International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET229459

A New Hybrid TLPD Algorithm for Task Scheduling in Cloud Computing

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Article Info
Volume 9, Issue 4
Page Number : 460-467

Publication Issue :
July-August-2022

Article History
Accepted : 05 August 2022
Published: 16 August 2022

ABSTRACT

In this paper we have designed the hybrid approach of combination of credit based task length & priority algorithm and credit based deadline algorithm as well as compare the results with FCFS, SJF and task length & priority scheduling algorithms. When we use the credit based task length & priority scheduling algorithm to schedule the task without knowing the deadline of the task, it will cause the dead of the least deadline task. The deadline credit is also included so that assigning number of resources to the tasks in such a way that there will be maximum resource utilization and minimum processing time achieved. This paper presents the simulation results of the proposed methodology implemented with the help of Cloudsim and Net beansIDE8.0 and analysis of results.

Keywords: Task length & Priority, Hybrid TLPD, FCFS, SJF, Cloudsim

I. INTRODUCTION

Cloud computing is a distributed computing environment that provides on demand services to the users for deploying their computational needs in a virtualized environment without the knowledge of technical infrastructure [1].

Resource Allocation strategy (RAS) in the cloud is all about the scheduling of tasks or requests by cloud provider in such a manner to balance the load over all the servers and provide high Quality of Service to clients. It also includes the time required to allocate the resources and the resources available. The main aim is to improve the utilization of resources and complete the entire request within the deadline and with least execution time [1].

In this paper we describe in Section 1 Introduction Section 2 Concept of scheduling Section 3 Simulation Tool Section 4 Traditional task scheduling algorithm Section 5 Proposed Hybrid TLPD Scheduling Algorithm Section 6 QOS parameters Section 7 Simulation Setup Section 8 Results and Analysis, section 9 Conclusion, Section 10 Acknowledgement, and Section 11 References.

II. CONCEPT OF SCHEDULING

The key aim of scheduling is to optimize resource efficiency while minimizing the effect on cloud resources. Currently, cloud computing uses the internet to provide complex services such as software, data, memory, bandwidth, and IT services. The dependability and efficiency of cloud services are influenced by a number of factors, including task scheduling. Scheduling can take place at the job, resource, or workflow stage. Scheduling is done based on a number of criteria in order to maximize overall cloud performance [3].

The main focus of this paper is on cloud resource scheduling. Users request services on demand, and the cloud provider is responsible for allocating the necessary resources to the customer in order to prevent Service Level Agreement violations (SLA). The Task Scheduling process instructs the scheduler to obtain tasks from users and requests information from the cloud information service (CIS) on available resources and their assets. The scheduler schedules user-submitted jobs on different resources according to the availability of resources and the Task Scheduling algorithm. The cloud scheduler is in charge of assigning multiple virtual machines (VMs) to various tasks.

I.SIMULATION TOOL

Cloudsim is a simulation program that allows you to conduct cloud computing experiments. CloudSim is a simulation framework that allows for seamless cloud computing and application service modeling, simulation, and experimentation. CloudSim also helps you to model cloud system components like data centres, virtual machines (VMs), and resource allocation policies, as well as their system and behaviour. Cloudsim uses generic device provisioning strategies that are simple to extend and require little effort. The datacenter, which acts as the cloud's backbone and includes a variety of hosts and virtual machines, is depicted in the diagram below(s) [5].

II.TRADITIONAL TASK SCHEDULING ALGORITHMS

(A) First Come First Serve Algorithm: FCFS is a cloud resource-saving scheduling policy that is quick, reliable, and error-free. It employs nonpreemptive scheduling, in which tasks are automatically queued and distributed in response to incoming requests. [8].

(B) Shortest Job First Scheduling Algorithm: Tasks are sorted based on their priority. Priority is given to tasks based on tasks lengths and begins from (smallest task = highest priority). Jobs are queued in order of execution time, with the shortest execution time placed first and the longest execution time placed last and given the lowest priority. [9].

(C) Task Length & Priority Algorithm: The credit based method takes into account two factors: task length and user priority. The credit scheme is used in the algorithm. Each assignment is given a credit depending on the duration and priority of the task. These credits will be taken into account when the job is scheduled. The final step in the algorithm is to find out the total credit based on task length and task priority. Finally task having highest credit will be scheduled first. But this scheduling algorithm based on task length and task priority has the problem of treating tasks with similar priority with similar credits [10].

III. PROPOSED HYBRID TLPD SCHEDULING ALGORITHM & FLOWCHART

Algorithm Hybrid TLPD

- Initialize the Cloudsim package by creating the datacenter, broker, virtual machines and cloudlets
- Initialize the virtual machines list
- Initialize the task list.
- Sort the virtual machines using QOS parameters (MIPS and Granulaity size).
- Sort the task list using priorities calculated using credits by using following procedure:
- In this credit to task is assigned using 3 parameters which are credits based on task length, priority of the task, deadline of the task.

Total_Credit$_i$ = Credit_Length$_i$ * Credit_Priority$_i$ * Credit_deadline$_i$

Procedure 1: Credit based on Length of task[8]

For all requested tasks in the set; Ti

Task_length_difference (*TLD*) = absolute_value (average_length – task_length)

If $TLD_i \le$ value1

then credit =5

else if value1 < $TLD_i \le$ value2

then credit =4

else if value2 < $TLD_i \le$ value3

then credit =3

else if value3 < $TLD_i \le$ value4

then credit =2

else value4 > TLD_i

then credit =1

End For

where

value1=high_len / 5;

value2=high_len / 4;

value3=value2+value1;

value4=value3+value2;

Procedure 2: Priority credits assigning to task [8]

For all requested tasks in the set: Ti

Find out highest priority task (Priority_Number)

Choose division_factor_value

For priority of each task (Tpri)

Calculate Pri_frac$_i$=Tpri /division_factor

Set priority credit as Pri_frac

End For

End For

Procedure 3: Deadline of the task

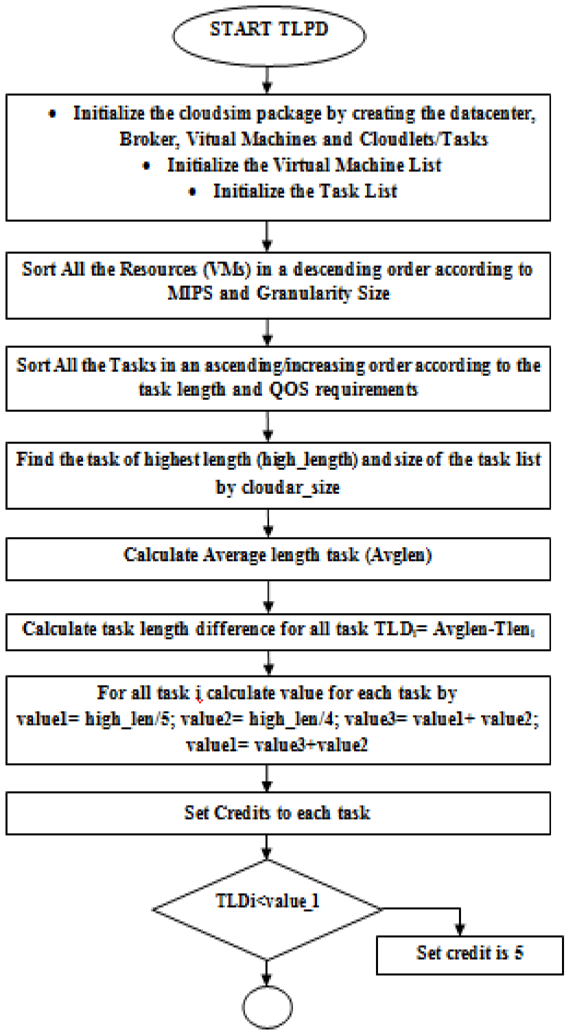
For all requested tasks in the set; Ti

Find out MAXMIPS of the VM from the virtual machine list

Deadline_Taski = (Credit_Lengthi * Credit_Priorityi) / MIPSMAX

Calculate Total_Credit$_i$ = Credit_Length$_i$ * Credit_Priority$_i$ * Credit_deadline$_i$

End For



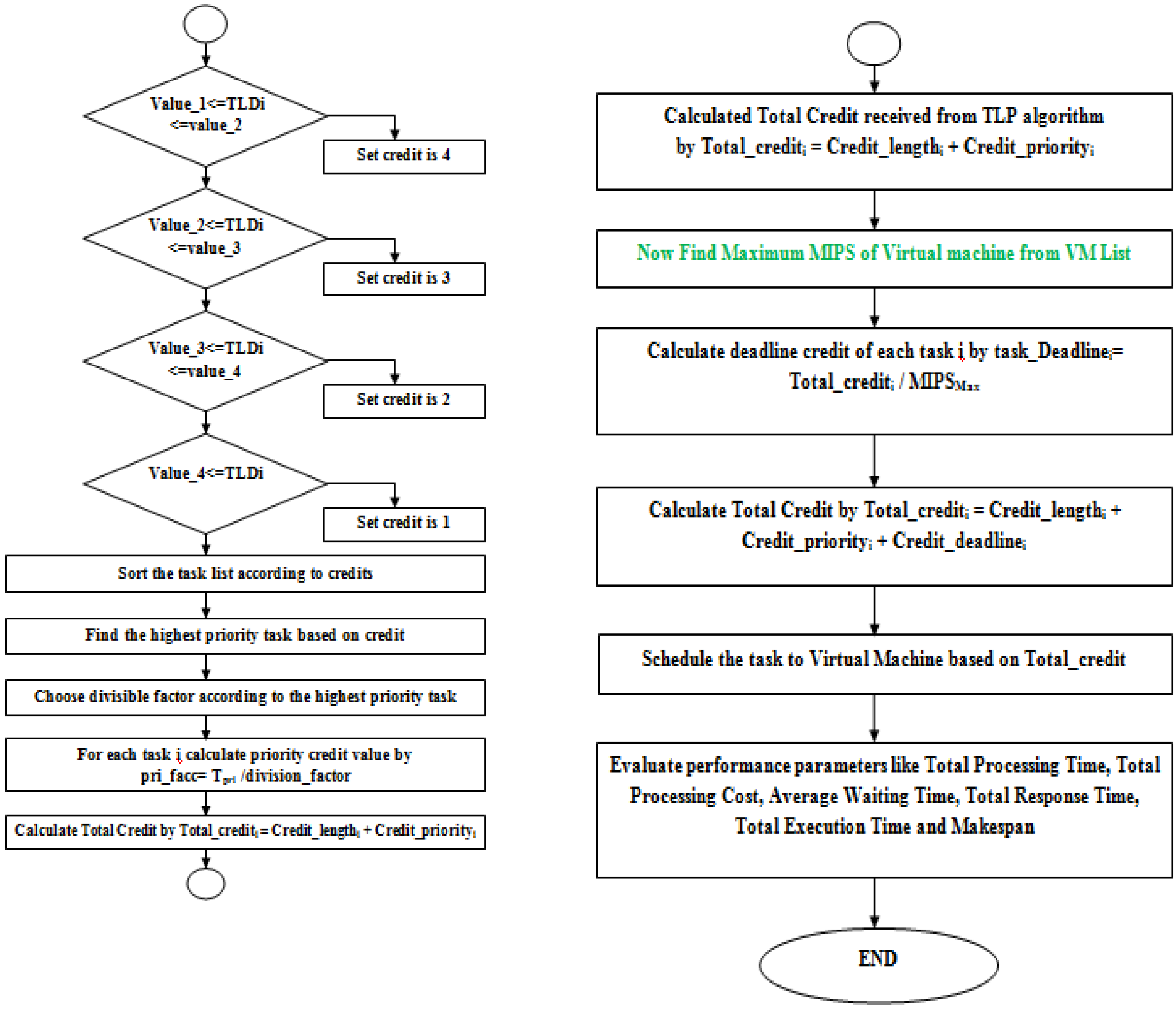


Figure 1 : Flowchart of proposed Hybrid Task length, Priority and Deadline scheduling algorithm (TLPD)

IV.QOS PARAMETERS

In this paper I have considered Makespan QOS parameter in analyzing the performance of scheduling algorithms. Makespan: The amount of time, from start to finish for completing a set of tasks. The makespan is the maximum time to complete all jobs. For better performance of the system makespan of scheduler must be minimum. A good scheduling algorithm always tries to reduce the Makespan.

$$\textbf{Makespan} = \textbf{CTn}$$

V. SIMULATION SETUP

The configuration of host contains 5 numbers of Hosts, size/processing speed is 5000 (in MIPS), RAM is 5048 (in MB). Configuration of virtual machine contains varying number of virtual machines from 5, 10, 20, 25 and 30 implemented respectively for varying number of cloudlets 30, 50, 100, 150, 200. The details of general simulation parameter are depicted in Table I.

Finding QOS parameter is Makespan. The experimental data are shown in tables as well as graphs.

TABLE I SIMULATION PARAMETER VALUES

S.No.	Parameter	Value
A		
1	Data center architecture	X86
2	Data center OS	Linux
3	VMM	Xen
B		
1	No of Hosts	5
2	MIPS	5000 (in mips)
3	RAM	5048 (in MB)
4	Storage	1000000 (in MB)
5	Bandwidth	500000 (in mbps)
C		
1	No of VMs	5, 10, 20, 25, 30
2	Size/speed of processing	10000 (in mips)
3	MIPS	250 (in mips)
4	RAM	256 (in MB)
5	Bandwidth	1000 (in mbps)
6	No of PEs	1
D		
1	No of Cloudlets	30, 50, 100, 150, 200
2	Length	5000-10000 (in MIs)
3	File Size	100-1000 (in MB)
4	Output Size	300 (in MB)
5	No of PEs	1

VI.RESULT AND ANALYSIS

This section presents the simulation results of the proposed methodology implemented with the help of Cloudsim and Net beansIDE8.0. In this paper, we tested and evaluated the traditional and proposed algorithms using different scenarios where varying number of cloudlets (jobs/tasks) are mapped to varying number of virtual machines (VMs). The performance of the proposed algorithms (TLPD) is evaluated against the traditional algorithm FCFS, SJF and Task Length & Priority and the comparative analysis is described.

When number of virtual machines are 5, 10, 20, 25 and 30 and number of cloudlets are 30, 50, 100, 150, 200 assigned respectively. Evaluating Parameter is Makespan.

TABLE 2: COMPARISON OF HYBRID TLPD SCHEDULING ALGORITHM WITH TRADITIONAL ALGORITHMS IN DIFFERENT SCENARIOS-EVALUATING PARAMETER MAKESPAN

Makespan				
Dataset	FCFS	SJF	Priority	Proposed Hybrid TLPD
[30,5]	405.63	405.64	405.88	405.65
[50,10]	996.31	910.41	888.07	806.85
[100,20]	3288.73	4640.97	4158.03	3013.09
[150,25]	6090.75	6670.7	7618.01	5147.34
[200,30]	10145.46	9643.88	9027.98	7612.7

This table shows the resultant values of the proposed algorithm Hybrid TLPD and traditional algorithms FCFS, SJF and task length & priority. The table contains different datasets of cloudlets and virtual machines.

The performance analysis is further illustrated using two different Line chart and PIE chart graphically:

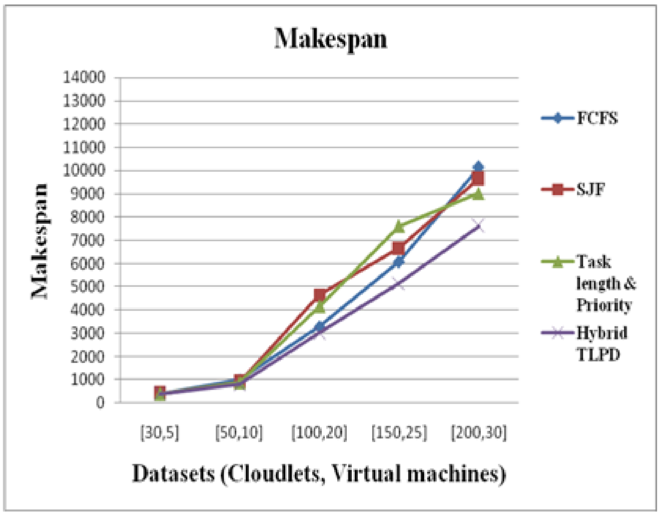


Figure 2 Comparison of Hybrid TLPD Scheduling Algorithm with Traditional Algorithms - Makespan

In this graph, cloudlets number and virtual machines is represented in the X-axis. In the Y-axis Makespan of cloudlets is represented. From the analysis of the resultant graph it is cleared shows that the proposed approach performs better result at each steps and evaluated result shows minimum Makespan at different scenarios.

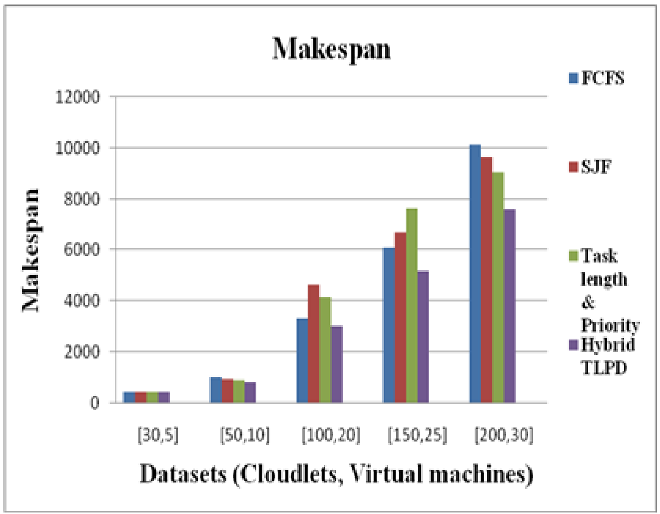


Figure 3 Comparison of Hybrid TLPD Scheduling Algorithm with Traditional Algorithms - Makespan

In this graph we have analyzed that in TLPD algorithm where we have proposed a hybrid approach with adding the concept of deadline constraints in traditional TLP algorithm, we have found the minimum Makespan compared with TLP algorithm and other traditional algorithms.

III.CONCLUSION

In this paper, traditional and proposed scheduling algorithms are presented. The traditional algorithms we analyzed the FCFS, SJF and task length & priority in different scenarios. The proposed hybrid approach works on both task length & priority and task deadline (Hybrid TLPD). From the results it is concluded that, the proposed hybrid TLPD algorithm works efficiently than the other traditional methods. Makespan of the task are lesser when compared with the other algorithms. In future we can add load balancing method for getting more efficient of resources allocation and resources utilization.

IV. ACKNOWLEDGMENT

The Research Scholar is thankful to the Department of Computer science, Jagannath University, Jaipur, Rajasthan, India for providing research facilities and their faculty for being the constant source of inspiration. I would like to thank my Supervisor Prof. (Dr.) Y.C. Bhatt and my Joint Supervisor Prof. (Dr.) Y. S. Shishodia for his valuable support during the preparation of this paper. I am also thankful to my parents Srimati Nirmala Devi and Shri Mohan Lal Shrimal and my wife Ms. Neha Shrimal for their support in my whole work.

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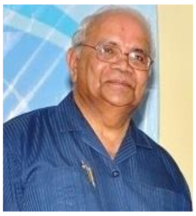

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Cite this article as :

Vijay Mohan Shrimal, Prof. (Dr.) Y. C. Bhatt, Prof. (Dr.) Y. S. Shishodia, " A New Hybrid TLPD Algorithm for Task Scheduling in Cloud Computing, International Journal of Scientific Research in Science, Engineering and Technology(IJSRSET), Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 9, Issue 4, pp.460-467, July-August-2022. Available at doi : https://doi.org/10.32628/IJSRSET229459
Journal URL : https://ijsrset.com/IJSRSET229459