execution, resource the board, dependability, and so on). One of the resource management issue is identified with task planning. Undertaking planning on Cloud registering alludes to assigning the clients' errands on the accessible resource for further develop execution of undertakings, and increment resource usage. As the assignment of Cloud asset depends on SLA, the undertaking execution cost is viewed as one of the principle execution boundaries of the errand booking calculation. Then again, the assignment booking calculation is viewed as a perplexing interaction since it should plan countless undertakings into the accessible resource. In the opposite side, there are numerous boundaries that ought to be thought about to foster an errand booking calculation. A portion of these boundaries are significant from the Cloud client viewpoint (i.e., assignments Compilation time, cost, and reaction time). Different boundaries are significant from the Cloud supplier viewpoint (i.e., asset use, issue open minded, and force utilization). The assignment planning issue is viewed as NP-Complete issue. Accordingly, streamlining approaches could be utilized to tackle it by thinking about execution boundaries (i.e., fulfillment time, cost, asset use, and so on). The point of this paper is to foster an undertaking booking calculation in the Cloud figuring climate dependent on particle swarm optimization algorithm for dispensing and executing free assignments to further develop task culmination time, decline the execution cost, just as, boost asset use.

II. LITERATURE SURVEY

V. Vignesh, K. Sendhil Kumar, and N. Jaisankar proposed "Resource management and scheduling in cloud environment." The cloud providers require an efficient resource scheduling method to manage the increasing number of virtual machine requests. We try to study resource allocation techniques based on various matrices in this research, and it points out that some strategies are more efficient than others in some respects. As a result, the applicability of each method can differ depending on the application.

"Palanikkumar, D. and 2G. Kousalya [2] proposed Evolutionary Algorithmic Approach based Optimal Web Service Selection for Composition with Quality of Service".

Web services are a type of technology that allows for interconnection and flexibility between various dispersed applications across the Internet and intranets. In the Existing online services can be joined to create a online service when a client request can't be fulfilled by any one. When there is a numerous available online services, it is difficult to locate a online services composition execution path that will fulfill the given request, because the search space for this problem is exponentially growing.

In this study, we examine and contrast two algorithms for optimizing the problem of optimal online service selection.

R. Buyya, R. N. Calheiros and R. Ranjan, proposed "Modeling and simulation of scalable Cloud computing environments and the CloudSim toolkit: Challenges and opportunities,".

Cloud computing enables application specialised co-ops to rent server farm capabilities for delivering applications based on customer QoS (Quality of Service) requirements. Different component, layout, and organisation requirements apply to cloud applications. Measuring the display of asset assignment approaches and application booking calculations at higher levels of granularity in Cloud processing conditions for various application and administration models under varying burden, energy execution (power utilisation, heat scattering), and framework size is a difficult problem to solve.

To address this problem, we provide CloudSim, an expandable reenactment tool module that allows for the demonstration and replication of Cloud registration situations. The CloudSim tool cache allows for the presentation and production of at least one virtual machine (VM) on a reenacted Data Center hub, as well as the allocation of positions to suitable VMs. It also enables the recreation of numerous Data Centers, allowing for research into collaboration and related tactics for VM relocation for unwavering quality and programmed scaling of uses.

III. PROPOSED SYSTEM

The aim of proposed system is to conveniently distribute the unique duty to each of the cloud hosts in order to improve both asset utilisation and execution time. It distributes the upcoming tasks to all available VMs. To achieve adjusting and avoid blockage, the proposed calculation distributes tasks to the least stacked VM and prevents the distribution of assignments to a VM when the difference between this VM's preparation time and the normal handling season of all VMs is greater than or equal to a limit esteem. As a result, the overall reaction time and the host's preparation season are reduced.

A. Advantages

- 1) Load distribution between virtual machines is well balanced.
- 2) Quickness of execution.
- 3) Shorten the response time.

IV. FLOW CHART OF PROPOSED SYSTEM

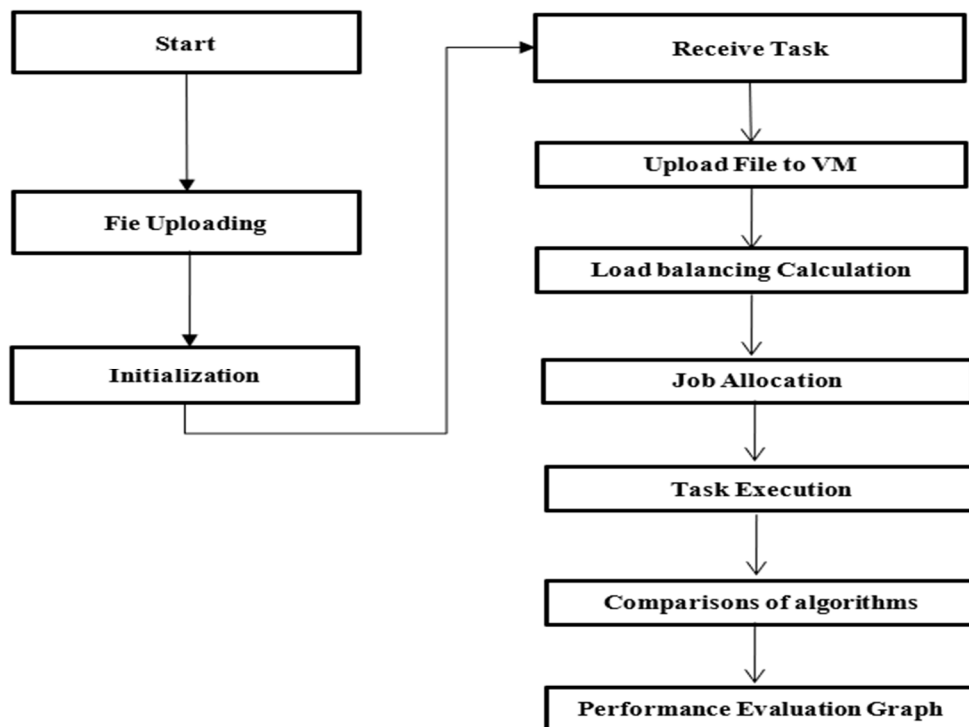


Fig 4.1 Flowchart Of Proposed system

V. METHODOLOGY

A. Algorithm Of Proposed System

1) Step1 : Initialization

Initialize position (X_i^t) and velocity (V_i^t) randomly for each particle

2) Step2 : Evaluate fitness value

Calculate fitness value for each particle

3) Step3 : For each particle calculate velocity and position

Calculate particle position by : $X_{ij}^{t+1} = X_{ij}^t + V_{ij}^{t+1}$

Calculate velocity : $V_{ij}^{t+1} = wV_{ij}^t + c_1r_1^t(pbest_{ij} - X_{ij}^t) + c_2r_2^t(gbest_{ij} - X_{ij}^t)$

4) Step4 : Find the current Global best value

5) Step5 : Update the global best value

6) Step6 : Output gbest and X_i^t

Where, X_i^t = position

V_i^t = velocity

w = inertia weight

c_1c_2 = two positive constants.

r_1r_2 = two random parameters

pbest = best particle position

gbest = best group position

PSO is a search optimization method that finds the best optimal solution. It is one of the algorithms that make up a simulation inspired by animal social behaviour. PSO algorithms work with a swarm of particles, each of which represents a problem solution in the search space. Each particle has two values: one represents the best personal experience (pbest), and the other indicates the best solution among all particles in the swarm (gbest). The particle position is determined by the difference between the prior and current positions, and the velocity is determined by the difference between the particles previous and current positions. Using the inertia w parameter, the particle velocity is utilised to govern particle mobility and prevent particles from falling into the local optima. PSO updates particle xi at iteration t to move the particle position in each iteration, and the velocity is then adjusted depending on the two best values and inertia w.

The constant constants c1 and c2 govern the particle acceleration values, with high values corresponding to previous sub-optimal solutions and low values allowing particles to fall into local optima. pbest is determined by the c1 constant, while c2 determines the c2 constant. Gbest is connected to how well the particle follows the swarm. The particle in question is a result of its own best location and the best position of its neighbours, the values are modified. The initialization of the particles with the available solutions is the first step in a normal PSO algorithm. The fitness function of each particle is then computed using established criteria to determine the best fitness value. Following that, each particles velocity and position are updated. Following that, the best value for each particle is chosen and compared to the pbest and gbest values. Finally, until a halting condition is met, these procedures are repeated.

VI. IMPLEMENTATION

A. Registration

It is the process of enrolling in the cloud or becoming cloud-enabled. Enrollment is required in order to schedule the task. During this method, your basic information, such as email and contacts, is retrieved and stored on the Cloud. A user cloud id will be generated automatically throughout the registration procedure.

Secret key: Every user should develop a secret key and use it to identify something when there is a strong probability that the identifier does not already exist or will exist to identify something else. Independent parties can use a secret key to label information, which can subsequently be incorporated into a single database or sent over the same channel without having to re-enter the information.

B. Initialization

We must initialise this module.

Datacenter: It's a collection of hosts or servers that supply infrastructure. The resources in a datacenter can be heterogeneous or homogeneous.

Hosts: A physical entity that serves as a resource for tasks.

Job: The task Service Broker determines which VM will supply the requested service.

CloudSim's VM allocation policies model the allocation of resources to tasks.

C. Uploading files

The amount of files that must be uploaded before the task may be scheduled. As if it were a file upload, the task is handled as such. Within the time limit, all of the files are uploaded to the cloud server. The cloudsim simulator is used for a variety of purposes. The feasibility of task scheduling, such as file uploading, is being investigated.

D. Identification of the Loads

Cloud Simulator is in charge of load balancing amongst virtual computers. We'll have to choose which virtual machine to use. Having the most available resource space We distribute jobs to virtual computers to accomplish load balancing. Then go ahead and make all of the necessary initializations. The amount of RAM, the broker id, the job id, and the host id of the Virtual machines.

E. Job Allocation

The fundamental concept is to assign jobs to the virtual machine until it becomes overloaded, i.e. the load on the virtual machine exceeds a threshold value. This VM is now processing fewer tasks than other VMs, and its processing time differs from the average processing time of all VMs by less than a value.

Transferring a file from the cloud to a virtual PC is one of our Task Scheduling tasks. When a VM example fails to arrive before the project deadline, new VM cases are assigned and the work is reassigned. A people group cloud is used in the proposed structure, which is made up of a collection of organisations. A short reaction time is crucial when all businesses and associations give their timesheets to the cloud. This is one of the most major obstacles influencing the local administration system. I'm also working on a handful of applications at the same time. The cloud scheduler is no longer capable of managing publicly accessible assets.

$$V_{ij}^{t+1} = wV_{ij}^t + c_1r_1^t(pbest_{ij} - X_{ij}^t) + c_2r_2^t(gbest_{ij} - X_{ij}^t)$$

And

$$X_{ij}^{t+1} = X_{ij}^t + V_{ij}^{t+1}$$

Where

$$i=1,2,3,\dots,p \text{ and } j=1,2,3,\dots,n$$

Eq.(1) indicates that there are three different contributions to a particle's movement in an iteration, hence it has three terms that will be studied further. Eq. (2), on the other hand, updates the particle positions. The inertia weight constant is parameter w , which is a positive constant value in the conventional PSO version. This is crucial for balancing the worldwide search, also known as exploration (when higher values are set), and exploitation, which is a type of local search (when lower values are set). It's possible to observe something interesting about this parameter that it is one of the most significant differences between the old PSO and various versions evolved from it.

F. Evaluation

Finally, we'll look at the performance of these four algorithms and create a comparison bar chart. The cloudsim simulator is used to assess the task scheduling overall performance.

VII. RESULTS

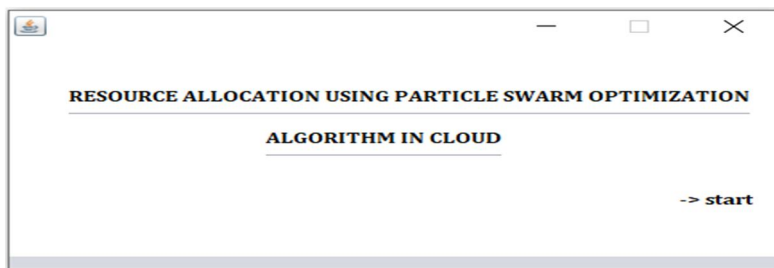


Fig 7.1 Home page

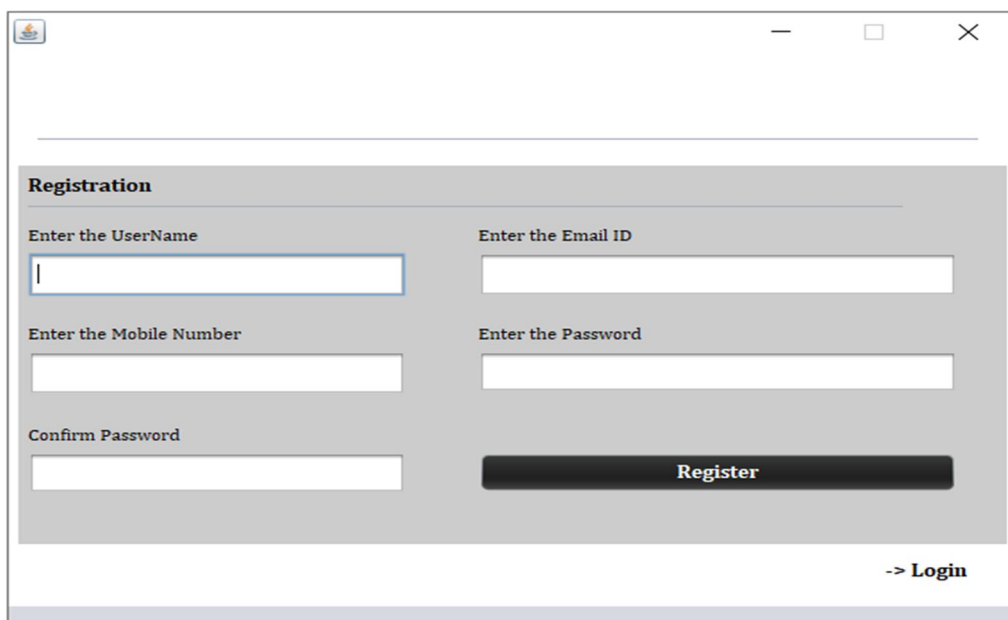


Fig 7.2 Registration page

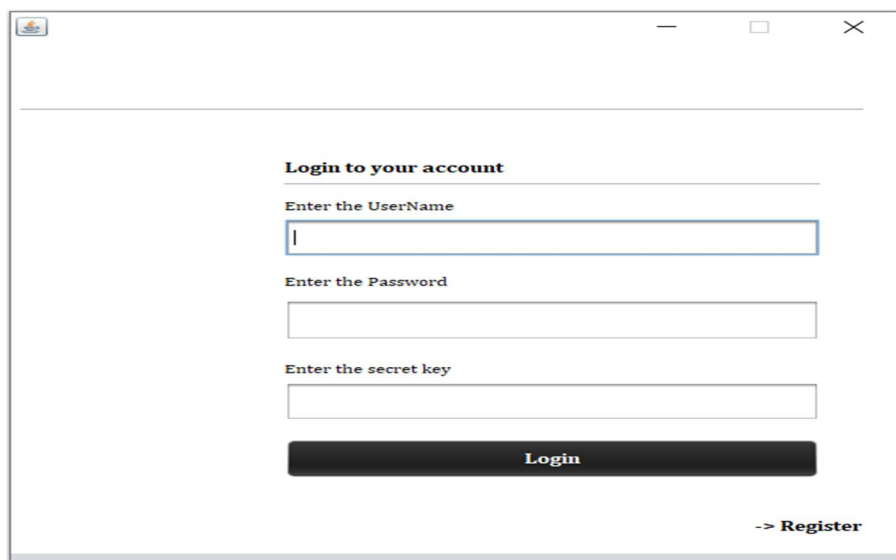
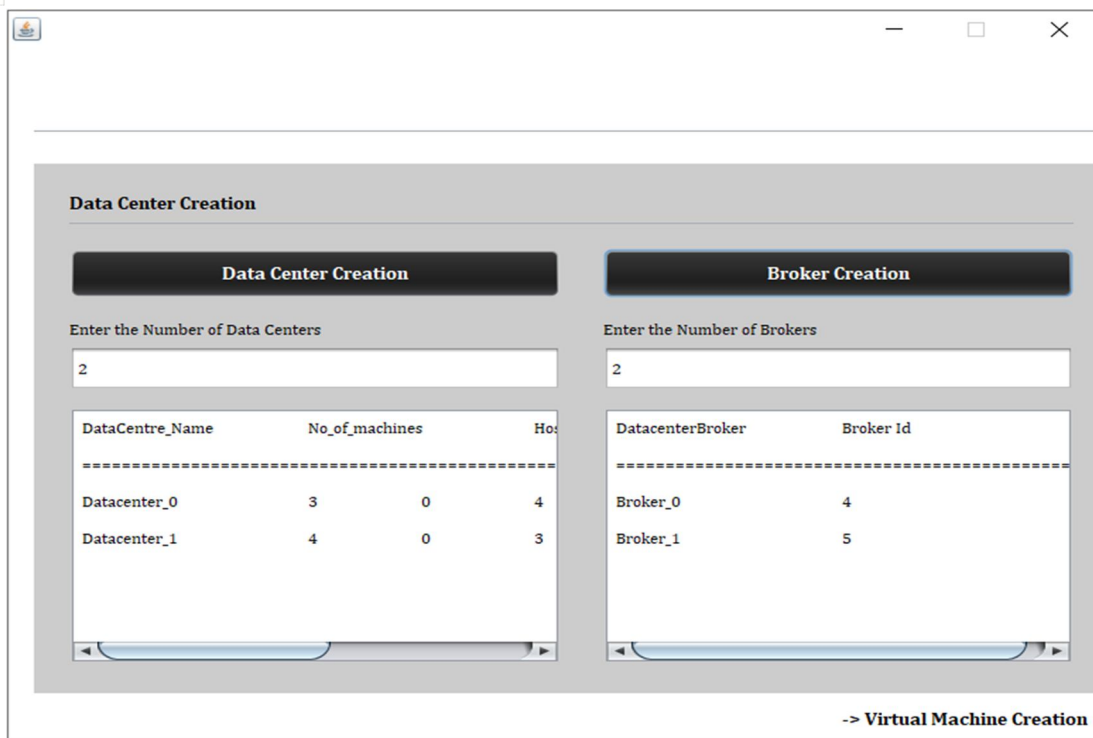


Fig 7.3 Login page



Data Center Creation

Enter the Number of Data Centers

2

DataCentre_Name	No_of_machines	Host
Datacenter_0	3	0
Datacenter_1	4	0

Broker Creation

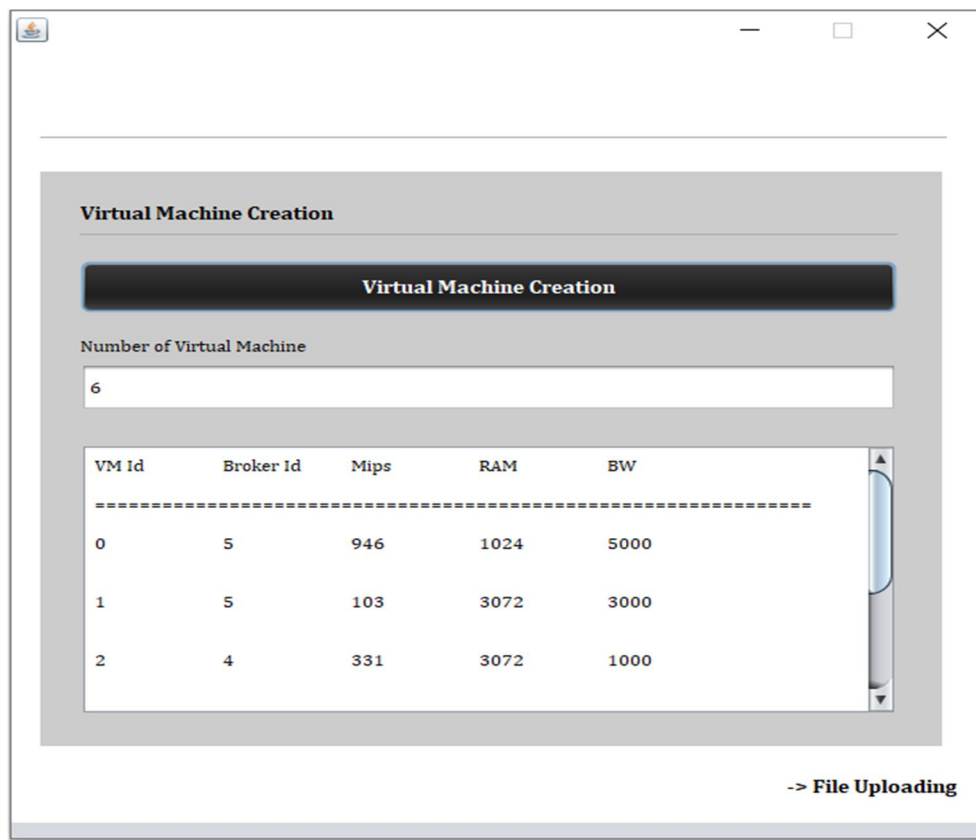
Enter the Number of Brokers

2

DatacenterBroker	Broker Id
Broker_0	4
Broker_1	5

-> Virtual Machine Creation

Fig 7.4 Initialization of Datacenters and Brokers



Virtual Machine Creation

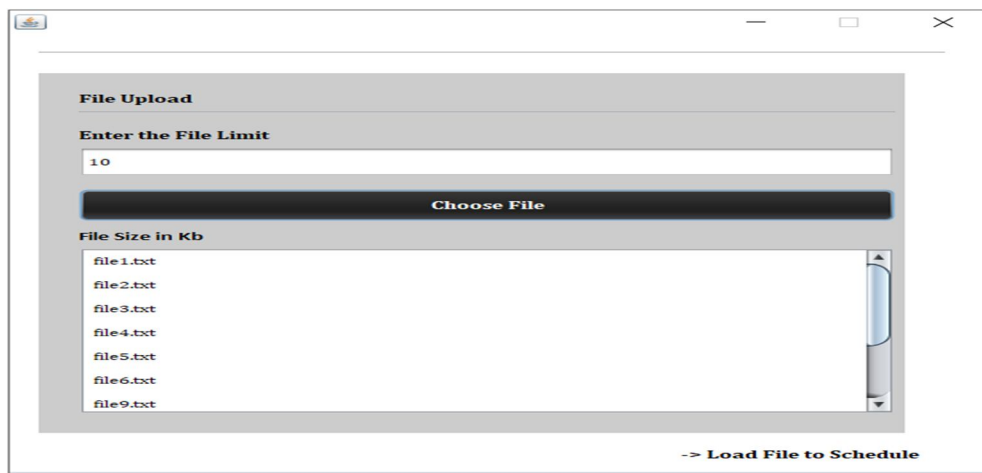
Number of Virtual Machine

6

VM Id	Broker Id	Mips	RAM	BW
0	5	946	1024	5000
1	5	103	3072	3000
2	4	331	3072	1000

-> File Uploading

Fig 7.5 Initialization of VMs



File Upload

Enter the File Limit

10

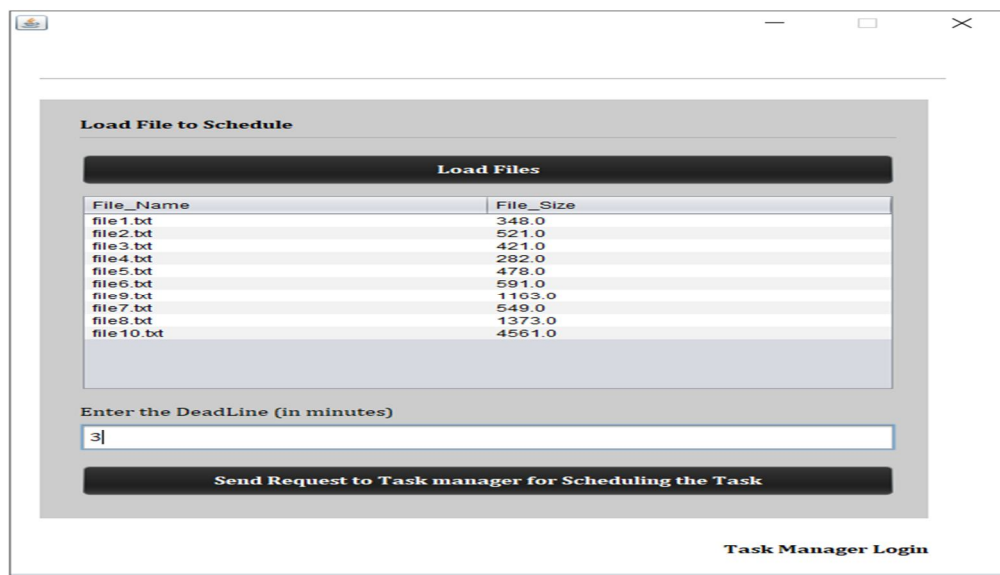
Choose File

File Size in Kb

file1.txt
file2.txt
file3.txt
file4.txt
file5.txt
file6.txt
file9.txt

-> Load File to Schedule

Fig 7.6 Uploads files



Load File to Schedule

Load Files

File_Name	File_Size
file1.txt	348.0
file2.txt	521.0
file3.txt	421.0
file4.txt	282.0
file5.txt	478.0
file6.txt	591.0
file9.txt	1103.0
file7.txt	549.0
file8.txt	1373.0
file10.txt	4561.0

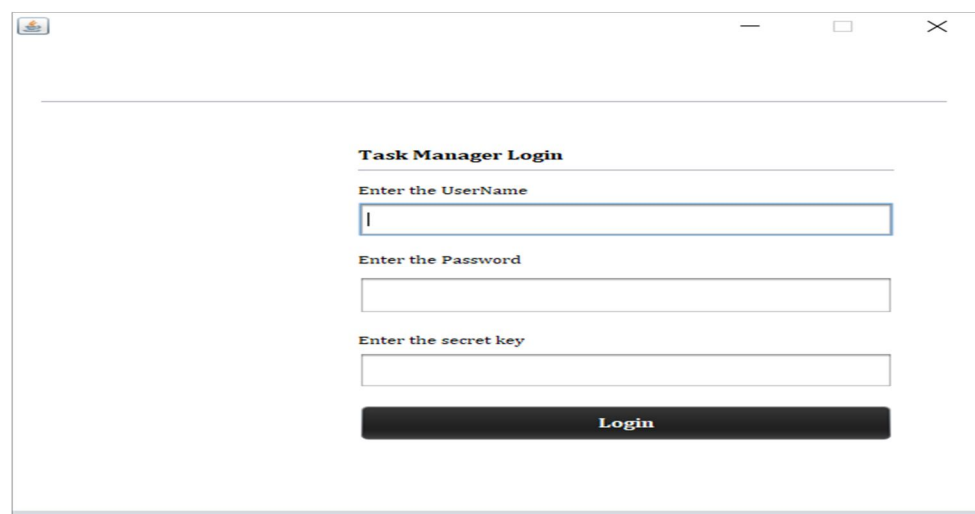
Enter the DeadLine (in minutes)

3

Send Request to Task manager for Scheduling the Task

Task Manager Login

Fig 7.7 Load files to schedule



Task Manager Login

Enter the UserName

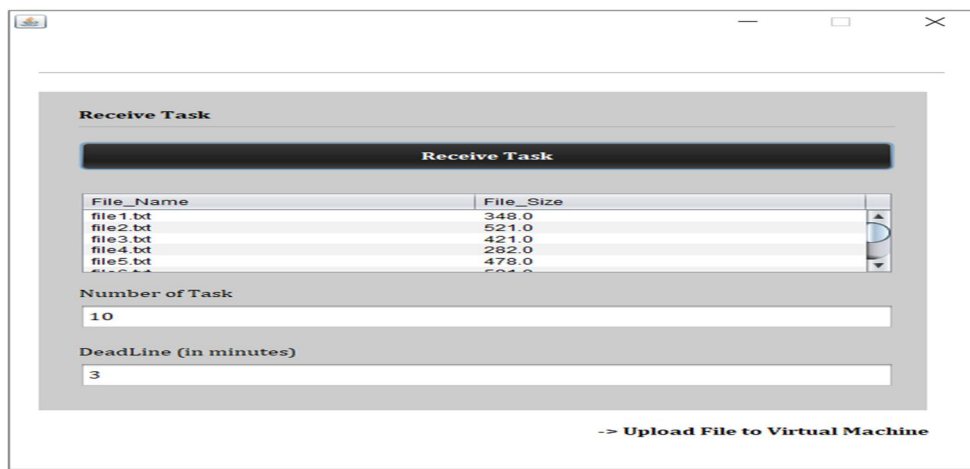
|

Enter the Password

Enter the secret key

Login

Fig 7.8 Taskmanager login



Receive Task

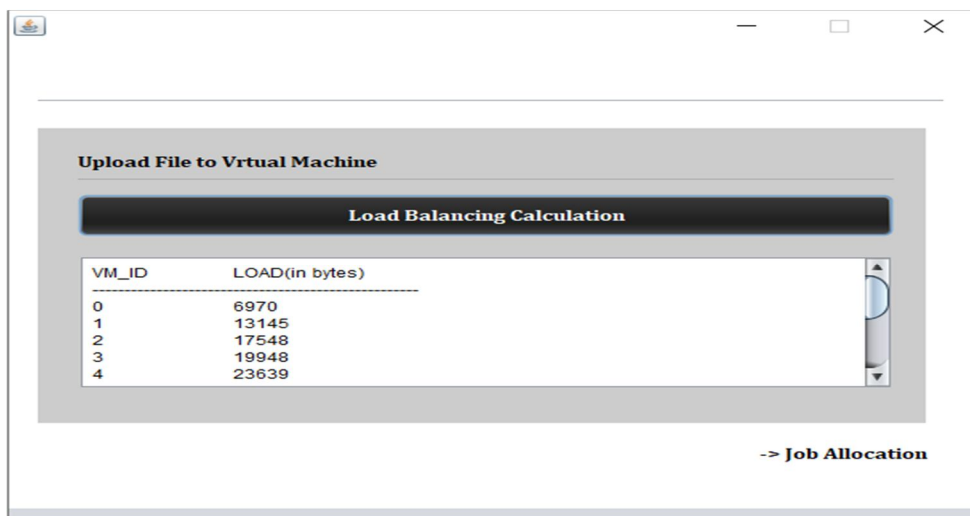
File_Name	File_Size
file1.txt	348.0
file2.txt	521.0
file3.txt	421.0
file4.txt	282.0
file5.txt	478.0
file6.txt	591.0
file9.txt	1163.0
file7.txt	549.0
file8.txt	1373.0
file10.txt	4561.0

Number of Task:

DeadLine (in minutes):

-> Upload File to Virtual Machine

Fig 7.9 Receive tasks



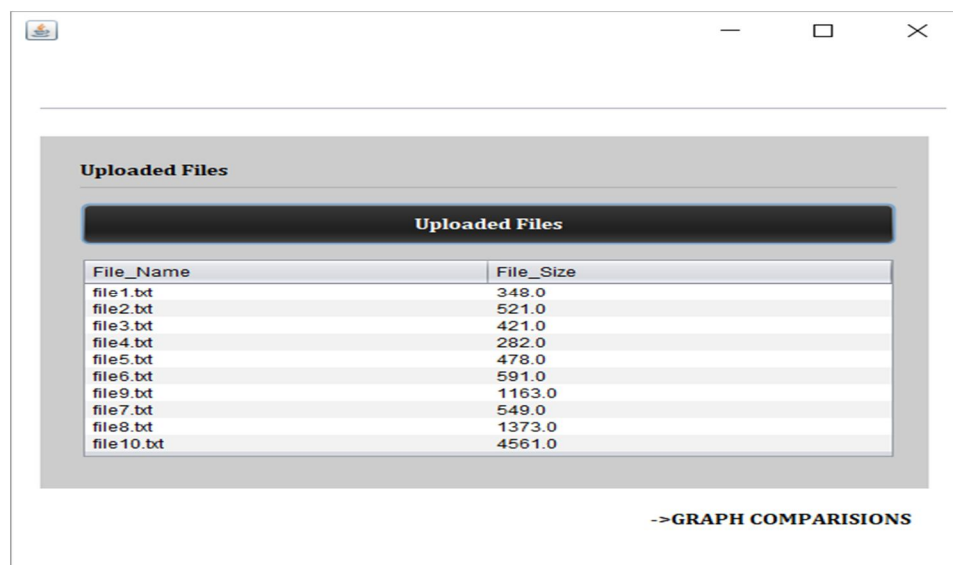
Upload File to Virtual Machine

Load Balancing Calculation

VM_ID	LOAD(in bytes)
0	6970
1	13145
2	17548
3	19948
4	23639

-> Job Allocation

Fig 7.10 Load balancing

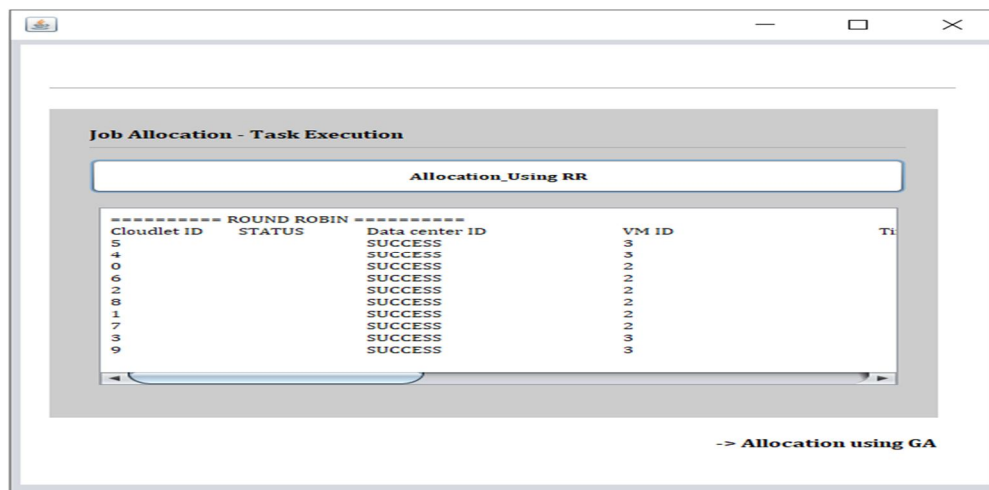


Uploaded Files

File_Name	File_Size
file1.txt	348.0
file2.txt	521.0
file3.txt	421.0
file4.txt	282.0
file5.txt	478.0
file6.txt	591.0
file9.txt	1163.0
file7.txt	549.0
file8.txt	1373.0
file10.txt	4561.0

->GRAPH COMPARISONS

Fig 7.11 Files uploaded



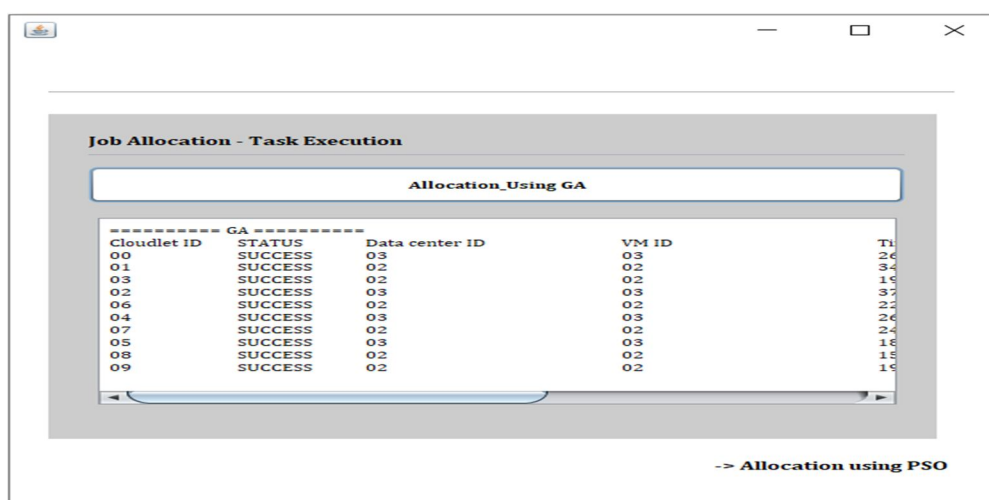
Job Allocation - Task Execution

Allocation_Using RR

Cloudlet ID	STATUS	Data center ID	VM ID	Time
5	SUCCESS	03	03	26
4	SUCCESS	02	02	34
0	SUCCESS	02	02	19
6	SUCCESS	02	02	37
2	SUCCESS	02	02	23
8	SUCCESS	02	02	18
1	SUCCESS	03	03	20
7	SUCCESS	02	02	21
3	SUCCESS	03	03	24
9	SUCCESS	03	03	28

-> Allocation using GA

Fig 7.12 Allocation using Round robin



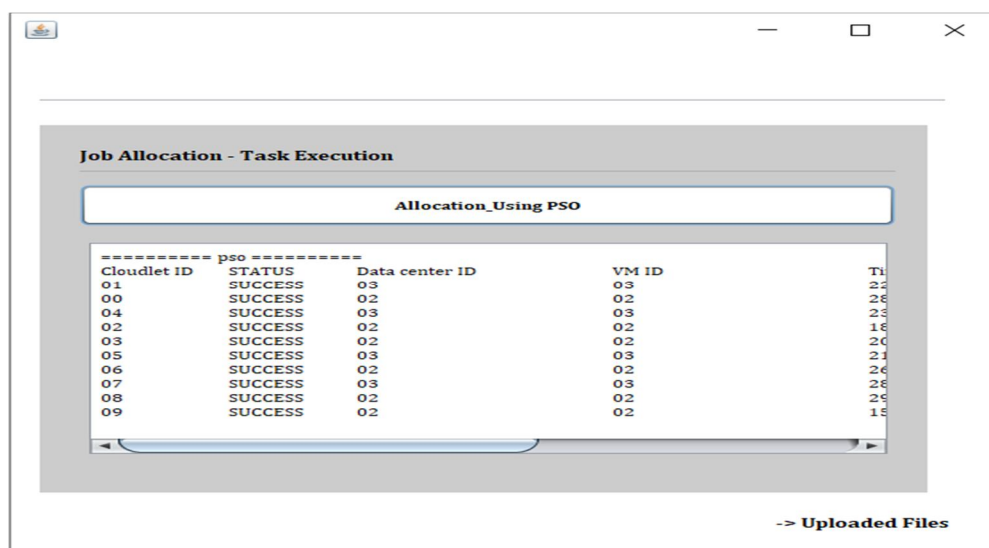
Job Allocation - Task Execution

Allocation_Using GA

Cloudlet ID	STATUS	Data center ID	VM ID	Time
00	SUCCESS	03	03	26
01	SUCCESS	02	02	34
03	SUCCESS	02	02	19
02	SUCCESS	03	03	37
06	SUCCESS	02	02	23
04	SUCCESS	03	03	21
07	SUCCESS	02	02	24
05	SUCCESS	03	03	18
08	SUCCESS	02	02	15
09	SUCCESS	02	02	19

-> Allocation using PSO

Fig 7.13 Allocation using Genetic algorithm



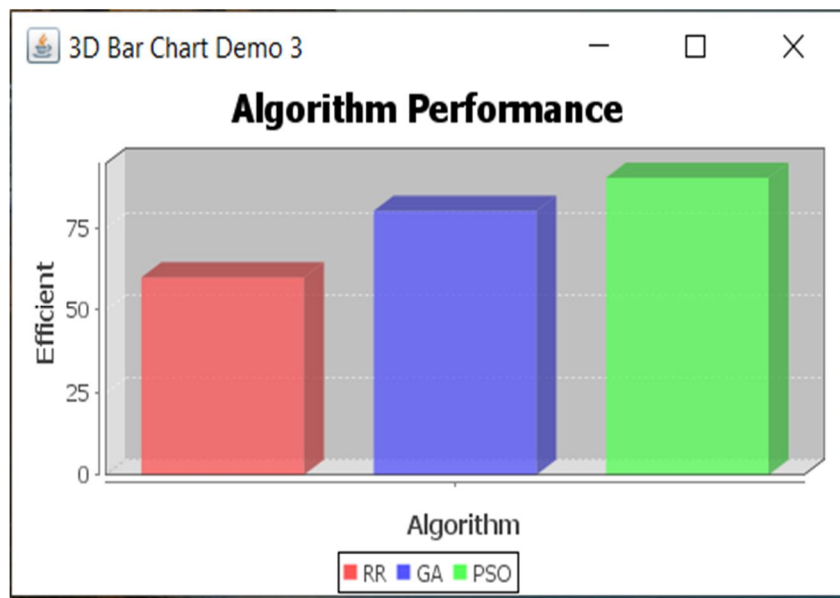
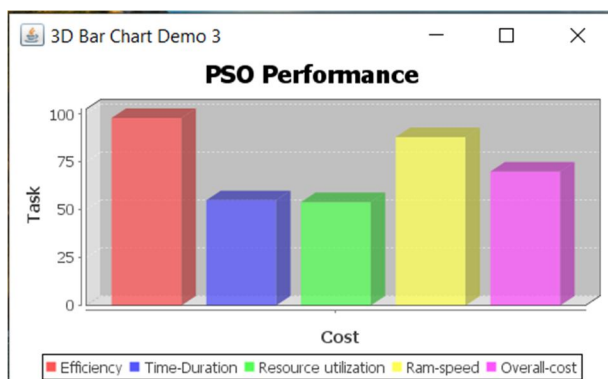
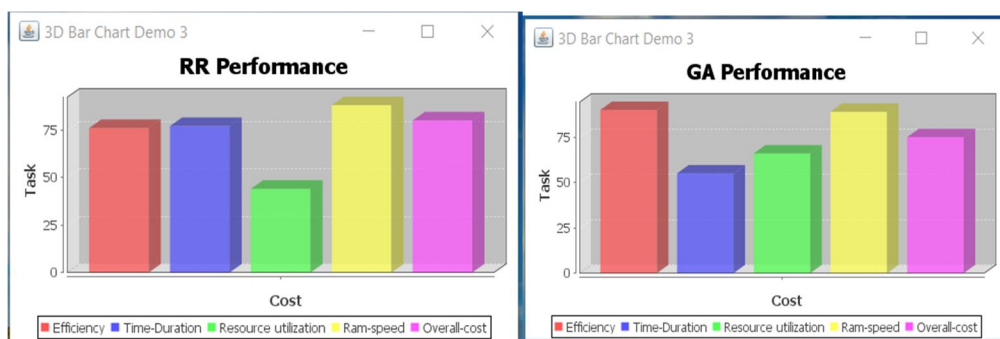
Job Allocation - Task Execution

Allocation_Using PSO

Cloudlet ID	STATUS	Data center ID	VM ID	Time
01	SUCCESS	03	03	22
00	SUCCESS	02	02	28
04	SUCCESS	03	03	23
02	SUCCESS	02	02	18
03	SUCCESS	02	02	20
05	SUCCESS	03	03	21
06	SUCCESS	02	02	24
07	SUCCESS	03	03	28
08	SUCCESS	02	02	29
09	SUCCESS	02	02	15

-> Uploaded Files

Fig 7.14 Allocation using PSO



VIII. CONCLUSION

This project effectively schedules work by reducing task completion time and cost while maximising resource utilisation. The cloudsim simulator is utilised in this research to effectively evaluate the task scheduling performance.

The proposed algorithm can be modified in the future to include the possibility of dynamic virtual machine characteristics using a run Genetic algorithm. Furthermore, more characteristics can be added based on the needs of the consumer.

IX. ACKNOWLEDGEMENT

While bringing out this project to its final form, I came across a number of people whose contributions in various ways helped my field of research and they deserve special thanks. It is a pleasure to convey my gratitude to all of them. First and foremost, I would like to express my deep sense of gratitude and indebtedness to my supervisors Dr.E.Padmalaatha and Mr.B.Ramana Reddy for his valuable encouragement, suggestions and support from an early stage of this research and providing me extraordinary experiences throughout the work. I am also thankful to the Head of the Department Dr. Y. Rama Devi for providing excellent infrastructure and such a nice atmosphere for completing this project successfully. Finally, I would like to take this opportunity to thank my family and friends for their support throughout this work. I also sincerely acknowledge and thank all those who gave directly or indirectly their support in completion of this work.

REFERENCES

- [1] Muthuram I and G. Kousalya, "GAF – Genetic Algorithm based Framework for Cloud Resource Scheduling," International Conference on Dependable, Autonomic and Secure Computing Vol. 1, 2017.
- [2] Dr. D. I. George Amalarethnam, T. Lucia Agnes Beena, "Workflow Scheduling for Public Cloud Using Genetic Algorithm (WSGA)," IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p-ISSN: 2278-8727, Volume 18, Issue 3, Ver. V (May-Jun. 2016), PP 23-27.
- [3] Yuqing Li, Shichuan Wang, Xin Hong, Yongzhi Li, " Multi-objective Task Scheduling Optimization in Cloud Computing based on Genetic Algorithm and Differential Evolution Algorithm," 37th Chinese Control Conference (CCC), IEEE Xplore: 08 October 2018
- [4] A. S. Ajeena Beegom, M. S. Rajasree, "Genetic Algorithm Framework for Bi-objective Task Scheduling in Cloud Computing Systems," International Conference on Distributed Computing and Internet Technology ICDCIT 2015: Distributed Computing and Internet Technology pp 356-359, Springer 2015.
- [5] Yamin Thet Htar Hlaing, Tin Tin Yee, "Static Independent Task Scheduling on Virtualized Servers in Cloud Computing Environment", International Conference on Advanced Information Technologies (ICAIT) 2019.
- [6] S. K. Panda and P. K. Jana, "Efficient task scheduling algorithms for heterogeneous multi-cloud environment," Super computer., vol. 71, no. 4, pp. 1505–1533, Jan. 2015.
- [7] S. Ravichandran and D. E. Naganathan, "Dynamic Scheduling of Data Using Genetic Algorithm in Cloud Computing," International Journal of Computing Algorithm, vol. 2, pp. 127-133, 2013.
- [8] V. Vignesh, K. Sendhil Kumar, and N. Jaisankar, "Resource management and scheduling in cloud environment," International Journal of Scientific and Research Publications, vol. 3, p. 1, 2013.
- [9] V. V. Kumar and S. Palaniswami, "A Dynamic Resource Allocation Method for Parallel Data Processing in Cloud Computing," Journal of computer science, vol. 8, p. 780, 2012.
- [10] Z. Zheng, R. Wang, H. Zhong, and X. Zhang, "An approach for cloud resource scheduling based on Parallel Genetic Algorithm," in Computer Research and Development (ICCRD), 2011 3rd International Conference on, 2011, pp. 444-44.
- [11] K. Thyagarajan, S. Vasu, and S. S. Harsha, "A Model for an Optimal Approach for Job Scheduling in Cloud Computing," in International Journal of Engineering Research and Technology, 2013.
- [12] S. Singh and M. Kalra, "Scheduling of Independent Tasks in Cloud Computing Using Modified Genetic Algorithm," in Computational Intelligence and Communication Networks (CICN), 2014 International Conference on, 2014, pp. 565-569.
- [13] R. Buyya, R. Ranjan, and R. N. Calheiros, "Modeling and simulation of scalable Cloud computing environments and the CloudSim toolkit: Challenges and opportunities," in High Performance Computing & Simulation, 2009. HPCS'09. International Conference on, 2009, pp. 1-11.
- [14] J. S. Raj and R. M. Thomas, "Genetic based scheduling in grid systems: A survey," in Computer Communication and Informatics (ICCCI), 2013 International Conference on, 2013, pp. 1-4.
- [15] B. Kruekaew and W. Kimpan, "Virtual Machine Scheduling Management on Cloud Computing Using Artificial Bee Colony," in Proceedings of the International MultiConference of Engineers and Computer Scientists, 2014.
- [16] R. N. Calheiros, R. Ranjan, C. A. De Rose, and R. Buyya, "Cloudsim: A novel framework for modeling and simulation of cloud computing infrastructures and services," arXiv preprint arXiv:0903.2525, 2009.
- [17] R. Sahal and F. A. Omara, "Effective virtual machine configuration for cloud environment," in Informatics and Systems (INFOS), 2014 9th International Conference on, 2014, pp. PDC-15-PDC-20.
- [18] D. M. Abdelkader, F. Omara, "Dynamic task scheduling algorithm with load balancing for heterogeneous computing," system Egyptian Informatics Journal, Vol.13, PP.135–145, 2012.



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