ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 5, Issue 11, November 2017

An Improved Task Scheduling algorithm Based on PSO for Cloud Computing

Surinder Singh [1], Amit Ranjan [2]

P.G. Student, Department of CSE, Shri Ram Institute of Science & Technology, Jabalpur, M.P. India[1]

Assistant Professor, Department of CSE, Shri Ram Institute of Science & Technology, Jabalpur, M.P., India[2]

ABSTRACT: In the current scenario, Cloud computing carved itself as an emerging technology which enables the organization to utilize hardware, software and applications without any upfront cost over the internet. A very efficient computing environment is provided by cloud computing where the customers or several tenants are in need of multiple resources to be provided as a service over the internet. The challenge before the cloud service provider is, how efficiently and effectively the underlying computing resources like virtual machines, network, storage units, and bandwidth etc. should be managed so that no computing device is in under-utilization or over-utilization state in a dynamic environment. A good task scheduling technique is always required for the dynamic allocation of the task to avoid such a situation. Through this thesis we are going to present the new Algorithm based on task scheduling technique, which will distribute the load effectively among the virtual machine so that the overall response time (QoS) should be minimal. A comparison of this proposed Algorithm of task scheduling technique is performed on CloudSim simulator which shows that, this will outperform the existing techniques like FCFS, SJF and PSO Model techniques.

KEYWORDS: Cloud Computing, Task Scheduling, FCFS, SJF, PSO, QoS.

I. INTRODUCTION

Cloud computing is the emerging technology in distributed environment consisting of several data centers, servers, virtual machines, load balancers etc. which are connected intelligently. Further, the cloud deals with many things such as storing and retrieving of documents, sharing of multimedia, lending the related resources on pay-as-you go model and much more [1]. Even though there is much advancement in the era of computers and Internet of Things (IoT) with respect to responsiveness, reliability and flexibility, still there is a room for improvement in scheduling, optimal resource allocation and management algorithms since these algorithms come under NP-hard and NP-complete complexity classes. Hence, there is a need to address these set of challenging problems using different techniques. Efficient task scheduling and resource management is a challenging problem of distributed computing but it is still in its infant stage in spite of exhaustive research in recent years [2].
In this paper, different algorithms (FCFS, RR, MOPSO and PSO) are used to find the near-optimal resource allocation for dynamic cloud tasks to minimize the makespan that is the finishing time of the last job or maximum completion time. After that, an evaluation and comparative study of these approaches are provided. The simulation based experiments using CloudSim [3], studies the proposed approaches with respect to the performance compared to each other. The results from experiments show that the proposed algorithms are able to achieve better resource utilization and significantly outperform the compared methods on the basis of makespan and degree of imbalance.

II. RELATED WORK

In [4] Efficient Task Scheduling Multi-Objective Particle Swarm Optimization in Cloud Computing is proposed. A novel multi-objective PSO (MOPSO) algorithm has been developed based on new ranking strategy based on three mentioned objectives to speed up the process of finding the best VM. The three factors are TEC, ECT and size of VM. Rank

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 5, Issue 11, November 2017

calculation method is complex.In this approach, each particle is evaluated for one objective function at a time. Calculation of TEC is based on size of task.

In [5] Execution Analysis of Load Balancing Particle Swarm Optimization Algorithm in Cloud Data Center is proposed. This paper focuses on the reduction of Dirty memory during Live Migration of Virtual machine. The data center environment considered is Heterogeneous Environment where the physical hosts have different configurations. Each task is assigned a priority, and priority is allowed to run. Equal-Priority processes are scheduled in FCFS order. Priority can be defined by checking the update frequency of the pages of the task that increases the complexity of the method.

In [6] Virtual Machine-Based Task Scheduling Algorithm in a Cloud Computing Environment is proposed. This paper introduces a Greedy Particle Swarm Optimization (G&PSO) based algorithm to solve the task scheduling problem. It uses a greedy algorithm to quickly solve the initial particle value of a PSO derived from a virtual machine-based cloud platform. Initial solution found by using Greedy method does not yield good results. The updating threshold value will not find the best value of gbest as it depends on the initial solution of Greedy method.

In [7] An Improved Particle Swarm Optimization for Energy-Efficiency Virtual Machine placement is proposed. This paper proposes a solution based on particle swarm optimization (PSO) for the virtual machine placement in the heterogeneous data center. In this work, we improved the PSO method to fit with virtual machine placement in data centers. The proposed method is based on matrix allocation technique, where a probability value is calculated for each task. Based on this value a random fitness is assigned. The probability calculation method is not accurate and some approax values are used that results in poor selection of gbest.

In [8] An Effective Multi-Objective Workflow Scheduling in Cloud Computing: A PSO based Approach is proposed. In this paper, we present a PSO based workflow scheduling which consider two such conflicting parameters i.e., makespan and resource utilization. An effective initialization procedure as well as encoding scheme to map the tasks onto VMs has been proposed. ETC matrix has been generated based on multiplication factor.

The multiplication method is complex and challenging task. Weighted linear transformed fitness function that involves two parameters is based on task length, which is not suitable for smaller tasks.

III. PROPOSED ALGORITHM

A. Proposed Cloud Scheduling Architecture: Cloud has applications with fluctuating loads. The user lease resources from service provider in order to run these applications and thereby pay for using resources. When user stops using resources, it is returned to service provider. Proper scheduling method must satisfy users as well as cloud service provider with quality of service. The main motive of scheduling is to minimize execution time and throughput.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 5, Issue 11, November 2017

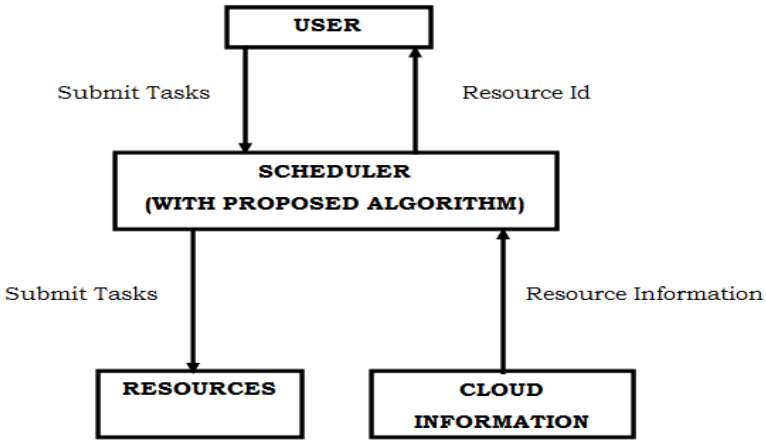

Fig 3.1: Cloud scheduling architecture.

Scheduler receives the tasks from users and all information regarding resources of cloud service provider, than perform scheduling according to proposed scheduling algorithm and return result to users.

B. Proposed Algorithm

In proposed system input is number of tasks and system will allocate virtual machines to these tasks. If numbers of tasks is less than or equals to numbers of virtual machines than simply assign task to available virtual machines otherwise perform task scheduling using PSO.

B. 1) Algorithm ProposedMain(task, VMs)

```
{
        TaskList=Empty
        Assign incoming task to taskList as per their arrival time
        TaskList={x1,x2,….,xn}
        m=number of VMs
        n=number of tasks
        Do
                If n>m than
                        Call ProposedSchedulingPSO(TaskList,VMs)
                Else
                        Assign all tasks from TaskList to VMs.
                End If
        While(TaskList is not empty)
}
```

B. 2) Algorithm ProposedSchedulingPSO (TaskList X, VMs)

```
{
        Assign Local Best (LBz) = 0
        Global Best (GB) = 0
        say VMs = vm0,vm1,vm2,...,vmk
        say Groups, Gz = g1, g2
        For all incoming requests xi Ɛ X i.e. x1,x2,x3,...,xn
                If task length of xi<=50 MB than
```

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 5, Issue 11, November 2017

```
                group Gz = least loaded VM from g2
        Else
                group Gz = least loaded VM from g1
        End If
        Assign each one of them as LBz from Gz
    End For
    Assign GB = least LBz
    Next task allocated to VM which contains GB
    If Next allocation = last used GB then skip
        goto step 2 for next least LBz
    Else
        goto step 6
    End If
}
```

IV. SIMULATION RESULTS

We have conducted several experiments to test the performance of proposed algorithm in terms of Execution time and this section also shows performance comparison between the proposed algorithm and existing scheduling algorithms like FCFS and Round Robin. Four data center and one scheduler are used for the simulation. A list of virtual machines has been created. Numbers of virtual machines are increased per evaluation to check the performance of proposed algorithm in each environment. During each evaluation, proposed algorithm has tested with different number of tasks. Below subsections shows the results of each evaluation.

MIPS of each virtual machine have been set to a static value. For current evaluation we are using four data centres each having fixed number of virtual machines. The data centres are given a fixed ID as 2,3,4,5 and 6. Every VM's has also assigned some fixed ID for evaluation purpose. Finally we are finding the execution time of each virtual machine that are allotted some task and the average value is calculated named as makespan. The tasks are known as cloudlet id and each algorithm are tested with different numbers of cloudlet id. Table below shows the comparisons of scheduling algorithm.

ALGORITHM / Task Size	FCFS ALGORITHM(MS)	RR ALGORITHM (MS)	PSO ALGORITHM (MS)	PROPOSED ALGORITHM (MS)
Task =30	6508.31	4929.9	5830.2	3267.1
Task =50	4806.7	6125.3	5549.2	2547.6
Task =100	4626.2	7872.6	8355.1	2856.8

Table1. Execution Time Comparison of Algorithms

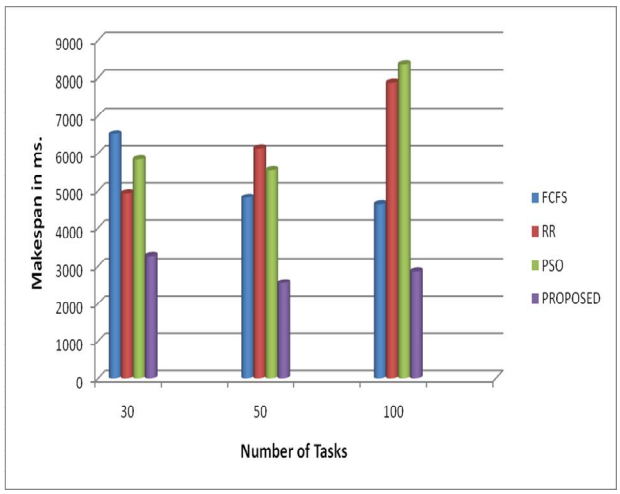

Figure 5.4: Comparison of Execution time.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 5, Issue 11, November 2017

Results of above evaluations show that proposed algorithm completes tasks execution with lower execution time and higher performance as compared to scheduling algorithms FCFS, Round Robin and existing PSO. Performance of proposed algorithm is better than FCFS, Round Robin and existing PSO for 30, 50 and 100 number of tasks. Results show that proposed algorithm behaves better in terms of Execution time. As we increased a number of tasks which are used for simulation, still the total length of scheduling for the proposed algorithm is less than the FCFS, round Robin and existing PSO.

V. CONCLUSION AND FUTURE WORK.

Issue of task scheduling is one of the main issues for cloud computing. Optimal task scheduling is essential for allocating resources, reducing the execution time, increasing throughput and decreasing the cost. Proposed work is an enhanced task scheduling algorithm for the cloud computing environment. The proposed algorithms is based on grouping of virtual machines and sorts them in ascending order of MIPS and group them in fast virtual machines and slow virtual machines. If expected execution time of task is low then proposed method assign task to slow virtual machines otherwise to fast group virtual machines. It reduces time because there is no need to take virtual machines from both categories every time. To evaluate the performance of the proposed algorithm, a comparative study has been done among the FCFS, Round Robin and existing PSO algorithms with respect to the execution time (i.e., make-span). The experimental results prove the efficiency of the proposed algorithm by minimizing make-span. So, the fairness has been satisfied at all levels. The proposed task scheduling algorithm could be further extended by considering dependent tasks, and also considering dynamic task scheduling.
In future hybrid task scheduling algorithm can also be developed. Work can be extended for heterogeneous environment also. Parallel and distributed task scheduling methods based on proposed work can also be developed. In future work the effect of precedence between tasks and load balancing will be considered. These methods can also be modeled according to cloud pricing models for providing more benefit to cloud service providers. Separate interface for task scheduling may be provided for cloud controller. The existing scheduling algorithm considered as topic of research and can be used to introduce more efficient and improved performance of algorithms based on parameters like trust value, execution rate, cost of the communication, speed and success rate.

REFERENCES

1. Y. Wang and W. Shi, “Budget-driven scheduling algorithms for batches of map reduce jobs in heterogeneous clouds,” IEEE Transactions on Cloud Computing, vol. 2, no. 3, pp. 306–319, 2014.
2. C.-W. Tsai, W.-C. Huang, M.-H. Chiang, M.-C. Chiang and C.-S. Yang, “A hyper-heuristic scheduling algorithm for cloud,” IEEE Transactions on Cloud Computing, vol. 2, no. 2, pp. 236–250, 2014.
3. Rodrigo N. Calheiros, Rajiv Ranjan, Anton Beloglazov, Cesar A. F. De Rose, and Rajkumar Buyya, "CloudSim: a toolkit for modelling and simulation of cloud computing environments and evaluation of resource provisioning algorithms," Software: Practice and Experience, vol . 41, no. I, pp. 23-50, 2011.
4. Entisar S. Alkayal, Nicholas R. Jennings, Maysoon F. Abulkhair,” Efficient Task Scheduling Multi-Objective Particle Swarm Optimization in Cloud Computing”, IEEE-2016.
5. Er. Sahil Sharma, Er.Manoj Agnihotri,” Execution Analysis of Load Balancing Particle Swarm Optimization Algorithm in Cloud Data Center”, IEEE-2016.
6. Zhifeng Zhong_, Kun Chen, Xiaojun Zhai, and Shuange Zhou,” Virtual Machine-Based Task Scheduling Algorithm in a Cloud Computing Environment”, IEEE-2016.
7. Foudil Abdessamia,Yu Tai, WeiZhe Zhang1, Muhammad Shafiq,” An Improved Particle Swarm Optimization For Energy-Efficiency Virtual Machine Placement”,IEEE-2017.
8. Shubham,Rishabh Gupta, Vatsal Gajera, Prasanta K. Jana, IEEE Senior Member,” An Effective Multi-Objective Workflow Scheduling in Cloud Computing: A PSO based Approach”,IEEE-2016.