ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 3, Issue 4, pp: (1-8), Month: October - December 2015, Available at: www.researchpublish.com

An Optimal Approach for Resource Consumption in Cloud Computing

[1]Vineetha B, [2]Anil Kumar G

[1]PG student Dept of CS&E, [2]Associate Professor Dept of CS&E
[1,2]Channabasaveshwara Institute of Technology, tumkur-572 216

Abstract: **Cloud computing includes a variety of computational concepts which involves a large number of computers connected through a network called internet. Cloud computing is a model for distributed computing and it is said to be the product for evolution of calculation. This technology becomes widely used because of more and more researchers and applications on cloud computing. The main problem in cloud computation is to make a right decisions when allocating hardware resources to the tasks and also when dispatching the computing tasks to resource pool. It is a software level conflicts, which takes place when more than two jobs are looking for the same resources and both are unsatisfied with the existing one. Thus in order to overcome from such condition, resource scheduling algorithm is utilized. In order to simulate the problem and solution, a simulation using the Cloud Sim is developed. In this paper, the performances of all implemented algorithms are compared in terms of time and space complexity and their scheduling performance. The proposed algorithm found optimum and which delivers the high performance resource allocation.**

Keywords: **Cloud Computing, Resource Provisioning, Resource Scheduling, Virtual Machine, Ant Colony Optimiza tion Algorithm and Cloudsim Tools.**

I. INTRODUCTION

Cloud computing is a new generation computing infrastructure for providing the efficient computational experience in remote manner. The cloud computing enables the data sharing, data transfer, job execution, application hosting and resource sharing techniques for efficient computing. Using the cloud computing environment, a user can get and consumes software and computational resources in plug and play manner. The key advantage of this infrastructure is no need of installation and maintenance of software's and data. If users have internet connection then they directly gain the advantage of distributed computing. Due to computational resource sharing a significant amount of users are taking advantages of services. These services are delivered according to the user request and their requirements. Due to this a number of computational resources are organized in efficient manner for work execution.Cloud computing offers easy accessible computing resources of variable size and capabilities. This standard allows applications to rent computing resources and services on-demand, benefiting from dynamic allocation and the economy of scale of large data centers. We focus the problem of resource management for a large-scale cloud environment.

Fig. 1 Cloud Environments

As shown in Figure 1 it describes a corporation, organization or individual that uses a Web-based application for every task rather than installing software or storing data in a computer.

In cloud computing, applications are submitted for use of cloud resources by users from their terminals. The resources include computing power, communication power and storage. An application consists of number of tasks; users want to execute these tasks in an efficient manner. There are two possibilities of submission of tasks/data on resources; in one of them, task is submitted on the resources where the input data is available and in the other, on the basis of specific criteria, resource is selected on which both task and input data are transferred and where the task is submitted on a scheduler and data on a resource identified by the scheduler. Show the figure 2 general step of job scheduling in cloud computing. In this figure the main component is scheduler, information repository, resources. In cloud computing a user submits tasks to schedulers. Scheduler is connecting to the information repository it's call Cloud Information Services(CIS). It has all information about to the cloud resources and it also has some virtual privet network for any other don't access to database. Job scheduling techniques (ACO) will employee within the CIS. Scheduler is receiving tasks from user then scheduler is arranging the tasks according to criteria of tasks.

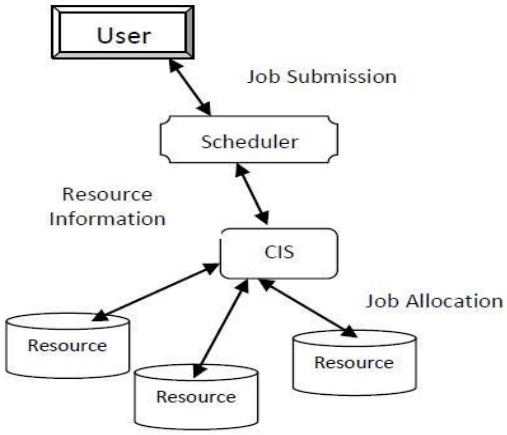

Fig.2 Scheduling Process in Cloud

Scheduler connects to CIS and gets information about the available resources and then scheduler compute to the resources. After compute the resources, tasks are submit on that resource which have high processing capabilities. The user submits the input data or tasks to the resource via CIS and finally user gets the output from the resource through the scheduler.

A. Resource Provisioning:

Generally, the services are provided to the clients by the Cloud Service Provider (CSP). Such services are namely, Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) and all these resources can be scheduled to the clients in cloud environment in a balanced and a cost-efficient manner with the application of scheduling algorithms, which balances the load condition on inputs.

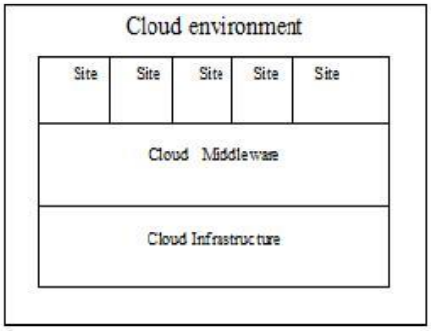

Fig.3: Overall working of the cloud environment

The CSP owns and administers the physical infrastructure, on which cloud services are provided. It offers hosting services to site owners through a middleware that executes on its infrastructure. This work contributes towards engineering a middleware layer that performs resource allocation in a cloud environment, with the following design goals:

***1) Performance objective*:** We consider computational and memory resources and the objective is to achieve reasonable fairness among sites for computational resources under memory constraints.

2) Adaptability: The resource allocation process must dynamically and efficiently adapt to changes in the demand from sites.

3) Scalability: The resource allocation process must be scalable both in the number of machines in the cloud and the number of sites that the cloud hosts.

B. Resource Scheduling:

For this work, computational resources (i.e., CPU) and memory resources of cloud are considered, which are available on the machines in the cloud infrastructure. Each machine runs a machine manager component given in that computes the resource allocation policy.There are so many scheduling algorithms are available in computational cloud such as FCFS, Round-Robin, Min-Min algorithm, Max-Min algorithm and meta-heuristic algorithms which includes GA, PSO, ACO and many more.

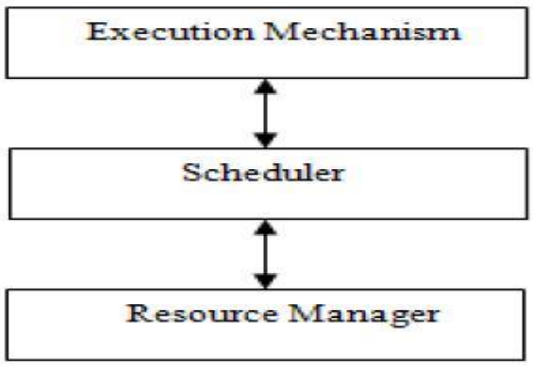

Fig.4: Resource Scheduling

The Figure 4 shows the general Resource Scheduling technique for improving the computational needs. Therefore it incorporates a resource manager and resource scheduler to schedule the task and their required computational resources, by which in less computational complexity the maximum task can be executed. Therefore the proposed study is intended to investigate different cloud computing resource management and resource provisioning techniques and proposes a new technique for improving the cloud scheduling. In this presented work the task and resource scheduling techniques are investigated for finding the optimum technique of resource management and allocation. Here, the main focus on scheduling of virtual machine and Cloudlet with various scheduling policies.

II. PROPOSED WORK

The scheduling and resource conflict issues can be handled using the optimization algorithms and techniques. The main objective of this work is to find optimum technique of the resource scheduling for optimizing the computational resource management and task scheduling. The entire study work is sub-divided in the following modules.

Study of resource scheduling techniques: In this phase different resource scheduling techniques are investigated and most optimum techniques are distinguished for resources and task scheduling.

Implementation and design of new resource scheduling techniques: In this phase using the optimization techniques a new algorithm is designed using the ACO (ant colony optimization algorithm) and implemented using Cloud Sim simulation tool.

Comparative performance study of proposed technique: In this phase the performance of the implemented technique is evaluated for finding the optimum resource scheduling and their computational complexity.

A. Problem Domain:

The cloud computing is adoptable for large scale service distribution, data storage, applications and data owner management for different business and educational domains. Therefore a huge computational infrastructure is required for computational services. These computing servers are built with OS which execute on multiprocessor architecture. The architecture of these multiprocessor OS are based on uniprocessor OS and their organizations. During job submission and execution, resource conflict and efficient resource provisioning problem arises. Therefore resource conflict in cloud systems is a situation that occurs when two concurrent processes, each waiting for the other to complete before proceeding. The result is that processes hang and not respond for a significant amount of time. Most commonly in multitasking and client/server environments these issues are much common. Therefore a new solution is desired for providing efficient scheduling with low resource consumption.

B. Solution Domain:

The scheduling and resource conflict issues can be handled using the optimization algorithms and techniques. Therefore for resolving the resource conflict and efficient job execution we need the modified ACO algorithm, which is desired to optimize using high-low normalization technique. By which the most jobs are satisfied with minimal number of available resources.

C. Simulation Architecture:

The proposed simulation architecture is given using figure 4. In this given system the different optimization and resource allocation algorithms are implemented namely back propagation neural network, space shared, time shared, ACO and modified ACO algorithm. And for selecting the algorithm an additional provision is made. User can select an appropriate scheduling algorithm which can work as the scheduler. In addition of that the generated work load is named here as job queue where the user submitted jobs take place. Additionally the available lists of resources are available. Scheduler accepts the available resources, jobs submitted and the scheduling algorithm. Scheduler uses the scheduling algorithm and find the optimum set of resources for satisfying the maximum jobs for execution. After evaluation the resources are allocated to the jobs for execution.

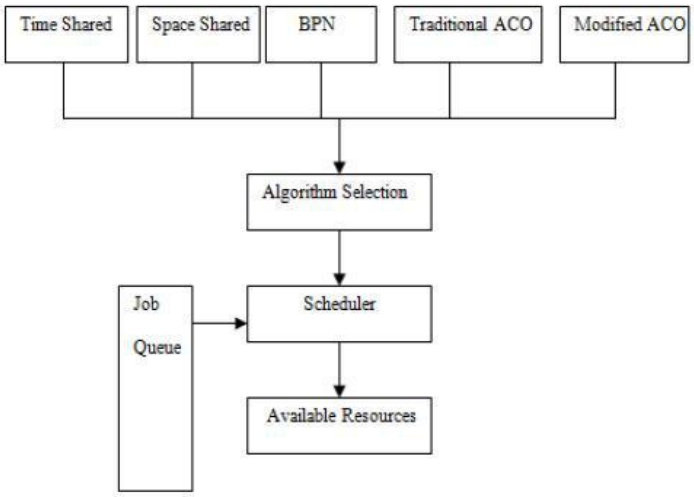

Fig.5: Simulation Architecture

1) Time Shared: Here, the operating system is considered on a time shared basis, in this kind of system the resources are shared on time basis, here the elapse time is increased if numbers of jobs in queue are increased.

2) Space Shared: In this scenario type of operating system is considered as the memory shared system. That is a high efficient system type, that increases the resource consumption, but the time required to execute a job is too small with respect to the time shared system.

3) BPN: In this scheduling technique the back propagation algorithm is selected for simulation. Using this system estimate the pattern of resource allocation and learn using historical pattern. After training the model is able to calculate the upcoming trend of jobs requirement and predict the resources which may best fit for solution.

ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 3, Issue 4, pp: (1-8), Month: October - December 2015, Available at: www.researchpublish.com

4) ACO: *The ACO was developed by Marco Dorigo in the early 1990's.*The ACO algorithm was first proposed and applied for the stationary TSP, which imitates the behavior of real ants when they search for food from their nest to the food sources. Ants communicate using pheromone, which is a chemical substance produced by them and is applied to their trails. The more pheromone on a specific trail shows higher the possibility of that trail to be followed by ants using this scheme, ants indirectly communicate and cooperate to complete their food searching task as efficiently as possible.

The advantage of ACO are applicable to a broad range of optimization problems, used in dynamic applications.

5) Proposed Algorithm (Modified ACO):

Ant colony optimization algorithm is a genetically inspired algorithm for finding the optimum solution. In this algorithm a number of solutions exist and among them an optimum solution that are best satisfying the problem is available. This technique minimizes the resource consumption and maximizes the job execution. Therefore the proposed algorithm is described as:

Let there are N number of jobs in the job queue and for executing the jobs the available resources I thus, the following procedure taken place.

1. Find available resources R[i]
2. List total jobs in job queue J[n]
3. Input the no. of iterations K, population size P
4. For p=0 to p<P
5. RR[p] ← random(R[p]);
6. End for
7. For k=0 to K
8. for each available solution in RR
9. If (RR[k] → satisfies (J[n]))
10. Estimate fitness F[k];
11. End if
12. End for
13. Find Fvalue=$\frac{1}{N}\sum_{k=1}^{N} F_k$
14. Initialize min[] and max[]
15. For i=0 to f.length ()
16. If F[i]<Fvalue
17. Min[i]← F[k];
18. Else
19. Max[i]←F[k];
20. End if
21. for each solution do
22. OS[i] = Combine (min[i], max[i]);
23. End for
24. Sort (OS[i]);
25. Return optimum

III. IMPLEMENTATION

Simulation Setup: This section describes the simulation development and their parameters by which the system is simulated.

Cloud Infrastructure Parameters: The simulation of the cloud environment using CloudSim discrete event simulator requires configuring first the cloud infrastructure, then after the simulation scenarios are necessary to be write down using codes.

TABLE I
CLOUD INFRASTRUCTURE PARAMETERS

S. No.	Parameters	Values
1	Number of Virtual Machine	20
2	Number of Cloudlets	40
3	VM Image Size	10000 MB
4	RAM	513MB
5	Number of Instruction	1000 MIPS
6	Processing Units	1

ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 3, Issue 4, pp: (1-8), Month: October - December 2015, Available at: www.researchpublish.com

Network Parameters: After finalizing the cloud infrastructure required to design simulation scenario, for that purpose some network parameters are also required to be utilized, the network setup is given using the below given table.

TABLE II

NETWORK PARAMETERS

S. No.	Parameters	Values
1	Resource length	1000
2	File Size	300MB
3	Host Memory	2048MB
4	Storage	1000000MB
5	Bandwidth	1000
6	Output size	300MB
7	Instructions per second for Host	1000

IV. RESULT ANALYSIS

This section reports the performance analysis of the proposed task scheduling strategy. In addition of that the comparative performance using different performance parameters are reported. The performance evaluations of the different implemented algorithms are given in two different phases: first the algorithm computational complexity and then after their scheduling ability.

1. Time Complexity: The amount of time required to process the available data for scheduling the jobs according to the available resources is known as the time complexity.

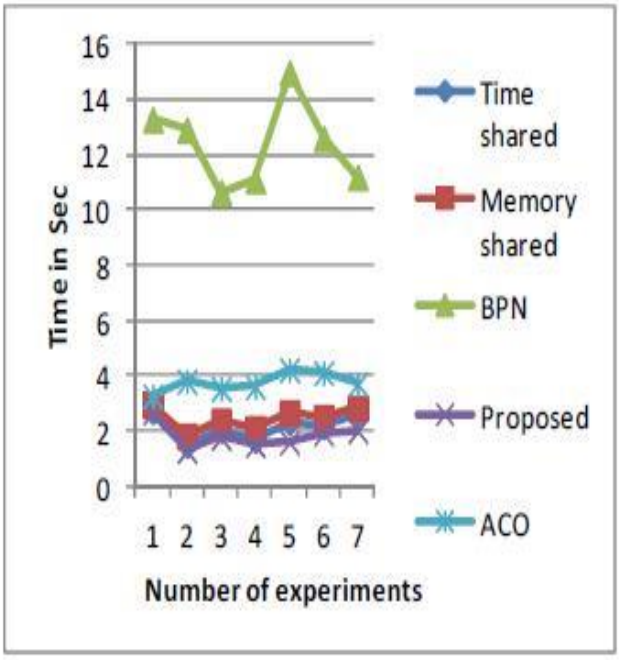

Fig.6: Time Complexity

The time consumption of the proposed system is given using figure 6. In this diagram the time consumption of all algorithms are estimated in terms of seconds and for demonstration the X axis shows the number of experiments and Y axis shows the consumed time in seconds. According to the obtained results the time consumption of the proposed system is very fewer than other algorithms.

2. Space Complexity: Here, the focus is the amount of main memory required for process the algorithm is known as the memory consumption of the system.

ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 3, Issue 4, pp: (1-8), Month: October - December 2015, Available at: www.researchpublish.com

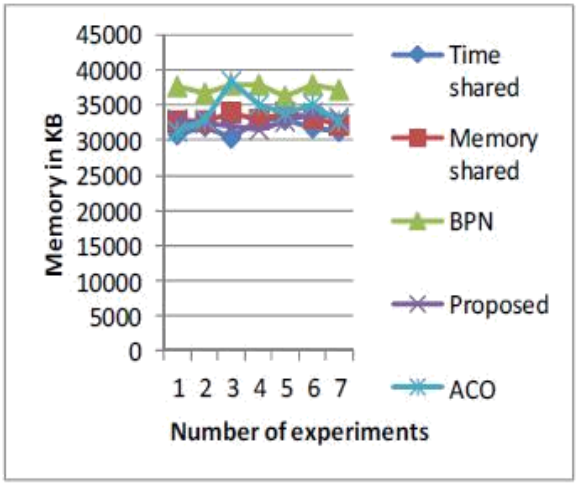

Fig. 6 Space Complexity

Figure 6 shows the memory consumption of the proposed simulation model. In this diagram the all algorithms are compared on the basis of memory consumption. For performance demonstration the X axis contains the different experiments performed and the Y axis contains the memory consumption in terms of kilobytes.

3. System Performance: The performance of scheduling of all algorithms are given using figure 6 where the X axis shows the different process in queue and Y axis shows the average CPU consumption in terms of seconds. According to the evaluated performance the proposed enhanced ACO (ant colony optimization) algorithm needs less CPU cycles for executing the entire jobs as compared to the traditionally available data models.

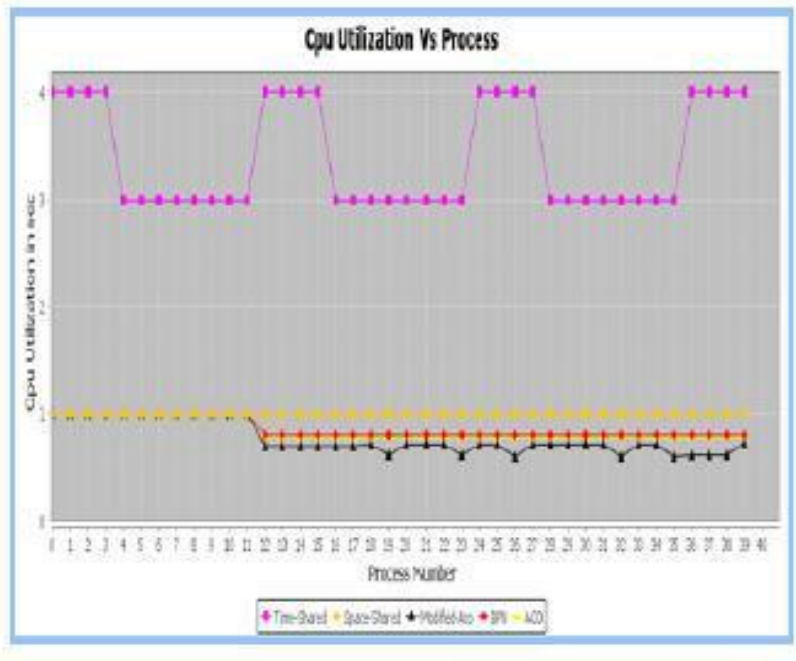

Fig.7: Performance Evaluation

V. CONCLUSION

Cloud computing is a promising and efficient computing technique for new generation computing. That promises to provide the applications and services in less cost and promising environment. The cloud computing faces two major problems,first privacy and security, another resource management and their scheduling. In this paper the cloud computing is investigated for their resource scheduling strategy and efficient resource allocation.

There are many number of resource scheduling techniques are evaluated and that is concluded, these optimization techniques are much helpful for resource allocation. Thus ACO algorithm is investigated and implemented and which produce desired output. Then a modified ACO algorithm is proposed for enhancing the ACO algorithm.

The modified ACO algorithm prepare a Fvalue using the mean fitness value of generated solutions and using this value the entire solutions are recomputed after combining them. We get the more efficient outcomes as a result in less number of iterations.Thus the ACO algorithm is used for resource scheduling and allocation of jobs. The implementation and simulation of the proposed ACO based scheduling algorithm is performed in Cloud Sim simulation tool and using JAVA technology.

After implementation of the important simulation, the presented algorithm is compared with two inbuilt algorithms, namely time shared and space shared. In addition of that, the proposed technique is also compared with the machine learning based back propagation algorithm and traditional ACO algorithm. After that the performances of all implemented algorithms are compared in terms of time and space complexity and their scheduling performance.

TABLE III

PERFORMANCE SUMMARY

S. No.	Parameters	Time Shared	Space Shared	BPN	ACO	Proposed
1	Space Complexity	Avg	High	High	Avg	Less
2	Time Complexity	Avg	High	High	Avg	Less
3	Scheduling Performance	Less	Avg	Avg	Avg	High

VI. FUTURE WORK

The aim of the proposed work is to study about the cloud computing and their simulation technique investigation. In addition of that the development of a resource allocation methodology by which the resource scheduling becomes optimum and enhancing the computing experience. In future the proposed technique can be enhanced more according to the need of computational host and also extended for fault tolerance methodology development. ACO algorithm that can be applied to clouds for improving the efficiency, resource utilization and energy consumption, can be applied to balance the load in clouds also the performance can also be increased by varying different parameters which would be the future research.

REFERENCES

[1] T. Arun Prakasam, D. Maruthanayagam, "Job Scheduling in Cloud Computing using Ant Colony Optimization", *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)*, vol. 3, February 2014.

[2] S. Khan, N. Sharma, "Effective Scheduling Algorithm for Load balancing (SALB) using Ant Colony Optimization in Cloud Computing", *International Journal of Advanced Research in Computer Science and Software Engineering*, vol. 4, February 2014.

[3] L. Zhu, Q. Li and L. He, "Study on Cloud Computing Resource Scheduling Strategy Based on the Ant Colony Optimization Algorithm", International Journal of Computer Science Issues, vol. 9, no. 2, September 2012.

[4] N. Asha, Dr. G. Rao , "A Review on Various Resource Allocation Strategies in Cloud Computing", *International Journal of Emerging Technology and Advanced Engineering*, vol. 3, July 2013.

[5] R. Mishra and A. Jaiswal, "Ant colony Optimization: A Solution of Load balancing in Cloud", *International Journal of Web & Semantic Technology*, vol. 3, pp. 33-50, 2012.

[6] K. Li, G. Xu, G. Zhao, Y. Dong, "Cloud Task Scheduling Based on Load Balancing Ant Colony Optimization", *IEEE*, 2011