INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume3, Issue4)
Available online at www.ijariit.com

Task Scheduling in Cloud Computing

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Abstract: ***Cloud computing is a new class of network based computing that provides the customers with computing resources as a service over a network on their demand. Cloud computing offers scalability, availability and different services as important benefits. Cloud provides the services to the organizations like storage, applications, and servers. Cloud computing is in demand and pays per use service. The unique concept of cloud computing creates new opportunities for Business and IT enterprises to achieve their goals. In cloud computing, usually, there are a number of jobs that need to be executed with the available resources to achieve optimal performance, least possible total time for completion, less processing cost, short average waiting time, shortest response time, and efficient utilization of resources etc. To accomplish these goals and achieve high performance, it is important to design and develop a multi objective scheduling algorithm. Hence, it is most challenging to schedule the tasks along with satisfying the user's Quality of Service requirements.***

Keywords: ***Cloud Computing, Software as a Service, Virtual Machine, Processing Cost, Quality of Service.***

I. INTRODUCTION

Cloud computing is a way to use the Internet in the daily life from your PC and Laptop. Cloud Computing came into action to know what happens when our data is moved to the internet that is in the cloud [11]. Cloud computing is a paradigm of appropriated computing to give the clients on-demand, utility based computing administrations. Cloud clients can give more reliable, accessible and refreshed administrations to their customers thus. Cloud itself consists of physical machines in the data focuses of cloud suppliers. Virtualization is given on top of these physical machines. These virtual machines are given to the cloud clients. Distinctive cloud supplier gives cloud administrations of various abstraction levels. E.g. Amazon EC2 empowers the clients to deal with low-level detail elements where Google App-Engine gives an improvement stage to the designers to create their applications. So the cloud administrations are isolated into many sorts of Software as a Service, Platform as a Service or Infrastructure as a Service. These administrations are accessible over the Internet in the entire world where the cloud goes about as the single purpose of access for serving all clients. Cloud computing architecture addresses challenges of vast scale data processing.

Cloud computing comes in three forms: public clouds, private clouds, and hybrids clouds. There are three sorts of partner's cloud suppliers, cloud clients, and the end clients. Cloud suppliers give cloud administrations to the cloud clients. These cloud administrations are of the type of utility computing i.e. the cloud clients utilize these administrations pay-as-you-go model. The cloud clients build up their item utilizing these administrations and convey the item to the end clients. The cloud service creator defines the services that they want to offer in the cloud computing space, which could Software as a Service environment.

The main two problems in computing are a resource. Cloud computing provides three types of service models. "Software as a service, platform as a service and infrastructure as a service [12]". Generally, task scheduling is the main process in infrastructure as a service model. While scheduling the task we consider virtual machines as scheduling machines. The main aim of task scheduling algorithms in a cloud environment is to maintain the correct load on processors. After studying and analyse the processing time of various low-level scheduling algorithms, an improved task scheduling is developed using quality of service parameters of resource nodes and priorities of the task. In order to achieve efficient consumption of cloud resources, the load balancing problem is solved by using adaptive load balancing algorithm. The evaluation parameters considered in the work includes total processing cost, average waiting time and total processing time.

II. RELATED WORK

[1] Wang L, von Laszewski G, Kunze M, Tao J. [2010], We have so many existing algorithms which deal with task scheduling but these algorithms do not deal with network band width. Wang et al proposed a "multidimensional task scheduling algorithms

according to the availability of CPU memory but does not consider about the network bandwidth and the main defect with this type of scheduling is it does not consider the dynamic change of resource requirement".

[2] Pandey S, Barker A, Gupta KK, Buyya R. [2010] In this the cost-based algorithm for the task scheduler that measures both source costs and computing performance and improves the rate of calculations. After summarizing the works done by usual cloud computing algorithms, it is the turn of heuristic algorithms. ACO and Simulated. Annealing optimization methods together with the classic methods, we have demonstrated considerable access.

[3] Wang C, Wang C, Yuan Y. [2011] a fusion algorithm is combined with the proposed in two-stages. The first stage is the same genetic algorithm stops after the last iteration, where the final product was obtained as an input to the second algorithm (fusion). Some of the other studies consider the network bandwidth but this does not consider the limitations of CPU and memory resources.

[4] Rizvi, Syed, Abdul Razaque, and Katie Cover [2015] in this growing market of business and organization, cloud computing is the alternative for their day-by-day increasing needs. A Cloud provider first constructs a computing system called cloud in this we have several virtual machines interconnected through this the provider processes the task of the users. "Cloud computing is not a well-behaved model for providing wanted, user- required, flexible access to a shared pool of configurable computing resources that can be quickly provided and released with low care effort or service are going to study the divisible task scheduling of high-performance computing algorithms"

[5] Yatendra et al. [2013], proposed a dynamic think about and adjusted calculation that takes a shot at element edge values [27]. The strategy is a calculation utilizes stack adjusting and the combination of server strategies. In the strategy, the asset utilization is noted and at whatever point required process is moved so that the stack get adjusted and therefore limiting the power utilization.

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[10] Abdul Razaque, Nikhileshwara Reddy Vennapusa, Nisargkumar Soni, Guna Sree Janapati and Akhilesh Reddy Vangala In this paper, we introduce an efficient task-scheduling algorithm, which presents divisible task scheduling by considering network bandwidth. By this, we can allocate the workflow based on the availability of network bandwidth. Our proposed task-scheduling algorithm uses a nonlinear programming model for divisible task scheduling, which assigns the correct number of tasks to each virtual machine. Based on the allocation, we design an algorithm for divisible load scheduling by considering the network bandwidth.

III.PROBLEM FORMULATION

There are numerous algorithms for scheduling available that are utilized in the environment of cloud computing for better resource scheduling. Scheduling is assigning fundamentally a number of resources to the tasks in a manner that there will be maximum utilization of a resource, the minimum time for total processing and minimum time of waiting. The traditional or any rule-based scheduling algorithms are widely used on cloud computing systems because they are simple and easy to implement, even provide an optimal solution for scheduling problem, but they are all suffered from the fact of not being able to find the optimal solution in a reasonable time, for too complex or large problems. Job scheduling is a procedure of mapping from tasks of users to the suitable resources selection and its execution also.

Job scheduling is convenient and flexible. Jobs and streams of job could be scheduled for running at whatever point needed, taking into account priorities, needs, and functions of the business. The processes and streams of job can set up day by day, week after week, month to month and yearly ahead of time, and the jobs which are run on-demand with no requirement for assistance from the staff of support. The goals of task scheduling Cloud computing are to offer scheduling of tasks which is optimal for users and offer the Quality of Service and throughput of entire system of cloud at the same time

IV.METHODOLOGY

- Study various low-level algorithms in cloud computing like FIFO, SJF and analyze their processing times.
- Develop an improved scheduling using QOS parameters for the virtual machine. In this, tasks are scheduled using the priorities which are calculated using weights assigned to each task and virtual machines are sorted using BW.
- After that, the tasks are mapped to virtual machines using some grouping factor in order to optimize the processing and average waiting time.

  The process of allocation will have following procedure:
  - Initialize the Cloudsim package by creating the data center, broker, virtual machines, and cloudlets.
  - Initialize the virtual machines list.
  - Initialize the task list.
  - Sort the virtual machines using QOS parameters (BW).
  - Sort the task list using priorities calculated using weights by using this procedure: (In this credit to task is assigned using 2 parameters which are weights based on task length difference, the priority of the task.)
  - Assigning the task to the virtual machines in groups. Like if there are 30 tasks and we have 10 virtual machines the assigning each virtual machine 3 tasks.
  - This process of allocation will be repeated for all tasks.

- Load balance of virtual machines is acquired by firstly mapping tasks to VM's and after that all the VM to resources which are the host, utilizing the method System Load balancing which is task based. This algorithm guarantees the load balancing of the system by the means of transferring extra tasks only from a VM which is overloaded rather than migration of the whole overloaded VM.
- Scheduling Strategies Considering Parameters are:
  Processing Time

$$Processing_{time} = cloudlet_{length} / vm_{MIPS} * no\_ofPES$$

Processing Cost

$$Processing_{cost} = Datacenter_{costpermemory} * VM_{Ram}$$

Average Waiting Time

$$Waiting_{time} = \sum_{i=1}^{no\ of\ cloudlets} cloudlet_i.waitingtime()$$

V. RESULTS

Figure 1 shows the Total Processing Time comparison of Existing Model and Implemented Model. In this scenario, the inputs given are Datasets which include the number of cloudlets mapped to the number of virtual machines and the data of total processing time of Existing and Implemented Models.

FIGURE 2 SHOWS THE TOTAL PROCESSING COST COMPARISON OF EXISTING MODEL AND IMPLEMENTED MODEL.

Datasets	[5,15]	[8,25]	[5,30]	[10,50]
Existing	481.015	985.241	1427.84	3046.02
Implemented	476.464	973.216	1397.378	2964.784

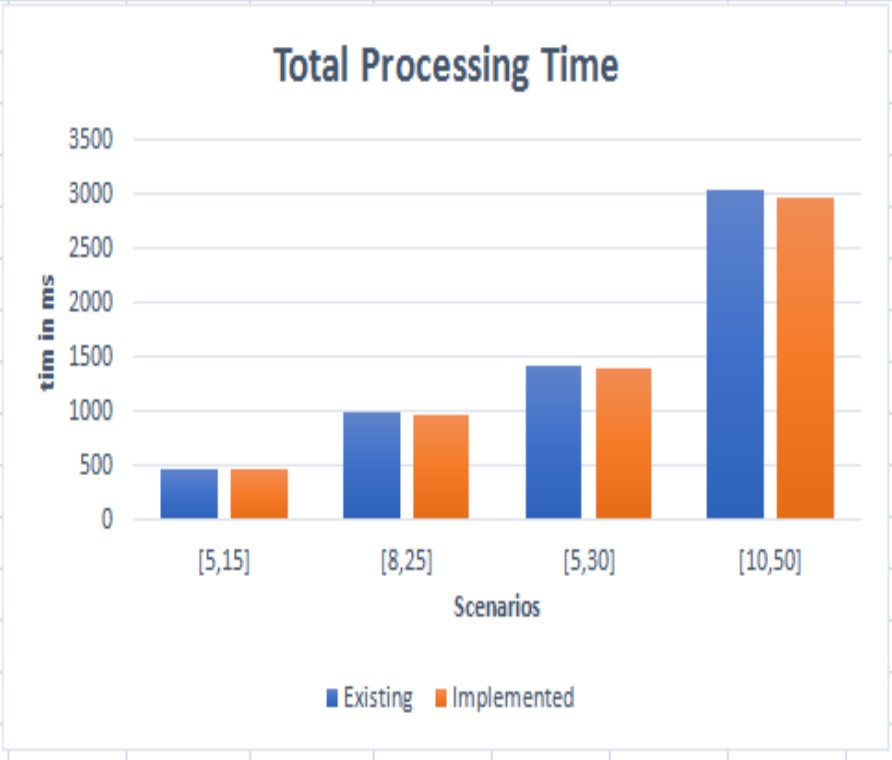

Fig. 1 Total Processing Time in Existing Model v/s Implemented Model

Datasets	[5,15]	[8,25]	[5,30]	[10,50]
Existing	454.464	926.135	824.579	1983.48
Implemented	387.036	765.679	752.811	1662.913

Fig. 2 Total Processing Cost in Existing Model v/s Implemented Model

In this scenario, the inputs given are Datasets which include the number of cloudlets mapped to the number of virtual machines and the data of total processing cost of Existing and Implemented Models.

Figure 3 shows the Average Waiting Time comparison of Existing Model and Implemented Model. In this scenario, the inputs given are Datasets which include the number of cloudlets mapped to the number of virtual machines and the data of average waiting time of Existing and Implemented Models.

Datasets	[5,15]	[8,25]	[5,30]	[10,50]
Existing	0.5803	0.5471	0.5241	0.47244
Implemented	0.2161	0.252	0.1865	0.2958

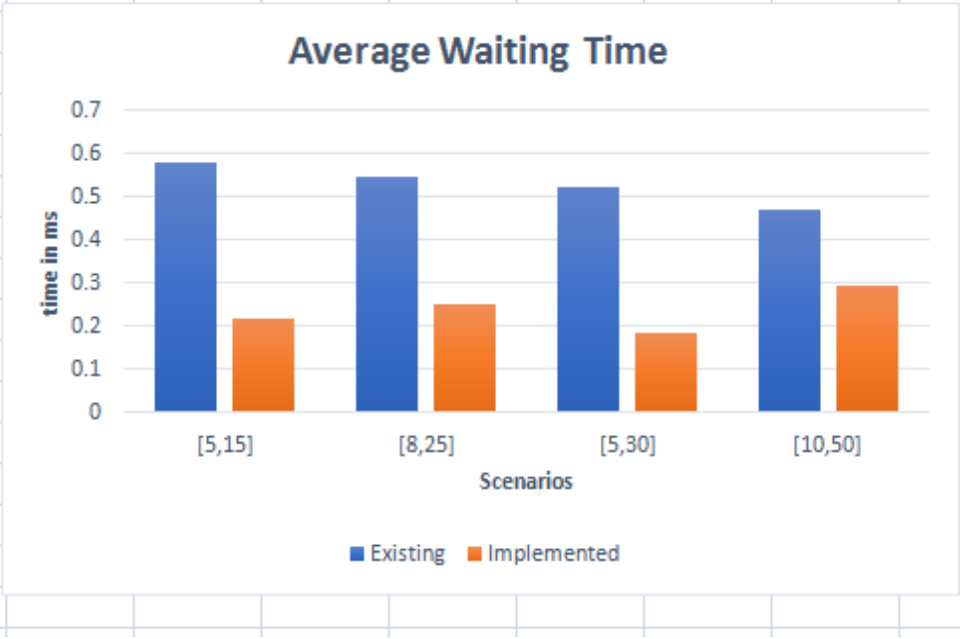

Fig. 3 Average Waiting Time in Existing Model v/s Implemented Model

CONCLUSIONS

In this research work, credit based adaptive load balancing task scheduling is emphasized and to achieve the scheduling problem solution, a credit based scheduling algorithm based on length and priority is proposed considering the user's Quality of Service requirements. In addition to this, the paper aims to achieve load balancing on VMs and improved resource utilization. The evaluation parameters considered in the work includes total processing cost, average waiting time and total processing time.

The work can be further extended in future aiming to achieve more efficient performance results. The proposed work is using Load balancing with the scheduling algorithm. In future work, resource allocation can be performed with the improved versions and evolutionary algorithms. In additions to this, the proposed system can be further implemented in real time scenario.

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