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Credit Based Scheduling Using Deadline in Cloud Computing Environment

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ABSTRACT: In today's IT industry Cloud Computing provides effectual and coherent customer services. It provides pervasive, convenient, on demand, network access to a shared pool of configurable computing resources. Services provided by the cloud providers are mainly data storage, memory and software development platforms. Because of limited resources and large number of user, it is difficult to maintain the QoS (quality of service) requirements for cloud providers. Scheduling in cloud plays crucial role. To achieve maximum utilization and user satisfaction cloud providers needs to schedule their resources effectively. In this research we give a optimum scheduling technique to enhance the performance of clouds. We took credits, based on lengths, priority & deadline constraints, which resulted in enhanced performance in cloud computing environment.

KEYWORDS: Information Technology; Quality of Services; Cloud Computing; Computing Resources; Cloud Providers; Scheduling; Length Priority; Deadline.

I. INTRODUCTION

Cloud computing is a internet based computing where resources and information are shared among different devices on demand also called on-demand computing. Data and application are maintained in cloud computing through internet and central remote servers. cloud computing focuses on maximizing the effectiveness of the shared resources and providing convenient network access to a shared pool of configurable resources like networks, servers, storage, application and services.

The cloud model is composed of three service models named Iaas (Infrastructure as a service) , Paas (Platform as a service), Saas (Software as a service) and four deployment models called public, private, community and hybrid clouds. The main technology used in cloud computing is virtualization.

Virtualization uses the concept of dividing physical uses the concept of dividing physical computing device into different "virtual" devices which can be easily used and managed to perform computing tasks.

Cloud hosting deployment model represent the exact category of cloud environment. Deployment models explains the nature and use of cloud computing. According to our website requirement it is important to know which deployment model is to be used. There are primarily four deployment models public cloud, private cloud, community cloud, hybrid cloud.

Scheduling is a major task in a cloud computing. In cloud computing environment datacenters take care of this task. The datacenters receive tasks from datacenter broker which arrived from different users. In some cases these tasks may be associated with priorities. If so, a broker should consider these priorities and it is responsible for assigning the task. A better scheduling algorithm is needed to achieve full utilization of resources[1].

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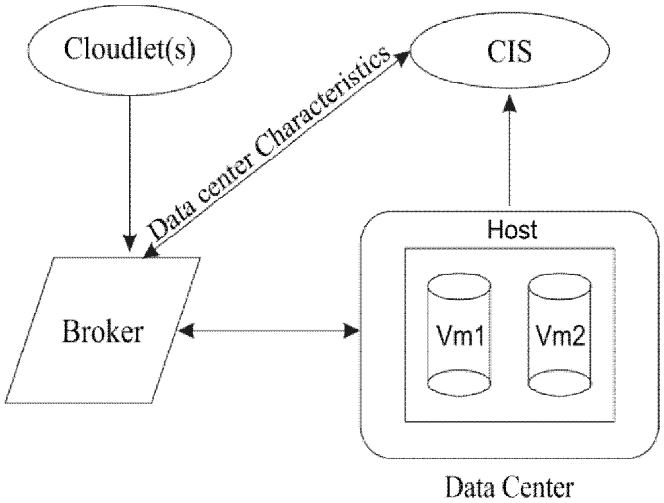

Fig. 1. Datacenter and Broker.

In cloud computing datacenter take care of scheduling. The datacenter receive tasks from different users[1]. Some tasks are associated with different priorities whereas some are associated with different lengths. Scheduling of these tasks are done accordingly. The main idea behind the proposed approach is considering task size, user priority and deadline of a task. Based on these parameters the execution order of the tasks will be considered by datacenter broker.

II. RELATED WORK

A lot of studies are taking place in cloud computing. Several scheduling algorithms are available today for cloud computing. Some of them are Allocation aware task scheduling[23], Credit based scheduling[1], Customer facilitated cost based scheduling[6], Cost based multi - QoS job scheduling[16] and Multi Objective task scheduling[2].

Load balancing algorithm increases the utilization of resources. Effective utilization is achieved by making use of idle resources while release the resources of processors having heavy load. The load balancing algorithm distribute the load among all the resources which are available. Load balancing algorithm can be classified into two ways static load balancing and dynamic load balancing algorithm. In resource allocation we have to select the available resources depending upon the specification of the task by using load balancing condition[25].

Five job scheduling algorithm[23] with some modifications are applied in cloud environment. The main aim of job scheduling algorithm is to improve the performance and quality of service and at the same time maintaining the efficiency and fairness among the job and reduce the execution time.

Job scheduling algorithm in cloud computing can be classified into two categories: Batch mode heuristic scheduling algorithm and online mode heuristic scheduling algorithm. In this paper various scheduling algorithm namely Short Job Scheduling, Job Scheduling Model based on Multi Objective Genetic Algorithm, Priority based Job Scheduling Algorithm, SLA - Tree and Enhanced Max min Task Scheduling Algorithm have been studied and analyzed. Based on their own experimental results it is shown that some of scheduling algorithms are beneficial to be used in cloud computing. Selection of job scheduling algorithm depends on problem need to be solved[23].

In Min Min algorithm the resource will be allocated to the task having minimum completion time. Min Min algorithm starts with a set of tasks. The algorithm chooses the task having minimum length. After completion the task it removed from the task set. The main issue of this algorithm is its consideration is only task length. Task priority and deadline are also important parameters in scheduling of task therefore these should be considered for scheduling[1].
The proposed algorithm provides an optimal scheduling method. Most of the algorithms schedule tasks based on single criteria (i.e. execution time). But in cloud environment it is required to consider various criteria like execution time, cost, bandwidth of user etc. This algorithm is simulated using CloudSim simulator and the result shows better performance and improved throughput[2].

Customer facilitated cost based scheduling (CFCSC) balances the load and minimizes the total monetary cost as compare to the HEFT algorithm. The CFCSC saves cost by using easier cost function[6].

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Cost based resource scheduling algorithm based on cost and availability of each resource. The resource with lowest cost is assigned to the task. But this algorithms having some limitation when user required high cost resources.

The multi objective task scheduling algorithm[2], for mapping tasks to a Vms in order to improve the throughput of the datacenter and reduce the cost without violating SLA for an application in cloud SaaS Environment. This algorithm provides an optimal scheduling method[2].

This credit for a length is assigned using a specific algorithm. Values are calculated for the different tasks based on their lengths in ascending order and credit are assigned on the bases of task length difference.

For assigning credits for priorities of different tasks it takes a division part. If the value of priority is 3 digits then division part is 1000 and if the value of priority is 2 digits then the division part is 100. On division part bases credits are calculated. The multiplication of these credits in done for number of tasks and total credits are calculated. Finally the task having highest credit is scheduled first[1].

III. PROPOSED WORK

The proposed approach considers three parameters namely

(i) Task Length.
(ii) Task Priority .
(iii) Task Deadline.

The algorithm is based on credit system. Each task is assigned a unique credit based upon these three factors. Credit are calculated using some particular algorithm for each parameter.

(i) Length based Credit:

Tasks executed in cloud having different lengths. If the tasks are arranged in ascending order that the shortest task is placed at first position in an array and the task having largest length is placed at last position.

The Credit system based on task length work as follow :

The first step is to finding the length of each task ($Tlen_i$). The next step is calculating the average of tasks. The next step is calculating the average of tasks length. Lets the value is len_{avg}. The third step is to calculate the difference in length with respect to len_{avg}.

Let the task set be T_1,T_2,T_3.....etc. Here equation (1) is used to finding the difference between length and average length. This data is useful when tasks are arranged in an array in increasing order of the tasks length. The proposed algorithm neither takes the smallest length nor the largest it takes the tasks from the middle of an array.

$$TLD_i = len_{avg} - Tlen_i \quad (1)$$

Where TLD_i is the difference of lengths of task i.

After finding this difference credits are assigned to each task. In this algorithm we are taking 5 credits and assigned for different conditions. 4 values are found from length array before these steps. Values should be in the range of task length. Values can be calculated as:

$$value\_1 = high\_len/5 \quad (2)$$

$$value\_2 = high\_length/4 \quad (3)$$

$$value\_3 = value\_1 + value\_2 \quad (4)$$

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value_4 = value_2 + value_3 (5)

Where high_len is the highest length of the task. Algorithm to find the credits of tasks are given below:

TLDi = len_{avg} -$Tlen_i$
If TLD_i<=value_1
then credit = 5
else if vlaue_1<TLD_i<=value_2
then credit = 4
else if vlaue_2<TLD_i<=value_3
then credit = 3
else if vlaue_3<TLD_i<=value_4
then credit = 2
else value_4>TLD_i
credit = 1
end For;

After this step every task is associated with a credit.

(ii) Task priority credit:

Priority is an important factor in scheduling. Every task may have different priority. Execution of each task depending on this priority. But problem arises when two tasks having same priority. But in this algorithm we assign credit due to which this problem not arises.

In this algorithm suppose we have 20 tasks then 20 credits are assigned, means each task having its own credit. Credits assigned based on priority are depending on division part.

For all submitted tasks in the set; Ti

Find out task with highest priority
Choose division_part
For each task with priority Tpri
find Pri_frac(i) = Tpri / divison_factor\
set credit as Pri_frac
End For;

Pseudo Code for assigning credit based on priority

(iii) Task deadline credit:

Deadline is an also important factor like length and priority for tasks in scheduling. Deadline is time provided to task if the task not executed in that time task will be terminated. So improve the efficiency this factor is important for our consideration. Tasks with small deadline should be executed first so they don't have to wait for long time.

In this we want to set the deadline for each task or cloudlet. In simulation we define deadline for task by ourselves. Because we want to know our algorithm can meet deadline constraint or not. One way to execute our task on fastest virtual machine and also on the slowest one. Then to find the deadline for a task using the following formula:

Deadline = Time (Fastest) + k * (Time(Fastest) - Time(Slowest))

K can be 0.1, 0.2, 0.3.....

Here we assign credits to the deadline of tasks. First of all, tasks are arranged in some order based on their deadline. The tasks with smallest deadline provided with the highest credit. Each task having its own credit based on their deadline. Suppose we have 10 tasks then 10 credits are assigned.

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$$Total\_Credit = Credit\_length_i * Credit\_Priority_i * Credit\_Deadline_i;$$

Where
Credit_length = Credits assigned for tasks length.
Credit_Priority = Credits assigned for tasks priority.
Credit_Deadline = Credits assigned for tasks deadline.
i = 1,2,3,3,.....n;

After finding the total credit for every task in task set. The task having the maximum credit value is executed first. This sequence of tasks is executed in the datacenter.

IV. SIMULATION AND RESULTS

The proposed algorithm is simulated in cloudsim 3.0.3 simulator. After comparing the makespan of cloudlets in the three algorithms, where first is based on task length, second is based on task priority, and third is based on task deadline, we observe that the proposed algorithm shows better results.

The simulation is done under the following conditions. Following tables describes the simulation conditions.

Number of Datacenters	1
Number of Cloudlets	20
Number of Brokers	1
Number of Hosts under Datacenter	2

Table1 Basic Configuration

RAM(MB)	16384
MIPS(Lines of Codes)	1000
Storage(MB)	1000000
Bandwidth(MB/Sec)	10000
Number of Virtual Machines	2

Table 2 Host Configuration

Host in the datacenter consists of several virtual machines. Each machine has its own configuration. Here same configuration is applied for each virtual machine. Virtual machine configuration is mentioned below:

Number of Cores	2
MIPS(Lines of Codes)	1000
Size(MB)	10000
RAM(MB)	512
Bandwidth(MB/Sec)	1000

Table 3 Virtual Machine Configuration

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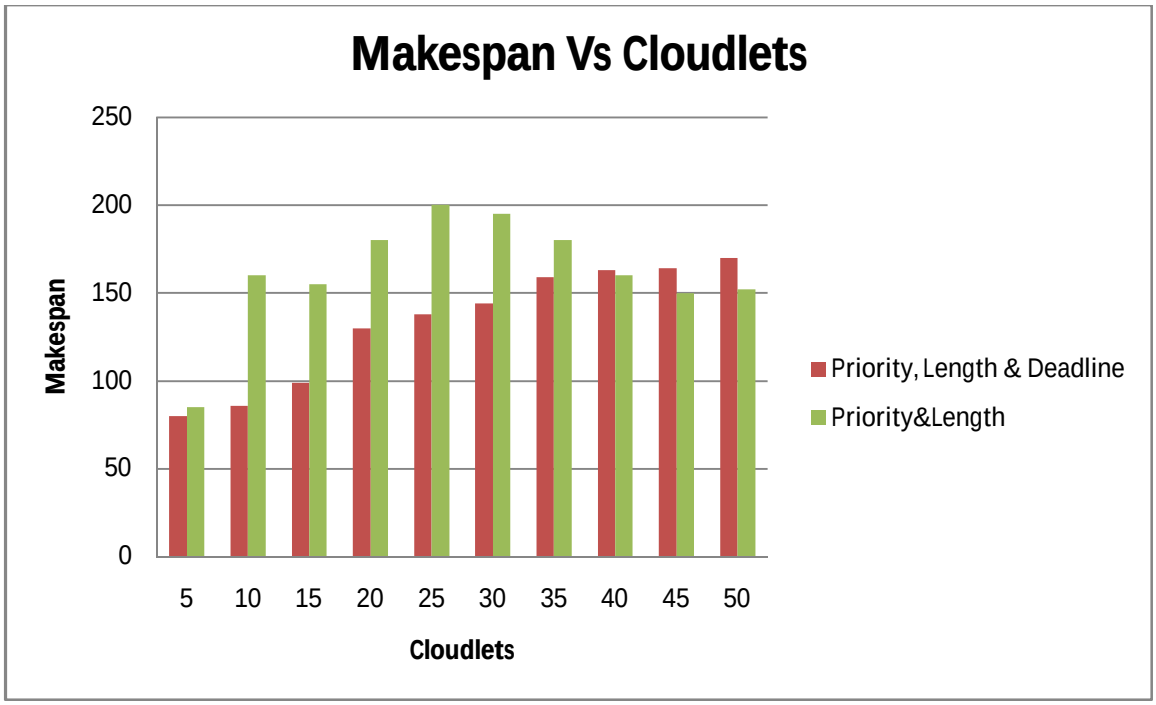

Fig 2 Shows the comparison of makespan among algorithms.

V. CONCLUSION AND FUTURE WORK

In this paper we introduce an algorithm based on credits for three parameters task length, task priority and task deadline. The proposed work is not depends on single factor for scheduling. Three important factors are considered for efficient workflows of tasks. Credits are used to reduce the makespan of tasks and execute all the tasks in cloud environment. Future work in this area might include the improvement of proposed scheduling formulation and algorithms considering the account costs of data transfer. We aim to work out a fast rescheduling algorithm based on factors like cost of resources including various other factors like length, priority and deadline.

REFERENCES

1. Antony Thomas, Krishnalal and Jagathy Raj V "Credit Based Scheduling Algorithm in Cloud Computing Environment, "International Conference on Information and Communication Technologies" (ICICT 2014).
2. AtulVikasLakraa and Dharmendra Kumar Yadav "Multi-Objective Tasks Scheduling Algorithm for Cloud Computing Throughput Optimization,"International Conference on Intelligent Computing, Communication & Convergence, Science 48, pp.107-113, 2015.
3. Kezia Rani, B. Padmaja Rani and A. VinayaBabu "Cloud Computing and Inter - Clouds Types, Topologies and Research Issues," 2nd International Symposium on Big Data and Cloud Computing (ISBCC'15), Science 50, pp. 24-29, 2015.
4. ChrysaPapagianni, ArisLeivadeas and SymeonPapavassiliou "On the Optimal Allocation of Virtual Resources in Cloud Computing Network" IEEE Transactions on Computers, Vol. 62, No. 6, 2013.
5. DavideTammaro, Elias A. Doumith, Sawsan Al Zahr, Jean - Paul Smets and Maurice Gagnaire "Dynamic Resource Allocation in Cloud Computing Environment Under Time - Variant Job Requests, "Third IEEE International Conference on Cloud Computing Technology and Science, 2011.
6. D.I. George Amalarethinam and T. Lucia Agnes Beena "Customer Facilitated Cost - Based Scheduling in Cloud," International Conference on Information and Communication Technologies (ICICT 2014), pp. 660-667, 2014.
7. EllendulaMadhukara and ThirumalaisamyRagunathanb "Efficient Scheduling Algorithm for Cloud," 2nd International Symposium on Big Data and Cloud Computing (ISBCC'15), pp. 353-356, 2015.
8. Fabien Heliot, Muhammad Ali Imran, and Rahim Tafazolli "Energy Efficiency based Resource Allocation for the Scalar Broadcast Channel" IEEE Wireless Communications and Networking Conference, 2012.
9. FarrukhShahzad "State-of-the-art Survey on Cloud Computing Security Challenges Approaches and Solutions" The 6th International Symposium on Applications of Ad hoc and Sensor Networks (AASNET'14), pp. 357-362, 2014.

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

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 2, February 2016

10. HamdiKachou, ZiedKechaou and Adel M. Alimi "Towards an Offloading framework based on Big Data Analytics in Mobile Cloud Computing Environments," INNS Conference on Big Data, Vol. 53, pp. 292-297, 2015.
11. HebaKurdi and Ebtehal T. Alotaibi "A Hybrid Approach for Scheduling Virtual Machines in Private Clouds," The 9th International Conference on Future Networks and Communications (FNC-2014), pp. 249-256, 2014.
12. Jianwu Wang, PrakashanKorambath, IlkayAltintas, Jim Davis and Daniel Crawl "Workflow as a Service in The Cloud: Architecture and Scheduling Algorithms," 14th International Conference on Computational Science(ICCS-2014*)*, Vol. 29, pp. 546-556, 2014.
13. KooroshGoodarzi and Abbas karimi "Cloud Computing Security by Integrating Classical Encryption," International Conference on Robot Pride 2013-2014 - Medical and Rehabilitation Robotics and Instrumentation, ConfPRIDE 2013-2014, pp.-320-326, 2013-2014.
14. KlavdiyaBochenina "A Comparative Study of Scheduling Algorithms for the Multiple Deadline Constraint workflows in Heterogeneous Computing Systems with the Time Windows," 14th International Conference on Computational Science(ICCS2014),Vol. 29, pp. 509-522,2014.
15. Lo'aiTawalbeh, Nour S. Darwazeh, Raad S. Al-Qasaas, and Fahd AlDosari "A Secure Cloud Computing Model based on Data Classification," First International Workshop On Mobile Cloud Computing Systems, Management and Security (MCSMS-2015),Vol. 52, pp. 1153-1158, 2015.
16. Monir Abdullah and Mohamed Othman "Cost-Based Multi-QoS Job Scheduling using Divisible Load Theory in Cloud Computing" International Conference on Computational Science (ICCS-2013*)*, Vol. 18, pp. 928-935, 2013.
17. MuhannadQuwaider, YaserJaraweh, Mahmoud Al-Alyyoub and Rehab Duwairi "Experimental Framework for Mobile Cloud Computing System," First International Workshop on Mobile Cloud Computing Systems, Management and Security (MCSMS-2015*)*, Vol. 52, pp. 1147-1152, 2015.
18. Muhammad H. Raza, Adewale Femi Adenola, Ali Nafareih, and William Robertson "The Slow Adoption of Cloud Computing and IT Workface," 3rd International Workshop on Survivable and Robust Optical Networks (IWSRON*)*, Vol. 52, pp. 1114-1119,2015.
19. Pratik P. Pandya and Hitesh A. Bheda "Dynamic Resource Allocation Techniques in Cloud Computing,"International Journal of advance Research in Computer Science and Management Studies,Vol. 2, Issue-1, 2014.
20. RizwanaShaikh and M. Sasikumar "Data Classification for Achieving Security in Cloud Computing," Procedia Computer Science 45, pp. 493-498, 2015.
21. RizwanaShaikh and M. Sasikumar "Trust Model for Measuring Security Strength of Cloud Computing Service," International Conference on Advanced computing Technologies and Applications (ICACTA-2015),Vol. 45, pp. 380-389, 2015.
22. R. Buyya, C.S. Yeo and S. Venugopal "Market-Oriented Cloud Computing: Vision, Hype and Reality for Delivering it Services As Coputing Utilities," IEEE International Conference High Performance Computing And Communication (HPCC'08),pp. 5-13, 2008.
23. Sanjaya K. Pandya, Indrajeet Gupta, and Prasanta K. Jana "Allocation Aware Task Scheduling for Heterogeneous Multi-Cloud Systems," 2nd International Symposium on Big Data cloud Computing (ISBCC'15*)*, Vol. 50, pp. 176-184, 2015.
24. Saravana Kumar N, Rajya Lakshmi G.V, and Balamurugan B "Enhanced Attribute Based Encryption for Cloud Computing," International Conference on Information and Computational Technologies (ICICT 2014),Vol. 46, pp. 689-696, 2014.
25. Saravana Kumar N, Rajya Lakshmi G.V, and Balamurugan B "Enhanced Attribute Based Encryption for Cloud Computing," International Conference on Information and Computational Technologies (ICICT 2014),Vol. 46, pp. 689-696, 2014.